

Main Catalog | 2010



Industrial PC  
Embedded PC

**IPC**

**I/O**

Bus Terminal  
EtherCAT  
Fieldbus Box  
Lightbus  
PC Fieldbus Cards,  
Switches



TwinCAT  
**Automation**

**Motion**

Drive Technology



IPC



**42** **Industrial PC, Control Panel**  
PC Control for all applications



**246** **Embedded PC**  
Modular DIN rail IPCs and Industrial Motherboards

IPC

I/O

**348** **Fieldbus Components**  
I/Os for all common fieldbus systems



**358** **Bus Terminal**  
The modular fieldbus system for automation



**642** **EtherCAT, EtherCAT Terminal**  
Ultra high-speed communication



**840** **Fieldbus Box, EtherCAT Box**  
The compact IP 67 modules



**1012** **Lightbus**  
The fast fibre optic fieldbus



**1038** **PC Fieldbus Cards, Switches**  
The intelligent interface generation

I/O

Motion



**1066** **Drive Technology**  
The drive system for high dynamic positioning tasks

Motion

Automation



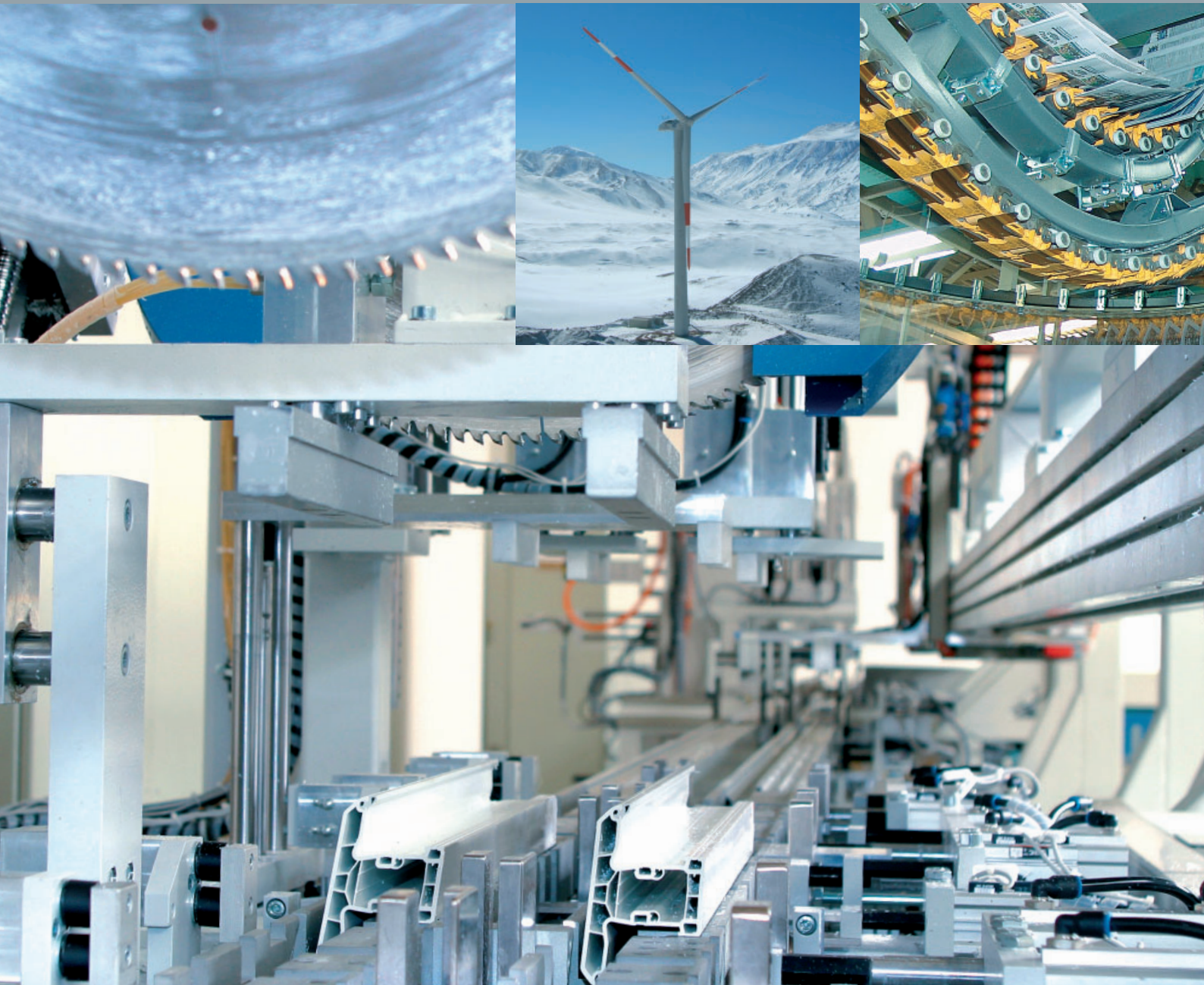
**1132** **TwinCAT**  
PLC and Motion Control on the PC

Automation



**1184** **Support, Service, Training**

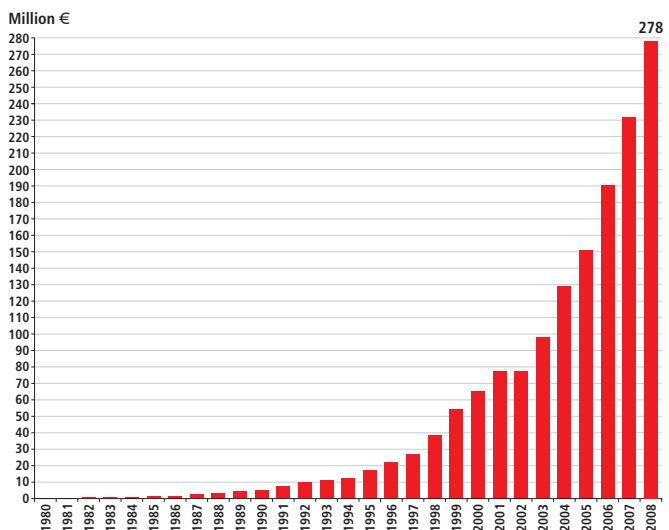
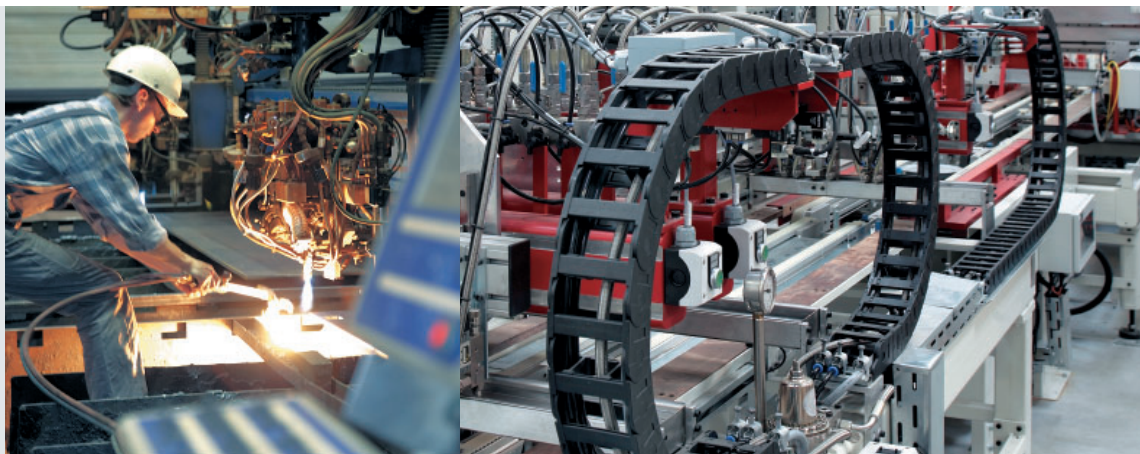
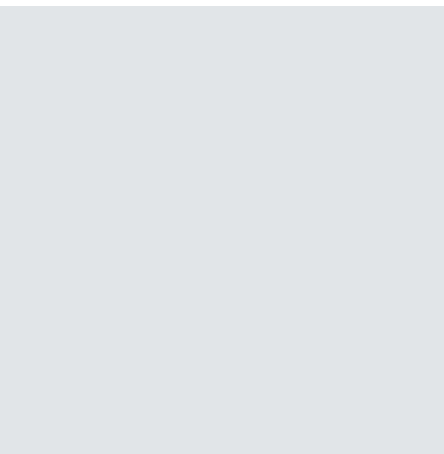
# New Automation Technology



Beckhoff implements open automation systems based on PC Control technology. The product range covers Industrial PCs, I/O and Fieldbus Components, Drive Technology and automation software. Products that can be used as separate components or integrated into a complete and seamless control system are available for all industries. The Beckhoff "New Automation Technology" philosophy represents universal and open control and automation solutions that are used worldwide in a wide variety of different applications, ranging from CNC-controlled machine tools to intelligent building automation.

**Worldwide presence on all continents**

The central divisions of Beckhoff, such as development, production, administration, distribution, marketing, support and service are located at the Beckhoff Automation GmbH headquarters in Verl, Germany. Rapidly growing presence in the international market is taking place through subsidiaries in Austria, Belgium, Denmark, Finland, France, Italy, Norway, Poland, Russia, Slovenia, Spain, Sweden, Switzerland, Turkey, as well as in Australia, Brazil, Canada, China, India, South Africa, the United Arab Emirates and the USA. Through worldwide co-operation with partners, Beckhoff is represented in more than 60 countries.



- Beckhoff Automation**
- Headquarters Verl, Germany
  - Staff worldwide: **1,220** (as of 10/2009)
  - Sales/Technical Offices Germany: **9**
  - Subsidiaries/Branch Offices worldwide: **23**
  - Distributors worldwide: **in more than 60 countries**

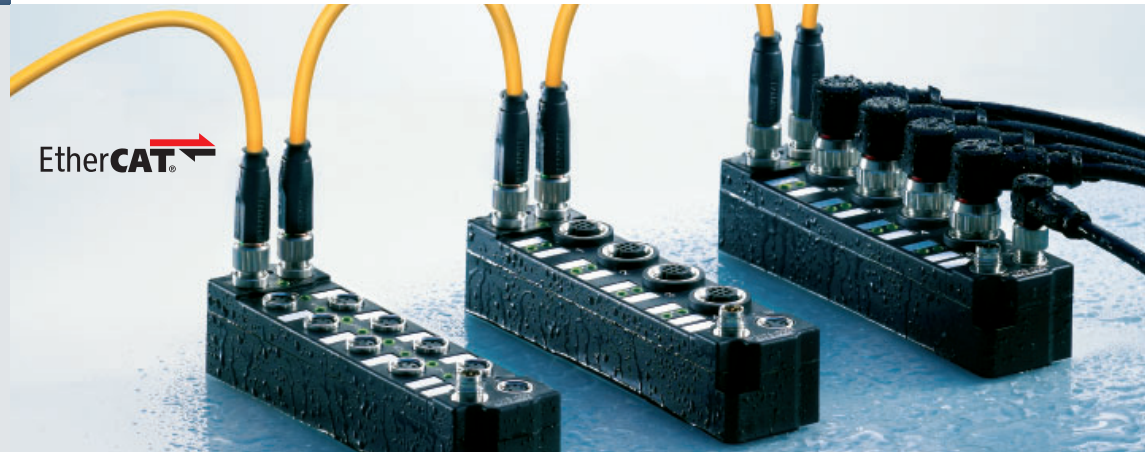
Turnover development

# PC-based control technology



Since the foundation of the company in 1980, continuous development of innovative products and solutions using PC-based control technology has been the basis for the continued success of Beckhoff. Many automation technology standards that are taken for granted today were conceptualised by Beckhoff at an early stage and successfully introduced to the market.

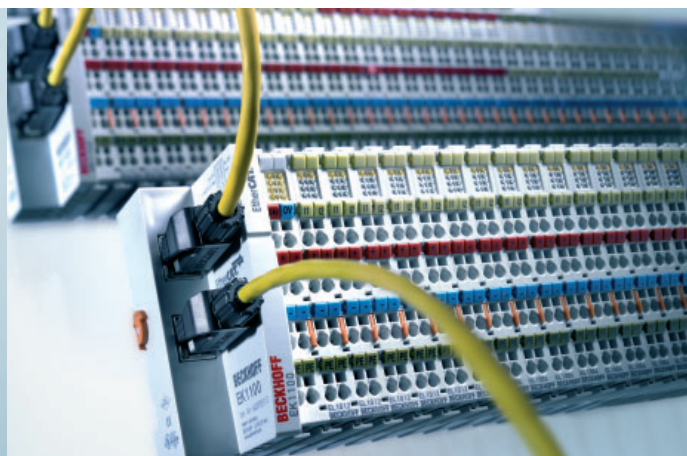
The Beckhoff PC Control philosophy and the invention of the Lightbus system, the Bus Terminals and TwinCAT automation software represent milestones in automation technology and have become accepted as high-performance alternatives to traditional control technology. EtherCAT, the real-time Ethernet solution, makes forward-looking, high-performance technology available for a new generation of leading edge control concepts.



**1982:** P1000 – single-board motion controller  
**1986:** PC Control – first PC-based machine controller  
**1988:** S1000 – software PLC/NC on PC (DOS)  
**1989:** Lightbus – high-speed fieldbus utilising optical fibre  
**1990:** All-in-one PC motherboard  
**1995:** Bus Terminal – fieldbus technology in terminal block format  
**1996:** TwinCAT – real-time software package under Windows with PLC and Motion Control functions

**1998:** Control Panel – remote IPC Control Panels  
**1999:** Fieldbus Box – the I/O system in IP 67  
**2002:** CX1000 – modular Embedded PCs for DIN rail mounting  
**2003:** EtherCAT – real-time Ethernet fieldbus system  
**2005:** TwinSAFE – safety solution for the Bus Terminal system  
**2005:** AX5000 – EtherCAT Servo Drive  
**2007:** Industrial Motherboards – Made in Germany  
**2008:** XFC – eXtreme Fast Control Technology

# IPC, I/O, Motion and Automation



## Beckhoff | The IPC Company

Beckhoff supplies the right Industrial PC for every application. High-quality components based on open standards and the rugged construction of the device housings mean that the Industrial PCs are ideally equipped for all control requirements. Embedded PCs make modular IPC technology available in miniature format for DIN rail mounting. In addition to their application in automation, Beckhoff Industrial PCs are also ideally suited to other kinds of tasks – wherever reliable and robust PC technology is required.

## Beckhoff | The I/O Company

Beckhoff has the right technology for every signal and every fieldbus. Beckhoff supplies a complete range of Fieldbus Components for all common I/Os and fieldbus systems. With the Bus Terminals in protection class IP 20, and the Fieldbus Box modules in IP 67, a complete range is available for all important signal types and fieldbus systems. In addition to conventional bus systems, Beckhoff offers a complete EtherCAT I/O range for the high-speed Ethernet fieldbus based on EtherCAT Terminals and the EtherCAT Box.



### Beckhoff | The Motion Company

In combination with the Motion Control solutions offered by the TwinCAT automation software, Beckhoff Drive Technology represents an advanced and complete drive system. PC-based control technology from Beckhoff is ideally suited for single and multiple axis positioning tasks with highly dynamic requirements. The AX5000 Servo Drive series with high-performance EtherCAT system communication offers maximum performance and dynamics.

### Beckhoff | The Automation Company

Beckhoff offers comprehensive system solutions in different performance classes for all areas of automation. Beckhoff control technology is scalable – from high-performance Industrial PCs to mini PLCs – and can be adapted precisely to the respective application. TwinCAT automation software integrates real-time control with PLC, NC and CNC functions in a single package. All Beckhoff controllers are programmed using TwinCAT in accordance with the globally-recognised IEC 61131-3 programming standard.





**Headquarters****Beckhoff Automation GmbH**

Eiserstraße 5

33415 Verl

Germany

Phone: +49(0)5246/963-0

Fax: +49(0)5246/963-198

info@beckhoff.com

www.beckhoff.com



# Beckhoff worldwide

## Headquarters

**Beckhoff Automation GmbH**  
Eiserstraße 5  
33415 Verl  
Germany  
Phone: +49 (0) 52 46/963-0  
info@beckhoff.de  
www.beckhoff.de

## Europe

### Germany

**Office Balingen**  
Beckhoff Automation GmbH  
Karlstraße 19  
72336 Balingen  
Germany  
Phone: +49 (0) 74 33/2 60 24-0  
balingen@beckhoff.de

**Office Berlin**  
Beckhoff Automation GmbH  
Fasanenstraße 81  
10623 Berlin  
Germany  
Phone: +49 (0) 30/88 71 16-0  
berlin@beckhoff.de

**Office Frankfurt**  
Beckhoff Automation GmbH  
Torhaus Westhafen  
Speicherstraße 59  
60327 Frankfurt am Main  
Germany  
Phone: +49 (0) 69/68 09 88-0  
frankfurt@beckhoff.de

**Office Hanover**  
Beckhoff Automation GmbH  
Podbielskistraße 342  
30655 Hanover  
Germany  
Phone: +49 (0) 511/87 57 58-0  
hannover@beckhoff.de

**Office Lübeck**  
Beckhoff Automation GmbH  
Wahmstraße 56  
23552 Lübeck  
Germany  
Phone: +49 (0) 451/20 39 88-0  
luebeck@beckhoff.de

**Office Munich**  
Beckhoff Automation GmbH  
Oppelner Straße 5  
82194 Gröbenzell/Munich  
Germany  
Phone: +49 (0) 81 42/41 05 9-0  
muenchen@beckhoff.de

**Office Nuremberg**  
Beckhoff Automation GmbH  
Ostendstraße 196  
90482 Nuremberg  
Germany  
Phone: +49 (0) 911/5 40 56-0  
nuernberg@beckhoff.de

**Sales Office Ravensburg**  
Beckhoff Automation GmbH  
Parkstraße 48  
88212 Ravensburg  
Germany  
Phone: +49 (0) 751/3 54 15 50  
ravensburg@beckhoff.de

**Office Rhein/Ruhr**  
Beckhoff Automation GmbH  
Eurotec-Ring 7  
47445 Moers  
Germany  
Phone: +49 (0) 28 41/9 08 16-6  
rhein-ruhr@beckhoff.de

### Austria

**Headquarters**  
Beckhoff Automation GmbH  
Hauptstraße 4  
6706 Bürs  
Austria  
Phone: +43 (0) 55 52/6 88 13-0  
info@beckhoff.at  
www.beckhoff.at

**Sales Office Oberösterreich**  
Beckhoff Automation GmbH  
Softwarepark 35  
4232 Hagenberg  
Austria  
Phone: +43 (0) 72 36/2 09 25-0  
oberoesterreich@beckhoff.at

**Sales Office Niederösterreich**  
Beckhoff Automation GmbH  
Leobersdorferstraße 42  
2560 Berndorf  
Austria  
Phone: +43 (0) 26 72/8 20 34  
niederoesterreich@beckhoff.at

**Sales Office Tirol**  
Beckhoff Automation GmbH  
Klammstraße 66/39  
6020 Innsbruck  
Austria  
Phone: +43 (0) 512/236 043  
tirol@beckhoff.at

**Belgium, Luxembourg**  
Beckhoff Automation BVBA  
Kempische Steenweg 305 bus 202  
3500 Hasselt  
Belgium  
Phone: +32 (0) 11/24 08 00  
info@beckhoff.be  
www.beckhoff.be

Multiprox N.V.  
Lion d'Örweg 12  
Pb. 71  
9300 Aalst  
Belgium  
Phone: +32 (0) 53/76 65 66  
info@multiprox.be  
www.multiprox.be

**Bulgaria**  
Kastiva GmbH  
68-72 Ami Bue Str., 4. Floor  
1612 Sofia  
Bulgaria  
Phone: +3 59 (2) 9 50 44 31  
office@kastiva.com  
www.kastiva.com

**Croatia**  
Krovel d.o.o.  
Barutanski jarak 114  
10000 Zagreb  
Croatia  
Phone: +3 85/16 11 77 20  
beckhoff@krovel.hr  
www.krovel.hr

**Czech Republic, Slovak Republic**  
Dyger s.r.o.  
Vystaviste 1  
648 59 Brno  
Czech Republic  
Phone: +420 5/41 32 10 04  
info@dyger.cz  
www.dyger.cz

**Denmark**  
Headquarters  
Beckhoff Automation ApS  
Naverland 2  
2600 Glostrup  
Denmark  
Phone: +45 43/46 76 20  
info@beckhoff.dk  
www.beckhoff.dk

### Office Hobro

Beckhoff Automation ApS  
Majsmarken 1  
9500 Hobro  
Denmark  
Phone: +45 76/36 38 31  
info@beckhoff.dk

**Office Kolding**  
Beckhoff Automation ApS  
Birkemose allé 25  
6000 Kolding  
Denmark  
Phone: +45 76/31 20 72  
info@beckhoff.dk

**Finland, Estonia**  
Headquarters  
Beckhoff Automation Oy  
P.O. Box 23  
Kankurinkatu 4-6  
05801 Hyvinkää  
Finland  
Phone: +358 (0) 20/7 42 38 00  
info@beckhoff.fi  
www.beckhoff.fi

**Sales Office Seinäjoki**  
Beckhoff Automation Oy  
Tiedekatu 2  
60320 Seinäjoki  
Finland  
Phone: +358 (0) 20/7 42 38 50  
info@beckhoff.fi

**Sales Office Tampere**  
Beckhoff Automation Oy  
Hermiankatu 1 B  
33720 Tampere  
Finland  
Phone: +358 (0) 20/7 42 38 70  
info@beckhoff.fi

**France**  
Beckhoff Automation Sarl  
Immeuble "Le Montréal"  
ZA de Courtaboeuf  
19 bis, avenue du Québec  
91951 Courtaboeuf Cedex  
France  
Phone: +33 (0) 1 69 29 83 70  
info@beckhoff.fr  
www.beckhoff.fr

**Great Britain, Ireland**  
Hayes Control Systems  
The Boathouse  
Station Road  
Henley-on-Thames  
Oxon RG9 1AZ  
Great Britain  
Phone: +44 1491/41 05 39  
sales@hayescontrols.co.uk  
www.hayescontrols.co.uk

**Greece, Cyprus**  
L. J. Skourgialos  
Industrial Automation Systems  
241 EL Venizelou  
17673 Kallithea/Athens  
Greece  
Phone: +30 21 09 51 02 60  
ias@otenet.gr

**Hungary**  
Controrg Kft.  
Pajta u. 14  
8200 Veszprem  
Hungary  
Phone: +36/88 42 40 75  
info@controrg.hu  
www.controrg.hu

**Italy**  
Headquarters  
Beckhoff Automation S.r.l.  
Via E. Majorana, 1  
20054 Nova Milanese (MI)  
Italy  
Phone: +39 03 62/36 51 64  
info@beckhoff.it  
www.beckhoff.it

### Office Bologna

Beckhoff Automation S.r.l.  
Via Zanini, 7  
40011 Anzola dell'Emilia (BO)  
Italy  
Phone: +39 05 1/73 15 09  
bologna@beckhoff.it

**Office Padua**  
Beckhoff Automation S.r.l.  
Via Alsazia, 3/B  
35127 Padua (PD)  
Italy  
Phone: +39 0 49/8 70 48 38  
padova@beckhoff.it

**Lithuania, Latvia, Belarus**  
Santavilte UAB  
Taikos 149  
52119 Kaunas  
Lithuania  
Phone: +3 70 37/35 01 66  
info@santavilte.lt  
www.santavilte.lt

**Netherlands**  
Industrial Automation Link  
Küppersweg 71  
2031 EB Haarlem  
Netherlands  
Phone: +31 23/5 18 51 40  
sales@ial.nl  
www.ial.nl

**Norway**  
Beckhoff Automation AS  
Træleborgodden 6  
3112 Tønsberg  
Norway  
Phone: +47 33 50 46 90  
info@beckhoff.no  
www.beckhoff.no

**Poland**  
Beckhoff Automation Sp. z o.o.  
Stara Iwiczna,  
ul. Sloneczna 116A  
05-500 Piaseczno  
Poland  
Phone: +48 22/7 57 26 10  
info@beckhoff.pl  
www.beckhoff.pl

**Portugal**  
Bresimar Automação, S.A.  
Quinta do Simão –  
EN109 – Esgueira  
Apartado 3080  
3801-101 Aveiro  
Portugal  
Phone: +351 234/30 33 20  
bresimar@bresimar.pt  
www.bresimar.pt

**Romania**  
Kreatron Automation S.R.L.  
Str. Octavian Fodor nr. 113, ap. 13  
400434, Cluj-Napoca  
jud. Cluj  
Romania  
Phone: +40 264/48 47 08  
office@kreatron.ro  
www.kreatron.ro

**Russia**  
Headquarters  
Beckhoff Automation OOO  
Ul. Bakuninskaya 14, Building 9  
105005 Moscow  
Russia  
Phone: +7 495 981 64 54  
russia@beckhoff.com  
www.beckhoff.ru

**Representation North-West Federal District**  
Beckhoff Automation GmbH  
V.O., 7-ya Liniya, 76, Office 620  
199178 Saint-Petersburg  
Russia  
Phone: +7 812/332 62 05  
north-westfo@beckhoff.ru

### Representation

**Ural Federal District**  
Beckhoff Automation GmbH  
Uliza Komsomolskaya 37,  
Office 402/4  
620049 Ekaterinburg  
Russia  
Phone: +7 343/3 79 98 73  
uralfo@beckhoff.ru

**Representation Volga Federal District**  
Beckhoff Automation GmbH  
Krasnoarmayskaya ul.1,  
Office 312  
443010 Samara  
Russia  
Phone: +7 846/2 69 80 67  
volgafo@beckhoff.ru

**Slovenia**  
Beckhoff Avtomatizacija d.o.o.  
Zbiljska cesta 4  
1215 Medvode  
Slovenia  
Phone: +3 86/13 61 30 80  
info@beckhoff.si  
www.beckhoff.si

### Spain

**Headquarters**  
Beckhoff Automation S.A.  
Edificio Testa Sant Cugat  
Avda. Alcalde Barnils, 64-68  
08174 Sant Cugat (Barcelona)  
Spain  
Phone: +34 93/5 84 49 97  
info@beckhoff.es  
www.beckhoff.es

**Sales Office Bilbao**  
Beckhoff Automation S.A.  
Edificio Udondo  
C. Ribera de Axpe, no 50  
4a planta, Oficina 4-5  
48950 Erandio (Bilbao)  
Spain  
Phone: +34 94/4 31 40 75  
info@beckhoff.es

**Sales Office Madrid**  
Beckhoff Automation S.A.  
Edificio Cimaga  
Sierra de Cazorla, 1  
Planta Baja, Oficina E  
28290 Las Matas (Madrid)  
Spain  
Phone: +34 91/6 36 43 57  
madrid@beckhoff.es

### Sweden

**Headquarters**  
Beckhoff Automation AB  
Stenåldersgatan 2A  
21376 Malmö  
Sweden  
Phone: +46 (0) 40/6 80 81 60  
info@beckhoff.se  
www.beckhoff.se

**Sales Office Danderyd**  
Beckhoff Automation AB  
Enebybergsvägen 10B  
18236 Danderyd  
Sweden  
Phone: +46 (0) 8/4 46 30 00  
info@beckhoff.se

**Sales Office Värnamo**  
Beckhoff Automation AB  
Västbovägen 53  
33153 Värnamo  
Sweden  
Phone: +46 (0) 40/6 80 81 60  
info@beckhoff.se

**Switzerland**

**Headquarters**  
Beckhoff Automation AG  
Rheinweg 9  
8200 Schaffhausen  
Switzerland  
Phone: +41 (0) 52/633 40 40  
info@beckhoff.ch  
www.beckhoff.ch

**Office Zurich**  
Beckhoff Automation AG  
Felsenrainstrasse 1  
8052 Zurich  
Switzerland  
Phone: +41 (0) 52/633 40 40  
info@beckhoff.ch

**Office Derendingen**  
Beckhoff Automation AG  
Application/Software  
Development  
Hauptstrasse 39  
4552 Derendingen  
Switzerland  
Phone: +41 (0) 32/682 04 28  
info@beckhoff.ch

**Sales + Support Center**  
Suisse Romande  
Beckhoff Automation AG  
En Chamard 35  
1442 Montagny-près-Yverdon  
Switzerland  
Phone: +41 (0) 24/447 27-00  
yverdon@beckhoff.ch

**Support Center Ticino**  
p.project sagl  
Via Pianella 19  
6596 Gordola  
Switzerland  
Phone: +41 (0) 91/745 01 11  
ticino@beckhoff.ch

**Turkey**  
Beckhoff Otomasyon Ltd. Şti.  
Gardenya-3 Plaza No: 18-19  
34758 Ataşehir Istanbul  
Turkey  
Phone: +90 216 580 9830  
info@beckhoff.com.tr  
www.beckhoff.com.tr

**North America**

**USA**  
**Headquarters**  
and Training Center  
Beckhoff Automation LLC  
12150 Nicolle Avenue South  
Burnsville, MN 55337  
USA  
Phone: +1 952/890 0000  
beckhoff.usa@beckhoff.com  
www.beckhoffautomation.com

**East Region Headquarters**  
and Training Center  
Beckhoff Automation LLC  
Charlotte, NC  
USA  
Phone: +1 704/910 4367  
east.usa@beckhoff.com

**East Region Sales**  
Beckhoff Automation LLC  
Coplay, PA  
USA  
Phone: +1 952/212 6226  
newengland@beckhoff.com

Beckhoff Automation LLC  
Hanover, PA  
USA  
Phone: +1 717/634 5536  
northeast.sales@beckhoff.com

Beckhoff Automation LLC  
Canton, MI  
USA  
Phone: +1 248/230 8835  
michigan@beckhoff.com

Beckhoff Automation LLC  
Medina, OH  
USA  
Phone: +1 330/725 2403  
mideast.usa@beckhoff.com

Beckhoff Automation LLC  
Lake Wylie, SC  
USA  
Phone: +1 803/746 5491  
east.usa@beckhoff.com

Beckhoff Automation LLC  
Apex, NC  
USA  
Phone: +1 919/367 0349  
southeast.usa@beckhoff.com

**Central Region Sales**  
and Training Center  
Beckhoff Automation LLC  
Fond du Lac, WI  
USA  
Phone: +1 920/929 0655  
wisconsin@beckhoff.com

**Central Region Sales**  
Beckhoff Automation LLC  
Burnsville, MN 55337  
USA  
Phone: +1 952/808 6513  
north.usa@beckhoff.com

Beckhoff Automation LLC  
Lemont, IL  
USA  
Phone: +1 630/631 8467  
midwest.usa@beckhoff.com

Beckhoff Automation LLC  
Rogers, AR  
USA  
Phone: +1 479/925 2951  
south.usa@beckhoff.com

Beckhoff Automation LLC  
Cedar Park, TX  
USA  
Phone: +1 512/250 9809  
southwest.sales@beckhoff.com

Beckhoff Automation LLC  
Justin, TX  
USA  
Phone: +1 817/428 5314  
southwest.sales@beckhoff.com

**West Region Sales**  
Beckhoff Automation LLC  
San Diego, CA  
USA  
Phone: +1 858/546 1111  
west.sales@beckhoff.com

Beckhoff Automation LLC  
La Crescenta, CA  
USA  
Phone: +1 818/224 9065  
losangeles@beckhoff.com

Beckhoff Automation LLC  
San Jose, CA  
USA  
Phone: +1 408/823 3962  
n.california@beckhoff.com

Beckhoff Automation LLC  
Phoenix, AZ  
USA  
Phone: +1 602/354 0506  
arizona@beckhoff.com

Beckhoff Automation LLC  
Arvada, CO  
USA  
Phone: +1 303/429 0758  
mountain.sales@beckhoff.com

Beckhoff Automation LLC  
Mill Creek, WA  
USA  
Phone: +1 425/451 4444  
northwest.sales@beckhoff.com

**West Region**  
**Technical Center**  
Beckhoff Automation LLC  
San Diego, CA  
USA  
Phone: +1 858/546 1111  
west.application@beckhoff.com

**Canada**  
**Headquarters**  
Sales, Training Center and  
Application Development  
Beckhoff Automation  
Canada Ltd.  
130 Research Lane  
Guelph, ON N1G 5G3  
Canada  
Phone: +1 905/852 1534  
canada@beckhoff.com

**Canada Sales**  
Beckhoff Automation  
Canada Ltd.  
London, ON  
Canada  
Phone: +1 519/451 8572  
canada@beckhoff.com

**Mexico**  
**Mexico Sales and**  
Application Development  
Integra Automation, SA de CV  
Av. Industrias 325-A  
78399 Fracc. Talleres  
San Luis Potosí, S.L.P.  
México  
Phone: +52 444/822 2615 al 17  
mexico@beckhoff.com

**Central and South America**

**Argentina**  
eFALCOM  
Alcorta 2411  
CPA B1 744HFM  
Moreno/Buenos Aires  
Argentina  
Phone: +54 237/463 1151  
info@efalcom.com  
www.efalcom.com

**Brazil**  
**Headquarters**  
Beckhoff Automação  
Industrial Ltda.  
Rua Continental,  
146 – Jd. do Mar  
São Bernardo do Campo  
São Paulo 09750-060  
Brazil  
Phone: +55 (11) 4126-3232  
info@beckhoff.com.br  
www.beckhoff.com.br

**Sales Office Campinas**  
Beckhoff Automação  
Industrial Ltda.  
Edifício Empresarial Torre do  
Castelo  
Rua Francisco Otaviano, 60  
Sala 94 – Bairro Chapadão  
Campinas 13070-056 – SP  
Brazil  
Phone: +55 (19) 3368-7288  
info@beckhoff.com.br

**Chile**

Tecmel Chile S.A.  
Padre Orellana 1486  
Santiago  
Chile  
Phone: +562/596 2541  
mberrios@tecmelchile.cl  
www.tecmelchile.cl

**Costa Rica, Nicaragua,**  
**Honduras, El Salvador,**  
**Guatemala, Belize, Panama**  
TAAC S.A.  
50 Sur Hotel Grano de Oro  
Calle 30, Avenidas 4-6  
San José 10103  
Costa Rica  
Phone: +506/2222-6450  
info@taac-sa.com  
www.taac-sa.com

**Uruguay**  
Comando Ltda.  
Dr. J. de Salterain 1142  
Montevideo 11200  
Uruguay  
Phone: +598 (2)/400-7923  
comando@comandonet.com  
www.comandonet.com

**Africa**

**Egypt**  
Industrial Control Systems ICS  
29 Dr. Mohamed El Harouny  
Street  
Nasr City, Cairo 11371  
Egypt  
Phone: +20 2/2 75 50 31  
info@ics-me.com  
www.ics-me.com

**South Africa**  
Beckhoff Automation (Pty) Ltd  
Unit 8, Boskruin Business Park,  
Randpark Ridge  
Randburg 2188  
South Africa  
Phone: +27 (0) 11 792 3374  
info@beckhoff.co.za  
www.beckhoff.co.za

**Asia**

**China**  
**Headquarters**  
Beckhoff Automation  
(Shanghai) Co. Ltd.  
5<sup>th</sup> Floor,  
No. 163 JiangChang San Road  
Shanghai Shibei Industrial Zone  
Shanghai, 200436  
P. R. China  
Phone: +86 21/66 31 26 66  
info@beckhoff.com.cn  
www.beckhoff.com.cn

**Office Beijing**  
Beckhoff Automation  
(Shanghai) Co., Ltd.  
Room 1801-1803, Tower T3,  
Xihuan Plaza,  
No.1, Xizhimenwai Avenue  
Xicheng District  
Beijing, 100044  
P. R. China  
Phone: +86 10/58 30 12 36  
beijing@beckhoff.com.cn

**Office Guangzhou**  
Beckhoff Automation  
(Shanghai) Co. Ltd.  
Room 4118-4119  
Yaoshong Plaza  
9 West Linhe Road  
Tianhe District  
Guangzhou, 510620  
P. R. China  
Phone: +86 20/38 01 03 00  
guangzhou@beckhoff.com.cn

**Office Chengdu**  
Beckhoff Automation  
(Shanghai) Co. Ltd.  
8F, G of The City Tower,  
No. 86, Section one,  
South Peoples Road  
Chengdu, Sichuan, 610016  
P. R. China  
Phone: +86 28/86 20 25 81  
chengdu@beckhoff.com.cn

**India**  
Beckhoff Automation Pvt. Ltd.  
Suite 4, Level 6, Muttha Towers  
Don Bosco Marg  
Pune – 411 006  
India  
Phone: +91 20/40 00 48 00  
info@beckhoff.co.in  
www.beckhoff.co.in

Inteltek Automation Pvt. Ltd.  
Sr.no.100/5, Ambegaon  
Pune – 411 046  
Maharashtra  
India  
Phone: +91 20/24 31 81 21  
info@inteltekindia.com  
www.inteltekindia.com

**Japan**  
K.MECS Co., Ltd.  
Yusen Iwamotocho Bldg. 3F  
2-3-3 Iwamotocho,  
Chiyoda-City,  
Tokyo 101-0032  
Japan  
Phone: +81 3 5825 5333  
info@kmecs.co.jp  
www.kmecs.com

**Lebanon, Jordan, Syria**  
Industrial Technologies (itec)  
S.A.L.  
1st Floor, Farah Bldg,  
Gouraud street  
Jemmayzeh, Beirut  
Lebanon  
Phone: +9 61 (1) 44 88 26  
info@iteclb.com  
www.iteclb.com

**Singapore, Malaysia,**  
**Philippines, Vietnam,**  
**Indonesia**  
TDS Technology (S) Pte Ltd.  
64 Sungei Kadut Loop  
(Hocen Building)  
Singapore 729493  
Singapore  
Phone: +65/63 66 16 61  
sales\_sg@tdstech.com  
www.tdstech.com

**Thailand**  
TDS Technology (Thailand)  
Co., Ltd.  
50/962 Moo 2  
Bengyeetos Thanayaburi  
Pratumthane  
12130 Bangkok  
Thailand  
Phone: +66 (0) 2569 5511  
sales\_th@tdstech.com  
www.tdstech.com

T&R Electronic (Thailand)  
Co., Ltd.  
120/62 Moo 8 Bang Sare  
Sattahip  
Chonburi 20250  
Thailand  
Phone: +66 (0) 3873 7487  
trthailand@trelectronic.co.th  
www.trelectronic.co.th

**South Korea**  
Tri-TEK Corp.  
717 DaeRyong TechnoTown III  
448 KasanDong Kumcheongu  
Seoul 153-803  
Korea  
Phone: +82 2/2107-32 42  
tritek@tritek.co.kr  
www.tritek.co.kr

**Taiwan**  
JI-DIEN Co., Ltd.  
9F, No. 22, Sec. 1,  
Zhongshan Rd.  
Xingzhuang City  
Taipei County 242  
Taiwan (R.O.C.)  
Phone: +886 (2) 8522 3237  
jidien@chgroup.com.tw  
www.chgroup.com.tw

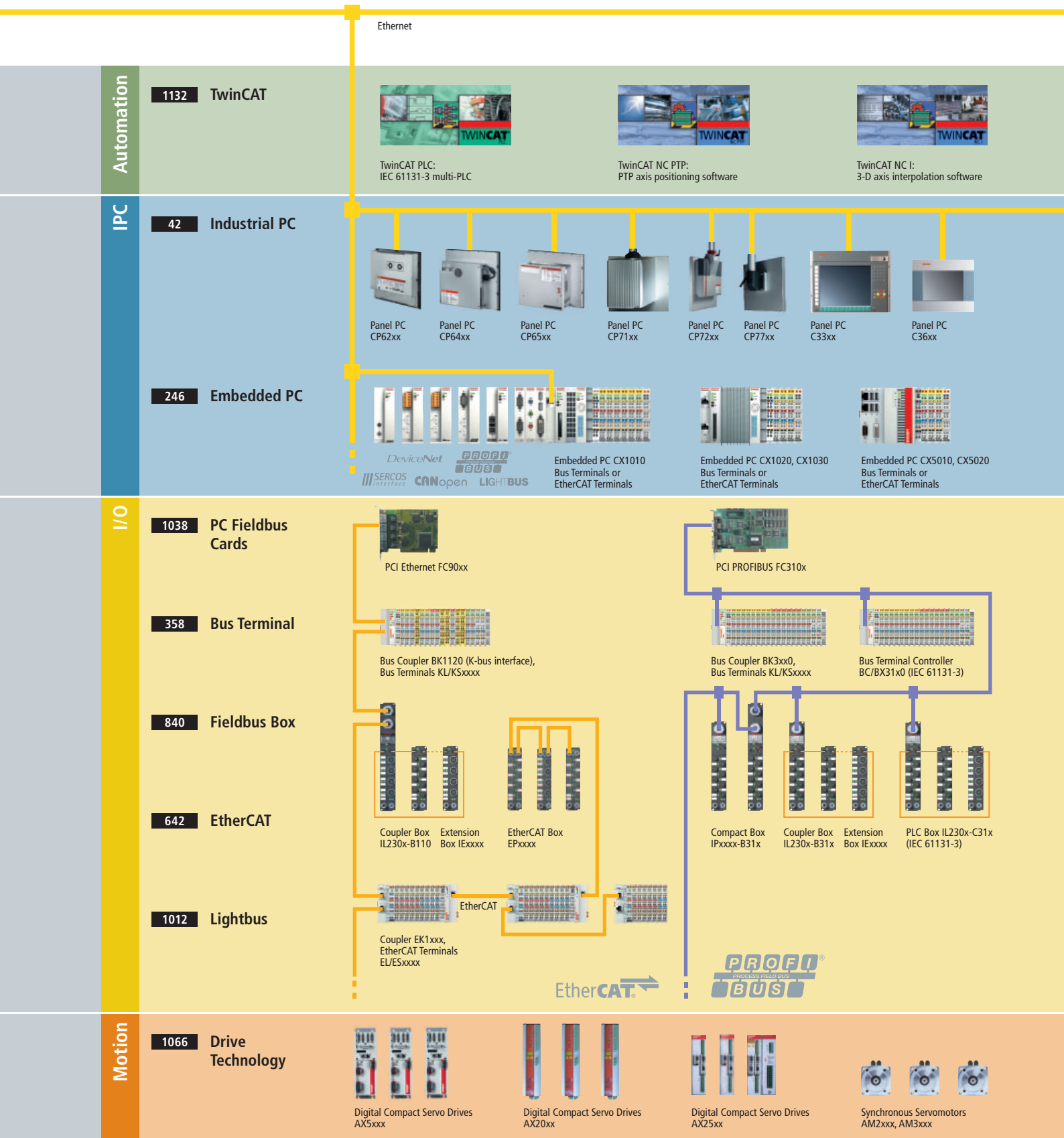
**United Arab Emirates,**  
**Oman, Qatar, Bahrain,**  
**Kuwait, Saudi Arabia**  
Beckhoff Automation FZE  
C# 608, Dubai Silicon Oasis  
P.O. Box No. 341007  
Dubai  
United Arab Emirates  
Phone: +971 4 501 5480  
info@beckhoff.ae  
www.beckhoff.ae

**Australia**

**Australia**  
Beckhoff Automation Pty. Ltd.  
Level 16, 10 Queens Road  
Melbourne, Victoria, 3004  
Australia  
Phone: +61 (3) 99 12 54 30  
info@beckhoff.com.au  
www.beckhoff.com.au

**New Zealand**  
W. Arthur Fisher  
P.O. Box 12747  
Penrose  
Auckland  
New Zealand  
Phone: +64 9/2 70 01 00  
waf@waf.co.nz  
www.waf.co.nz

# System overview





TwinCAT CNC:  
CNC path control software



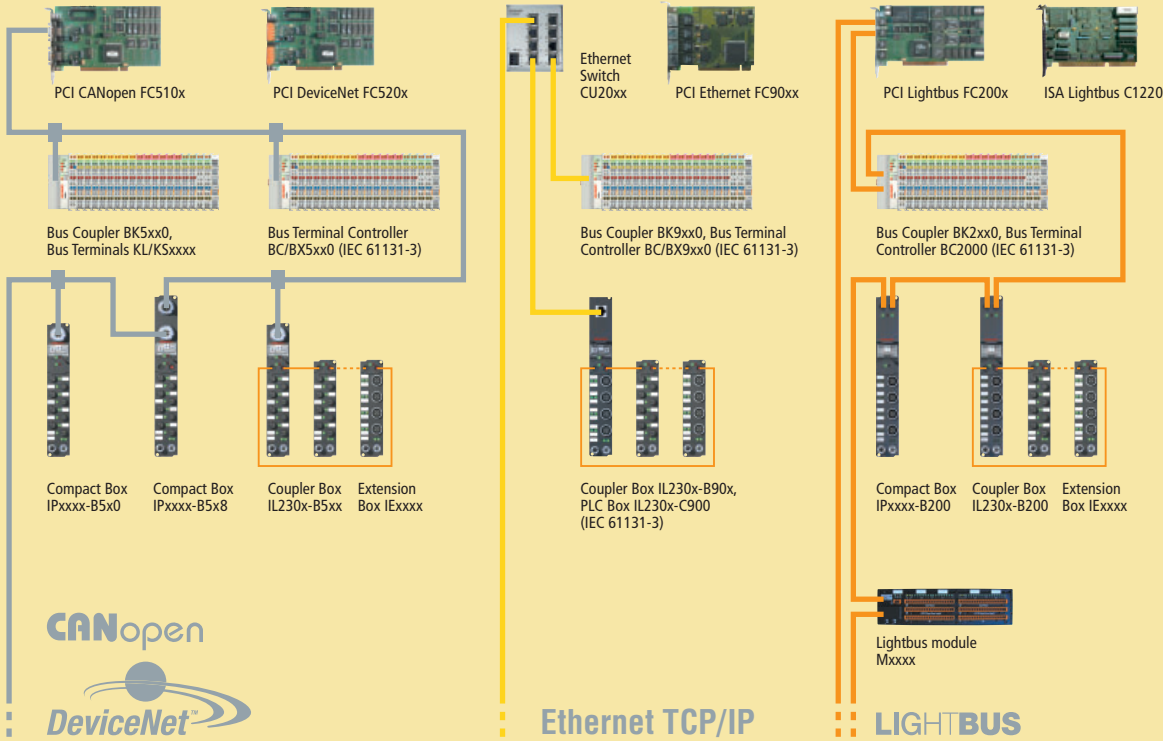
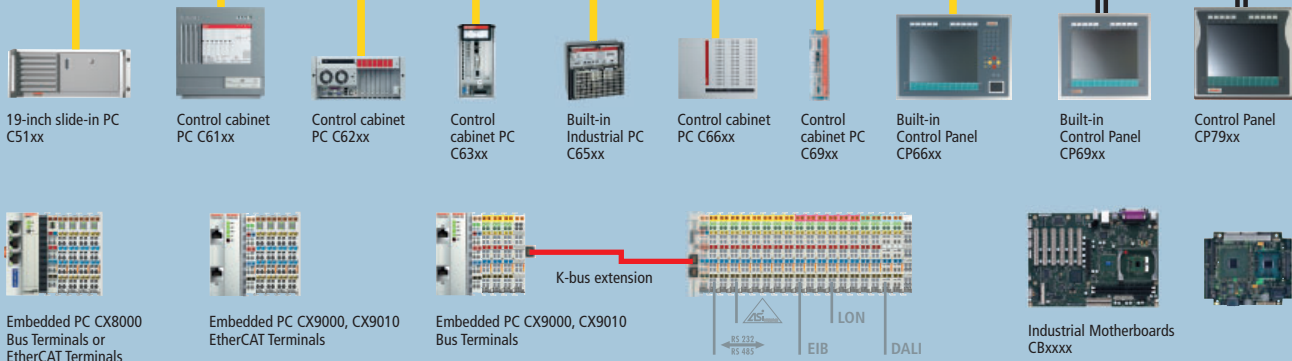
TwinCAT I/O:  
I/O software interface



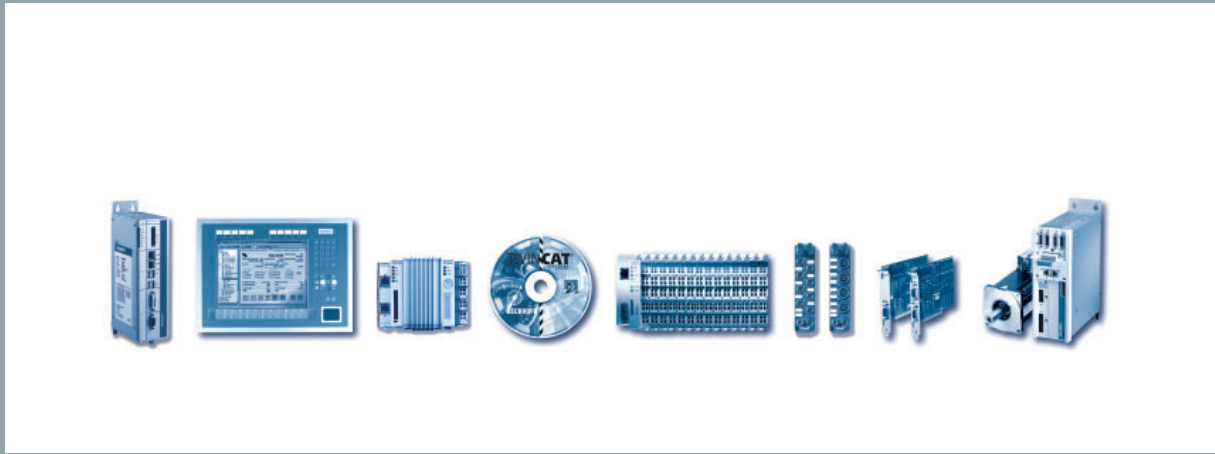
TwinCAT CP:  
Control Panel driver



TwinCAT OPC:  
Visualisation interface



# Product Index



## A

AG1000	1128	Planetary gear unit for Stepper Motors AS1000
AG2200	1117	Planetary gear units for AM2000/AM3000/AM3500 Synchronous Servomotors
AL2000	1118	Drive Technology: Linear Servomotors AL2000, iron core motor (magnetic path width 80 mm)
AL20xx	1118	Linear Servomotors (coil unit)
AL21xx	1119	Linear Servomotors (magnet plate)
AL2200	1129	Magnetic encoder system for Linear Servomotors AL2xxx (MES)
AL2250	1130	Connector box for motor, encoder and thermal protection cables
AL2400	1120	Drive Technology: Linear Servomotors AL2400, iron core motor (magnetic path width 50 mm)
AL240x	1120	Linear Servomotors (coil unit)
AL25xx	1121	Linear Servomotors (magnet plate)
AL2800	1122	Drive Technology: Linear Servomotors AL2800, iron core motor (magnetic path width 130 mm)
AL28xx	1122	Linear Servomotors (coil unit)
AL29xx	1123	Linear Servomotors (magnet plate)
AL3800	1124	Drive Technology: Linear Servomotors AL3800, ironless motor (magnetic yoke width 48 mm)
AL38xx	1124	Linear Servomotors (coil unit)
AL39xx	1125	Linear Servomotors (magnet yoke)
AM2xxx	1114	Drive Technology: Synchronous Servomotors AM2000, for positioning tasks with high demands on dynamics and stability
AM30uv-wxyz-000a	1108	Drive Technology: Synchronous Servomotors AM3000, for applications with highest demands on dynamics and performance
AM35uv-wxyz	1112	Drive Technology: Synchronous Servomotors AM3500, motor with higher moment of inertia for applications with highest demands on synchronism and optimal ratio of load/motor inertia
AMxxxx	1106	Drive Technology: Synchronous Servomotors AMxxxx
AS10xx	1126	Drive Technology: Stepper Motors AS1000
AX2003-Bxxx	1098	Digital Compact Servo Drive, nominal output current 3 A
AX2006-Bxxx	1098	Digital Compact Servo Drive, nominal output current 6 A
AX2010-Bxxx	1098	Digital Compact Servo Drive, nominal output current 10 A
AX2020-Bxxx	1098	Digital Compact Servo Drive, nominal output current 20 A
AX2040-Bxxx	1098	Digital Compact Servo Drive, nominal output current 40 A
AX2070-Bxxx	1098	Digital Compact Servo Drive, nominal output current 70 A/80 A
AX2090-BW0x	1105	External ballast resistor for Servo Drive AX2000
AX2090-BW50-xxxx	1091	External ballast resistor for AX5x01 to AX5112
AX2090-IO01	1105	I/O interface card for Servo Drive AX2000
AX2090-MD20	1105	Motor choke for Servo Drive AX2xxx
AX2090-MD50	1092	Motor choke for Servo Drive AX5000
AX2090-ND50	1091	Mains choke for Servo Drive AX5000
AX2090-NDxx	1105	Mains choke for Servo Drive AX2xxx
AX2090-NF50	1091	Mains filter for Servo Drive AX5000
AX2090-NFxx	1105	Mains filter for Servo Drive AX2xxx
AX2090-S003	1105	Commissioning software for Servo Drive AX2000
AX20xx-Bxxx	1096	Drive Technology: Digital Compact Servo Drive AX2000
AX2503-Bxxx	1100	Digital Compact Servo Drive, master module, nominal output current 3 A
AX2506-Bxxx	1100	Digital Compact Servo Drive, master module, nominal output current 6 A
AX2513-Bxxx	1100	Digital Compact Servo Drive, master module, nominal output current 3 A
AX2516-Bxxx	1100	Digital Compact Servo Drive, master module, nominal output current 6 A
AX2523-Bxxx	1100	Digital Compact Servo Drive, axis module, nominal output current 3 A
AX2526-Bxxx	1100	Digital Compact Servo Drive, axis module, nominal output current 6 A
AX25xx-Bxxx	1100	Drive Technology: Modular servo system AX2500
AX5000	1072	Drive Technology: Digital Compact Servo Drive AX5000
AX5001	1089	DC-Link expansion module for Servo Drive AX5000
AX5021	1089	Ballast unit with internal braking resistor and connection option for an external ballast resistor (up to 6 kW) for Servo Drive AX5000
AX504x	1089	Energy recovery module for Servo Drive AX5000
AX5101	1082	Digital Compact Servo Drive, 1-axis module, rated output current 1.5 A, EtherCAT interface



AX5103	1082	Digital Compact Servo Drive, 1-axis module, rated output current 3 A, EtherCAT interface
AX5106	1082	Digital Compact Servo Drive, 1-axis module, rated output current 6 A, EtherCAT interface
AX5112	1082	Digital Compact Servo Drive, 1-axis module, rated output current 12 A, EtherCAT interface
AX5118	1082	Digital Compact Servo Drive, 1-axis module, rated output current 18 A, EtherCAT interface
AX5125	1082	Digital Compact Servo Drive, 1-axis module, rated output current 25 A, EtherCAT interface
AX5140	1082	Digital Compact Servo Drive, 1-axis module, rated output current 40 A, EtherCAT interface
AX5160	1086	Digital Compact Servo Drive, 1-axis module, rated output current 60 A, EtherCAT interface
AX5172	1086	Digital Compact Servo Drive, 1-axis module, rated output current 72 A, EtherCAT interface
AX5190	1086	Digital Compact Servo Drive, 1-axis module, rated output current 90 A, EtherCAT interface
AX5191	1086	Digital Compact Servo Drive, 1-axis module, rated output current 110 A, EtherCAT interface
AX5192	1086	Digital Compact Servo Drive, 1-axis module, rated output current 143 A, EtherCAT interface
AX5193	1086	Digital Compact Servo Drive, 1-axis module, rated output current 170 A, EtherCAT interface
AX51xx	1082	Digital Compact Servo Drive AX51xx, 1-axis modules
AX5201	1084	Digital Compact Servo Drive, 2-axis module, rated output current 2 x 1.5 A, EtherCAT interface
AX5203	1084	Digital Compact Servo Drive, 2-axis module, rated output current 2 x 3 A, EtherCAT interface
AX5206	1084	Digital Compact Servo Drive, 2-axis module, rated output current 2 x 6 A, EtherCAT interface
AX52xx	1084	Digital Compact Servo Drive AX52xx, 2-axis modules
AX5801	1089	TwinSAFE drive option card: safe restart lock, STO, SS1; for Servo Drive AX5000
AX5805	1089	TwinSAFE drive option card: STO, SS1, SS2, SOS, SLS, SDI; for Servo Drive AX5000
AX5901	1089	AX-Bridge power supply module for Servo Drive AX5000
AX5911	1089	AX-Bridge power distribution module for Servo Drive AX5000 for AX5101...AX5121 and AX5201...AX5206
AX5912	1089	AX-Bridge power distribution module for Servo Drive AX5000 for AX5118 and AX5125
AX-Bridge	1089	Quick connection system for multi-axis system
<b>B</b>		
BC2000	444	Bus Terminal Controller for Lightbus system, IEC 61131-3
BC3100	446	Bus Terminal Controller for PROFIBUS system (12 Mbaud), IEC 61131-3
BC3150	446	Bus Terminal Controller "Compact" for PROFIBUS system (12 Mbaud), IEC 61131-3
BC4000	450	Bus Terminal Controller for Interbus system, IEC 61131-3
BC5150	452	Bus Terminal Controller "Compact" for CANopen system, IEC 61131-3
BC5250	456	Bus Terminal Controller "Compact" for DeviceNet system, IEC 61131-3
BC7300	460	Bus Terminal Controller for Modbus system, IEC 61131-3
BC8000	462	Bus Terminal Controller for RS485 system, IEC 61131-3
BC8100	462	Bus Terminal Controller for RS232 system, IEC 61131-3
BC8150	462	Bus Terminal Controller "Compact" for RS232 system, IEC 61131-3
BC9000	466	Bus Terminal Controller for Ethernet TCP/IP system, IEC 61131-3
BC9020	468	"Economy plus" Bus Terminal Controller for Ethernet TCP/IP system, IEC 61131-3

BC9050	466	Bus Terminal Controller "Compact" with Ethernet TCP/IP interface, IEC 61131-3
BC9100	470	Bus Terminal Controller for Ethernet TCP/IP system with 2-channel switch, IEC 61131-3
BC9120	468	"Economy plus" Bus Terminal Controller for Ethernet TCP/IP system with 2-channel switch, IEC 61131-3
BG15xx	637	Bus Terminal system housing
BK1120	394	Bus Coupler for EtherCAT system, "Economy plus" coupler
BK1250	396	Bus Coupler between E-bus and K-bus Terminals, "Compact" coupler
BK2000	398	Bus Coupler for Lightbus system, "Standard" coupler
BK2010	398	Bus Coupler for Lightbus system, "Economy" coupler
BK2020	398	Bus Coupler for Lightbus system, "Economy plus" coupler
BK3010	400	Bus Coupler for PROFIBUS system, "Economy" coupler, 1.5 Mbaud
BK3100	400	Bus Coupler for PROFIBUS DP/FMS system, "Standard" coupler, 12 Mbaud
BK3110	400	Bus Coupler for PROFIBUS system, "Economy" coupler, 12 Mbaud
BK3120	402	Bus Coupler for PROFIBUS system, "Economy plus" coupler, 12 Mbaud
BK3150	403	Bus Coupler for PROFIBUS system, "Compact" coupler, 12 Mbaud
BK3500	404	Bus Coupler for PROFIBUS system, "Standard" coupler, fibre optic connection, 1.5 Mbaud
BK3520	406	Bus Coupler for PROFIBUS system, "Economy plus" coupler, fibre optic connection, 12 Mbaud
BK4000	408	Bus Coupler for Interbus system, "Standard" coupler
BK4010	408	Bus Coupler for Interbus system, "Economy" coupler
BK4020	408	Bus Coupler for Interbus system, "Economy plus" coupler
BK4500	410	Bus Coupler for Interbus system, "Standard" coupler with fibre optic connection
BK5110	412	Bus Coupler for CANopen system, "Economy" coupler
BK5120	412	Bus Coupler for CANopen system, "Economy plus" coupler
BK5150	414	Bus Coupler for CANopen system, "Compact" coupler
BK5151	414	Bus Coupler for CANopen system, "Compact" coupler, D-sub plug, 9-pin
BK5200	416	Bus Coupler for DeviceNet system, "Standard" coupler
BK5210	416	Bus Coupler for DeviceNet system, "Economy" coupler
BK5220	416	Bus Coupler for DeviceNet system, "Economy plus" coupler
BK5250	418	Bus Coupler for DeviceNet system, "Compact" coupler
BK7000	420	Bus Coupler for ControlNet system, "Standard" coupler
BK7150	422	Bus Coupler for CC-Link system, "Compact" coupler
BK7300	424	Bus Coupler for Modbus system, "Standard" coupler
BK7350	424	Bus Coupler for Modbus system, "Compact" coupler
BK7420	426	Bus Coupler for Fipio system, "Economy plus" coupler
BK7500	428	Bus Coupler for SERCOS interface system, "Standard" coupler
BK7520	428	Bus Coupler for SERCOS interface system, "Economy plus" coupler
BK8000	430	Bus Coupler with RS485 communications interface, "Standard" coupler
BK8100	430	Bus Coupler with RS232 communications interface, "Standard" coupler
BK9000	432	Bus Coupler for Ethernet TCP/IP system, "Standard" coupler
BK9050	432	Bus Coupler for Ethernet TCP/IP system, "Compact" coupler
BK9100	434	Bus Coupler for Ethernet TCP/IP system with 2-channel switch, "Standard" coupler
BK9103	436	Bus Coupler for PROFINET system with 2-channel switch, "Standard" coupler
BK9105	438	Bus Coupler for EtherNet/IP system with 2-channel switch, "Standard" coupler
BK9500	440	Bus Coupler for USB system, "Standard" coupler
Built-in Panel PC	62	Panel PC for control cabinet installation CP62xx, CP64xx, CP65xx, CP67xx, C33xx, C36xx
Bus Coupler	392	The link between series terminals and the fieldbus
Bus Coupler for EtherCAT Terminal system	696	Connection between conventional fieldbus systems and EtherCAT
Bus Terminal Controller	442	Controller with fieldbus interface, BCxxxx, BXxxxx
Bus Terminals	358	Fieldbus-independent electronic series terminals
BX3100	448	Bus Terminal Controller with PROFIBUS interface (12 Mbaud), IEC 61131-3
BX5100	454	Bus Terminal Controller with CANopen interface, IEC 61131-3
BX5200	458	Bus Terminal Controller with DeviceNet interface, IEC 61131-3

BX8000	464	Bus Terminal Controller with RS232/RS485 interface, IEC 61131-3
BX9000	472	Bus Terminal Controller with Ethernet interface, IEC 61131-3
BZ1xxx	638	Labelling material for Bus Terminal Controller and Bus Coupler
BZ30x0	638	Equipment identification label for Bus Terminals
BZ5100	638	Push-in strips for removable label plates
<b>C</b>		
C1200	1023	Lightbus, ISA interface card
C1220	1024	Lightbus, ISA interface card with communications processor
C1300	1025	Lightbus, VME bus interface card
C3320	96	19-inch Panel PC, 12-inch LCD, numeric keypad
C3330	98	19-inch Panel PC, 12-inch LCD, alphanumeric keyboard
C3340	100	19-inch Panel PC, 15-inch LCD, numeric keypad
C3350	102	19-inch Panel PC, 15-inch LCD, alphanumeric keyboard
C3620	110	Built-in Panel PC, 12-inch LCD, for ATX motherboards
C3640	112	Built-in Panel PC, 15-inch LCD, for ATX motherboards
C5101	116	19-inch slide-in PC for slot motherboards
C5102	118	19-inch slide-in PC for ATX motherboards
C6110	124	Control cabinet PC for slot motherboards, short plug-in cards
C6120	126	Control cabinet PC for slot motherboards, long plug-in cards, 5 free slots
C6130	128	Control cabinet PC for slot motherboards, long plug-in cards, 8 free slots
C6140	130	Control cabinet PC for ATX motherboards, short plug-in cards
C6150	132	Control cabinet PC for ATX motherboards, long plug-in cards
C6210	138	Control cabinet PC for slot motherboards, 1 free slot
C6220	140	Control cabinet PC for slot motherboards, 3 free slots
C6240	142	Control cabinet PC for ATX motherboards, 6 free slots
C6250	144	Control cabinet PC for ATX motherboards, long plug-in cards, 6 free slots
C6320	148	Control cabinet PC for slot motherboards, 1 free slot
C6325	150	Fanless control cabinet PC for slot motherboards, 1 free slot
C6330	152	Control cabinet PC for slot motherboards, 1 free slot
C6335	154	Fanless control cabinet PC for slot motherboards, 1 free slot
C6340	156	Control cabinet Industrial PC for slot motherboards, 3 free slots
C6350	158	Control cabinet Industrial PC for slot motherboards, 3 free slots, CD-ROM drive
C6515	162	Built-in Industrial PC with Intel® Core™ Duo 2.0 GHz
C6525	164	Built-in Industrial PC with Intel® Core™ Duo 2.0 GHz
C6640	168	Control cabinet PC for ATX motherboards in compact housing
C6650	170	Control cabinet PC for ATX motherboards in compact housing, 2 hard drive removable frames
C6915	174	Fanless control cabinet Industrial PC with 3½-inch motherboard, Intel® Atom™ processor
C6920	176	Control cabinet Industrial PC with 3½-inch motherboard, 1 free Mini PCI slot
C6925	178	Fanless control cabinet Industrial PC with 3½-inch motherboard, 1 free Mini PCI slot
C6930	180	Control cabinet Industrial PC with 3½-inch motherboard, 2 hard disk slots for 2½-inch hard disks
C9900-A2xx	189	ADD-IN cards
C9900-E21x	241	RFID reader in the Control Panel front
C9900-E78x	234	PLC or CNC push-button extension for tool machines
C9900-Ex0x	214	Push-button extension for Control Panel and Panel PCs with 12-inch display and numeric keyboard
C9900-Ex1x	216	Push-button extension for Control Panel and Panel PCs with 12-inch display and alphanumeric keyboard
C9900-Ex2x	226	Push-button extension for Control Panel and Panel PCs with 19-inch display without keyboard
C9900-Ex3x	228	Push-button extension for Control Panel and Panel PCs with 19-inch display and function keys
C9900-Ex4x	218	Push-button extension for Control Panel and Panel PCs with 15-inch display without keyboard
C9900-Ex5x	220	Push-button extension for Control Panel and Panel PCs with 15-inch display and function keys

C9900-Ex6x	222	Push-button extension for Control Panel and Panel PCs with 15-inch display and numeric keyboard
C9900-Ex7x	224	Push-button extension for Control Panel and Panel PCs with 15-inch display and alphanumeric keyboard
C9900-Ex96	230	Push-button extension for Control Panel and Panel PCs with 19-inch display and numeric keyboard
C9900-Ex97	232	Push-button extension for Control Panel and Panel PCs with 19-inch display and alphanumeric keyboard
C9900-Exxx	214	Push-button extension for Control Panel and Panel PCs
C9900-H35x	188	USB stick, USB 2.0
C9900-M3x0	238	Holder for additional Control Panel keyboard
C9900-M400	239	Keyboard shelf for the Control Panel
C9900-T90x	240	Touch screen pen with holder for Control Panel and Industrial PC
C9900-U330	188	Maintenance-free 24 V battery pack with 3.4 Ah
CANopen Bus Coupler	412	Bus Coupler for CANopen system, BK5110, BK5120, BK5150, BK5151, LC5100, BC5150, BX5100
CANopen Fieldbus Box	882	Fieldbus Box for CANopen system, IPxxx-B51x, IL230x-B51x
CANopen PC cards	1045	PC Fieldbus Cards with PCI bus for CANopen system, FC5101, FC5102, FC5151
CB1050	318	ATX Industrial Motherboard, mPGA479M, Intel® Pentium® M/Celeron® M
CB1051	320	ATX Industrial Motherboard, mPGA479M, Intel® Celeron® M/Core™ Duo/Core™2 Duo
CB1052	322	ATX Industrial Motherboard, mPGA479M, Intel® Core™ Duo/Core™2 Duo/Core™2 Quad
CB2050	324	Slot Industrial Motherboard, Intel® Pentium® M/Celeron® M
CB2051	326	Slot Industrial Motherboard, Intel® Celeron® M/Core™ Duo/Core™2 Duo
CB3010	332	3½-inch Industrial Motherboard, Intel® IXP420
CB3050	328	3½-inch Industrial Motherboard, Intel® Pentium® M/Celeron® M
CB3051	330	3½-inch Industrial Motherboard, Intel® Celeron® M/Core™ Duo/Core™2 Duo
CB3053	334	3½-inch Industrial Motherboard, Intel® Atom™
CB3110	338	Compact Industrial Motherboard, Intel® IXP420
CB3150	336	Compact Industrial Motherboard, Intel® Pentium® M/Celeron® M
CB4021	340	PC/104 Industrial Motherboard, AMD LX800
CB4050	342	PC/104 Industrial Motherboard, Intel® Pentium® M/Celeron® M
CB4051	344	PC/104 Industrial Motherboard, Intel® Celeron® M/Core™ Duo/Core™2 Duo
CB4053	346	PC/104 Industrial Motherboard, Intel® Atom™
CC-Link Bus Coupler	422	Bus Coupler for CC-Link, BK7150
CNC	1152	Software CNC, CNC path control for tough requirements
ControlNet Bus Coupler	420	Bus Coupler for ControlNet, BK7000
Control Panel	194	Operating and display elements for Industrial PCs
CP620x	64	"Economy" built-in Panel PC with 3½-inch motherboard, without keyboard
CP621x	64	"Economy" built-in Panel PC with 3½-inch motherboard, function keys
CP622x	64	"Economy" built-in Panel PC with 3½-inch motherboard, numeric keyboard
CP623x	64	"Economy" built-in Panel PC with 3½-inch motherboard, alphanumeric keyboard
CP624x	64	"Economy" built-in Panel PC with 3½-inch motherboard, alphanumeric keyboard, 16 special PLC keys on the sides
CP640x	72	Built-in Panel PC with slot motherboard, without keyboard
CP641x	72	Built-in Panel PC with slot motherboard, function keys
CP642x	72	Built-in Panel PC with slot motherboard, numeric keyboard
CP643x	72	Built-in Panel PC with slot motherboard, alphanumeric keyboard
CP644x	72	Built-in Panel PC with slot motherboard, alphanumeric keyboard, 16 special PLC keys on the sides
CP650x	76	Built-in Panel PC with ATX motherboard, without keyboard
CP651x	76	Built-in Panel PC with ATX motherboard, function keys
CP652x	76	Built-in Panel PC with ATX motherboard, numeric keyboard
CP653x	76	Built-in Panel PC with ATX motherboard, alphanumeric keyboard
CP654x	76	Built-in Panel PC with ATX motherboard, alphanumeric keyboard, 16 special PLC keys on the sides

CP660x	206	"Economy" built-in Control Panel with Ethernet interface, without keyboard
CP661x	206	"Economy" built-in Control Panel with Ethernet interface, function keys
CP662x	206	"Economy" built-in Control Panel with Ethernet interface, numeric keypad
CP663x	206	"Economy" built-in Control Panel with Ethernet interface, alphanumeric keypad
CP690x	208	"Economy" built-in Control Panel with DVI/USB Extended interface, without keyboard
CP691x	208	"Economy" built-in Control Panel with DVI/USB Extended interface, function keys
CP692x	208	"Economy" built-in Control Panel with DVI/USB Extended interface, numeric keypad
CP693x	208	"Economy" built-in Control Panel with DVI/USB Extended interface, alphanumeric keyboard
CP694x	208	"Economy" built-in Control Panel with DVI/USB Extended interface, alphanumeric keyboard, 16 special PLC keys on the sides
CP710x	80	Panel PC with slot motherboard, IP 65, without keyboard
CP711x	80	Panel PC with slot motherboard, IP 65, function keys
CP712x	80	Panel PC with slot motherboard, IP 65, numeric keyboard
CP713x	80	Panel PC with slot motherboard, IP 65, alphanumeric keyboard
CP714x	80	Panel PC with slot motherboard, IP 65, alphanumeric keyboard, 16 special PLC keys on the sides
CP720x	84	"Economy" Panel PC with 3½-inch motherboard, IP 65, without keyboard
CP721x	84	"Economy" Panel PC with 3½-inch motherboard, IP 65, function keys
CP722x	84	"Economy" Panel PC with 3½-inch motherboard, IP 65, numeric keyboard
CP723x	84	"Economy" Panel PC with 3½-inch motherboard, IP 65, alphanumeric keyboard
CP724x	84	"Economy" Panel PC with 3½-inch motherboard, IP 65, alphanumeric keyboard, 16 special PLC keys on the sides
CP770x	88	Panel PC, without keyboard
CP771x	88	Panel PC, function keys
CP772x	88	Panel PC, numeric keypad
CP773x	88	Panel PC, alphanumeric keyboard
CP790x	210	"Economy" Control Panel with DVI/USB Extended interface, without keyboard
CP791x	210	"Economy" Control Panel with DVI/USB Extended interface, function keys
CP792x	210	"Economy" Control Panel with DVI/USB Extended interface, numeric keypad
CP793x	210	"Economy" Control Panel with DVI/USB Extended interface, alphanumeric keyboard
CP794x	210	"Economy" Control Panel with DVI/USB Extended interface, alphanumeric keyboard, 16 special PLC keys on the sides
CPV1x-VI-IP-8	967	Festo valve terminal with IP-Link interface for Fieldbus Box system
CP-Link 3	190	Ethernet- and IP protocol-based desktop transfer software
CU2008	1058	Ethernet Switch, 8 ports
CU2016	1059	Ethernet Switch, 16 ports
CU2508	1061	Real-time Ethernet port multiplier
CU8005	185	USB hub with 4 USB downstream ports
CU8800	184	USB extender Tx sends USB signals to the receiver box CU8850
CU8810	183	DVI splitter, freely configurable 2:4 switch with cable drivers for multi-monitor displays
CU8850	184	USB extender Rx receives USB signals from sending box CU8800
CU8870	185	Extension module for usage of a mass storage Compact Flash card
CU8880	186	Ethernet controller with USB input
CU8890	187	WLAN controller with USB input
CX1010	280	Embedded PC CX1010, 500 MHz Pentium® MMX-compatible processor
CX1010-0xxx	280	Embedded PC CX1010, basic CPU module
CX1010-N010	282	Embedded PC CX1010, system interface, USB/DVI
CX1010-N020	282	Embedded PC CX1010, system interface, Audio
CX1010-N030	282	Embedded PC CX1010, system interface, COM1/COM2 RS232 interface module
CX1010-N031	282	Embedded PC CX1010, system interface, COM1/COM2 RS422/485 interface module
CX1010-N040	282	Embedded PC CX1010, system interface, COM3/COM4 RS232 interface module
CX1010-N041	282	Embedded PC CX1010, system interface, COM3/COM4 RS422/485 interface module
CX1010-N060	282	Embedded PC CX1010, system interface, 10/100 Mbit Ethernet interface module
CX1010-N0xx	282	Embedded PC CX1010, system interfaces

CX1020	290	Embedded PC CX1020, 1 GHz Intel® Celeron® M ULV processor
CX1020-0xxx	290	Embedded PC CX1020, basic CPU module
CX1020-N010	294	Embedded PC CX1020, system interface, DVI/USB interface module
CX1020-N020	294	Embedded PC CX1020, system interface, Audio interface module
CX1020-N030	294	Embedded PC CX1020, system interface, COM1/COM2 RS232 interface module
CX1020-N031	294	Embedded PC CX1020, system interface, COM1/COM2 RS422/485 interface module
CX1020-N040	294	Embedded PC CX1020, system interface, COM3/COM4 RS232 interface module
CX1020-N041	294	Embedded PC CX1020, system interface, COM3/COM4 RS422/485 interface module
CX1020-N060	294	Embedded PC CX1020, system interface, 10/100 Mbit Ethernet interface module
CX1020-N0xx	294	Embedded PC CX1010, system interfaces
CX1030	292	Embedded PC CX1030, 1.8 GHz Intel® Pentium® M processor
CX1030-0xxx	292	Embedded PC CX1030, basic CPU module
CX1030-N010	295	Embedded PC CX1030, system interface, DVI/USB interface module
CX1030-N020	295	Embedded PC CX1030, system interface, Audio interface module
CX1030-N030	295	Embedded PC CX1030, system interface, COM1/COM2 RS232 interface module
CX1030-N031	295	Embedded PC CX1030, system interface, COM1/COM2 RS422/485 interface module
CX1030-N040	295	Embedded PC CX1030, system interface, COM3/COM4 RS232 interface module
CX1030-N041	295	Embedded PC CX1030, system interface, COM3/COM4 RS422/485 interface module
CX1030-N060	295	Embedded PC CX1030, system interface, 10/100 Mbit Ethernet interface module
CX1030-N0xx	295	Embedded PC CX1030, system interfaces
CX1100-0001	298	Embedded PC CX1010/CX1020, power supply
CX1100-0002	298	Embedded PC CX1010/CX1020, power supply with K-bus interface
CX1100-0003	298	Embedded PC CX1010/CX1020, power supply with K-bus/IP-Link interface
CX1100-0004	299	Embedded PC CX1010/CX1020, power supply with E-bus interface
CX1100-0012	300	Embedded PC CX1030, power supply with K-bus interface
CX1100-0013	300	Embedded PC CX1030, power supply with K-bus/IP-Link interface
CX1100-0014	301	Embedded PC CX1030, power supply with E-bus interface
CX1100-00xx	298	Embedded PC CX1010/CX1020/CX1030, power supply units and I/O interfaces
CX1100-09x0	306	Embedded PC CX, UPS module
CX1500-B200	304	Embedded PC CX1010/CX1020/CX1030, Lightbus slave fieldbus connection
CX1500-B310	304	Embedded PC CX1010/CX1020/CX1030, PROFIBUS slave fieldbus connection
CX1500-B510	305	Embedded PC CX1010/CX1020/CX1030, CANopen slave fieldbus connection
CX1500-B520	305	Embedded PC CX1010/CX1020/CX1030, DeviceNet slave fieldbus connection
CX1500-Bxx0	304	Embedded PC CX1010/CX1020/CX1030, slave fieldbus connections
CX1500-M200	302	Embedded PC CX1010/CX1020/CX1030, Lightbus master fieldbus connection
CX1500-M310	302	Embedded PC CX1010/CX1020/CX1030, PROFIBUS master fieldbus connection
CX1500-M510	303	Embedded PC CX1010/CX1020/CX1030, CANopen master fieldbus connection
CX1500-M520	303	Embedded PC CX1010/CX1020/CX1030, DeviceNet master fieldbus connection
CX1500-M750	303	Embedded PC CX1010/CX1020/CX1030, SERCOS interface master fieldbus connection
CX1500-Mxx0	302	Embedded PC CX1010/CX1020/CX1030, master fieldbus connections
CX5010	284	Embedded PC CX5010, processor Intel® Atom™ Z510, 1.1 GHz clock frequency
CX5020	284	Embedded PC CX5020, processor Intel® Atom™ Z530, 1.6 GHz clock frequency
CX8000	258	Embedded PCs CX8000, 32 bit processor ARM, 400 MHz clock frequency
CX8010	262	Embedded PC CX8010 for EtherCAT
CX8031	263	Embedded PC CX8031 for PROFIBUS
CX8051	264	Embedded PC CX8031 for CANopen
CX8090	265	Embedded PC CX8090 for Ethernet
CX8093	266	Embedded PC CX8093 for PROFINET
CX8095	267	Embedded PC CX8095 for EtherNet/IP
CX9000	272	Embedded PC CX9000, 266 MHz Intel® IXP420 CPU with XScale® technology
CX900x-000x	272	Embedded PC CX9000, E-bus interface (for EtherCAT Terminals)
CX900x-100x	272	Embedded PC CX9000, K-bus interface (for Bus Terminals)
CX900x-x00x	272	Embedded PC CX9000, basic CPU module
CX9010	274	Embedded PC CX9010, 533 MHz Intel® IXP420 CPU with XScale® technology
CX901x-000x	274	Embedded PC CX9010, E-bus interface (for EtherCAT Terminals)

CX901x-100x	274	Embedded PC CX9010, K-bus interface (for Bus Terminals)
CX901x-x00x	274	Embedded PC CX9010, basic CPU module
CX90x0-A001	276	Embedded PC CX9000/CX9010, system interface, Compact Flash extension module
CX90x0-A001/N0xx	276	Embedded PC CX9000/CX9010, system interfaces
CX90x0-N010	276	Embedded PC CX9000/CX9010, system interface, DVI/USB interface module
CX90x0-N030	276	Embedded PC CX9000/CX9010, system interface, COM1/COM2 RS232 interface module
CX90x0-N031	276	Embedded PC CX9000/CX9010, system interface, COM1/COM2 RS422/485 interface module
CX90x0-N070	276	Embedded PC CX9000/CX9010, system interface, 4-port USB hub

D

DeviceNet Bus Coupler	416	Bus Coupler for DeviceNet system, BK52x0, LC5200, BC5250, BX5200
DeviceNet Fieldbus Box	886	Fieldbus Box for DeviceNet system, IPxxx-B52x, IL230x-B52x
DeviceNet PC cards	1046	PC Fieldbus Cards with PCI bus for DeviceNet system, FC5201, FC5202, FC5251
DIN rail PC	246	DIN rail PC CX8000, CX9000, CX9010, CX5010, CX5020, CX1010, CX1020, CX1030
Drive Technology	1066	Servo Drives AX5000, AX2000, AX2500, Servomotors AM3500, AM3000, AM2000, AL2000, AL2400, AL2800, AL3800, Stepper Motors AS1000

E

EK1000	687	EtherCAT Coupler for operation at the switch
EK1100	686	EtherCAT Coupler
EK1101	688	EtherCAT Coupler with ID switch for E-bus terminals
EK1110	693	EtherCAT extension
EK1122	691	EtherCAT junction, 2-port
EK1132	692	EtherCAT junction, 2-port, Power over EtherCAT
EK1501	689	EtherCAT Coupler with ID switch, multimode fibre optic for E-bus terminals
EK1521	690	EtherCAT multimode fibre optic junction, 1-port
EK3100	696	PROFIBUS Bus Coupler for EtherCAT Terminals
EK5100	697	CANopen Bus Coupler for EtherCAT Terminals
EK5200	698	DeviceNet Bus Coupler for EtherCAT Terminals
EK9000	699	Ethernet Bus Coupler for EtherCAT Terminals
EK9300	700	PROFINET IO Bus Coupler for EtherCAT Terminals
EK9500	701	EtherNet/IP Bus Coupler for EtherCAT Terminals
EK9700	702	SERCOS III Bus Coupler for EtherCAT Terminals
EL1002   ES1002	705	EtherCAT Terminal, 2-channel digital input 24 V DC, 3.0 ms filter
EL1004   ES1004	705	EtherCAT Terminal, 4-channel digital input 24 V DC, 3.0 ms filter
EL1008   ES1008	705	EtherCAT Terminal, 8-channel digital input 24 V DC, 3.0 ms filter
EL1012   ES1012	712	EtherCAT Terminal, 2-channel digital input 24 V DC, 10 µs filter
EL1014   ES1014	712	EtherCAT Terminal, 4-channel digital input 24 V DC, 10 µs filter
EL1018   ES1018	712	EtherCAT Terminal, 8-channel digital input 24 V DC, 10 µs filter
EL1024   ES1024	713	EtherCAT Terminal, 4-channel digital input 24 V DC, filter 3.0 ms
EL1034   ES1034	714	EtherCAT Terminal, 4-channel digital input 24 V DC, potential-free inputs, filter 10 µs
EL1084   ES1084	716	EtherCAT Terminal, 4-channel digital input 24 V DC, negative switching, filter 3.0 ms
EL1088   ES1088	716	EtherCAT Terminal, 8-channel digital input 24 V DC, negative switching, filter 3.0 ms
EL1094   ES1094	716	EtherCAT Terminal, 4-channel digital input 24 V DC, negative switching, filter 10 µs
EL1098   ES1098	716	EtherCAT Terminal, 8-channel digital input 24 V DC, negative switching, filter 10 µs
EL1104   ES1104	715	EtherCAT Terminal, 4-channel digital input 24 V DC, filter 3.0 ms
EL1114   ES1114	715	EtherCAT Terminal, 4-channel digital input 24 V DC, filter 10 µs
EL1124   ES1124	704	EtherCAT Terminal, 4-channel digital input 5 V DC, filter 10 µs
EL1134   ES1134	704	EtherCAT Terminal, 4-channel digital input 48 V DC, filter 10 µs
EL1144   ES1144	704	EtherCAT Terminal, 4-channel digital input 12 V DC, filter 10 µs

EL1202   ES1202	717	EtherCAT Terminal, 2-channel digital input 24 V DC, $T_{ON}/T_{OFF}$ 1 $\mu$ s
EL1252   ES1252	718	EtherCAT Terminal, 2-channel digital input 24 V DC, filter 10 $\mu$ s, with time stamp
EL1262   ES1262	719	EtherCAT Terminal, 2-channel digital input 24 V DC, filter 3.0 ms, with oversampling
EL1502   ES1502	723	EtherCAT Terminal, up/down counter 24 V DC, 100 kHz, 32 bit counter depth
EL1512   ES1512	724	EtherCAT Terminal, 2-channel, up/down counter 24 V DC, 1 kHz, 16 bit counter
EL1702   ES1702	722	EtherCAT Terminal, 2-channel digital input 120...230 V AC
EL1712   ES1712	722	EtherCAT Terminal, 2-channel digital input 120 V AC/DC
EL1722   ES1722	722	EtherCAT Terminal, 2-channel digital input 120...230 V AC, no power contacts
EL1804	708	EtherCAT Terminal, 4-channel digital input 24 V DC, 8 x 24 V DC, 4 x 0 V DC, 3.0 ms filter, 3-wire connection
EL1808	707	EtherCAT Terminal, 8-channel digital input 24 V DC, 8 x 24 V DC, 3.0 ms filter, 2-wire connection
EL1809	706	EtherCAT Terminal, 16-channel digital input 24 V DC, filter 3.0 ms, type 3
EL1814	708	EtherCAT Terminal, 4-channel digital input 24 V DC, 8 x 24 V DC, 4 x 0 V DC, filter typ. 10 $\mu$ s, 3-wire connection
EL1819	706	EtherCAT Terminal, 16-channel digital input 24 V DC, filter typ. 10 $\mu$ s, type 3
EL1859	710	EtherCAT Terminal, 8 digital inputs + 8 digital outputs 24 V DC, filter 3.0 ms, type 3, 0.5 A
EL1862	711	EtherCAT Terminal, 16-channel digital input 24 V DC, filter 3.0 ms, flat-ribbon cable connection, type 3
EL1872	711	EtherCAT Terminal, 16-channel digital input 24 V DC, filter typ. 10 $\mu$ s, flat-ribbon cable connection, type 3
EL1889	709	EtherCAT Terminal, 16-channel digital input 24 V DC, filter 3.0 ms, 0 V (ground) switching
EL1904	720	EtherCAT Terminal, 4 fail-safe inputs, TwinSAFE, 24 V DC
EL1934	721	EtherCAT Terminal, PROFI-safe, 4 fail-safe inputs 24 V DC
EL2002   ES2002	726	EtherCAT Terminal, 2-channel digital output 24 V DC, 0.5 A
EL2004   ES2004	726	EtherCAT Terminal, 4-channel digital output 24 V DC, 0.5 A
EL2008   ES2008	726	EtherCAT Terminal, 8-channel digital output 24 V DC, 0.5 A
EL2022   ES2022	731	EtherCAT Terminal, 2-channel digital output 24 V DC, 2 A
EL2024   ES2024	732	EtherCAT Terminal, 4-channel digital output 24 V DC, 2 A
EL2032   ES2032	731	EtherCAT Terminal, 2-channel digital output 24 V DC, 2 A
EL2034   ES2034	732	EtherCAT Terminal, 4-channel digital output 24 V DC, 2 A with diagnostics
EL2042   ES2042	733	EtherCAT Terminal, 2-channel digital output 24 V DC, 2 x 4 A/1 x 8 A
EL2084   ES2084	734	EtherCAT Terminal, 4-channel digital output 24 V DC, negative switching, 0.5 A
EL2088   ES2088	734	EtherCAT Terminal, 8-channel digital output 24 V DC, 0.5 A, total current 3 A, negative switching
EL2124   ES2124	725	EtherCAT Terminal, 4-channel digital output 5 V DC, 0.02 A
EL2202   ES2202	735	EtherCAT Terminal, 2-channel digital output 24 V DC, $T_{ON}/T_{OFF}$ 1 $\mu$ s, push-pull outputs
EL2212   ES2212	736	EtherCAT Terminal, 2-channel digital output terminal 24 V DC with overexcitation
EL2252   ES2252	737	EtherCAT Terminal, 2-channel digital output 24 V DC, 0.5 A, with time stamp, tri-state
EL2262   ES2262	738	EtherCAT Terminal, 2-channel digital output 24 V DC, 0.5 A, high-speed outputs with oversampling
EL2502   ES2502	745	EtherCAT Terminal, 2-channel pulse width output 24 V DC
EL2521   ES2521	748	EtherCAT Terminal, 1-channel pulse train output terminal, 2 RS422 outputs (5 V level)
EL2521-0024   ES2521-0024	748	EtherCAT Terminal, 1-channel pulse train output terminal, 2 outputs 24 V DC (supplied from an external source)
EL2535   ES2535	746	EtherCAT Terminal, 2-channel pulse width current terminal 24 V DC, 1 A
EL2545   ES2545	747	EtherCAT Terminal, 2-channel pulse width current terminal 50 V DC, 3.5 A
EL2602   ES2602	742	EtherCAT Terminal, 2-channel relay output 230 V AC, 2 A, make contact
EL2612   ES2612	742	EtherCAT Terminal, 2-channel relay output 125 V AC, 1 A, potential-free change-over, no power contacts
EL2622   ES2622	742	EtherCAT Terminal, 2-channel relay output 230 V AC, 2 A, potential-free make contact, no power contacts
EL2624   ES2624	743	EtherCAT Terminal, 4-channel relay output 125 V AC/30 V DC
EL2712   ES2712	744	EtherCAT Terminal, 2-channel triac output 12...230 V AC, 0.5 A
EL2722   ES2722	744	EtherCAT Terminal, 2-channel triac output 12...230 V AC, 1 A with mutually locked outputs
EL2732   ES2732	744	EtherCAT Terminal, 2-channel triac output 12...230 V AC, 0.5 A, no power contacts



EL2808	728	EtherCAT Terminal, 8-channel digital output 24 V DC, 8 x 0 V DC, 0.5 A
EL2809	727	EtherCAT Terminal, 16-channel digital output 24 V DC, 0.5 A
EL2872	730	EtherCAT Terminal, 16-channel digital output 24 V DC, 0.5 A, flat-ribbon cable connection
EL2889	729	EtherCAT Terminal, 16-channel digital output 24 V DC, 0.5 A, 0 V (ground) switching
EL2902	739	EtherCAT Terminal, 2 fail-safe outputs, TwinSAFE, 24 V DC, 2.3 A
EL2904	740	EtherCAT Terminal, 4 fail-safe outputs, TwinSAFE, 24 V DC, 0.5 A
EL2934	741	EtherCAT Terminal, PROFI-safe, 4 fail-safe outputs 24 V DC, 0.5 A
EL3001   ES3001	753	EtherCAT Terminal, 1-channel analog input -10...+10 V, single-ended, 12 bit
EL3002   ES3002	753	EtherCAT Terminal, 2-channel analog input -10...+10 V, single-ended, 12 bit
EL3004   ES3004	754	EtherCAT Terminal, 4-channel analog input -10...+10 V, single-ended, 12 bit
EL3008   ES3008	754	EtherCAT Terminal, 8-channel analog input -10...+10 V, single-ended, 12 bit
EL3011   ES3011	759	EtherCAT Terminal, 1-channel analog input 0...20 mA, differential input, 12 bit
EL3012   ES3012	759	EtherCAT Terminal, 2-channel analog input 0...20 mA, differential input, 12 bit
EL3014   ES3014	761	EtherCAT Terminal, 4-channel analog input 0...20 mA, differential input, 12 bit
EL3021   ES3021	764	EtherCAT Terminal, 1-channel analog input 4...20 mA, differential input, 12 bit
EL3022   ES3022	764	EtherCAT Terminal, 2-channel analog input 4...20 mA, differential input, 12 bit
EL3024   ES3024	766	EtherCAT Terminal, 4-channel analog input 4...20 mA, differential input, 12 bit
EL3041   ES3041	760	EtherCAT Terminal, 1-channel analog supply terminal 0...20 mA with power supply for transducers, single-ended, 12 bit
EL3042   ES3042	760	EtherCAT Terminal, 2-channel analog supply terminal 0...20 mA with power supply for transducers, single-ended, 12 bit
EL3044   ES3044	762	EtherCAT Terminal, 4-channel analog input 0...20 mA, single-ended, 12 bit
EL3048   ES3048	762	EtherCAT Terminal, 8-channel analog input 0...20 mA, single-ended, 12 bit
EL3051   ES3051	765	EtherCAT Terminal, 1-channel analog supply terminal 4...20 mA with power supply for transducers, single-ended, 12 bit
EL3052   ES3052	765	EtherCAT Terminal, 2-channel analog supply terminal 4...20 mA with power supply for transducers, single-ended, 12 bit
EL3054   ES3054	767	EtherCAT Terminal, 4-channel analog input 4...20 mA, single-ended, 12 bit
EL3058   ES3058	767	EtherCAT Terminal, 8-channel analog input 4...20 mA, single-ended, 12 bit
EL3061   ES3061	750	EtherCAT Terminal, 1-channel analog input 0...10 V, single-ended, 12 bit
EL3062   ES3062	750	EtherCAT Terminal, 2-channel analog input 0...10 V, single-ended, 12 bit
EL3064   ES3064	752	EtherCAT Terminal, 4-channel analog input 0...10 V, single-ended, 12 bit
EL3068   ES3068	752	EtherCAT Terminal, 8-channel analog input 0...10 V, single-ended, 12 bit
EL3101   ES3101	755	EtherCAT Terminal, 1-channel analog input -10...+10 V, differential input, 16 bit
EL3102   ES3102	755	EtherCAT Terminal, 2-channel analog input -10...+10 V, differential input, 16 bit
EL3104   ES3104	757	EtherCAT Terminal, 4-channel analog input -10...+10 V, differential input, 16 bit
EL3111   ES3111	759	EtherCAT Terminal, 1-channel analog input 0...20 mA, differential input, 16 bit
EL3112   ES3112	759	EtherCAT Terminal, 2-channel analog input 0...20 mA, differential input, 16 bit
EL3114   ES3114	761	EtherCAT Terminal, 4-channel analog input 0...20 mA, differential input, 16 bit
EL3121   ES3121	764	EtherCAT Terminal, 1-channel analog input 4...20 mA, differential input, 16 bit
EL3122   ES3122	764	EtherCAT Terminal, 2-channel analog input 4...20 mA, differential input, 16 bit
EL3124   ES3124	766	EtherCAT Terminal, 4-channel analog input 4...20 mA, differential input, 16 bit
EL3141   ES3141	760	EtherCAT Terminal, 1-channel analog supply terminal 0...20 mA with power supply for transducers via power contacts, single-ended, 16 bit
EL3142   ES3142	760	EtherCAT Terminal, 2-channel analog input 0...20 mA, single-ended, 16 bit
EL3144   ES3144	762	EtherCAT Terminal, 4-channel analog input 0...20 mA, single-ended, 16 bit
EL3151   ES3151	765	EtherCAT Terminal, 1-channel analog input 4...20 mA, single-ended, 16 Bit
EL3152   ES3152	765	EtherCAT Terminal, 2-channel analog input 4...20 mA, single-ended, 16 bit
EL3154   ES3154	767	EtherCAT Terminal, 4-channel analog input 4...20 mA, single-ended, 16 bit
EL3161   ES3161	751	EtherCAT Terminal, 1-channel analog input 0...10 V, single-ended, 16 bit
EL3162   ES3162	751	EtherCAT Terminal, 2-channel analog input 0...10 V, single-ended, 16 bit
EL3164   ES3164	752	EtherCAT Terminal, 4-channel analog input 0...10 V, single-ended, 16 bit
EL3201   ES3201	770	EtherCAT Terminal, 1-channel input PT100 (RTD) for resistance sensors, 16 bit
EL3202   ES3202	770	EtherCAT Terminal, 2-channel input PT100 (RTD) for resistance sensors, 16 bit
EL3204   ES3204	771	EtherCAT Terminal, 4-channel input PT100 (RTD) for resistance sensors, 16 bit

EL3311	768	EtherCAT Terminal, 1-channel thermocouple input, 16 bit
EL3312	768	EtherCAT Terminal, 2-channel thermocouple input, 16 bit
EL3314	769	EtherCAT Terminal, 4-channel thermocouple input, 16 bit
EL3351   ES3351	772	EtherCAT Terminal, 1 analog input, resistance bridge (strain gauge), 16 bit
EL3356   ES3356	773	EtherCAT Terminal, 1-channel accurate resistance bridge evaluation, 16 bit
EL3403   ES3403	778	EtherCAT Terminal, 3-phase power measurement terminal, max. 500 V AC 3~ max. 1 A (AC/DC), via measuring transformers x A/1A
EL3403-0010   ES3403-0010	778	EtherCAT Terminal, 3-phase power measurement terminal, max. 500 V AC 3~ max. 5 A (AC/DC), via measuring transformers x A/1 A
EL3602   ES3602	756	EtherCAT Terminal, 2-channel analog input -10...+10 V, differential input, 24 bit
EL3612   ES3612	774	EtherCAT Terminal, 2-channel analog input 0...20 mA, differential input, 24 bit
EL3632	775	EtherCAT Terminal, 2-channel analog input for Condition Monitoring (IEPE)
EL3681   ES3681	776	EtherCAT Terminal, digital multimeter terminal
EL3692	777	EtherCAT Terminal, 2-channel resistance measurement terminal 10 mΩ...10 MΩ, high-precision
EL3702   ES3702	758	EtherCAT Terminal, 2-channel analog input -10...+10 V, differential inputs, 16 bit, oversampling
EL3742   ES3742	763	EtherCAT Terminal, 2-channel analog input 0...20 mA, differential inputs, 16 bit, oversampling
EL4001   ES4001	780	EtherCAT Terminal, 1-channel analog output 0...10 V, 12 bit
EL4002   ES4002	780	EtherCAT Terminal, 2-channel analog output 0...10 V, 12 bit
EL4004   ES4004	781	EtherCAT Terminal, 4-channel analog output 0...10 V, 12 bit
EL4008   ES4008	781	EtherCAT Terminal, 8-channel analog output 0...10 V, 12 bit
EL4011   ES4011	785	EtherCAT Terminal, 1-channel analog output 0...20 mA, 12 bit
EL4012   ES4012	785	EtherCAT Terminal, 2-channel analog output 0...20 mA, 12 bit
EL4014   ES4014	786	EtherCAT Terminal, 4-channel analog output 0...20 mA, 12 bit
EL4018   ES4018	786	EtherCAT Terminal, 8-channel analog output 0...20 mA, 12 bit
EL4021   ES4021	788	EtherCAT Terminal, 1-channel analog output 4...20 mA, 12 bit
EL4022   ES4022	788	EtherCAT Terminal, 2-channel analog output 4...20 mA, 12 bit
EL4024   ES4024	789	EtherCAT Terminal, 4-channel analog output 4...20 mA, 12 bit
EL4028   ES4028	789	EtherCAT Terminal, 8-channel analog output 4...20 mA, 12 bit
EL4031   ES4031	782	EtherCAT Terminal, 1-channel analog output -10...+10 V, 12 bit
EL4032   ES4032	782	EtherCAT Terminal, 2-channel analog output -10...+10 V, 12 bit
EL4034   ES4034	783	EtherCAT Terminal, 4-channel analog output -10...+10 V, 12 bit
EL4038   ES4038	783	EtherCAT Terminal, 8-channel analog output -10...+10 V, 12 bit
EL4102   ES4102	780	EtherCAT Terminal, 2-channel analog output 0...10 V, 16 bit
EL4104   ES4104	781	EtherCAT Terminal, 4-channel analog output 0...10 V, 16 bit
EL4112   ES4112	785	EtherCAT Terminal, 2-channel analog output 0...20 mA, 16 bit
EL4112-0010   ES4112-0010	785	EtherCAT Terminal, 2-channel analog output -10...+10 mA, 16 bit
EL4114   ES4114	786	EtherCAT Terminal, 4-channel analog output 0...20 mA, 16 bit
EL4122   ES4122	788	EtherCAT Terminal, 2-channel analog output 4...20 mA, 16 bit
EL4124   ES4124	789	EtherCAT Terminal, 4-channel analog output 4...20 mA, 16 bit
EL4132   ES4132	782	EtherCAT Terminal, 2-channel analog output -10...+10 V, 16 bit
EL4134   ES4134	783	EtherCAT Terminal, 4-channel analog output -10...+10 V, 16 bit
EL4712   ES4712	787	EtherCAT Terminal, 2-channel analog output 0...20 mA, 16 bit, with oversampling
EL4732   ES4732	784	EtherCAT Terminal, 2-channel analog output -10...+10 V, with oversampling
EL5001   ES5001	790	EtherCAT Terminal, SSI encoder interface
EL5002   ES5002	790	EtherCAT Terminal, SSI encoder interface
EL5021   ES5021	791	EtherCAT Terminal, 1-channel SinCos encoder interface, 1 V <sub>SS</sub>
EL5101   ES5101	792	EtherCAT Terminal, incremental encoder interface with differential inputs, 16 bit
EL5151   ES5151	793	EtherCAT Terminal, 1-channel incremental encoder interface, 32 bit
EL5152   ES5152	793	EtherCAT Terminal, 2-channel incremental encoder interface, 32 bit
EL6001   ES6001	794	EtherCAT Terminal, serial interface RS232
EL6002	796	EtherCAT Terminal, 2-channel serial interface RS232
EL6021   ES6021	795	EtherCAT Terminal, serial interface RS422/RS485

EL6022	796	EtherCAT Terminal, 2-channel serial interface RS422/RS485
EL6080	797	EtherCAT Terminal, memory terminal, 128 kbyte
EL6201   ES6201	798	EtherCAT Terminal, AS-Interface master terminal
EL6224   ES6224	799	EtherCAT Terminal, IO-Link terminal
EL6601	800	EtherCAT Terminal, 1-port Ethernet switch port terminal
EL6614	800	EtherCAT Terminal, 4-port Ethernet switch port terminal
EL6631	801	EtherCAT Terminal, PROFINET IO controller/device terminal
EL6688	802	EtherCAT Terminal, IEEE 1588 synchronisation support
EL6692	803	EtherCAT Terminal, EtherCAT bridge terminal
EL6720	804	EtherCAT Terminal, Lightbus master terminal
EL6731	805	EtherCAT Terminal, PROFIBUS master terminal
EL6731-0010	805	EtherCAT Terminal, PROFIBUS slave terminal
EL6740-0010	806	EtherCAT Terminal, Interbus slave terminal
EL6751	807	EtherCAT Terminal, CANopen master terminal
EL6751-0010	807	EtherCAT Terminal, CANopen slave terminal
EL6752	808	EtherCAT Terminal, DeviceNet master terminal
EL6752-0010	808	EtherCAT Terminal, DeviceNet slave terminal
EL6851	809	EtherCAT Terminal, DMX master
EL6900	810	EtherCAT Terminal, TwinSAFE PLC
EL7031   ES7031	811	EtherCAT Terminal, Stepper Motor terminal 24 V DC, 1.5 A, 2 phases, 2 digital inputs 24 V DC
EL7041   ES7041	812	EtherCAT Terminal, Stepper Motor terminal with incremental encoder, 50 V DC, 5 A
EL7332   ES7332	813	EtherCAT Terminal, 2-channel DC motor output stage 24 V DC, 1 A
EL7342   ES7342	814	EtherCAT Terminal, 2-channel DC motor output stage 50 V DC, 3.5 A
EL9011	817	EtherCAT Terminal, bus end cap
EL9080	817	EtherCAT Terminal, isolation terminal
EL9100   ES9100	818	EtherCAT Terminal, passive potential feed terminal, 24 V DC
EL9110   ES9110	816	EtherCAT Terminal, power supply terminal with diagnostics, 24 V DC
EL9150   ES9150	816	EtherCAT Terminal, power supply terminal, 230 V AC
EL9160   ES9160	816	EtherCAT Terminal, power supply terminal with diagnostics, 230 V AC
EL9180   ES9180	817	EtherCAT Terminal, potential distribution terminal with 2 clamps per power contact
EL9184	819	EtherCAT Terminal, potential distribution terminal, 8 x 24 V contact, 8 x 0 V contact
EL9185   ES9185	817	EtherCAT Terminal, potential distribution terminal with 4 clamps per power contact
EL9186   ES9186	818	EtherCAT Terminal, potential distribution terminal, 8 x 24 V contact
EL9187   ES9187	818	EtherCAT Terminal, potential distribution terminal, 8 x 0 V contact
EL9188	819	EtherCAT Terminal, potential distribution terminal, 16 x 24 V contact
EL9189	819	EtherCAT Terminal, potential distribution terminal, 16 x 0 V contact
EL9190   ES9190	816	EtherCAT Terminal, power supply terminal for any voltage up to 230 V
EL9195   ES9195	817	EtherCAT Terminal, shield terminal
EL9200	817	EtherCAT Terminal, power supply terminal with fuse, 24 V DC
EL9210	817	EtherCAT Terminal, power supply terminal with fuse and diagnostics, 24 V DC
EL9250	817	EtherCAT Terminal, power supply terminal with fuse, 230 V AC
EL9260	817	EtherCAT Terminal, power supply terminal with fuse and diagnostics, 230 V AC
EL9290	817	EtherCAT Terminal, power supply terminal, up to 400 V AC
EL9400   ES9400	820	EtherCAT Terminal, power supply terminal for E-bus, 24 V DC, 2 A
EL9410   ES9410	820	EtherCAT Terminal, power supply terminal for E-bus with diagnostics
EL9505   ES9505	822	EtherCAT Terminal, power supply unit terminal 24 V DC, output 5 V DC, 0.5 A
EL9508   ES9508	822	EtherCAT Terminal, power supply unit terminal 24 V DC, output 8 V DC, 0.5 A
EL9510   ES9510	822	EtherCAT Terminal, power supply unit terminal 24 V DC, output 10 V DC, 0.5 A
EL9512   ES9512	822	EtherCAT Terminal, power supply unit terminal 24 V DC, output 12 V DC, 0.5 A
EL9515   ES9515	822	EtherCAT Terminal, power supply unit terminal 24 V DC, output 15 V DC, 0.5 A
EL9520   ES9520	821	EtherCAT Terminal, AS-Interface potential feed terminal with filter
EL9560   ES9560	823	EtherCAT Terminal, power supply terminal 24 V DC, output 24 V DC, 0.5 A
EL9570   ES9570	824	EtherCAT Terminal, buffer capacitor terminal
EL98xx	826	EtherCAT evaluation kit

ELxxxx	703	EtherCAT Terminals
EM2042	749	Terminal module, 16-channel digital output 24 V, 0.5 A, D-sub connection
EM7004	815	EtherCAT module, 4-axis interface
Embedded PC	246	DIN rail PC CX8000, CX9000, CX9010, CX5010, CX5020, CX1010, CX1020, CX1030
EP1008	973	EtherCAT Box, 8 digital inputs 24 V DC, filter 3.0 ms
EP1018	973	EtherCAT Box, 8 digital inputs 24 V DC, filter 10 µs
EP1122	972	EtherCAT Box, EtherCAT junction, 2-port
EP1258	975	EtherCAT Box, 8 digital inputs with 2-channel time stamp
EP1816	974	EtherCAT Box, 16 digital inputs 24 V DC, filter 10 µs
EP2008	976	EtherCAT Box, 8 digital outputs 24 V DC, 0.5 A
EP2028	977	EtherCAT Box, 8 digital outputs 24 V DC, 2 A (I <sub>s</sub> = 4 A)
EP2308	979	EtherCAT Box, 4 digital inputs 24 V DC, 3.0 ms, 4 digital outputs 24 V DC, 0.5 A
EP2316	980	EtherCAT Box, 8 digital inputs 24 V DC, 10 µs, 8 digital outputs 24 V DC, 0.5 A
EP2318	979	EtherCAT Box, 4 digital inputs 24 V DC, 10 µs, 4 digital outputs 24 V DC, 0.5 A
EP2338	981	EtherCAT Box, 8 digital inputs or outputs, freely configurable
EP2816	978	EtherCAT Box, 16 digital outputs 24 V DC, 0.5 A
EP3174	982	EtherCAT Box, 4 differential analog inputs -10...+10 V or 0/4...20 mA, parameterisable, 16 bit
EP3204	983	EtherCAT Box, 4 analog RTD inputs for resistance thermometer (PT100), 16 bit
EP3314	984	EtherCAT Box, 4 analog TC inputs for thermocouples, 16 bit
EP4174	985	EtherCAT Box, 4 analog outputs -10...+10 V or 0/4...20 mA, parameterisable, 16 bit
EP7041	986	EtherCAT Box, Stepper Motor module 50 V DC, 5 A, with incremental encoder, 2 digital inputs, 1 digital output
ESxxxx	703	EtherCAT Terminals with pluggable wiring
ET1100	827	EtherCAT ASIC, BGA128, 10 x 10 mm
ET1200	827	EtherCAT ASIC, QFN48, 7 x 7 mm
ET1810	828	EtherCAT IP core, node-locked licence for Altera FPGAs
ET1811	829	EtherCAT IP core, one-time kick-off charge for the node-locked licence for selected Altera devices
ET1815	828	EtherCAT IP core, node-locked licence for Xilinx FPGAs
ET1816	829	EtherCAT IP core, one-time kick-off charge for the node-locked licence for selected Xilinx devices
ET1902	834	Safety over EtherCAT slave licence
ET1903	834	Safety over EtherCAT master licence
ET2000	831	Industrial Ethernet multi-channel probe
ET9000	832	Licence for using the EtherCAT configurator
ET9200	832	Licence for using the EtherCAT Master Sample Code
ET9300	832	Licence for using the EtherCAT Slave Sample Code
ET9400	833	EtherCAT conformance test tool
EtherCAT	642	Real-time Ethernet fieldbus
EtherCAT Box	970	IP 67 modules with direct EtherCAT interface
EtherCAT Bus Coupler	694	Bus Coupler for EtherCAT system, BK1120, BK1250
EtherCAT Coupler	684	Couplers for EtherCAT system, EKxxxx
EtherCAT Drives	1072	Digital Compact Servo Drive for EtherCAT system, AX5000
EtherCAT Fieldbus Box	866	Fieldbus Box for EtherCAT system, IL230x-B110
EtherCAT Terminals	703	EtherCAT Terminals for EtherCAT system, ELxxxx, ESxxxx
EtherNet/IP Bus Coupler	438	Bus Coupler for EtherNet/IP system, BK9105
Ethernet Bus Coupler	432	Bus Coupler for Ethernet TCP/IP system, BK9xx0, BC9xx0, BX9000
Ethernet Fieldbus Box	902	Fieldbus Box for Ethernet TCP/IP system, IL230x-B900, IL230x-C900
Ethernet PC cards	1048	PC Fieldbus Cards with PCI bus for Ethernet, FC9001-0010, FC9011, FC9002, FC9004, FC9051, FC9151
Ethernet Switches	1056	Ethernet Switches CU2008, CU2016
EX250	968	SMC valve terminal with IP-Link interface for Fieldbus Box system

## F

FB1111-014x	830	EtherCAT piggyback controller boards with ET1100
FB1122	830	EtherCAT piggyback controller boards with Altera Cyclone III
FB1130	830	EtherCAT piggyback controller boards with Xilinx Spartan-3E
FC1100	1050	PC Fieldbus Cards, PCI EtherCAT slave card
FC2001	1022	PC Fieldbus Cards, PCI Lightbus, 1-channel
FC2002	1022	PC Fieldbus Cards, PCI Lightbus, 2-channel
FC3101	1044	PC Fieldbus Cards, PCI PROFIBUS, 1-channel
FC3102	1044	PC Fieldbus Cards, PCI PROFIBUS, 2-channel
FC3151	1051	PC Fieldbus Cards, Mini PCI PROFIBUS, 1-channel
FC5101	1045	PC Fieldbus Cards, PCI CANopen, 1-channel
FC5102	1045	PC Fieldbus Cards, PCI CANopen, 2-channel
FC5151	1052	PC Fieldbus Cards, Mini PCI CANopen, 1-channel
FC5201	1046	PC Fieldbus Cards, PCI DeviceNet, 1-channel
FC5202	1046	PC Fieldbus Cards, PCI DeviceNet, 2-channel
FC5251	1053	PC Fieldbus Cards, Mini PCI DeviceNet, 1-channel
FC7501	1047	PC Fieldbus Cards, PCI SERCOS interface, 1-channel
FC7502	1047	PC Fieldbus Cards, PCI SERCOS interface, 2-channel
FC7551	1054	PC Fieldbus Cards, Mini PCI SERCOS interface, 1-channel
FC9001-0010	1048	PC Fieldbus Cards, PCI Ethernet 10/100 Mbit/s, 1-channel
FC9002	1049	PC Fieldbus Cards, PCI Ethernet, 2-channel
FC9004	1049	PC Fieldbus Cards, PCI Ethernet, 4-channel
FC9011	1048	PC Fieldbus Cards, PCI Ethernet 10/100/1000 Mbit/s, 1-channel
FC9051	1055	PC Fieldbus Cards, Mini PCI Ethernet 10/100 Mbit/s, 1-channel
FC9151	1055	PC Fieldbus Cards, Mini PCI Ethernet 10/100/1000 Mbit/s, 1-channel
Fieldbus Box	840	Compact IP 67 modules
Fieldbus Module	1008	Fieldbus Modules with multi-thermocouple connection, PROFIBUS interface
Fipio Bus Coupler	426	Bus Coupler for Fipio system, BK7420
FM3312-B310	1010	Fieldbus Module with 12-channel thermocouple connection, PROFIBUS interface
FM3332-B310	1010	Fieldbus Module with 32-channel thermocouple connection, PROFIBUS interface

## I

IE100x	944	Fieldbus Box, Extension Box, 8 digital inputs 24 V DC, 3.0 ms filter
IE101x	944	Fieldbus Box, Extension Box, 8 digital inputs 24 V DC, 0.2 ms filter
IE1502	945	Fieldbus Box, Extension Box, up/down counter 24 V DC, 100 kHz
IE200x	946	Fieldbus Box, Extension Box, 8 digital outputs 24 V DC, 0.5 A
IE202x	947	Fieldbus Box, Extension Box, 8 digital outputs 24 V DC, 2 A (I <sub>s</sub> = 4 A)
IE204x	948	Fieldbus Box, Extension Box, 8 digital outputs 24 V DC, 2 A (I <sub>s</sub> = 12 A)
IE230x	951	Fieldbus Box, Extension Box, 4 digital inputs 24 V, 3.0 ms, 4 digital outputs 24 V, 0.5 A
IE231x	951	Fieldbus Box, Extension Box, 4 digital inputs 24 V DC, 0.2 ms, 4 digital outputs 24 V DC, 0.5 A
IE232x	952	Fieldbus Box, Extension Box, 4 digital inputs 24 V DC, 3.0 ms, 4 digital outputs 24 V DC, 2 A (I <sub>s</sub> = 4 A)
IE233x	952	Fieldbus Box, Extension Box, 4 digital inputs 24 V DC, 0.2 ms, 4 digital outputs 24 V DC, 2 A (I <sub>s</sub> = 4 A)
IE2403	954	Fieldbus Box, Extension Box, 16 digital combined inputs/outputs 24 V DC, 3.0 ms, 24 V DC, 0.5 A (connector with spring-loaded system)
IE240x	953	Fieldbus Box, Extension Box, 16 digital combined inputs/outputs 24 V DC, 3.0 ms, 24 V DC, 0.5 A (4-pin)
IE2512	950	Fieldbus Box, Extension Box, 2 digital pulse-width outputs 24 V DC, 2.5 A
IE2808	949	Fieldbus Box, Extension Box, 16 digital outputs, D-sub, 25-pin, 24 V DC, 0.5 A
IE3102	956	Fieldbus Box, Extension Box, 4 differential analog inputs -10...+10 V, 16 bit
IE3112	957	Fieldbus Box, Extension Box, 4 differential analog inputs 0/4...20 mA, 16 bit

IE3202	958	Fieldbus Box, Extension Box, 4 analog RTD inputs for resistance thermometer (PT100), 16 bit
IE3312	959	Fieldbus Box, Extension Box, 4 analog TC inputs for thermocouples, 16 bit
IE4112	960	Fieldbus Box, Extension Box, 4 analog outputs 0/4...20 mA, 16 bit
IE4132	961	Fieldbus Box, Extension Box, 4 analog outputs -10...+10 V, 16 bit
IE5009	962	Fieldbus Box, Extension Box, SSI encoder interface
IE5109	963	Fieldbus Box, Extension Box, incremental encoder interface with complementary inputs, 1 MHz
IE6002	964	Fieldbus Box, Extension Box, serial interface RS232
IE6012	965	Fieldbus Box, Extension Box, serial interface, 0...20 mA (TTY)
IE6022	966	Fieldbus Box, Extension Box, serial interface RS422, RS485
IL230x-B110	866	Fieldbus Box, Coupler Box for EtherCAT system, with IP-Link interface
IL230x-B200	870	Fieldbus Box, Coupler Box for Lightbus system, with IP-Link interface
IL230x-B310	874	Fieldbus Box, Coupler Box for PROFIBUS system (12 Mbaud), with IP-Link interface
IL230x-B318	874	Fieldbus Box, Coupler Box for PROFIBUS system (12 Mbaud), with IP-Link interface, with integrated tee-connector
IL230x-B400	878	Fieldbus Box, Coupler Box for Interbus system, with IP-Link interface
IL230x-B510	882	Fieldbus Box, Coupler Box for CANopen system, with IP-Link interface
IL230x-B518	882	Fieldbus Box, Coupler Box for CANopen system, with IP-Link interface, with integrated tee-connector
IL230x-B520	886	Fieldbus Box, Coupler Box for DeviceNet system, with IP-Link interface
IL230x-B528	886	Fieldbus Box, Coupler Box for DeviceNet system, with IP-Link interface, with integrated tee-connector
IL230x-B730	890	Fieldbus Box, Coupler Box for Modbus system, with IP-Link interface
IL230x-B800	894	Fieldbus Box, Coupler Box for RS485 system, with IP-Link interface
IL230x-B810	898	Fieldbus Box, Coupler Box for RS232 system, with IP-Link interface
IL230x-B900	902	Fieldbus Box, Coupler Box for Ethernet TCP/IP system, with IP-Link interface, RJ 45 socket
IL230x-B901	902	Fieldbus Box, Coupler Box for Ethernet TCP/IP system, with IP-Link interface, d-coded M12 socket
IL230x-B903	906	Fieldbus Box, Coupler Box for PROFINET system, with IP-Link interface
IL230x-B905	910	Fieldbus Box, Coupler Box for EtherNet/IP system, with IP-Link interface
IL230x-Bxxx	938	Fieldbus Box, Coupler Box, 4 digital inputs, 4 digital outputs, with IP-Link interface
IL230x-C310	874	Fieldbus Box, PLC Box for PROFIBUS system (12 Mbaud), with IP-Link interface, IEC 61131-3
IL230x-C318	874	Fieldbus Box, PLC Box for PROFIBUS system (12 Mbaud), with IP-Link interface, IEC 61131-3, with integrated tee-connector
IL230x-C810	898	Fieldbus Box, PLC Box for RS232 system, with IP-Link interface, IEC 61131-3
IL230x-C900	902	Fieldbus Box, PLC Box for Ethernet TCP/IP system, with IP-Link interface, IEC 61131-3
IL230x-Cxxx	940	Fieldbus Box, PLC Box, 4 digital inputs, 4 digital outputs, with IP-Link interface, IEC 61131-3
<b>Interbus Bus Coupler</b>	408	Bus Couplers for Interbus, BK4000, BK4010, BK4020, BK4500, BC4000
<b>Interbus Fieldbus Box</b>	878	Fieldbus Box for Interbus system, IPxxx-B400, IL230x-B400
IP100x-Bxxx	914	Fieldbus Box, Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter
IP101x-Bxxx	914	Fieldbus Box, Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter
IP1502-Bxxx	915	Fieldbus Box, Compact Box, 2-channel up/down counter 24 V DC, 100 kHz
IP200x-Bxxx	916	Fieldbus Box, Compact Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A
IP202x-Bxxx	917	Fieldbus Box, Compact Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (I <sub>S</sub> = 4 A)
IP204x-Bxxx	918	Fieldbus Box, Compact Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (I <sub>S</sub> = 12 A)
IP230x-Bxxx	920	Fieldbus Box, Compact Box, 4 digital inputs 24 V DC, 3.0 ms, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A
IP231x-Bxxx	920	Fieldbus Box, Compact Box, 4 digital inputs 24 V DC, 0.2 ms, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A
IP232x-Bxxx	921	Fieldbus Box, Compact Box, 4 digital inputs 24 V DC, 3 ms, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (I <sub>S</sub> = 4 A)

IP233x-Bxxx	921	Fieldbus Box, Compact Box, 4 digital inputs 24 V DC, 0.2 ms, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (I <sub>s</sub> = 4 A)
IP240x-Bxxx	922	Fieldbus Box, Compact Box, 16 digital combined inputs/outputs 24 V DC, 3.0 ms, 24 V DC, I <sub>MAX</sub> = 0.5 A (4-pin)
IP2512-Bxxx	919	Fieldbus Box, Compact Box, 2-channel pulse width outputs 24 V DC, I <sub>MAX</sub> = 2.5 A
IP3102-Bxxx	924	Fieldbus Box, Compact Box, 4 differential analog inputs -10...+10 V, 16 bit
IP3112-Bxxx	925	Fieldbus Box, Compact Box, 4 differential analog inputs 0/4...20 mA, 16 bit
IP3202-Bxxx	926	Fieldbus Box, Compact Box, 4 analog RTD inputs for resistance sensors PT100...1000, Ni100, Ni120, Ni1000, 16 bit
IP3312-Bxxx	927	Fieldbus Box, Compact Box, 4 analog TC inputs for thermocouples, types J, K, L, B, E, N, R, S, T, U, 16 bit
IP4112-Bxxx	928	Fieldbus Box, Compact Box, 4 analog outputs 0/4...20 mA, 16 bit
IP4132-Bxxx	929	Fieldbus Box, Compact Box, 4 analog outputs -10...+10 V, 16 bit
IP5009-Bxxx	930	Fieldbus Box, Compact Box, 1-channel SSI encoder interface
IP5109-Bxxx	931	Fieldbus Box, Compact Box, 1-channel incremental encoder interface with complementary inputs, 1 MHz
IP5209-Bxxx	932	Fieldbus Box, Compact Box, 1-channel SinCos encoder interface, 1 V <sub>SS</sub>
IP5209-Bxxx-1000	932	Fieldbus Box, Compact Box, 1-channel SinCos encoder interface, 11 μA <sub>SS</sub>
IP6002-Bxxx	933	Fieldbus Box, Compact Box, 1-channel serial interface RS232
IP6012-Bxxx	934	Fieldbus Box, Compact Box, 1-channel serial interface, 0...20 mA (TTY)
IP6022-Bxxx	935	Fieldbus Box, Compact Box, 1-channel serial interface RS422, RS485
IPxxx-B200	870	Fieldbus Box, Compact Box for Lightbus system
IPxxx-B310	874	Fieldbus Box, Compact Box for PROFIBUS system (12 Mbaud)
IPxxx-B318	874	Fieldbus Box, Compact Box for PROFIBUS system (12 Mbaud), with integrated tee-connector
IPxxx-B400	878	Fieldbus Box, Compact Box for Interbus system
IPxxx-B510	882	Fieldbus Box, Compact Box for CANopen system
IPxxx-B518	882	Fieldbus Box, Compact Box for CANopen system, with integrated tee-connector
IPxxx-B520	886	Fieldbus Box, Compact Box for DeviceNet system
IPxxx-B528	886	Fieldbus Box, Compact Box for DeviceNet system, with integrated tee-connector
IPxxx-B730	890	Fieldbus Box, Compact Box for Modbus system
IPxxx-B800	894	Fieldbus Box, Compact Box for RS485 system
IPxxx-B810	898	Fieldbus Box, Compact Box for RS232 system
<b>K</b>		
K7xxx   KT7xxx	238	Additional keyboard for Control Panels
Keyboard	238	Additional keyboard for Control Panels
KL1002   KS1002	476	Bus Terminal, 2 digital inputs 24 V DC, 3.0 ms filter
KL1012   KS1012	476	Bus Terminal, 2 digital inputs 24 V DC, 0.2 ms filter
KL1032   KS1032	477	Bus Terminal, 2 digital inputs 48 V DC, 3.0 ms filter
KL1052   KS1052	478	Bus Terminal, 2 digital inputs 24 V DC, p/n-switching, 3.0 ms filter
KL1104   KS1104	479	Bus Terminal, 4 digital inputs 24 V DC, 3.0 ms filter
KL1114   KS1114	479	Bus Terminal, 4 digital inputs 24 V DC, 0.2 ms filter
KL1124   KS1124	480	Bus Terminal, 4 digital inputs 5 V DC, 0.2 ms filter
KL1154   KS1154	481	Bus Terminal, 4 digital inputs 24 V DC, p/n-switching, 3.0 ms filter
KL1164   KS1164	481	Bus Terminal, 4 digital inputs 24 V DC, p/n-switching, 0.2 ms filter
KL1184   KS1184	482	Bus Terminal, 4 digital inputs 24 V DC, negative switching, 3.0 ms filter
KL1194   KS1194	482	Bus Terminal, 4 digital inputs 24 V DC, negative switching, 0.2 ms filter
KL1212   KS1212	483	Bus Terminal, 2 digital inputs 24 V DC, with short-circuit protected sensor supply and diagnostics, 3.0 ms filter
KL1232   KS1232	484	Bus Terminal, 2 digital inputs 24 V DC, with edge triggered pulse expansion
KL1302   KS1302	485	Bus Terminal, 2 digital inputs 24 V DC for type 2 sensors, 3.0 ms filter
KL1304   KS1304	486	Bus Terminal, 4 digital inputs 24 V DC for type 2 sensors, 3.0 ms filter

KL1312   KS1312	485	Bus Terminal, 2 digital inputs 24 V DC for type 2 sensors, 0.2 ms filter
KL1314   KS1314	486	Bus Terminal, 4 digital inputs 24 V DC for type 2 sensors, 0.2 ms filter
KL1352   KS1352	487	Bus Terminal, 2 digital inputs for Namur sensors
KL1362   KS1362	488	Bus Terminal, 2 digital inputs, break-in alarm
KL1382   KS1382	489	Bus Terminal, 2 digital inputs, thermistor
KL1402   KS1402	490	Bus Terminal, 2 digital inputs 24 V DC, 3.0 ms filter, IEC 61131-2, type 3
KL1404   KS1404	491	Bus Terminal, 4 digital inputs 24 V DC, 3.0 ms filter, IEC 61131-2, type 3
KL1408   KS1408	492	Bus Terminal, 8 digital inputs 24 V DC, 3.0 ms filter, IEC 61131-2, type 3
KL1412   KS1412	490	Bus Terminal, 2 digital inputs 24 V DC, 0.2 ms filter, IEC 61131-2, type 3
KL1414   KS1414	491	Bus Terminal, 4 digital inputs 24 V DC, 0.2 ms filter, IEC 61131-2, type 3
KL1418   KS1418	492	Bus Terminal, 8 digital inputs 24 V DC, 0.2 ms filter, IEC 61131-2, type 3
KL1434   KS1434	491	Bus Terminal, 4 digital inputs 24 V DC, 0.2 ms filter, input current 6 mA typ.
KL1488   KS1488	492	Bus Terminal, 8 digital inputs 24 V DC, 3.0 ms filter, negative switching
KL1498   KS1498	492	Bus Terminal, 8 digital inputs 24 V DC, 0.2 ms filter, negative switching
KL1501   KS1501	493	Bus Terminal, up/down counter 24 V DC, 100 kHz, 32 bit
KL1512   KS1512	494	Bus Terminal, up/down counter 24 V DC, 1 kHz, 16 bit
KL1702   KS1702	495	Bus Terminal, 2 digital inputs 120...230 V AC
KL1712   KS1712	495	Bus Terminal, 2 digital inputs 120 V AC/DC
KL1712-0060   KS1712-0060	495	Bus Terminal, 2 digital inputs 60 V DC
KL1722   KS1722	495	Bus Terminal, 2 digital inputs 120...230 V AC without power contacts
KL1804	496	Bus Terminal, 4 digital inputs 24 V DC, 8 x 24 V DC, 4 x 0 V DC, 3.0 ms filter, 3-wire connection
KL1808	497	Bus Terminal, 8 digital inputs 24 V DC, 8 x 24 V DC, 3.0 ms filter, 2-wire connection
KL1809	498	Bus Terminal, 16 digital inputs 24 V DC, filter 3.0 ms, type 3
KL1814	496	Bus Terminal, 4 digital inputs 24 V DC, 8 x 24 V DC, 4 x 0 V DC, 0.2 ms filter, 3-wire connection
KL1819	498	Bus Terminal, 16 digital inputs 24 V DC, filter 0.2 ms, type 3
KL1859	499	Bus Terminal, 8 digital inputs + 8 digital outputs 24 V DC, filter 3.0 ms, type 3, 0.5 A
KL1862	500	Bus Terminal, 16 digital inputs 24 V DC, filter 3.0 ms, flat-ribbon cable connection, type 3
KL1872	500	Bus Terminal, 16 digital inputs 24 V DC, filter 0.2 ms, flat-ribbon cable connection, type 3
KL1889	501	Bus Terminal, 16 digital inputs 24 V DC, filter 3.0 ms, 0 V (ground) switching
KL1904	502	Bus Terminal, TwinSAFE, 4 fail-safe inputs 24 V DC
KL2012   KS2012	507	Bus Terminal, 2 digital outputs 24 V DC, 0.5 A
KL2022   KS2022	507	Bus Terminal, 2 digital outputs 24 V DC, 2.0 A
KL2032   KS2032	507	Bus Terminal, 2 digital outputs 24 V DC, 0.5 A with reverse connection protection
KL2114   KS2114	508	Bus Terminal, 4 digital outputs 24 V DC, 0.5 A
KL2124   KS2124	509	Bus Terminal, 4 digital outputs 5 V DC, 0.02 A
KL2134   KS2134	508	Bus Terminal, 4 digital outputs 24 V DC, 0.5 A with reverse connection protection
KL2184   KS2184	510	Bus Terminal, 4 digital outputs 24 V DC, negative switching, 0.5 A
KL2212   KS2212	511	Bus Terminal, 2 digital outputs 24 V DC, 0.5 A, diagnostic function for wire break and overload
KL2404   KS2404	512	Bus Terminal, 4 digital outputs 24 V DC, 0.5 A
KL2408   KS2408	513	Bus Terminal, 8 digital outputs 24 V DC, 0.5 A
KL2424   KS2424	512	Bus Terminal, 4 digital outputs 24 V DC, 2.0 A
KL2442	514	Bus Terminal, 2 digital outputs 24 V DC, 2 x 4 A/1 x 8 A
KL2488   KS2488	513	Bus Terminal, 8 digital outputs 24 V DC, 0.5 A, negative switching
KL2502   KS2502	516	Bus Terminal, 2 digital pulse width outputs 24 V DC, 0.1 A
KL2512   KS2512	516	Bus Terminal, 2-channel pulse width output terminal 24 V DC, 1 A, negative switching
KL2521   KS2521	515	Bus Terminal, 1 pulse train output, 2 RS422 outputs (5 V level)
KL2521-0024   KS2521-0024	515	Bus Terminal, 1 pulse train output, 2 outputs 24 V DC (supplied from an external source)
KL2531   KS2531	519	Bus Terminal, 1 digital Stepper Motor output 24 V DC, 1.5 A
KL2532   KS2532	521	Bus Terminal, 2-channel DC motor output stage 24 V DC, 1 A
KL2535   KS2535	517	Bus Terminal, 2-channel pulse width current terminal 24 V DC, 1 A
KL2541   KS2541	520	Bus Terminal, 1 digital Stepper Motor output 50 V DC, 5.0 A, incremental encoder
KL2545   KS2545	518	Bus Terminal, 2-channel pulse width current terminal 50 V DC, 3.5 A



KL2552   KS2552	522	Bus Terminal, 2-channel DC motor output stage 50 V DC, 5 A
KL2602   KS2602	524	Bus Terminal, 2 relay outputs 230 V AC, 2 A, make contacts
KL2612   KS2612	524	Bus Terminal, 2 relay outputs 125 V AC, 0.5 A, potential-free change-over
KL2622   KS2622	524	Bus Terminal, 2 relay outputs 230 V AC, 2 A, potential-free make contacts
KL2631   KS2631	525	Bus Terminal, 1 relay output 400 V AC, 3.75 A, make contact
KL2641	526	Bus Terminal, 1 relay output 230 V AC, 16 A, manual operation
KL2652   KS2652	527	Bus Terminal, 2 relay outputs 230 V AC, 1 A, isolated change-over
KL2692   KS2692	528	Bus Terminal, cycle monitoring terminal (watchdog)
KL2701   KS2701	529	Bus Terminal, 1-channel solid state load relay up to 230 V AC/DC, 3 A, solid state load relay
KL2702   KS2702	530	Bus Terminal, 2 solid state outputs 230 V AC, 0.3 A
KL2712   KS2712	531	Bus Terminal, 2 triac outputs 12...230 V AC, 0.01...0.5 A
KL2722   KS2722	531	Bus Terminal, 2 triac outputs 12...230 V AC, 1 A
KL2732   KS2732	531	Bus Terminal, 2 triac outputs 12...230 V AC, 1 A, without power contacts
KL2751   KS2751	534	Bus Terminal, 1-channel universal dimmer terminal 230 V AC, 300 VA (W)
KL2761   KS2761	535	Bus Terminal, 1-channel universal dimmer terminal 230 V AC, 600 VA (W)
KL2784   KS2784	532	Bus Terminal, 4 digital outputs 24 V DC, 1 A, short-circuit-proof
KL2791   KS2791	523	Bus Terminal, 1-channel AC motor speed controller, 230 V AC, 200 VA
KL2794   KS2794	533	Bus Terminal, 4 digital outputs 24 V DC, 1 A, potential-free, short-circuit-proof
KL2808	536	Bus Terminal, 8 digital outputs 24 V DC, 8 x 0 V DC, 0.5 A
KL2809	537	Bus Terminal, 16 digital outputs 24 V DC, 0.5 A
KL2872	538	Bus Terminal, 16 digital outputs 24 V DC, 0.5 A, flat-ribbon cable connection
KL2889	539	Bus Terminal, 16 digital outputs 24 V DC, 0.5 A, 0 V (ground) switching
KL2904	540	Bus Terminal, TwinSAFE, 4 fail-safe outputs 24 V DC, 0.5 A
KL3001   KS3001	548	Bus Terminal, 1 differential analog input -10...+10 V, 12 bit
KL3002   KS3002	548	Bus Terminal, 2 differential analog inputs -10...+10 V, 12 bit
KL3011   KS3011	549	Bus Terminal, 1 differential analog input 0...20 mA, 12 bit
KL3012   KS3012	549	Bus Terminal, 2 differential analog inputs 0...20 mA, 12 bit
KL3021   KS3021	549	Bus Terminal, 1 differential analog input 4...20 mA, 12 bit
KL3022   KS3022	549	Bus Terminal, 2 differential analog inputs 4...20 mA, 12 bit
KL3041   KS3041	550	Bus Terminal, 1 analog input 0...20 mA with power supply for measuring transducer, 12 bit
KL3042   KS3042	550	Bus Terminal, 2 analog inputs 0...20 mA with power supply for measuring transducer, 12 bit
KL3044   KS3044	551	Bus Terminal, 4 analog inputs 0...20 mA, 12 bit
KL3051   KS3051	550	Bus Terminal, 1 analog input 4...20 mA with power supply for measuring transducer, 12 bit
KL3052   KS3052	550	Bus Terminal, 2 analog inputs 4...20 mA with power supply for measuring transducer, 12 bit
KL3054   KS3054	551	Bus Terminal, 4 analog inputs 4...20 mA, 12 bit
KL3061   KS3061	552	Bus Terminal, 1 analog input 0...10 V, single-ended, 12 bit
KL3062   KS3062	552	Bus Terminal, 2 analog inputs 0...10 V, single-ended, 12 bit
KL3064   KS3064	553	Bus Terminal, 4 analog inputs 0...10 V, single-ended, 12 bit
KL3102   KS3102	554	Bus Terminal, 2 differential analog inputs -10...+10 V, 16 bit
KL3112   KS3112	555	Bus Terminal, 2 differential analog inputs 0...20 mA, 16 bit
KL3122   KS3122	555	Bus Terminal, 2 differential analog inputs 4...20 mA, 16 bit
KL3132   KS3132	556	Bus Terminal, 2 differential analog inputs -10...+10 V, 16 bit, ±0.05 % accuracy
KL3142   KS3142	557	Bus Terminal, 2 differential analog inputs 0...20 mA, 16 bit, ±0.05 % accuracy
KL3152   KS3152	557	Bus Terminal, 2 differential analog inputs 4...20 mA, 16 bit, ±0.05 % accuracy
KL3162   KS3162	556	Bus Terminal, 2 differential analog inputs 0...10 V, 16 bit, ±0.05 % accuracy
KL3172   KS3172	556	Bus Terminal, 2 differential analog inputs 0...2 V, 16 bit, ±0.05 % accuracy
KL3182   KS3182	556	Bus Terminal, 2 differential analog inputs -2...+2 V, 16 bit, ±0.05 % accuracy
KL3201   KS3201	558	Bus Terminal, 1 analog RTD input for resistance thermometers (PT100), 16 bit
KL3202   KS3202	558	Bus Terminal, 2 analog RTD inputs for resistance thermometers (PT100), 16 bit
KL3204   KS3204	559	Bus Terminal, 4 analog RTD inputs for resistance thermometers (PT100), 16 bit
KL3222   KS3222	560	Bus Terminal, 2 analog inputs RTD for resistance thermometers (PT100), high-precision
KL3228   KS3228	561	Bus Terminal, 8 analog RTD inputs for resistance thermometers PT1000/Ni1000
KL3311	562	Bus Terminal, 1 analog TC input for thermocouples, 16 bit
KL3312	562	Bus Terminal, 2 analog TC inputs for thermocouples, 16 bit

KL3314	563	Bus Terminal, 4 analog TC inputs for thermocouples, 16 bit
KL3351   KS3351	564	Bus Terminal, 1 analog input, resistance bridge (strain gauge), 16 bit
KL3356   KS3356	565	Bus Terminal, 1 analog input for accurate resistance bridge evaluation, 16 bit
KL3361   KS3361	566	Bus Terminal, 1 analog oscilloscope input -20...+20 mV, 14 bit
KL3362   KS3362	567	Bus Terminal, 2 analog oscilloscope inputs -10...+10 V, 14 bit
KL3403   KS3403	569	Bus Terminal, 3-phase power measurement terminal, 16 bit
KL3404   KS3404	570	Bus Terminal, 4 differential analog inputs -10...+10 V, 12 bit
KL3408   KS3408	570	Bus Terminal, 8 differential analog inputs -10...+10 V, 12 bit
KL3444   KS3444	571	Bus Terminal, 4 differential analog inputs 0...20 mA, 12 bit
KL3448   KS3448	571	Bus Terminal, 8 differential analog inputs 0...20 mA, 12 bit
KL3454   KS3454	572	Bus Terminal, 4 differential analog inputs 4...20 mA, 12 bit
KL3458   KS3458	572	Bus Terminal, 8 differential analog inputs 4...20 mA, 12 bit
KL3464   KS3464	570	Bus Terminal, 4 analog inputs 0...10 V, single-ended, 12 bit
KL3468   KS3468	570	Bus Terminal, 8 analog inputs 0...10 V, single-ended, 12 bit
KL3681   KS3681	568	Bus Terminal, digital multimeter terminal
KL4001   KS4001	576	Bus Terminal, 1 analog output 0...10 V DC, 12 bit
KL4002   KS4002	576	Bus Terminal, 2 analog outputs 0...10 V DC, 12 bit
KL4004   KS4004	577	Bus Terminal, 4 analog outputs 0...10 V DC, 12 bit
KL4011   KS4011	578	Bus Terminal, 1 analog output 0...20 mA, 12 bit
KL4012   KS4012	578	Bus Terminal, 2 analog outputs 0...20 mA, 12 bit
KL4021   KS4021	578	Bus Terminal, 1 analog output 4...20 mA, 12 bit
KL4022   KS4022	578	Bus Terminal, 2 analog outputs 4...20 mA, 12 bit
KL4031   KS4031	579	Bus Terminal, 1 analog output -10...+10 V DC, 12 bit
KL4032   KS4032	579	Bus Terminal, 2 analog outputs -10...+10 V DC, 12 bit
KL4034   KS4034	580	Bus Terminal, 4 analog outputs -10...+10 V DC, 12 bit
KL4112   KS4112	581	Bus Terminal, 2 analog outputs 0...20 mA, 15 bit, configurable 16 bit
KL4132   KS4132	582	Bus Terminal, 2 analog outputs -10...+10 V DC, 16 bit
KL4404   KS4404	583	Bus Terminal, 4 analog outputs 0...10 V DC, 12 bit
KL4408   KS4408	583	Bus Terminal, 8 analog outputs 0...10 V DC, 12 bit
KL4414   KS4414	584	Bus Terminal, 4 analog outputs 0...20 mA, 12 bit
KL4418   KS4418	584	Bus Terminal, 8 analog outputs 0...20 mA, 12 bit
KL4424   KS4424	584	Bus Terminal, 4 analog outputs 4...20 mA, 12 bit
KL4428   KS4428	584	Bus Terminal, 8 analog outputs 4...20 mA, 12 bit
KL4434   KS4434	583	Bus Terminal, 4 analog outputs -10...+10 V DC, 12 bit
KL4438   KS4438	583	Bus Terminal, 8 analog outputs -10...+10 V DC, 12 bit
KL4494   KS4494	585	Bus Terminal, 2 analog inputs -10...+10 V, 2 analog outputs -10...+10 V, 12 bit
KL5001   KS5001	588	Bus Terminal, SSI encoder interface
KL5051   KS5051	588	Bus Terminal, SSI encoder interface, bi-directional for digifas® drives
KL5101   KS5101	589	Bus Terminal, incremental encoder interface with complementary inputs
KL5111   KS5111	590	Bus Terminal, incremental encoder interface with single inputs
KL5121   KS5121	591	Bus Terminal, linear motion controller terminal with 4 switching outputs
KL5151   KS5151	592	Bus Terminal, incremental encoder interface
KL5152   KS5152	592	Bus Terminal, 2-channel incremental encoder interface
KL6001   KS6001	593	Bus Terminal, RS232 serial interface, 9.6 kbaud
KL6011   KS6011	594	Bus Terminal, 20 mA current loop serial interface TTY
KL6021   KS6021	595	Bus Terminal, RS422/RS485 serial interface, 9.6 kbaud
KL6023	601	Bus Terminal, Wireless Adapter for EnOcean radio technology
KL6031   KS6031	593	Bus Terminal, serial interface RS232, 115.2 kbaud
KL6041   KS6041	595	Bus Terminal, serial interface RS422/RS485, 115.2 kbaud
KL6051   KS6051	596	Bus Terminal, data exchange terminal, 32 bit serial
KL6201   KS6201	597	Bus Terminal, AS-Interface master terminal
KL6211   KS6211	597	Bus Terminal, AS-Interface master terminal with power contacts
KL6224   KS6224	598	Bus Terminal, IO-Link terminal
KL6301   KS6301	599	Bus Terminal, EIB Bus Terminal
KL6401   KS6401	600	Bus Terminal, LON Bus Terminal

KL6581	602	Bus Terminal, EnOcean master terminal
KL6583	603	Bus Terminal, EnOcean transmitter and receiver
KL6771   KS6771	604	Bus Terminal, MP-Bus master terminal
KL6811   KS6811	605	Bus Terminal, DALI/DSI master and power supply terminal
KL6904	606	Bus Terminal, TwinSAFE Logic Bus Terminal, 4 fail-safe outputs 24 V DC, 0.5 A
KL8001	608	Bus Terminal, power terminal with adapter for Siemens contactor, series Sirius 3R
KL8601	610	Bus Terminal, communication module for TeSys model U
KL8610	611	Bus Terminal, adapter terminal for TeSys model U
KL9010	621	Bus Terminal, bus end terminal
KL9020	612	Bus Terminal, terminal bus extension end terminal
KL9050	613	Bus Terminal, terminal bus extension coupler terminal
KL9060	614	Bus Terminal, adapter terminal for power terminal KL8xxx
KL9070   KS9070	615	Bus Terminal, shield terminal, 8 x shield
KL9080	621	Bus Terminal, isolation terminal
KL9100   KS9100	620	Bus Terminal, passive potential feed terminal 24 V DC
KL9110   KS9110	620	Bus Terminal, potential feed terminal with diagnostics 24 V DC
KL9150   KS9150	620	Bus Terminal, passive potential feed terminal 230 V AC
KL9160   KS9160	620	Bus Terminal, potential feed terminal with diagnostics 230 V AC
KL9180   KS9180	621	Bus Terminal, potential distribution terminal with 2 terminal locations per power contact
KL9184	618	Bus Terminal, potential distribution terminal, 8 x 24 V contact, 8 x 0 V contact
KL9185   KS9185	621	Bus Terminal, potential distribution terminal with 4 terminal locations at each of two power contacts
KL9186   KS9186	617	Bus Terminal, potential distribution terminal, 8 x 24 V contact
KL9187   KS9187	617	Bus Terminal, potential distribution terminal, 8 x 0 V contact
KL9188	618	Bus Terminal, potential distribution terminal, 16 x 24 V contact
KL9189	618	Bus Terminal, potential distribution terminal, 16 x 0 V contact
KL9190   KS9190	620	Bus Terminal, potential feed terminal for any voltages up to 230 V
KL9195   KS9195	621	Bus Terminal, screening terminal, potential distributor terminal with connection to ground
KL9200	621	Bus Terminal, passive potential feed terminal with fuse, 24 V DC
KL9210	621	Bus Terminal, potential feed terminal with diagnostics and fuse, 24 V DC
KL9250	621	Bus Terminal, passive potential feed terminal with fuse, 125...230 V AC
KL9260	621	Bus Terminal, potential feed terminal with diagnostics and fuse, 230 V AC
KL9290	621	Bus Terminal, passive potential feed terminal, up to 400 V AC
KL9300   KS9300	616	Bus Terminal, diode array terminals, 4 potential-free diodes, 1 A
KL9301   KS9301	616	Bus Terminal, diode array terminals, 7 diodes (common cathode), 1 A
KL9302   KS9302	616	Bus Terminal, diode array terminals, 7 diodes (common anode), 1 A
KL9400   KS9400	622	Bus Terminal, K-bus power unit 2 A and potential feed terminal, 24 V DC
KL9505   KS9505	623	Bus Terminal, power supply terminal 24 V DC, output 5 V DC, 0.5 A
KL9508   KS9508	623	Bus Terminal, power supply terminal 24 V DC, output 8 V DC, 0.5 A
KL9510   KS9510	623	Bus Terminal, power supply terminal 24 V DC, output 10 V DC, 0.5 A
KL9512   KS9512	623	Bus Terminal, power supply terminal 24 V DC, output 12 V DC, 0.5 A
KL9515   KS9515	623	Bus Terminal, power supply terminal 24 V DC, output 15 V DC, 0.5 A
KL9520   KS9520	624	Bus Terminal, AS-Interface potential feed terminal with filter, 35 V DC
KL9528   KS9528	625	Bus Terminal, AS-Interface power supply terminal 24 V DC, output 30 V DC, 1.25 A
KL9540   KS9540	626	Bus Terminal, surge filter field supply
KL9550   KS9550	626	Bus Terminal, surge filter system and field supply
KL9560   KS9560	627	Bus Terminal, power supply terminal 24 V DC/ 24 V DC, 0.1 A
KL9570   KS9570	628	Bus Terminal, buffer capacitor terminal
KM1002	503	Bus Terminal, 16 (2 x 8) digital inputs 24 V DC, 3.0 ms filter
KM1004	504	Bus Terminal, 32 (4 x 8) digital inputs 24 V DC, 3.0 ms filter
KM1008	505	Bus Terminal, 64 (8 x 8) digital inputs 24 V DC, 3.0 ms filter
KM1012	503	Bus Terminal, 16 (2 x 8) digital inputs 24 V DC, 0.2 ms filter
KM1014	504	Bus Terminal, 32 (4 x 8) digital inputs 24 V DC, 0.2 ms filter
KM1018	505	Bus Terminal, 64 (8 x 8) digital inputs 24 V DC, 0.2 ms filter
KM1644	506	Terminal module, 4-channel manual operation and display

KM2002	541	Bus Terminal, 16 (2 x 8) digital outputs 24 V DC, 0.5 A
KM2004	542	Bus Terminal, 32 (4 x 8) digital outputs 24 V DC, 0.5 A
KM2008	543	Bus Terminal, 64 (8 x 8) digital outputs 24 V DC, 0.5 A
KM2042	544	Terminal module, 16 digital outputs 24 V, 0.5 A, D-sub connection
KM2604	545	Terminal module, 4-channel relay module, 230 V AC, 16 A
KM2614	545	Terminal module, 4-channel relay module, 230 V AC, 16 A, manual operation
KM2642	546	Bus Terminal, 2 relay outputs, 230 V AC, 16 A, manual/automatic operation
KM2774	547	Terminal module, triac output for 4 blind motors, 230 V AC, 1.5 A with mutually locked outputs and overload protection
KM3701	573	Terminal module, 1-channel differential pressure measuring terminal -100...+100 hPa (-100...+100 mbar)
KM3702	574	Terminal module, 2-channel absolute pressure measuring terminal 7,500 hPa (7.5 bar)
KM3712	575	Terminal module, 2-channel absolute pressure measuring terminal -1,000...+1,000 hPa (-1...+1 bar)
KM4602	586	Terminal module, 2 analog outputs 0...10 V, manual/automatic operation
KM6551	607	Terminal module, wireless data exchange terminal
KS2000	1064	Configuration software for fieldbus components
KS2000-Z2-USB	635	Accessories fieldbus components, USB cable for the connection between PC and BK, BC and LC Couplers
KS2000-Z3-USB	1000	Accessories fieldbus components, USB cable for the connection between PC and Fieldbus Box
KS8000	1065	ActiveX software tool for the operation of I/O components
LC3100	407	Bus Coupler for PROFIBUS system (12 Mbaud), "Low Cost" coupler
LC5100	415	Bus Coupler for CANopen system, "Low Cost" coupler
LC5200	419	Bus Coupler for DeviceNet system, "Low Cost" coupler
Lightbus	1012	Fast fibre optic fieldbus
Lightbus Bus Coupler	398	Bus Coupler for the Lightbus system: BK2000, BK2010, BK2020, BK2500, BC2000
Lightbus Fieldbus Box	870	Fieldbus Box for Lightbus system, IPxxxx-B200, IL230x-B200
Lightbus interface	1023	Interface cards for Lightbus system, C1200, C1220, C1300
Lightbus modules	1026	Peripheral modules for Lightbus system, Mxxxx
Lightbus PC cards	1022	PC Fieldbus Cards with PCI bus for Lightbus system, FC2001, FC2002
M1110	1027	Lightbus module, 16 bit digital input/output module, IP 65, 24 V DC
M1200	1026	Lightbus module, CMOS interface module, plug-in, U = 5 V DC
M1210	1026	Lightbus module, CMOS interface module, plug-in, U = 24 V DC
M1400	1028	Lightbus module, 32 bit digital input/output module, 24 V DC
M1410	1028	Lightbus module, 16 bit digital input/output module, 24 V DC
M2400	1029	Lightbus module, 4 analog inputs and 16 digital I/O channels
M2510	1030	Lightbus module, 4 analog inputs
M3000	1031	Lightbus module, absolute encoder
M3100	1032	Lightbus module, incremental encoder connection box, IP 65
M3120	1033	Lightbus module, 4-channel incremental encoder interface
M3200	1031	Lightbus module, incremental encoder
M63xx	1034	Lightbus module, control unit with Lightbus interface
MES system	1129	Magnetic encoder system for Linear Servomotors AL2xxx
Mini PLC	442	Bus Terminal Controller BC series, IEC 61131-3
Modbus Bus Coupler	424	Bus Coupler for Modbus system, BK73x0, BC7300
Modbus Fieldbus Box	890	Fieldbus Box for Modbus system, IPxxxx-B730, IL230x-B730
MP-Bus master terminal	604	Bus Terminal, MP Bus master terminal

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NC	1148	TwinCAT, interpolation and PTP positioning software for Windows NT/2000/XP/Vista, Windows 7
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P

Panel PCs	62	Panel PC CP62xx, CP64xx, CP65xx, CP67xx, CP71xx, CP72xx, CP77xx, C33xx, C36xx
PC Fieldbus Cards	1038	Fieldbus interface cards with PCI bus, FCxxxx
PLC	1146	TwinCAT PLC, IEC 61131-3 PLC automation software for Windows NT/2000/XP/Vista, Windows 7
PROFIBUS Bus Coupler	400	Bus Couplers for PROFIBUS system, BK3010, BK3100, BK3110, BK3120, BK3150, BK3500, BK3520, BC3100, BC3150, BX3100, LC3100
PROFIBUS Fieldbus Box	874	Fieldbus Box for PROFIBUS system, IPxxx-B31x, IL230x-B31x, IL230x-C31x
PROFIBUS Fieldbus Module	1010	Multi-thermocouple module with PROFIBUS interface, FM3300-B310
PROFIBUS PC cards	1044	PC Fieldbus Cards with PCI bus, FC3101, FC3102, FC3151
PROFINET Bus Coupler	436	Bus Couplers for PROFINET system, BK9103

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RFID reader	241	RFID reader in the Control Panel front
RS232 Bus Coupler	430	Bus Coupler with communication interface BK8100, BC8100, BC8150
RS232 Fieldbus Box	898	Fieldbus Box for RS232 system, IPxxx-B810, IL230x-B810, IL230x-C810
RS485 Bus Coupler	430	Bus Coupler with communication interface BK8000, BC8000, BX8000
RS485 Fieldbus Box	894	Fieldbus Box for RS485 system, IPxxx-B800, IL230x-B800

S

Safety	384	TwinSAFE: safety and I/O technology in one system
SERCOS Bus Coupler	428	Bus Coupler for SERCOS system, BK7500, BK7520
SERCOS PC cards	1047	PC Fieldbus Cards with PCI bus for SERCOS system, FC7501, FC7502, FC7551
Small controllers	442	Bus Terminal Controller BC/BX series, IEC 61131-3
Software CNC	1152	Software CNC, CNC path control for tough requirements
Software NC	1148	TwinCAT NC, interpolation and PTP positioning software for Windows NT/2000/XP/Vista, Windows 7
Software PLC	1146	TwinCAT PLC, IEC 61131-3 PLC automation software for Windows NT/2000/XP/Vista, Windows 7
Switches	1056	Ethernet Switches CU2008, CU2016

T

TC9910-B110	839	EtherCAT demokit, with TwinCAT PLC licence
TC9910-B111	839	EtherCAT demokit, without TwinCAT PLC licence
TC9910-Bxxx	639	Demokit with Bus Coupler and TwinCAT PLC licence
TC9910-Cxxx	639	Demokit with Bus Terminal Controller and TwinCAT PLC licence
TR1xxx	1190	Training, TwinCAT
TR2xxx	1191	Training, TwinCAT NC
TR3xxx	1192	Training, TwinCAT, Ethernet components
TR4xxx	1194	Training, Embedded PC CX
TR5xxx	1193	Training, TwinCAT, Building Automation
TR8010	1192	Training, TwinCAT, TwinSAFE
TR8100	1195	EtherCAT evaluation workshop for slave developers
TR8110	1195	Training, EtherCAT technology basics for developers
TR8200	1195	EtherCAT Master Sample Code workshop for master developers

<b>Training</b>	1188	Training program for Beckhoff system components
<b>TwinCAT ADS Communication Library</b>	1174	ADS OCX/DLL for access to TwinCAT from Windows programs
<b>TwinCAT Backup</b>	1160	TwinCAT Backup tool for backing up and restoring of files, operating system settings and TwinCAT settings
<b>TwinCAT Building Automation Framework</b>	1181	Development and commissioning of building automation applications
<b>TwinCAT Cam Design Tool</b>	1168	Graphical development tool for programming cam plates
<b>TwinCAT CNC</b>	1152	Software CNC, CNC path control for tough requirements
<b>TwinCAT CNC Axes Pack</b>	1153	Expansion to a total of 64 axes/controlled spindles, of which a maximum of 32 can be path axes and a maximum of 12 can be controlled spindles
<b>TwinCAT CNC Channel Pack</b>	1153	1 further CNC channel, expandable to a maximum of 12 channels, channel synchronisation, axis transfer between channels
<b>TwinCAT CNC HSC Pack</b>	1153	Path programming via splines with programmable spline type, Akima spline, B-spline
<b>TwinCAT CNC Transformation</b>	1153	Transformation functionality (5-axis functionality), kinematics selection from kinematics library, RTCP function, TLC function, definition of various coordinate systems, linking/transition of coordinate systems
<b>TwinCAT CP</b>	1156	Driver for Windows programs and the Beckhoff Control Panel
<b>TwinCAT Crestron Server</b>	1183	For communication between a TwinCAT PLC and a Crestron control centre via Ethernet TCP/IP
<b>TwinCAT Database Server</b>	1161	Database Server for logging of PLC data in a database
<b>TwinCAT Digital Cam Server</b>	1168	Fast camshaft controller implemented in software in TwinCAT
<b>TwinCAT DriveCOM OPC Server</b>	1173	Drive server for communication with DriveCOM devices
<b>TwinCAT DriveTop Server</b>	1173	Configuration of Indramat SERCOS drives with DriveTop software on TwinCAT systems
<b>TwinCAT ECAD Import</b>	1158	Tool for importing the I/Os from an ECAD application into the TwinCAT System Manager
<b>TwinCAT Engineering Interface Server</b>	1158	Server for source code management programs, to access PLC projects, Microsoft Visual SourceSafe, CVS Subversion or PVCS in the source code management database
<b>TwinCAT EtherCAT Redundancy</b>	1163	Extends the TwinCAT EtherCAT master with cable redundancy capability
<b>TwinCAT EtherNet/IP Slave</b>	1165	TwinCAT supplement for using every Beckhoff PC-based control system as an EtherNet/IP slave
<b>TwinCAT Eventlogger</b>	1159	Alarm and diagnostic system for managing and forwarding all messages (events) that appear in the TwinCAT system
<b>TwinCAT FTP Client</b>	1178	Enables the TwinCAT PLC to access several FTP servers
<b>TwinCAT I/O</b>	1154	I/O real-time software DLL for Windows NT/2000/XP/Vista, Windows 7 for exchanging data with Windows programs
<b>TwinCAT Kinematic Transformation</b>	1169	Realises different kinematic transformations for TwinCAT PTP or TwinCAT NC I
<b>TwinCAT Management Server</b>	1162	Management Server for central administration of Beckhoff CE controls
<b>TwinCAT Modbus TCP Server</b>	1177	TwinCAT Modbus server for communication with Modbus TCP devices, server and client functionality
<b>TwinCAT Modbus TCP Server CE</b>	1177	TwinCAT Modbus server for communication with Modbus TCP devices, server and client functionality, Windows CE
<b>TwinCAT NC Camming</b>	1167	Software library for TwinCAT PLC for implementation of the cam plate functionality of TwinCAT NC
<b>TwinCAT NC FIFO Axes</b>	1166	Software library for TwinCAT PLC, permitting set value generation for an NC axis
<b>TwinCAT NC Flying Saw</b>	1167	Software library for TwinCAT PLC, for implementation of the "flying saw" functionality
<b>TwinCAT NC I</b>	1150	Interpolation and PTP positioning software for Windows NT/2000/XP/Vista, Windows 7 with integrated IEC 61131-3 PLC TwinCAT PLC

TwinCAT NC PTP	1148	PTP positioning software for Windows NT/2000/XP/Vista, Windows 7 with integrated IEC 61131-3 PLC TwinCAT PLC
TwinCAT OPC Server	1175	Standard interface for automation, data exchange via OPC server
TwinCAT OPC Server CE	1175	Standard interface for automation, data exchange via OPC server, Windows CE
TwinCAT OPC UA Server	1176	UA interface for automation, data exchange via OPC UA server
TwinCAT OPC UA Server CE	1176	UA interface for automation, data exchange via OPC UA server, Windows CE
TwinCAT PLC	1146	IEC 61131-3 PLC automation software for Windows NT/2000/XP/Vista and Windows 7, programming environment for all Beckhoff controllers
TwinCAT PLC Building Automation	1180	Software library for TwinCAT PLC for execution of basic functions in the building automation area
TwinCAT PLC Building Automation DALI	1180	Software library for TwinCAT PLC for communication with the KL6811 DALI master Bus Terminal
TwinCAT PLC Controller Toolbox	1179	Software library for TwinCAT PLC with blocks for basic controllers, complex controllers, pulse width modulation, ramps, signal generators, filters
TwinCAT PLC HMI	1161	Tool for developing visualisations under Windows NT/2000/XP/Vista, Windows 7
TwinCAT PLC HMI CE	1162	Tool for developing visualisations under Windows CE
TwinCAT PLC HMI Web	1162	Tool for developing web-based visualisations under Windows XP or CE
TwinCAT PLC HVAC	1182	HVAC library for automation of heating, ventilation, air-conditioning and sanitary installations in the area of building automation
TwinCAT PLC Hydraulic Positioning	1166	Software library for TwinCAT PLC for controlling hydraulic axes
TwinCAT PLC IEC 60870-5-101 Master	1172	Software library for TwinCAT PLC for communication via the telecontrol protocol according to IEC 60870-5-101 (serial transfer). The master can be realised using the library.
TwinCAT PLC IEC 60870-5-101 Slave	1172	Software library for TwinCAT PLC for communication via the telecontrol protocol according to IEC 60870-5-101 (serial transfer)
TwinCAT PLC IEC 60870-5-102 Master	1172	Software library for TwinCAT PLC for communication via the telecontrol protocol according to IEC 60870-5-101 (transmission of integrated totals). The master can be realised using the library.
TwinCAT PLC IEC 60870-5-103 Master	1172	Software library for TwinCAT PLC for communication via the telecontrol protocol according to IEC 60870-5-103 (serial communication with digital protective equipment). The master can be realised using the library.
TwinCAT PLC IEC 60870-5-104 Master	1172	Software library for TwinCAT PLC for communication via the telecontrol protocol according to IEC 60870-5-104 (TCP/IP-based transfer). The master can be realised using the library.
TwinCAT PLC IEC 60870-5-104 Master CE	1172	Software library for TwinCAT PLC for communication via the telecontrol protocol according to IEC 60870-5-102 (TCP/IP-based transfer) for Windows CE. The master can be realised using the library.
TwinCAT PLC IEC 60870-5-104 Slave	1172	Software library for TwinCAT PLC for communication via the telecontrol protocol according to IEC 60870-5-104 (TCP/IP-based transfer)
TwinCAT PLC IEC 60870-5-104 Slave CE	1172	Licence for using an IEC 61131-3 software library for TwinCAT PLC for communication via the telecontrol protocol according to IEC 60870-5-104 (TCP/IP-based transmission) for Windows CE platforms
TwinCAT PLC M-Bus	1183	M-Bus (metering bus) library for logging consumption data (e.g. in water meters, electricity meters, gas meters, heat/cold meters, etc.)
TwinCAT PLC Modbus RTU	1171	Software library for TwinCAT PLC with function blocks for serial communication with Modbus end devices
TwinCAT PLC Remote Synchronisation	1167	Time synchronisation of information in distributed systems and special techniques for synchronising NC axes
TwinCAT PLC RFID Reader Communication	1178	For the connection of RFID readers to the TwinCAT PLC

TwinCAT PLC Serial Communication	1170	Software library for TwinCAT PLC for connection to serial devices
TwinCAT PLC Serial Communication 3964R/RK512	1170	Software library for TwinCAT PLC for communication via Bus Terminals or PC COM ports using the 3964R/RK512 protocol
TwinCAT PLC Serial Communication EnOcean	1171	Software library for TwinCAT PLC for communication with the KL6021-0023 serial Bus Terminal (EnOcean technology)
TwinCAT PLC Temperature Controller	1179	Software library for TwinCAT PLC for implementation of a temperature controller
TwinCAT PROFINET IO Controller	1164	TwinCAT supplement for using a standard Ethernet interface as PROFINET master on PCs and Embedded PCs
TwinCAT PROFINET IO Device	1164	TwinCAT supplement for using every Beckhoff PC-based control system as a PROFINET slave
TwinCAT Scope 2	1163	Software scope for displaying TwinCAT variables as complex 2-D and 3-D graphics
TwinCAT Simulation Manager	1160	Real-time simulation solution for the TwinCAT system
TwinCAT SMS/SMTP Server	1176	Server for sending SMS messages via mobile telephones and for sending e-mails via the Simple Mail Transfer Protocol
TwinCAT SMTP/SMS Server CE	1176	Server for sending SMS messages via mobile telephones and for sending e-mails via the Simple Mail Transfer Protocol for Windows CE
TwinCAT TCP/IP Server	1177	TwinCAT TCP/IP Server for communication with TCP/IP devices, server and client functionality
TwinCAT TCP/IP Server CE	1177	TwinCAT TCP/IP Server for communication with TCP/IP devices, server and client functionality for Windows CE
TwinCAT Valve Diagram Editor	1169	Graphics-oriented editor for designing the characteristic curve of a hydraulic valve
TwinCAT Virtual Serial COM Driver	1177	Driver for the insertion of one or more EL60xx EtherCAT Terminals as normal serial interfaces ('COMx') in Windows CE or XP
TwinCAT XML Data Server	1159	XML Data Server for data exchange between an XML file and TwinCAT PLC
TwinCAT XML Data Server CE	1159	XML Data Server for data exchange between an XML file and TwinCAT PLC for Windows CE
TwinSAFE	384	TwinSAFE: safety and I/O technology in one system
USB Bus Coupler	440	Bus Coupler for Universal Serial Bus (USB), BK9500
XFC	664	eXtreme Fast Control Technology
Z1000	634	Bus Coupler accessories, standard Lightbus connector for 1000 µm plastic fibre
Z1003	634	Bus Coupler accessories, Interbus/SERCOS interface FSMA connector for 1000 µm plastic fibre
Z1010	634	Bus Coupler accessories, standard Lightbus connector for 200 µm PCS fibre
Z1020	634	Bus Coupler accessories, Lightbus coupling for Z1000
Z10xx	1036	Optical fibre connector for Bus Coupler BK2xxx, Lightbus
Z11xx	636	Bus Coupler accessories, plastic optical fibres
ZB260x	637	Bus Terminal accessories, relay, 230 V AC, 16 A

U

X

Z



ZB3100	634	Bus Coupler accessories, PROFIBUS connector with switchable termination resistor
ZB3101	634	Bus Coupler accessories, PROFIBUS connector with programming interface
ZB3200	636	Bus Coupler accessories, PROFIBUS cable
ZB4100	634	Bus Coupler accessories, Interbus, D-sub socket, 9-pin, for incoming remote bus
ZB4101	634	Bus Coupler accessories, Interbus, D-sub plug, 9-pin, for outgoing remote bus
ZB4200	636	Bus Coupler accessories, Interbus copper cable for Bus Coupler BK4xxx
ZB5100	636	Bus Coupler accessories, CAN copper cable for Bus Coupler BK51xx
ZB5200	636	Bus Coupler accessories, DeviceNet copper cable for Bus Coupler BK52xx
ZB900x	1000	Fieldbus Box accessories, power lead, sensor lead
ZB90x0	636	Bus Coupler accessories, industrial Ethernet/EtherCAT cable, CAT5e, 4-wires
ZK1010-xxxx	635	Bus Coupler accessories, ribbon cable for K-bus extension
ZK1020-0101-1000	990	Fieldbus Box accessories, IP-Link connector
ZK1020-xxxx	990	Fieldbus Box accessories, IP-Link cable
ZK1031-xxxx	994	Fieldbus Box accessories, cordsets for PROFIBUS, Modbus, RS485
ZK1052-xxxx	998	Fieldbus Box accessories, cordsets for CANopen, DeviceNet
ZK1090-31xx	988	Accessories Fieldbus Box, EtherCAT fieldbus cables
ZK1090-9191-000x	1091	Drive Technology accessories, EtherCAT patch cable
ZK1090-xxxx	635	Bus Coupler accessories, cable for K-bus extension
ZK1091-1001-00xx	837	EtherCAT accessories, fibre-optic cables for EK1501, EK1521
ZK2000-xxxx	1002	Fieldbus Box accessories, sensor lead
ZK2020-xxxx	1000	Fieldbus Box accessories, power lead
ZK4000-21xx	1102	Drive Technology accessories, motor cables for Servo Drive AX2000
ZK4000-22xx	1103	Drive Technology accessories, resolver cables for Servomotors AM2000, AM3000, AM3500
ZK4000-23xx	1104	Drive Technology accessories, interface cables for Servo Drive AX2xxx
ZK4000-24xx	1103	Drive Technology accessories, encoder cables for Servomotors AL2xxx
ZK4000-25xx	1104	Drive Technology accessories, thermal protection cables for Servomotors AL2xxx
ZK4000-26xx	1103	Drive Technology accessories, encoder cables for Servomotors AM2000, AM3000, AM3500, AL2000
ZK4000-27xx	1102	Drive Technology accessories, motor cables for Servo Drive AX2500
ZK4000-5100-2zzz	1131	Drive Technology accessories, encoder cables for Stepper motors AS1000
ZK4000-6200-2zzz	1131	Drive Technology accessories, motor cables for Stepper motors AS1000
ZK450x-00yy-zzzz	1092	Drive Technology accessories, motor cables for Servomotors AM2000, AM3000, AL2000
ZK451x-00yy-zzzz	1094	Drive Technology accessories, encoder cables for Servomotors AM3000, AM3500, AL2000
ZK451x-01yy-zzzz	1095	Drive Technology accessories, encoder cables for Servomotors AM2000
ZK453x-00yy-zzzz	1094	Drive Technology accessories, resolver cables for Servomotors AM2000, AM3000, AM3500
ZS1000-xxxx	991	Fieldbus Box accessories for PROFIBUS, Modbus, RS232, RS485
ZS1010-xxxx	635	Bus Coupler accessories, end plug for the KL8001
ZS102x-0010	990	Fieldbus Box accessories, IP-Link connector
ZS1031-xxxx	991	Fieldbus Box accessories for PROFIBUS, Modbus, RS232, RS485
ZS1052-xxxx	996	Fieldbus Box accessories for CANopen, DeviceNet
ZS1090-0002	989	Fieldbus Box accessories for Ethernet RJ 45 plug
ZS1090-0003	634	Fieldbus Box accessories RJ 45 connector, 4-pin, IP 20, for field assembly
ZS1090-0004	989	Fieldbus Box accessories, Ethernet d-coded M12 plug, field assembly
ZS2000-xxxx	1006	Fieldbus Box accessories, sensor and power lead accessories for field assembly
ZS2001-000x	637	Bus Terminal accessories, connector for KM modules, EM modules, Extension Box IE2403
ZS2010	637	Bus Terminal accessories, connector for KS Bus Terminals, ES EtherCAT Terminals
ZS2020-xxxx	1007	Fieldbus Box accessories, power distribution box
ZS4000-200x	1104	Drive Technology accessories, connector for Servo Drive AX2000
ZS4000-20xx	1090	Drive Technology accessories, connector for Servomotor ALxxxx, AM2000, AM3000, AM3500

ZS4000-2100	1090	Drive Technology accessories, metal flange for motor cable
ZS4000-2101	1090	Drive Technology accessories, metal flange for feedback cable
ZS4000-250x	1104	Drive Technology accessories, connector for Servo Drive AX2500
ZS4500-20xx	1089	Drive Technology accessories, connector for Servo Drive AX5000
ZS5x00-xxxx	1001	Fieldbus Box accessories, marking material
ZS6100-0900	640	Accessories 2.4 GHz radio technology, directional antenna, 9 dBi
ZS6100-1800	641	Accessories 2.4 GHz radio technology, directional antenna, 18 dBi
ZS6200-0400	640	Accessories 2.4 GHz radio technology, omni-directional antenna, 4 dBi
ZS6201-0410	641	Accessories 2.4 GHz radio technology, rod antenna, 4 dBi
ZS6201-0500	641	Accessories 2.4 GHz radio technology, rod antenna, 5 dBi

## International units | Measures, weights and temperature

Linear measures	
1 inch (in)	25.4 mm
1 foot (ft)	30.48 cm

Square measures	
1 square inch (sq in)	6.4516 cm <sup>2</sup>
1 square foot (sq ft)	0.09290306 m <sup>2</sup>

Weights	
1 pound (lb)	453.59237 g
1 ounce (oz)	28.3495 g

Fahrenheit (°F)	Celsius (°C)
$t_F = 9/5 * t_C + 32$	$t_C = 5/9 * (t_F - 32)$

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**BECKHOFF**  
C6920

**BECKHOFF**  
TOP

COM1  
X 106

DVI-I  
X 108

USB 4  
X 107

USB 3  
X 106

USB 2  
X 105

USB 1  
X 104

LAN2 10/100  
X 105

LAN1 100/1000  
X 102

3 Pin  
PC-ON  
24V  
24V UPS  
BAT  
Green USB  
only

# Industrial PC

PC Control for all applications



62 Panel PCs



114 Control cabinet Industrial PCs



194 Control Panel

# Industrial PC

The right Industrial PC for every application

<b>46</b>	Product overview	<b>108</b>	<b>C36xx   Built-in Panel PC</b> Industrial PC with display, ATX motherboard with 3 PCI and 3 PCIe slots	<b>172</b>	<b>C69xx   Control cabinet Industrial PC</b> 3½-inch motherboard with one Mini PCI slot in compact aluminium housing
<b>59</b>	Beckhoff Industrial PC   The right Industrial PC for every application			<b>182</b>	<b>Accessories Industrial PC</b> Adapter to extend and to branch out DVI and USB, USB flash drive devices and USP battery pack
<b>62</b>	<b>Panel PCs</b>	<b>114</b>	<b>Control cabinet Industrial PCs</b>	<b>190</b>	<b>CP-Link 3</b> Desktop transfer software
<b>64</b>	<b>CP62xx   "Economy" built-in Panel PC</b> Industrial PC with display, 3½-inch motherboard with one Mini PCI slot	<b>114</b>	<b>C51xx   19-inch slide-in Industrial PC</b> ATX motherboard or slot motherboard on passive backplane	<b>194</b>	<b>Control Panel</b>
<b>72</b>	<b>CP64xx   Built-in Panel PC</b> Industrial PC with display, slot motherboard on passive backplane, 2 PCI slots	<b>120</b>	<b>C61xx   Control cabinet Industrial PC</b> ATX motherboard or slot motherboard on passive backplane in five housing sizes	<b>206</b>	<b>CP66xx   Built-in Control Panel with Ethernet interface</b> The PC operating terminal for installation in the control cabinet door
<b>76</b>	<b>CP65xx   Built-in Panel PC</b> Industrial PC with display, ATX motherboard with 3 PCI and 3 PCIe slots	<b>134</b>	<b>C62xx   Control cabinet Industrial PC</b> ATX motherboard or slot motherboard on passive backplane in compact drawer housing	<b>208</b>	<b>CP69xx   Built-in Control Panel with DVI/USB interface</b> The PC operating terminal for installation in the control cabinet door
<b>80</b>	<b>CP71xx   Panel PC IP 65</b> Industrial PC with display, slot motherboard on passive backplane, 1 PCI slot	<b>146</b>	<b>C63xx   Control cabinet Industrial PC</b> Slot motherboard on passive backplane in compact aluminium housing	<b>210</b>	<b>CP79xx   Control Panel with DVI/USB interface</b> The PC operating terminal for mounting arm installation
<b>84</b>	<b>CP72xx   Panel PC IP 65</b> Industrial PC with display, 3½-inch motherboard, 1 Mini PCI slot	<b>160</b>	<b>C65xx   Control cabinet Industrial PC</b> Built-in PC with 3½-inch motherboard and external cooling fins	<b>212</b>	<b>Control Panel and Panel PC accessories</b> Push-button extensions, keyboard shelf, additional keyboards, touch screen pen, RFID reader
<b>88</b>	<b>CP77xx   Panel PC IP 65</b> Industrial PC with display	<b>166</b>	<b>C66xx   Control cabinet Industrial PC</b> ATX motherboard with 3 PCI and 3 PCIe slots		
<b>92</b>	<b>C33xx   19-inch Panel PC</b> Industrial PC with display and keyboard, ATX motherboard with 3 PCI and 3 PCIe slots				

# Product overview Panel PC



## Built-in Panel PCs, front side IP 65

	Display Resolution	5.7-inch 640 x 480	6.5-inch 640 x 480	12-inch 800 x 600	15-inch 1024 x 768	19-inch 1280 x 1024	24-inch 1920 x 1200
<b>Panel PC CP62xx-0020</b> – 3½-inch motherb. – Atom™ – depth 58–67 mm – 1 Mini PCI slot free	without keys	CP6207-0020 64	CP6209-0020 64	CP6201-0020 64	CP6202-0020 64	CP6203-0020 64	
	function keys		CP6219-0020 64	CP6211-0020 64	CP6212-0020 64	CP6213-0020 64	
	numerical		CP6229-0020 64	CP6221-0020 64	CP6222-0020 64	CP6223-0020 64	
	alphanumeric			CP6231-0020 64	CP6232-0020 64 CP6242-0020 64	CP6233-0020 64	
<b>Panel PC CP62xx-0010</b> – 3½-inch motherb. – up to Core™2 Duo – depth 58–67 mm – 1 Mini PCI slot free	without keys			CP6201-0010 68	CP6202-0010 68	CP6203-0010 68	CP6204-0010 68
	function keys			CP6211-0010 68	CP6212-0010 68	CP6213-0010 68	
	numerical			CP6221-0010 68	CP6222-0010 68	CP6223-0010 68	
	alphanumeric			CP6231-0010 68	CP6232-0010 68 CP6242-0010 68	CP6233-0010 68	
<b>Panel PC CP64xx</b> – slot CPU – up to Core™2 Duo – depth 111–122 mm – 2 slots free	without keys			CP6401 72	CP6402 72	CP6403 72	
	function keys			CP6411 72	CP6412 72	CP6413 72	
	numerical			CP6421 72	CP6422 72	CP6423 72	
	alphanumeric			CP6431 72	CP6432 72 CP6442 72	CP6433 72	
<b>Panel PC CP65xx</b> – ATX – up to Core™2 Duo – depth 196–207 mm – 6 slots free	without keys			CP6501 76	CP6502 76	CP6503 76	
	function keys			CP6511 76	CP6512 76	CP6513 76	
	numerical			CP6521 76	CP6522 76	CP6523 76	
	alphanumeric			CP6531 76	CP6532 76 CP6542 76	CP6533 76	



CP71xx



CP72xx



CP77xx



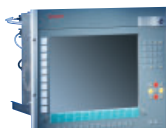
C3320



C3330



C3340



C3350



C3620



C3640

**Panel PCs, all sides IP 65**

	Display Resolution	6.5-inch 640 x 480	12-inch 800 x 600	15-inch 1024 x 768	19-inch 1280 x 1024	24-inch 1920 x 1200	
<b>Panel PC CP71xx</b> – slot CPU – up to Core™2 Duo – depth 216–234 mm – 1 slot free	without keys		CP7101 80	CP7102 80	CP7103 80		
	function keys		CP7111 80	CP7112 80	CP7113 80		
	numerical		CP7121 80	CP7122 80	CP7123 80		
	alphanumeric			CP7131 80	CP7132 80	CP7133 80	
					CP7142 80		
<b>Panel PC CP72xx</b> – 3½-inch motherb. – up to Core™2 Duo – depth 107–123 mm – 1 Mini PCI slot free	without keys		CP7201 84	CP7202 84	CP7203 84	CP7204 84	
	function keys		CP7211 84	CP7212 84	CP7213 84		
	numerical		CP7221 84	CP7222 84	CP7223 84		
	alphanumeric			CP7231 84	CP7232 84	CP7233 84	
					CP7242 84		
<b>Panel PC CP77xx</b> – CP motherboard – Atom™ – depth 28–45 mm	without keys	CP7709 88	CP7701 88	CP7702 88	CP7703 88		
	function keys	CP7719 88	CP7711 88	CP7712 88	CP7713 88		
	numerical	CP7729 88	CP7721 88	CP7722 88	CP7723 88		
	alphanumeric		CP7731 88	CP7732 88	CP7733 88		

**Panel PCs**

	Motherboard Processor	ATX motherboard	
		Intel® Core™2 Duo	Intel® Core™2 Quad
<b>19-inch Panel PC C33xx</b> – depth 282 mm – front flap for drives – touch screen/ pad optional	12-inch display partial keyboard	C3320 96	C3320 96
	12-inch display full keyboard	C3330 98	C3330 98
	15-inch display partial keyboard	C3340 100	C3340 100
	15-inch display full keyboard	C3350 102	C3350 102
<b>Panel PC C36xx</b> – depth 200 mm – touch screen optional	12-inch display without keys	C3620 110	C3620 110
	15-inch display without keys	C3640 112	C3640 112



# Product overview

## control cabinet Industrial PCs



### Control cabinet Industrial PCs

	Motherboard Processor	3½-inch motherboard					
		Intel® Atom™	Celeron® M ULV 1 GHz	Intel® Core™ Duo	Intel® Core™2 Duo		
19-inch slide-in Industrial PC series C51xx – 4 RU	14 slots						
	7 slots						
Control cabinet PC series C61xx, connectors on top	4 slots						
	5 slots						
	8 slots						
	7 slots						
Control cabinet PC series C62xx, con- nectors front side	4 slots						
	6 slots						
	7 slots						
Compact control cabinet PC series C63xx	3 slots						
	3 slots, fanless						
	3 slots						
	3 slots, fanless						
	3 slots						
Control cabinet PC series C65xx	1 Mini PCI slot			C6515	162	C6515	162
	1 Mini PCI slot, fanless			C6525	164	C6525	164
Control cabinet PC series C66xx	7 slots						
	7 slots, 2 removable frames						
Control cabinet PC series C69xx, con- nectors front side	1 Mini PCI slot			C6920	176	C6920	176
	1 Mini PCI slot, fanless	C6915	174	C6925	178		
	1 Mini PCI slot, RAID			C6930	180	C6930	180



	Processor				
	ARM, 400 MHz	Intel® IXP420, 266 MHz Intel® IXP420, 533 MHz	Pentium® MMX- compatible, 500 MHz	Intel® Atom™, 1.1 GHz Intel® Atom™, 1.6 GHz	
Embedded PC	CX8000	262	CX9000	272	
			CX9010	274	
			CX1010	280	
				CX5010	284
				CX5020	284



C6240



C6250



C6640



C6650



C6320



C6325



C6330



C6335



C6340



C6350



C6515



C6525



C6915



C6920



C6925



C6930

Slot motherboard		ATX motherboard	
Intel® Core™ Duo	Intel® Core™2 Duo	Intel® Core™2 Duo	Intel® Core™2 Quad
C5101	116	C5101	116
		C5102	118
		C5102	118
C6110	124	C6110	124
C6120	126	C6120	126
C6130	128	C6130	128
		C6140	130
		C6150	132
		C6140	130
		C6150	132
C6210	138	C6210	138
C6220	140	C6220	140
		C6240	142
		C6250	144
		C6240	142
		C6250	144
C6320	148	C6320	148
C6325	150	C6325	150
C6330	152	C6330	152
C6335	154	C6335	154
C6340	156	C6340	156
C6350	158	C6350	158
		C6640	168
		C6650	170
		C6640	168
		C6650	170

Slot motherboard	
Intel® Celeron® M ULV 1 GHz	Intel® Pentium® M 1.8 GHz
CX1020	290
CX1030	292

# Product overview

## Control Panel



### Built-in Control Panel, front side IP 65

	Display Resolution	5.7-inch 640 x 480	6.5-inch 640 x 480	12-inch 800 x 600	15-inch 1024 x 768	19-inch 1280 x 1024	24-inch 1920 x 1200
<b>Ethernet interface (Embedded PC)</b> – Intel® IXP420 CPU, 533 MHz	without keys	CP6607 206	CP6609 206	CP6601 206	CP6602 206		
	function keys		CP6619 206	CP6611 206	CP6612 206		
	numerical		CP6629 206	CP6621 206	CP6622 206		
	alphanumeric			CP6631 206	CP6632 206		

<b>DVI/USBExt ended interface</b>	without keys	CP6907 208	CP6909 208	CP6901 208	CP6902 208	CP6903 208	CP6904 208
	function keys		CP6919 208	CP6911 208	CP6912 208	CP6913 208	
	numerical		CP6929 208	CP6921 208	CP6922 208	CP6923 208	
	alphanumeric			CP6931 208	CP6932 208	CP6933 208	

### Control Panel, all sides IP 65

	Display Resolution	6.5-inch 640 x 480	12-inch 800 x 600	15-inch 1024 x 768	19-inch 1280 x 1024	24-inch 1920 x 1200
<b>DVI/USBExt ended interface</b>	without keys	CP7909 210	CP7901 210	CP7902 210	CP7903 210	CP7904 210
	function keys	CP7919 210	CP7911 210	CP7912 210	CP7913 210	
	numerical	CP7929 210	CP7921 210	CP7922 210	CP7923 210	
	alphanumeric		CP7931 210	CP7932 210	CP7933 210	

# Panel PC configuration



CP62xx-0020



CP62xx-0010



CP64xx



CP65xx



## Built-in Panel PC CP6xxx

	CP62xx-0020 <span style="float: right;">64</span>	CP62xx-0010 <span style="float: right;">68</span>	CP64xx <span style="float: right;">72</span>	CP65xx <span style="float: right;">76</span>
<b>Display</b>	5.7-, 6.5-, 12-, 15- or 19-inch TFT display	12-, 15-, 19- or 24-inch TFT display	12-, 15- or 19-inch TFT display	12-, 15- or 19-inch TFT display
<b>Processor</b>	Intel® Atom™	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Core™2 Duo or Core™2 Quad
<b>Motherboard</b>	3½-inch	3½-inch	passive backplane	ATX
<b>Slots</b>	1 Mini PCI slot	1 Mini PCI slot	4	7
<b>Free slots</b>	1 Mini PCI slot	1 Mini PCI slot	2 PCI	3 PCI and 3 PCIe x1
<b>Maximum card length</b>	Mini PCI	Mini PCI	2 x 190 mm	6 x 190 mm
<b>Memory</b>	1 GB DDR2RAM	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	1 GB...8 GB DDR3RAM
<b>Graphic adapter</b>	on-board	on-board	on-board	on-board
<b>Ethernet</b>	2 on-board	2 on-board	2 on-board	on-board
<b>Hard disks</b>	2½-inch and/or CF card or 2 CF cards	2½-inch and/or CF card or 2 CF cards	1 x 2½-inch	1 x 3½-inch
<b>RAID 1</b>	–	–	–	–
<b>Possible disk drives</b>	–	–	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray
<b>Power supply</b>	24 V DC	24 V DC	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC
<b>Dimensions</b>	see page <span style="float: right;">67</span>	see page <span style="float: right;">71</span>	see page <span style="float: right;">75</span>	see page <span style="float: right;">79</span>

# Panel PC configuration



CP71xx



CP72xx



CP77xx



Panel PC CP7xxx			
	CP71xx	CP72xx	CP77xx
	80	84	88
<b>Display</b>	12-, 15- or 19-inch TFT display	12-, 15-, 19- or 24-inch TFT display	6,5-, 12-, 15- or 19-inch TFT display
<b>Processor</b>	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Atom™
<b>Motherboard</b>	passive backplane	3½-inch	CP format
<b>Slots</b>	4	1 Mini PCI slot	–
<b>Free slots</b>	1 PCI	1 Mini PCI slot	–
<b>Maximum card length</b>	1 x 190 mm	Mini PCI	–
<b>Memory</b>	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	1 GB
<b>Graphic adapter</b>	on-board	on-board	on-board
<b>Ethernet</b>	2 on-board	2 on-board	on-board
<b>Hard disks</b>	1 x 2½-inch	1 or 2 x 2½-inch, 1 x 2½-inch and CF card or 2 CF cards	CF card
<b>RAID 1</b>	–	2 x 2½-inch HDD	–
<b>Possible disk drives</b>	multi DVD or Blu-ray	–	–
<b>Power supply</b>	24 V DC	24 V DC	24 V DC
<b>Dimensions</b>	see page 83	see page 87	see page 91



C3320

C3330

C3340

C3350

C3620

C3640

### 19-inch Panel PC C33xx

	C3320 <span style="float: right;">96</span>	C3330 <span style="float: right;">98</span>	C3340 <span style="float: right;">100</span>	C3350 <span style="float: right;">102</span>
<b>Display</b>	12-inch TFT display, resolution 800 x 600	12-inch TFT display, resolution 800 x 600	15-inch TFT display, resolution 1024 x 768	15-inch TFT display, resolution 1024 x 768
<b>Processor</b>	Intel® Core™2 Duo or Core™2 Quad	Intel® Core™2 Duo or Core™2 Quad	Intel® Core™2 Duo or Core™2 Quad	Intel® Core™2 Duo or Core™2 Quad
<b>Motherboard</b>	ATX	ATX	ATX	ATX
<b>Slots</b>	7	7	7	7
<b>Free slots</b>	3 PCI and 3 PCIe x1	3 PCI and 3 PCIe x1	3 PCI and 3 PCIe x1	3 PCI and 3 PCIe x1
<b>Maximum card length</b>	3 x fullsize, 4 x 240 mm	3 x fullsize, 4 x 240 mm	3 x fullsize, 4 x 240 mm	3 x fullsize, 4 x 240 mm
<b>Memory</b>	1 GB...8 GB DDR3RAM	1 GB...8 GB DDR3RAM	1 GB...8 GB DDR3RAM	1 GB...8 GB DDR3RAM
<b>Graphic adapter</b>	on-board	on-board	on-board	on-board
<b>Ethernet</b>	on-board	on-board	on-board	on-board
<b>Hard disks</b>	1 or 2 x 3½-inch	1 or 2 x 3½-inch	1 or 2 x 3½-inch	1 or 2 x 3½-inch
<b>RAID 1</b>	2 x 3½-inch HDD	2 x 3½-inch HDD	2 x 3½-inch HDD	2 x 3½-inch HDD
<b>Possible disk drives</b>	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray
<b>Power supply</b>	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC
<b>Dimen. (W x H x D)</b>	482.7 x 355 x 282 mm	482.7 x 400 x 282 mm	482.7 x 355 x 282 mm	482.7 x 444 x 282 mm

### Panel PC C36xx

	C3620 <span style="float: right;">110</span>	C3640 <span style="float: right;">112</span>
<b>Display</b>	12-inch TFT display, resolution 800 x 600	15-inch TFT display, resolution 1024 x 768
<b>Processor</b>	Intel® Core™2 Duo or Core™2 Quad	Intel® Core™2 Duo or Core™2 Quad
<b>Motherboard</b>	ATX	ATX
<b>Slots</b>	7	7
<b>Free slots</b>	3 PCI and 3 PCIe x1	3 PCI and 3 PCIe x1
<b>Maximum card length</b>	7 x 220 mm	7 x 235 mm
<b>Memory</b>	1 GB...8 GB DDR3RAM	1 GB...8 GB DDR3RAM
<b>Graphic adapter</b>	on-board	on-board
<b>Ethernet</b>	on-board	on-board
<b>Hard disks</b>	1 x 3½-inch	1 or 2 x 3½-inch
<b>RAID 1</b>	–	2 x 3½-inch HDD
<b>Possible disk drives</b>	slimline CD/DVD-ROM, multi DVD or Blu-ray	slimline CD/DVD-ROM, multi DVD or Blu-ray
<b>Power supply</b>	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC
<b>Dimen. (W x H x D)</b>	388 x 324 x 201 mm	470 x 348 x 199 mm

# Control cabinet Industrial PC configuration



C5101



C5102



C6110



C6120



C6130



C6140



C6150

## 19-inch slide-in Industrial PC C51xx

	C5101 116	C5102 118
Processor	Intel® Core™ Duo or Core™2 Duo	Intel® Core™2 Duo or Core™2 Quad
Motherboard	passive backplane	ATX
Slots	14	7
Free slots	11 PCI	3 PCI, 3 PCIe x1 and 1 PCIe x16 graphic card slot
Max. card length	8 x fullsize, 6 x 190 mm	7 x fullsize
Memory	512 MB...3 GB DDR2RAM	1 GB...8 GB DDR3RAM
Graphic adapter	on-board	on-board
Ethernet	2 on-board	on-board
Hard disks	1, 2 or 3 x 3½-inch	1, 2 or 3 x 3½-inch
RAID 1	2 x 3½-inch HDD	2 x 3½-inch HDD
Possible disk drives	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray
Power supply	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC
Dimen. (W x H x D)	483 x 177 x 500 mm	483 x 177 x 500 mm

## Control cabinet Industrial PC C61xx

	C6110 124	C6120 126	C6130 128	C6140 130	C6150 132
Processor	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Core™2 Duo or Core™2 Quad	Intel® Core™2 Duo or Core™2 Quad
Motherboard	passive backplane	passive backplane	passive backplane	ATX	ATX
Slots	4	5	8	7	7
Free slots	1 PCI	2 PCI	6 PCI	3 PCI, 3 PCIe x1 and 1 PCIe x16 graphic slot	3 PCI, 3 PCIe x1 and 1 PCIe x16 graphic slot
Maximum card length	4 x 190 mm	5 x fullsize	4 x fullsize, 4 x 250 mm	3 x 270 mm and 4 x 240 mm	7 x fullsize
Memory	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	1 GB...8 GB DDR3RAM	1 GB...8 GB DDR3RAM
Graphic adapter	on-board	on-board	on-board	on-board	on-board
Ethernet	2 on-board	2 on-board	2 on-board	on-board	on-board
Hard disks	1 x 3½-inch	1–2 x 3½-inch	1–3 x 3½-inch	1–3 x 3½-inch	1–3 x 3½-inch
RAID 1	–	2 x 3½-inch HDD	2 x 3½-inch HDD	2 x 3½-inch HDD	2 x 3½-inch HDD
Possible disk drives	–	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray
Power supply	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC
Dimen. (W x H x D)	180 x 287 x 250 mm	195 x 423 x 250 mm	295 x 423 x 250 mm	383 x 362 x 265 mm	383 x 423 x 265 mm



### Control cabinet Industrial PC C62xx

	C6210 138	C6220 140	C6240 142	C6250 144
Processor	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Core™2 Duo or Core™2 Quad	Intel® Core™2 Duo or Core™2 Quad
Motherboard	passive backplane	passive backplane	ATX	ATX
Slots	4	6	7	7
Free slots	1 PCI	3 PCI	3 PCI, 3 PCIe x1 and 1 PCIe x16 graphic card slot	3 PCI, 3 PCIe x1 and 1 PCIe x16 graphic card slot
Max. card length	4 x 190 mm	6 x 190 mm	7 x 190 mm	7 x 190 mm
Memory	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	1 GB...8 GB DDR3RAM	1 GB...8 GB DDR3RAM
Graphic adapter	on-board	on-board	on-board	on-board
Ethernet	2 on-board	2 on-board	on-board	on-board
Hard disks	1 x 2½-inch	1 x 2½-inch	1 x 3½-inch or 2 x 2½-inch	1, 2 or 3 x 3½-inch
RAID 1	–	–	2 x 2½-inch HDD	2 x 3½-inch HDD
Possible disk drives	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray
Power supply	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC
Dimen. (W x H x D)	257 x 170 x 286 mm	307 x 170 x 286 mm	430 x 170 x 274 mm	680 x 184 x 270 mm

### Control cabinet Industrial PC C63xx

	C6320 148	C6325 150	C6330 152	C6335 154	C6340 156	C6350 158
Processor	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo
Motherboard	passive backplane	passive backplane	passive backplane	passive backplane	passive backplane	passive backplane
Slots	3	3	3	3	5	5
Free slots	1 PCI	1 PCI	1 PCI	1 PCI	3 PCI	3 PCI
Maximum card length	1 x 190 mm	1 x 190 mm	1 x 190 mm	1 x 190 mm	3 x 190 mm	3 x 190 mm
Memory	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM
Graphic adapter	on-board	on-board	on-board	on-board	on-board	on-board
Ethernet	2 on-board	2 on-board	2 on-board	2 on-board	2 on-board	2 on-board
Hard disks	1 x 2½-inch	1 x 2½-inch	1 x 2½-inch	1 x 2½-inch	1 x 2½-inch	1 x 2½-inch
RAID 1	–	–	–	–	–	–
Possible disk drives	–	–	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray	–	CD/DVD-ROM, multi DVD or Blu-ray
Power supply	24 V DC	24 V DC	24 V DC	24 V DC	24 V DC	24 V DC
Dimen. (W x H x D)	93 x 196 x 226 mm	133 x 196 x 226 mm	107 x 196 x 226 mm	147 x 196 x 226 mm	134 x 196 x 226 mm	148 x 196 x 226 mm



# Control cabinet Industrial PC configuration



C6515



C6525



C6640



C6650

## Control cabinet Industrial PC C65xx

	C6515	C6525
		162
		164
<b>Processor</b>	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo
<b>Motherboard</b>	3½-inch motherboard	3½-inch motherboard
<b>Free slots</b>	1 Mini PCI for NOVRAM	1 Mini PCI
<b>Memory</b>	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM
<b>Graphic adapter</b>	on-board	on-board
<b>Ethernet</b>	2 on-board	2 on-board
<b>Hard disks</b>	1 or 2 CF cards	2½-inch and/or CF card or 2 CF cards or 2 x 2½-inch
<b>RAID 1</b>	–	2 x 2½-inch HDD
<b>Power supply</b>	24 V DC	24 V DC
<b>Dimen. (W x H x D)</b>	240 x 230 x 81 mm	330 x 275 x 82 mm

## Control cabinet Industrial PC C66xx

	C6640	C6650
		168
		170
<b>Processor</b>	Intel® Core™2 Duo or Core™2 Quad	Intel® Core™ Duo or Core™2 Duo
<b>Motherboard</b>	ATX	ATX
<b>Slots</b>	7	7
<b>Free slots</b>	3 PCI, 3 PCIe x1 and 1 PCIe x16 graphic card slot	3 PCI, 3 PCIe x1 and 1 PCIe x16 graphic card slot
<b>Maximum card length</b>	6 x 210 mm	6 x 210 mm
<b>Memory</b>	1...8 GB DDR3RAM	1...8 GB DDR3RAM
<b>Graphic adapter</b>	on-board	on-board
<b>Ethernet</b>	on-board	on-board
<b>Hard disks</b>	1 x 3½-inch and 1 x 2½-inch or CF card	1 or 2 x 3½-inch and 1 x 2½-inch or CF card
<b>RAID 1</b>	–	2 x 3½-inch HDD
<b>Possible disk drives</b>	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray
<b>Power supply</b>	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC
<b>Dimen. (W x H x D)</b>	371 x 336 x 198 mm	410 x 360 x 201 mm



### Control cabinet Industrial PC C69xx

	C6915 174	C6920 176	C6925 178	C6930 180
<b>Processor</b>	Intel® Atom™	Intel® Core™ Duo or Core™2 Duo	Intel® Celeron® M ULV 1 GHz	Intel® Core™ Duo or Core™2 Duo
<b>Motherboard</b>	3½-inch motherboard	3½-inch motherboard	3½-inch motherboard	3½-inch motherboard
<b>Free slots</b>	1 Mini PCI	1 Mini PCI	1 Mini PCI	1 Mini PCI
<b>Memory</b>	1 GB DDR2RAM	512 MB...3 GB DDR2RAM	256 MB...2 GB DDR RAM	512 MB...3 GB DDR2RAM
<b>Graphic adapter</b>	on-board	on-board	on-board	on-board
<b>Ethernet</b>	2 on-board	2 on-board	2 on-board	2 on-board
<b>Hard disks</b>	2½-inch and/or CF card or 2 CF cards	2½-inch and/or CF card or 2 CF cards	2½-inch and/or CF card or 2 CF cards	1 or 2 x 2½-inch and CF card
<b>RAID 1</b>	–	–	–	2 x 2½-inch HDD
<b>Power supply</b>	24 V DC	24 V DC	24 V DC	24 V DC
<b>Dimen. (W x H x D)</b>	48 x 164 x 116 mm	65 x 231 x 116 mm	65 x 208 x 116 mm	89 x 231 x 119 mm

# The right Industrial PC for every application

## Robust industrial design PCs with highest performance components

Beckhoff Industrial PCs satisfy industry's demands:

- the right Industrial PC for every controller
- highest performance PCs with Intel® Core™2 Duo and Intel® Core™2 Quad processors
- PCs with low power consumption with Intel® Atom™ processors
- open standards following the norm ATX
- components carefully tested to ensure appropriateness for industrial applications
- appealing industrial design housings
- easy access to PC components
- Individual housing construction allows optimum adaptation to controller requirements.
- integration of electromechanical buttons, switches, scanner, handwheel and other components in the Control Panel







## Requirements for PC-based control technology

### Balance between latest PC technology and long-term availability of control components

The personal computer has experienced an unprecedented success story and has become a firmly established part of everyday life, including industrial environments. Together with associated software, PCs in different shapes and forms are at the core of a wide range of diverse automation tasks such as control of machines, processes or logistics systems, networking of system components, data acquisition, or image processing. For classic control tasks, PC-based control technology offers excellent scalability and flexibility and is therefore increasingly used in place of hardware PLCs.

Beckhoff is one of the pioneers of PC-based automation: the first PC control system was delivered as early as 1986. Beckhoff Industrial PCs are characterised by a wealth of technology know-how accumulated over recent years. In combination with the TwinCAT automation software, they offer a high-performance control system for PLC, NC and CNC functionalities.

An important feature of the Beckhoff product philosophy is the use of advanced, high-performance components and processors for the development and design of Industrial PCs: they integrate the latest

developments offered by the technology market and are used successfully worldwide. Fine scaling is provided for through processor incrementing from Intel® Atom™ up to Intel® Core™2 Quad. Intel® Core™2 Quad processors provide sufficient processing power even for complex applications. Due to the low processor power dissipation, Intel® Atom™ processors enable extremely small, fanless controllers and are to be found in the lower price range.

In addition to long-standing experience, another factor driving the development of our comprehensive IPC product portfolio is customer-orientation. More than ten Industrial PC series with a wide range of basic PC types form the basis of our product range. The optimally tailored control computer can be found for every application from the large choice of devices and options.

The PC housing varies in size between paperback format to 14-slot passive backplane, depending on the device type. In addition to long-term availability of the built-in processors and motherboards, Beckhoff also offers full commissioning of all integrated components, including software and different drives. Customised solutions can also be realised for optimum adaptation to the respective task.

### Elegant Control Panels and Panel PCs

The IPC is complemented by an industrial display unit. The Beckhoff Control Panels and Panel PCs are the visual front end for machines or plants. Spatial separation of display/control unit and control computer offers maximum flexibility. Appealing design, robustness and suitability for industrial applications were important criteria in the development of the Control Panel series, which comes with display sizes between 5.7" and 24".

All displays can be fully tailored to customer requirements: options include visual adaptation to the corporate design or application of a customer logo, customised front membranes, a wide range of special mechanical keys, emergency stop switches, card scanners or RFID readers.

The Control Panel housing is made from high-quality solid aluminium and is suitable for protection class IP 65, as usually required in industrial environments. Thorough development and integration of electronic modules, displays, touch screens and front membranes ensure high availability and reliability during operation. Beckhoff Control Panels and Panel PCs can optionally be operated as

- stand-alone device (Panel PC with Windows XP or Embedded Standard and Ethernet panel with Windows CE);



- DVI/USB Extended Control Panel for direct or indirect operation at the PC (distance up to 50 m); or via
- CP-Link 3 (Panel PCs up to 100 m away from the host PC).

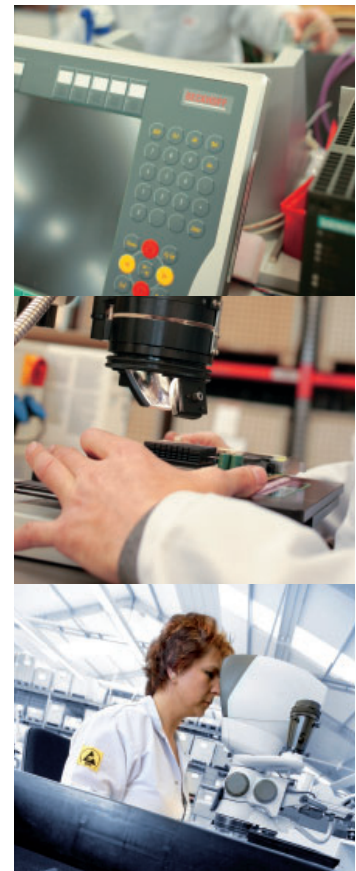
The CP-Link 3 technology is described on page 190.

### Careful selection of components

A great deal of attention and care is put into the development and choice of the IPC components used, their compatibility, their long-term availability, mechanical loading capacity and industrial suitability. In developing electronic modules, Beckhoff fulfils the high requirements for Industrial PC components that are necessary in order to ensure permanent reliable operation.

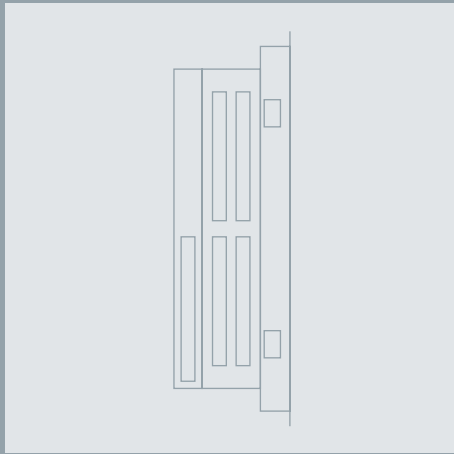
Beckhoff is the developer and manufacturer of the motherboards in the Industrial PCs. The BIOS for the motherboards even has its own development department. In addition to that, 24 V DC power supplies with integrated UPS, Ethernet adapters and Ethernet switches, Fieldbus Cards, DVI display interfaces, DVI/USB extensions and USB hubs are produced by Beckhoff's own development and manufacturing facilities. International standards and experience in the application of PC systems under difficult industrial conditions provide the basis for Beckhoff

system integration. Only a few LC displays, plug-in cards or hard disks are suited to use in tough industrial environments. Experience and detailed testing are therefore required for checking whether the components meet the stringent requirements in terms of temperature resistance, resistance to vibration, and electromagnetic compatibility. Prior to delivery, all Industrial PCs are subjected to comprehensive quality control procedures in order to verify that they are fit for the purpose. Beckhoff Industrial PCs satisfy the Machine Guidelines and carry the CE mark: all PC components are checked for electromagnetic compatibility (EMC) and comply with the relevant standards.



# Panel PC series CP62xx, CP64xx, CP65xx, CP71xx, CP72xx, CP77xx

Control Panel + PC = Panel PC



The Panel PCs are designed for installation in the front of a control cabinet (CP6xxx) or on a mounting arm system (CP7xxx). In combination with the wide variety of Control Panels as operating units, various add-on PCs result in a large choice of Panel PCs, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



**The right Panel PC for every application**

All Panel PCs are equipped with powerful components, with Intel® Core™ Duo or Core™2 Duo on a 3½-inch or slot motherboard and with Intel® Core™2 Duo or Core™2 Quad on an ATX motherboard. The series provides the appropriate

Panel PC for every application, according to the available installation space. All housings are optimised in terms of space utilisation and easy accessibility of all components.

The RAM can be extended from 512 MB DDR2RAM up to 3 GB, for CP65xx with Core™2 Duo or Core™2 Quad even up to 8 GB, which requires a 64 bit operating system.

The housings permit fast access to the fitted components. After removing the cover, plug-in cards and drives are freely accessible. In many ways, the housing is designed for the implementation of individual adaptations.

	CP62xx-0020	CP62xx-0010	CP64xx	CP65xx	CP71xx	CP72xx	CP77xx
<b>Display</b>	5.7-, 6.5-, 12-, 15- or 19-inch TFT display	12-, 15-, 19- or 24-inch TFT display	12-, 15- or 19-inch TFT display	12-, 15- or 19-inch TFT display	12-, 15- or 19-inch TFT display	12-, 15-, 19- or 24-inch TFT display	6.5-, 12-, 15- or 19-inch TFT display
<b>Processor</b>	Intel® Atom™	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Core™2 Duo or Core™2 Quad	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Atom™
<b>Motherboard</b>	3½-inch	3½-inch	passive backplane	ATX	passive backplane	3½-inch	CP format
<b>Slots</b>	1 Mini PCI slot	1 Mini PCI slot	4	7	4	1 Mini PCI slot	–
<b>Free slots</b>	1 Mini PCI slot	1 Mini PCI slot	2 PCI	3 PCI and 3 PCIe x1	1 PCI	1 Mini PCI slot	–
<b>Maximum card length</b>	Mini PCI	Mini PCI	2 x 190 mm	6 x 190 mm	1 x 190 mm	Mini PCI	–
<b>Memory</b>	1 GB DDR2RAM	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	1 GB...8 GB DDR3RAM	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	1 GB
<b>Graphic adapter</b>	on-board	on-board	on-board	on-board	on-board	on-board	on-board
<b>Ethernet</b>	2 on-board	2 on-board	2 on-board	on-board	2 on-board	2 on-board	on-board
<b>Hard disks</b>	2½-inch and/or CF card or 2 CF cards	2½-inch and/or CF card or 2 CF cards	1 x 2½-inch	1 x 3½-inch	1 x 2½-inch	1 or 2 x 2½-inch, 1 x 2½-inch and CF card or 2 CF cards	CF card
<b>RAID 1</b>	–	–	–	–	–	2 x 2½-inch HDD	–
<b>Possible disk drives</b>	–	–	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray	multi DVD or Blu-ray	–	–
<b>Power supply</b>	24 V DC	24 V DC	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC	24 V DC	24 V DC	24 V DC
<b>Dimensions</b>	see page 67	see page 71	see page 75	see page 79	see page 83	see page 87	see page 91





## CP62xx-0020 | “Economy” built-in Panel PC with Intel® Atom™ The slimline built-in Industrial PC with 3½-inch motherboard

The CP62xx built-in Panel PC series is designed for installation in the front of a control cabinet. The CP62xx series combines the Beckhoff Control Panel design with state-of-the-art Industrial PC technology. The right display size and keyboard are available for every application.

With their highly integrated 3½-inch motherboard the CP62xx built-in Industrial PCs represent a high-performance platform for machine construction and plant engineering applications running the TwinCAT automation software under Windows CE, XP or Embedded Standard, for example.

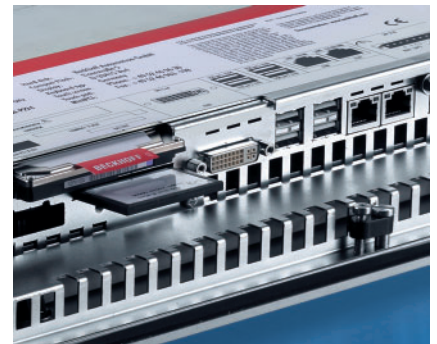
Equipped with an Intel® Atom™ 1.1 or 1.6 GHz and one or two Compact Flash cards, a CP62xx Panel PC contains no rotating parts. Alternatively a hard disk is available. The Panel PCs of this series are approved for ambient temperatures between 0 and 55 °C.

The C62xx units are supplied with a 24 V power supply unit, optionally with integrated uninterruptible power supply (UPS). A battery pack can be connected externally and installed on a DIN rail close to the PC. The 1-second UPS is a UPS solution without battery pack. Capacitors integrated

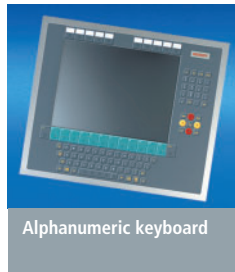
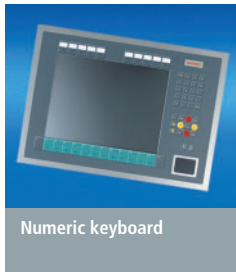
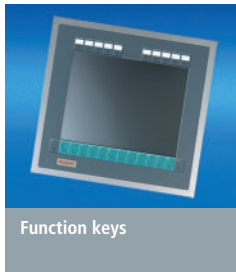
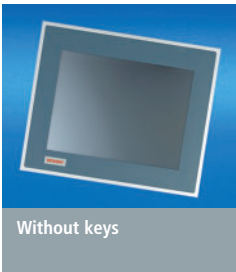
on the motherboard maintain PC operation for a few seconds, so that key variables can be saved.

In basic configuration the Panel PC is offered with a 64 MB Compact Flash card and Windows CE. Windows XP or Embedded Standard can be installed on devices with a larger CF card or a hard disk. Two Compact Flash cards or a hard disk and a Compact Flash plus the lithium battery of the system clock are accessible from the rear in the plug connector panel.

Due to its two independent gigabit Ethernet interfaces, the CP62xx is ideally suited as a compact central processing unit for an EtherCAT control system. Both Ethernet ports offer optimum performance for all EtherCAT control tasks or for connecting the higher-level network. A free Mini PCI slot enables different fieldbus cards or a third, independent Ethernet interface to be used. NOVRAM for fail-safe data storage can also be plugged into the Mini PCI slot.



CP62xx-0020	"Economy" built-in Panel PC
<b>Housing</b>	aluminium front with steel sheet rear cover
	drives easily accessible
	all connectors at the bottom of the rear side
	status LEDs
	1 slot for Compact Flash and, from a 12-inch display, 1 slot for a 2½-inch hard disk accessible from the rear
	lithium battery of the system clock accessible from the rear side
	pull-out clamping levers for fast installation without loose parts
	protection class front side IP 65, rear side IP 20
<b>Front panel</b>	operating temperature 0...55 °C
	TFT display in five sizes
	– 5.7-inch display 640 x 480
	– 6.5-inch display 640 x 480
	– 12-inch display 800 x 600
	– 15-inch display 1024 x 768
	– 19-inch display 1280 x 1024
	front laminate in five variants
– only display	
– function keys and 10 PLC special keys with LED	
– numeric keyboard and 10 PLC special keys with LED	
– alphanumeric PC keyboard in US layout and 10 PLC special keys with LED	
– alphanumeric PC keyboard in US layout and 16 PLC special keys with LED on the sides	
<b>Features</b>	special keys identified by slide-in labels
	processor Intel® Atom™ 1.1 GHz
	3½-inch motherboard for Intel® Atom™
	1 Mini PCI slot free for cards installed ex factory
	1 GB DDR2RAM
	on board graphic adapter, Intel® GMA 500, DVI-D connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	64 MB Compact Flash card type I, extended temperature range
	4 USB 2.0 ports
	24 V DC power supply
<b>Options</b>	operating system Microsoft Windows CE, English
	processor Intel® Atom™ 1.6 GHz
	serial port led out as RS232, RS422 or RS485, optically linked, overload protection
	Mini PCI card with fieldbus interface or Ethernet port
	Mini PCI card with up to 512 kB NOVRAM for fail-safe storage of process data
	hard disk, 2½-inch, 40 GB
	larger or second Compact Flash card
	solid-state disk SSD
uninterruptible power supply UPS	
<b>Further information</b>	TwinCAT run-time for Windows CE
	Microsoft Windows XP, Windows Embedded Standard
	www.beckhoff.com/CP62xx



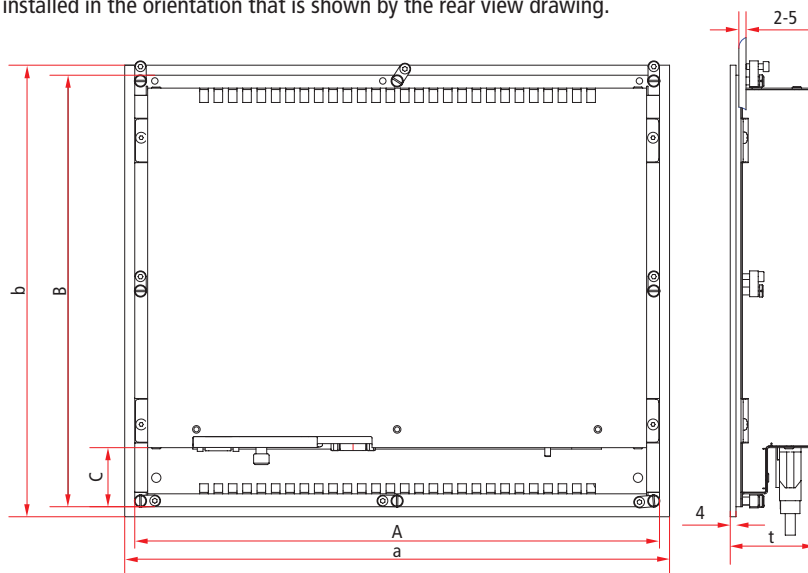
Ordering information	without touch screen	with touch screen	with touch pad
<b>Display only</b>			
5.7-inch display 640 x 480	CP6207-0000-0020*	CP6207-0001-0020*	
6.5-inch display 640 x 480	CP6209-0000-0020*	CP6209-0001-0020*	
12-inch display 800 x 600	CP6201-0000-0020	CP6201-0001-0020	
15-inch display 1024 x 768	CP6202-0000-0020	CP6202-0001-0020	
19-inch display 1280 x 1024	CP6203-0000-0020	CP6203-0001-0020	
<b>With function keys</b>			
6.5-inch display 640 x 480	CP6219-0000-0020*	CP6219-0001-0020*	
12-inch display 800 x 600	CP6211-0000-0020	CP6211-0001-0020	
15-inch display 1024 x 768	CP6212-0000-0020	CP6212-0001-0020	
19-inch display 1280 x 1024	CP6213-0000-0020	CP6213-0001-0020	
<b>Numeric keyboard</b>			
6.5-inch display 640 x 480	CP6229-0000-0020*	CP6229-0001-0020*	
12-inch display 800 x 600	CP6221-0000-0020	CP6221-0001-0020	CP6221-0002-0020
15-inch display 1024 x 768	CP6222-0000-0020	CP6222-0001-0020	CP6222-0002-0020
19-inch display 1280 x 1024	CP6223-0000-0020	CP6223-0001-0020	CP6223-0002-0020
<b>Alphanumeric keyboard</b>			
12-inch display 800 x 600	CP6231-0000-0020	CP6231-0001-0020	CP6231-0002-0020
15-inch display 1024 x 768	CP6232-0000-0020	CP6232-0001-0020	CP6232-0002-0020
19-inch display 1280 x 1024	CP6233-0000-0020	CP6233-0001-0020	CP6233-0002-0020
<b>Alphanumeric keyboard with PLC keys on the sides</b>			
15-inch display 1024 x 768	CP6242-0000-0020	CP6242-0001-0020	

\*without hard drive slot

## Dimensions

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com).

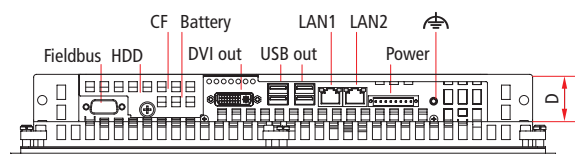
The device must be installed in the orientation that is shown by the rear view drawing.



Dimensions in mm

Rear view

Side view



Connectors

Dimensions		a	b	t	A	B	C	D
<b>Display only</b>								
CP6207	5.7" display	183 mm	128.5 mm	66.2 mm	169 mm	114.5 mm	5.4 mm	0 mm
CP6209	6.5" display	240 mm	175 mm	73.5 mm	226 mm	161 mm	26.6 mm	30.5 mm
CP6201	12" display	330 mm	275 mm	58 mm	316 mm	261 mm	24.6 mm	32.5 mm
CP6202	15" display	380 mm	315 mm	59 mm	366 mm	301 mm	41.2 mm	33 mm
CP6203	19" display	455 mm	390 mm	67 mm	441 mm	376 mm	77.2 mm	33 mm
<b>With function keys</b>								
CP6219	6.5" display	272.3 mm	221 mm	73.5 mm	258.3 mm	207 mm	70 mm	30.5 mm
CP6211	12" display	372.2 mm	342.2 mm	58 mm	358.2 mm	328.2 mm	67 mm	32.5 mm
CP6212	15" display	430.4 mm	403 mm	59 mm	416.4 mm	389 mm	86.5 mm	33 mm
CP6213	19" display	508.4 mm	463 mm	67 mm	494.4 mm	449 mm	116.2 mm	33 mm
<b>Numeric keyboard</b>								
CP6229	6.5" display	340.4 mm	221 mm	73.5 mm	326.4 mm	207 mm	70 mm	30.5 mm
CP6221	12" display	414 mm	336 mm	58 mm	400 mm	322 mm	51.5 mm	32.5 mm
CP6221-0002	12" display	444.2 mm	336 mm	58 mm	430.2 mm	322 mm	51.5 mm	32.5 mm
CP6222	15" display	519.4 mm	378.2 mm	59 mm	505.4 mm	364.2 mm	70.9 mm	33 mm
CP6223	19" display	567.4 mm	434 mm	67 mm	553.4 mm	420 mm	93.5 mm	33 mm
<b>Alphanumeric keyboard</b>								
CP6231	12" display	410.4 mm	378.2 mm	58 mm	396.4 mm	364.2 mm	115.7 mm	32.5 mm
CP6231-0002	12" display	430.4 mm	378.2 mm	58 mm	416.4 mm	364.2 mm	115.7 mm	32.5 mm
CP6232	15" display	489.4 mm	418.2 mm	59 mm	475.4 mm	404.2 mm	128.3 mm	33 mm
CP6233	19" display	508.4 mm	543 mm	67 mm	494.4 mm	529 mm	195.8 mm	33 mm
<b>Alphanumeric keyboard with PLC keys on the sides</b>								
CP6242	15" display	449.4 mm	458 mm	59 mm	435.4 mm	444 mm	167.5 mm	33 mm



## CP62xx-0010 | “Economy” built-in Panel PC

### The slimline built-in Industrial PC with 3½-inch motherboard

The CP62xx built-in Panel PC series is designed for installation in the front of a control cabinet. The CP62xx series combines the Beckhoff Control Panel design with state-of-the-art Industrial PC technology. The right display size and keyboard are available for every application.

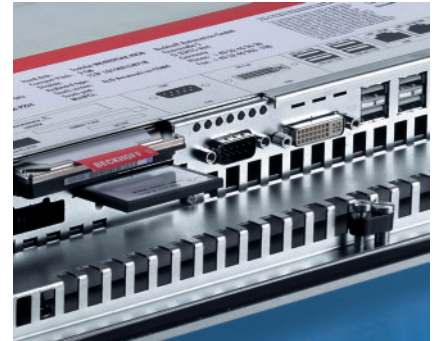
With their highly integrated 3½-inch motherboard the CP62xx built-in Industrial PCs represent a high-performance platform for machine construction and plant engineering applications running the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional, for example.

A CP62xx Panel PC is equipped with a 1.0 GHz Intel® Celeron® M ULV processor and 64 MB Compact Flash as standard. It contains no rotating parts. The models with high-performance Intel® processors (Core™ Duo and Core™2 Duo) feature a fan cartridge with fans with double ball bearings and speed observation. In each configuration the Panel PCs of this series are approved for ambient temperatures between 0 and 55 °C. In front of the fan a free space of 2 cm is required for air circulation.

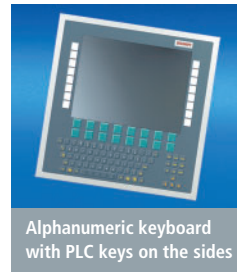
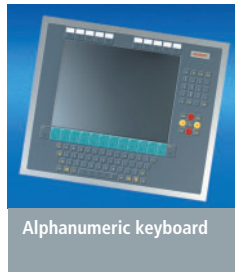
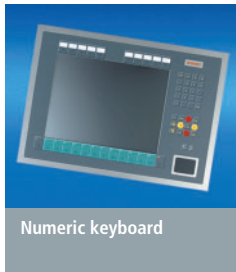
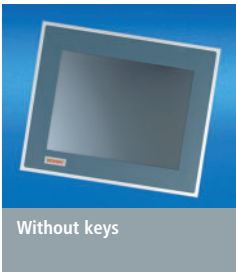
The C62xx units are supplied with a 24 V power supply unit, optionally with integrated uninterruptible power supply (UPS). A battery pack can be connected externally and installed on a DIN rail close to the PC.

In basic configuration the Panel PC is offered with a 2½-inch hard disk on which Windows XP Professional or Windows Embedded Standard can be installed. As an option, a Compact Flash card can be used instead of the hard disk. Two Compact Flash cards or a hard disk and a Compact Flash plus the lithium battery of the system clock are accessible from the rear in the plug connector panel.

Due to its two independent Ethernet interfaces, the CP62xx is ideally suited as a compact central processing unit for an EtherCAT control system. While the 100 Mbit Ethernet port offers optimum performance for all EtherCAT control tasks, a Gigabit port is available for connecting the higher-level network. A free Mini PCI slot enables different fieldbus cards or a third, independent Ethernet interface to be used. NOVRAM for fail-safe data storage can also be plugged into the Mini PCI slot.



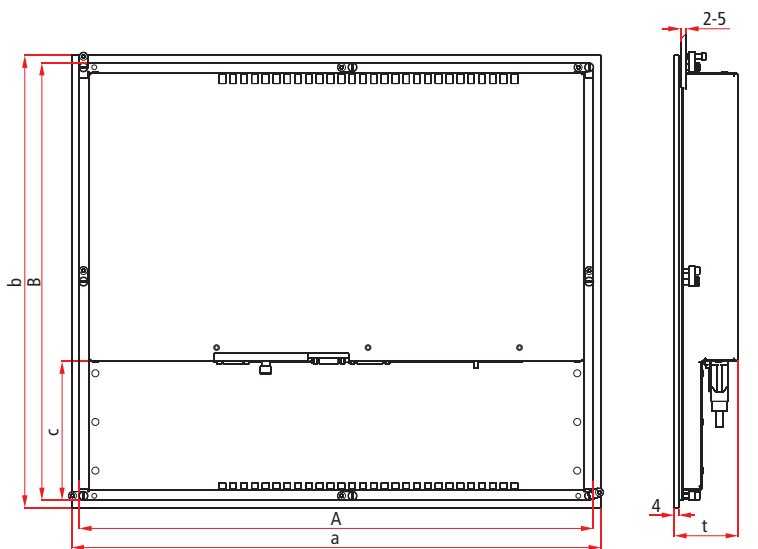
CP62xx-0010	"Economy" built-in Panel PC
<b>Housing</b>	aluminium front with steel sheet rear cover
	drives easily accessible
	all connectors at the bottom of the rear side
	status LEDs
	1 slot for 2½-inch hard disk and 1 slot for Compact Flash accessible from the rear side
	fan cartridge at the rear side, accessible from outside
	lithium battery of the system clock accessible from the rear side
	pull-out clamping levers for fast installation without loose parts
	protection class front side IP 65, rear side IP 20
	operating temperature 0...55 °C
<b>Front panel</b>	TFT display in four sizes <ul style="list-style-type: none"> <li>– 12-inch display 800 x 600</li> <li>– 15-inch display 1024 x 768</li> <li>– 19-inch display 1280 x 1024</li> <li>– 24-inch display 1920 x 1200</li> </ul>
	front laminate in five variants <ul style="list-style-type: none"> <li>– only display</li> <li>– function keys and 10 PLC special keys with LED</li> <li>– numeric keyboard and 10 PLC special keys with LED</li> <li>– alphanumeric PC keyboard in US layout and 10 PLC special keys with LED</li> <li>– alphanumeric PC keyboard in US layout and 16 PLC special keys with LED on the sides</li> </ul>
	special keys identified by slide-in labels
	processor Intel® Core™ Duo 2.0 GHz
	3½-inch motherboard for Intel® Core™ Duo or Core™2 Duo
	1 free Mini PCI slot for cards installed ex factory
	512 MB DDR2RAM, expandable ex factory to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	hard disk, 2½-inch, 40 GB
1 serial port RS232 and 4 USB 2.0 ports	
24 V DC power supply	
<b>Options</b>	processor Intel® Core™2 Duo
	for variants with Intel® Celeron® M, Pentium® M or fanless with Celeron® M ULV see price list
	touch screen pen with wall holder
	second serial port led out as RS232, RS422 or RS485, optically linked, overload protection
	Mini PCI card with fieldbus interface or Ethernet port
	Mini PCI card with up to 512 kB NOVRAM for fail-safe storage of process data
	Compact Flash or solid-state disk SSD
	uninterruptible power supply UPS
	push-button extension with electromechanical switches and keys
<b>Further information</b>	<a href="http://www.beckhoff.com/CP62xx">www.beckhoff.com/CP62xx</a>



Ordering information	without touch screen	with touch screen	with touch pad
<b>Display only</b>			
12-inch display 800 x 600	CP6201-0000-0010	CP6201-0001-0010	
15-inch display 1024 x 768	CP6202-0000-0010	CP6202-0001-0010	
19-inch display 1280 x 1024	CP6203-0000-0010	CP6203-0001-0010	
24-inch display 1920 x 1200	CP6204-0000-0010	CP6204-0001-0010	
<b>With function keys</b>			
12-inch display 800 x 600	CP6211-0000-0010	CP6211-0001-0010	
15-inch display 1024 x 768	CP6212-0000-0010	CP6212-0001-0010	
19-inch display 1280 x 1024	CP6213-0000-0010	CP6213-0001-0010	
<b>Numeric keyboard</b>			
12-inch display 800 x 600	CP6221-0000-0010	CP6221-0001-0010	CP6221-0002-0010
15-inch display 1024 x 768	CP6222-0000-0010	CP6222-0001-0010	CP6222-0002-0010
19-inch display 1280 x 1024	CP6223-0000-0010	CP6223-0001-0010	CP6223-0002-0010
<b>Alphanumeric keyboard</b>			
12-inch display 800 x 600	CP6231-0000-0010	CP6231-0001-0010	CP6231-0002-0010
15-inch display 1024 x 768	CP6232-0000-0010	CP6232-0001-0010	CP6232-0002-0010
19-inch display 1280 x 1024	CP6233-0000-0010	CP6233-0001-0010	CP6233-0002-0010
<b>Alphanumeric keyboard with PLC keys on the sides</b>			
15-inch display 1024 x 768	CP6242-0000-0010	CP6242-0001-0010	

# Dimensions

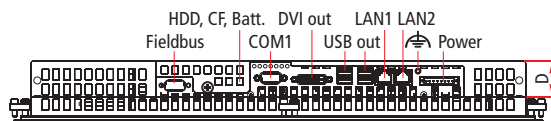
The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com).  
 The device must be installed in the orientation that is shown by the rear view drawing.



Dimensions in mm

Rear view

Side view



Connectors

Dimensions		a	b	t	A	B	C	D
<b>Display only</b>								
CP6201	12" display	330 mm	275 mm	58 mm	316 mm	261 mm	24.6 mm	32.5 mm
CP6202	15" display	380 mm	315 mm	59 mm	366 mm	301 mm	41.2 mm	33 mm
CP6203	19" display	455 mm	390 mm	67 mm	441 mm	376 mm	77.2 mm	33 mm
CP6204	24" display	594.4 mm	423 mm	75 mm	562.4 mm	391 mm	44.6 mm	33 mm
<b>With function keys</b>								
CP6211	12" display	372.2 mm	342.2 mm	58 mm	358.2 mm	328.2 mm	67 mm	32.5 mm
CP6212	15" display	430.4 mm	403 mm	59 mm	416.4 mm	389 mm	86.5 mm	33 mm
CP6213	19" display	508.4 mm	463 mm	67 mm	494.4 mm	449 mm	116.2 mm	33 mm
<b>Numeric keyboard</b>								
CP6221	12" display	414 mm	336 mm	58 mm	400 mm	322 mm	51.5 mm	32.5 mm
CP6221-0002	12" display	444.2 mm	336 mm	58 mm	430.2 mm	322 mm	51.5 mm	32.5 mm
CP6222	15" display	519.4 mm	378.2 mm	59 mm	505.4 mm	364.2 mm	70.9 mm	33 mm
CP6223	19" display	567.4 mm	434 mm	67 mm	553.4 mm	420 mm	93.5 mm	33 mm
<b>Alphanumeric keyboard</b>								
CP6231	12" display	410.4 mm	378.2 mm	58 mm	396.4 mm	364.2 mm	115.7 mm	32.5 mm
CP6231-0002	12" display	430.4 mm	378.2 mm	58 mm	416.4 mm	364.2 mm	115.7 mm	32.5 mm
CP6232	15" display	489.4 mm	418.2 mm	59 mm	475.4 mm	404.2 mm	128.3 mm	33 mm
CP6233	19" display	508.4 mm	543 mm	67 mm	494.4 mm	529 mm	195.8 mm	33 mm
<b>Alphanumeric keyboard with PLC keys on the sides</b>								
CP6242	15" display	449.4 mm	458 mm	59 mm	435.4 mm	444 mm	167.5 mm	33 mm





## CP64xx | Built-in Panel PC

### The flat built-in Industrial PC with slot motherboard

The Panel PC series CP64xx is designed for installation in the front of a control cabinet. A built-in Control Panel CP68xx with DVI and USB interface is the front of the Panel PC. The correct display size and keyboard are thus available for every application. The CP64xx built-in Industrial PCs represent a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.

The 4-slot add-on PC CP64xx complements all types of built-in Control Panels CP68xx by a full Industrial PC. The Panel PCs can be equipped with a 12-, 15- or 19-inch TFT display, as a monitor without keys or with different types of keyboards. A touch screen or touch pad is optionally available. A large number of expansion options with electro-

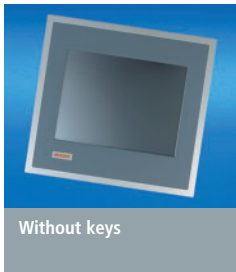
mechanical keys is also available. A compact PC housing is installed on the back wall of the Control Panel, which is equipped with Intel® Core™ Duo or Core™2 Duo on an all-in-one slot motherboard with passive backplane. Two free slots are available. A CD/DVD-ROM or multi DVD drive can be installed, even to write Blu-ray Discs™. A 100 to 240 V AC full range or a 24 V DC power supply unit is installed in the PC. The PC deals with the power supply for the Control Panel. The cables are installed in the PC housing.



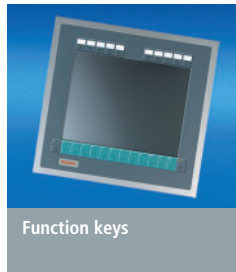
Drives and plug-in cards are easily accessible after removing the cover due to the hinged internal chassis.



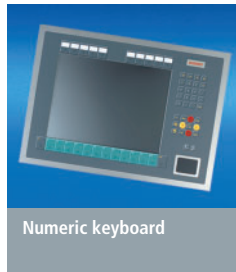
CP64xx	Built-in Panel PC
<b>Housing</b>	4-slot housing
	2 slots for plug-in cards with a length of up to 190 mm
	drives and plug-in cards easily accessible
	status LEDs and protected reset key
	card holders, actuated without tools
	pull-out clamping levers for fast installation without loose parts
	protection class front side IP 65, rear side IP 20
<b>Front panel</b>	operating temperature 0...55 °C
	TFT display in three sizes
	– 12-inch display 800 x 600
	– 15-inch display 1024 x 768
	– 19-inch display 1280 x 1024
	front laminate in five variants
	– only display
– function keys and 10 PLC special keys with LED	
– numeric keyboard and 10 PLC special keys with LED	
– alphanumeric PC keyboard in US layout and 10 PLC special keys with LED	
– alphanumeric PC keyboard in US layout and 16 PLC special keys with LED on the sides	
<b>Features</b>	special keys identified by slide-in labels
	processor Intel® Core™ Duo 2.0 GHz
	slot motherboard for Intel® Core™ Duo or Core™2 Duo
	4-slot passive backplane, 2 PCI slots available
	512 MB DDR2RAM, expandable to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	hard disk, 2½-inch, 40 GB
4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 8 USB 2.0, 3 of these USB ports are led out	
100–240 V AC full range power supply	
<b>Options</b>	processor Intel® Core™2 Duo
	for variants with Intel® Celeron® M or Pentium® M see price list
	touch screen pen with wall holder
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
uninterruptible power supply UPS	
push-button extension with electromechanical switches and keys	
<b>Further information</b>	<a href="http://www.beckhoff.com/CP64xx">www.beckhoff.com/CP64xx</a>



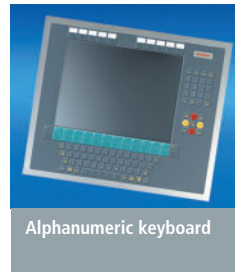
Without keys



Function keys



Numeric keyboard



Alphanumeric keyboard

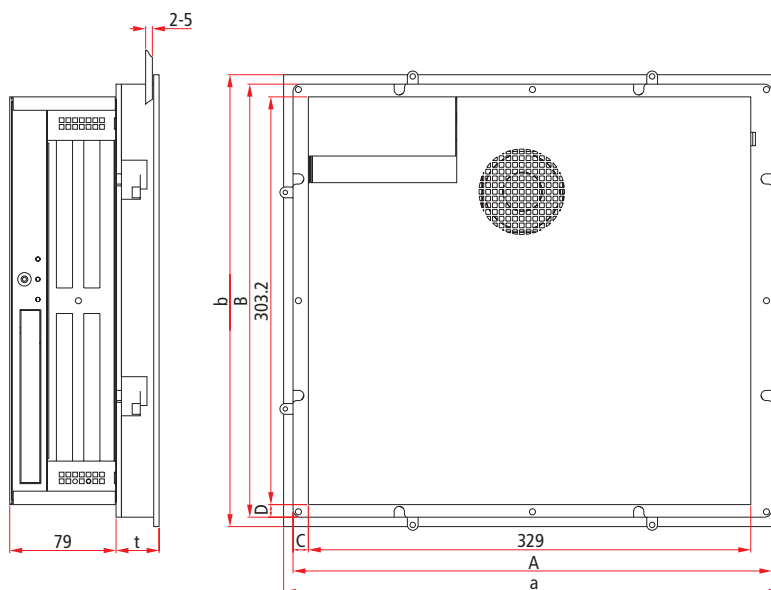


Alphanumeric keyboard with PLC keys on the sides

Ordering information	without touch screen	with touch screen	with touch pad
<b>Display only</b>			
12-inch display 800 x 600	CP6401-0000	CP6401-0001	
15-inch display 1024 x 768	CP6402-0000	CP6402-0001	
19-inch display 1280 x 1024	CP6403-0000	CP6403-0001	
<b>With function keys</b>			
12-inch display 800 x 600	CP6411-0000	CP6411-0001	
15-inch display 1024 x 768	CP6412-0000	CP6412-0001	
19-inch display 1280 x 1024	CP6413-0000	CP6413-0001	
<b>Numeric keyboard</b>			
12-inch display 800 x 600	CP6421-0000	CP6421-0001	CP6421-0002
15-inch display 1024 x 768	CP6422-0000	CP6422-0001	CP6422-0002
19-inch display 1280 x 1024	CP6423-0000	CP6423-0001	CP6423-0002
<b>Alphanumeric keyboard</b>			
12-inch display 800 x 600	CP6431-0000	CP6431-0001	CP6431-0002
15-inch display 1024 x 768	CP6432-0000	CP6432-0001	CP6432-0002
19-inch display 1280 x 1024	CP6433-0000	CP6433-0001	CP6433-0002
<b>Alphanumeric keyboard with PLC keys on the sides</b>			
15-inch display 1024 x 768	CP6442-0000	CP6442-0001	

## Dimensions

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com).  
The device must be installed in the orientation that is shown in these drawings.



Dimensions in mm

Side view

Rear view

Dimensions		a	b	t	A	B	C	D
<b>Display only</b>								
CP6401	12" display	372.2 mm	342.2 mm	32 mm	358.2 mm	328.2 mm	9.6 mm	8.6 mm
CP6402	15" display	430.4 mm	403 mm	32 mm	416.4 mm	389 mm	8.6 mm	8.6 mm
CP6403	19" display	508.4 mm	463 mm	43 mm	494.4 mm	449 mm	10.8 mm	9.3 mm
<b>With function keys</b>								
CP6411	12" display	372.2 mm	342.2 mm	32 mm	358.2 mm	328.2 mm	9.6 mm	8.6 mm
CP6412	15" display	430.4 mm	403 mm	32 mm	416.4 mm	389 mm	8.6 mm	8.6 mm
CP6413	19" display	508.4 mm	463 mm	43 mm	494.4 mm	449 mm	10.8 mm	9.3 mm
<b>Numeric keyboard</b>								
CP6421	12" display	414 mm	336 mm	32 mm	400 mm	322 mm	9.2 mm	10.2 mm
CP6421-0002	12" display	444.2 mm	336 mm	32 mm	430.2 mm	322 mm	43.4 mm	9.4 mm
CP6422	15" display	519.4 mm	378.2 mm	32 mm	505.4 mm	364.2 mm	8.6 mm	7.1 mm
CP6423	19" display	576.4 mm	434 mm	43 mm	553.4 mm	420 mm	15.8 mm	19.3 mm
<b>Alphanumeric keyboard</b>								
CP6431	12" display	410.4 mm	378.2 mm	32 mm	396.4 mm	364.2 mm	9.6 mm	48.6 mm
CP6431-0002	12" display	430.4 mm	378.2 mm	32 mm	416.4 mm	364.2 mm	9.7 mm	8.4 mm
CP6432	15" display	489.4 mm	418.2 mm	32 mm	475.4 mm	404.2 mm	33.4 mm	52.4 mm
CP6433	19" display	508.4 mm	543 mm	43 mm	494.4 mm	529 mm	41.2 mm	89.3 mm
<b>Alphanumeric keyboard with PLC keys on the sides</b>								
CP6442	15" display	449.4 mm	458 mm	32 mm	435.4 mm	444 mm	18 mm	29.5 mm



## CP65xx | Built-in Panel PC

### The universal built-in Industrial PC with ATX motherboard

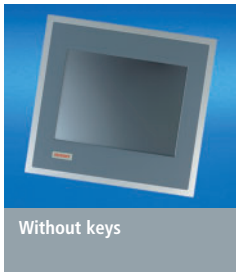
The Panel PC series CP65xx is designed for installation in the front of a control cabinet. A built-in Control Panel CP68xx with DVI and USB interface is the front of the Panel PC. The correct display size and keyboard are thus available for every application. The CP65xx built-in Industrial PCs represent a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.

The 7-slot ATX add-on PC CP65xx complements all types of built-in Control Panels CP68xx by a full Industrial PC. The Panel PCs can be equipped with 12-, 15- or 19-inch TFT display, as a monitor without keys or with different types of keyboards. A touch screen or touch pad is optionally available. A large number of push-button extensions are also available.

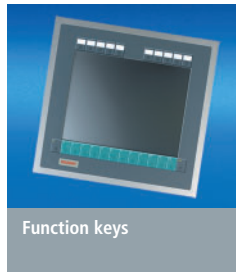
An ATX PC housing is mounted on the backplane of the Control Panel, which can be equipped with Intel® Core™2 Duo or Core™2 Quad on an ATX motherboard. Three PCI and three PCI Express slots are available. A CD/DVD-ROM or multi DVD drive can be installed, even to write Blu-ray Discs™. A 100 to 240 AC full range power supply or a 24 V DC power supply is used in the PC. The Control Panel is connected to the PC via DVI and USB. The PC deals with the power supply for the Control Panel. The cables are installed in the PC housing.



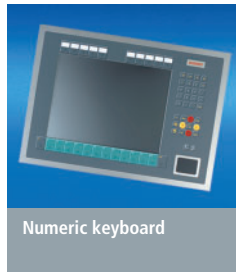
CP65xx	Built-in Panel PC
<b>Housing</b>	7-slot ATX housing
	all slots for plug-in cards with a length of up to 190 mm
	drives and plug-in cards easily accessible
	all connectors on the top
	detailed PC configuration information on the housing
	card holders, actuated without tools
	status LEDs and protected reset key
	pull-out clamping levers for fast installation without loose parts
	protection class front side IP 65, rear side IP 20
	operating temperature 0...55 °C
<b>Front panel</b>	TFT display in three sizes <ul style="list-style-type: none"> <li>– 12-inch display 800 x 600</li> <li>– 15-inch display 1024 x 768</li> <li>– 19-inch display 1280 x 1024</li> </ul>
	front laminate in five variants <ul style="list-style-type: none"> <li>– only display</li> <li>– function keys and 10 PLC special keys with LED</li> <li>– numeric keyboard and 10 PLC special keys with LED</li> <li>– alphanumeric PC keyboard in US layout and 10 PLC special keys with LED</li> <li>– alphanumeric PC keyboard in US layout and 16 PLC special keys with LED on the sides</li> </ul>
	special keys identified by slide-in labels
	processor Intel® Core™2 Duo 2.53 GHz
	ATX motherboard for Intel® Core™2 Duo or Core™2 Quad
	3 PCI Express x1 slots free, 3 PCI slots free and 1 PCI Express x16 graphic card slot
	1 GB DDR3RAM, expandable to 8 GB
	on-board graphic adapter, Intel® GMA 4500MHD, monitor connector
	ADD-IN card in the PCI Express x16 graphic card slot with internal DVI connector to control the display in the front
	on-board Ethernet adapter with 10/100BASE-T connector
<b>Features</b>	hard disk, 3½-inch, 250 GB
	4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 12 USB 2.0, 4 of these USB ports are led out; and 1 parallel port
	PS/2 keyboard socket and PS/2 mouse socket
	100–240 V AC full range power supply
	processor Intel® Core™2 Quad
	for variants with Intel® Celeron® M, Pentium® M or Core™ Duo see price list
	touch screen pen with wall holder
	second on board Ethernet adapter with 10/100/1000 BASE-T connector
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
<b>Options</b>	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
	uninterruptible power supply UPS
	push-button extension with electromechanical switches and keys
	www.beckhoff.com/CP65xx
<b>Further information</b>	



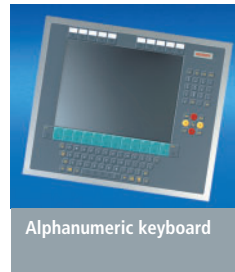
Without keys



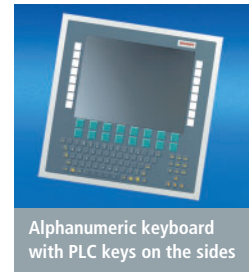
Function keys



Numeric keyboard



Alphanumeric keyboard

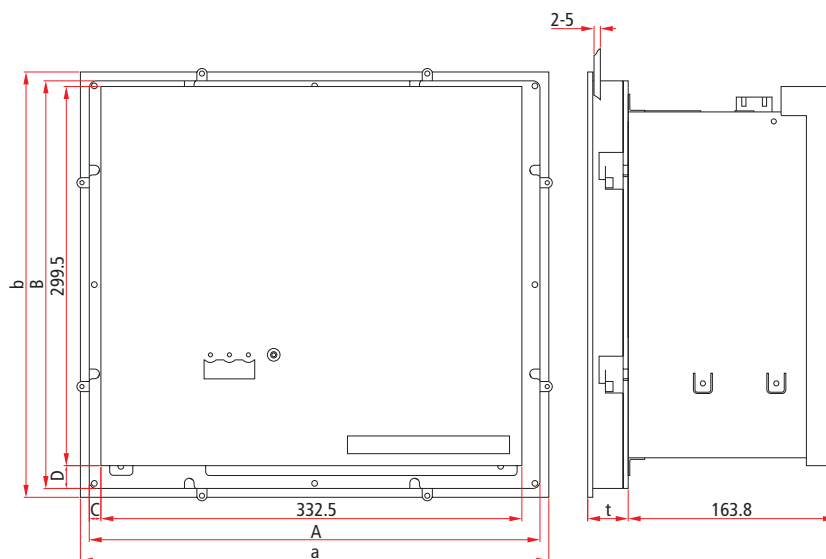


Alphanumeric keyboard with PLC keys on the sides

Ordering information	without touch screen	with touch screen	with touch pad
<b>Display only</b>			
12-inch display 800 x 600	CP6501-0000	CP6501-0001	
15-inch display 1024 x 768	CP6502-0000	CP6502-0001	
19-inch display 1280 x 1024	CP6503-0000	CP6503-0001	
<b>With function keys</b>			
12-inch display 800 x 600	CP6511-0000	CP6511-0001	
15-inch display 1024 x 768	CP6512-0000	CP6512-0001	
19-inch display 1280 x 1024	CP6513-0000	CP6513-0001	
<b>Numeric keyboard</b>			
12-inch display 800 x 600	CP6521-0000	CP6521-0001	CP6521-0002
15-inch display 1024 x 768	CP6522-0000	CP6522-0001	CP6522-0002
19-inch display 1280 x 1024	CP6523-0000	CP6523-0001	CP6523-0002
<b>Alphanumeric keyboard</b>			
12-inch display 800 x 600	CP6531-0000	CP6531-0001	CP6531-0002
15-inch display 1024 x 768	CP6532-0000	CP6532-0001	CP6532-0002
19-inch display 1280 x 1024	CP6533-0000	CP6533-0001	CP6533-0002
<b>Alphanumeric keyboard with PLC keys on the sides</b>			
15-inch display 1024 x 768	CP6542-0000	CP6542-0001	

## Dimensions

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com).  
The device must be installed in the orientation that is shown in these drawings.



Dimensions in mm

Rear view

Side view

Dimensions		a	b	t	A	B	C	D
<b>Display only</b>								
CP6501	12" display	372.2 mm	342.2 mm	32 mm	358.2 mm	328.2 mm	7.5 mm	17.3 mm
CP6502	15" display	430.4 mm	403 mm	32 mm	416.4 mm	389	6.5 mm	17.3 mm
CP6503	19" display	508.4 mm	463 mm	43 mm	494.4 mm	449 mm	8.6 mm	18 mm
<b>With function keys</b>								
CP6511	12" display	372.2 mm	342.2 mm	32 mm	358.2 mm	328.2 mm	7.5 mm	17.3 mm
CP6512	15" display	430.4 mm	403 mm	32 mm	416.4 mm	389 mm	6.5 mm	17.3 mm
CP6513	19" display	508.4 mm	463 mm	43 mm	494.4 mm	449 mm	8.6 mm	18 mm
<b>Numeric keyboard</b>								
CP6521	12" display	414 mm	336 mm	32 mm	400 mm	322 mm	7 mm	18.9 mm
CP6521-0002	12" display	444.2 mm	336 mm	32 mm	430.2 mm	322 mm	41.2 mm	18.1 mm
CP6522	15" display	519.4 mm	378.2 mm	32 mm	505.4 mm	364.2 mm	6.5 mm	15.8 mm
CP6523	19" display	567.4 mm	434 mm	43 mm	553.4 mm	420 mm	13.6 mm	18 mm
<b>Alphanumeric keyboard</b>								
CP6531	12" display	410.4 mm	378.2 mm	32 mm	396.4 mm	364.2 mm	7.5 mm	57.3 mm
CP6531-0002	12" display	430.4 mm	378.2 mm	32 mm	416.4 mm	364.2 mm	7.5 mm	17 mm
CP6532	15" display	489.4 mm	418.2 mm	32 mm	475.4 mm	404.2 mm	31.3 mm	61 mm
CP6533	19" display	508.4 mm	543 mm	43 mm	494.4 mm	529 mm	39 mm	98 mm
<b>Alphanumeric keyboard with PLC keys on the sides</b>								
CP6542	15" display	449.4 mm	458 mm	32 mm	435.4 mm	444 mm	17 mm	38 mm





## CP71xx | Panel PC

### The waterproof Industrial PC with slot motherboard

The Panel PC series CP71xx is designed for mounting arm installation. A Control Panel is the front of the Panel PC. The correct display size and keyboard are thus available for every application. The CP71xx Industrial PCs represent a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.

The 4-slot add-on PC CP71xx adds a full Industrial PC to all versions of the Control Panel series CP78xx. An aluminium PC housing with protection class IP 65 is attached to the back of the Control Panel. It can accommodate all the components of a high-performance PC with Intel® Core™ Duo or Core™2 Duo. It is possible to fit an CD/DVD-ROM or multi DVD drive behind the side door, even to write Blu-ray Discs™. The cooling is achieved by means of cooling fins on the outer wall. A fan inside the closed housing ensures that the heat is distributed evenly. The PC can operate at an ambient temperature up to 45 °C. The housing is made for mounting arm installation with the mounting arm system Rolec. The mounting arm can be installed from top or bottom. The connection

cables are wired through the mounting arm. The housing can be opened easily without having to remove the unit from the mounting arm and allows rapid access to all integrated components.

The add-on PC CP71xx is designed for mounting behind a Beckhoff Control Panel. The IP 65 Panel PCs can be equipped with 12-, 15- or 19-inch LCD, as a monitor without keys or with keyboards in different variants. A touch screen or touch pad is optionally available. A large number of push-button extensions is also available.

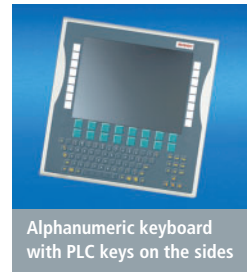
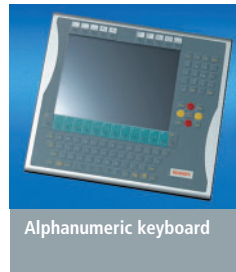
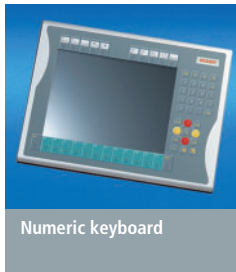
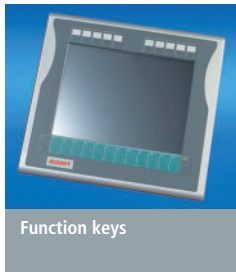
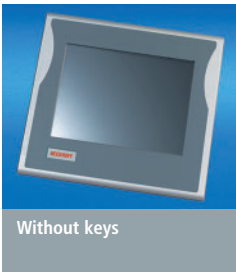


The CD/DVD drive is accessible behind the side door.



The mounting arm can be installed from top or bottom.

CP71xx	Panel PC
<b>Housing</b>	4-slot housing
	1 slot for plug-in cards with a length of up to 190 mm
	drives and plug-in cards easily accessible
	mounting arm connector for Roolec part 146.025.016 from top or bottom
	side door to access the CD/DVD drive
	status LEDs and reset key behind the side door
	card holders, actuated without tools
	passive cooling through heat sink structure at the outer housing, internal fan for equal heat distribution to all the walls of the housing
	50 cm free space required around the PC for air circulation
	fan quickly exchangeable from outside
	protection class IP 65
	operating temperature 0...45 °C
<b>Front panel</b>	TFT display in three sizes <ul style="list-style-type: none"> <li>– 12-inch display 800 x 600</li> <li>– 15-inch display 1024 x 768</li> <li>– 19-inch display 1280 x 1024</li> </ul>
	front laminate in five variants <ul style="list-style-type: none"> <li>– only display</li> <li>– function keys and 10 PLC special keys with LED</li> <li>– numeric keyboard and 10 PLC special keys with LED</li> <li>– alphanumeric PC keyboard in US layout and 10 PLC special keys with LED</li> <li>– alphanumeric PC keyboard in US layout and 16 PLC special keys with LED on the sides</li> </ul>
	special keys identified by slide-in labels
	processor Intel® Core™ Duo 2.0 GHz
	slot motherboard for Intel® Core™ Duo or Core™2 Duo
	3-slot passive backplane, 1 PCI slot available
<b>Features</b>	512 MB DDR2RAM, expandable to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	hard disk, 2½-inch, 40 GB
	CD/DVD-ROM drive slimline
	4 serial ports RS232 on-board, 1 of these RS232 ports is linked to an internal 9-pin D-sub connector; 8 USB 2.0, 3 of these USB ports are linked to internal USB sockets
	24 V DC power supply
	processor Intel® Core™2 Duo
<b>Options</b>	for variants with Intel® Celeron® M or Pentium® M see price list
	touch screen pen with holder
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	2-port USB socket IP 65 inside the Control Panel backplane
	Compact Flash or solid-state disk SSD
	multi DVD or Blu-ray multi DVD drive
	uninterruptible power supply UPS
push-button extension with electromechanical switches and keys	
<b>Further information</b>	<a href="http://www.beckhoff.com/CP71xx">www.beckhoff.com/CP71xx</a>

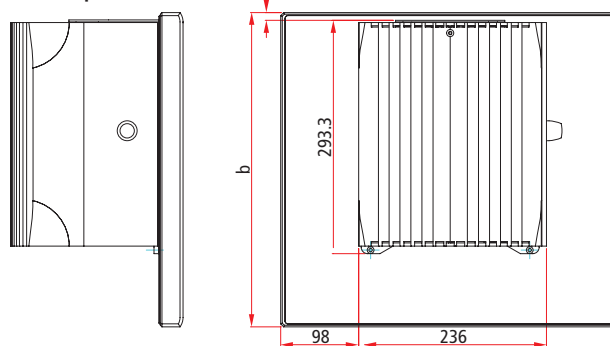


Ordering information	without touch screen	with touch screen	with touch pad
<b>Display only</b>			
12-inch display 800 x 600	CP7101-0000	CP7101-0001	
15-inch display 1024 x 768	CP7102-0000	CP7102-0001	
19-inch display 1280 x 1024	CP7103-0000	CP7103-0001	
<b>With function keys</b>			
12-inch display 800 x 600	CP7111-0000	CP7111-0001	
15-inch display 1024 x 768	CP7112-0000	CP7112-0001	
19-inch display 1280 x 1024	CP7113-0000	CP7113-0001	
<b>Numeric keyboard</b>			
12-inch display 800 x 600	CP7121-0000	CP7121-0001	CP7121-0002
15-inch display 1024 x 768	CP7122-0000	CP7122-0001	CP7122-0002
19-inch display 1280 x 1024	CP7123-0000	CP7123-0001	CP7123-0002
<b>Alphanumeric keyboard</b>			
12-inch display 800 x 600	CP7131-0000	CP7131-0001	CP7131-0002
15-inch display 1024 x 768	CP7132-0000	CP7132-0001	CP7132-0002
19-inch display 1280 x 1024	CP7133-0000	CP7133-0001	CP7133-0002
<b>Alphanumeric keyboard with PLC keys on the sides</b>			
15-inch display 1024 x 768	CP7142-0000	CP7142-0001	

## Dimensions

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in the rear view drawing.

M152 mounting arm  
from top

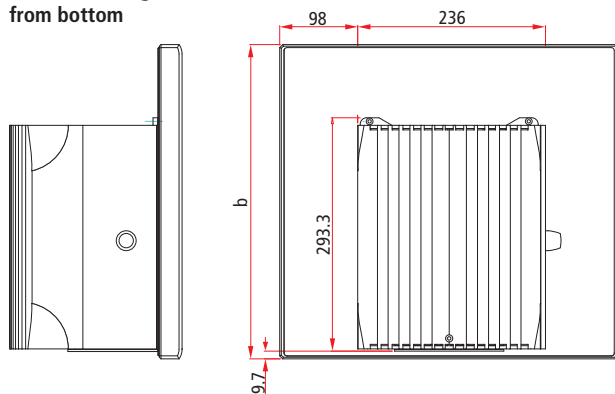


Side view

Rear view

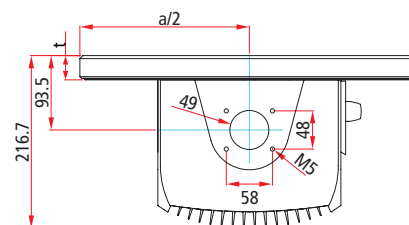
Dimensions in mm

M154 mounting arm  
from bottom



Side view

Rear view



Top view

Dimensions		a	b	t
<b>Display only</b>				
CP7101	12" display	353.8 mm	326.3 mm	29.5 mm
CP7102	15" display	426 mm	395 mm	30.5 mm
CP7103	19" display	504 mm	455 mm	47 mm
<b>With function keys</b>				
CP7111	12" display	353.8 mm	326.3 mm	29.5 mm
CP7112	15" display	426 mm	395 mm	30.5 mm
CP7113	19" display	504 mm	455 mm	47 mm
<b>Numeric keyboard</b>				
CP7121	12" display	406 mm	308.3 mm	29.5 mm
CP7121-0002	12" display	439.8 mm	308.3 mm	29.5 mm
CP7122	15" display	515 mm	370.2 mm	30.5 mm
CP7123	19" display	563 mm	426 mm	47 mm
<b>Alphanumeric keyboard</b>				
CP7131	12" display	406 mm	370.2 mm	29.5 mm
CP7131-0002	12" display	426 mm	370.2 mm	29.5 mm
CP7132	15" display	485 mm	410.2 mm	30.5 mm
CP7133	19" display	504 mm	535 mm	47 mm
<b>Alphanumeric keyboard with PLC keys on the sides</b>				
CP7142	15" display	445 mm	450 mm	28.5 mm



## CP72xx | “Economy” Panel PC

### The Industrial PC with mounting arm and 3½-inch motherboard

The CP72xx “Economy” Panel PC series is designed for mounting arm installation. Control Panels form the front of the IP 65 Panel PC. The right display size and keyboard are thus available for every application. The CP72xx Industrial PCs represent a powerful platform for use in machine and plant construction, for example using the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.

The PC can be equipped with a 12-, 15-, 19- or 24-inch LC display as a monitor without keys or with different types of keyboards. Optionally, a touch screen or touch pad is available. In addition, a large number of push-button extensions are available.

Cooling is achieved via cooling ribs between the Control Panel and the add-on PC. A fan inside the closed housing ensures that the heat is distributed evenly. The PC can be operated at up to 45 °C ambient temperature.

The housing is designed for installation on a mounting arm. There is a choice of attaching the mounting arm from above or below. The Panel PC features an integrated rotatable mounting arm adapter for a 48 mm

diameter mounting arm tube. Optionally, a rotatable and tiltable mounting arm adapter can be integrated in the Panel PC. The connecting cables are laid through the mounting arm.

The compact aluminium housing of the CP72xx Panel PCs is equipped with a 3½-inch Beckhoff Motherboard for Intel® Core™ Duo or Core™2 Duo.

The Industrial PC connections (up to six) with IP 65 connectors are positioned in the large wiring space and are easily accessible. The wiring area can be opened easily without dismantling the device from the mounting arm, offering fast access to the IP 65 connectors for power supply, Ethernet and optional fieldbus, USB or RS232. Prefabricated cables in various lengths are available for all connections.

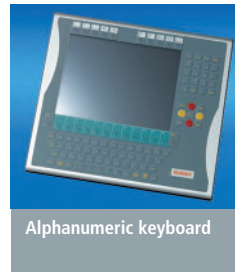
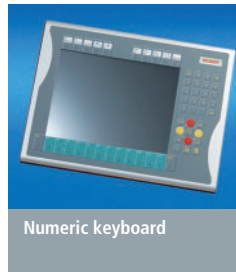
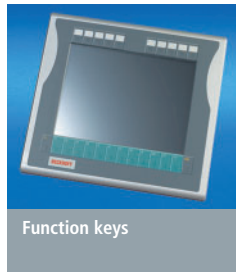
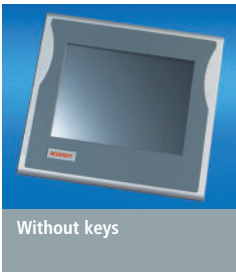
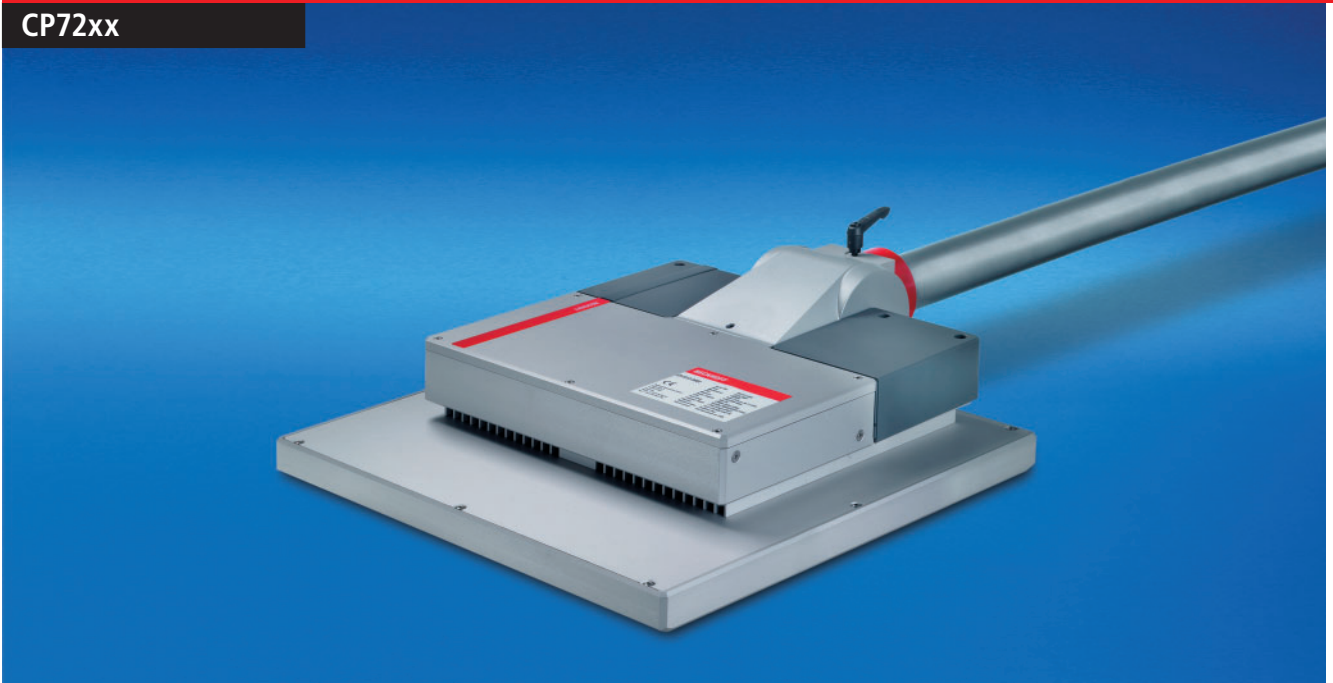
Due to its two independent Ethernet interfaces the CP72xx is ideally suited as a compact central processing unit for an EtherCAT control system. While the 100 Mbit Ethernet port offers optimum performance for all EtherCAT control tasks, a gigabit port is available for connecting the higher-level network.

The C72xx series Panel PCs are supplied with a 24 V power supply unit, optionally with integrated uninterruptible power supply (UPS). A battery pack can be connected externally and installed on a DIN rail in the control cabinet.

One or two Compact Flash Cards or up to two hard disks, as well as the lithium battery for the system clock, are accessible from the rear side underneath a cover. Two hard disks can be mirrored using the on-board SATA RAID 1 controller.

There is a Mini PCI slot in the CP72xx. The Beckhoff Mini PCI Ethernet or fieldbus cards can be factory-fitted. NOVRAM up to 512 kB is also available in the form of an optional Mini PCI plug-in card for fail-safe data storage.

CP72xx	"Economy" Panel PC	
<b>Housing</b>	Industrial PC with Control Panel for mounting arm installation	
	rotatable mounting arm adapter for Rittal and Rolec mounting arm systems with 48 mm tube from top	
	wiring area for up to 6 IP 65 connectors	
	1 slot for a 2½-inch hard disk and 1 slot for Compact Flash	
	lithium battery of the system clock, changeable from outside	
	passive cooling through heat sink structure between Control Panel and add-on PC, internal fan for equal heat distribution to all the walls of the housing	
	20 cm free space required around the PC for air circulation	
	protection class IP 65	
	operating temperature 0...45 °C	
<b>Front panel</b>	TFT display in four sizes <ul style="list-style-type: none"> <li>– 12-inch display 800 x 600</li> <li>– 15-inch display 1024 x 768</li> <li>– 19-inch display 1280 x 1024</li> <li>– 24-inch display 1920 x 1200</li> </ul>	
	front laminate in five variants <ul style="list-style-type: none"> <li>– only display</li> <li>– function keys and 10 PLC special keys with LED</li> <li>– numeric keyboard and 10 PLC special keys with LED</li> <li>– alphanumeric PC keyboard in US layout and 10 PLC special keys with LED</li> <li>– alphanumeric PC keyboard in US layout and 16 PLC special keys with LED on the sides</li> </ul>	
	special keys identified by slide-in labels	
	processor Intel® Core™ Duo 2.0 GHz	
	3½-inch motherboard for Intel® Core™ Duo or Core™2 Duo	
	1 Mini PCI slot free for cards installed ex factory	
<b>Features</b>	512 MB DDR2RAM, expandable ex factory to 3 GB	
	on-board graphic adapter, Intel® GMA950	
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector	
	on-board SATA RAID 1 controller, Intel® Matrix Storage Technology	
	hard disk, 2½-inch, 40 GB	
	M23 built-in socket for power supply and 1 Harting push-pull Ethernet built-in socket 10/100/1000 MBit/s in the wiring area	
	24 V DC power supply	
	<b>Options</b>	processor Intel® Core™2 Duo
		for variants with Intel® Celeron® M or Pentium® M see price list
touch screen pen with holder		
mounting arm adapter from bottom instead of from top		
rotatable and tiltable mounting arm adapter		
Mini PCI card with fieldbus interface or Ethernet port		
Mini PCI plug-in card with up to 512 kB NOVRAM for fail-safe storage of process data		
1 or 2 M12 built-in sockets for serial interfaces RS232 in the wiring area, optically linked, overload protection		
M12 built-in socket for USB or USB-A built-in socket with IP 65 screw-on cap in the wiring area		
2 port USB socket IP 65 inside the Control Panel backplane		
second hard disk, 2½-inch, 40 GB		
one or two Compact Flash instead of hard disk		
solid state disk SSD		
uninterruptible power supply UPS		
push-button extension with electromechanical switches and keys		
assembled connecting cables in different lengths for all interfaces		
<b>Further information</b>	<a href="http://www.beckhoff.com/CP72xx">www.beckhoff.com/CP72xx</a>	



Ordering information	without touch screen	with touch screen	with touch pad
<b>Display only</b>			
12-inch display 800 x 600	CP7201-0000	CP7201-0001	
15-inch display 1024 x 768	CP7202-0000	CP7202-0001	
19-inch display 1280 x 1024	CP7203-0000	CP7203-0001	
24-inch display 1920 x 1200	CP7204-0000	CP7204-0001	
<b>With function keys</b>			
12-inch display 800 x 600	CP7211-0000	CP7211-0001	
15-inch display 1024 x 768	CP7212-0000	CP7212-0001	
19-inch display 1280 x 1024	CP7213-0000	CP7213-0001	
<b>Numeric keyboard</b>			
12-inch display 800 x 600	CP7221-0000	CP7221-0001	CP7221-0002
15-inch display 1024 x 768	CP7222-0000	CP7222-0001	CP7222-0002
19-inch display 1280 x 1024	CP7223-0000	CP7223-0001	CP7223-0002
<b>Alphanumeric keyboard</b>			
12-inch display 800 x 600	CP7231-0000	CP7231-0001	CP7231-0002
15-inch display 1024 x 768	CP7232-0000	CP7232-0001	CP7232-0002
19-inch display 1280 x 1024	CP7233-0000	CP7233-0001	CP7233-0002
<b>Alphanumeric keyboard with PLC keys on the sides</b>			
15-inch display 1024 x 768	CP7242-0000	CP7242-0001	

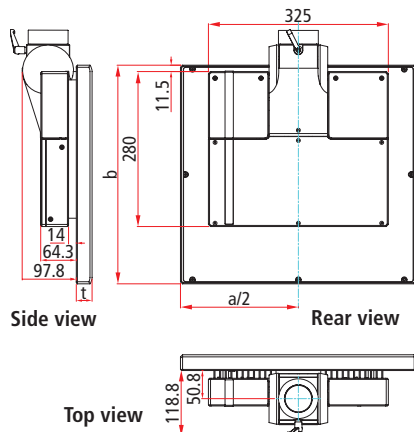
## Dimensions

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com).

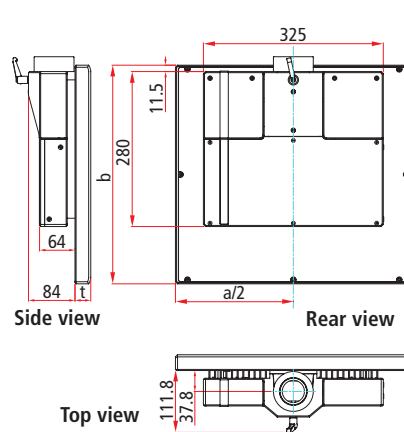
The device must be installed in the orientation that is shown in the rear view drawing.

Dimensions in mm

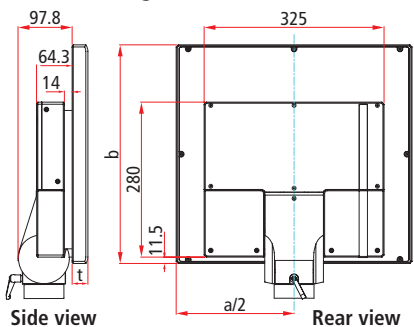
M162 mounting arm from top, rotatable and tiltable



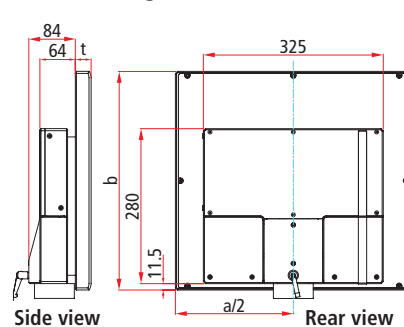
Mounting arm from top, rotatable



M163 mounting arm from bottom, rotatable and tiltable



M161 mounting arm from bottom, rotatable



Dimensions		a	b	t
<b>Display only</b>				
CP7201	12" display	353.8 mm	308.3 mm	29.5 mm
CP7202	15" display	426 mm	395 mm	30.5 mm
CP7203	19" display	504 mm	455 mm	47 mm
CP7204	24" display	610 mm	435 mm	53 mm
<b>With function keys</b>				
CP7211	12" display	353.8 mm	326.3 mm	29.5 mm
CP7212	15" display	426 mm	395 mm	30.5 mm
CP7213	19" display	504 mm	455 mm	47 mm
<b>Numeric keyboard</b>				
CP7221	12" display	406 mm	308.3 mm	29.5 mm
CP7221-0002	12" display	439.8 mm	308.3 mm	29.5 mm
CP7222	15" display	515 mm	370.2 mm	30.5 mm
CP7223	19" display	563 mm	426 mm	47 mm
<b>Alphanumeric keyboard</b>				
CP7231	12" display	406 mm	370.2 mm	29.5 mm
CP7231-0002	12" display	426 mm	370.2 mm	29.5 mm
CP7232	15" display	485 mm	410.2 mm	30.5 mm
CP7233	19" display	504 mm	535 mm	47 mm
<b>Alphanumeric keyboard with PLC keys on the sides</b>				
CP7242	15" display	445 mm	450 mm	28.5 mm





## CP77xx | Panel PC with Intel® Atom™

### The compact Industrial PC with mounting arm

The CP77xx Panel PC series is designed for mounting arm installation. Control Panels form the front of the IP 65 Panel PC. The right display size and keyboard are thus available for every application. The CP77xx Industrial PCs represent a powerful platform for use in machine and plant construction, for example using the TwinCAT automation software under Windows XP, Embedded Standard or Windows CE.

The PC can be equipped with a 6.5-, 12-, 15- or 19-inch LC display, as a monitor without keys or with different types of keyboard. Optionally, a touch screen or touch pad is available. In addition, a large number of push-button extensions are available.

Cooling is achieved directly via the rear panel of the Control Panel. No fan is required. The PC can be operated at up to 55 °C ambient temperature.

The housing is optionally designed for direct wall mounting or for mounting arm installation. The mounting arm can be attached from above or below. If a mounting arm is used, the connection cables are fed through the mounting arm adapter attached

centrally at the rear. Prefabricated cables in various lengths are available for the Ethernet connections.

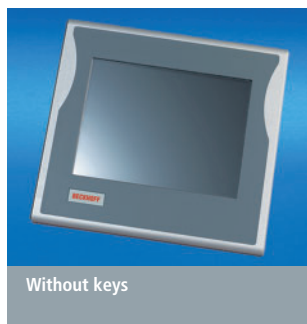
The compact aluminium housing of the Panel PCs CP77xx is equipped with a Beckhoff motherboard for Intel® Atom™ 1.1 or 1.6 GHz.

Due to its two independent gigabit Ethernet interfaces, the CP77xx are ideally suited as a compact central processing unit for an EtherCAT control system. Both Ethernet ports offer optimum performance for all EtherCAT control tasks or for connecting the higher-level network.

The CP77xx series Panel PCs are supplied with a 24 V power supply unit. With the optional 1-second UPS, capacitors integrated on the motherboard can maintain PC operation for a few seconds, so that key variables can be saved.

The Compact Flash cards and the lithium battery for the system clock are located under a cover and accessible from the rear.

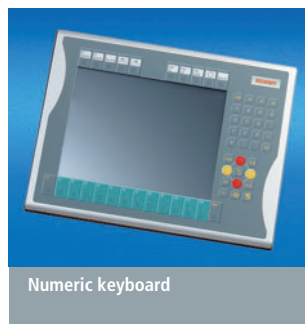
CP77xx	Panel PC
<b>Features</b>	<p>TFT display in four sizes</p> <ul style="list-style-type: none"> <li>– 6.5-inch display 640 x 480</li> <li>– 12-inch display 800 x 600</li> <li>– 15-inch display 1024 x 768</li> <li>– 19-inch display 1280 x 1024</li> </ul> <hr/> <p>aluminium housing, protection class IP 65</p> <hr/> <p>front laminate in four variants</p> <ul style="list-style-type: none"> <li>– only display</li> <li>– function keys and 10 PLC special keys with LED</li> <li>– numeric keyboard and 10 PLC special keys with LED</li> <li>– alphanumeric PC keyboard in US layout and 10 PLC special keys with LED</li> </ul> <hr/> <p>special keys identified by slide-in labels</p> <hr/> <p>integrated PC, Intel® Atom™ processor 1.1 GHz, 1 GB DDR2RAM</p> <hr/> <p>64 MB Compact Flash card type I, extended temperature range</p> <hr/> <p>2 RJ 45 Ethernet connectors in the backplane, 10/100 Mbps, IP 65</p> <hr/> <p>1 RS232 serial port interface in the backplane, DIN 12-pin IP 65, with adapter cable from DIN 12-pin to D-Sub, 9-pin</p> <hr/> <p>24 V power supply, connector in the backplane</p> <hr/> <p>operating temperature 0...55 °C</p> <hr/> <p>for mounting 4 M6 x 18 mm threaded holes in the backplane</p> <hr/> <p>operating system Microsoft Windows CE, English</p>
<b>Options</b>	<p>processor Intel® Atom™ 1.6 GHz</p> <hr/> <p>for variants with AMD LX800 processor see price list</p> <hr/> <p>2-port USB interface, IP 65 connector inside the backplane</p> <hr/> <p>touch screen pen with holder</p> <hr/> <p>additional keyboard IP 65 or toolboard for keyboard and tools</p> <hr/> <p>push-button extension with electromechanical switches and keys</p> <hr/> <p>larger compact flash card, internal</p> <hr/> <p>Windows Embedded Standard</p> <hr/> <p>TwinCAT run-time for Windows CE</p> <hr/> <p>adapter plate for mounting arm installation</p>
<b>Further information</b>	<p><a href="http://www.beckhoff.com/CP77xx">www.beckhoff.com/CP77xx</a></p>



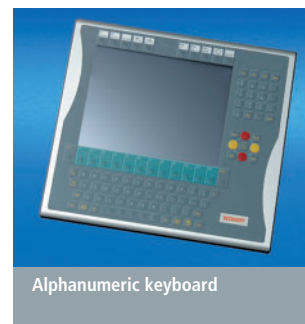
Without keys



Function keys



Numeric keyboard



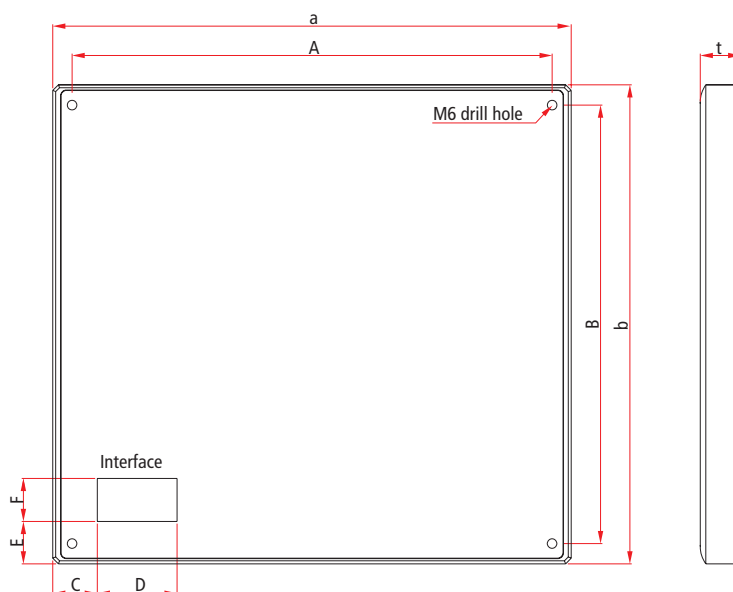
Alphanumeric keyboard

Ordering information	without touch screen	with touch screen	with touch pad
<b>Display only</b>			
6.5-inch display 640 x 480	CP7709-0000	CP7709-0001	
12-inch display 800 x 600	CP7701-0000	CP7701-0001	
15-inch display 1024 x 768	CP7702-0000	CP7702-0001	
19-inch display 1280 x 1024	CP7703-0000	CP7703-0001	
<b>With function keys</b>			
6.5-inch display 640 x 480	CP7719-0000	CP7719-0001	
12-inch display 800 x 600	CP7711-0000	CP7711-0001	
15-inch display 1024 x 768	CP7712-0000	CP7712-0001	
19-inch display 1280 x 1024	CP7713-0000	CP7713-0001	
<b>Numeric keyboard</b>			
6.5-inch display 640 x 480	CP7729-0000	CP7729-0001	
12-inch display 800 x 600	CP7721-0000	CP7721-0001	CP7721-0002
15-inch display 1024 x 768	CP7722-0000	CP7722-0001	CP7722-0002
19-inch display 1280 x 1024	CP7723-0000	CP7723-0001	CP7723-0002
<b>Alphanumeric keyboard</b>			
12-inch display 800 x 600	CP7731-0000	CP7731-0001	CP7731-0002
15-inch display 1024 x 768	CP7732-0000	CP7732-0001	CP7732-0002
19-inch display 1280 x 1024	CP7733-0000	CP7733-0001	CP7733-0002

## Dimensions

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com).

The device must be installed in the orientation that is shown in the rear view drawing.



Dimensions in mm

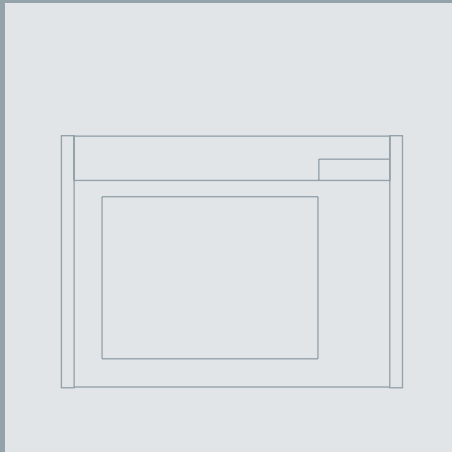
Rear view

Side view

Dimensions		a	b	t	A	B	C	D	E	F
<b>Display only</b>										
CP7709	6.5" display	267.9 mm	173 mm	40 mm	241.9 mm	149 mm	159 mm	50 mm	47 mm	50 mm
CP7701	12" display	353.8 mm	326.3 mm	27.5 mm	327.6 mm	303.7 mm	33 mm	50 mm	12 mm	50 mm
CP7702	15" display	426 mm	395 mm	28.5 mm	399.8 mm	367.4 mm	35 mm	50 mm	18 mm	50 mm
CP7703	19" display	504 mm	455 mm	40 mm	474 mm	430 mm	30 mm	50 mm	20 mm	50 mm
<b>With function keys</b>										
CP7719	6.5" display	267.9 mm	213 mm	38 mm	241.9 mm	189 mm	58 mm	50 mm	151 mm	50 mm
CP7711	12" display	353.8 mm	326.3 mm	27.5 mm	327.6 mm	303.7 mm	33 mm	50 mm	12 mm	50 mm
CP7712	15" display	426 mm	395 mm	28.5 mm	399.8 mm	367.4 mm	35 mm	50 mm	18 mm	50 mm
CP7713	19" display	504 mm	455 mm	40 mm	474 mm	430 mm	30 mm	50 mm	20 mm	50 mm
<b>Numeric keyboard</b>										
CP7729	6.5" display	336 mm	213 mm	38 mm	310 mm	189 mm	31 mm	50 mm	14 mm	50 mm
CP7721	12" display	406 mm	308.3 mm	27.5 mm	374.8 mm	280.7 mm	34 mm	50 mm	14 mm	50 mm
CP7721-0002	12" display	439.8 mm	308.3 mm	27.5 mm	408.6 mm	280.7 mm	66 mm	50 mm	14 mm	50 mm
CP7722	15" display	515 mm	370.2 mm	28.5 mm	483.8 mm	342.6 mm	36 mm	50 mm	29 mm	50 mm
CP7723	19" display	563 mm	426 mm	40 mm	533 mm	401 mm	30 mm	50 mm	20 mm	50 mm
<b>Alphanumeric keyboard</b>										
CP7731	12" display	406 mm	370.2 mm	27.5 mm	379.8 mm	342.6 mm	35 mm	50 mm	27 mm	50 mm
CP7731-0002	12" display	426 mm	370.2 mm	27.5 mm	399.8 mm	342.6 mm	44 mm	50 mm	74 mm	50 mm
CP7732	15" display	483 mm	410.2 mm	28.5 mm	458.8 mm	387.6 mm	31.5 mm	50 mm	78 mm	50 mm
CP7733	19" display	504 mm	535 mm	40 mm	474 mm	510 mm	30 mm	50 mm	100 mm	50 mm

# Panel PC series C33xx

## 19-inch Panel PC



The 19-inch Panel PC series C33xx is designed for fitting into 19-inch racks or into the front of a control cabinet. The Industrial PCs of this series are equipped with maximum performance class components according to the ATX standard and are ideally suited for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



The 19-inch Panel PC series C33xx, fitted with Intel® Core™2 Duo or Core™2 Quad on a standard ATX motherboard, offers controllers of the highest performance class, with a 12- or 15-inch TFT display, optionally with alphanumeric PC keyboard or numeric keyboard, with a touch screen or a touch pad. The RAM can be expanded from 1 GB DDR3RAM up to 8 GB. More than 3 GB require a 64 bit operating system. The housing can be installed and re-fitted from the front. A CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive can be fitted behind the lockable front cover. It is also possible to fit USB connection sockets for keyboard and mouse under the front cover, permitting commissioning and software updates with the aid of standard input devices. In this case the connected keyboard operates in parallel with the front keyboard. The mouse works in parallel with the touch screen or touch pad. Additionally, one or two 3½-inch hard disks can be installed. The on-board RAID 1 controller can mirror two SATA hard disks.

Card holders for the plug-in cards generate insensitivity to shocks and vibrations. The card holders can be fixed and removed without tools.

The Industrial PC corresponds to the ATX standard, and is therefore compatible with all new PC components.

The type plate provides detailed information regarding the PC's configuration. Data on the function, type and use of resources such as memory areas and interrupts is listed for the fitted plug-in cards. Data about drives indicates not just the manufacturer and type, but also provides information about type of connection and jumpers.

The construction of the housing has been designed to allow individual changes,

and many features can be optimised for the application.

A variety of front panels can be combined with the computer core. Although the front panels have different heights, the computer core is always made to fit eight rack units. It is possible that the front panel will extend one or two rack units further at the lower side. The fitting cut-out required for installation is always the same.

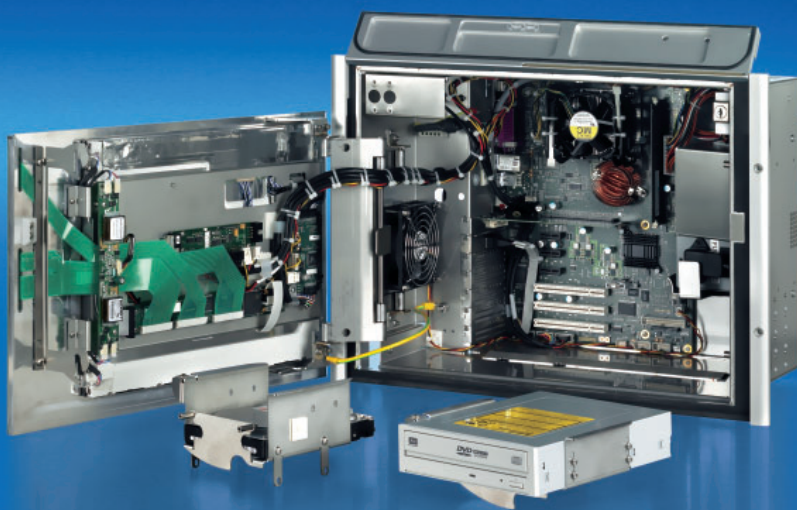




The CD/DVD drive is accessible under the lockable front flap.



If the front door is open, it is possible to access all the components.



The drives can be pulled out after the front cover is taken off.

### Customer-specific design

Beckhoff designs Industrial PCs in a modular way and has years of experience in customising designs to specific needs, e.g. for individual artwork and company logo on the drive flap or bezel, keyboard layout or additional electromechanical keys. A programmable keyboard controller provides flexible adaptation to specific key functions.

### Upgrading and maintenance at the front side

The housing is opened from the front. A lock behind the drive flap opens the front door. Different keys distinguish between users and maintenance personnel. With the front door opened, components can be exchanged without any tools necessary: a hard disk exchange takes place in seconds to upgrade software, changed from another computer, in the field.

Plug-in cards can also be accessed from the front. To install these, access to the cable connectors is supported by a unique slide out support on ball bearings: the complete IPC slides out of its installation position like a drawer; the assembly frame holds the PC in position in front of the rack or the control cabinet. In this position, the technician is able to access the connectors and cables alone from the side without a second person holding the IPC.

The slide mechanism is offered as an accessory as it is often unnecessary for control cabinet installations. In the case of a 19-inch rack systems, however, in which the PC would be difficult to access from behind, the slide mechanism greatly improves access to the internal workings of the IPC.

### Assembly from the front

It is possible to carry out full installation of the Industrial PC from the front. For this purpose the slide mechanism is divided into two halves. The left and right halves of the assembly frame are inserted one by one into the assembly opening and are screwed to the rack or control cabinet from the front. The technician then takes hold of the connection cables, which hang down inside the installation space, and pulls them forward. The telescopic guide supports are pulled forward, the PC is placed onto them and screwed in position. The technician can do this by themselves. The cables are connected

next. The PC is then pushed into the installation space and fixed on the left and right with two screws. – Ready to run in a few minutes.

### Converting existing plants

The computer core is the same in all variants. Its assembly dimensions, 19 inches wide and eight rack units high, are identical to those of its predecessors, the MIC3210 and the C3230: one to one replacement is guaranteed. When using the alphanumeric keyboard, additional space of one to two rack units in front of the front flap below the PC is required.



The mounting frame for withdrawal of the PC allows it to be mounted from the front. Connection cables are accessible from the side, as soon as the computer core slides out.



	C3320	C3330	C3340	C3350
<b>Display</b>	12-inch TFT display, resolution 800 x 600	12-inch TFT display, resolution 800 x 600	15-inch TFT display, resolution 1024 x 768	15-inch TFT display, resolution 1024 x 768
<b>Processor</b>	Intel® Core™2 Duo or Core™2 Quad	Intel® Core™2 Duo or Core™2 Quad	Intel® Core™2 Duo or Core™2 Quad	Intel® Core™2 Duo or Core™2 Quad
<b>Motherboard</b>	ATX	ATX	ATX	ATX
<b>Slots</b>	7	7	7	7
<b>Free slots</b>	3 PCI and 3 PCIe x1	3 PCI and 3 PCIe x1	3 PCI and 3 PCIe x1	3 PCI and 3 PCIe x1
<b>Maximum card length</b>	3 x fullsize, 4 x 240 mm	3 x fullsize, 4 x 240 mm	3 x fullsize, 4 x 240 mm	3 x fullsize, 4 x 240 mm
<b>Memory</b>	1 GB...8 GB DDR3RAM	1 GB...8 GB DDR3RAM	1 GB...8 GB DDR3RAM	1 GB...8 GB DDR3RAM
<b>Graphic adapter</b>	on-board	on-board	on-board	on-board
<b>Ethernet</b>	on-board	on-board	on-board	on-board
<b>Hard disks</b>	1 or 2 x 3½-inch	1 or 2 x 3½-inch	1 or 2 x 3½-inch	1 or 2 x 3½-inch
<b>RAID 1</b>	2 x 3½-inch HDD	2 x 3½-inch HDD	2 x 3½-inch HDD	2 x 3½-inch HDD
<b>Possible disk drives</b>	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray
<b>Power supply</b>	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC
<b>Dimen. (W x H x D)</b>	482.7 x 355 x 282 mm	482.7 x 400 x 282 mm	482.7 x 355 x 282 mm	482.7 x 444 x 282 mm





## C3320 | 19-inch Panel PC

The 19-inch Panel PC C3320 is designed for installation into 19-inch racks or the front of a control cabinet. It provides the highest performance and openness of ATX standard components. The C3320 is ideally suited for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



Front flap with drive

Slide mechanism for front assembly



CD/DVD-ROM or multi DVD drive

USB sockets under the front flap

Touch screen

Touch pad

C3320	19-inch Panel PC
<b>Housing</b>	19-inch built-in housing, 8 rack units
	7-slot processor core for ATX motherboard
	PC to be opened from the front
	all components easily accessible from the front
	3 PCI slots for full-length plug-in cards and 3 PCI Express x1 slots for up to 240 mm long plug-in cards
	card holders, actuated without tools
	protection class front side IP 65, rear side IP 20
	operating temperature 0...55 °C
	weight of the basic configuration 18 kg (39.8 lbs)
	dimensions (W x H x D) 482.7 x 355 x 282 mm (19" x 14" x 11.1"), depth behind front 261 mm (10.4")
<b>Front panel</b>	12 function keys, Escape, Enter, numeric keys, cursor keys
	10 PLC special keys with LED, special keys identified by slide-in labels
	12-inch TFT display, resolution 800 x 600
	lockable front flap with bays for one 3½-inch and one 5¼-inch drive
	status LEDs on the front panel
	reset key behind the front flap
<b>Features</b>	processor Intel® Core™2 Duo 2.53 GHz
	ATX motherboard for Intel® Core™2 Duo or Core™2 Quad
	3 PCI Express x1 slots free, 3 PCI slots free and 1 PCI Express x16 graphic card slot
	1 GB DDR3RAM, expandable to 8 GB
	on-board graphic adapter, Intel® GMA 4500MHD, monitor connector
	ADD-IN card in the PCI Express x16 graphic card slot with internal DVI connector to control the display in the front
	on-board Ethernet adapter with 10/100BASE-T connector
	on-board SATA RAID 1 controller, Intel® Matrix Storage Technology
	hard disk, 3½-inch, 250 GB
	4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 12 USB 2.0, 4 of these USB ports are led out; 1 parallel port; COM4 is used for controlling the PLC special keys and the LEDs on the front
100–240 V AC full range power supply	
<b>Options</b>	processor Intel® Core™2 Quad
	for variants with Intel® Celeron® M, Pentium® M or Core™ Duo see price list
	installation frame with telescope rails for front assembly
	touch screen and touch pad
	touch screen pen with wall holder
	second on board Ethernet adapter with 10/100/1000 BASE-T connector
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	second hard disk, 3½-inch, 250 GB
	2 USB sockets under the front flap
	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
uninterruptible power supply UPS	
<b>Further information</b>	<a href="http://www.beckhoff.com/C3320">www.beckhoff.com/C3320</a>
<b>Dimensions</b>	drawings with main dimensions of the Industrial PC C3320 on page



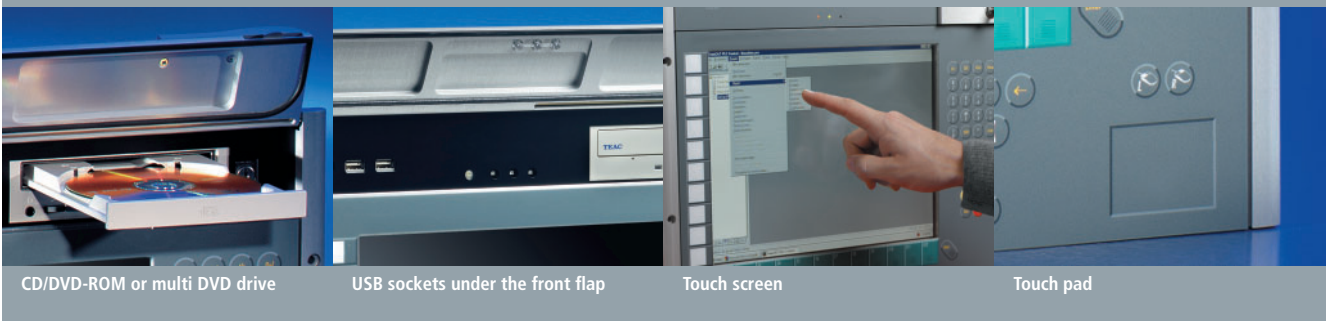
## C3330 | 19-inch Panel PC

The 19-inch Panel PC C3330 is designed for installation into 19-inch racks or the front of a control cabinet. It provides the highest performance and openness of ATX standard components. The C3330 is ideally suited for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



Front flap with drive

Slide mechanism for front assembly



CD/DVD-ROM or multi DVD drive

USB sockets under the front flap

Touch screen

Touch pad

C3330	19-inch Panel PC
<b>Housing</b>	19-inch built-in housing, 9 rack units
	7-slot processor core for ATX motherboard
	PC to be opened from the front
	all components easily accessible from the front
	3 PCI slots for full-length plug-in cards and 3 PCI Express x1 slots for up to 240 mm long plug-in cards
	card holders, actuated without tools
	protection class front side IP 65, rear side IP 20
	operating temperature 0...55 °C
	weight of the basic configuration 18.5 kg (40.9 lbs)
	dimensions (W x H x D) 482.7 x 400 x 282 mm (19" x 15.7" x 11.1"), depth behind front 261 mm (10.4")
<b>Front panel</b>	alphanumeric PC keyboard in US layout
	10 PLC special keys with LED, special keys identified by slide-in labels
	12-inch TFT display, resolution 800 x 600
	lockable front flap with bays for one 3½-inch and one 5¼-inch drive
	status LEDs on the front panel
	reset key behind the front flap
<b>Features</b>	processor Intel® Core™2 Duo 2.53 GHz
	ATX motherboard for Intel® Core™2 Duo or Core™2 Quad
	3 PCI Express x1 slots free, 3 PCI slots free and 1 PCI Express x16 graphic card slot
	1 GB DDR3RAM, expandable to 8 GB
	on-board graphic adapter, Intel® GMA 4500MHD, monitor connector
	ADD-IN card in the PCI Express x16 graphic card slot with internal DVI connector to control the display in the front
	on-board Ethernet adapter with 10/100BASE-T connector
	on-board SATA RAID 1 controller, Intel® Matrix Storage Technology
	hard disk, 3½-inch, 250 GB
	4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 12 USB 2.0, 4 of these USB ports are led out; 1 parallel port; COM4 is used for controlling the PLC special keys and the LEDs on the front
100–240 V AC full range power supply	
<b>Options</b>	processor Intel® Core™2 Quad
	for variants with Intel® Celeron® M, Pentium® M or Core™ Duo see price list
	installation frame with telescope rails for front assembly
	touch screen and touch pad
	touch screen pen with wall holder
	second on board Ethernet adapter with 10/100/1000 BASE-T connector
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	second hard disk, 3½-inch, 250 GB
	2 USB sockets under the front flap
	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
uninterruptible power supply UPS	
<b>Further information</b>	<a href="http://www.beckhoff.com/C3330">www.beckhoff.com/C3330</a>
<b>Dimensions</b>	drawings with main dimensions of the Industrial PC C3330 on page



## C3340 | 19-inch Panel PC

The 19-inch Panel PC C3340 is designed for installation into 19-inch racks or the front of a control cabinet. It provides the highest performance and openness of ATX standard components. The C3340 is ideally suited for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



Front flap with drive

Slide mechanism for front assembly



CD/DVD-ROM or multi DVD drive

USB sockets under the front flap

Touch screen

Touch pad

C3340	19-inch Panel PC
<b>Housing</b>	19-inch built-in housing, 8 rack units
	7-slot processor core for ATX motherboard
	PC to be opened from the front
	all components easily accessible from the front
	3 PCI slots for full-length plug-in cards and 3 PCI Express x1 slots for up to 240 mm long plug-in cards
	card holders, actuated without tools
	protection class front side IP 65, rear side IP 20
	operating temperature 0...55 °C
	weight of the basic configuration 18.5 kg (40.9 lbs)
	dimensions (W x H x D) 482.7 x 355 x 282 mm (19" x 14" x 11.1"), depth behind front 261 mm (10.4")
<b>Front panel</b>	12 function keys, Escape, Enter, numeric keys, cursor keys
	10 PLC special keys with LED, special keys identified by slide-in labels
	15-inch TFT display, resolution 1024 x 768
	lockable front flap with bays for one 3½-inch and one 5¼-inch drive
	status LEDs on the front panel
	reset key behind the front flap
<b>Features</b>	processor Intel® Core™2 Duo 2.53 GHz
	ATX motherboard for Intel® Core™2 Duo or Core™2 Quad
	3 PCI Express x1 slots free, 3 PCI slots free and 1 PCI Express x16 graphic card slot
	1 GB DDR3RAM, expandable to 8 GB
	on-board graphic adapter, Intel® GMA 4500MHD, monitor connector
	ADD-IN card in the PCI Express x16 graphic card slot with internal DVI connector to control the display in the front
	on-board Ethernet adapter with 10/100BASE-T connector
	on-board SATA RAID 1 controller, Intel® Matrix Storage Technology
	hard disk, 3½-inch, 250 GB
	4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 12 USB 2.0, 4 of these USB ports are led out; 1 parallel port; COM4 is used for controlling the PLC special keys and the LEDs on the front
100–240 V AC full range power supply	
<b>Options</b>	processor Intel® Core™2 Quad
	for variants with Intel® Celeron® M, Pentium® M or Core™ Duo see price list
	installation frame with telescope rails for front assembly
	touch screen and touch pad
	touch screen pen with wall holder
	second on board Ethernet adapter with 10/100/1000 BASE-T connector
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	second hard disk, 3½-inch, 250 GB
	2 USB sockets under the front flap
	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
uninterruptible power supply UPS	
<b>Further information</b>	<a href="http://www.beckhoff.com/C3340">www.beckhoff.com/C3340</a>
<b>Dimensions</b>	drawings with main dimensions of the Industrial PC C3340 on page



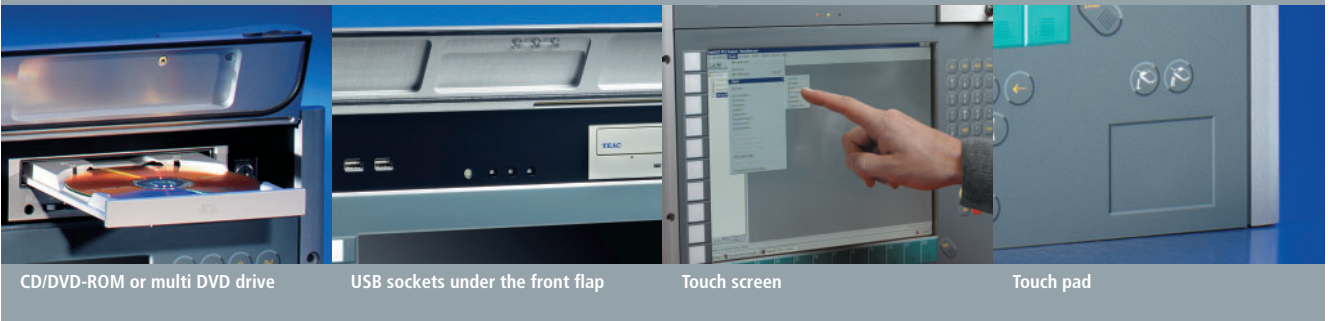
## C3350 | 19-inch Panel PC

The 19-inch Panel PC C3350 is designed for installation into 19-inch racks or the front of a control cabinet. It provides the highest performance and openness of ATX standard components. The C3350 is ideally suited for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



Front flap with drive

Slide mechanism for front assembly



CD/DVD-ROM or multi DVD drive

USB sockets under the front flap

Touch screen

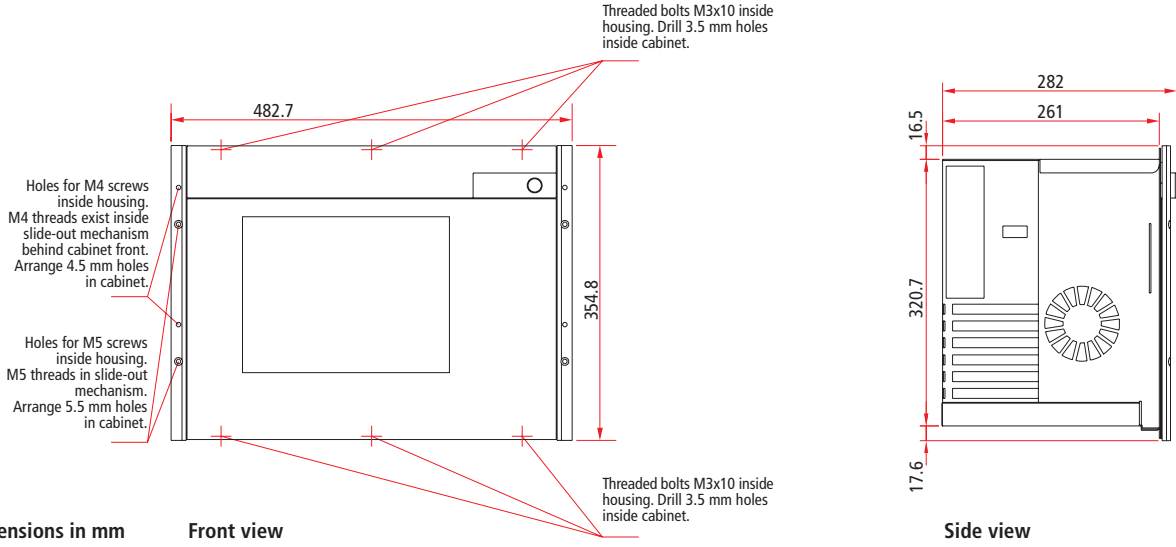
Touch pad

C3350	19-inch Panel PC
<b>Housing</b>	19-inch built-in housing, 10 rack units
	7-slot processor core for ATX motherboard
	PC to be opened from the front
	all components easily accessible from the front
	3 PCI slots for full-length plug-in cards and 3 PCI Express x1 slots for up to 240 mm long plug-in cards
	card holders, actuated without tools
	protection class front side IP 65, rear side IP 20
	operating temperature 0...55 °C
	weight of the basic configuration 19 kg (42 lbs)
	dimensions (W x H x D) 482.7 x 444 x 282 mm (19" x 17.5" x 11.1"), depth behind front 261 mm (10.4")
<b>Front panel</b>	alphanumeric PC keyboard in US layout
	10 PLC special keys with LED, special keys identified by slide-in labels
	15-inch TFT display, resolution 1024 x 768
	lockable front flap with bays for one 3½-inch and one 5¼-inch drive
	status LEDs on the front panel
	reset key behind the front flap
<b>Features</b>	processor Intel® Core™2 Duo 2.53 GHz
	ATX motherboard for Intel® Core™2 Duo or Core™2 Quad
	3 PCI Express x1 slots free, 3 PCI slots free and 1 PCI Express x16 graphic card slot
	1 GB DDR3RAM, expandable to 8 GB
	on-board graphic adapter, Intel® GMA 4500MHD, monitor connector
	ADD-IN card in the PCI Express x16 graphic card slot with internal DVI connector to control the display in the front
	on-board Ethernet adapter with 10/100BASE-T connector
	on-board SATA RAID 1 controller, Intel® Matrix Storage Technology
	hard disk, 3½-inch, 250 GB
	4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 12 USB 2.0, 4 of these USB ports are led out; 1 parallel port; COM4 is used for controlling the PLC special keys and the LEDs on the front
100–240 V AC full range power supply	
<b>Options</b>	processor Intel® Core™2 Quad
	for variants with Intel® Celeron® M, Pentium® M or Core™ Duo see price list
	installation frame with telescope rails for front assembly
	touch screen and touch pad
	touch screen pen with wall holder
	second on board Ethernet adapter with 10/100/1000 BASE-T connector
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	second hard disk, 3½-inch, 250 GB
	2 USB sockets under the front flap
	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
uninterruptible power supply UPS	
<b>Further information</b>	<a href="http://www.beckhoff.com/C3350">www.beckhoff.com/C3350</a>
<b>Dimensions</b>	drawings with main dimensions of the Industrial PC C3350 on page <b>107</b>



# C3320 – Drawings with dimensions

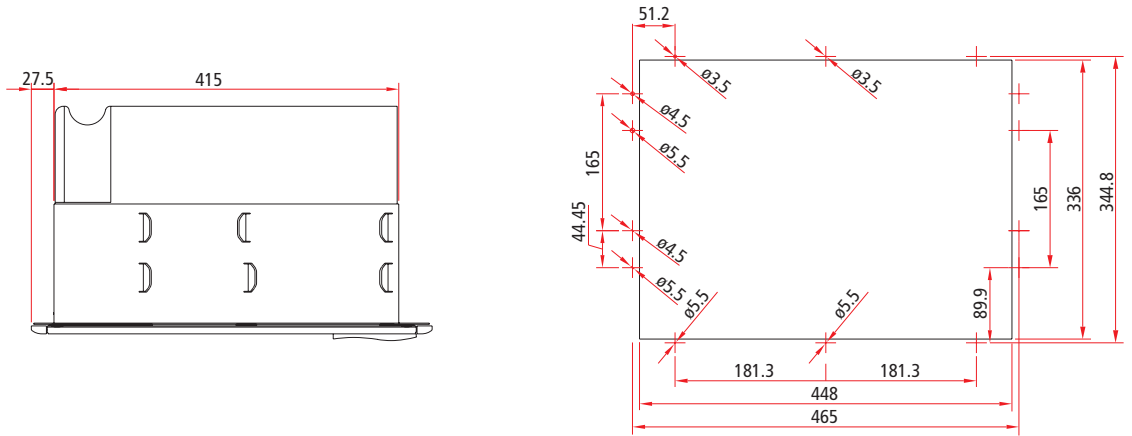
The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in the front view drawing.



Dimensions in mm

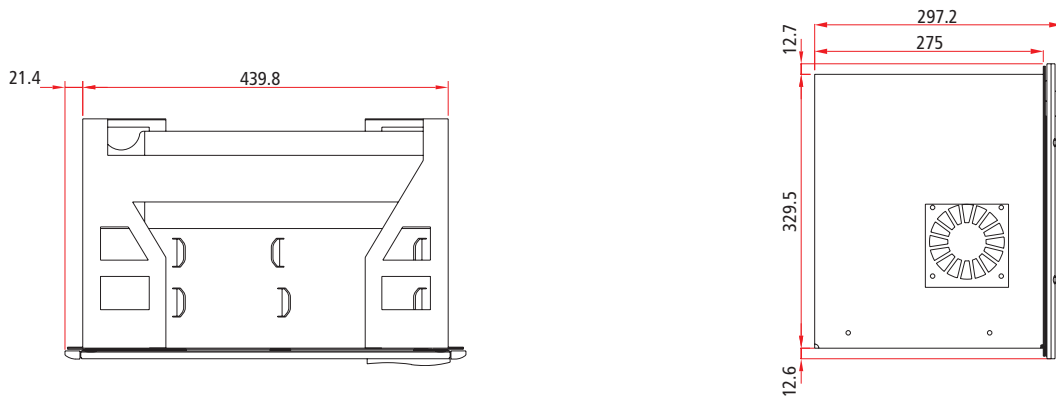
Front view

Side view



Top view

Cut-out required for fitting

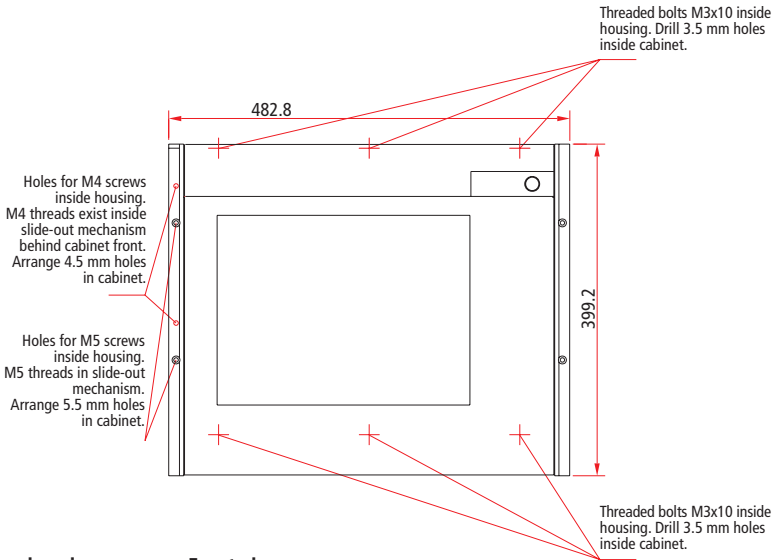


View from above with slide mechanism for front assembly

View from the side with slide mechanism for front assembly

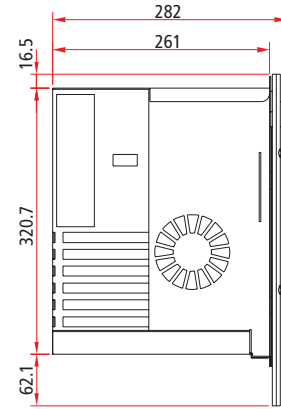
# C3330 – Drawings with dimensions

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in the front view drawing.

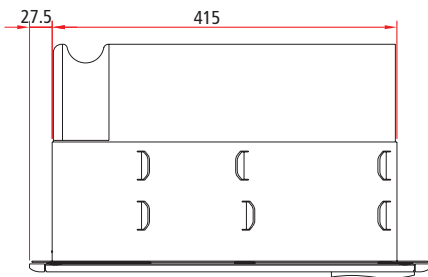


Dimensions in mm

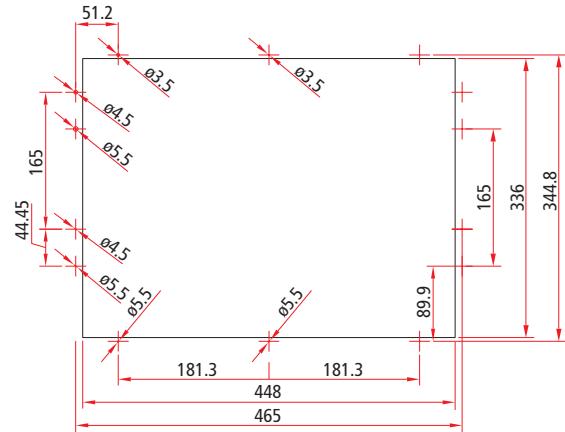
Front view



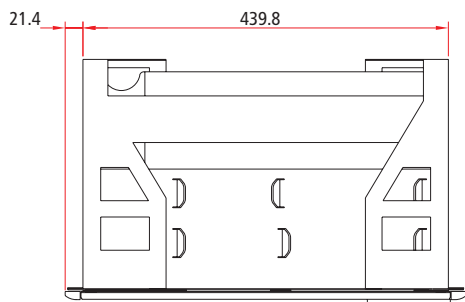
Side view



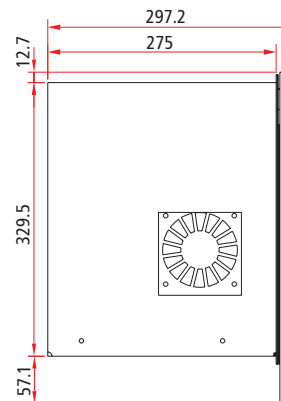
Top view



Cut-out required for fitting



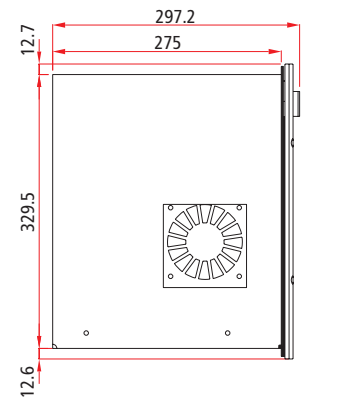
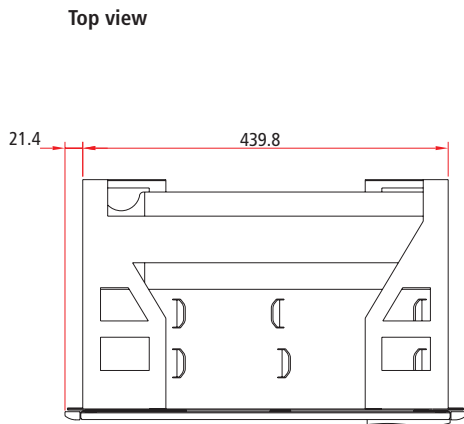
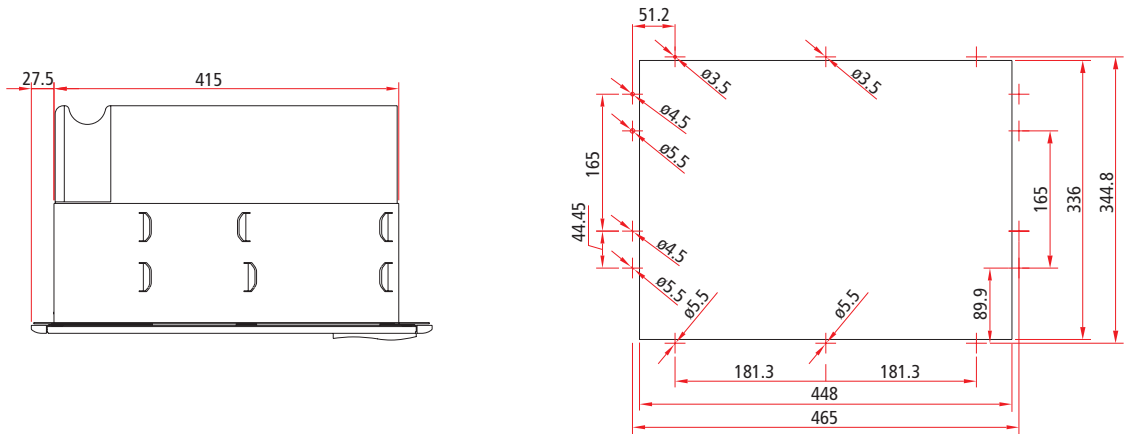
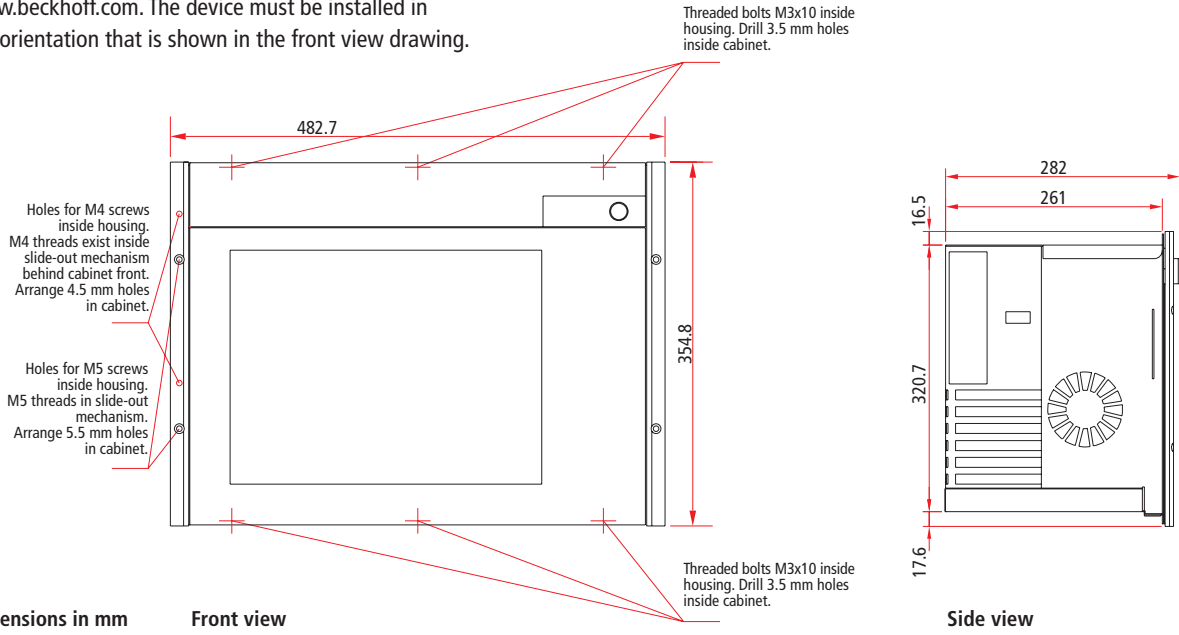
View from above with slide mechanism for front assembly



View from the side with slide mechanism for front assembly

# C3340 – Drawings with dimensions

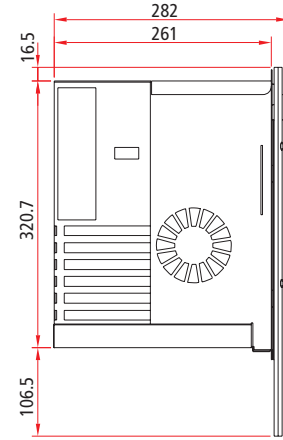
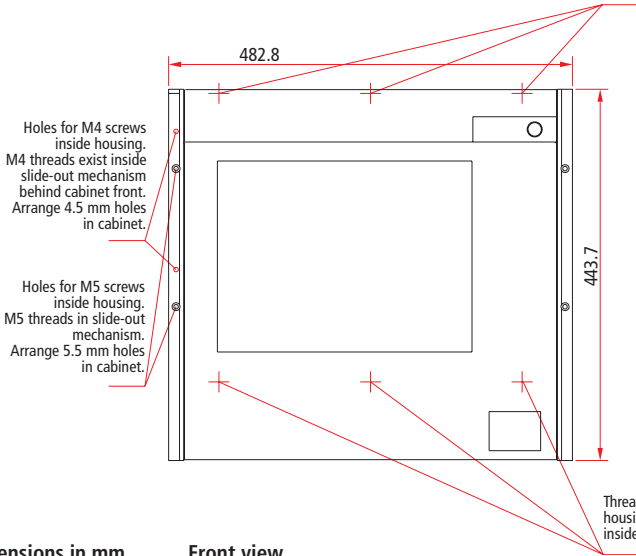
The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in the front view drawing.



# C3350 – Drawings with dimensions

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in the front view drawing.

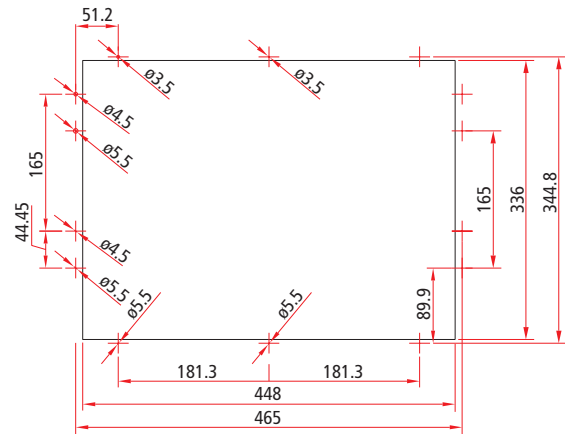
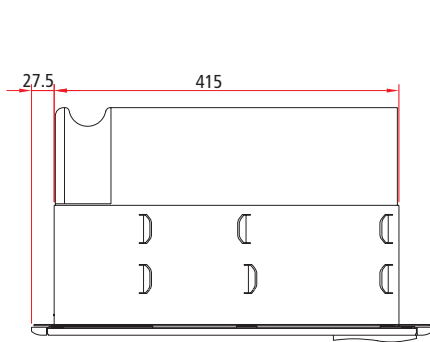
Threaded bolts M3x10 inside housing. Drill 3.5 mm holes inside cabinet.



Dimensions in mm

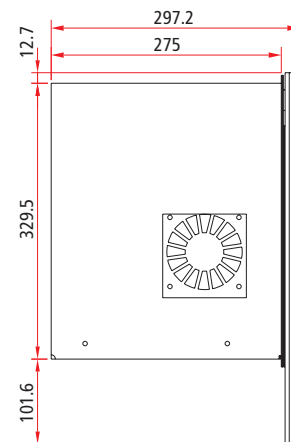
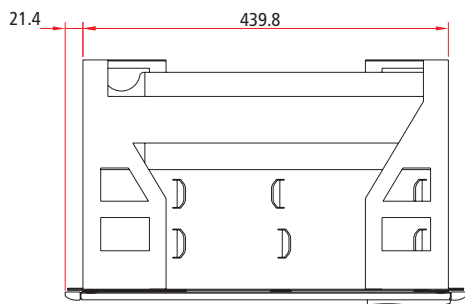
Front view

Side view



Top view

Cut-out required for fitting

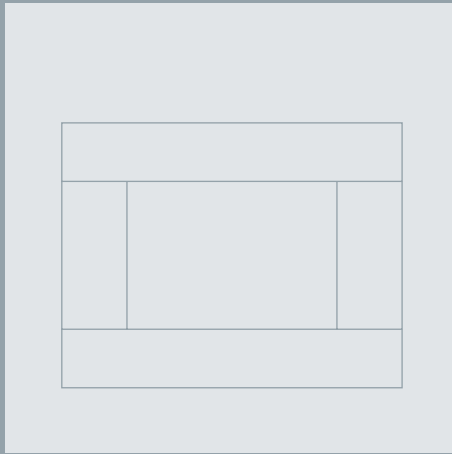


View from above with slide mechanism for front assembly

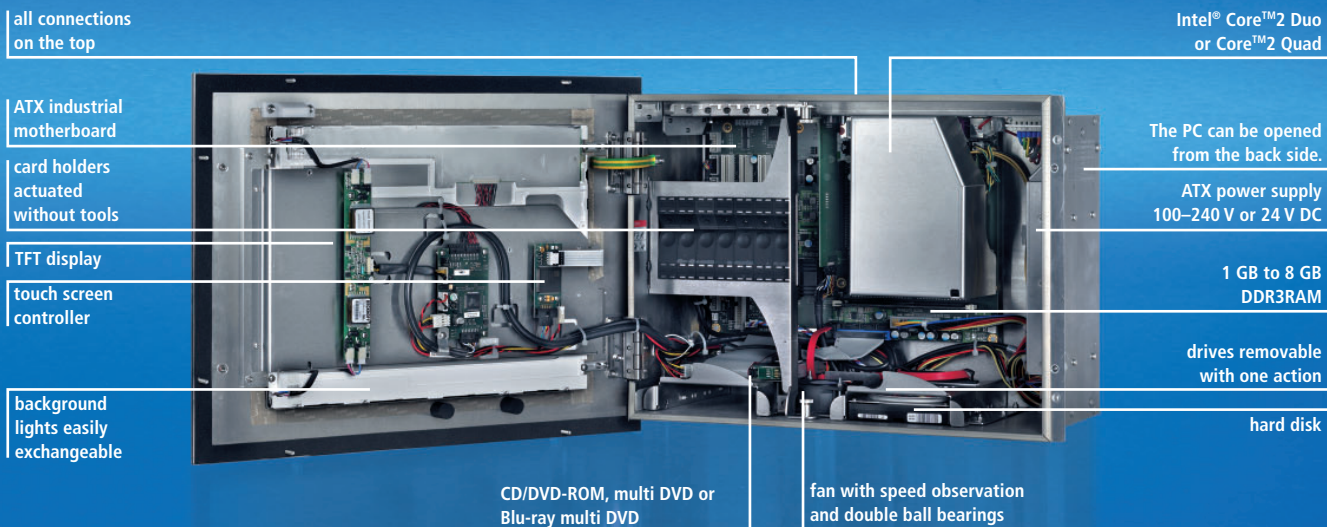
View from the side with slide mechanism for front assembly

# Panel PC series C36xx

## Panel PC



The Panel PC series C36xx, fitted with Intel® Core™2 Duo or Core™2 Quad on an ATX motherboard, offers controllers of the highest performance class with 12- or 15-inch TFT display, as a display/computer unit optionally with touch screen. The housing is opened from the rear. All components can be reached quickly and easily. The RAM can be expanded from 1 GB DDR3RAM up to 8 GB.



A CD/DVD-ROM for commissioning and software updates or a multi DVD or Blu-ray multi DVD drive for data backup are accessible from the rear side. The drives can be removed without tools once the housing has been opened. Card holders for the plug-in cards generate insensitivity to shocks and vibrations. The card holders can be fixed and removed without tools.

The type plate on the rear provides detailed information regarding the PC's configuration. Data on the function and type is

listed for the fitted plug-in cards. Data about drives indicates not just the manufacturer and type, but also provides information about type of connection and jumpers.

The construction of the housing of the C36xx series accords with the ATX standard, thus ensuring long-term compatibility with any PC components that will appear in the next few years. If, in a few years, the Industrial PC needs to be upgraded, you swap the motherboard, the processor, the memory or the hard disk, but the housing, display

and touch screen remain unchanged, being compatible with the technology of the future. The computing power can be upgraded with anything that the PC market has to offer in the highest performance class.

**Customer-specific design**

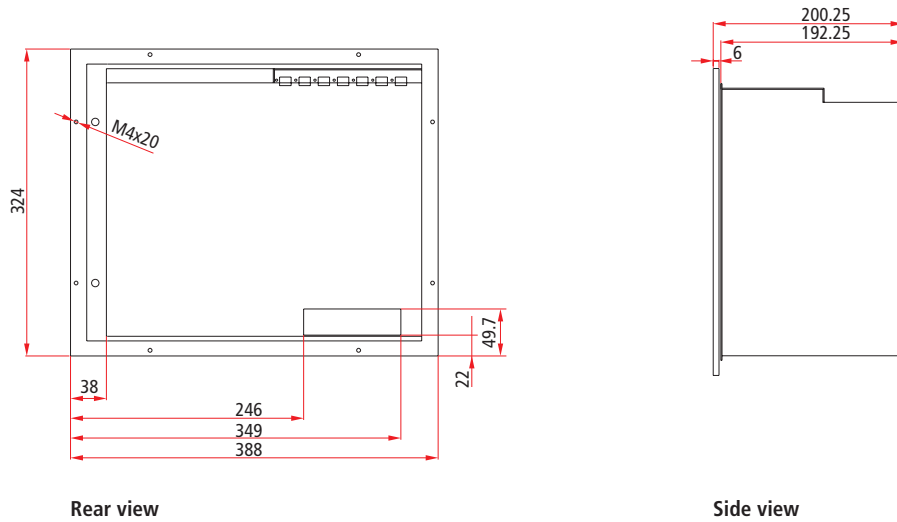
Beckhoff designs Industrial PCs in a modular way and has a long experience in customising designs to specific needs, e.g. for individual artwork and company logo on the front. An Industrial PC should express Corporate Identity.

	C3620	C3640
<b>Display</b>	12-inch TFT display, resolution 800 x 600	15-inch TFT display, resolution 1024 x 768
<b>Processor</b>	Intel® Core™2 Duo or Core™2 Quad	Intel® Core™2 Duo or Core™2 Quad
<b>Motherboard</b>	ATX	ATX
<b>Slots</b>	7	7
<b>Free slots</b>	3 PCI and 3 PCIe x1	3 PCI and 3 PCIe x1
<b>Maximum card length</b>	7 x 220 mm	7 x 235 mm
<b>Memory</b>	1 GB...8 GB DDR3RAM	1 GB...8 GB DDR3RAM
<b>Graphic adapter</b>	on-board	on-board
<b>Ethernet</b>	on-board	on-board
<b>Hard disks</b>	1 x 3½-inch	1 or 2 x 3½-inch
<b>RAID 1</b>	–	2 x 3½-inch HDD
<b>Possible disk drives</b>	slimline CD/DVD-ROM, multi DVD or Blu-ray	slimline CD/DVD-ROM, multi DVD or Blu-ray
<b>Power supply</b>	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC
<b>Dimen. (W x H x D)</b>	388 x 324 x 201 mm	470 x 348 x 199 mm



## C3620 | Panel PC

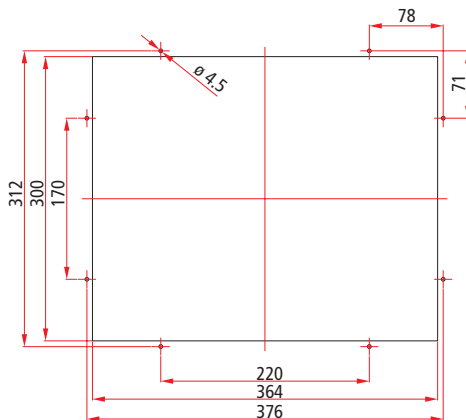
The Panel PC C3620 is designed for installation into the front of a control cabinet. It provides the highest performance and openness of ATX standard components. The C3620 is ideally suited for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



Dimensions in mm

Rear view

Side view



Cut-out required for fitting

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in the rear view drawing.



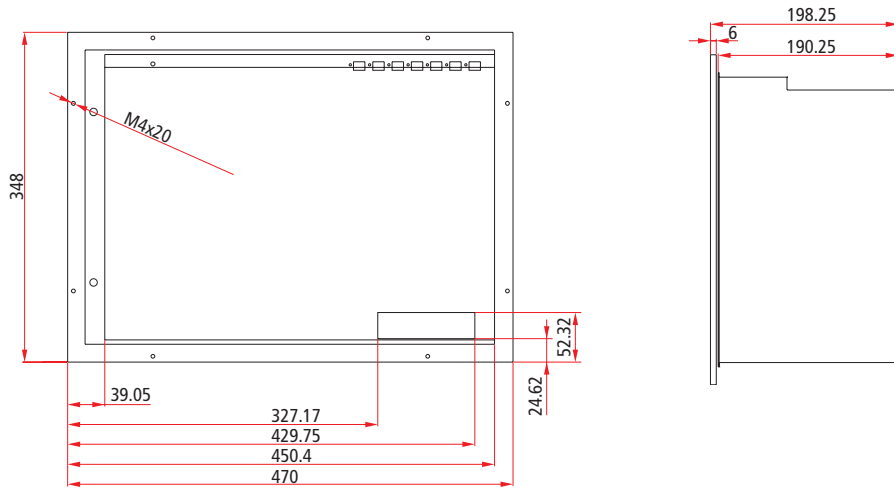
C3620	Built-in Panel PC
<b>Housing</b>	<p>built-in housing, 388 x 324 mm</p> <p>7-slot processor core for ATX motherboard</p> <p>PC to be opened from the back side</p> <p>all components easily accessible</p> <p>7 slots for up to 220 mm long plug-in cards</p> <p>card holders, actuated without tools</p> <p>protection class front side IP 65, rear side IP 20</p> <p>operating temperature 0...55 °C</p> <p>weight of the basic configuration 11.5 kg (25.4 lbs)</p> <p>dimensions (W x H x D) 388 x 324 x 201 mm (15.3" x 12.8" x 7.9"), depth behind front 193 mm (7.6")</p>
<b>Front panel</b>	12-inch TFT display, resolution 800 x 600
<b>Features</b>	<p>processor Intel® Core™2 Duo 2.53 GHz</p> <p>ATX motherboard for Intel® Core™2 Duo or Core™2 Quad</p> <p>3 PCI Express x1 slots free, 3 PCI slots free and 1 PCI Express x16 graphic card slot</p> <p>1 GB DDR3RAM, expandable to 8 GB</p> <p>on-board graphic adapter, Intel® GMA 4500MHD, monitor connector</p> <p>ADD-IN card in the PCI Express x16 graphic card slot with internal DVI connector to control the display in the front</p> <p>on-board Ethernet adapter with 10/100BASE-T connector</p> <p>hard disk, 3½-inch, 250 GB</p> <p>4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 12 USB 2.0, 4 of these USB ports are led out; and 1 parallel port</p> <p>PS/2 keyboard socket and PS/2 mouse socket on the back side</p> <p>100–240 V AC full range power supply</p>
<b>Options</b>	<p>processor Intel® Core™2 Quad</p> <p>for variants with Intel® Celeron® M, Pentium® M or Core™ Duo see price list</p> <p>touch screen</p> <p>touch screen pen with wall holder</p> <p>2-port USB socket inside the front with IP 65 screw-on cap</p> <p>second on board Ethernet adapter with 10/100/1000 BASE-T connector</p> <p>slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports</p> <p>PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter</p> <p>Compact Flash or solid-state disk SSD</p> <p>CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive</p> <p>24 V DC power supply</p> <p>uninterruptible power supply UPS</p>
<b>Further information</b>	<a href="http://www.beckhoff.com/C3620">www.beckhoff.com/C3620</a>





## C3640 | Panel PC

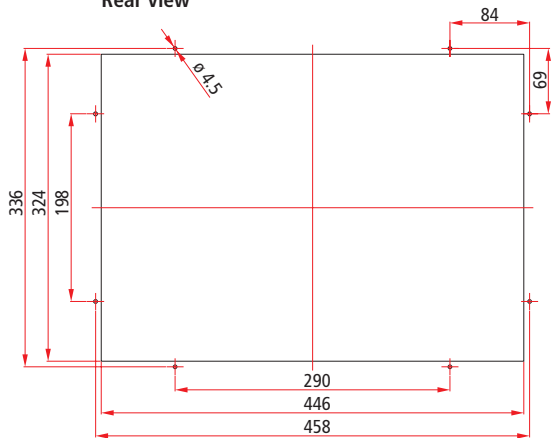
The Panel PC C3640 is designed for installation into the front of a control cabinet. It provides the highest performance and openness of ATX standard components. The C3640 is ideally suited for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



Dimensions in mm

Rear view

Side view



Cut-out required for fitting

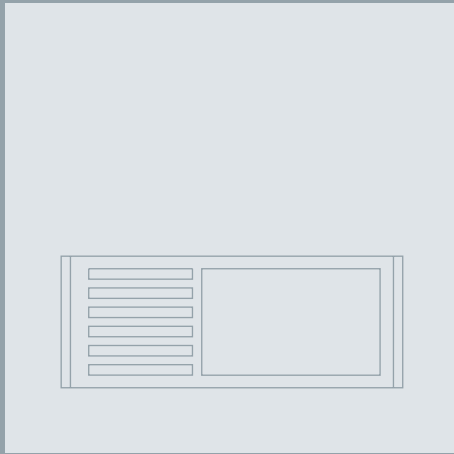
The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in the rear view drawing.



C3640	Built-in Panel PC
<b>Housing</b>	<p>built-in housing, 470 x 348 mm</p> <p>7-slot processor core for ATX motherboard</p> <p>PC to be opened from the back side</p> <p>all components easily accessible</p> <p>7 slots for up to 235 mm long plug-in cards</p> <p>card holders, actuated without tools</p> <p>protection class front side IP 65, rear side IP 20</p> <p>operating temperature 0...55 °C</p> <p>weight of the basic configuration 14.1 kg (31.1 lbs)</p> <p>dimensions (W x H x D) 470 x 348 x 199 mm (18.5" x 13.7" x 7.8"), depth behind front 191 mm (7.5")</p>
<b>Front panel</b>	15-inch TFT display, resolution 1024 x 768
<b>Features</b>	<p>processor Intel® Core™2 Duo 2.53 GHz</p> <p>ATX motherboard for Intel® Core™2 Duo or Core™2 Quad</p> <p>3 PCI Express x1 slots free, 3 PCI slots free and 1 PCI Express x16 graphic card slot</p> <p>1 GB DDR3RAM, expandable to 8 GB</p> <p>on-board graphic adapter, Intel® GMA 4500MHD, monitor connector</p> <p>ADD-IN card in the PCI Express x16 graphic card slot with internal DVI connector to control the display in the front</p> <p>on-board Ethernet adapter with 10/100BASE-T connector</p> <p>on-board SATA RAID 1 controller, Intel® Matrix Storage Technology</p> <p>hard disk, 3½-inch, 250 GB</p> <p>4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 12 USB 2.0, 4 of these USB ports are led out; and 1 parallel port</p> <p>PS/2 keyboard socket and PS/2 mouse socket on the back side</p> <p>100–240 V AC full range power supply</p>
<b>Options</b>	<p>processor Intel® Core™2 Quad</p> <p>for variants with Intel® Celeron® M, Pentium® M or Core™ Duo see price list</p> <p>touch screen</p> <p>touch screen pen with wall holder</p> <p>second on board Ethernet adapter with 10/100/1000 BASE-T connector</p> <p>slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports</p> <p>PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter</p> <p>second hard disk, 3½-inch, 250 GB</p> <p>Compact Flash or solid-state disk SSD</p> <p>CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive</p> <p>24 V DC power supply</p> <p>uninterruptible power supply UPS</p>
<b>Further information</b>	<a href="http://www.beckhoff.com/C3640">www.beckhoff.com/C3640</a>

# Industrial PC series C51xx

Industrial PC for 19-inch rack installation



The Industrial PCs of the series C51xx are designed for 19-inch rack installation. They are equipped with maximum performance class components and are ideally suited for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



The 19-inch rack mount Industrial PC series C51xx, equipped with Intel® Core™ Duo or Core™2 Duo on a slot motherboard or with Intel® Core™2 Duo or Core™2 Quad on an ATX motherboard, offers maximum performance class controls. The 19-inch slide-in housing measures only four rack units, yet has plenty of internal space for expansions of any form. A CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive can be fitted behind the lockable front door.

The type plate provides detailed information regarding the PC's configuration. Data

on the function, type and use of resources such as memory areas and interrupts is listed for the fitted plug-in cards. Data about drives indicates not just the manufacturer and type, but also provides information about type of connection and jumpers. Carefully designed ventilation creates a slight excess pressure inside the housing, effectively preventing the entry of dust. A stable card holder generates insensitivity to shocks and vibrations. A C51xx series Industrial PC and a Control Panel as its operating unit create an ideal combination.

### Features

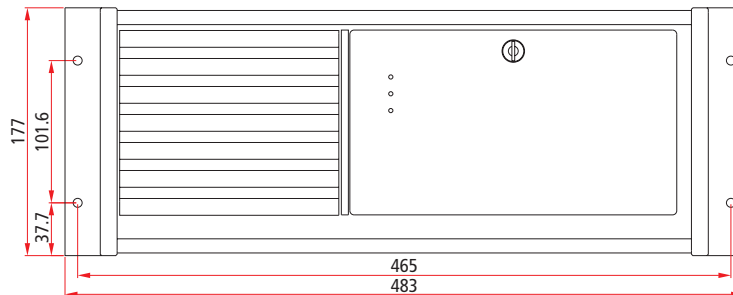
The computing power can be upgraded with anything that the PC market has to offer in the highest performance class. The construction of the housing ensures long-term compatibility with any new PC components that will appear over the next few years. One 3½- and three 5¼-inch drive slots are accessible behind the lockable front door. The on-board RAID 1 controller mirrors two hard disks. These can be installed with removable frames into two of the 5¼-inch drive bays. This allows the hotplug exchange of hard disks while the PC is operating.

	C5101	C5102
<b>Processor</b>	Intel® Core™ Duo or Core™2 Duo	Intel® Core™2 Duo or Core™2 Quad
<b>Motherboard</b>	passive backplane	ATX
<b>Slots</b>	14	7
<b>Free slots</b>	11 PCI	3 PCI, 3 PCIe x1 and 1 PCIe x16 graphic card slot
<b>Max. card length</b>	8 x fullsize, 6 x 190 mm	7 x fullsize
<b>Memory</b>	512 MB...3 GB DDR2RAM	1 GB...8 GB DDR3RAM
<b>Graphic adapter</b>	on-board	on-board
<b>Ethernet</b>	2 on-board	on-board
<b>Hard disks</b>	1, 2 or 3 x 3½-inch	1, 2 or 3 x 3½-inch
<b>RAID 1</b>	2 x 3½-inch HDD	2 x 3½-inch HDD
<b>Possible disk drives</b>	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray
<b>Power supply</b>	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC
<b>Dimen. (W x H x D)</b>	483 x 177 x 500 mm	483 x 177 x 500 mm

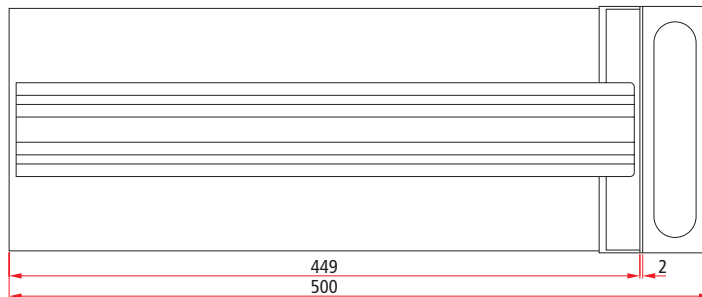


## C5101 | 19-inch slide-in Industrial PC

The Industrial PC C5101 has been designed for installation in a 19-inch rack and is equipped with a slot motherboard on a passive backplane. The C5101 is ideally suited for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



Front view



Side view

Dimensions in mm

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in these drawings. The installation in vertical orientation with connectors on the rear side is optionally possible.

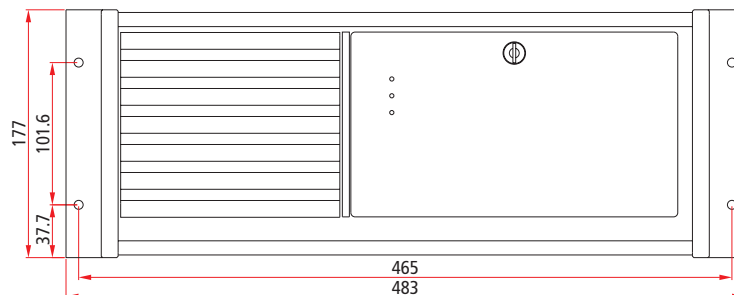


C5101	19-inch slide-in Industrial PC
<b>Housing</b>	14-slot slide-in housing for 19-inch racks, 4 rack units
	lockable front flap
	card holders
	protection class IP 60 when operating
	operating temperature 0...55 °C
	weight of the basic configuration 17.0 kg (37.5 lbs)
	dimensions (W x H x D) 483 x 177 x 500 mm (19" x 7" x 19.5")
<b>Features</b>	processor Intel® Core™ Duo 2.0 GHz
	slot motherboard for Intel® Core™ Duo or Core™2 Duo
	14-slot passive backplane, 11 PCI slots available
	512 MB DDR2RAM, expandable to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	on-board SATA RAID 1 controller, Intel® Matrix Storage Technology
	hard disk, 3½-inch, 250 GB
	4 serial ports RS232 on-board, 2 of these RS232 ports are led out with 9-pin D-sub connectors; 8 USB 2.0, 3 of these USB ports on the back side and 2 behind the front flap
	100–240 V AC full range power supply
<b>Options</b>	processor Intel® Core™2 Duo
	for variants with Intel® Celeron® M or Pentium® M see price list
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	second hard disk, 3½-inch, 250 GB
	removable frame for hard disks
	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
	uninterruptible power supply UPS
<b>Further information</b>	<a href="http://www.beckhoff.com/C5101">www.beckhoff.com/C5101</a>

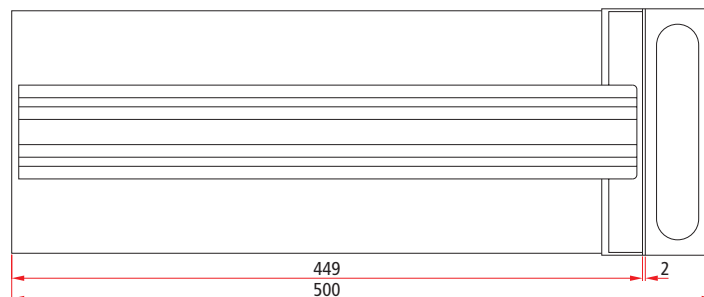


## C5102 | 19-inch slide-in Industrial PC

The built-in Industrial PC C5102 has been designed for installation in a 19-inch rack and is fitted with components of the highest performance class meeting the ATX standard. The C5102 is ideally suited for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



Front view



Side view

Dimensions in mm

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in these drawings. The installation in vertical orientation with connectors on the rear side is optionally possible.

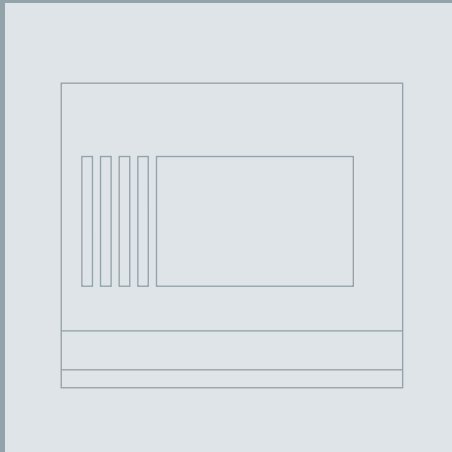


C5102	19-inch slide-in Industrial PC
<b>Housing</b>	7-slot slide-in housing ATX for 19-inch racks, 4 rack units
	all slots for full-length plug-in cards
	lockable front flap
	card holders
	protection class IP 60 when operating
	operating temperature 0...55 °C
	weight of the basic configuration 17.0 kg (37.5 lbs) dimensions (W x H x D) 483 x 177 x 500 mm (19" x 7" x 19.5")
<b>Features</b>	processor Intel® Core™2 Duo 2.53 GHz
	ATX motherboard for Intel® Core™2 Duo or Core™2 Quad
	3 PCI Express x1 slots, 3 PCI slots and 1 PCI Express x16 graphic card slot free
	1 GB DDR3RAM, expandable to 8 GB
	on-board graphic adapter, Intel® GMA 4500MHD, monitor connector
	on-board Ethernet adapter with 10/100BASE-T connector
	on-board SATA RAID 1 controller, Intel® Matrix Storage Technology
	hard disk, 3½-inch, 250 GB
	4 serial ports RS232 on-board, 1 of these RS232 ports are led out with 9-pin D-sub connectors; 12 USB 2.0, 4 of these USB ports are led out and 2 behind the front flap; 1 parallel port
	PS/2 keyboard socket and PS/2 mouse socket
100–240 V AC full range power supply	
<b>Options</b>	processor Intel® Core™2 Quad
	for variants with Intel® Celeron® M, Pentium® M or Core™ Duo see price list
	second on-board Ethernet adapter with 10/100/1000BASE-T connector
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	ADD-IN card with one or two DVI connectors
	second hard disk, 3½-inch, 250 GB
	removable frame for hard disks
	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
uninterruptible power supply UPS	
<b>Further information</b>	<a href="http://www.beckhoff.com/C5102">www.beckhoff.com/C5102</a>



# Industrial PC series C61xx

Industrial PC for control cabinet installation



The C61xx series of Industrial PCs has been designed for control cabinet installation. The Industrial PCs of this series and a Beckhoff Control Panel as operating unit make an ideal combination, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



The C61xx control cabinet PC series comprises five devices of different sizes, all equipped with maximum performance class components with Intel® Core™ Duo or Core™2 Duo on a slot motherboard or with Intel® Core™2 Duo or Core™2 Quad on an ATX motherboard. The series provides the appropriate Industrial PC for every application, according to the available installation space. All the PCs in the C61xx series are constructed according to a uniform plan, optimised for the exploitation of available space and easy accessibility of all components.

The construction of the housing for the C61xx series ensures long-term compatibility with any new PC components that appear over the next few years. If, in a few years, the Industrial PC needs to be upgraded, you swap the motherboard, the processor, the memory or the hard disk, but the housing remains unchanged and is compatible with the technology of the future. The RAM can be extended from 512 MB DDR2RAM up to 3 GB, for C6140 and C6150 with Core™2 Duo or Core™2 Quad even up to 8 GB DDR3RAM, which requires a 64 bit operating system.

All the PC's connections face upwards, so that the connecting cable can be taken directly to the wiring channel. The side walls are completely passive and allow the Industrial PC to be fitted immediately next to other control cabinet devices.

The housing permits fast access to the fitted components. After removing the front cover, plug-in cards and drives are freely accessible. Hard disks are held by spring-loaded ball catches and can be removed in a single action. Three screws must be undone, after which the PC's inner chassis, to which all the components are attached, can be removed from the outer housing. The inner chassis can be placed on a table in any orientation for maintenance purposes. When removed, the inner chassis still has the full function of a PC and can be operated with a standard monitor and a standard keyboard.

The C61xx series PCs are supplied with a 100...240 V AC full range or 24 V DC power supply unit. An industrial latching socket strip is used for the power supply. A CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive can be fitted.

Card holders for the plug-in cards generate insensitivity to shocks and vibrations. The card holders can be fixed and removed without tools.

Additional slot brackets for C6110, C6120 and C6130 offer room to connect interfaces to the outside without occupying the space for real slots. A type plate is located on the front cover behind an inspection window, giving detailed information about the configuration of the PC. Data on the function, type and use of resources such as memory areas and interrupts is listed for the fitted plug-in cards. Data about drives indicates the manufacturer and type.

The construction of the housing has been designed to allow individual adaptation, and many features can be adjusted for your application.

all connections on the top

inner chassis can be removed for service purposes

ATX industrial motherboard

plug-in cards quickly reached

passive side wall: fitting possible immediately next to other devices

fan with speed observation and double ball bearings, easily exchangeable from the front

hard disk

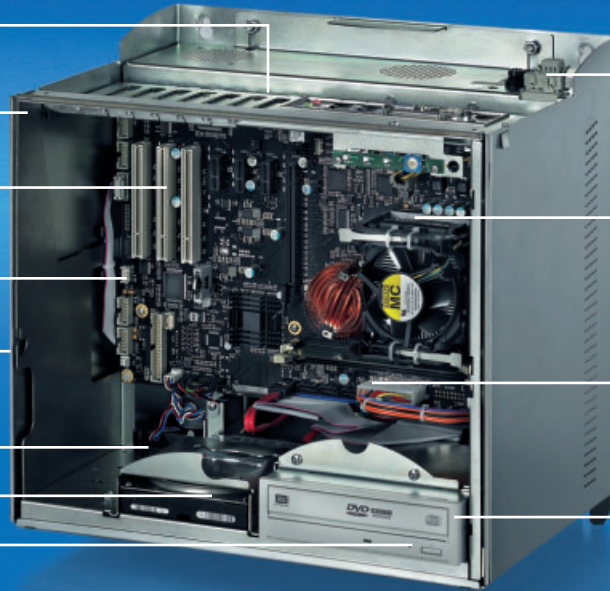
drives removable with one action

industrial socket strip for power supply

Intel® Core™2 Duo or Core™2 Quad

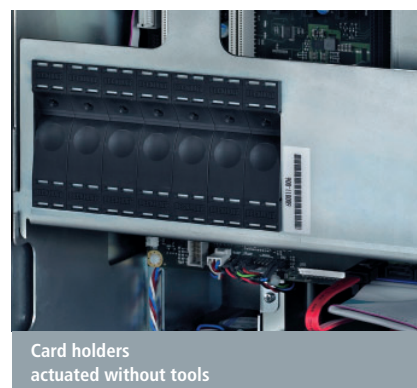
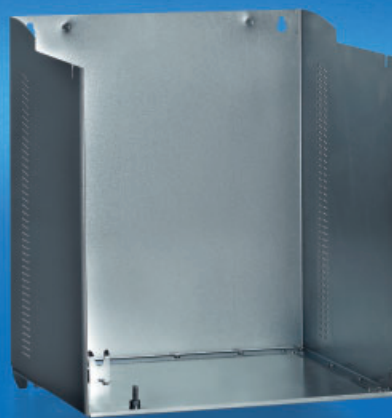
1 GB to 8 GB DDR3RAM

CD/DVD-ROM, multi DVD or Blu-ray multi DVD



### Variants

- The **C6110**, the smallest member of the series, finds room in any control cabinet. A slot motherboard is used on a 4-slot passive backplane. One PCI slot is available for plug-in cards with a maximum length of 190 mm. The graphic adapter and two Ethernet adapters are already on-board and do not occupy a slot.
- The **C6120** has room for up to five full-length plug-in cards. A slot motherboard is used on a 5-slot passive backplane. Two PCI slots are available. The graphic adapter and two Ethernet adapters are already on-board and do not occupy a slot. If no full-length plug-in cards are needed, a CD/DVD drive can be fitted. The on-board RAID 1 controller can mirror two SATA hard disks. These are accessible after removing the front cover of the PC.
- The **C6130** is designed for slot motherboards on passive backplanes. The housing offers eight slots. Three slots can be fitted with long plug-in cards, even if a CD/DVD drive has been installed. Altogether, six PCI slots are available. The graphic adapter and two Ethernet adapters are already on-board and do not occupy a slot. The on-board RAID 1 controller can mirror two SATA hard disks. These are accessible after removing the front cover of the PC.
- The **C6140** is fitted out as a 7-slot housing with an ATX motherboard. From three PCI slots two slots can accept plug-in cards that are 270 mm long; one PCI and three PCI-Express slots accept cards that are up to 240 mm long. The graphic adapter and 10/100 Mbit Ethernet adapter are already on-board and do not occupy a slot. The on-board RAID 1 controller can mirror two SATA hard disks. These are accessible after removing the front cover of the PC.
- The **C6150** is also fitted out as a 7-slot housing with an ATX motherboard. All seven slots can accept full-length cards. The graphic adapter and 10/100 Mbit Ethernet adapter are already on-board and do not occupy a slot. The on-board RAID 1 controller can mirror two SATA hard disks. These are accessible after removing the front cover of the PC.



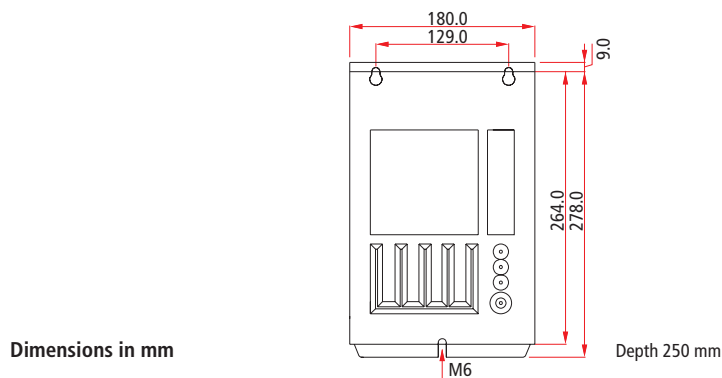
Card holders  
actuated without tools

	C6110	C6120	C6130	C6140	C6150
<b>Processor</b>	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Core™2 Duo or Core™2 Quad	Intel® Core™2 Duo or Core™2 Quad
<b>Motherboard</b>	passive backplane	passive backplane	passive backplane	ATX	ATX
<b>Slots</b>	4	5	8	7	7
<b>Free slots</b>	1 PCI	2 PCI	6 PCI	3 PCI, 3 PCIe x1 and 1 PCIe x16 graphic slot	3 PCI, 3 PCIe x1 and 1 PCIe x16 graphic slot
<b>Maximum card length</b>	4 x 190 mm	5 x fullsize	4 x fullsize, 4 x 250 mm	3 x 270 mm and 4 x 240 mm	7 x fullsize
<b>Memory</b>	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	1 GB...8 GB DDR3RAM	1 GB...8 GB DDR3RAM
<b>Graphic adapter</b>	on-board	on-board	on-board	on-board	on-board
<b>Ethernet</b>	2 on-board	2 on-board	2 on-board	on-board	on-board
<b>Hard disks</b>	1 x 3½-inch	1–2 x 3½-inch	1–3 x 3½-inch	1–3 x 3½-inch	1–3 x 3½-inch
<b>RAID 1</b>	–	2 x 3½-inch HDD	2 x 3½-inch HDD	2 x 3½-inch HDD	2 x 3½-inch HDD
<b>Possible disk drives</b>	–	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray
<b>Power supply</b>	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC
<b>Dimen. (W x H x D)</b>	180 x 287 x 250 mm	195 x 423 x 250 mm	295 x 423 x 250 mm	383 x 362 x 265 mm	383 x 423 x 265 mm



## C6110 | Control cabinet Industrial PC

The Industrial PC C6110 is designed for installation in a control cabinet and equipped with a slot motherboard on a passive backplane. A Beckhoff Control Panel and the C6110 make an ideal combination, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in this drawing.

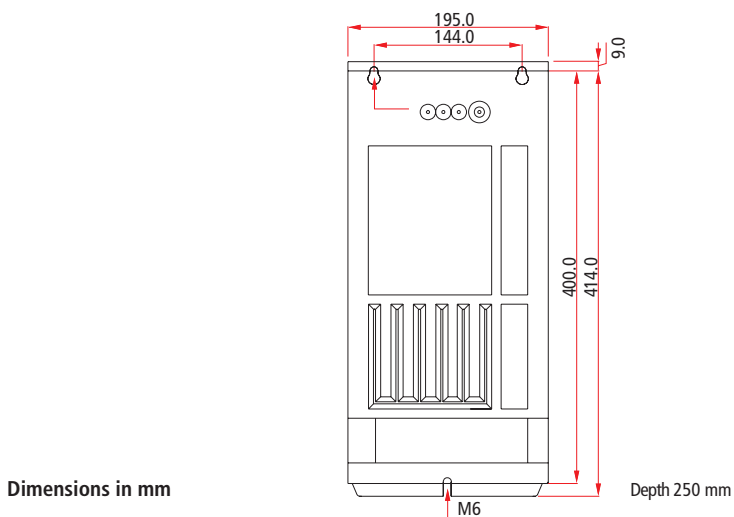


C6110	Control cabinet PC
<b>Housing</b>	4-slot Industrial PC for space-saving control cabinet installation 1 PCI slot for plug-in cards with a length of up to 190 mm drives and plug-in cards easily accessible all connectors on the top detailed PC configuration information on the front status LEDs and protected reset key card holders, actuated without tools protection class IP 20 operating temperature 0...55 °C weight of the basic configuration 7 kg (15.4 lbs) compact dimensions (W x H x D) 180 x 287 x 250 mm (7.1" x 11.3" x 9.9")
<b>Features</b>	processor Intel® Core™ Duo 2.0 GHz slot motherboard for Intel® Core™ Duo or Core™2 Duo 4-slot passive backplane, 1 PCI slot available 512 MB DDR2RAM, expandable to 3 GB on-board graphic adapter, Intel® GMA950, DVI-I connector on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector hard disk, 3½-inch, 250 GB 4 serial ports RS232 on-board, 2 of these RS232 ports are led out with 9-pin D-sub connectors; 8 USB 2.0, 3 of these USB ports are led out 100–240 V AC full range power supply
<b>Options</b>	processor Intel® Core™2 Duo for variants with Intel® Celeron® M or Pentium® M see price list slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter Compact Flash or solid-state disk SSD 24 V DC power supply uninterruptible power supply UPS
<b>Further information</b>	www.beckhoff.com/C6110



## C6120 | Control cabinet Industrial PC

The Industrial PC C6120 is designed for installation in a control cabinet and equipped with a slot motherboard on a passive backplane. A Beckhoff Control Panel and the C6120 make an ideal combination, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in this drawing.



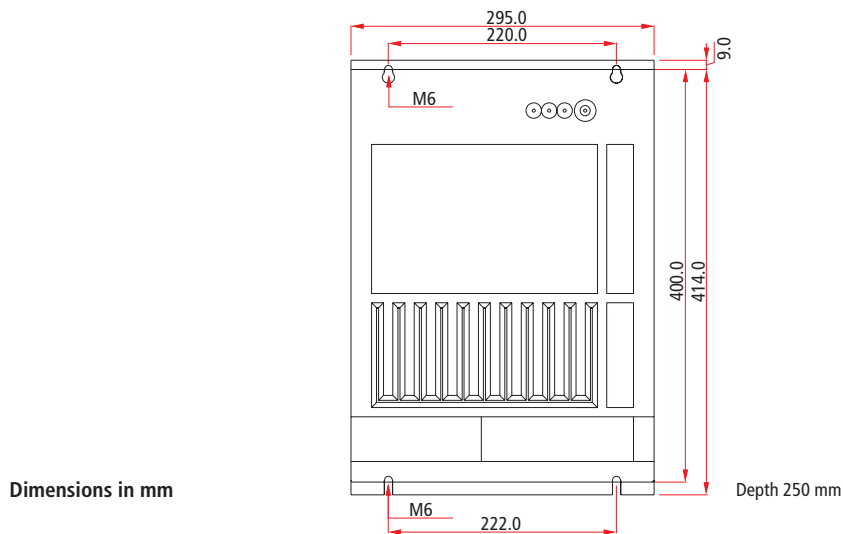
C6120	Control cabinet PC
<b>Housing</b>	5-slot Industrial PC for space-saving control cabinet installation
	all slots for full-length plug-in cards
	drives and plug-in cards easily accessible
	all connectors on the top
	detailed PC configuration information on the front
	status LEDs and protected reset key
	card holders, actuated without tools
	protection class IP 20
	operating temperature 0...55 °C
	weight of the basic configuration 9 kg (19.8 lbs)
compact dimensions (W x H x D) 195 x 423 x 250 mm (7.7" x 16.7" x 9.9")	
<b>Features</b>	processor Intel® Core™ Duo 2.0 GHz
	slot motherboard for Intel® Core™ Duo or Core™2 Duo
	5-slot passive backplane, 2 PCI slots available
	512 MB DDR2RAM, expandable to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	on-board SATA RAID 1 controller, Intel® Matrix Storage Technology
	hard disk, 3½-inch, 250 GB
	4 serial ports RS232 on-board, 2 of these RS232 ports are led out with 9-pin D-sub connectors; 8 USB 2.0, 3 of these USB ports are led out
	100–240 V AC full range power supply
<b>Options</b>	processor Intel® Core™2 Duo
	for variants with Intel® Celeron® M or Pentium® M see price list
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	second hard disk, 3½-inch, 250 GB
	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
uninterruptible power supply UPS	
<b>Further information</b>	<a href="http://www.beckhoff.com/C6120">www.beckhoff.com/C6120</a>





## C6130 | Control cabinet Industrial PC

The Industrial PC C6130 is designed for installation in a control cabinet and equipped with a slot motherboard on a passive backplane. A Beckhoff Control Panel and the C6130 make an ideal combination, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in this drawing.

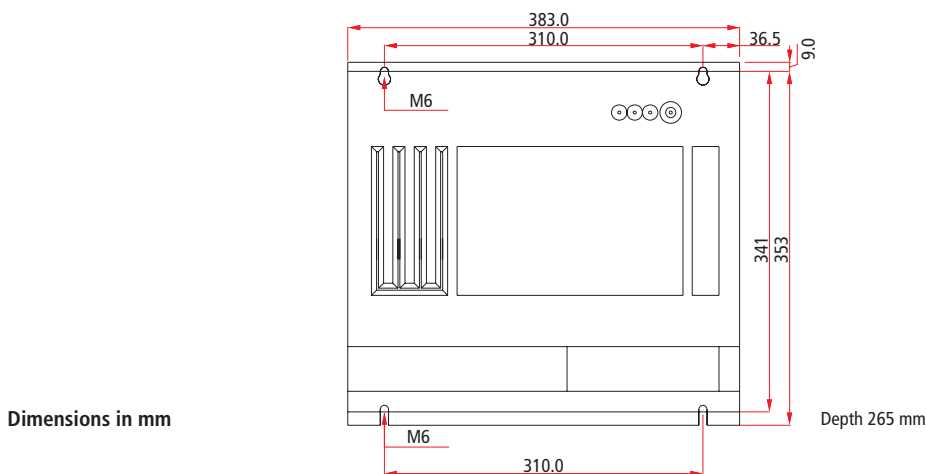


C6130	Control cabinet PC
<b>Housing</b>	8-slot Industrial PC for control cabinet installation
	2 PCI slots for full-length plug-in cards and 4 PCI slots for up to 290 mm long plug-in cards
	drives and plug-in cards easily accessible
	all connectors on the top
	detailed PC configuration information on the front
	status LEDs and protected reset key
	card holders, actuated without tools
	protection class IP 20
	operating temperature 0...55 °C
	weight of the basic configuration 12 kg (26.5 lbs)
dimensions (W x H x D) 295 x 423 x 250 mm (11.6" x 16.7" x 9.9")	
<b>Features</b>	processor Intel® Core™ Duo 2.0 GHz
	slot motherboard for Intel® Core™ Duo or Core™2 Duo
	8-slot passive backplane, 6 PCI slots available
	512 MB DDR2RAM, expandable to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	on-board SATA RAID 1 controller, Intel® Matrix Storage Technology
	hard disk, 3½-inch, 250 GB
	4 serial ports RS232 on-board, 2 of these RS232 ports are led out with 9-pin D-sub connectors; 8 USB 2.0, 3 of these USB ports are led out
	100–240 V AC full range power supply
<b>Options</b>	processor Intel® Core™2 Duo
	for variants with Intel® Celeron® M or Pentium® M see price list
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	second hard disk, 3½-inch, 250 GB
	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
uninterruptible power supply UPS	
<b>Further information</b>	<a href="http://www.beckhoff.com/C6130">www.beckhoff.com/C6130</a>



## C6140 | Control cabinet Industrial PC

The Industrial PC C6140 is designed for installation in a control cabinet and fitted with components of the highest performance class meeting the ATX standard. A Beckhoff Control Panel and the C6140 make an ideal combination, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in this drawing.

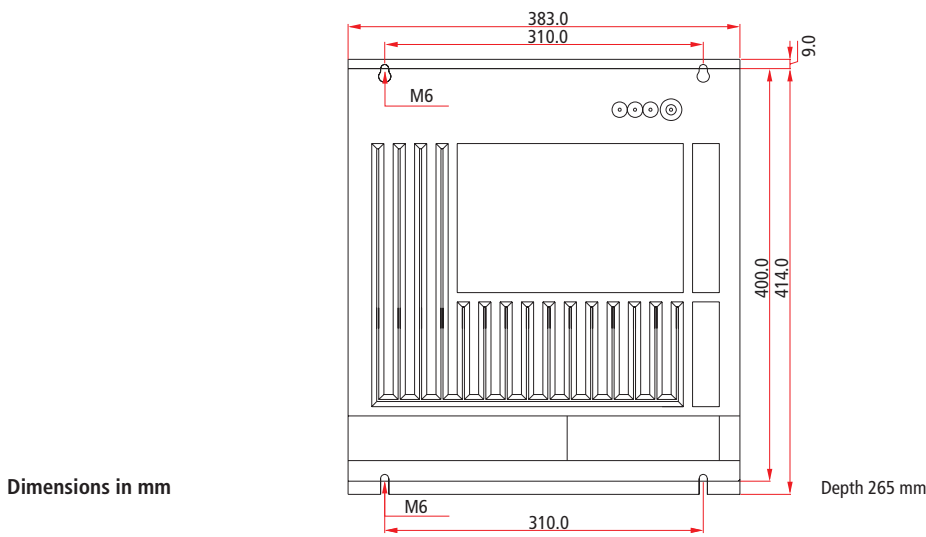


C6140	Control cabinet PC
<b>Housing</b>	7-slot ATX Industrial PC for control cabinet installation
	3 PCI slots for plug-in cards with a length of up to 270 mm and 3 PCI Express x1 slots for plug-in cards with a length of up to 240 mm
	drives and plug-in cards easily accessible
	all connectors on the top
	detailed PC configuration information on the front
	status LEDs and protected reset key
	card holders, actuated without tools
	protection class IP 20
	operating temperature 0...55 °C
	weight of the basic configuration 14 kg (30.9 lbs)
dimensions (W x H x D) 383 x 362 x 265 mm (14.9" x 14.1" x 10.5")	
<b>Features</b>	processor Intel® Core™2 Duo 2.53 GHz
	ATX motherboard for Intel® Core™2 Duo or Core™2 Quad
	3 PCI Express x1 slots, 3 PCI slots and 1 PCI Express x16 graphic card slot free
	1 GB DDR3RAM, expandable to 8 GB
	on-board graphic adapter, Intel® GMA 4500MHD, monitor connector
	on-board Ethernet adapter with 10/100BASE-T connector
	on-board SATA RAID 1 controller, Intel® Matrix Storage Technology
	hard disk, 3½-inch, 250 GB
	4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 12 USB 2.0, 4 of these USB ports are led out; and 1 parallel port
	PS/2 keyboard socket and PS/2 mouse socket
100–240 V AC full range power supply	
<b>Options</b>	processor Intel® Core™2 Quad
	for variants with Intel® Celeron® M, Pentium® M or Core™ Duo see price list
	second on-board Ethernet adapter with 10/100/1000BASE-T connector
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	ADD-IN card with one or two DVI connectors
	second hard disk, 3½-inch, 250 GB
	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
uninterruptible power supply UPS	
<b>Further information</b>	<a href="http://www.beckhoff.com/C6140">www.beckhoff.com/C6140</a>



## C6150 | Control cabinet Industrial PC

The Industrial PC C6150 is designed for installation in a control cabinet and fitted with components of the highest performance class meeting the ATX standard. A Beckhoff Control Panel and the C6150 make an ideal combination, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



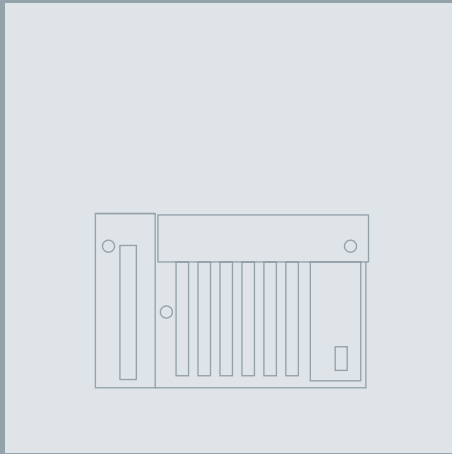
The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in this drawing.



C6150	Control cabinet PC
<b>Housing</b>	7-slot ATX Industrial PC for control cabinet installation
	all slots for full-length plug-in cards
	drives and plug-in cards easily accessible
	all connectors on the top
	detailed PC configuration information on the front
	status LEDs and protected reset key
	card holders, actuated without tools
	protection class IP 20
	operating temperature 0...55 °C
	weight of the basic configuration 15 kg (33.1 lbs)
dimensions (W x H x D) 381 x 423 x 265 mm (14.9" x 16.7" x 10.5")	
<b>Features</b>	processor Intel® Core™2 Duo 2.53 GHz
	ATX motherboard for Intel® Core™2 Duo or Core™2 Quad
	3 PCI Express x1 slots, 3 PCI slots and 1 PCI Express x16 graphic card slot free
	1 GB DDR3RAM, expandable to 8 GB
	on-board graphic adapter, Intel® GMA 4500MHD, monitor connector
	on-board Ethernet adapter with 10/100BASE-T connector
	on-board SATA RAID 1 controller, Intel® Matrix Storage Technology
	hard disk, 3½-inch, 250 GB
	4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 12 USB 2.0, 4 of these USB ports are led out; and 1 parallel port
	PS/2 keyboard socket and PS/2 mouse socket
100–240 V AC full range power supply	
<b>Options</b>	processor Intel® Core™2 Quad
	for variants with Intel® Celeron® M, Pentium® M or Core™ Duo see price list
	second on-board Ethernet adapter with 10/100/1000BASE-T connector
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	ADD-IN card with one or two DVI connectors
	second hard disk, 3½-inch, 250 GB
	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
uninterruptible power supply UPS	
<b>Further information</b>	<a href="http://www.beckhoff.com/C6150">www.beckhoff.com/C6150</a>

# Industrial PC series C62xx

Industrial PC for control cabinet installation



The C62xx series of Industrial PCs has been designed for control cabinet installation. The Industrial PCs of this series and a Beckhoff Control Panel as operating unit make an ideal combination, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



The control cabinet PC series C62xx comprises four devices of different size, all equipped with maximum performance class components: with Intel® Core™ Duo or Core™2 Duo on a slot motherboard or with Intel® Core™2 Duo or Core™2 Quad on an ATX motherboard. The series provides the appropriate Industrial PC for every application, according to the available installation space. All the PCs in the C62xx series are constructed according to a uniform plan, optimised for the exploitation of available space and easy accessibility of all components.

The construction of the housing for the C62xx series ensures long-term compatibility with any new PC components that appear over the next few years. If, in a few years, the Industrial PC needs to be upgraded, you swap the motherboard, the processor, the memory or the hard disk, but the housing remains unchanged, and is compatible with the technology of the future. The RAM can

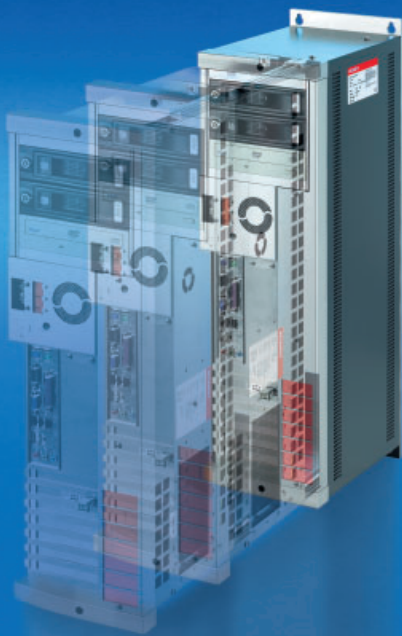
be expanded from 512 MB DDR2RAM up to 3 GB, for C6240 and C6250 with Core™2 Duo or Core™2 Quad even up to 8 GB DDR3RAM, which requires a 64 bit operating system.

All the PC's connections face to the front. The inner chassis can be drawn out forward on telescopic rails, thus offering free access to all the fitted components.

The C62xx series PCs are supplied with a 100...240 V AC full range or 24 V DC power supply unit. An industrial latching socket strip is used for the power supply.

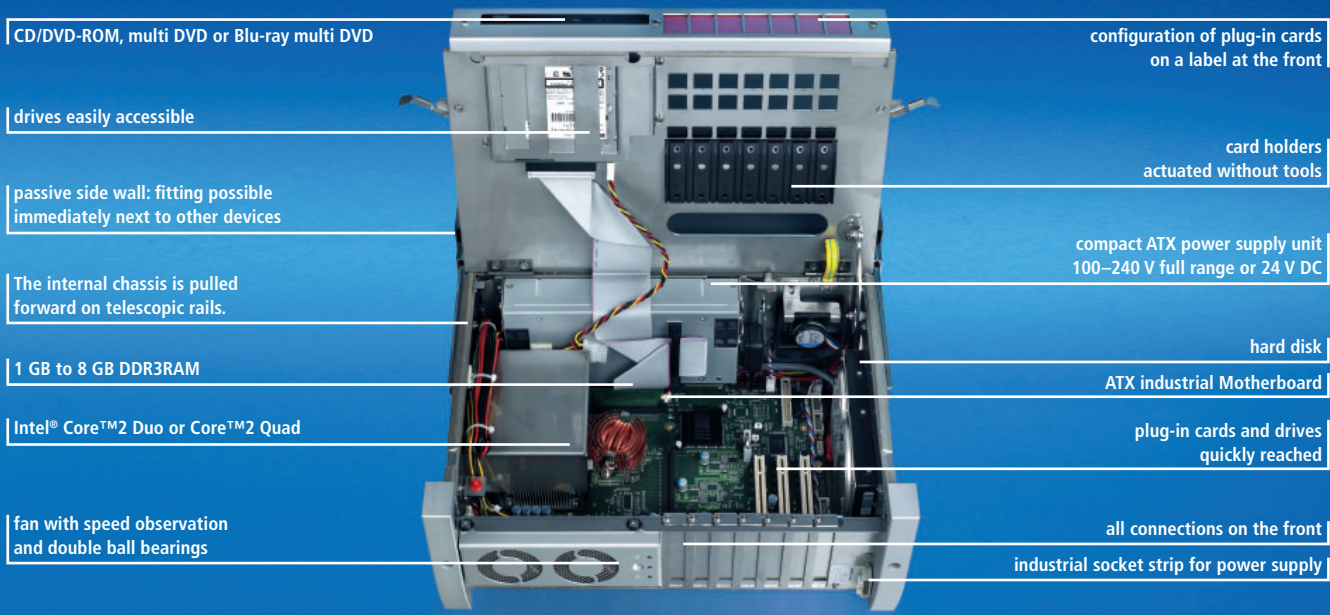
Card holders for the plug-in cards generate insensitivity to shocks and vibrations. The card holders can be fixed and removed without tools. Data describing the function and type for the fitted plug-in cards is listed on the front.





### Variants

- The **C6210** is equipped as a 4-slot housing with slot motherboard on a passive backplane. One PCI slot is freely available for one up to 190 mm long card. The graphic adapter and two Ethernet adapters are already on-board and do not occupy a slot. Optionally, a slimline CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive can be installed.
- The **C6220** is equipped as a 6-slot housing with slot motherboard on a passive backplane. Three PCI slots are freely available for up to 190 mm long cards. The graphic adapter and two Ethernet adapters are already on-board and do not occupy a slot. Optionally, a slimline CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive can be installed.
- The **C6240** is equipped as a 7-slot housing with an ATX motherboard. Three PCI and three PCI Express slots are available for plug-in cards with a length of up to 190 mm. The graphic adapter and 10/100 Mbit Ethernet adapter are already on-board and do not occupy a slot. The on-board RAID 1 controller mirrors two 2½-inch SATA hard disks. These can be installed instead of the 3½-inch hard disk of the basic configuration. A slimline CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive is available as an option.
- The **C6250** is also equipped as a 7-slot housing with an ATX motherboard. From three free PCI Express x1 slots two are available for plug-in cards with a length of up to 220 mm and three PCI and one PCI Express for up to 190 mm long cards. The graphic adapter and 10/100 Mbit Ethernet adapter are already on-board and do not occupy a slot. Three 5¼-inch drive bays are accessible from the front. The on-board RAID 1 controller mirrors two SATA hard disks. These can be installed with SATA removable frames into two of the 5¼-inch drive bays. This allows the hotplug exchange of hard disks while the PC is operating. A slimline CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive is available as an option.



CD/DVD-ROM, multi DVD or Blu-ray multi DVD

configuration of plug-in cards on a label at the front

drives easily accessible

card holders actuated without tools

passive side wall: fitting possible immediately next to other devices

compact ATX power supply unit 100–240 V full range or 24 V DC

The internal chassis is pulled forward on telescopic rails.

1 GB to 8 GB DDR3RAM

hard disk

Intel® Core™2 Duo or Core™2 Quad

ATX industrial Motherboard

plug-in cards and drives quickly reached

fan with speed observation and double ball bearings

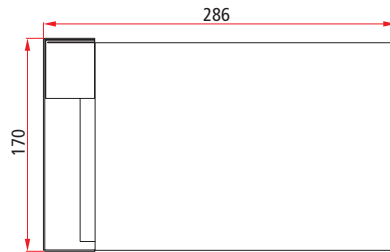
all connections on the front industrial socket strip for power supply

	C6210	C6220	C6240	C6250
<b>Processor</b>	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Core™2 Duo or Core™2 Quad	Intel® Core™2 Duo or Core™2 Quad
<b>Motherboard</b>	passive backplane	passive backplane	ATX	ATX
<b>Slots</b>	4	6	7	7
<b>Free slots</b>	1 PCI	3 PCI	3 PCI, 3 PCIe x1 and 1 PCIe x16 graphic card slot	3 PCI, 3 PCIe x1 and 1 PCIe x16 graphic card slot
<b>Maximum card length</b>	4 x 190 mm	6 x 190 mm	7 x 190 mm	7 x 190 mm
<b>Memory</b>	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	1 GB...8 GB DDR3RAM	1 GB...8 GB DDR3RAM
<b>Graphic adapter</b>	on-board	on-board	on-board	on-board
<b>Ethernet</b>	2 on-board	2 on-board	on-board	on-board
<b>Hard disks</b>	1 x 2½-inch	1 x 2½-inch	1 x 3½-inch or 2 x 2½-inch	1, 2 or 3 x 3½-inch
<b>RAID 1</b>	–	–	2 x 2½-inch HDD	2 x 3½-inch HDD
<b>Possible disk drives</b>	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray
<b>Power supply</b>	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC
<b>Dimen. (W x H x D)</b>	257x170x286 mm	307x170x286 mm	430x170x274 mm	680 x 184 x 270 mm



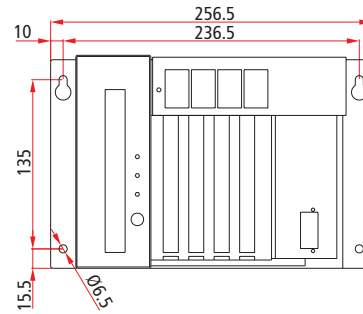
## C6210 | Control cabinet Industrial PC

The Industrial PC C6210 is designed for installation in a control cabinet and equipped with a slot motherboard on a passive backplane. A Beckhoff Control Panel and the C6210 make an ideal combination, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.

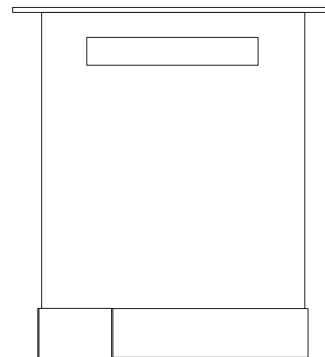


Dimensions in mm

Side view



Front view



Top view

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in the front view drawing.

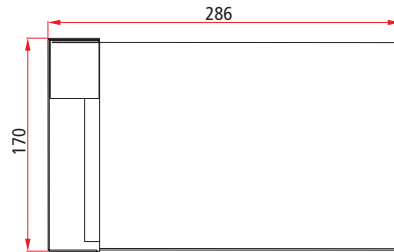


C6210	Control cabinet PC
<b>Housing</b>	4-slot Industrial PC for space-saving control cabinet installation
	all slots for plug-in cards with a length of up to 190 mm
	drives and plug-in cards are easily accessible
	all connectors on the front
	detailed PC configuration information on the front
	status LEDs and protected reset key
	card holders, actuated without tools
	protection class IP 20
	operating temperature 0...55 °C
	weight of the basic configuration 9.5 kg (21 lbs)
dimensions (W x H x D) 257 x 170 x 286 mm (10.1" x 6.7" x 11.3")	
<b>Features</b>	processor Intel® Core™ Duo 2.0 GHz
	slot motherboard for Intel® Core™ Duo or Core™2 Duo
	4-slot passive backplane, 1 PCI slot available
	512 MB DDR2RAM, expandable to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	hard disk, 2½-inch, 40 GB
	4 serial ports RS232 on-board, 2 of these RS232 ports are led out with 9-pin D-sub connectors; 8 USB 2.0, 3 of these USB ports are led out
100–240 V AC full range power supply	
<b>Options</b>	processor Intel® Core™2 Duo
	for variants with Intel® Celeron® M or Pentium® M see price list
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
uninterruptible power supply UPS	
<b>Further information</b>	<a href="http://www.beckhoff.com/C6210">www.beckhoff.com/C6210</a>



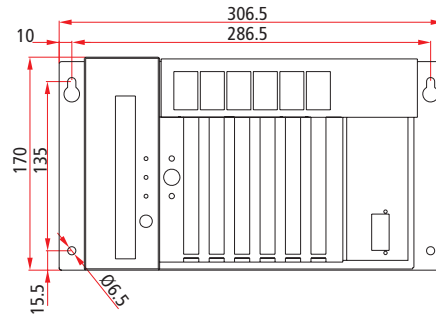
## C6220 | Control cabinet Industrial PC

The Industrial PC C6220 is designed for installation in a control cabinet and equipped with a slot motherboard on a passive backplane. A Beckhoff Control Panel and the C6220 make an ideal combination, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.

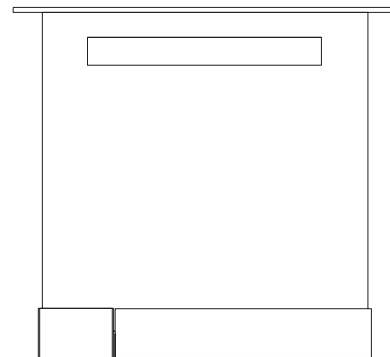


Dimensions in mm

Side view

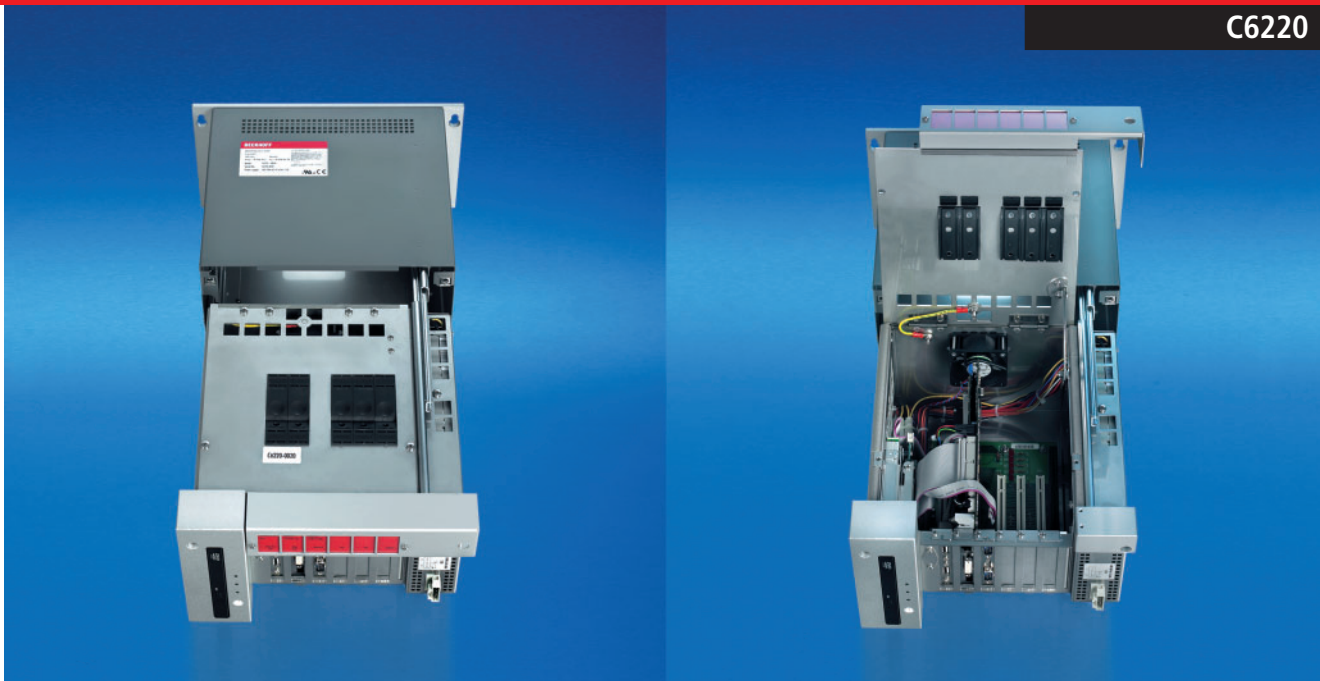


Front view



Top view

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in the front view drawing.

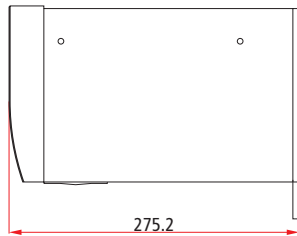


C6220	Control cabinet PC
<b>Housing</b>	6-slot Industrial PC for space-saving control cabinet installation
	all slots for plug-in cards with a length of up to 190 mm
	drives and plug-in cards are easily accessible
	all connectors on the front
	detailed PC configuration information on the front
	status LEDs and protected reset key
	card holders, actuated without tools
	protection class IP 20
	operating temperature 0...55 °C
	weight of the basic configuration 10 kg (22 lbs)
dimensions (W x H x D) 307 x 170 x 286 mm (12.1" x 6.7" x 11.3")	
<b>Features</b>	processor Intel® Core™ Duo 2.0 GHz
	slot motherboard for Intel® Core™ Duo or Core™2 Duo
	6-slot passive backplane, 3 PCI slots available
	512 MB DDR2RAM, expandable to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	hard disk, 2½-inch, 40 GB
	4 serial ports RS232 on-board, 2 of these RS232 ports are led out with 9-pin D-sub connectors; 8 USB 2.0, 3 of these USB ports are led out
	100–240 V AC full range power supply
	processor Intel® Core™2 Duo
<b>Options</b>	for variants with Intel® Celeron® M or Pentium® M see price list
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
	uninterruptible power supply UPS
<b>Further information</b>	<a href="http://www.beckhoff.com/C6220">www.beckhoff.com/C6220</a>

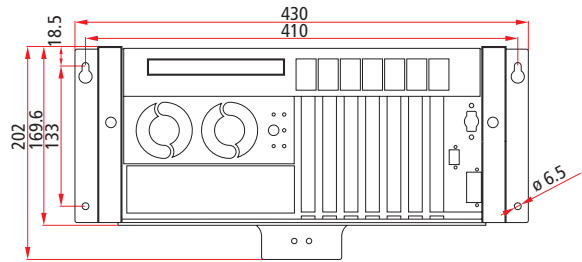


## C6240 | Control cabinet Industrial PC

The Industrial PC C6240 is designed for installation in a control cabinet and fitted with components of the highest performance class meeting the ATX standard. A Beckhoff Control Panel and the C6240 make an ideal combination, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.

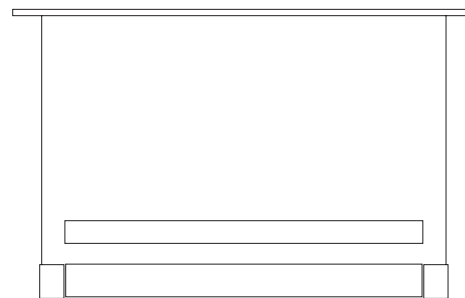


Side view



Front view

Dimensions in mm



Top view

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in the front view drawing. The installation in vertical orientation with connectors on the front side is optionally possible.



C6240	Control cabinet PC
<b>Housing</b>	7-slot ATX Industrial PC for control cabinet installation
	all slots for plug-in cards with a length of up to 190 mm
	drives and plug-in cards easily accessible
	all connectors on the front
	detailed PC configuration information on the front
	status LEDs and protected reset key
	card holders, actuated without tools
	protection class IP 20
	operating temperature 0...55 °C
	weight of the basic configuration 12.3 kg (27.2 lbs)
dimensions (W x H x D) 430 x 170 x 274 mm (16.9" x 6.7" x 10.8")	
<b>Features</b>	processor Intel® Core™2 Duo 2.53 GHz
	ATX motherboard for Intel® Core™2 Duo or Core™2 Quad
	3 PCI Express x1 slots, 3 PCI slots and 1 PCI Express x16 graphic card slot free
	1 GB DDR3RAM, expandable to 8 GB
	on-board graphic adapter, Intel® GMA 4500MHD, monitor connector
	on-board Ethernet adapter with 10/100BASE-T connector
	on-board SATA RAID 1 controller, Intel® Matrix Storage Technology
	hard disk, 3½-inch, 250 GB
	4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 12 USB 2.0, 4 of these USB ports are led out; and 1 parallel port
	PS/2 keyboard socket and PS/2 mouse socket
100–240 V AC full range power supply	
<b>Options</b>	processor Intel® Core™2 Quad
	for variants with Intel® Celeron® M, Pentium® M or Core™ Duo see price list
	mounting sheet for vertical PC installation
	cable carrier chain to open the PC with connected cables
	second on-board Ethernet adapter with 10/100/1000BASE-T connector
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	ADD-IN card with one or two DVI connectors
	two hard disks, 2½-inch, 40 GB as a RAID 1 system, instead of one 3½-inch hard disk, 250 GB
	Compact Flash or solid-state disk SSD
CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive	
24 V DC power supply	
uninterruptible power supply UPS	
<b>Further information</b>	<a href="http://www.beckhoff.com/C6240">www.beckhoff.com/C6240</a>

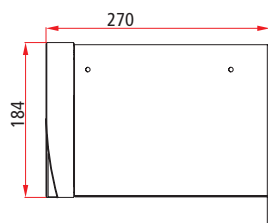




## C6250 | Control cabinet Industrial PC

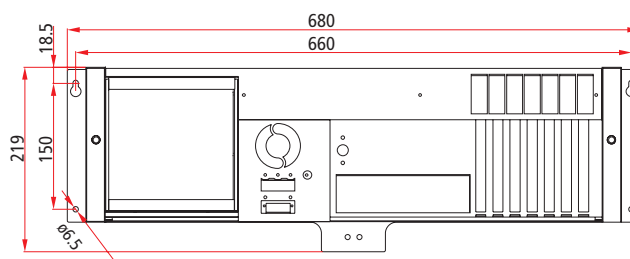
The Industrial PC C6250 is designed for installation in a control cabinet and fitted with components of the highest performance class meeting the ATX standard. A Beckhoff Control Panel and the C6250 make an ideal combination, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.

C6250	Control cabinet PC
<b>Housing</b>	7-slot ATX Industrial PC for control cabinet installation
	mounting sheet for horizontal installation
	1 PCI Express x1 slot and 2 PCI slots for up to 220 mm long plug-in cards and 1 PCI slot and 2 PCI Express x1 slots for up to 190 mm long plug-in cards
	drives and plug-in cards easily accessible
	all connectors on the front
	detailed PC configuration information on the front
	status LEDs and protected reset key
	card holders, actuated without tools
	protection class IP 20
	operating temperature 0...55 °C
	weight of the basic configuration 19.8 kg (43.7 lbs)
	dimensions (W x H x D) 680 x 184 x 270 mm (26.8" x 7.2" x 10.7")
	<b>Features</b>
ATX motherboard for Intel® Core™2 Duo or Core™2 Quad	
3 PCI Express x1 slots, 3 PCI slots and 1 PCI Express x16 graphic card slot free	
1 GB DDR3RAM, expandable to 8 GB	
on-board graphic adapter, Intel® GMA 4500MHD, monitor connector	
on-board Ethernet adapter with 10/100BASE-T connector	
on-board SATA RAID 1 controller, Intel® Matrix Storage Technology	
hard disk, 3½-inch, 250 GB	
4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 12 USB 2.0, 4 of these USB ports are led out; and 1 parallel port	
PS/2 keyboard socket and PS/2 mouse socket	
100–240 V AC full range power supply	

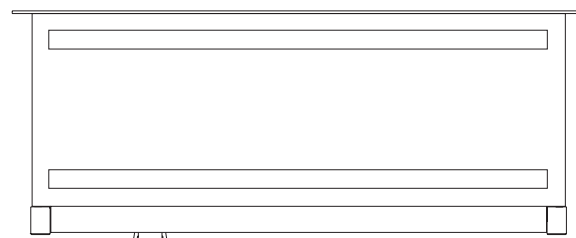


Dimensions in mm

Side view



Front view



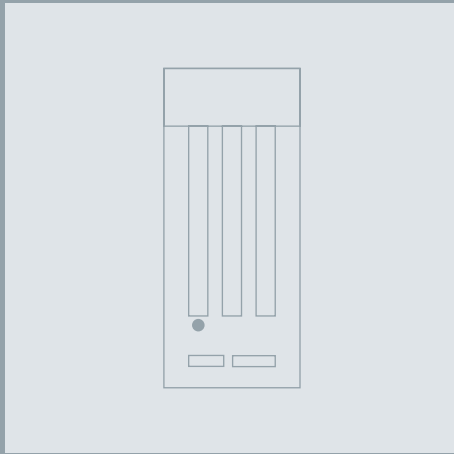
Top view

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in the front view drawing. The installation in vertical orientation with connectors on the front side is optionally possible.

C6250	Control cabinet PC
Options	processor Intel® Core™2 Quad
	for variants with Intel® Celeron® M, Pentium® M or Core™ Duo see price list
	mounting sheet for vertical PC installation
	cable carrier chain to open the PC with connected cables
	second on-board Ethernet adapter with 10/100/1000BASE-T connector
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	ADD-IN card with one or two DVI connectors
	second hard disk, 3½-inch, 250 GB and removable frame for hard disks
	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
uninterruptible power supply UPS	
Further information	<a href="http://www.beckhoff.com/C6250">www.beckhoff.com/C6250</a>

# Industrial PC series C63xx

Industrial PC for control cabinet installation



The C63xx series of Industrial PCs has been designed for control cabinet installation. The Industrial PCs of this series and a Beckhoff Control Panel with DVI and USB connection as operating unit make an ideal combination, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



The C63xx series of Industrial PCs has been designed for fitting into control cabinets. The compact housing is equipped with a slot motherboard for Intel® Core™ Duo or Core™2 Duo. One or three free PCI slots are available. The graphic adapter and two Ethernet adapters are already on-board and do not occupy a slot. The use of a fieldbus interface card transforms the C6320 into a very compact, high performance machine control. In addition, the C6330, C6335 and C6350 offer a CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive and are only 14 mm wider than the C6320, C6325 and the C6340.

All PC connections are on one side of the housing. The PC can optionally be equipped with mounting plates on two sides and fastened with screws in the control cabinet. In terms of the photo, installation is possible at the rear panel or on the right-hand panel.

For maintenance purposes, the internal chassis can be removed from the external housing. When removed, the inner chassis still has the full function of a PC and can be operated with a standard USB keyboard and a standard DVI display.

The PCs of this series are supplied with a 24 V DC power supply unit.

The DVI and USB interfaces supplied with the basic configuration enable the connection of a Control Panel. An Industrial PC of this series and a Beckhoff Control Panel as its operating unit create an ideal combination.

The C6325 and C6335 enable fanless operation up to 45 °C. The use of a Compact Flash or solid-state disk SSD instead of a hard disk in the C6325 creates a PC without moving parts.

	C6320	C6325	C6330	C6335	C6340	C6350
<b>Processor</b>	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo
<b>Motherboard</b>	passive backplane	passive backplane	passive backplane	passive backplane	passive backplane	passive backplane
<b>Slots</b>	3	3	3	3	5	5
<b>Free slots</b>	1 PCI	1 PCI	1 PCI	1 PCI	3 PCI	3 PCI
<b>Maximum card length</b>	1 x 190 mm	1 x 190 mm	1 x 190 mm	1 x 190 mm	3 x 190 mm	3 x 190 mm
<b>Memory</b>	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM
<b>Graphic adapter</b>	on-board	on-board	on-board	on-board	on-board	on-board
<b>Ethernet</b>	2 on-board	2 on-board	2 on-board	2 on-board	2 on-board	2 on-board
<b>Hard disks</b>	1 x 2½-inch	1 x 2½-inch	1 x 2½-inch	1 x 2½-inch	1 x 2½-inch	1 x 2½-inch
<b>RAID 1</b>	–	–	–	–	–	–
<b>Possible disk drives</b>	–	–	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray	–	CD/DVD-ROM, multi DVD or Blu-ray
<b>Power supply</b>	24 V DC	24 V DC	24 V DC	24 V DC	24 V DC	24 V DC
<b>Dimen. (W x H x D)</b>	93 x 196 x 226 mm	133 x 196 x 226 mm	107 x 196 x 226 mm	147 x 196 x 226 mm	134 x 196 x 226 mm	148 x 196 x 226 mm



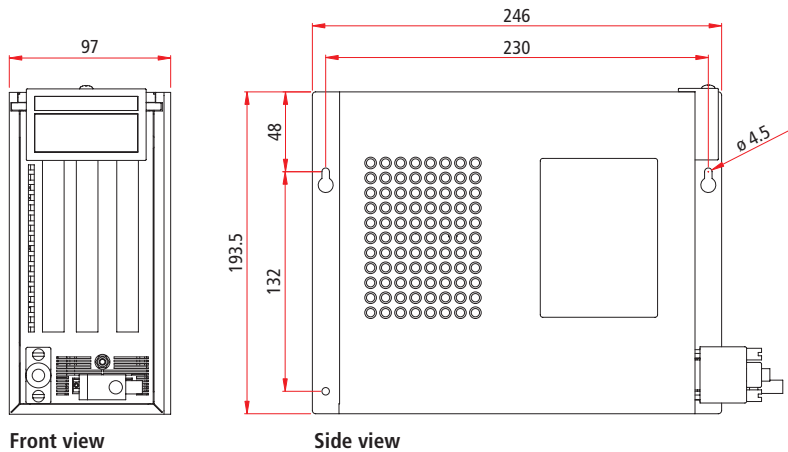
## C6320 | Control cabinet Industrial PC

The Industrial PC C6320 is designed for the installation in a control cabinet in combination with a Control Panel as operating unit. The PC is equipped with a slot motherboard on a passive backplane. The C6320 is ideally suited for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in these drawings.

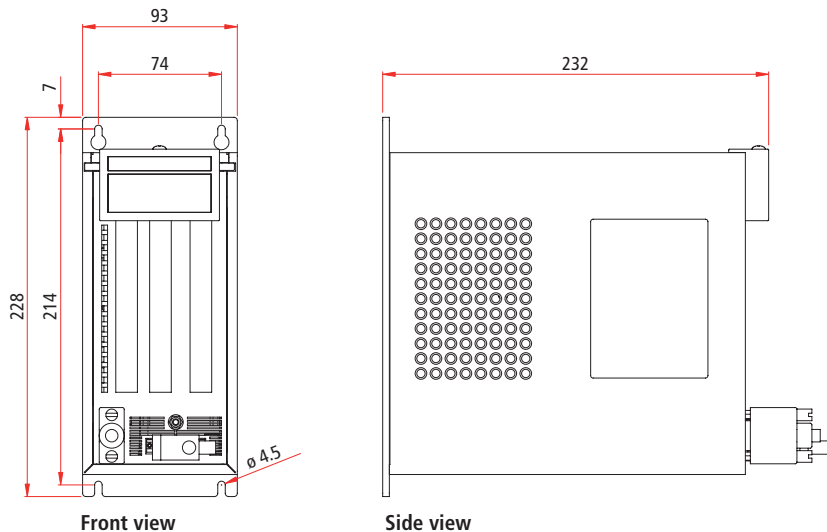
Mounting plate  
at the side wall

Dimensions in mm



Mounting plate  
at the back wall

Dimensions in mm





C6320	Control cabinet PC
<b>Housing</b>	3-slot Industrial PC for space-saving control cabinet installation
	mounting sheet at the rear wall
	1 slot for plug-in cards with a length of up to 190 mm
	drives and plug-in cards easily accessible
	all connectors at one side
	detailed PC configuration information on the housing
	protection class IP 20
	operating temperature 0...55 °C
<b>Features</b>	weight of the basic configuration 4 kg (8.8 lbs)
	compact dimensions (W x H x D) 93 x 196 x 226 mm (3.6" x 7.7" x 8.8") without mounting plate
	processor Intel® Core™ Duo 2.0 GHz
	slot motherboard for Intel® Core™ Duo or Core™2 Duo
	3-slot passive backplane, 1 PCI slot available
	512 MB DDR2RAM, expandable to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	hard disk, 2½-inch, 40 GB
	4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 8 USB 2.0, 3 of these USB ports are led out
24 V DC power supply	
<b>Options</b>	processor Intel® Core™2 Duo
	for variants with Intel® Celeron® M or Pentium® M see price list
	mounting plate at the side wall, instead of plate at the rear wall
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	Compact Flash or solid-state disk SSD
<b>Further information</b>	uninterruptible power supply UPS
	<a href="http://www.beckhoff.com/C6320">www.beckhoff.com/C6320</a>



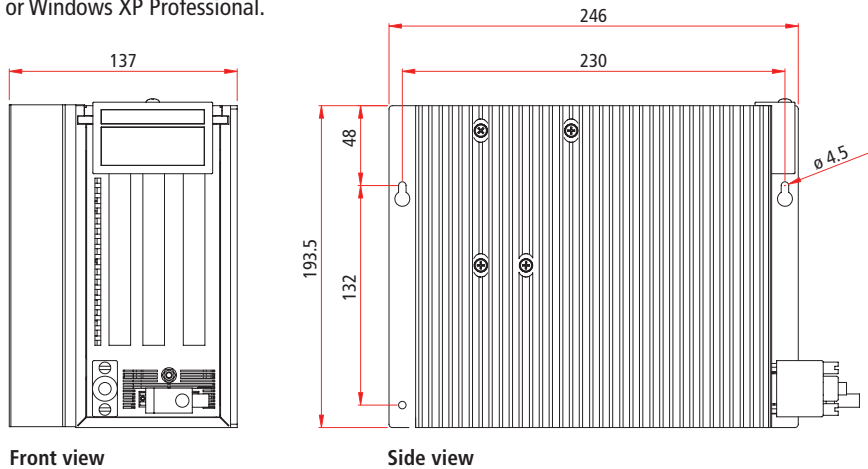
## C6325 | Fanless control cabinet Industrial PC

The fanless Industrial PC C6325 is designed for the installation in a control cabinet in combination with a Control Panel as operating unit. The PC is equipped with a slot motherboard on a passive backplane. The cooling is passive without fan through the heat sink structure at the left side wall. The C6325 is ideally suited for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in these drawings.

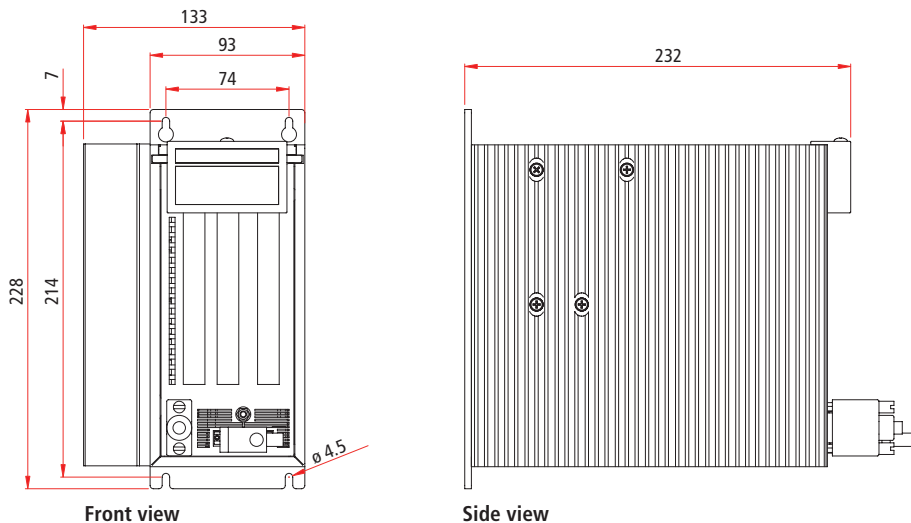
Mounting plate at the side wall

Dimensions in mm



Mounting plate at the back wall

Dimensions in mm





C6325	Fanless control cabinet PC
<b>Housing</b>	fanless 3-slot Industrial PC for space-saving control cabinet installation
	mounting sheet at the rear wall
	1 slot for plug-in cards with a length of up to 190 mm
	drives and plug-in cards easily accessible
	all connectors on one side
	detailed PC configuration information on the housing
	passive cooling without fan through heat sink structure at the outer housing
	10 cm (4") free space on top and bottom of the PC necessary for air circulation
	protection class IP 20
	operating temperature 0...45 °C
<b>Features</b>	weight of the basic configuration 6 kg (13.2 lbs)
	compact dimensions (W x H x D) 133 x 196 x 226 mm (5.2" x 7.7" x 8.8") without mounting plate
	processor Intel® Core™ Duo 2.0 GHz
	slot motherboard for Intel® Core™ Duo or Core™2 Duo
	3-slot passive backplane, 1 PCI slot available
	512 MB DDR2RAM, expandable to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	hard disk, 2½-inch, 40 GB
	4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 8 USB 2.0, 3 of these USB ports are led out
<b>Options</b>	24 V DC power supply
	processor Intel® Core™2 Duo
	for variants with Intel® Celeron® M or Pentium® M see price list
	mounting plate at the side wall, instead of plate at the rear wall
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	Compact Flash or solid-state disk SSD
uninterruptible power supply UPS	
<b>Further information</b>	<a href="http://www.beckhoff.com/C6325">www.beckhoff.com/C6325</a>





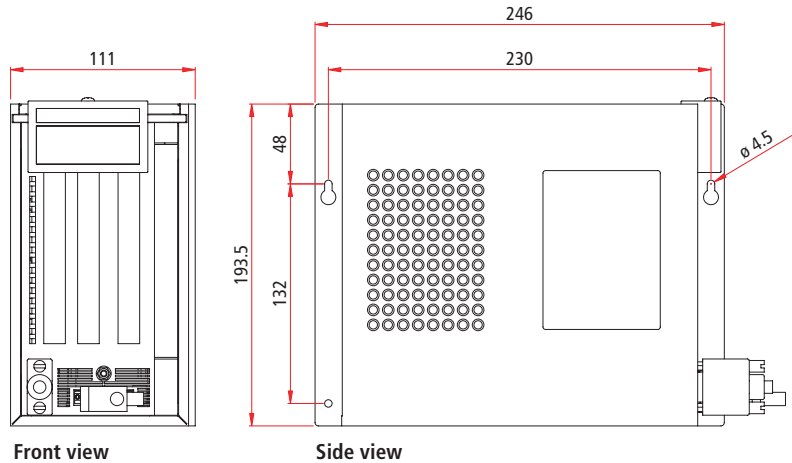
## C6330 | Control cabinet Industrial PC

The Industrial PC C6330 is designed for the installation in a control cabinet in combination with a Control Panel as operating unit. The PC is equipped with a slot motherboard on a passive backplane. The C6330 is ideally suited for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in these drawings.

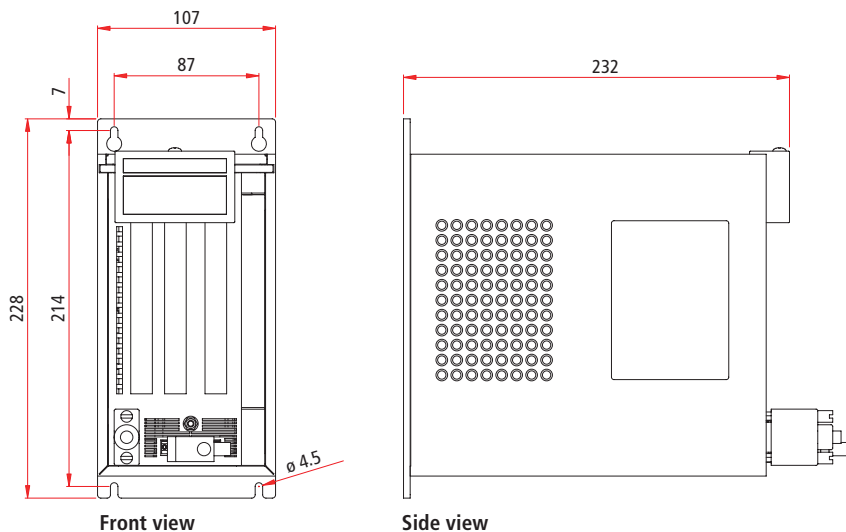
Mounting plate at the side wall

Dimensions in mm



Mounting plate at the back wall

Dimensions in mm





C6330	Control cabinet PC
<b>Housing</b>	3-slot Industrial PC for space-saving control cabinet installation
	mounting sheet at the rear wall
	1 slot for plug-in cards with a length of up to 190 mm
	drives and plug-in cards easily accessible
	all connectors at one side
	detailed PC configuration information on the housing
	protection class IP 20
	operating temperature 0...55 °C
	weight of the basic configuration 4.6 kg (10.1 lbs)
	compact dimensions (W x H x D) 107 x 196 x 226 mm (4.2" x 7.7" x 8.8") without mounting plate
<b>Features</b>	processor Intel® Core™ Duo 2.0 GHz
	slot motherboard for Intel® Core™ Duo or Core™2 Duo
	3-slot passive backplane, 1 PCI slot available
	512 MB DDR2RAM, expandable to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	hard disk, 2½-inch, 40 GB
	CD/DVD-ROM drive slimline
	4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 8 USB 2.0, 3 of these USB ports are led out
	24 V DC power supply
<b>Options</b>	processor Intel® Core™2 Duo
	for variants with Intel® Celeron® M or Pentium® M see price list
	mounting plate at the side wall, instead of plate at the rear wall
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	Compact Flash or solid-state disk SSD
	multi DVD or Blu-ray multi DVD drive
	uninterruptible power supply UPS
<b>Further information</b>	<a href="http://www.beckhoff.com/C6330">www.beckhoff.com/C6330</a>



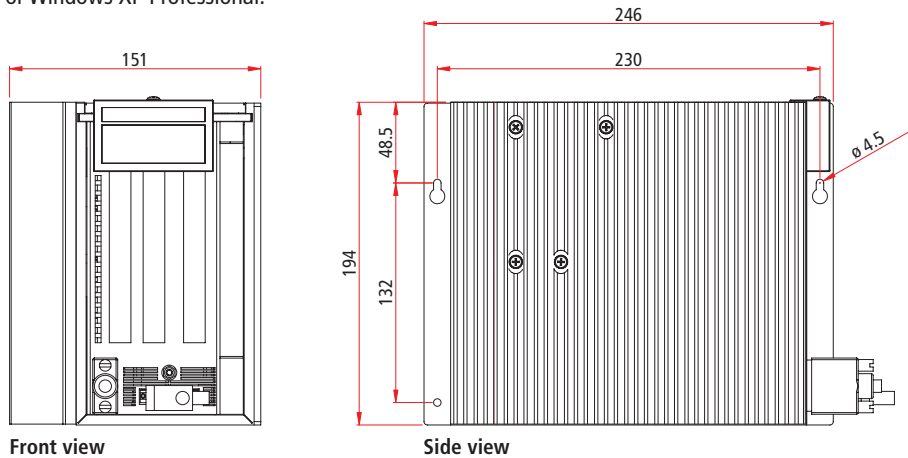
## C6335 | Fanless control cabinet Industrial PC

The fanless Industrial PC C6335 is designed for the installation in a control cabinet in combination with a Control Panel as operating unit. The PC is equipped with a slot motherboard on a passive backplane. The cooling is passive without fan through the heat sink structure at the left side wall. The C6335 is ideally suited for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in these drawings.

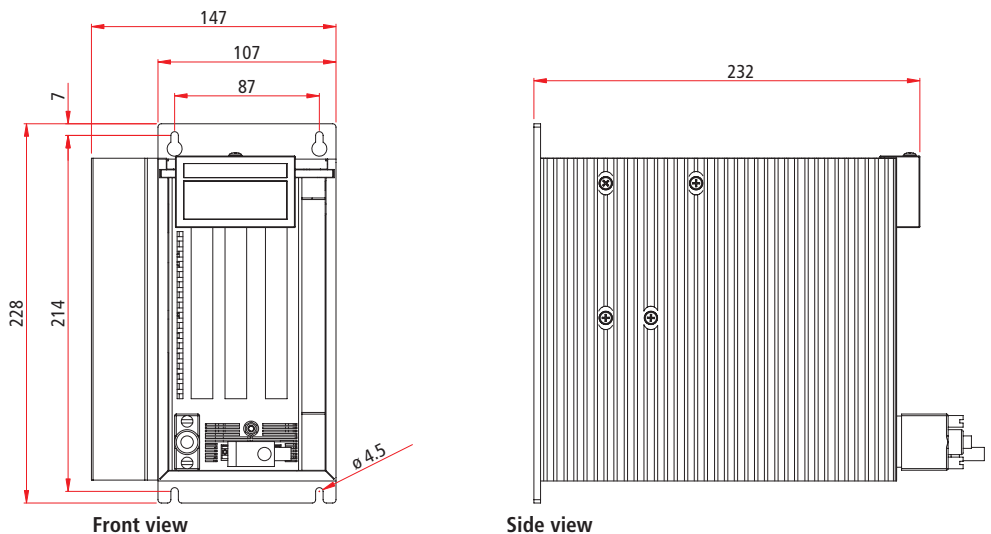
Mounting plate at the side wall

Dimensions in mm



Mounting plate at the back wall

Dimensions in mm





C6335	Fanless control cabinet PC
<b>Housing</b>	fanless 3-slot Industrial PC for space-saving control cabinet installation
	mounting sheet at the rear wall
	1 slot for plug-in cards with a length of up to 190 mm
	drives and plug-in cards easily accessible
	all connectors on one side
	detailed PC configuration information on the housing
	passive cooling without fan through heat sink structure at the outer housing
	10 cm (4") free space on top and bottom of the PC necessary for air circulation
	protection class IP 20
	operating temperature 0...45 °C
<b>Features</b>	weight of the basic configuration 6.6 kg (14.6 lbs)
	compact dimensions (W x H x D) 147 x 196 x 226 mm (5.8" x 7.7" x 8.8") without mounting plate
	processor Intel® Core™ Duo 2.0 GHz
	slot motherboard for Intel® Core™ Duo or Core™2 Duo
	3-slot passive backplane, 1 PCI slot available
	512 MB DDR2RAM, expandable to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	hard disk, 2½-inch, 40 GB
	CD/DVD-ROM drive slimline
<b>Options</b>	4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 8 USB 2.0, 3 of these USB ports are led out
	24 V DC power supply
	processor Intel® Core™2 Duo
	for variants with Intel® Celeron® M or Pentium® M see price list
	mounting plate at the side wall, instead of plate at the rear wall
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	Compact Flash or solid-state disk SSD
	multi DVD or Blu-ray multi DVD drive
	uninterruptible power supply UPS
<b>Further information</b>	<a href="http://www.beckhoff.com/C6335">www.beckhoff.com/C6335</a>



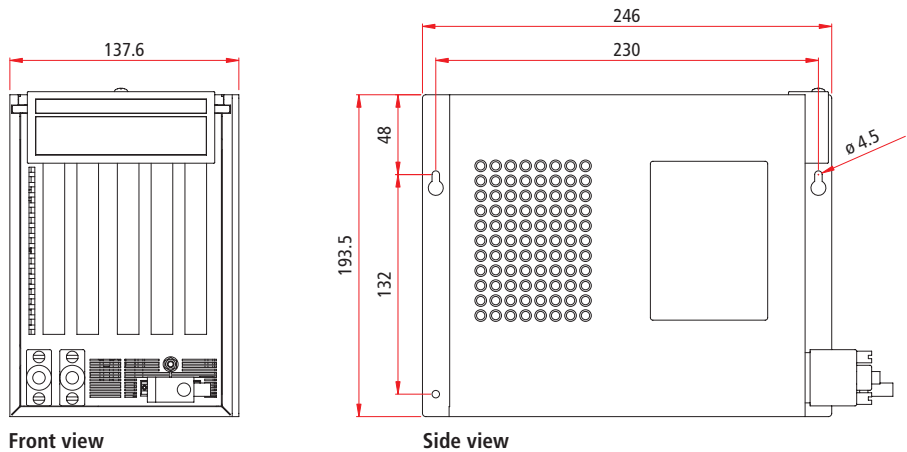
## C6340 | Control cabinet Industrial PC

The Industrial PC C6340 is designed for the installation in a control cabinet in combination with a Control Panel as operating unit. The PC is equipped with a slot motherboard on a passive backplane. In contrast to the control cabinet PC C6320 the C6340 has two additional slots. The C6340 is ideally suited for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in these drawings.

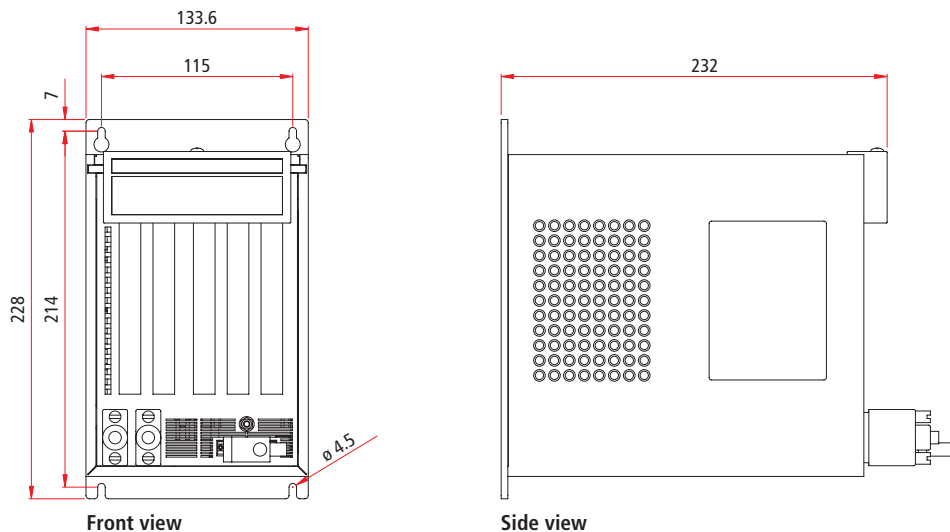
Mounting plate at the side wall

Dimensions in mm



Mounting plate at the back wall

Dimensions in mm





C6340	Control cabinet PC
<b>Housing</b>	5-slot Industrial PC for space-saving control cabinet installation
	mounting sheet at the rear wall
	3 slots for plug-in cards with a length of up to 190 mm
	drives and plug-in cards easily accessible
	all connectors on one side
	detailed PC configuration information on the housing
	protection class IP 20
	operating temperature 0...55 °C
<b>Features</b>	weight of the basic configuration 4.5 kg (9.9 lbs)
	compact dimensions (W x H x D) 134 x 196 x 226 mm (5.3" x 7.7" x 8.8") without mounting plate
	processor Intel® Core™ Duo 2.0 GHz
	slot motherboard for Intel® Core™ Duo or Core™2 Duo
	5-slot passive backplane, 3 PCI slots available
	512 MB DDR2RAM, expandable to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	hard disk, 2½-inch, 40 GB
	4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 8 USB 2.0, 3 of these USB ports are led out
24 V DC power supply	
<b>Options</b>	processor Intel® Core™2 Duo
	for variants with Intel® Celeron® M or Pentium® M see price list
	mounting plate at the side wall, instead of plate at the rear wall
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	Compact Flash or solid-state disk SSD
<b>Further information</b>	uninterruptible power supply UPS
	<a href="http://www.beckhoff.com/C6340">www.beckhoff.com/C6340</a>



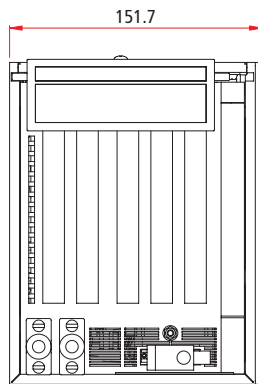
## C6350 | Control cabinet Industrial PC

The Industrial PC C6350 is designed for the installation in a control cabinet in combination with a Control Panel as operating unit. The PC is equipped with a slot motherboard on a passive backplane. In contrast to the control cabinet PC C6330 the C6350 has two additional slots. The C6350 is ideally suited for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.

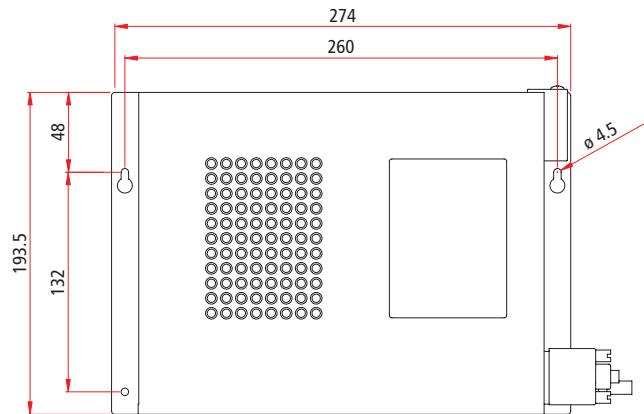
The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in these drawings.

Mounting plate at the side wall

Dimensions in mm



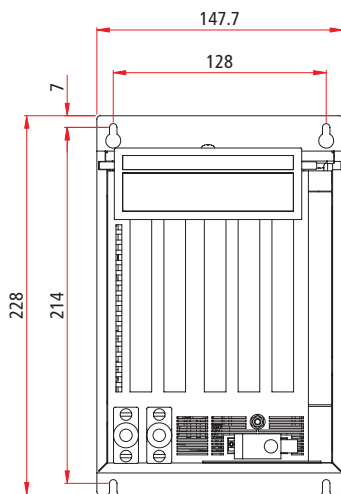
Front view



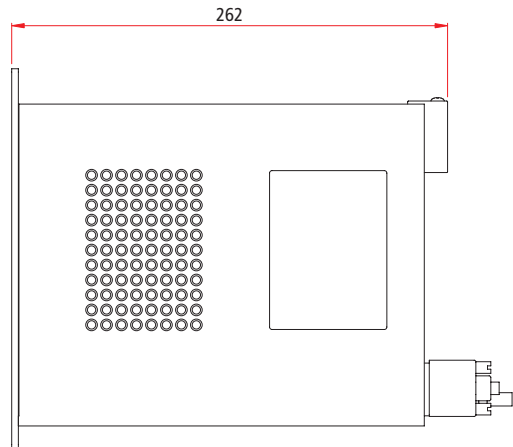
Side view

Mounting plate at the back wall

Dimensions in mm



Front view



Side view

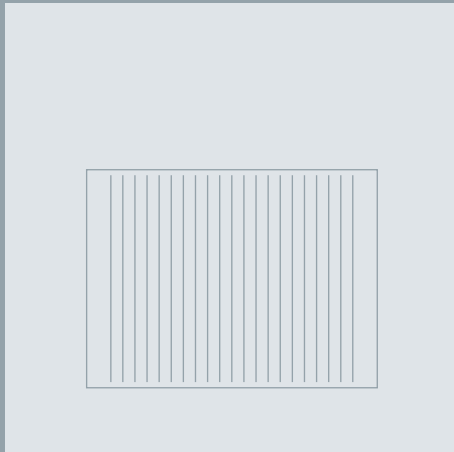


C6350	Control cabinet PC
<b>Housing</b>	5-slot Industrial PC for space-saving control cabinet installation
	mounting sheet at the rear wall
	3 slots for plug-in cards with a length of up to 190 mm
	drives and plug-in cards easily accessible
	all connectors on one side
	detailed PC configuration information on the housing
	protection class IP 20
	operating temperature 0...55 °C
	weight of the basic configuration 5.1 kg (11.2 lbs)
	compact dimensions (W x H x D) 148 x 196 x 226 mm (5.8" x 7.7" x 8.8") without mounting plate
<b>Features</b>	processor Intel® Core™ Duo 2.0 GHz
	slot motherboard for Intel® Core™ Duo or Core™2 Duo
	5-slot passive backplane, 3 PCI slots available
	512 MB DDR2RAM, expandable to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	hard disk, 2½-inch, 40 GB
	CD/DVD-ROM drive slimline
	4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 8 USB 2.0, 3 of these USB ports are led out
	24 V DC power supply
<b>Options</b>	processor Intel® Core™2 Duo
	for variants with Intel® Celeron® M or Pentium® M see price list
	mounting plate at the side wall, instead of plate at the rear wall
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	Compact Flash or solid-state disk SSD
	multi DVD or Blu-ray multi DVD drive
	uninterruptible power supply UPS
<b>Further information</b>	<a href="http://www.beckhoff.com/C6350">www.beckhoff.com/C6350</a>



# Industrial PC series C65xx

Industrial PC for control cabinet installation



The C65xx Industrial PC series is designed for space-saving installation in control cabinets. The Industrial PCs of this series and a Beckhoff Control Panel with DVI and USB connection as operating unit make an ideal combination, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows CE, Windows XP Professional or Windows Embedded Standard.



The C65xx Industrial PC series is designed to be installed in control cabinets or in the rear panel of a control or console housing. The heat sink of the IPC is thereby fed to the outside through a suitable cut-out in the panel of the control cabinet. In this way, the power dissipation of the processor and chipset is given off directly to the surroundings. Integrated seals provide for an IP 67 closure. This enables high thermal stability and at the same time fanless operation. C65xx Industrial PCs can be constructed completely without rotating parts. In particular when installed in a control housing and in combination with a Beckhoff Control Panel and TwinCAT automation software, the system becomes a powerful PLC and Motion Control system.

The compact housing is equipped with a Beckhoff 3½-inch motherboard for Intel® Core™ Duo 2.0 GHz or Core™2 Duo 2.16 GHz. All of the PC's connectors are located on the top side of the housing.

The PC's heat sink is installed externally at the rear panel of the console housing or the control cabinet wall and dissipates heat to the surroundings. The IPC circuitry is protected inside by a sheet-steel back cover. The C65xx series PCs are supplied with an integrated power supply unit with 24 V DC input voltage, optionally with integrated uninterruptible power supply (UPS). A battery pack can be connected externally and installed on a DIN rail close to the PC. The PC is cooled by means of cooling fins, enabling operation at ambient temperatures of up to 45 °C. The basic C6515 configuration features a flash disk, thereby creating a PC without moving parts. It has a free Mini PCI slot that can be used for NOVRAM modules for fail-safe storage of process data. Mini PCI fieldbus cards or a further Ethernet card can be used with the C6525.

Industrial PCs of this series and Beckhoff Control Panels as operating units make an ideal combination and offer a high-perfor-

mance control platform for machine construction and plant engineering applications, particularly in conjunction with the TwinCAT automation software under Windows CE, Windows XP Professional or Windows Embedded Standard. Due to their two independent Ethernet interfaces the C6515 and C6525 Industrial PCs are ideally suited as compact central processing units for an EtherCAT control system. While the 100 Mbit Ethernet port offers optimum performance for all EtherCAT control tasks, a Gigabit port is available for connecting the higher-level network.

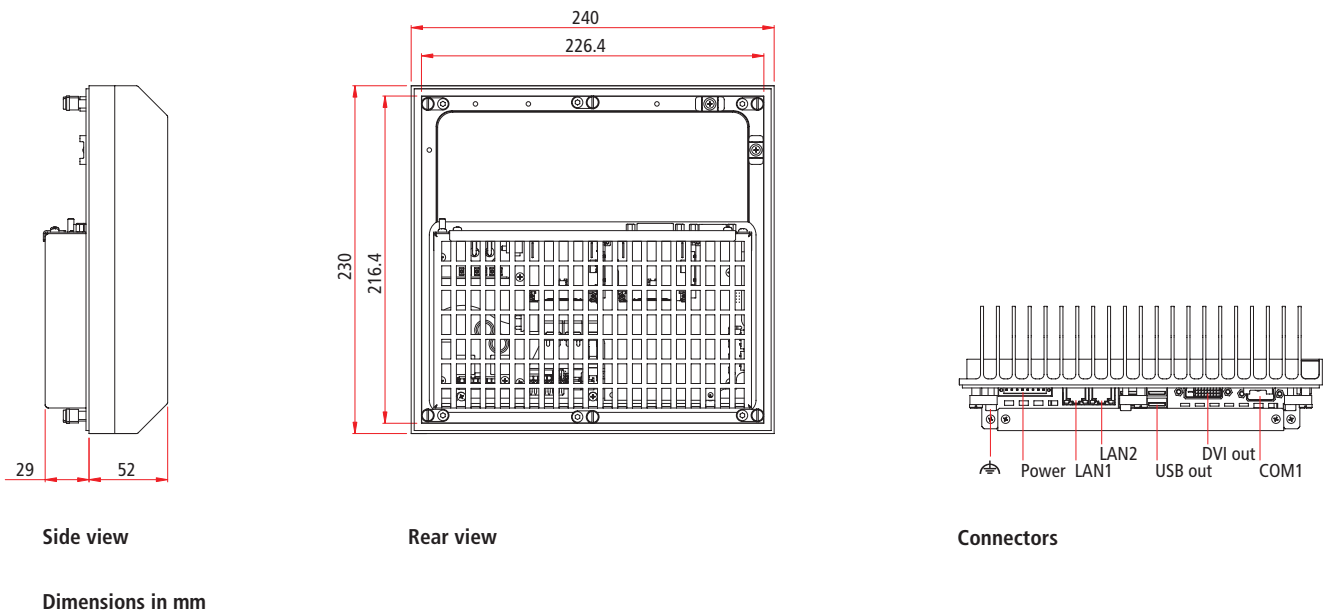
The C6525 enables the installation of two hard disks, which can be mirrored using the on-board SATA RAID 1 controller with Intel® matrix storage technology. If one of the hard disks fails, the system continues to run. The faulty hard disk can be replaced and mirrored during operation.

	C6515	C6525
<b>Processor</b>	Intel® Core™ Duo or Core™2 Duo	Intel® Core™ Duo or Core™2 Duo
<b>Motherboard</b>	3½-inch motherboard	3½-inch motherboard
<b>Free slots</b>	1 Mini PCI for NOVRAM	1 Mini PCI
<b>Memory</b>	512 MB...3 GB DDR2RAM	512 MB...3 GB DDR2RAM
<b>Graphic adapter</b>	on-board	on-board
<b>Ethernet</b>	2 on-board	2 on-board
<b>Hard disks</b>	1 or 2 CF cards	2½-inch and/or CF card or 2 CF cards or 2 x 2½-inch
<b>RAID 1</b>	–	2 x 2½-inch HDD
<b>Power supply</b>	24 V DC	24 V DC
<b>Dimen. (W x H x D)</b>	240 x 230 x 81 mm	330 x 275 x 82 mm



## C6515 | Fanless built-in Industrial PC

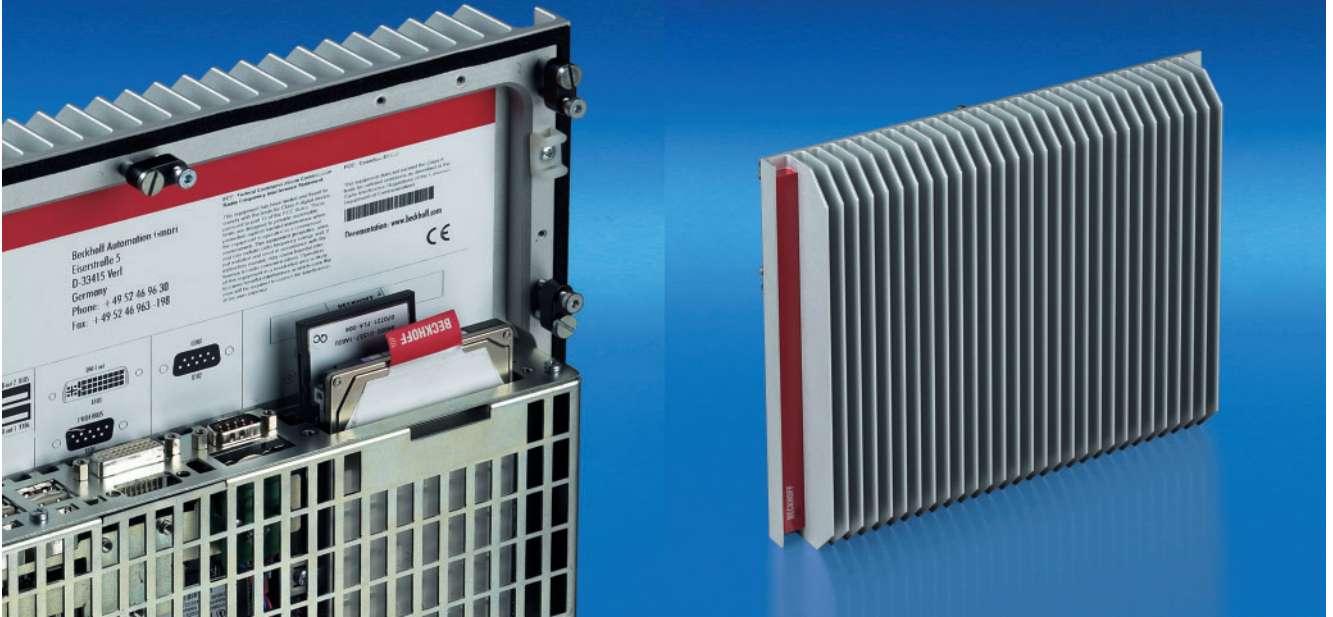
The C6515 Industrial PC is designed for space-saving control cabinet installation. The compact case is equipped with a 3½-inch motherboard for Intel® Core™ Duo or Core™2 Duo. The heat sink of the IPC is fed to the outside through a suitable opening in the control cabinet wall. The basic C6515 configuration features a Compact Flash card and a second, free Compact Flash slot, thereby creating a PC without moving parts.



The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in the rear view drawing.

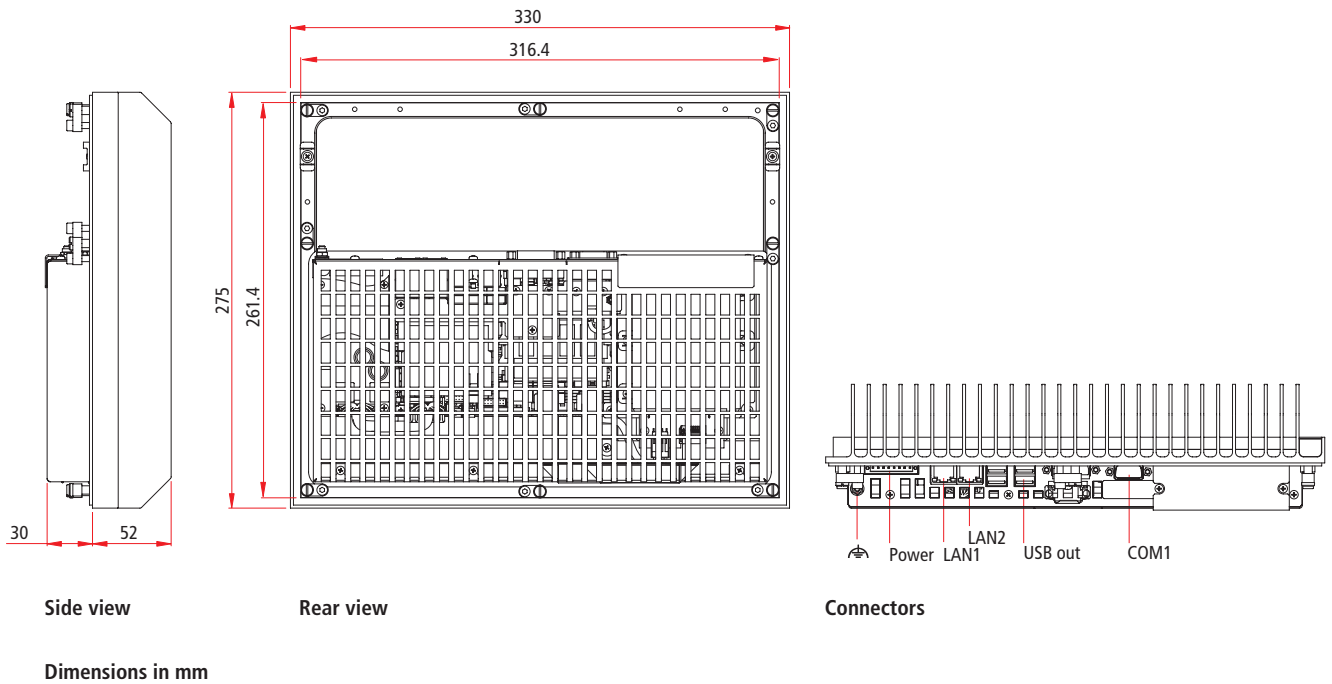


C6515	Built-in Industrial PC
<b>Housing</b>	built-in Industrial PC with external cooling to be mounted in the back panel of a control housing or in the wall of a control cabinet
	2 slots for Compact Flash
	Compact Flash and lithium battery of the system clock easily exchangeable
	passive cooling through heat sink structure outside
	20 cm free space required around the heat sink of the PC for air circulation
	protection class outside IP 67, inside IP 20
	operating temperature outside 0...45 °C, inside 0...55 °C
<b>Features</b>	dimensions (W x H x D) 240 x 230 x 81 mm (9.5" x 9.1" x 3.2")
	processor Intel® Core™ Duo 2.0 GHz
	3½-inch motherboard for Intel® Core™ Duo or Core™2 Duo
	1 free Mini PCI slot for NOVRAM cards installed ex factory
	512 MB DDR2RAM, expandable ex factory to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	1 GB Compact Flash card type I, extended temperature range
<b>Options</b>	1 serial port RS232 and 4 USB 2.0 ports
	24 V DC power supply
	processor Intel® Core™2 Duo
	Mini PCI card with up to 512 kB NOVRAM for fail-safe storage of process data
<b>Further information</b>	larger or second Compact Flash card
	uninterruptible power supply UPS
	<a href="http://www.beckhoff.com/C6515">www.beckhoff.com/C6515</a>

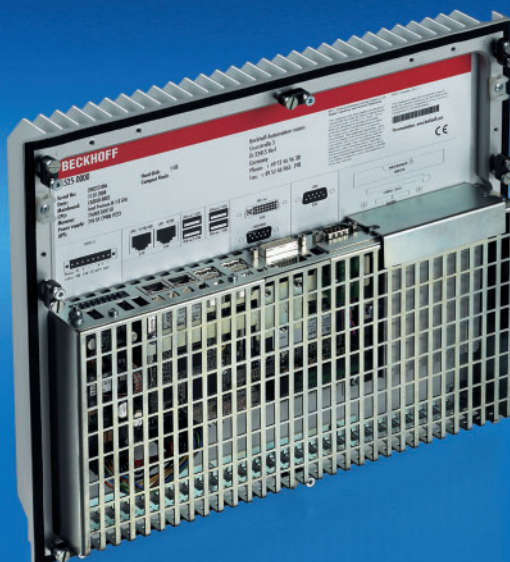


## C6525 | Fanless built-in Industrial PC

The C6525 Industrial PC is designed for space-saving control cabinet installation. The compact case is equipped with a 3½-inch motherboard for Intel® Core™ Duo or Core™2 Duo. The heat sink of the IPC is fed to the outside through a suitable opening in the control cabinet wall. The basic C6525 configuration features a 2½-inch hard disk and a free Compact Flash slot.



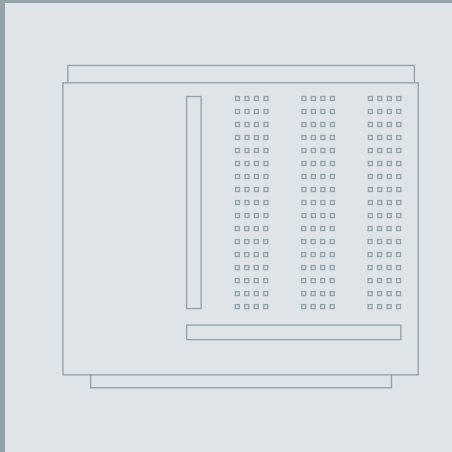
The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in the rear view drawing.



C6525	Built-in Industrial PC
<b>Housing</b>	built-in Industrial PC with external cooling to be mounted in the back panel of a control housing or in the wall of a control cabinet
	1 slot for 2½-inch hard disk and 1 slot for Compact Flash
	hard disk, Compact Flash and lithium battery of the system clock easily exchangeable
	passive cooling through heat sink structure outside
	20 cm free space required around the heat sink of the PC for air circulation
	protection class outside IP 67, inside IP 20
	operating temperature outside 0...45 °C, inside 0...55 °C
<b>Features</b>	dimensions (W x H x D) 330 x 275 x 82 mm (13" x 10.8" x 3.2")
	processor Intel® Core™ Duo 2.0 GHz
	3½-inch motherboard for Intel® Core™ Duo or Core™2 Duo
	1 Mini PCI slot free for cards installed ex factory
	512 MB DDR2RAM, expandable ex factory to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	on-board SATA RAID 1 controller, Intel® Matrix Storage Technology
	hard disk, 2½-inch, 40 GB
	1 serial port RS232 and 4 USB 2.0 ports
<b>Options</b>	24 V DC power supply
	processor Intel® Core™2 Duo
	second serial port led out as RS232, RS422 or RS485, optically linked, overload protection
	Mini PCI card with fieldbus interface or Ethernet port
	Mini PCI plug-in card with up to 512 kB NOVRAM for fail-safe storage of process data
	second hard disk, 2½-inch, 40 GB
	Compact Flash or solid-state disk SSD
uninterruptible power supply UPS	
<b>Further information</b>	<a href="http://www.beckhoff.com/C6525">www.beckhoff.com/C6525</a>

# Industrial PC series C66xx

Industrial PC for control cabinet installation



The C66xx series of Industrial PCs has been designed for control cabinet installation. Industrial PCs from this series and a Beckhoff Control Panel with DVI and USB connection or Ethernet Control Panel as operating unit make an ideal combination and offer a high-performance control platform for machine construction and plant engineering applications – particularly in conjunction with the TwinCAT automation software under Windows XP or Embedded Standard. The C66xx is ideally suited as a central processing unit for an EtherCAT control system.



The C66xx control cabinet PC series includes two devices, both of which are equipped with top-performance components with Intel® Core™2 Duo or Core™2 Quad on an ATX motherboard. Versions are additionally available with Intel® Core™ Duo and, in the case of the C6640, also with Celeron® M or Pentium® M. Three free PCI and three PCI Express x1 slots are available for plug-in cards with a length of up to 210 mm. Graphics and 10/100 Mbit Ethernet adapters are already available on-board, without taking up a slot.

All PC connections face upwards, so that the connecting cable can be taken directly to the wiring channel. The side walls are completely passive, and allow the Industrial PC to be fitted immediately next to other control cabinet devices.

The C66xx series is designed for optimum space utilisation and easy accessibility of all components. The C6640 is the most compact PC with ATX motherboard but nevertheless offers convenient access to drives, memory and plug-in cards.

The C6650 features hard drive removable frames which, together with the on-board RAID controller, form a RAID 1 system with two mirrored hard disks. This ensures high data security. Hard disks which failed can easily be exchanged during operation.

The housing design of the C66xx series ensures long-term compatibility with new PC components. The motherboard, processor, memory or hard disk are upgradable, while the same housing can be used for years to come.

The RAM can be extended from 1 GB DDR3 RAM up to 8 GB. A 64-bit operating system is required for 4 GB or above. The device can be equipped with a CD/DVD ROM, multi DVD or Blu-ray multi DVD drive. A choice of a Compact Flash socket or a 2½-inch SSD slot is offered for flash disks. Card holders for the plug-in cards generate insensitivity to impacts and vibrations. The C66xx series PCs are supplied with 100 to 240 V AC full range or 24 V DC power supply unit.

A type plate is located on the front cover, giving detailed information about the PC configuration.

The housing design offers plenty of scope for adjustment to the respective application.

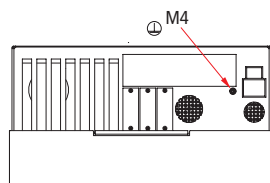
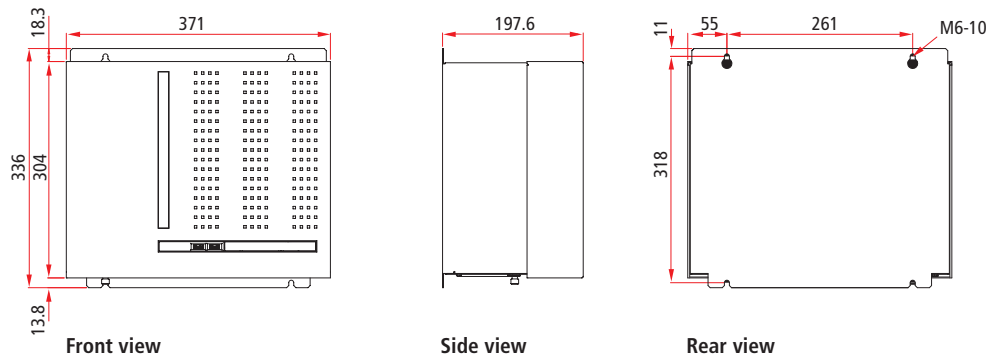
	C6640	C6650
<b>Processor</b>	Intel® Core™2 Duo or Core™2 Quad	Intel® Core™ Duo or Core™2 Duo
<b>Motherboard</b>	ATX	ATX
<b>Slots</b>	7	7
<b>Free slots</b>	3 PCI, 3 PCIe x1 and 1 PCIe x16 graphic card slot	3 PCI, 3 PCIe x1 and 1 PCIe x16 graphic card slot
<b>Maximum card length</b>	6 x 210 mm	6 x 210 mm
<b>Memory</b>	1...8 GB DDR3RAM	1...8 GB DDR3RAM
<b>Graphic adapter</b>	on-board	on-board
<b>Ethernet</b>	on-board	on-board
<b>Hard disks</b>	1 x 3½-inch and 1 x 2½-inch or CF card	1 or 2 x 3½-inch and 1 x 2½-inch or CF card
<b>RAID 1</b>	–	2 x 3½-inch HDD
<b>Possible disk drives</b>	CD/DVD-ROM, multi DVD or Blu-ray	CD/DVD-ROM, multi DVD or Blu-ray
<b>Power supply</b>	100...240 V AC or 24 V DC	100...240 V AC or 24 V DC
<b>Dimen. (W x H x D)</b>	371 x 336 x 198 mm	410 x 360 x 201 mm



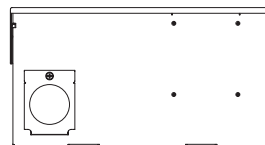


## C6640 | Control cabinet Industrial PC

The Industrial PC C6640 is designed for installation in a control cabinet and fitted with components of the highest performance class meeting the ATX standard. A Beckhoff Control Panel and the C6640 make an ideal combination, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows XP or Embedded Standard.



Top view



View from below

Dimensions in mm

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com).  
The device must be installed in the orientation that is shown in the front view drawing.

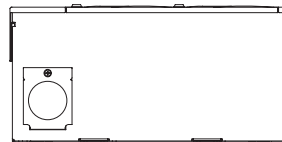
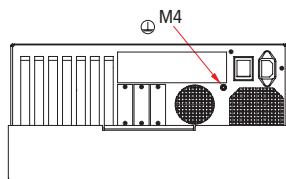
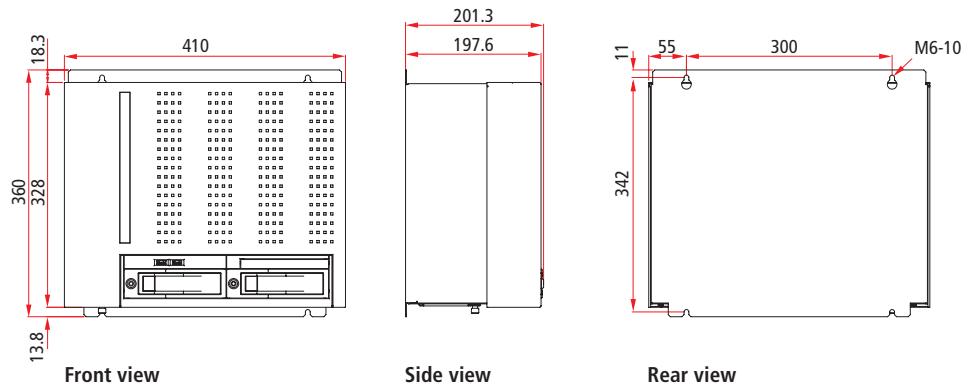


C6640	Control cabinet PC
<b>Housing</b>	7-slot ATX Industrial PC for control cabinet installation
	all slots for plug-in cards with a length of up to 210 mm
	drives and plug-in cards easily accessible
	all connectors on the top
	detailed PC configuration information on the front
	card holders, actuated without tools
	protection class IP 20
	operating temperature 0...55 °C
<b>Features</b>	weight of the basic configuration 11 kg (24.3 lbs)
	dimensions (W x H x D) 371 x 336 x 198 mm (14.6" x 13.2" x 7.8")
	processor Intel® Core™2 Duo 2.53 GHz
	ATX motherboard for Intel® Core™2 Duo or Core™2 Quad
	3 PCI Express x1 slots, 3 PCI slots and 1 PCI Express x16 graphic card slot free
	1 GB DDR3RAM, expandable to 8 GB
	on-board graphic adapter, Intel® GMA 4500MHD, monitor connector
	on-board Ethernet adapter with 10/100BASE-T connector
	hard disk, 3½-inch, 250 GB
	4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 12 USB 2.0, 4 of these USB ports are led out; and 1 parallel port
PS/2 keyboard socket and PS/2 mouse socket	
<b>Options</b>	100–240 V AC full range power supply
	processor Intel® Core™2 Quad
	for variants with Intel® Celeron® M, Pentium® M or Core™ Duo see price list
	second on-board Ethernet adapter with 10/100/1000BASE-T connector
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	ADD-IN card with one or two DVI connectors
	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
uninterruptible power supply UPS	
<b>Further information</b>	<a href="http://www.beckhoff.com/C6640">www.beckhoff.com/C6640</a>



## C6650 | Control cabinet Industrial PC

The Industrial PC C6650 is designed for installation in a control cabinet and fitted with components of the highest performance class meeting the ATX standard. A Beckhoff Control Panel and the C6650 make an ideal combination, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows XP or Embedded Standard.



Dimensions in mm

Top view

View from below

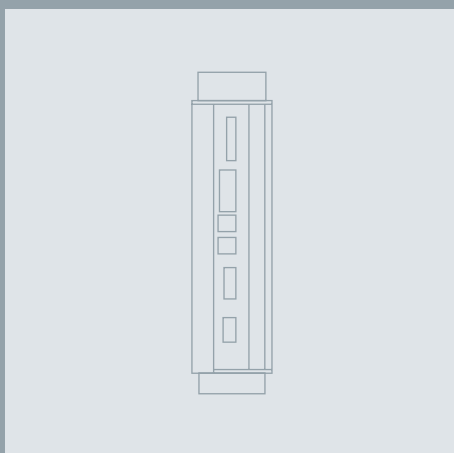
The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com).  
The device must be installed in the orientation that is shown in the front view drawing.



C6650	Control cabinet PC
<b>Housing</b>	7-slot ATX Industrial PC for control cabinet installation
	all slots for up to 210 mm long plug-in cards
	2 removable frames for hard disks
	drives and plug-in cards easily accessible
	all connectors on the top
	detailed PC configuration information on the front
	card holders, actuated without tools
	protection class IP 20
	operating temperature 0...55 °C
	weight of the basic configuration 12 kg (26.5 lbs)
dimensions (W x H x D) 410 x 360 x 201 mm (16.1" x 14.2" x 7.9")	
<b>Features</b>	processor Intel® Core™2 Duo 2.53 GHz
	ATX motherboard for Intel® Core™2 Duo or Core™2 Quad
	3 PCI Express x1 slots, 3 PCI slots and 1 PCI Express x16 graphic card slot free
	1 GB DDR3RAM, expandable to 8 GB
	on-board graphic adapter, Intel® GMA 4500MHD, monitor connector
	on-board Ethernet adapter with 10/100BASE-T connector
	on-board SATA RAID 1 controller, Intel® Matrix Storage Technology
	hard disk, 3½-inch, 250 GB, built into removable frames
	4 serial ports RS232 on-board, 1 of these RS232 ports is led out with D-sub 9 connector; 12 USB 2.0, 4 of these USB ports are led out; and 1 parallel port
	PS/2 keyboard socket and PS/2 mouse socket
100–240 V AC full range power supply	
<b>Options</b>	processor Intel® Core™2 Quad
	for variants with Intel® Celeron® M, Pentium® M or Core™ Duo see price list
	second on-board Ethernet adapter with 10/100/1000BASE-T connector
	slot bracket with additional serial ports RS232/RS422/RS485 or USB 2.0 ports
	PCI plug-in cards: fieldbus interface, Ethernet adapter, serial interface card, modem or ISDN adapter
	ADD-IN card with one or two DVI connectors
	second hard disk, 3½-inch, 250 GB
	Compact Flash or solid-state disk SSD
	CD/DVD-ROM, multi DVD or Blu-ray multi DVD drive
	24 V DC power supply
uninterruptible power supply UPS	
<b>Further information</b>	<a href="http://www.beckhoff.com/C6650">www.beckhoff.com/C6650</a>

# Industrial PC series C69xx

Industrial PC for control cabinet installation



The C69xx Industrial PC series is designed for installation in control cabinets. The Industrial PCs of this series and a Beckhoff Control Panel with DVI and USB connection as operating unit make an ideal combination, representing a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional.



The C69xx Industrial PC series is designed for installation in control cabinets. The compact aluminium housing of the C69xx Industrial PCs is equipped with a 3½-inch motherboard. All PC connections are on one side of the housing. The PC can optionally be equipped with mounting plates on two sides and fastened with screws in the control cabinet. Installation is possible at the rear panel or on the right-hand side panel (see figure).

The C69xx series PCs are supplied with a 24 V DC power supply unit, optionally with integrated uninterruptible power supply (UPS). A battery pack can be connected externally and installed on a DIN rail close to the PC. Cooling fins behind the right-hand side panel enable fanless operation of the PC at temperatures up to 55 °C. The four types of Industrial PCs in the C69xx series differ in their processors and data storage devices.

Cooling of the C6915 with Intel® Atom™ 1.1 or 1.6 GHz and the C6925 with Intel® Celeron® M ULV 1 GHz requires no fan. The basic configuration of the C6915 and C6925 features a flash disk, thereby creating PCs without moving parts. A hard disk or a second CF card can be integrated in all of the PCs from this series as an option.

The C6920 with Intel® Core™ Duo or Core™2 Duo has an easily exchangeable fan cartridge on the underside of the housing. The C6930 Industrial PC is also offered with Intel® Core™ Duo or Core™2 Duo. It has a SATA RAID controller for mirroring two hard disks. In the basic configuration, one of the two hard disk slots is equipped with a 40 GB drive. A second hard disk is offered as an option. In addition, a Compact Flash slot is accessible behind the front cover.

All of the CP69xx PCs feature a free Mini PCI slot. The Beckhoff Mini PCI fieldbus cards

for PROFIBUS (FC3151), CANopen (FC5151), DeviceNet (FC5251), SERCOS (FC7551), or a further Ethernet card (FC9151) can be used.

Industrial PCs of this series and a Beckhoff Control Panel with DVI and USB connection or an Ethernet Control Panel as operating unit make an ideal combination and offer a high-performance control platform for machine construction and plant engineering applications, particularly in conjunction with the TwinCAT automation software under Windows Embedded Standard or Windows XP Professional. Due to its two independent Ethernet interfaces, the C69xx is ideally suited as a compact central processing unit for an EtherCAT control system. While the 100 Mbit Ethernet port offers optimum performance for all EtherCAT control tasks, a Gigabit port is available for connecting the higher-level network. The C6915 even has two Gigabit ports.

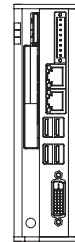
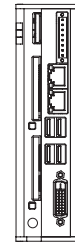
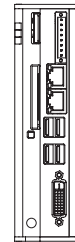
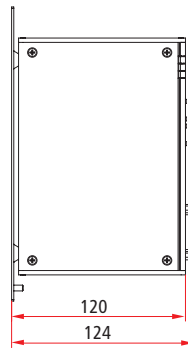
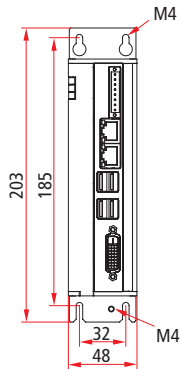
	C6915	C6920	C6925	C6930
<b>Processor</b>	Intel® Atom™	Intel® Core™ Duo or Core™2 Duo	Intel® Celeron® M ULV 1 GHz	Intel® Core™ Duo or Core™2 Duo
<b>Motherboard</b>	3½-inch motherboard	3½-inch motherboard	3½-inch motherboard	3½-inch motherboard
<b>Free slots</b>	1 Mini PCI	1 Mini PCI	1 Mini PCI	1 Mini PCI
<b>Memory</b>	1 GB DDR2RAM	512 MB...3 GB DDR2RAM	256 MB...2 GB DDR RAM	512 MB...3 GB DDR2RAM
<b>Graphic adapter</b>	on-board	on-board	on-board	on-board
<b>Ethernet</b>	2 on-board	2 on-board	2 on-board	2 on-board
<b>Hard disks</b>	2½-inch and/or CF card or 2 CF cards	2½-inch and/or CF card or 2 CF cards	2½-inch and/or CF card or 2 CF cards	1 or 2 x 2½-inch and CF card
<b>RAID 1</b>	–	–	–	2 x 2½-inch HDD
<b>Power supply</b>	24 V DC	24 V DC	24 V DC	24 V DC
<b>Dimen. (W x H x D)</b>	48 x 164 x 116 mm	65 x 231 x 116 mm	65 x 208 x 116 mm	89 x 231 x 119 mm



## C6915 | Control cabinet Industrial PC with Intel® Atom™

The C6915 Industrial PC is designed for control cabinet installation. The compact housing is equipped with a 3½-inch motherboard with Intel® Atom™. All PC connections are located at the front of the housing. The Industrial PC is cooled by internal cooling fins without a fan, allowing operation at up to 55 °C.

Mounting at the back



Dimensions in mm

Front view

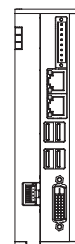
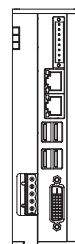
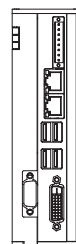
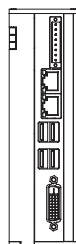
Side view

CF version

2 x CF version

HDD version

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in these drawings.



Basic configuration

PROFIBUS

CANopen

DeviceNet

Ethernet

SERCOS interface



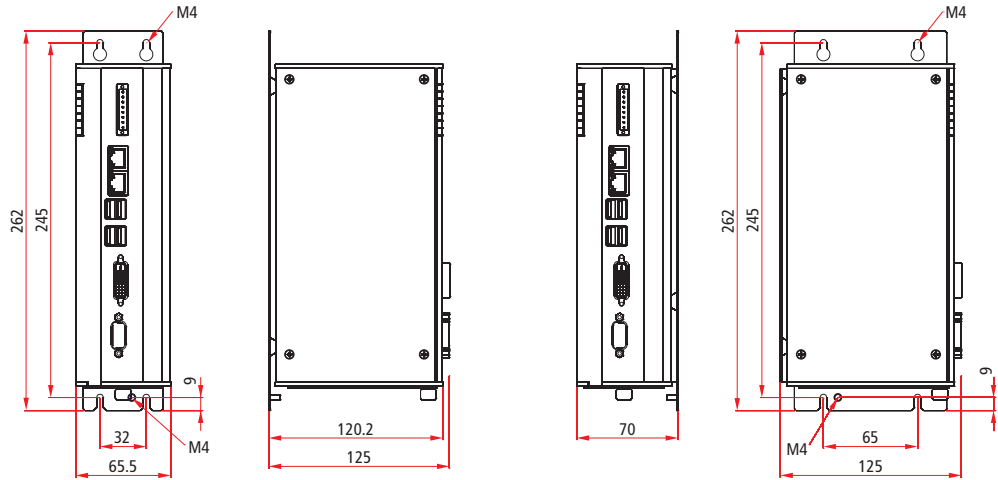
C6915	Fanless control cabinet PC
<b>Housing</b>	fanless Industrial PC for space-saving control cabinet installation
	mounting sheet at the rear wall
	all connectors on the front
	status LEDs
	lithium battery accessible behind the front flap
	slot for 1 Compact Flash card behind the front flap
	passive cooling without fan
	5 cm (2") free space on top and bottom of the PC necessary for air circulation
	protection class IP 20
	operating temperature 0...55 °C
weight of the basic configuration 1.25 kg (2.8 lbs)	
compact dimensions (W x H x D) 48 x 164 x 116 mm (1.9" x 6.5" x 4.6") without mounting plate	
<b>Features</b>	processor Intel® Atom™ 1.1 GHz
	3½-inch motherboard for Intel® Atom™
	1 Mini PCI slot free for cards installed ex factory
	1 GB DDR2RAM
	on-board graphic adapter, Intel® GMA 500, DVI-D connector
	on-board dual Ethernet adapter with 2 x 10/100/1000BASE-T connector
	64 MB Compact Flash card type I, extended temperature range
	4 USB 2.0 ports
24 V DC power supply	
operating system Microsoft Windows CE, English	
<b>Options</b>	processor Intel® Atom™ 1.6 GHz
	mounting plate at the side wall, instead of plate at the rear wall
	serial port led out as RS232, RS422 or RS485, optically linked, overload protection
	Mini PCI card with fieldbus interface or Ethernet port
	Mini PCI card with up to 512 kB NOVRAM for fail-safe storage of process data
	hard disk, 2½-inch, 40 GB
	larger or second Compact Flash card
	solid state disk SSD
	uninterruptible power supply UPS
	TwinCAT run-time for Windows CE
Microsoft Windows XP, Windows Embedded Standard	
<b>Further information</b>	<a href="http://www.beckhoff.com/C6915">www.beckhoff.com/C6915</a>





## C6920 | Control cabinet Industrial PC

The Industrial PC C6920 is designed for control cabinet installation. The compact case is equipped with a 3½-inch motherboard for Intel® Core™Duo or Core™2 Duo. All PC connections are located at the front of the housing. The cooling is done by internal cooling fins and an easily exchangeable fan cartridge at the bottom of the housing.

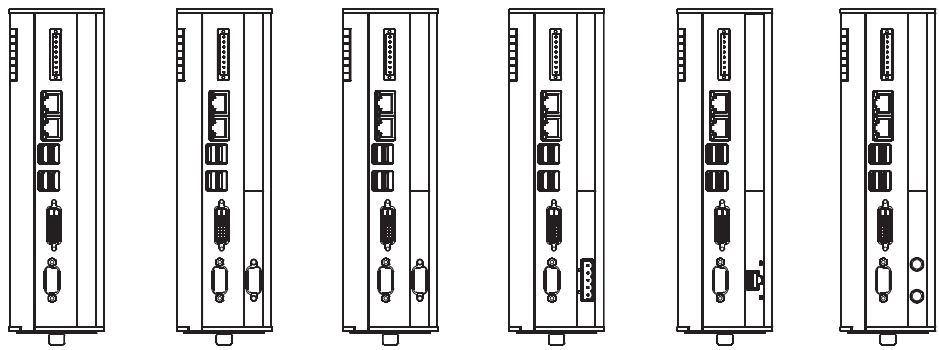


Dimensions in mm

Front view  
Side view  
Mounting at the back

Front view  
Side view  
Mounting at the side

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in these drawings.



Basic configuration PROFIBUS CANopen DeviceNet Ethernet SERCOS interface



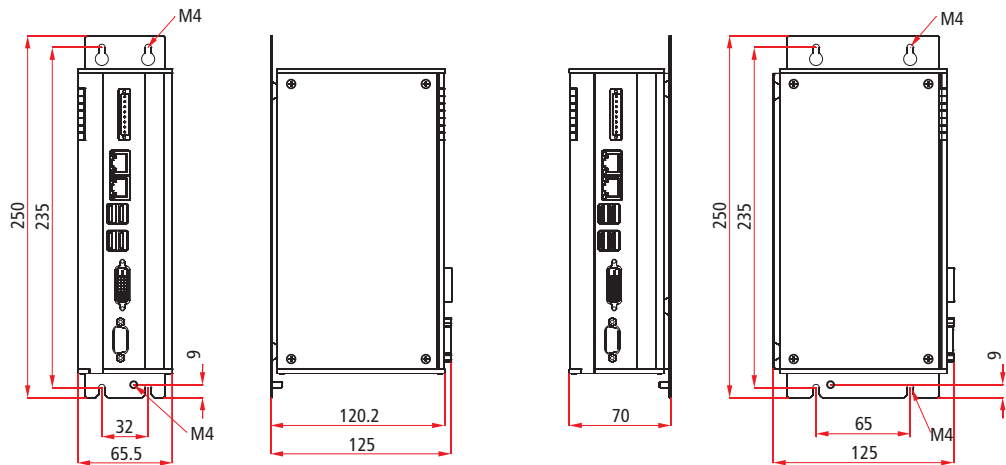
C6920	Control cabinet PC
<b>Housing</b>	Industrial PC for space-saving control cabinet installation
	mounting sheet at the rear wall
	all connectors on the front
	status LEDs
	lithium battery accessible behind the front flap
	slot for one 2½-inch hard disk behind the front flap
	slot for 1 Compact Flash card behind the front flap
	fan cartridge with speed control and double ball bearing fans, accessible from the front
	5 cm (2") free space above and under the PC required for air circulation
	protection class IP 20
<b>Features</b>	operating temperature 0...55 °C
	weight of the basic configuration 1.9 kg (4.2 lbs)
	compact dimensions (W x H x D) 65 x 231 x 116 mm (2.6" x 9.1" x 4.6") without mounting plate
	processor Intel® Core™ Duo 2.0 GHz
	3½-inch motherboard for Intel® Core™ Duo or Core™2 Duo
	1 Mini PCI slot free for cards installed ex factory
	512 MB DDR2RAM, expandable ex factory to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	hard disk, 2½-inch, 40 GB
<b>Options</b>	1 serial port RS232 and 4 USB 2.0 ports
	24 V DC power supply
	processor Intel® Core™2 Duo
	for variants with Intel® Celeron® M or Pentium® M see price list
	mounting plate at the side wall, instead of plate at the rear wall
	second serial port led out as RS232, RS422 or RS485, optically linked, overload protection
	Mini PCI card with fieldbus interface or Ethernet port
	Mini PCI card with up to 512 kB NOVRAM for fail-safe storage of process data
	Compact Flash or solid-state disk SSD
	uninterruptible power supply UPS
<b>Further information</b>	<a href="http://www.beckhoff.com/C6920">www.beckhoff.com/C6920</a>



The orientation shown in this picture is not a permissible installation position.

## C6925 | Fanless control cabinet Industrial PC

The Industrial PC C6925 is designed for control cabinet installation. The compact housing is equipped with an Intel® Celeron® M ULV processor on a 3½-inch motherboard. All PC connections are located at the front of the housing. The cooling is done by cooling fins inside the housing. The PC can operate at temperatures up to 55 °C.



Dimensions in mm

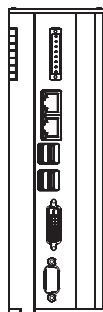
Front view  
Mounting at the back

Side view

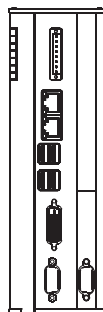
Front view  
Mounting at the side

Side view

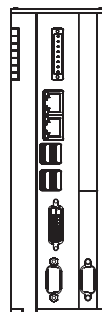
The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in these drawings.



Basic configuration



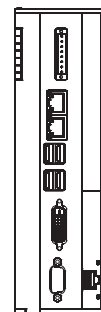
PROFIBUS



CANopen



DeviceNet



Ethernet



SERCOS interface

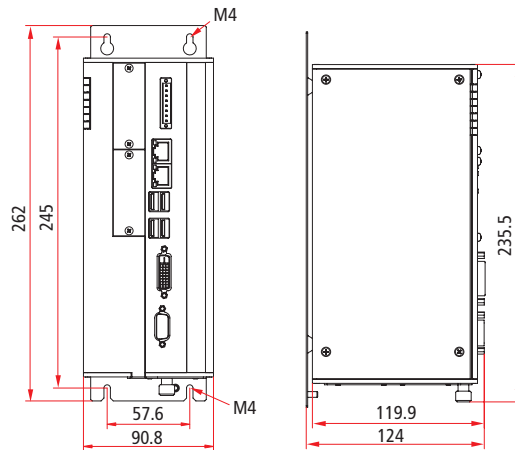


C6925	Fanless control cabinet PC
<b>Housing</b>	fanless Industrial PC for space-saving control cabinet installation
	mounting sheet at the rear wall
	all connectors on the front
	status LEDs
	lithium battery accessible behind the front flap
	slot for a 2½-inch hard disk behind the front flap
	slot for 1 Compact Flash card behind the front flap
	passive cooling without fan with a heat sink
	5 cm (2") free space on top and bottom of the PC necessary for air circulation
	protection class IP 20
<b>Features</b>	operating temperature 0...55 °C
	weight of the basic configuration 1.75 kg (3.9 lbs)
	compact dimensions (W x H x D) 65 x 208 x 116 mm (2.6" x 8.2" x 4.6") without mounting plate
	processor Intel® Celeron® M ULV 1.0 GHz
	3½-inch motherboard for Intel® Celeron® M or Pentium® M
	1 Mini PCI slot free for cards installed ex factory
	256 MB DDR RAM, expandable ex factory to 2 GB
	on-board graphic adapter, Intel® Extreme Graphic, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	64 MB Compact Flash card type I, extended temperature range
<b>Options</b>	1 serial port RS232 and 4 USB 2.0 ports
	24 V DC power supply
	operating system Microsoft Windows CE, English
	mounting plate at the side wall, instead of plate at the rear wall
	second serial port led out as RS232, RS422 or RS485, optically linked, overload protection
	Mini PCI card with fieldbus interface or Ethernet port
	Mini PCI card with up to 512 kB NOVRAM for fail-safe storage of process data
	hard disk, 2½-inch, 40 GB
	larger or second Compact Flash card
	uninterruptible power supply UPS
<b>Further information</b>	<a href="http://www.beckhoff.com/C6925">www.beckhoff.com/C6925</a>



## C6930 | Control cabinet Industrial PC

The C6930 Industrial PC is designed for control cabinet installation. The compact housing is equipped with a 3½-inch motherboard for Intel® Core™ Duo or Core™2 Duo. The C6930 has a SATA RAID controller for mirroring two hard disks. Cooling fins behind the right-hand side panel enable fanless operation of the PC at temperatures up to 55 °C.

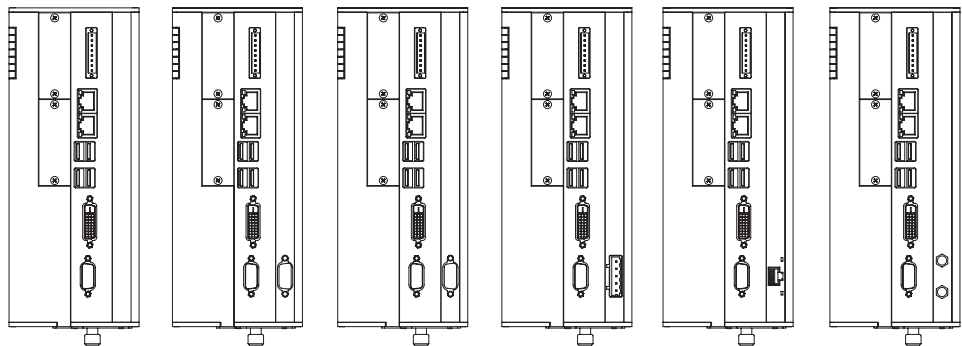


Dimensions in mm

Front view

Side view

The drawings are available as AutoCAD DXF files at [www.beckhoff.com](http://www.beckhoff.com). The device must be installed in the orientation that is shown in these drawings.



Basic configuration

PROFIBUS

CANopen

DeviceNet

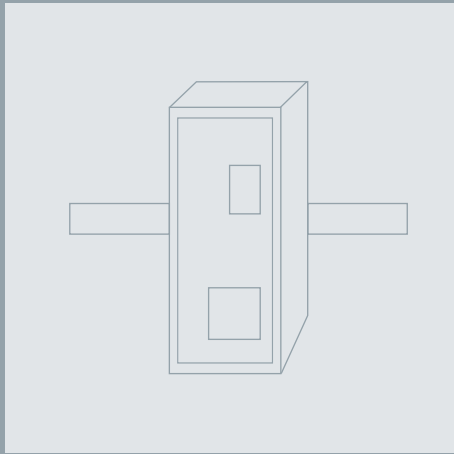
Ethernet

SERCOS interface



C6930	Control cabinet PC
Housing	Industrial PC for space-saving control cabinet installation
	mounting sheet at the rear wall
	all connectors on the front
	status LEDs
	lithium battery accessible behind the front flap
	2 slots for 2½-inch hard disks behind the front flap
	slot for 1 Compact Flash card behind the front flap
	2 brackets for additional interfaces installed ex factory
	fan cartridge with speed control and double ball bearing fans, accessible from the front
	5 cm (2") free space above and under the PC required for air circulation
	protection class IP 20
	operating temperature 0...55 °C
	weight of the basic configuration 2.1 kg (4.6 lbs)
compact dimensions (W x H x D) 89 x 231 x 119 mm (3.5" x 9.1" x 4.7") without mounting plate	
Features	processor Intel® Core™ Duo 2.0 GHz
	3½-inch motherboard for Intel® Core™ Duo or Core™2 Duo
	1 Mini PCI slot free for cards installed ex factory
	512 MB DDR2RAM, expandable ex factory to 3 GB
	on-board graphic adapter, Intel® GMA950, DVI-I connector
	on-board dual Ethernet adapter with 1 x 10/100BASE-T and 1 x 10/100/1000BASE-T connector
	on-board SATA RAID 1 controller, Intel® Matrix Storage Technology
	1 hard disk, 2½-inch, 40 GB
	1 serial port RS232 and 4 USB 2.0 ports
	24 V DC power supply
Options	processor Intel® Core™2 Duo
	mounting plate at the side wall, instead of plate at the rear wall
	serial ports led out as RS232, RS422 or RS485, optically linked, overload protection
	2 additional USB interfaces
	sound connection, Line output and Line input
	Mini PCI card with fieldbus interface or Ethernet port
	Mini PCI card with up to 512 kB NOVRAM for fail-safe storage of process data
	second hard disk, 2½-inch, 40 GB
	Compact Flash or solid-state disk SSD
	uninterruptible power supply UPS
Further information	<a href="http://www.beckhoff.com/C6930">www.beckhoff.com/C6930</a>

# Accessories Industrial PC

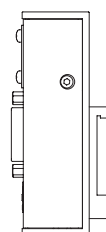


Display, keyboard, mouse and removable data storage devices are connected to the Industrial PC via DVI and USB. More interfaces and longer cables between the devices are important requirements in industrial environments. The CU8xxx series offers various adaptors for extending and branching DVI and USB. CF cards and USB sticks are offered as data storage devices that can be connected externally via USB. The storage of energy is the task of the C9900-U330 battery pack, which is used together with all PCs with a 24 V power supply unit and integrated UPS.

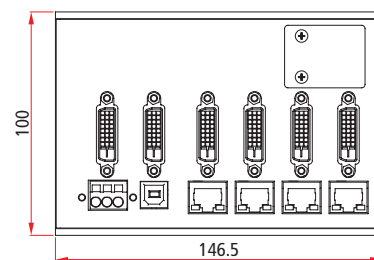


## CU8810 | DVI splitter

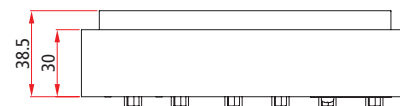
A common application in machine and plant construction is the simultaneous display of a PC screen on several monitors. Up to four DVI/USB Control Panels can be connected to a PC via the CU8810 DVI splitter. Thanks to DVI/USB extension technology, the Control Panels can each be connected at distances of 50 m from the DVI splitter. PCs with two DVI outputs, which are configured as extended desktops, generate two different screen contents. Both DVI outputs can be fed into the DVI splitter. Using DIP switches, the four DVI outputs can each be assigned to one of the two DVI inputs, so that the Control Panels show either the left or the right half of the desktop, as selected.



Side view



Front view



Dimensions in mm

Top view

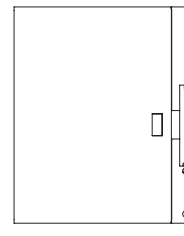
CU8810	DVI splitter
	metal housing for DIN rail installation
	compact industrial design
	2 DVI-D inputs
	4 DVI-D outputs
	assignment of the 4 DVI outputs to the 2 inputs freely configurable via DIP switches
	DVI inputs and outputs with full DVI data range up to 1.65 Gbit/s
	unused DVI input and outputs can be switched off to save energy
	1 USB input with USB B socket
	4-port USB hub with 4 USB Extended outputs as RJ 45 connectors
	USB transfer rate up to 12 Mbit/s for USB 1.1, downwards compatible to USB 1.0
	protection class IP 20
	operating temperature 0...55 °C
	dimensions (W x H x D) 146.5 x 100 x 38 mm (5.8" x 4" x 1.5")
	24 V DC power supply



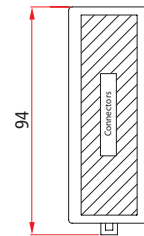


## CU8800, CU8850 | USB extension

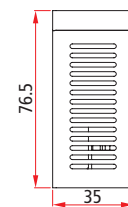
The USB specification allows a distance of 5 m between the PC and the USB devices. A further 5 metres of cable can be added by using a USB hub. In the construction of machines and plants, larger distances must be bridged without having to insert a USB hub every 5 metres. The CU8800 USB Extender sends the USB signal via a CAT5 cable that can be up to 50 m long to the CU8850 USB Extended receiver, which converts the signal back to USB. Data rates of up to 12 Mbit/s can be transmitted. Both USB Extender boxes are designed for DIN rail mounting. The CU8800 transmitter is powered by the PC. The CU8850 receiver has an integrated 24 V DC power supply unit.



Side view



Front view



Dimensions in mm

Top view

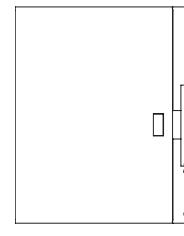
Technical data	CU8800   USB Extender Tx	CU8850   USB Extender Rx
	USB Extended transmitter box	USB Extended receiver box
	1 USB input with USB B socket to be connected to the PC in maximum 1 m distance	1 USB Extended input with RJ 45 socket for up to 50 m CAT5 cable
	1 USB Extended output with RJ 45 socket for up to 50 m CAT5 cable	1 USB output with USB A socket to be connected to an USB device in maximum 5 m distance
	–	quick error analysing with diagnostic LEDs
	plastic housing for DIN rail installation	
	USB transfer rate up to 12 MBit/s for USB 1.1, downwards compatible to USB 1.0	
	protection class IP 20	
	operating temperature 0...55 °C	
	dimensions (W x H x D) 35 x 94 x 76.5 mm (1.3" x 3.7" x 3")	
	power supply via USB	24 V DC power supply



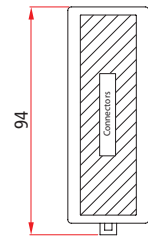
## CU8005 | 4-port USB 2.0 hub, CU8870 | USB Compact Flash slot

The CU8005 USB hub for DIN rail-mounting has four ports and supports the USB 2.0 data transfer rate of 480 Mbit/s, but is also compatible with slower USB standards. Whereas the USB standard prescribes a power supply of 5 V/0.5 A for each USB downstream output, the CU8005 even provides 5 V/1 A for each USB device.

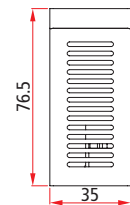
The CU8870 offers a Compact Flash socket with USB connector. The Compact Flash cards are hot-plug capable in the CU8870 and can hence be plugged and unplugged like removable data storage devices for exchanging data with other PCs during operation. Together with the CU8800 and the CU8850, this CF socket can be mounted on a DIN rail at a distance of up to 50 m from the PC.



Side view



Front view



Dimensions in mm

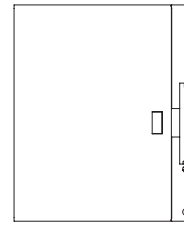
Top view

Technical data	CU8005   4-port USB 2.0 hub	CU8870   USB Compact Flash slot
	1 USB 2.0 input with USB B socket	Compact Flash slot for CF cards type I and II
	4 USB 2.0 outputs with USB A socket	front LED indicators for: PWR (power), LOCK (read only) and CF access
	delivers up to 1 A supply current at each USB downstream output	1 USB 2.0 input with USB B socket
	USB transfer rate up to 480 Mbit/s, compatible to all USB standards	
	plastic housing for DIN rail installation	
	protection class IP 20	
	operating temperature 0...55 °C	
	dimensions (W x H x D) 35 x 94 x 76.5 mm (1.3" x 3.7" x 3")	
	24 V DC power supply	power supply via USB

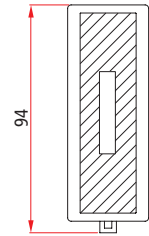


## CU8880 | Ethernet controller with USB input

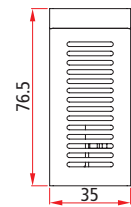
The CU8880 USB-to-LAN adapter places an additional industrially-suited and independent Ethernet interface at the user's disposal. In this way, four or more Ethernet interfaces can be implemented, depending on the system configuration. The CU8880 is used for necessary IT communication, so that the respective on-board Ethernet interfaces are available for EtherCAT or real-time Ethernet communication. Drivers for the USB-to-LAN adapter are available for Windows XP Professional and Windows XP Embedded.



Side view



Front view



Dimensions in mm

Top view

CU8880	Ethernet controller with USB input
	Ethernet controller box
	1 USB 2.0 input with USB B socket
	1 Ethernet interface with 1 x 10/100BASE-T connector RJ 45
	not suitable for real-time Ethernet or EtherCAT
	plastic housing for DIN rail installation
	protection class IP 20
	operating temperature 0...55 °C
	dimensions (W x H x D) 35 x 94 x 76.5 mm (1.3" x 3.7" x 3")
	power supply via USB



## CU8890 | WLAN controller with USB input

The industrial grade CU8890 WLAN controller is based on the standard IEEE 802.11 b/g and is designed for DIN rail installation. Connected to an IPC it offers a fieldbus-independent data exchange. The data exchange module has a reverse SMA plug for connection of various radio antennas. The free choice of antenna enables adaptation to the respective environment. The outdoor range between two modules depends on the environment and can be up to 300 m. The CU8890 can be used either as access-point or as client. Status and data exchange are displayed via LEDs, thereby offering fast and simple diagnostics. Client drivers are available for Windows XP, XP Embedded as well as Windows CE (from CE 6). With the drivers for Windows XP and XP Embedded, the CU8890 can also operate as an access-point.

CU8890	WLAN controller with USB input
	WLAN controller box
	1 USB 2.0 input with USB B socket
	1 antenna connection: reverse SMA connector (RP-SMA)
	IEEE 802.11b/g standard
	bit rate: max. 54 Mbit/s
	dynamic data rate adaption in mode b: 1, 5, 11 Mbit/s; in mode g: 6, 9, 12, 18, 24, 36, 48, 54 Mbit/s
	not suitable for real-time Ethernet or EtherCAT
	64/128 bit encryption, WEP, WPA, WPA2
	cisco compatible extension CCX, supports PEAP and LEAP
	plastic housing for DIN rail installation
	protection class IP 20
	operating temperature 0...55 °C
	dimensions (W x H x D) 34 x 98 x 77 mm (1.3" x 3.9" x 3")
	power supply via USB

Accessories	Description	
ZS6200-0400	omni-directional antenna 4 dBi, matching cables: ZK6000-0102-0020/-0040 (not included in the scope of supply)	640
ZS6100-0900	directional antenna 9 dBi, matching cables: ZK6000-0102-0020/-0040 (not included in the scope of supply)	640
ZS6201-0410	rod antenna 4 dBi, 1 m cable with reverse SMA socket (included in the scope of supply)	641
ZS6201-0500	rod antenna 5 dBi, direct connection, reverse SMA socket	641

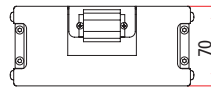
## C9900-U330 | Battery pack

All Industrial PCs can be equipped with a 24 V power supply unit and an integrated UPS. The UPS supplies the PC with power if the mains power fails. This allows data to be saved on the hard disk or Flash, after which the PC can be shut down properly. A battery pack, which serves as the energy storage device, is mounted on a DIN rail outside the PC. Rated at 3.4 Ah, the maintenance-free C9900-U330 24 V battery pack offers a very high nominal capacity in a compact package.

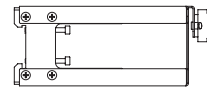
C9900-U330	Battery pack
	battery pack for PCs with 24 V power supply with intergrated UPS
	metal housing for mounting on norm rail TS35x15 2.3
	24 V nominal voltage
	3.4 Ah nominal capacity (20 h discharge)
	two 12 V batteries in series connection
	VRLA AGM Technology = valve regulated lead acid batteries with glass fiber mat inside the separator (VRLA = valve regulated lead acid, AGM = absorbed glass mat technology)
	maintenance-free
	9 A fuse by PTC element
	weight 3.3 kg (7.3 lb)
	operating temperature 0...50 °C
	dimensions (W x H x D) 157 x 70 x 175 mm (6.2" x 2.8" x 6.9")



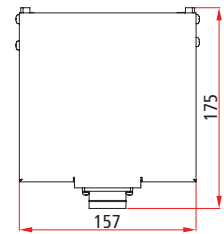
Dimensions in mm



Front view



Side view



Top view

## C9900-H35x | USB sticks

The USB stick replaces the floppy disk drive for the exchange of data between PCs that are not networked with one another. With a storage capacity one thousand times larger than a floppy disk and a speed similar to a hard disk, the hot-plug capable data storage device is in demand everywhere PCs are used. The USB stick can also be used for data backups. A 2 GB USB stick can store the contents of three CDs, whereby the housing of the Beckhoff stick is so small that no collision with adjacent USB plugs occurs, even when the USB sockets are arranged directly alongside one another. Together with the USB extension comprised of the CU8800 and CU8850, a USB stick can be operated at a distance of 50 m from the PC. In the case of systems with a detached DVI/USB Control Panel, a USB stick can be plugged into either the PC or the Control Panel as desired.

Ordering information	USB sticks
C9900-H351	USB stick, 1 GB, USB 2.0
C9900-H352	USB stick, 2 GB, USB 2.0
C9900-H356	USB stick, 4 GB, USB 2.0
C9900-H359	USB stick, 8 GB, USB 2.0





## C9900-A2xx | ADD-IN cards

A common application in machine and plant construction is the display of a PC screen on two monitors simultaneously. The ADD-IN cards offer one or two DVI outputs for PCs with ATX motherboard for Intel® Core™2 Duo or Core™2 Quad, i.e. the Industrial PCs CP65xx-0060, C3xxx-0040, C5102-0040, C6140-0040, C6150-0040, C6240-0040, C6250-0050 and C66xx-0020. The second DVI output is active under Windows XP and optionally shows the same image as the first DVI connection or different image content, i.e. half the extended desktop in each display.

The ADD-IN cards are available in six versions, i.e. with two external outputs, two internal outputs, or one internal and one external output. An internal output is used for connecting the display in the Panel PC front or for one to three CP-Link cards, each controlling a Control Panel at maximum distance of 100 m from the PC.

The C9900-A257 ADD-IN card with an internal and an external DVI connection enables an additional DVI/USB Control Panel to be operated at a C3xxx or CP65xx Panel PC. The C9900-A257 enables DVI and CP-Link Control Panels to be connected simultaneously at a C5102 or C6140, C6150, C6240, C6250 or C66xx control cabinet PCs.

A C9900-A258 ADD-IN card with two internal DVI outputs enables connection of additional CP-Link Control Panels at a C3xxx or CP65xx Panel PC. For 19-inch rack PCs and ATX control cabinet PCs CP-Link Control Panels can be configured as extended desktop so that they display different image content.

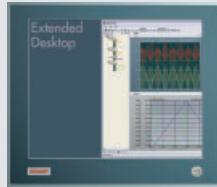
The C9900-A259 ADD-IN card, which features two external DVI connections, enables two DVI/USB Control Panels to be connected to the C5102, C6140, C6150, C6240, C6250 or C66xx PCs. Via the CU8810 DVI splitter these two DVI outputs can be branched further to up to four Control Panels.

DVI/USB Control Panels can be operated up to 50 m away from the PC using DVI/USB extension technology.

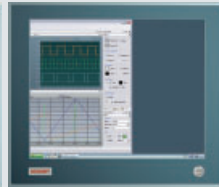
The two-channel ADD-IN card can be configured as an extended desktop to generate different image content. The desktop has twice the display resolution. Each display shows half the screen. The Start menu and the taskbar are shown on one of the two displays and can be moved to the other display. The mouse cursor always jumps to the display on which the operator touches the touch screen. Keyboard entries are always entered in the active window, irrespective of which display this window is currently displayed in. Programs generally start on display no. 1 and can then be moved to the second display. If a window is set to full screen, it will fill the display that previously showed the larger part of the window. In the Windows XP Control Panel the displays can be configured as no. 1 or no. 2, and their relative arrangement can be determined.

Ordering information	ADD-IN cards
C9900-A257	ADD-IN card with one internal DVI interface and one external DVI interface, PCI Express x16 plug-in card
C9900-A258	ADD-IN card with two internal DVI interfaces, PCI Express x16 plug-in card
C9900-A259	ADD-IN card with two external DVI interfaces, PCI Express x16 plug-in card
C9900-A260	ADD-IN card with one external DisplayPort interface, PCI Express x16 plug-in card
C9900-A264	ADD-IN card with two internal DVI interfaces, PCI Express x16 plug-in card
C9900-A265	ADD-IN card with two external DVI interfaces, PCI Express x16 plug-in card

Panel PC 1  
(Windows CE, XP,  
Embedded Standard)



Panel PC 2



USB 1.1/2.0

Panel PC 1  
(Windows CE, XP,  
Embedded Standard)

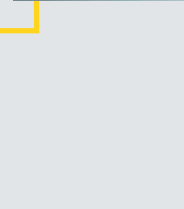


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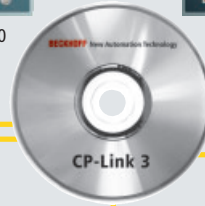
Ethernet UDP/IP (TCP/IP)  
(Multicast)

USB 1.1/2.0

Panel PC x



Ethernet TCP/IP



Ethernet TCP/IP, UDP/IP



Host PC

## CP-Link 3 | Ethernet- and IP protocol-based desktop transfer software

CP-Link 3 transfers the desktop of a PC via Ethernet to several Panel PCs and the operator mouse and keyboard entries to the host PC. The screen contents are captured by a virtual graphic adapter in the host PC and sent using Ethernet to one or more Panel PCs with Windows operating systems (CE, XP or Embedded Standard). Networking can be done using cost-effective standard Ethernet cables (CAT 5) which are suitable for drag chains.

Since the data and image transfer are based on TCP/IP, the operating and display functions can be extended using the Internet. Panel PCs can be integrated using the Internet via VPN (Virtual Private Network). A VPN service must be available for the Internet security functions.

Keyboard entries, touch screen and special key functions are transferred from the client to the host PC via Virtual USB. USB devices connected to a Panel PC appear in the host PC like locally plugged-in devices and can be used in the normal way.

Virtual USB emulates a USB root hub in the host PC. If a USB device is plugged into a Panel PC, then the virtual hub logs the device on to the operating system of the host PC and transparently transmits the ensuing communication. For the operating system, the USB device behaves as though it was directly connected to the PC. Virtual USB transfers the standards USB 1.1 and USB 2.0. As communication takes place using 100 Mbit/s Ethernet, the USB 2.0 transmission performance (480 Mbit/s) is restricted.

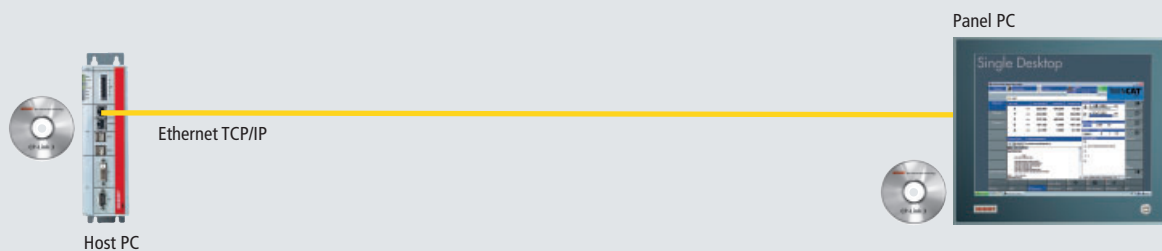
Additional input/output devices on the Panel PCs, such as rotary switches, buttons, etc., are read in by the host PC using an additional communication channel. Printers and webcams, which are connected to a Panel PC by means of USB, can be used from the host PC.

The scope of delivery for CP-Link 3 includes host and client software. The host PC may have Windows XP or Embedded Standard installed. Panel PCs with Windows CE, XP or Embedded Standard are used

as clients. As the application software (PLC/NC, HMI, etc.), once started, runs on the host PC, any necessary software licences are only payable once for the host PC. The client Panel PCs only receive image data. Apart from the operating system and CP-Link 3, no other software licence is required for the clients. Even for PCs with more than one graphics card only one license per application software is required.

The CP-Link 3 software is available in three versions:

- Single Desktop
- Multi Desktop
- Extended Desktop



Single Desktop

## CP-Link 3 | Single Desktop

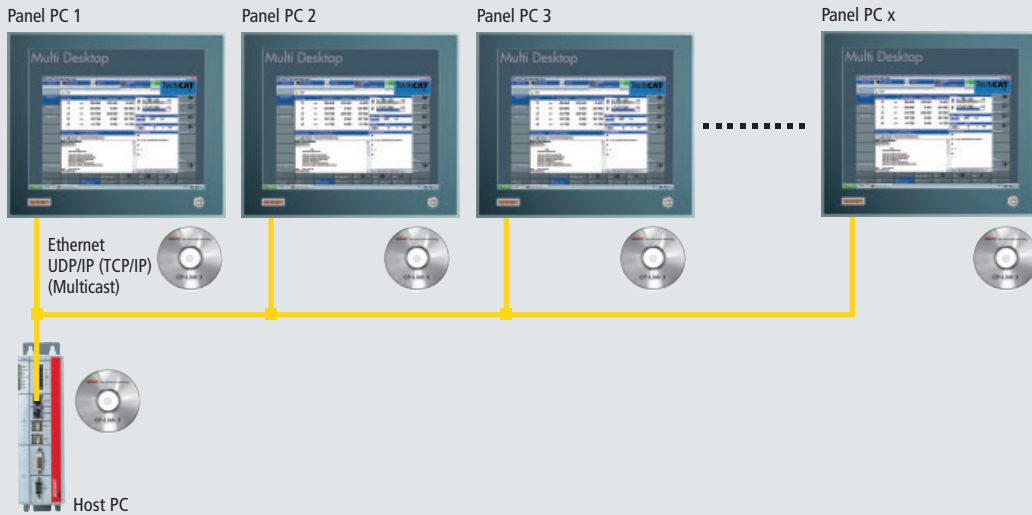
A Panel PC is connected with a host PC via Ethernet and shows the image of the host PC. Communication takes place using TCP/IP.

Keyboard entries, touch screen and special key functions are transferred from

the client to the host PC via Virtual USB. USB devices connected to a Panel PC appear in the host PC just like locally connected devices.

Ordering information	CP-Link 3 Single Desktop
CP-Link 3 Single Desktop	Ethernet and IP protocol-based desktop transfer software CP-Link 3
	transfers the desktop of a PC via Ethernet to one Panel PC
	transmission of mouse and keyboard inputs of the client user to the host PC
	connection by Ethernet or Internet, TCP/IP or UDP/IP
	1 virtual graphic adapter
	Virtual USB
	USB devices connected at the client are found by the host PC like a local USB device.
	1 client controllable
	The client shows the screen of the host PC.
	host software for Beckhoff Industrial PCs with Windows XP or Embedded Standard
client software for Beckhoff Panel PCs with Windows CE, XP or Embedded Standard	





Multi Desktop

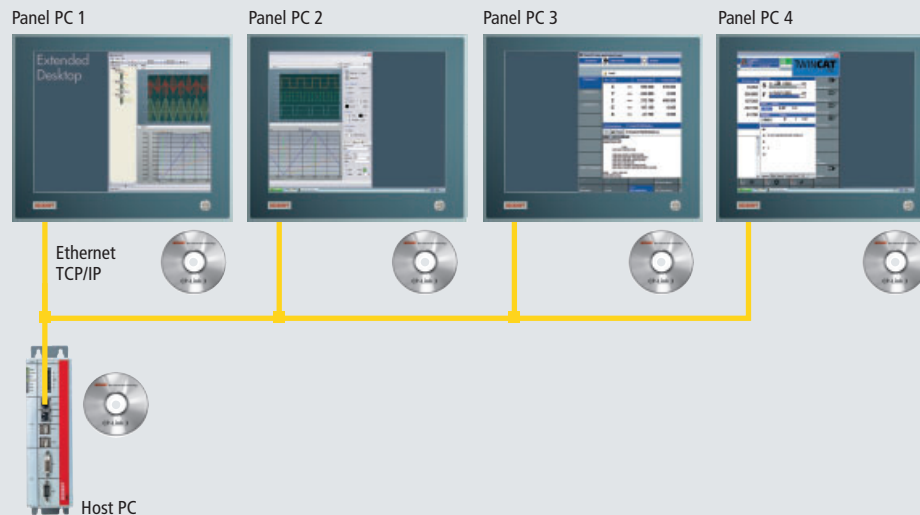
## CP-Link 3 | Multi Desktop

Several Panel PCs are connected with a PC via Ethernet and display the image of the host PC. All connected client Panel PCs show the same image.

transferred to several Panel PCs simultaneously without the transmitter bandwidth multiplying by the number of receivers.

Communication takes place using TCP/IP (up to 10 Panel PCs) or via UDP Multicast (up to 255 Panel PCs). The benefit of Multicast lies in the fact that messages can be

Ordering information	CP-Link 3 Multi Desktop
CP-Link 3 Multi Desktop	Ethernet and IP protocol-based desktop transfer software CP-Link 3
	transfers the desktop of a PC via Ethernet to Panel PCs
	transmission of mouse and keyboard inputs of client users to the host PC
	connection by Ethernet or Internet, TCP/IP or UDP/IP (Multicast)
	1 virtual graphic adapter
	Virtual USB
	USB devices connected at a client are found by the host PC like a local USB device.
	Up to 255 clients are controllable in UDP/IP mode, up to 10 clients in TCP/IP mode.
	All clients show the same picture, the screen of the host PC.
	The input devices can be locked at any client by TwinCAT-PLC or via application programming interface (API)
host software for Beckhoff Industrial PCs with Windows XP or Embedded Standard	
client software for Beckhoff Panel PCs with Windows CE, XP or Embedded Standard	



Extended Desktop

## CP-Link 3 | Extended Desktop

One or several virtual graphic adapters are used to extend the host PC desktop. The program windows of the application software can be moved to additional monitors covered by the extended desktop. Applications may be started on a specific monitor. The desktop can be extended to up to 9 monitors. CP-Link 3 can transfer

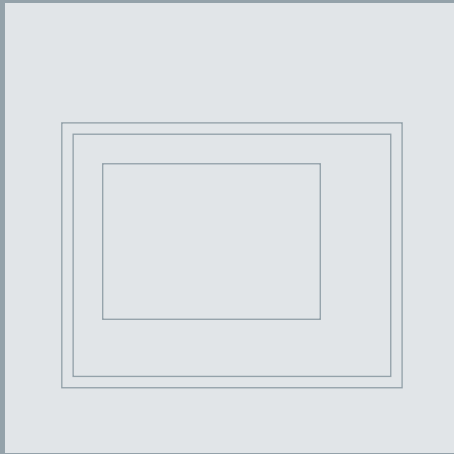
the data via Ethernet to several client Panel PCs. In addition, freely definable image details can be transferred from the host screen to client Panel PCs.

The mouse and keyboard entries of individual clients can be locked via TwinCAT PLC or a software interface (API), in order to prevent interference between several users.

Ordering information	CP-Link 3 Extended Desktop
CP-Link 3 Extended Desktop	Ethernet and IP protocol-based desktop transfer software CP-Link 3 transfers up to 9 screens of the extended desktop of a PC via Ethernet to Panel PCs
	transmission of mouse and keyboard inputs of client users to the host PC
	connection via Ethernet or Internet, TCP/IP or UDP/IP (Multicast)
	Up to 9 virtual graphic adapters extend the desktop of the host PC.
	Virtual USB
	USB devices connected at a client are found by the host PC like a local USB device.
	Up to 255 clients are controllable in UDP/IP mode, up to 10 clients in TCP/IP mode.
	Each client shows 1 of maximally 9 screens of the extended desktop of the host PC.
	The input devices can be locked at any client by TwinCAT PLC or via application programming interface (API).
	Applications are allocable to one of the additional screens of the extended desktop.
	Freely definable areas of the host's screen can be transferred to clients.
	host software for Beckhoff Industrial PCs with Windows XP or Embedded Standard
	client software for Beckhoff Panel PCs with Windows CE, XP or Embedded Standard

# Control Panel

## The PC Control Panel



Operating and display elements form an independent unit, separate from the control level. The computer is located in the control cabinet. This concept, which has been thoroughly implemented in the Beckhoff Control Panel, allows the user much freedom.



The CP6xxx and CP7xxx series Control Panels are designed for use as a human-machine interface. Operating and display elements create an independent unit, separated from the control level. The Control Panel has a flat, elegant form, with a large surface presented to the user, but a low depth. The PC is protected in the control cabinet, yet its location is easily accessible. The PC housing can be optimised for fitting PC components.

### Beckhoff Control Panel

Functionality and esthetic design in aluminium: the Control Panel housing is machined from an aluminium block. Aluminium is a material with many advantages. It has low weight, high strength, enormous resistance to environmental stresses, can easily be machined and is entirely recyclable. All this can be seen and felt in the Beckhoff Control Panel.

### The display is the basis

High-quality TFT displays, with even illumination and long service life, ensure the key requirement: the picture must be right.

For an optimum image the PC should be adjusted to the resolution of the display: 5.7- and 6.5-inch displays have a resolution of 640 x 480 pixels, 12-inch displays 800 x 600, 15-inch Control Panels should have 1024 x 768 pixels, 19-inch displays 1280 x 1024 and 24-inch displays use the resolution 1920 x 1200.

The Control Panel can be fitted with a touch pad or with a touch screen.



**CP6xxx | Built-in Control Panel**  
Operator panel for control cabinet front installation



**CP7xxx | Control Panel**  
Operator panel for mounting arm installation



M6 thread for wall fixing



**What frame does an image need?**

The carefully planned use of design elements gives the Control Panel its reserved and elegant appearance.

The open design possibilities of a membrane keyboard are fully exploited here. The robust keyboard ensures that the IP 65 protection class is retained as if new, even after long use in a tough industrial environment.

Light emitting diodes are integrated into the keys, while slide-in labels mean that exchangeable key identification can match the needs of the plant.

**The emergency stop at the Control Panel**

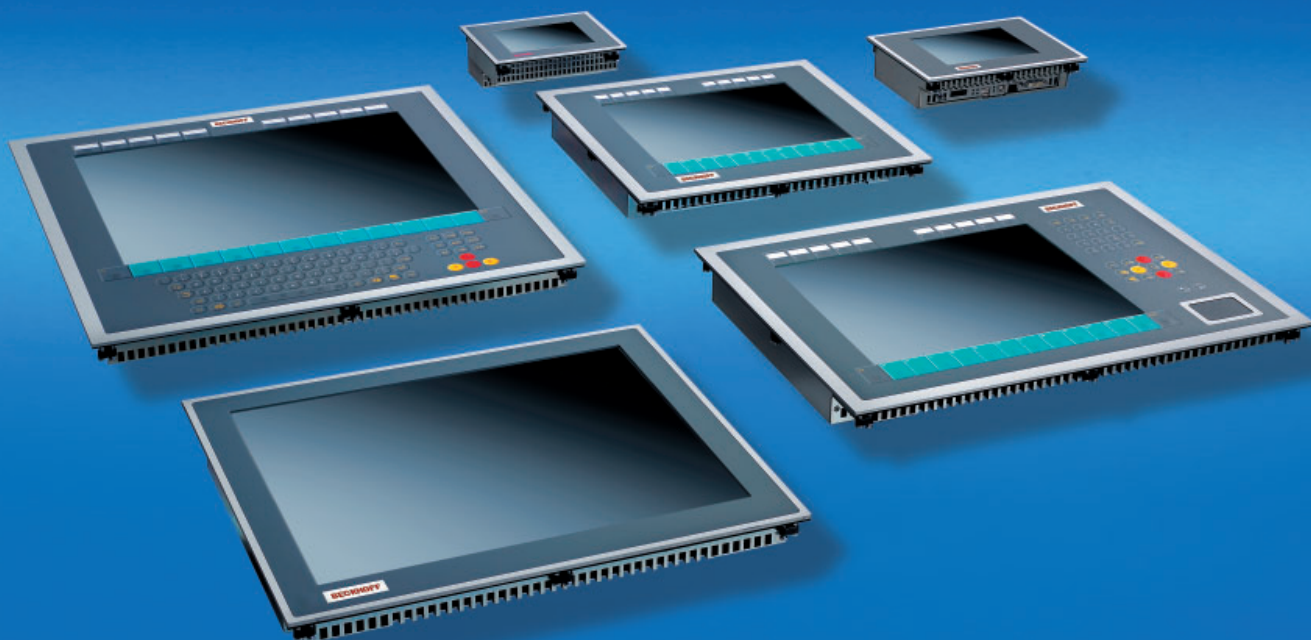
Push-button extensions in the design of the Control Panel make it thicker, but permit the application-specific arrangement of electromechanical keys and other components such as all kinds of switches, barcode scanners, graycode switches and handwheels. External housings can be attached to either side of the Control Panel. The signal leads may be laid separately or can be operated via USB.

**Assembly**

The back plate of the Control Panel series CP7xxx offers a free surface for a variety of assembly methods, for example a mounting arm system.



Mounting arm



### Control Panel for installation in the control cabinet door

The built-in Control Panels CP6xxx are designed for control cabinet installation. Only 4 mm of the front are visible in front of the control cabinet wall. Installation via pull-out clamping levers makes the process very simple without loose parts.

The built-in Control Panels CP66xx are available with 5.7-, 6.5-, 12- or 15-inch TFT display, CP69xx in addition with 19- or 24-inch TFT display, with touch screen or touch pad, as a monitor without keyboard with different membrane keyboard models up to full alphanumeric keyboards with 10 special PLC keys and 10 LEDs. The same range of push-button extensions with electromechanical keys as for the CP7xxx series is available.

The built-in Control Panels are connected to the PC by two different interfaces:

- CP66xx "Economy" Ethernet Control Panel with Intel® IXP processor for Windows CE
- CP69xx "Economy" Control Panel with DVI/USB Extended interface for distances of up to 50 m

The Ethernet Control Panels with integrated processor can be used as an independent controller. For higher performance with Intel® Core™ Duo and Core™2 Duo the built-in Panel PCs CP62xx are available with the same front design.



The clamping levers are released,



pulled out



and fastened.





Control Panel as a monitor



Function keys and special keys



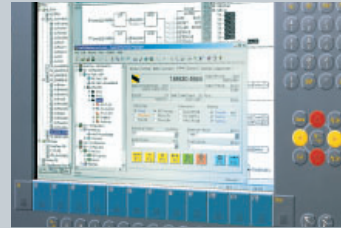
Partial numeric keyboard



Alphanumeric keyboard



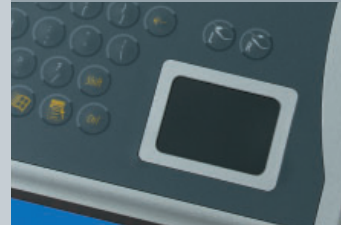
Keyboard socket and serial interface in IP 65



5.7-, 6.5-, 12-, 15-, 19- or 24-inch TFT display



Touch screen



Touch pad

## The Control Panel toolkit

A housing that can be dimensioned precisely in line with the needs of the particular application according to the customer's wishes can be combined with an individually designed membrane keyboard. This puts customisation on a new footing at Beckhoff. Hardly one Control Panel is like another, and yet mass production is in operation.

The Bus Terminal interface integrated into the Control Panel permits the connection of standard Beckhoff Bus Terminals to realise handwheels, graycode switches, buttons, switches, indicator lamps or other components without any additional wiring. Such elements can be integrated into the Control Panel and connected to the PC via USB.



Additional keyboard in IP 65

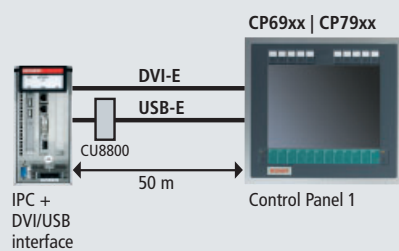


Push-button extensions

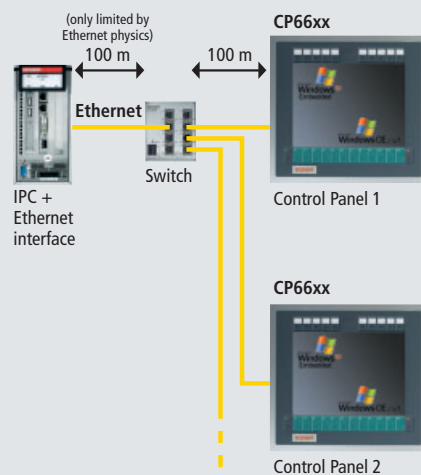


Panel PCs with individual front design

### DVI/USB Extended



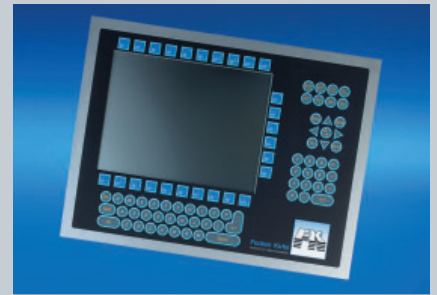
### Ethernet Control Panel





# Customised Beckhoff Control Panel

- cost-effective implementation of company logos in form of a slide-in label for standard Control Panels
- complete revision of the colour scheme of the front membrane based on the corporate design of the company
- customised keyboard extensions according to customer specifications
- realisation of customer-specific bracket adapter plates for integrating different bracket systems
- realisation of complex operating terminals with fieldbus connections (PROFIBUS, Lightbus, CANopen, Ethernet, ...)
- modification of the mechanical/electrical connection of the devices according to the local situation
- development and realisation of the design jointly with the customer

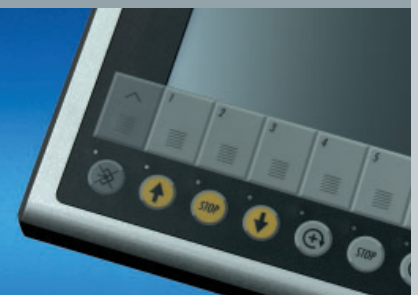


Front membrane design with modified colour scheme and different size membrane keys

Complex operating terminal with fieldbus connection



Large number of electromechanical keys



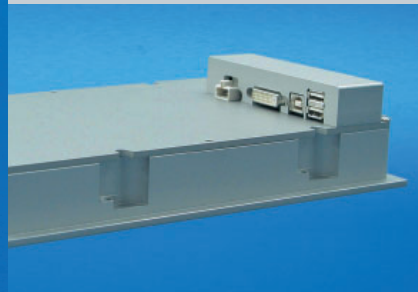
Modified membrane keypad colour scheme and keypad matrix



Individual housing construction



Individual housing design, colour scheme and key shape/layout according to customer requirements



Modified interface layout



Extension with joystick, graycode switch and incremental encoder



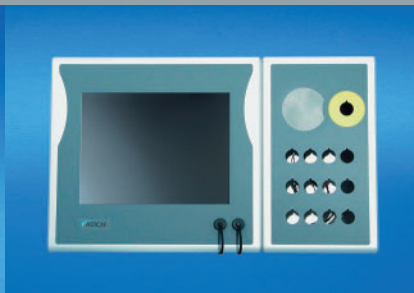
Keyboard with larger number and higher density of membrane keys



Integration of a barcode scanner and signal transducer



Customised colour scheme with customer-specific, separate key extension



Key extension with freely selectable switch elements and integrated speaker



Customised Ethernet Control Panel



Extension with additional display, incremental encoders and switch elements



Individual housing adaptation

**Ethernet panel**

The Control Panels have two independent Ethernet interfaces and can be used as:

- independent Panel PC,
- remote desktop display,
- server terminal.



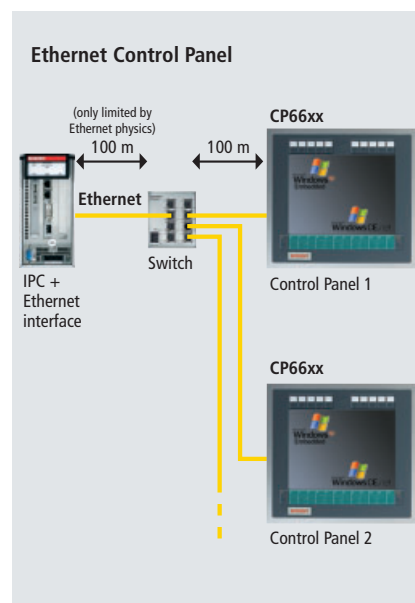
CP66xx | "Economy" built-in Control Panel

# Control Panels with Ethernet interface CP66xx

CP66xx Ethernet Control Panels have a wide range of uses including independent Panel PC, remote desktop display, or server terminal. A PC with Microsoft Windows XP Professional can transfer its image to an Ethernet Control Panel via the remote desktop function. The Ethernet connection between PC and Control Panel can bridge almost any distance, even via the internet. The image of the PC can optionally be displayed on one of several Control Panels distributed across large systems. When a user logs into an Ethernet Control Panel, the other panels are logged out since Windows XP Professional only has one desktop license. A Windows 2003 server enables all Control Panels to be used simultaneously as independent terminals with different display content. In each case communication takes place via one of the two 100 Mbit Ethernet interfaces integrated in the rear of the Control Panel. The processor of the Control Panel is only used for setting up the image on the display and for querying the keyboard and mouse or touch screen. Application software is installed on the server and executed by the

high-performance processor of the server. Data can be entered simultaneously at the different Ethernet Control Panels. In contrast to a PC with a multi-channel graphics card, each Ethernet Control Panel connected to the terminal server has its own mouse and keyboard cursor, so that several operators can work on the same system at the same time. If the same image is to be displayed on several displays, it is advisable to use CP-Link 3 as described on page 190.

The Ethernet Panels can also be used as independent Panel PCs. These devices are ideally suited as small controllers for machine construction and plant engineering applications in conjunction with the TwinCAT automation software under Windows CE.



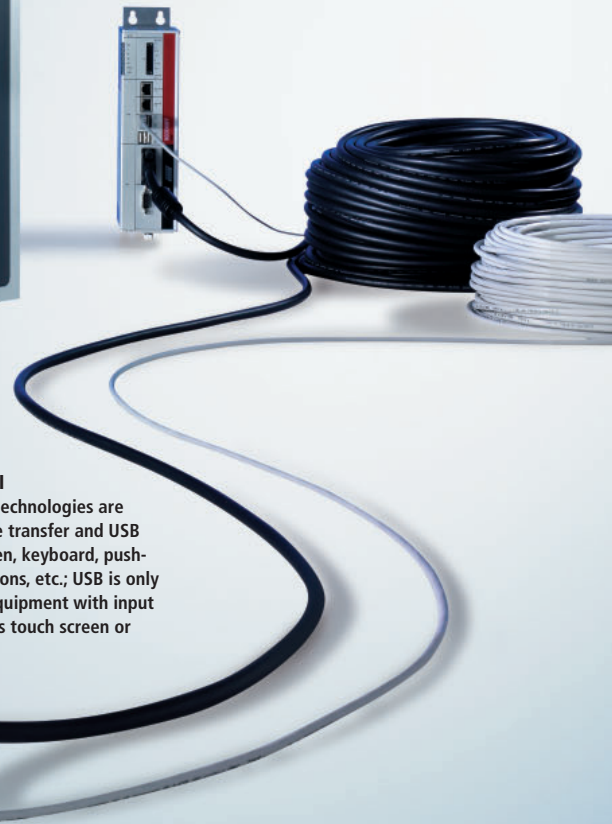
	CP66xx
CPU	Intel® IXP 420, 533 MHz
RAM	128 MB
Flash on-board	32 MB
CF card slot	1
NOVRAM	128–512 kB as Mini PCI
Graphics processor	SM501
Max. resolution	1024 x 768
Display sizes	5.7-, 6.5-, 12- or 15-inch
Slots	1 Mini PCI
USB	2 USB
Ethernet	2 RJ 45 10/100 MBit
Serial ports	1 RS232
Power supply	24 V
Operating temp.	0...55 °C
Operating system	Windows CE



DVI interface



USB interface



**DVI/USB panel**  
Standard DVI technologies are used for image transfer and USB for touch screen, keyboard, push-button extensions, etc.; USB is only required for equipment with input devices such as touch screen or keyboard.



CP69xx | "Economy" built-in Control Panel



CP79xx | "Economy" Control Panel

# Control Panels with DVI/USB Extended connection CP69xx and CP79xx

The digital visual interface (DVI), defined as successor to analog VGA connections, digitally transfers the PC image to the display. The universal serial bus (USB) enables connection of input devices and drives to the PC. DVI/USB Extended enables CP69xx and CP79xx "Economy" Control Panels to be operated at a distance of up to 50 metres from the PC. Apart from a graphics card or a motherboard with DVI output and the USB port available with every motherboard, no additional card is required in the PC.

CP79xx Control Panels are designed for mounting arm installation. They offer all-round IP 65 protection. To this end they are equipped via industrial IP 65 round connectors for DVI or USB Extended and the 24 V power supply.

The CP69xx built-in Control Panels are connected via standard USB and DVI connectors and feature an industrial pin contact strip for the 24 V power supply. A 2-port USB socket in the rear panel enables connection of keyboard, mouse, USB stick or CD/DVD drive. The integrated USB 1.1 hub enables a transfer rate of 12 Mbit/s.

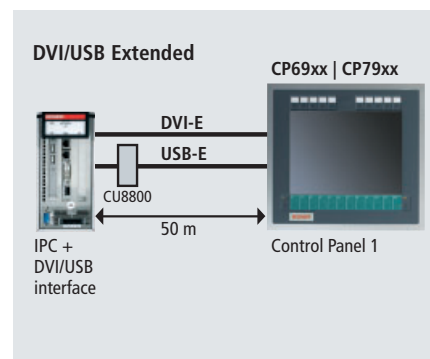
## DVI/USB Extended

The DVI/USB Extended technology integrated in each CP69xx and CP79xx "Economy" DVI/USB panel enables remote panel operation at a distance of up to 50 m from the PC via standard cables. The graphics signal is transferred directly via DVI cable over a maxi-

mum distance of 50 m, while the USB signal is transferred to a CAT5 cable at the PC in order to extend the 5 m limit of the USB specification to a distance of up to 50 m.

A 50 m DVI cable has 10 times the length allowed by the DVI specification. Such a cable length leads to strong distortion of the graphics signal on arrival at the Control Panel. The CP69xx "Economy" Control Panel features a signal processor that restores the DVI signal. Since it is a digital signal, it can be fully restored. The display shows a perfect image without interference. The PC requires a conventional DVI output. An on-board graphics controller such as Intel® Extreme Graphic or a graphics card can be used.

For USB the specification requires installation of a hub every 5 m. In order to realise a distance of 50 m without hubs, with USB Extended the USB signal is converted so that it can be transferred via 50 m CAT5 cables with RJ 45 connectors commonly used for Ethernet wiring. In the Control Panel the signal is converted back to USB. Through the 12 Mbit/s transfer rate a USB 1.1 interface is available in the Control Panel. In addition to touch screen, membrane keyboard and push-button extension, a hub in the Control Panel enables connection of two external USB devices such as keyboard, mouse, USB stick or CD/DVD drive. However, no further USB hub can be connected to the Control Panel. The PC must have a USB 1.1 or USB 2.0 interface.



The CU8800 USB-to-USB Extended converter box requires no auxiliary power supply. It has a USB input and an RJ 45 USB Extended output. The box together with all required cables is offered as a set for distances of 10, 20, 30, 40 or 50 m between the PC and the Control Panel. For distances up to 5 m the PC and the Control Panels CP69xx can be connected directly via a USB cable. The Control Panels CP79xx are connected via the adapter CU8800, even at short distance.

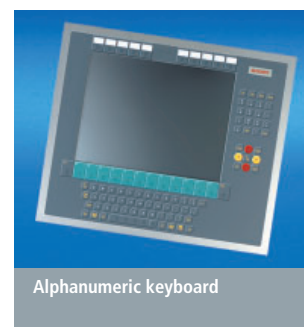
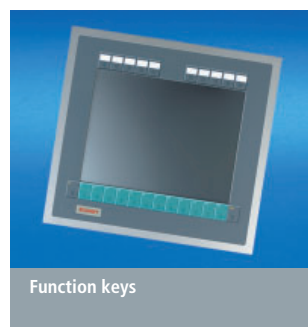
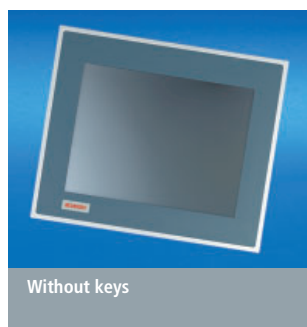
	CP69xx	CP79xx
<b>Interface</b>	DVI/USB Extended	DVI/USB Extended
<b>Max. distance from PC</b>	50 m	50 m
<b>Max. resolution</b>	1280 x 1024	1280 x 1024
<b>Display sizes</b>	5.7-, 6.5-, 12-, 15-, 19- or 24-inch	6.5-, 12-, 15-, 19- or 24-inch
<b>USB</b>	2 USB 1.1	2 USB 1.1
<b>Power supply</b>	24 V	24 V
<b>Operating temp.</b>	0...55 °C	0...55 °C



## CP66xx | “Economy” built-in Control Panel with Ethernet interface

CP66xx	“Economy” built-in Control Panel	Drawings with dimensions	243	
Features	TFT display in four sizes			
	– 5.7-inch display 640 x 480			
	– 6.5-inch display 640 x 480			
	– 12-inch display 800 x 600			
	– 15-inch display 1024 x 768			
	aluminium front with sheet-steel rear cover, front side IP 65, rear side IP 20			
	front laminate in four variants			
	– only display			
	– function keys and 10 PLC special keys with LED			
	– numeric keyboard and 10 PLC special keys with LED			
	– alphanumeric PC keyboard in US layout and 10 PLC special keys with LED			
	integrated PC, 3½-inch motherboard for Intel® IXP processor with XScale® technology			
	Intel® IXP420 with XScale® technology, clock frequency 533 MHz			
	128 MB on-board RAM			
	32 MB on-board flash			
	slot for 1 Compact Flash card accessible from the rear side			
	lithium battery of the system clock, accessible from the rear side			
on-board graphic adapter, graphic chip SM501 (max. resolution 1024 x 768)				
1 Mini PCI slot free, e.g. for a fieldbus interface card				
2 USB ports				
2 RJ 45 Ethernet connectors 10/100 Mbps				
1 RS232 serial port, D-sub, 9-pin				
all connectors at the lower rear side				
24 V power supply				
operating temperature 0...55 °C				
pull-out clamping levers for fast installation without loose parts				
operating system Microsoft Windows CE, English				

<b>CP66xx</b>	<b>"Economy" built-in Control Panel</b>
<b>Options</b>	touch screen pen with wall holder
	push-button extension with electromechanical switches and keys
	Compact Flash card
	1 Mini PCI slot for cards installed ex factory with fieldbus interface, Ethernet port or NOVRAM
	TwinCAT run-time for Windows CE
<b>Further information</b>	wall mounting frame for building installation
	<a href="http://www.beckhoff.com/CP66xx">www.beckhoff.com/CP66xx</a>



CP66xx	"Economy" built-in Control Panel with Ethernet interface		Weight	Power consumption
CP6607-0000	5.7-inch display 640 x 480	without keys	1.5 kg	12 W
CP6607-0001	5.7-inch display 640 x 480	without keys	touch screen	1.5 kg 12 W
CP6608-0000	5.7-inch display 640 x 480	without keys, without CF card slot	1.1 kg	12 W
CP6608-0001	5.7-inch display 640 x 480	without keys, without CF card slot	touch screen	1.1 kg 12 W
CP6609-0000	6.5-inch display 640 x 480	without keys	1.6 kg	15 W
CP6609-0001	6.5-inch display 640 x 480	without keys	touch screen	1.6 kg 15 W
CP6619-0000	6.5-inch display 640 x 480	function keys	1.9 kg	15 W
CP6619-0001	6.5-inch display 640 x 480	function keys	touch screen	1.9 kg 15 W
CP6629-0000	6.5-inch display 640 x 480	numeric keyboard	2.3 kg	15 W
CP6629-0001	6.5-inch display 640 x 480	numeric keyboard	touch screen	2.3 kg 15 W
CP6601-0000	12-inch display 800 x 600	without keys	3.6 kg	19 W
CP6601-0001	12-inch display 800 x 600	without keys	touch screen	3.6 kg 19 W
CP6601-0020	12-inch display 800 x 600	without keys, USB A socket in the front	3.7 kg	19 W
CP6601-0021	12-inch display 800 x 600	without keys, USB A socket in the front	touch screen	3.7 kg 19 W
CP6611-0000	12-inch display 800 x 600	function keys	4.8 kg	19 W
CP6611-0001	12-inch display 800 x 600	function keys	touch screen	4.8 kg 19 W
CP6621-0000	12-inch display 800 x 600	numeric keyboard	5.5 kg	19 W
CP6621-0001	12-inch display 800 x 600	numeric keyboard	touch screen	5.5 kg 19 W
CP6621-0002	12-inch display 800 x 600	numeric keyboard	touch pad	5.7 kg 19 W
CP6631-0000	12-inch display 800 x 600	alphanumeric keyboard	5.7 kg	19 W
CP6631-0001	12-inch display 800 x 600	alphanumeric keyboard	touch screen	5.7 kg 19 W
CP6631-0002	12-inch display 800 x 600	alphanumeric keyboard	touch pad	5.7 kg 19 W
CP6602-0000	15-inch display 1024 x 768	without keys	5.0 kg	30 W
CP6602-0001	15-inch display 1024 x 768	without keys	touch screen	5.0 kg 30 W
CP6602-0020	15-inch display 1024 x 768	without keys, USB A socket in the front	5.1 kg	30 W
CP6602-0021	15-inch display 1024 x 768	without keys, USB A socket in the front	touch screen	5.1 kg 30 W
CP6612-0000	15-inch display 1024 x 768	function keys	6.5 kg	30 W
CP6612-0001	15-inch display 1024 x 768	function keys	touch screen	6.5 kg 30 W
CP6622-0000	15-inch display 1024 x 768	numeric keyboard	7.2 kg	30 W
CP6622-0001	15-inch display 1024 x 768	numeric keyboard	touch screen	7.2 kg 30 W
CP6622-0002	15-inch display 1024 x 768	numeric keyboard	touch pad	7.2 kg 30 W
CP6632-0000	15-inch display 1024 x 768	alphanumeric keyboard	7.3 kg	30 W
CP6632-0001	15-inch display 1024 x 768	alphanumeric keyboard	touch screen	7.3 kg 30 W
CP6632-0002	15-inch display 1024 x 768	alphanumeric keyboard	touch pad	7.3 kg 30 W





## CP69xx | “Economy” built-in Control Panel with DVI/USB Extended interface

CP69xx	“Economy” built-in Control Panel	Drawings with dimensions	244
<b>Features</b>	<p>TFT display in six sizes</p> <ul style="list-style-type: none"> <li>– 5.7-inch display 640 x 480</li> <li>– 6.5-inch display 640 x 480</li> <li>– 12-inch display 800 x 600</li> <li>– 15-inch display 1024 x 768</li> <li>– 19-inch display 1280 x 1024</li> <li>– 24-inch display 1920 x 1200</li> </ul> <p>aluminium front with sheet-steel rear cover, front side IP 65, rear side IP 20</p> <p>front laminate in five variants</p> <ul style="list-style-type: none"> <li>– only display</li> <li>– function keys and 10 PLC special keys with LED</li> <li>– numeric keyboard and 10 PLC special keys with LED</li> <li>– alphanumeric PC keyboard in US layout and 10 PLC special keys with LED</li> <li>– alphanumeric PC keyboard in US layout and 16 PLC special keys with LED on the sides</li> </ul> <p>integrated DVI/USB extension technology</p> <ul style="list-style-type: none"> <li>– DVI-E and USB-E enable remote panel operation at a distance of up to 50 m from the PC.</li> <li>– DVI-E input is compatible to the standard DVI output of a PC.</li> </ul> <p>USB input for the direct connection to a standard USB output of a PC with distances of up to 5 m</p> <p>all connectors at the lower rear side</p> <p>24 V power supply</p> <p>operating temperature 0...55 °C</p> <p>pull-out clamping levers for fast installation without loose parts</p>		
<b>Options</b>	<p>touch screen pen with wall holder</p> <p>push-button extension with electromechanical switches and keys</p> <p>connecting kits for up to 50 m distance to the PC</p> <p>wall mounting frame for building installation</p>		
<b>Further information</b>	<a href="http://www.beckhoff.com/CP69xx">www.beckhoff.com/CP69xx</a>		

CP69xx	"Economy" built-in Control Panel with DVI/USB Extended interface		Weight	Power consumption	
CP6907-0000	5.7-inch display 640 x 480	without keys	1.2 kg	10 W	
CP6907-0001	5.7-inch display 640 x 480	without keys	touch screen	1.2 kg	10 W
CP6909-0000	6.5-inch display 640 x 480	without keys	1.6 kg	10 W	
CP6909-0001	6.5-inch display 640 x 480	without keys	touch screen	1.6 kg	10 W
CP6919-0000	6.5-inch display 640 x 480	function keys	1.9 kg	10 W	
CP6919-0001	6.5-inch display 640 x 480	function keys	touch screen	1.9 kg	10 W
CP6929-0000	6.5-inch display 640 x 480	numeric keyboard	2.3 kg	10 W	
CP6929-0001	6.5-inch display 640 x 480	numeric keyboard	touch screen	2.3 kg	10 W
CP6901-0000	12-inch display 800 x 600	without keys	3.6 kg	14 W	
CP6901-0001	12-inch display 800 x 600	without keys	touch screen	3.6 kg	14 W
CP6901-0020	12-inch display 800 x 600	without keys, USB A socket in the front	3.7 kg	14 W	
CP6901-0021	12-inch display 800 x 600	without keys, USB A socket in the front	touch screen	3.7 kg	14 W
CP6911-0000	12-inch display 800 x 600	function keys	4.8 kg	14 W	
CP6911-0001	12-inch display 800 x 600	function keys	touch screen	4.8 kg	14 W
CP6921-0000	12-inch display 800 x 600	numeric keyboard	5.5 kg	14 W	
CP6921-0001	12-inch display 800 x 600	numeric keyboard	touch screen	5.5 kg	14 W
CP6921-0002	12-inch display 800 x 600	numeric keyboard	touch pad	5.7 kg	14 W
CP6931-0000	12-inch display 800 x 600	alphanumeric keyboard	5.7 kg	14 W	
CP6931-0001	12-inch display 800 x 600	alphanumeric keyboard	touch screen	5.7 kg	14 W
CP6931-0002	12-inch display 800 x 600	alphanumeric keyboard	touch pad	5.7 kg	14 W
CP6902-0000	15-inch display 1024 x 768	without keys	5.0 kg	25 W	
CP6902-0001	15-inch display 1024 x 768	without keys	touch screen	5.0 kg	25 W
CP6902-0020	15-inch display 1024 x 768	without keys, USB A socket in the front	5.1 kg	25 W	
CP6902-0021	15-inch display 1024 x 768	without keys, USB A socket in the front	touch screen	5.1 kg	25 W
CP6912-0000	15-inch display 1024 x 768	function keys	6.5 kg	25 W	
CP6912-0001	15-inch display 1024 x 768	function keys	touch screen	6.5 kg	25 W
CP6922-0000	15-inch display 1024 x 768	numeric keyboard	7.2 kg	25 W	
CP6922-0001	15-inch display 1024 x 768	numeric keyboard	touch screen	7.2 kg	25 W
CP6922-0002	15-inch display 1024 x 768	numeric keyboard	touch pad	7.2 kg	25 W
CP6932-0000	15-inch display 1024 x 768	alphanumeric keyboard	7.3 kg	25 W	
CP6932-0001	15-inch display 1024 x 768	alphanumeric keyboard	touch screen	7.3 kg	25 W
CP6932-0002	15-inch display 1024 x 768	alphanumeric keyboard	touch pad	7.3 kg	25 W
CP6942-0000	15-inch display 1024 x 768	alphanumeric keyboard, PLC keys on the sides	7.8 kg	25 W	
CP6942-0001	15-inch display 1024 x 768	alphanumeric keyboard, PLC keys on the sides	touch screen	7.8 kg	25 W
CP6903-0000	19-inch display 1280 x 1024	without keys	7.7 kg	32 W	
CP6903-0001	19-inch display 1280 x 1024	without keys	touch screen	7.7 kg	32 W
CP6903-0020	19-inch display 1280 x 1024	without keys, USB A socket in the front	7.8 kg	32 W	
CP6903-0021	19-inch display 1280 x 1024	without keys, USB A socket in the front	touch screen	7.8 kg	32 W
CP6913-0000	19-inch display 1280 x 1024	function keys	8.8 kg	32 W	
CP6913-0001	19-inch display 1280 x 1024	function keys	touch screen	8.8 kg	32 W
CP6923-0000	19-inch display 1280 x 1024	numeric keyboard	10.3 kg	32 W	
CP6923-0001	19-inch display 1280 x 1024	numeric keyboard	touch screen	10.3 kg	32 W
CP6923-0002	19-inch display 1280 x 1024	numeric keyboard	touch pad	10.3 kg	32 W
CP6933-0000	19-inch display 1280 x 1024	alphanumeric keyboard	10.3 kg	32 W	
CP6933-0001	19-inch display 1280 x 1024	alphanumeric keyboard	touch screen	10.3 kg	32 W
CP6933-0002	19-inch display 1280 x 1024	alphanumeric keyboard	touch pad	10.3 kg	32 W
CP6904-0000	24-inch display 1920 x 1200	without keys	10.0 kg	80 W	
CP6904-0001	24-inch display 1920 x 1200	without keys	touch screen	10.0 kg	80 W
CP6904-0020	24-inch display 1920 x 1200	without keys, USB A socket in the front	10.0 kg	80 W	
CP6904-0021	24-inch display 1920 x 1200	without keys, USB A socket in the front	touch screen	10.0 kg	80 W



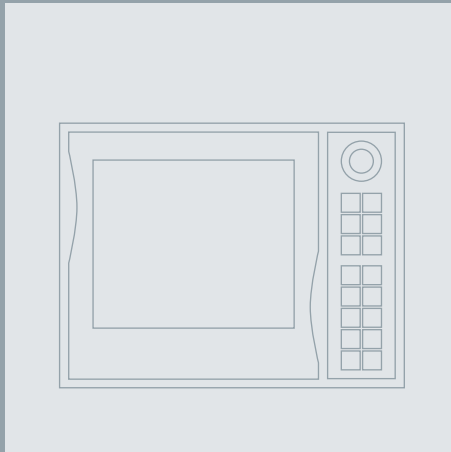
## CP79xx | "Economy" Control Panel with DVI/USB Extended interface

CP79xx	"Economy" Control Panel	Drawings with dimensions	245	
Features	TFT display in five sizes			
	– 6.5-inch display 640 x 480			
	– 12-inch display 800 x 600			
	– 15-inch display 1024 x 768			
	– 19-inch display 1280 x 1024			
	– 24-inch display 1920 x 1200			
	aluminium housing, protection class IP 65			
	front laminate in five variants			
	– only display			
	– function keys and 10 PLC special keys with LED			
– numeric keyboard and 10 PLC special keys with LED				
– alphanumeric PC keyboard in US layout and 10 PLC special keys with LED				
– alphanumeric PC keyboard in US layout and 16 PLC special keys with LED on the sides				
special keys identified by slide-in labels				
integrated DVI/USB extension technology				
– DVI-E and USB-E enable remote panel operation at a distance of up to 50 m from the PC.				
– DVI-E input is compatible to the standard DVI output of a PC.				
connection via 3 round connectors (IP 65) for DVI, USB-E and 24 V power supply unit in the backplane				
operating temperature 0...55 °C				
for mounting 4 M6 x 18 mm threaded holes in the backplane				
Options	2-port IP 65 USB interface in the backplane			
	touch screen pen with holder			
	additional keyboard IP 65 or toolboard for keyboard and tools			
	push-button extension with electromechanical switches and keys			
	connection set up to 50 m length			
	adapter plate for mounting arm installation			
Further information	<a href="http://www.beckhoff.com/CP79xx">www.beckhoff.com/CP79xx</a>			

CP79xx	"Economy" Control Panel with DVI/USB Extended interface		Weight	Power consumption	
CP7909-0000	6.5-inch display 640 x 480	without keys	2.3 kg	10 W	
CP7909-0001	6.5-inch display 640 x 480	without keys	touch screen	2.3 kg	10 W
CP7919-0000	6.5-inch display 640 x 480	function keys	2.6 kg	10 W	
CP7919-0001	6.5-inch display 640 x 480	function keys	touch screen	2.6 kg	10 W
CP7929-0000	6.5-inch display 640 x 480	numeric keyboard	3.1 kg	10 W	
CP7929-0001	6.5-inch display 640 x 480	numeric keyboard	touch screen	3.1 kg	10 W
CP7901-0000	12-inch display 800 x 600	without keys	4.1 kg	14 W	
CP7901-0001	12-inch display 800 x 600	without keys	touch screen	4.1 kg	14 W
CP7901-0020	12-inch display 800 x 600	without keys, USB A socket in the front	4.0 kg	14 W	
CP7901-0021	12-inch display 800 x 600	without keys, USB A socket in the front	touch screen	4.1 kg	14 W
CP7911-0000	12-inch display 800 x 600	function keys	4.1 kg	14 W	
CP7911-0001	12-inch display 800 x 600	function keys	touch screen	4.1 kg	14 W
CP7921-0000	12-inch display 800 x 600	numeric keyboard	4.3 kg	14 W	
CP7921-0001	12-inch display 800 x 600	numeric keyboard	touch screen	4.4 kg	14 W
CP7921-0002	12-inch display 800 x 600	numeric keyboard	touch pad	4.6 kg	14 W
CP7931-0000	12-inch display 800 x 600	alphanumeric keyboard	5.0 kg	14 W	
CP7931-0001	12-inch display 800 x 600	alphanumeric keyboard	touch screen	5.1 kg	14 W
CP7931-0002	12-inch display 800 x 600	alphanumeric keyboard	touch pad	5.2 kg	14 W
CP7902-0000	15-inch display 1024 x 768	without keys	5.8 kg	25 W	
CP7902-0001	15-inch display 1024 x 768	without keys	touch screen	6.0 kg	25 W
CP7902-0020	15-inch display 1024 x 768	without keys, USB A socket in the front	5.8 kg	25 W	
CP7902-0021	15-inch display 1024 x 768	without keys, USB A socket in the front	touch screen	6.0 kg	25 W
CP7912-0000	15-inch display 1024 x 768	function keys	5.8 kg	25 W	
CP7912-0001	15-inch display 1024 x 768	function keys	touch screen	6.0 kg	25 W
CP7922-0000	15-inch display 1024 x 768	numeric keyboard	6.4 kg	25 W	
CP7922-0001	15-inch display 1024 x 768	numeric keyboard	touch screen	6.7 kg	25 W
CP7922-0002	15-inch display 1024 x 768	numeric keyboard	touch pad	6.4 kg	25 W
CP7932-0000	15-inch display 1024 x 768	alphanumeric keyboard	6.7 kg	25 W	
CP7932-0001	15-inch display 1024 x 768	alphanumeric keyboard	touch screen	6.9 kg	25 W
CP7932-0002	15-inch display 1024 x 768	alphanumeric keyboard	touch pad	6.7 kg	25 W
CP7942-0000	15-inch display 1024 x 768	alphanumeric keyboard, PLC keys on the sides	7.5 kg	25 W	
CP7942-0001	15-inch display 1024 x 768	alphanumeric keyboard, PLC keys on the sides	touch screen	7.5 kg	25 W
CP7903-0000	19-inch display 1280 x 1024	without keys	10.7 kg	32 W	
CP7903-0001	19-inch display 1280 x 1024	without keys	touch screen	10.5 kg	32 W
CP7903-0020	19-inch display 1280 x 1024	without keys, USB A socket in the front	10.7 kg	32 W	
CP7903-0021	19-inch display 1280 x 1024	without keys, USB A socket in the front	touch screen	10.5 kg	32 W
CP7913-0000	19-inch display 1280 x 1024	function keys	10.7 kg	32 W	
CP7913-0001	19-inch display 1280 x 1024	function keys	touch screen	10.5 kg	32 W
CP7923-0000	19-inch display 1280 x 1024	numeric keyboard	11.0 kg	32 W	
CP7923-0001	19-inch display 1280 x 1024	numeric keyboard	touch screen	10.9 kg	32 W
CP7923-0002	19-inch display 1280 x 1024	numeric keyboard	touch pad	11.0 kg	32 W
CP7933-0000	19-inch display 1280 x 1024	alphanumeric keyboard	12.2 kg	32 W	
CP7933-0001	19-inch display 1280 x 1024	alphanumeric keyboard	touch screen	12.0 kg	32 W
CP7933-0002	19-inch display 1280 x 1024	alphanumeric keyboard	touch pad	12.1 kg	32 W
CP7904-0000	24-inch display 1920 x 1200	without keys	14.0 kg	80 W	
CP7904-0001	24-inch display 1920 x 1200	without keys	touch screen	14.0 kg	80 W
CP7904-0020	24-inch display 1920 x 1200	without keys, USB A socket in the front	14.0 kg	80 W	
CP7904-0021	24-inch display 1920 x 1200	without keys, USB A socket in the front	touch screen	14.0 kg	80 W

# Control Panel and Panel PC accessories

Push-button extension, additional keyboard, keyboard shelf, touch screen pen, RFID reader



Extensions can be installed at the Control Panel or the Panel PC. They contain electromechanical buttons, switches and indicator lamps, additional membrane keys or a handwheel. An industrial keyboard with adjustable brackets or a shelf can be installed on the underside of a CP7xxx Control Panel or a Panel PC for mounting arm installation. A pen for optimum touch screen operation complements the range of accessories.



## Electromechanical buttons on the Control Panel

Control Panels and Panel PCs with push-button extension enable the application-specific arrangement of electromechanical buttons, switches, signal lamps, additional membrane keys and a hand wheel directly on the operating unit. This enables precise adaptation of the Control Panel to the machine control requirements. In many cases a machine operator control panel is no longer required, since all functions are integrated in the Control Panel. The Control Panel housing is increased in size on one side. Depending on the required functions and the electromechanical components, the flat rear panel is enlarged or extended with a trough-shaped rear panel for the button area.

A mounting arm system can be installed centrally at the rear of the panel. Depending on the mounting arm system, the cables are

fed through the mounting arm. The cables for the push-button extension are fed into the mounting arm via a channel on the rear side of the Control Panel. The wiring area can be opened without having to remove the Control Panel from the mounting arm. It is possible to attach the mounting arm from below or above as desired. The housing has protection class IP 65 on all sides. The buttons, switches and signal lamps are connected to the controller via USB. At the same time, a second contact on the buttons and switches can be wired directly via a terminal row.

Besides the push-button extensions shown on the following pages, numerous other variants are possible, which can be individually designed in accordance with requirements.





The photo presents an application-specific push-button configuration.

## C9900-Ex0x | Push-button extension for Control Panel and Panel PCs with 12-inch display and numeric keyboard

C9900-Ex0x	Drawings with dimensions: <a href="http://www.beckhoff.com">www.beckhoff.com</a>
<b>Features</b>	push-button extension for CP6x21-00xx and CP7x21-00xx push-button extension on the right side 12 push-button keys with signal lamp, type Siemens Signum square, 30 x 30 mm 1 emergency stop key Siemens Signum, directly wireable Labels for push-button caps allow individual marking. All push-buttons are transmitted via USB with one normally-open contact. Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row. All signal lamps are transmitted via USB only.

Ordering information	Push-button extension for built-in Control Panel, "Economy" built-in Control Panel and "Economy" built-in Panel PCs
C9900-E505	push-button extension for "Economy" built-in Panel PC CP6221-00xx with screwed cable gland
C9900-E705	push-button extension for built-in Panel PC CP6421 and CP6521 with screwed cable gland
C9900-E905	push-button extension for DVI/USB Extended "Economy" built-in Control Panel CP6921-00xx with screwed cable gland
C9900-E406	push-button extension for Ethernet "Economy" built-in Control Panel CP6621-00xx with screwed cable gland

Circular plug-in connector instead of screwed cable gland on request

Ordering information	Push-button extension for Control Panel and Panel PCs
C9900-E506	push-button extension for Panel PC CP7121-00xx without cable bushing
C9900-E701	push-button extension for DVI/USB Extended "Economy" Control Panel CP7921-00xx without mounting arm connection, without cable bushing
C9900-E708	push-button extension for DVI/USB Extended "Economy" Control Panel CP7931-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request
C9900-E801	push-button extension for Panel PC CP7721-00xx without mounting arm connection, without cable bushing
C9900-E808	push-button extension for Panel PC CP7721-00xx, mounting arm connection from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request

Ordering information	Options for the push-button extensions for Control Panel and Panel PCs
C9900-M931	screwed cable gland, designed for feeding the signal line into the push-button extension without mounting arm connection
C9900-M205	mounting arm adapter plate with a cable pit centrally attached at the Control Panel CP79xx with push-button extension for mounting arm system Rittal CP6508.020 or Rittal CP6501.170 instead of Rolec Tara Plus; mounting arm from top or bottom, wiring through the mounting arm with cable gland M25 in the wiring area of the mounting arm adapter plate; circular plug-in connector instead of screwed cable gland on request
C9900-M405	mounting arm adapter plate with a cable pit centrally attached at the Panel PC CP77xx with push-button extension for mounting arm system Rittal CP6508.020 instead of Rolec Tara Plus, mounting arm from top or bottom

Ordering information	Push-button extension for "Economy" Panel PCs
C9900-E507	push-button extension for "Economy" Panel PC CP7221-00xx with circular plug-in connector between push-button extension and connection section





The photo presents an application-specific push-button configuration.

## C9900-Ex1x | Push-button extension for Control Panel and Panel PCs with 12-inch display and alphanumeric keyboard

C9900-Ex1x	Drawings with dimensions: <a href="http://www.beckhoff.com">www.beckhoff.com</a>
Features	push-button extension for CP6x31-00xx and CP7x31-00xx push-button extension on the right side 16 push-button keys with signal lamp, type Siemens Signum square, 30 x 30 mm 1 emergency stop key Siemens Signum, directly wireable Labels for push-button caps allow individual marking. All push-buttons are transmitted via USB with one normally-open contact. Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row. All signal lamps are transmitted via USB only.

Ordering information	Push-button extension for built-in Control Panel, "Economy" built-in Control Panel and "Economy" built-in Panel PCs
C9900-E515	push-button extension for "Economy" built-in Panel PC CP6231-00xx with screwed cable gland
C9900-E715	push-button extension for built-in Panel PC CP6431 and CP6531 with screwed cable gland
C9900-E915	push-button extension for DVI/USB Extended "Economy" built-in Control Panel CP6931-00xx with screwed cable gland
C9900-E416	push-button extension for Ethernet "Economy" built-in Control Panel CP6631-00xx with screwed cable gland

Circular plug-in connector instead of screwed cable gland on request

Ordering information	Push-button extension for Control Panel and Panel PCs
C9900-E516	push-button extension for Panel PC CP7131-00xx without cable bushing
C9900-E711	push-button extension for DVI/USB Extended "Economy" Control Panel CP7931-00xx without mounting arm connection, without cable bushing
C9900-E718	push-button extension for DVI/USB Extended "Economy" Control Panel CP7931-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request
C9900-E811	push-button extension for Panel PC CP7731-00xx without mounting arm connection, without cable bushing
C9900-E818	push-button extension for Panel PC CP7731-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request

Ordering information	Options for the push-button extensions for Control Panel and Panel PCs
C9900-M931	screwed cable gland, designed for feeding the signal line into the push-button extension without mounting arm connection
C9900-M205	mounting arm adapter plate with a cable pit centrally attached at the Control Panel CP79xx with push-button extension for mounting arm system Rittal CP6508.020 or Rittal CP6501.170 instead of Rolec Tara Plus; mounting arm from top or bottom, wiring through the mounting arm with cable gland M25 in the wiring area of the mounting arm adapter plate; circular plug-in connector instead of screwed cable gland on request
C9900-M405	mounting arm adapter plate with a cable pit centrally attached at the Panel PC CP77xx with push-button extension for mounting arm system Rittal CP6508.020 instead of Rolec Tara Plus, mounting arm from top or bottom

Ordering information	Push-button extension for "Economy" Panel PCs
C9900-E517	push-button extension for "Economy" Panel PC CP7231-00xx with circular plug-in connector between push-button extension and connection section



## C9900-Ex4x | Push-button extension for Control Panel and Panel PCs with 15-inch display without keyboard

C9900-Ex4x	Drawings with dimensions: <a href="http://www.beckhoff.com">www.beckhoff.com</a>
Features	push-button extension for CP6x02-00xx and CP7x02-00xx push-button extension on the right side 16 push-button keys with signal lamp, type Siemens Signum square, 30 x 30 mm 1 emergency stop key Siemens Signum, directly wireable Labels for push-button caps allow individual marking. All push-buttons are transmitted via USB with one normally-open contact. Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row. All signal lamps are transmitted via USB only.

Ordering information	Push-button extension for built-in Control Panel, "Economy" built-in Control Panel and "Economy" built-in Panel PCs
C9900-E545	push-button extension for "Economy" built-in Panel PC CP6202-00xx with screwed cable gland
C9900-E745	push-button extension for built-in Panel PC CP6402 and CP6502 with screwed cable gland
C9900-E945	push-button extension for DVI/USB Extended "Economy" built-in Control Panel CP6902-00xx with screwed cable gland
C9900-E446	push-button extension for Ethernet "Economy" built-in Control Panel CP6602-00xx with screwed cable gland

Circular plug-in connector instead of screwed cable gland on request

Ordering information	Push-button extension for Control Panel and Panel PCs
C9900-E546	push-button extension for Panel PC CP7102-00xx without cable bushing
C9900-E741	push-button extension for DVI/USB Extended "Economy" Control Panel CP7902-00xx without mounting arm connection, without cable bushing
C9900-E748	push-button extension for DVI/USB Extended "Economy" Control Panel CP7902-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request
C9900-E841	push-button extension for Panel PC CP7702-00xx without mounting arm connection, without cable bushing
C9900-E848	push-button extension for Panel PC CP7702-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request

Ordering information	Options for the push-button extensions for Control Panel and Panel PCs
C9900-M931	screwed cable gland, designed for feeding the signal line into the push-button extension without mounting arm connection
C9900-M205	mounting arm adapter plate with a cable pit centrally attached at the Control Panel CP79xx with push-button extension for mounting arm system Rittal CP6508.020 or Rittal CP6501.170 instead of Rolec Tara Plus; mounting arm from top or bottom, wiring through the mounting arm with cable gland M25 in the wiring area of the mounting arm adapter plate; circular plug-in connector instead of screwed cable gland on request
C9900-M405	mounting arm adapter plate with a cable pit centrally attached at the Panel PC CP77xx with push-button extension for mounting arm system Rittal CP6508.020 instead of Rolec Tara Plus, mounting arm from top or bottom

Ordering information	Push-button extension for "Economy" Panel PCs
C9900-E547	push-button extension for "Economy" Panel PC CP7202-00xx with circular plug-in connector between push-button extension and connection section



## C9900-Ex5x | Push-button extension for Control Panel and Panel PCs with 15-inch display and function keys

C9900-Ex5x	Drawings with dimensions: <a href="http://www.beckhoff.com">www.beckhoff.com</a>
Features	push-button extension for CP6x12-00xx and CP7x12-00xx push-button extension on the right side 16 push-button keys with signal lamp, type Siemens Signum square, 30 x 30 mm 1 emergency stop key Siemens Signum, directly wireable Labels for push-button caps allow individual marking. All push-buttons are transmitted via USB with one normally-open contact. Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row. All signal lamps are transmitted via USB only.

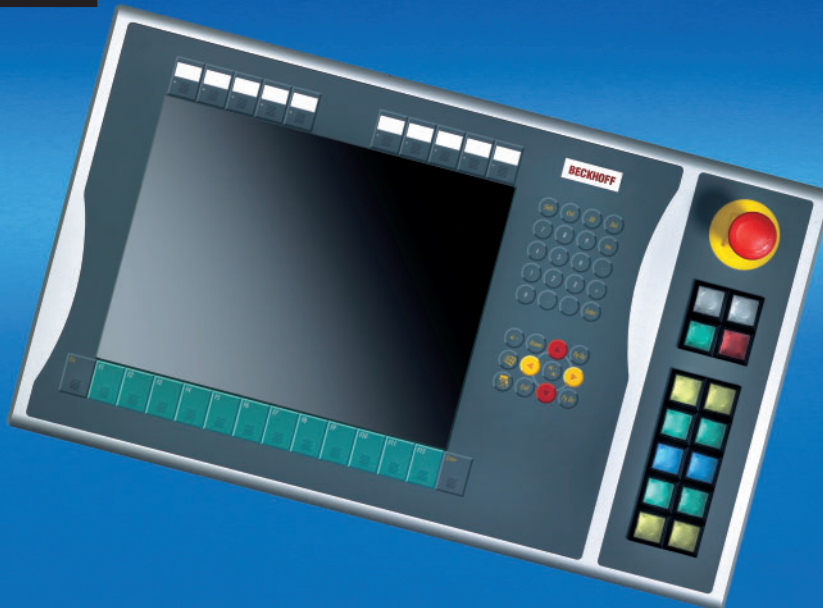
Ordering information	Push-button extension for built-in Control Panel, "Economy" built-in Control Panel and "Economy" built-in Panel PCs
C9900-E555	push-button extension for "Economy" built-in Panel PC CP6212-00xx with screwed cable gland
C9900-E755	push-button extension for built-in Panel PC CP6412 and CP6512 with screwed cable gland
C9900-E955	push-button extension for DVI/USB Extended "Economy" built-in Control Panel CP6912-00xx with screwed cable gland
C9900-E456	push-button extension for Ethernet "Economy" built-in Control Panel CP6612-00xx with screwed cable gland

Circular plug-in connector instead of screwed cable gland on request

Ordering information	Push-button extension for Control Panel and Panel PCs
C9900-E556	push-button extension for Panel PC CP7112-00xx without cable bushing
C9900-E751	push-button extension for DVI/USB Extended "Economy" Control Panel CP7912-00xx without mounting arm connection, without cable bushing
C9900-E758	push-button extension for DVI/USB Extended "Economy" Control Panel CP7912-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request
C9900-E851	push-button extension for Panel PC CP7712-00xx without mounting arm connection, without cable bushing
C9900-E858	push-button extension for Panel PC CP7712-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request

Ordering information	Options for the push-button extensions for Control Panel and Panel PCs
C9900-M931	screwed cable gland, designed for feeding the signal line into the push-button extension without mounting arm connection
C9900-M205	mounting arm adapter plate with a cable pit centrally attached at the Control Panel CP79xx with push-button extension for mounting arm system Rittal CP6508.020 or Rittal CP6501.170 instead of Rolec Tara Plus; mounting arm from top or bottom, wiring through the mounting arm with cable gland M25 in the wiring area of the mounting arm adapter plate; circular plug-in connector instead of screwed cable gland on request
C9900-M405	mounting arm adapter plate with a cable pit centrally attached at the Panel PC CP77xx with push-button extension for mounting arm system Rittal CP6508.020 instead of Rolec Tara Plus, mounting arm from top or bottom

Ordering information	Push-button extension for "Economy" Panel PCs
C9900-E557	push-button extension for "Economy" Panel PC CP7212-00xx with circular plug-in connector between push-button extension and connection section



## C9900-Ex6x | Push-button extension for Control Panel and Panel PCs with 15-inch display and numeric keyboard

C9900-Ex6x	Drawings with dimensions: <a href="http://www.beckhoff.com">www.beckhoff.com</a>
Features	push-button extension for CP6x22-00xx and CP7x22-00xx push-button extension on the right side 14 push-button keys with signal lamp, type Siemens Signum square, 30 x 30 mm 1 emergency stop key Siemens Signum, directly wireable Labels for push-button caps allow individual marking. All push-buttons are transmitted via USB with one normally-open contact. Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row. All signal lamps are transmitted via USB only.

Ordering information	Push-button extension for built-in Control Panel, "Economy" built-in Control Panel and "Economy" built-in Panel PCs
C9900-E565	push-button extension for "Economy" built-in Panel PC CP6222-00xx with screwed cable gland
C9900-E765	push-button extension for built-in Panel PC CP6422 and CP6522 with screwed cable gland
C9900-E965	push-button extension for DVI/USB Extended "Economy" built-in Control Panel CP6922-00xx with screwed cable gland
C9900-E466	push-button extension for Ethernet "Economy" built-in Control Panel CP6622-00xx with screwed cable gland

Circular plug-in connector instead of screwed cable gland on request

Ordering information	Push-button extension for Control Panel and Panel PCs
C9900-E566	push-button extension for Panel PC CP7122-00xx without cable bushing
C9900-E761	push-button extension for DVI/USB Extended "Economy" Control Panel CP7922-00xx without mounting arm connection, without cable bushing
C9900-E768	push-button extension for DVI/USB Extended "Economy" Control Panel CP7922-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request
C9900-E861	push-button extension for Panel PC CP7722-00xx without mounting arm connection, without cable bushing
C9900-E868	push-button extension for Panel PC CP7722-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request

Ordering information	Options for the push-button extensions for Control Panel and Panel PCs
C9900-M931	screwed cable gland, designed for feeding the signal line into the push-button extension without mounting arm connection
C9900-M205	mounting arm adapter plate with a cable pit centrally attached at the Control Panel CP79xx with push-button extension for mounting arm system Rittal CP6508.020 or Rittal CP6501.170 instead of Rolec Tara Plus; mounting arm from top or bottom, wiring through the mounting arm with cable gland M25 in the wiring area of the mounting arm adapter plate; circular plug-in connector instead of screwed cable gland on request
C9900-M405	mounting arm adapter plate with a cable pit centrally attached at the Panel PC CP77xx with push-button extension for mounting arm system Rittal CP6508.020 instead of Rolec Tara Plus, mounting arm from top or bottom

Ordering information	Push-button extension for "Economy" Panel PCs
C9900-E567	push-button extension for "Economy" Panel PC CP7222-00xx with circular plug-in connector between push-button extension and connection section





## C9900-Ex7x | Push-button extension for Control Panel and Panel PCs with 15-inch display and alphanumeric keyboard

C9900-Ex7x	Drawings with dimensions: <a href="http://www.beckhoff.com">www.beckhoff.com</a>
Features	push-button extension for CP6x32-00xx and CP7x32-00xx push-button extension on the right side 18 push-button keys with signal lamp, type Siemens Signum square, 30 x 30 mm 1 emergency stop key Siemens Signum, directly wireable Labels for push-button caps allow individual marking. All push-buttons are transmitted via USB with one normally-open contact. Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row. All signal lamps are transmitted via USB only.

Ordering information	Push-button extension for built-in Control Panel, "Economy" built-in Control Panel and "Economy" built-in Panel PCs
C9900-E575	push-button extension for "Economy" built-in Panel PC CP6232-00xx with screwed cable gland
C9900-E775	push-button extension for built-in Panel PC CP6432 and CP6532 with screwed cable gland
C9900-E975	push-button extension for DVI/USB Extended "Economy" built-in Control Panel CP6932-00xx with screwed cable gland
C9900-E476	push-button extension for Ethernet "Economy" built-in Control Panel CP6632-00xx with screwed cable gland

Circular plug-in connector instead of screwed cable gland on request

Ordering information	Push-button extension for Control Panel and Panel PCs
C9900-E576	push-button extension for Panel PC CP7132-00xx without cable bushing
C9900-E771	push-button extension for DVI/USB Extended "Economy" Control Panel CP7932-00xx without mounting arm connection, without cable bushing
C9900-E778	push-button extension for DVI/USB Extended "Economy" Control Panel CP7932-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request
C9900-E871	push-button extension for Panel PC CP7732-00xx without mounting arm connection, without cable bushing
C9900-E878	push-button extension for Panel PC CP7732-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request

Ordering information	Options for the push-button extensions for Control Panel and Panel PCs
C9900-M931	screwed cable gland, designed for feeding the signal line into the push-button extension without mounting arm connection
C9900-M205	mounting arm adapter plate with a cable pit centrally attached at the Control Panel CP79xx with push-button extension for mounting arm system Rittal CP6508.020 or Rittal CP6501.170 instead of Rolec Tara Plus; mounting arm from top or bottom, wiring through the mounting arm with cable gland M25 in the wiring area of the mounting arm adapter plate; circular plug-in connector instead of screwed cable gland on request
C9900-M405	mounting arm adapter plate with a cable pit centrally attached at the Panel PC CP77xx with push-button extension for mounting arm system Rittal CP6508.020 instead of Rolec Tara Plus, mounting arm from top or bottom

Ordering information	Push-button extension for "Economy" Panel PCs
C9900-E577	push-button extension for "Economy" Panel PC CP7232-00xx with circular plug-in connector between push-button extension and connection section



## C9900-Ex2x | Push-button extension for Control Panel and Panel PCs with 19-inch display without keyboard

C9900-Ex2x	Drawings with dimensions: <a href="http://www.beckhoff.com">www.beckhoff.com</a>
Features	push-button extension for CP6x03-00xx and CP7x03-00xx
	push-button extension on the right side
	20 push-button keys with signal lamp, type Siemens Signum square, 30 x 30 mm
	1 emergency stop key Siemens Signum, directly wireable
	Labels for push-button caps allow individual marking.
	All push-buttons are transmitted via USB with one normally-open contact.
Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row.	
	All signal lamps are transmitted via USB only.

Ordering information	Push-button extension for built-in Control Panel, "Economy" built-in Control Panel and "Economy" built-in Panel PCs
C9900-E525	push-button extension for "Economy" built-in Panel PC CP6203-00xx with screwed cable gland
C9900-E725	push-button extension for built-in Panel PC CP6403 and CP6503 with screwed cable gland
C9900-E925	push-button extension for DVI/USB Extended "Economy" built-in Control Panel CP6903-00xx with screwed cable gland

Circular plug-in connector instead of screwed cable gland on request

Ordering information	Push-button extension for Control Panel and Panel PCs
C9900-E526	push-button extension for Panel PC CP7103-00xx without cable bushing
C9900-E723	push-button extension for DVI/USB Extended "Economy" Control Panel CP7903-00xx without mounting arm connection, without cable bushing
C9900-E728	push-button extension for DVI/USB Extended "Economy" Control Panel CP7903-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request
C9900-E823	push-button extension for Panel PC CP7703-00xx without mounting arm connection, without cable bushing
C9900-E828	push-button extension for Panel PC CP7703-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request

Ordering information	Options for the push-button extensions for Control Panel and Panel PCs
C9900-M931	screwed cable gland, designed for feeding the signal line into the push-button extension without mounting arm connection
C9900-M205	mounting arm adapter plate with a cable pit centrally attached at the Control Panel CP79xx with push-button extension for mounting arm system Rittal CP6508.020 or Rittal CP6501.170 instead of Rolec Tara Plus; mounting arm from top or bottom, wiring through the mounting arm with cable gland M25 in the wiring area of the mounting arm adapter plate; circular plug-in connector instead of screwed cable gland on request
C9900-M405	mounting arm adapter plate with a cable pit centrally attached at the Panel PC CP77xx with push-button extension for mounting arm system Rittal CP6508.020 instead of Rolec Tara Plus, mounting arm from top or bottom

Ordering information	Push-button extension for "Economy" Panel PCs
C9900-E527	push-button extension for "Economy" Panel PC CP7203-00xx with circular plug-in connector between push-button extension and connection section



## C9900-Ex3x | Push-button extension for Control Panel and Panel PCs with 19-inch display and function keys

<b>C9900-Ex3x</b>	Drawings with dimensions: <a href="http://www.beckhoff.com">www.beckhoff.com</a>
<b>Features</b>	<p>push-button extension for CP6x13-00xx and CP7x13-00xx</p> <p>push-button extension on the right side</p> <p>20 push-button keys with signal lamp, type Siemens Signum square, 30 x 30 mm</p> <p>1 emergency stop key Siemens Signum, directly wireable</p> <p>Labels for push-button caps allow individual marking.</p> <p>All push-buttons are transmitted via USB with one normally-open contact.</p> <p>Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row.</p> <p>All signal lamps are transmitted via USB only.</p>

<b>Ordering information</b>	<b>Push-button extension for built-in Control Panel, "Economy" built-in Control Panel and "Economy" built-in Panel PCs</b>
C9900-E535	push-button extension for "Economy" built-in Panel PC CP6213-00xx with screwed cable gland
C9900-E735	push-button extension for built-in Panel PC CP6413 and CP6513 with screwed cable gland
C9900-E935	push-button extension for DVI/USB Extended "Economy" built-in Control Panel CP6913-00xx with screwed cable gland

Circular plug-in connector instead of screwed cable gland on request

Ordering information	Push-button extension for Control Panel and Panel PCs
C9900-E536	push-button extension for Panel PC CP7113-00xx without cable bushing
C9900-E731	push-button extension for DVI/USB Extended "Economy" Control Panel CP7913-00xx without mounting arm connection, without cable bushing
C9900-E738	push-button extension for DVI/USB Extended "Economy" Control Panel CP7913-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request
C9900-E831	push-button extension for Panel PC CP7713-00xx without mounting arm connection, without cable bushing
C9900-E838	push-button extension for Panel PC CP7713-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request

Ordering information	Options for the push-button extensions for Control Panel and Panel PCs
C9900-M931	screwed cable gland, designed for feeding the signal line into the push-button extension without mounting arm connection
C9900-M205	mounting arm adapter plate with a cable pit centrally attached at the Control Panel CP79xx with push-button extension for mounting arm system Rittal CP6508.020 or Rittal CP6501.170 instead of Rolec Tara Plus; mounting arm from top or bottom, wiring through the mounting arm with cable gland M25 in the wiring area of the mounting arm adapter plate; circular plug-in connector instead of screwed cable gland on request
C9900-M405	mounting arm adapter plate with a cable pit centrally attached at the Panel PC CP77xx with push-button extension for mounting arm system Rittal CP6508.020 instead of Rolec Tara Plus, mounting arm from top or bottom

Ordering information	Push-button extension for "Economy" Panel PCs
C9900-E537	push-button extension for "Economy" Panel PC CP7213-00xx with circular plug-in connector between push-button extension and connection section



## C9900-Ex9x | Push-button extension for Control Panel and Panel PCs with 19-inch display and numeric keyboard

C9900-Ex9x	Drawings with dimensions: <a href="http://www.beckhoff.com">www.beckhoff.com</a>
Features	push-button extension for CP6x23-00xx and CP7x23-00xx push-button extension on the right side 20 push-button keys with signal lamp, type Siemens Signum square, 30 x 30 mm 1 emergency stop key Siemens Signum, directly wireable Labels for push-button caps allow individual marking. All push-buttons are transmitted via USB with one normally-open contact. Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row. All signal lamps are transmitted via USB only.

Ordering information	Push-button extension for built-in Control Panel, "Economy" built-in Control Panel and "Economy" built-in Panel PCs
C9900-E594	push-button extension for "Economy" built-in Panel PC CP6223-00xx with screwed cable gland
C9900-E796	push-button extension for built-in Panel PC CP6423 and CP6523 with screwed cable gland
C9900-E996	push-button extension for DVI/USB Extended "Economy" built-in Control Panel CP6923-00xx with screwed cable gland

Circular plug-in connector instead of screwed cable gland on request

Ordering information	Push-button extension for Control Panel and Panel PCs
C9900-E596	push-button extension for Panel PC CP7123-00xx without cable bushing
C9900-E792	push-button extension for DVI/USB Extended "Economy" Control Panel CP7923-00xx without mounting arm connection, without cable bushing
C9900-E798	push-button extension for DVI/USB Extended "Economy" Control Panel CP7923-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request
C9900-E892	push-button extension for Panel PC CP7723-00xx without mounting arm connection, without cable bushing
C9900-E898	push-button extension for Panel PC CP7723-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request

Ordering information	Options for the push-button extensions for Control Panel and Panel PCs
C9900-M931	screwed cable gland, designed for feeding the signal line into the push-button extension without mounting arm connection
C9900-M205	mounting arm adapter plate with a cable pit centrally attached at the Control Panel CP79xx with push-button extension for mounting arm system Rittal CP6508.020 or Rittal CP6501.170 instead of Rolec Tara Plus; mounting arm from top or bottom, wiring through the mounting arm with cable gland M25 in the wiring area of the mounting arm adapter plate; circular plug-in connector instead of screwed cable gland on request
C9900-M405	mounting arm adapter plate with a cable pit centrally attached at the Panel PC CP77xx with push-button extension for mounting arm system Rittal CP6508.020 instead of Rolec Tara Plus, mounting arm from top or bottom

Ordering information	Push-button extension for "Economy" Panel PCs
C9900-E597	push-button extension for "Economy" Panel PC CP7222-00xx with circular plug-in connector between push-button extension and connection section CP7223-00xx





## C9900-Ex9x | Push-button extension for Control Panel and Panel PCs with 19-inch display and alphanumeric keyboard

<b>C9900-Ex9x</b>	Drawings with dimensions: <a href="http://www.beckhoff.com">www.beckhoff.com</a>
<b>Features</b>	<p>push-button extension for CP6x33-00xx and CP7x33-00xx</p> <p>push-button extension on the right side</p> <p>20 push-button keys with signal lamp, type Siemens Signum square, 30 x 30 mm</p> <p>1 emergency stop key Siemens Signum, directly wireable</p> <p>Labels for push-button caps allow individual marking.</p> <p>All push-buttons are transmitted via USB with one normally-open contact.</p> <p>Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row.</p> <p>All signal lamps are transmitted via USB only.</p>

<b>Ordering information</b>	Push-button extension for built-in Control Panel, "Economy" built-in Control Panel and "Economy" built-in Panel PCs
C9900-E595	push-button extension for "Economy" built-in Panel PC CP6233-00xx with screwed cable gland
C9900-E797	push-button extension for built-in Panel PC CP6433 and CP6533 with screwed cable gland

Circular plug-in connector instead of screwed cable gland on request

Ordering information	Push-button extension for Control Panel and Panel PCs
C9900-E598	push-button extension for Panel PC CP7133-00xx without cable bushing
C9900-E793	push-button extension for DVI/USB Extended "Economy" Control Panel CP7933-00xx without mounting arm connection, without cable bushing
C9900-E799	push-button extension for DVI/USB Extended "Economy" Control Panel CP7933-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request
C9900-E893	push-button extension for Panel PC CP7733-00xx without mounting arm connection, without cable bushing
C9900-E899	push-button extension for Panel PC CP7733-00xx, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane, circular plug-in connector instead of screwed cable gland on request

Ordering information	Options for the push-button extensions for Control Panel and Panel PCs
C9900-M931	screwed cable gland, designed for feeding the signal line into the push-button extension without mounting arm connection
C9900-M205	mounting arm adapter plate with a cable pit centrally attached at the Control Panel CP79xx with push-button extension for mounting arm system Rittal CP6508.020 or Rittal CP6501.170 instead of Rolec Tara Plus; mounting arm from top or bottom, wiring through the mounting arm with cable gland M25 in the wiring area of the mounting arm adapter plate; circular plug-in connector instead of screwed cable gland on request
C9900-M405	mounting arm adapter plate with a cable pit centrally attached at the Panel PC CP77xx with push-button extension for mounting arm system Rittal CP6508.020 instead of Rolec Tara Plus, mounting arm from top or bottom

Ordering information	Push-button extension for "Economy" Panel PCs
C9900-E599	push-button extension for "Economy" Panel PC CP7233-00xx with circular plug-in connector between push-button extension and connection section



The photo presents an application-specific push-button configuration.

## C9900-E78x | PLC push-button extension for tool machines

New Control Panels have been developed for universal application as control units for the tool machine industry. The U-shaped arrangement of the control keys (i.e. control keys arranged on the sides and function keys below the display) matches that of the Transline concept commonly used in the automotive industry. A push-button extension that has been optimised for PLC applications is available for simple and convenient machine operation. Control Panels with tool machine push-button extension are optionally available with built-in or mounting arm housing. As with all Control Panels, the design, equipment, functionality, etc. can be adapted to customer requirements.

C9900-E78x	Drawings with dimensions: <a href="http://www.beckhoff.com">www.beckhoff.com</a>
<b>Features</b>	PLC push-button extension for tool machines at Control Panel CP6942, CP7942 and Panel PC CP6442, CP6542, CP7142 and CP7242 push-button extension below 16 push-button keys with signal lamp, type Siemens Signum square, 30 x 30 mm 1 emergency stop key Siemens Signum, directly wireable Labels for push-button caps allow individual marking. push-button status readable via USB Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row. All indicator lights are controlled exclusively via USB. 1 graycode switch with 23 positions, controlled via USB 2-port USB A interface in the front with screw cap IP 65

Ordering information	PLC push-button extension for built-in Control Panel, "Economy" built-in Panel PC and Panel PC
C9900-E780	PLC push-button extension for Panel PC CP6442 and CP6542, with screwed cable gland
C9900-E781	PLC push-button extension for DVI/USB Extended built-in Control Panel CP6942 and "Economy" built-in Panel PC CP6242, with screwed cable gland

Circular plug-in connector instead of screwed cable gland on request

Ordering information	PLC push-button extension for Panel PC
C9900-E782	PLC push-button extension for Panel PC CP7142, with screwed cable gland, mounting arm connection from top

Circular plug-in connector instead of screwed cable gland on request

Ordering information	PLC push-button extension for Control Panel
C9900-E783	PLC push-button extension for DVI/USB Extended "Economy" Control Panel CP7942, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane

Circular plug-in connector instead of screwed cable gland on request

Ordering information	Options for PLC push-button extension for Control Panel
C9900-M203	mounting arm adapter plate with a cable pit centrally attached at the Control Panel with circular plug-in connector, for mounting arm system Rose GTN 49.467300 instead of Rolec Tara Plus and 2-port USB interface on the side with screw cap IP 65, mounting arm from top
C9900-M204	mounting arm adapter plate with a cable pit centrally attached at the Control Panel with circular plug-in connector, for mounting arm system Rose GTN 49.467300 instead of Rolec Tara Plus and 2-port USB interface on the side with screw cap IP 65, mounting arm from bottom
C9900-M205	mounting arm adapter plate with a cable pit centrally attached at the Control Panel CP79xx with push-button extension for mounting arm system Rittal CP6508.020 instead of Rolec Tara Plus, mounting arm from top or bottom, circular plug-in connector instead of screwed cable gland on request

Ordering information	PLC push-button extension for "Economy" Panel PC
C9900-E784	PLC push-button extension for "Economy" Panel PC CP7242 with circular plug-in connector between push-button extension and connection section, mounting arm connection from top



The photo presents an application-specific push-button configuration.

## C9900-E78x | CNC push-button extension for tool machines

New Control Panels have been developed for universal application as control units for the tool machine industry. The U-shaped arrangement of the control keys (i.e. control keys arranged on the sides and function keys below the display) matches that of the Transline concept commonly used in the automotive industry. A push-button extension that has been optimised for CNC applications is available for simple and convenient machine operation. Control Panels with tool machine push-button extension are optionally available with built-in or mounting arm housing. As with all Control Panels, the design, equipment, functionality, etc. can be adapted to customer requirements.

C9900-E78x	Drawings with dimensions: <a href="http://www.beckhoff.com">www.beckhoff.com</a>
<b>Features</b>	CNC push-button extension for tool machines at Control Panel CP6942, CP7942 and Panel PC CP6442, CP6542, CP7142 and CP7242 push-button extension below 2 push-button keys with signal lamp, type Siemens Signum round, directly wireable 1 emergency stop key Siemens Signum, directly wireable 1 key switch, type Siemens Signum round, directly wireable 45 membrane keys with a LED in each key, controlled via USB inscription of the keys via slide-in labels 1 graycode switch with 17 positions, controlled via USB 1 graycode switch with 23 positions, controlled via USB

Ordering information	CNC push-button extension for built-in Control Panel, "Economy" built-in Panel PC and Panel PC
C9900-E786	CNC push-button extension for Panel PC CP6442 and CP6542, with circular plug-in connector
C9900-E787	CNC push-button extension for DVI/USB Extended built-in Control Panel CP6942 and "Economy" built-in Panel PC CP6242, with circular plug-in connector

Ordering information	CNC push-button extension for Control Panel
C9900-E789	CNC push-button extension for DVI/USB Extended "Economy" Control Panel CP7942, mounting arm mountable from top or bottom, mounting arm system RolecTara Plus part no. 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015 at the Control Panel backplane

Ordering information	Options for CNC push-button extension for Control Panel, built-in Control Panel, "Economy" Panel PC and Panel PC
C9900-E181	connection IP 65 for control unit Euchner HBA-079827 at the bottom of the CNC push-button extension
C9900-M203	mounting arm adapter plate with a cable pit centrally attached at the Control Panel with circular plug-in connector, for mounting arm system Rose GTN 49.467300 instead of Rolec Tara Plus and 2-port USB interface on the side with screw cap IP 65, mounting arm from top
C9900-M204	mounting arm adapter plate with a cable pit centrally attached at the Control Panel with circular plug-in connector, for mounting arm system Rose GTN 49.467300 instead of Rolec Tara Plus and 2-port USB interface on the side with screw cap IP 65, mounting arm from bottom
C9900-M205	mounting arm adapter plate with a cable pit centrally attached at the Control Panel CP79xx with push-button extension for mounting arm system Rittal CP6508.020 instead of Rolec Tara Plus, mounting arm from top or bottom, with circular plug-in connector

Ordering information	CNC push-button extension for "Economy" Panel PC and Panel PC
C9900-E788	CNC push-button extension for Panel PC CP7142 with circular plug-in connector, mounting arm connection from top
C9900-E791	CNC push-button extension for „Economy" Panel PC CP7242 with circular plug-in connector between push-button extension and connection section, mounting arm connection from top

Ordering information	Options for CNC push-button extension for "Economy" Panel PC
C9900-E181	connection IP 65 for control unit Euchner HBA-079827 at the bottom of the CNC push-button extension



## K7xxx, KT7xxx | Additional keyboard for Control Panels and Panel PCs



### The indestructible PC keyboard

The K7xxx and KT7xxx PC keyboards add a keyboard to the Control Panel which allows the comfortable entry of large amounts of data with a keyboard designed for industrial use. The Control Panel keyboards K7xxx and KT7xxx are even more robust than a membrane keyboard and yet feel almost like a standard keyboard. They offer the optimum in operating comfort in tough industrial environments.

An aluminium keyboard housing in Control Panel design combines the keyboard and the Control Panel to form a homogeneous unit. The width of the housing is adapted to the Control Panel for which the keyboard is intended.

A touch pad can be integrated into the keyboard housing. Here, large, easily accessible keys meeting protection class IP 67 serve as mouse keys. The keyboards K7xxx and KT7xxx are mounted in a holder on the Control Panel which is available in a version located at a fixed angle of 100° and a version which can be adjusted between 90° and 180°. The Control Panel is modified to have additional open sections in the side contour which allow the cabling to be stored in an invisible way.

### Ordering information

K71xx-xxxx	additional keyboard to be mounted to a Control Panel CP79xx or to a Panel PC CP71xx, CP72xx and CP77xx
KT71xx-xxxx	additional keyboard with touch pad to be mounted to a Control Panel CP79xx or to a Panel PC CP71xx, CP72xx and CP77xx
C9900-M300	mounting adapter with fixed 100° angle for mounting a keyboard K7xxx or KT7xxx to a Control Panel
C9900-M310	mounting adapter with adjustable 90° to 180° angle for mounting a keyboard K7xxx or KT7xxx to a Control Panel



## C9900-M400 | Keyboard shelf for Control Panel and Panel PCs



The keyboard shelf at a Beckhoff Control Panel permits a standard PC keyboard to be placed in front of the Control Panel, allowing convenient operation during commissioning or software updates. During normal production, the machine operator can rest tools and other items here while he is using the Control Panel.

The shelf is constructed from anodised aluminium, and its design matches that of the Control Panel. A ribbed rubber mat is glued to the surface of

the shelf. The keyboard shelf is made as wide as the Control Panel. In the case of small Control Panels, the shelf is wider than the Control Panel housing, so that a keyboard can be rested on it.

The Control Panel is given additional holes on the lower side, so the shelf should be ordered at the same time as the Control Panel.

### Ordering information

C9900-M400	toolboard for keyboard or tools, mounted under a Control Panel CP7xxx or Panel PCs CP7xxx
C9900-M401	drill holes at the bottom of a Control Panel or Panel PC CP7xxx for assembly of a keyboard shelf (supply without shelf)





## C9900-T90x | Touch screen pen for Control Panel and Panel PCs



### Precision in touch screen operation

The touch screen is the ideal operating medium for the Industrial PC. By using the Beckhoff touch screen pen, it is possible to make the touch screen technology available for tough operating environments and to allow higher operating precision than using the finger or another pointing medium.

The stable, round point of the pen allows easy, flowing operation of the touch screen and gives a better view of the display at the same time. It is also possible for operators who wear gloves to work in a precise and comfortable way with the Beckhoff touch screen pen. Grit or dirt on the finger is no longer

a problem. The plastic tip is gentle on the surface of the touch screen. Direct operation without a pen still remains possible. The user of the Beckhoff touch screen pen receives a precise input medium with an ergonomically formed, non-slip aluminium shaft, in a design which conforms to that of the Control Panel, and with the right balance of weight, form and friction. This pen is also ideal for the Beckhoff built-in Panel PCs with touch screen.

The touch screen pen is kept in a holder fastened to the Control Panel or to the Panel PC. A connecting cord between the pen and the holder makes the pen accessible at any time.

### Ordering information

C9900-T900	touch screen pen with holder for Control Panel and Panel PCs CP7xxx
C9900-T902	touch screen pen with wall holder for built-in Control Panel and Panel PCs CP6xxx and C3xxx



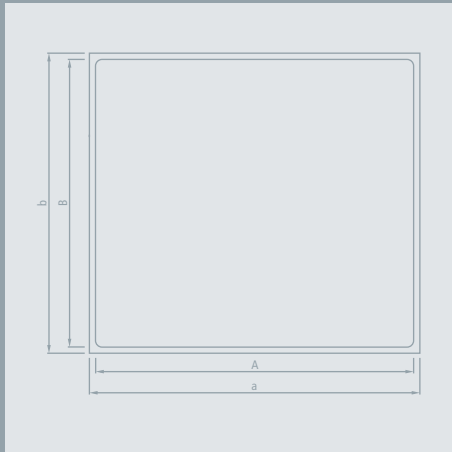
## C9900-E21x | RFID reader in the Control Panel front

The CP710x, CP720x and CP770x Panel PCs and the CP790x Control Panels with 15- or 19-inch display without membrane keyboard are available with RFID reader in the front panel. The card reader enables user identification at the device. The RFID module reads Legic transponders at a distance of up to 30 mm. The data are transferred to the PC via USB. The RFID reader is integrated in the Control Panel or the Panel PC behind the front laminate. The print on the front laminate indicates the position of the RFID reader below the display on the right-hand side. IP 65 protection class is maintained and enables operation in harsh industrial environments. The RFID option has no influence on the dimensions of the Control Panel.

C9900-E21x	RFID reader
	Legic transponder type
	transponder frequency 13.56 MHz
	integrated in the Control Panel behind the front laminate
	up to 30 mm reading distance
	internally connected via USB interface
	protection class IP 65
Ordering information	
C9900-E213	RFID reader for Legic transponder inside the front of a Panel PC CP7102, CP7202 or CP7702 or of a Control Panel CP7902, integrated behind the front laminate, protection class IP 65, connected internally by USB
C9900-E214	RFID reader for Legic transponder inside the front of a Panel PC CP7103, CP7203 or CP7703 or of a Control Panel CP7903, integrated behind the front laminate, protection class IP 65, connected internally by USB

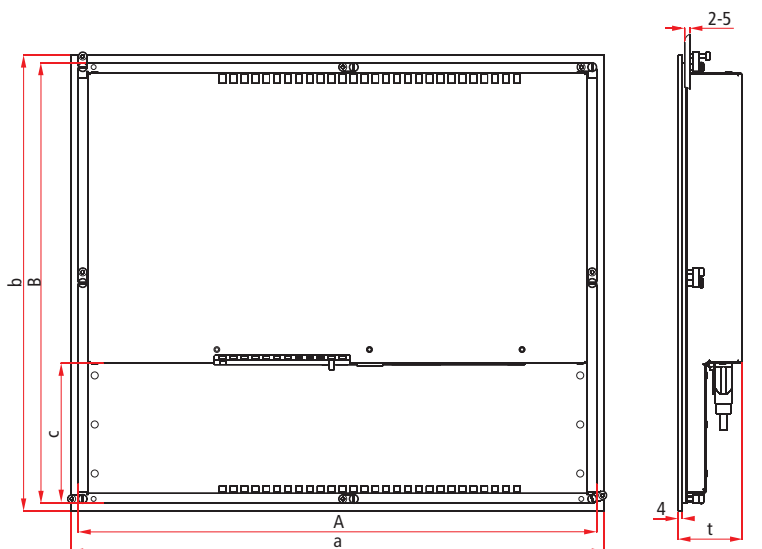
# Dimensions Control Panel

Technical drawings of the Control Panels



The drawings of each Control Panel are available as AutoCAD DXF file at [www.beckhoff.com](http://www.beckhoff.com).

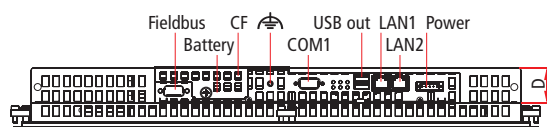
## CP66xx – Dimensions



Dimensions in mm

Rear view

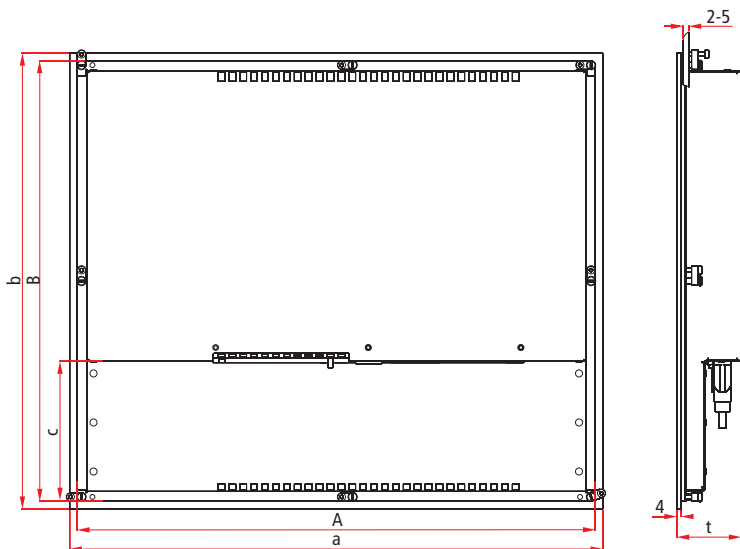
Side view



Connectors

Dimensions		a	b	t	A	B	C	D
<b>Display only</b>								
CP6607	5.7" display	183 mm	128.5 mm	62.2 mm	169 mm	114.5 mm	5.4 mm	0 mm
CP6608	5.7" display	185 mm	150 mm	62.5 mm	171 mm	136 mm	56 mm	24 mm
CP6609	6.5" display	240 mm	175 mm	55 mm	226 mm	161 mm	26.6 mm	30.5 mm
CP6601	12" display	330 mm	275 mm	58 mm	316 mm	261 mm	24.6 mm	32.5 mm
CP6602	15" display	380 mm	315 mm	59 mm	366 mm	301 mm	41.2 mm	33 mm
<b>With function keys</b>								
CP6619	6.5" display	272.3 mm	221 mm	55 mm	258.3 mm	207 mm	70 mm	30.5 mm
CP6611	12" display	372.2 mm	342.2 mm	58 mm	358.2 mm	328.2 mm	67 mm	32.5 mm
CP6612	15" display	430.4 mm	403 mm	59 mm	416.4 mm	389 mm	86.5 mm	33 mm
<b>Numeric keyboard</b>								
CP6629	6.5" display	340.4 mm	221 mm	55 mm	326.4 mm	207 mm	70 mm	30.5 mm
CP6621	12" display	414 mm	336 mm	58 mm	400 mm	322 mm	51.5 mm	32.5 mm
CP6621-0002	12" display	444.2 mm	336 mm	58 mm	430.2 mm	322 mm	51.5 mm	32.5 mm
CP6622	15" display	519.4 mm	378.2 mm	59 mm	505.4 mm	364.2 mm	70.9 mm	33 mm
<b>Alphanumeric keyboard</b>								
CP6631	12" display	410.4 mm	378.2 mm	58 mm	396.4 mm	364.2 mm	115.7 mm	32.5 mm
CP6631-0002	12" display	430.4 mm	378.2 mm	58 mm	416.4 mm	364.2 mm	115.7 mm	32.5 mm
CP6632	15" display	489.4 mm	418.2 mm	59 mm	475.4 mm	404.2 mm	128.3 mm	33 mm

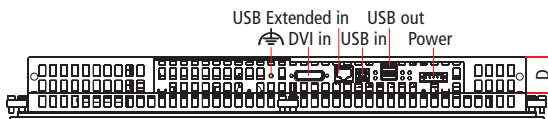
# CP69xx – Dimensions



Dimensions in mm

Rear view

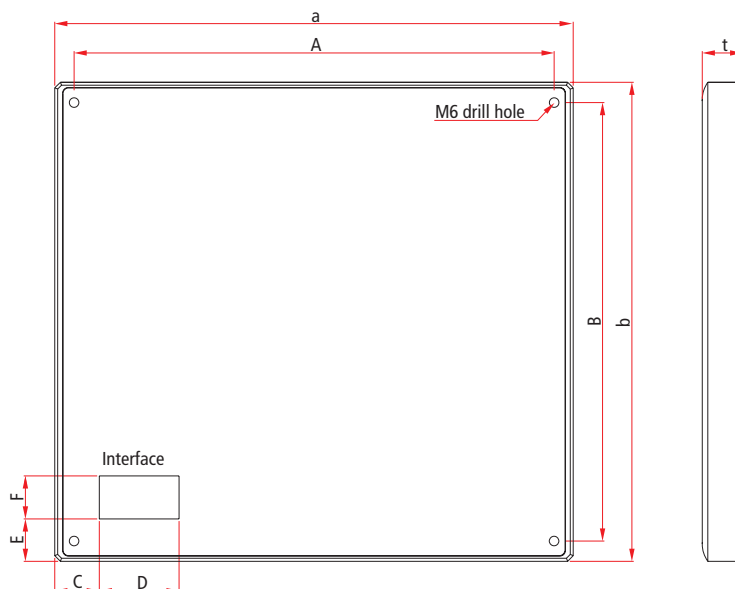
Side view



Connectors

Dimensions		a	b	t	A	B	C	D
<b>Display only</b>								
CP6907	5.7" display	183 mm	128.5 mm	50.7 mm	169 mm	114.5 mm	5.4 mm	0 mm
CP6909	6.5" display	240 mm	175 mm	55 mm	226 mm	161 mm	26.6 mm	30.5 mm
CP6901	12" display	330 mm	275 mm	58 mm	316 mm	261 mm	24.6 mm	32.5 mm
CP6902	15" display	380 mm	315 mm	59 mm	366 mm	301 mm	41.2 mm	33 mm
CP6903	19" display	455 mm	390 mm	67 mm	441 mm	376 mm	77.2 mm	33 mm
CP6904	24" display	594.4 mm	423 mm	75 mm	562.4 mm	391 mm	44.6 mm	33 mm
<b>With function keys</b>								
CP6919	6.5" display	272.3 mm	221 mm	55 mm	258.3 mm	207 mm	70 mm	30.5 mm
CP6911	12" display	372.2 mm	342.2 mm	58 mm	358.2 mm	328.2 mm	67 mm	32.5 mm
CP6912	15" display	430.4 mm	403 mm	59 mm	416.4 mm	389 mm	86.5 mm	33 mm
CP6913	19" display	508.4 mm	463 mm	67 mm	494.4 mm	449 mm	116.2 mm	33 mm
<b>Numeric keyboard</b>								
CP6929	6.5" display	340.4 mm	221 mm	55 mm	326.4 mm	207 mm	70 mm	30.5 mm
CP6921	12" display	414 mm	336 mm	58 mm	400 mm	322 mm	51.5 mm	32.5 mm
CP6921-0002	12" display	444.2 mm	336 mm	58 mm	430.2 mm	322 mm	51.5 mm	32.5 mm
CP6922	15" display	519.4 mm	378.2 mm	59 mm	505.4 mm	364.2 mm	70.9 mm	33 mm
CP6923	19" display	567.4 mm	434 mm	67 mm	553.4 mm	420 mm	93.5 mm	33 mm
<b>Alphanumeric keyboard</b>								
CP6931	12" display	410.4 mm	378.2 mm	58 mm	396.4 mm	364.2 mm	115.7 mm	32.5 mm
CP6931-0002	12" display	430.4 mm	378.2 mm	58 mm	416.4 mm	364.2 mm	115.7 mm	32.5 mm
CP6932	15" display	489.4 mm	418.2 mm	59 mm	475.4 mm	404.2 mm	128.3 mm	33 mm
CP6933	19" display	508.4 mm	543 mm	67 mm	494.4 mm	529 mm	195.8 mm	33 mm
<b>Alphanumeric keyboard with PLC keys on the sides</b>								
CP6942	15" display	449.4 mm	458 mm	59 mm	435.4 mm	444 mm	167.5 mm	33 mm

## CP79xx – Dimensions



Dimensions in mm

Rear view

Side view

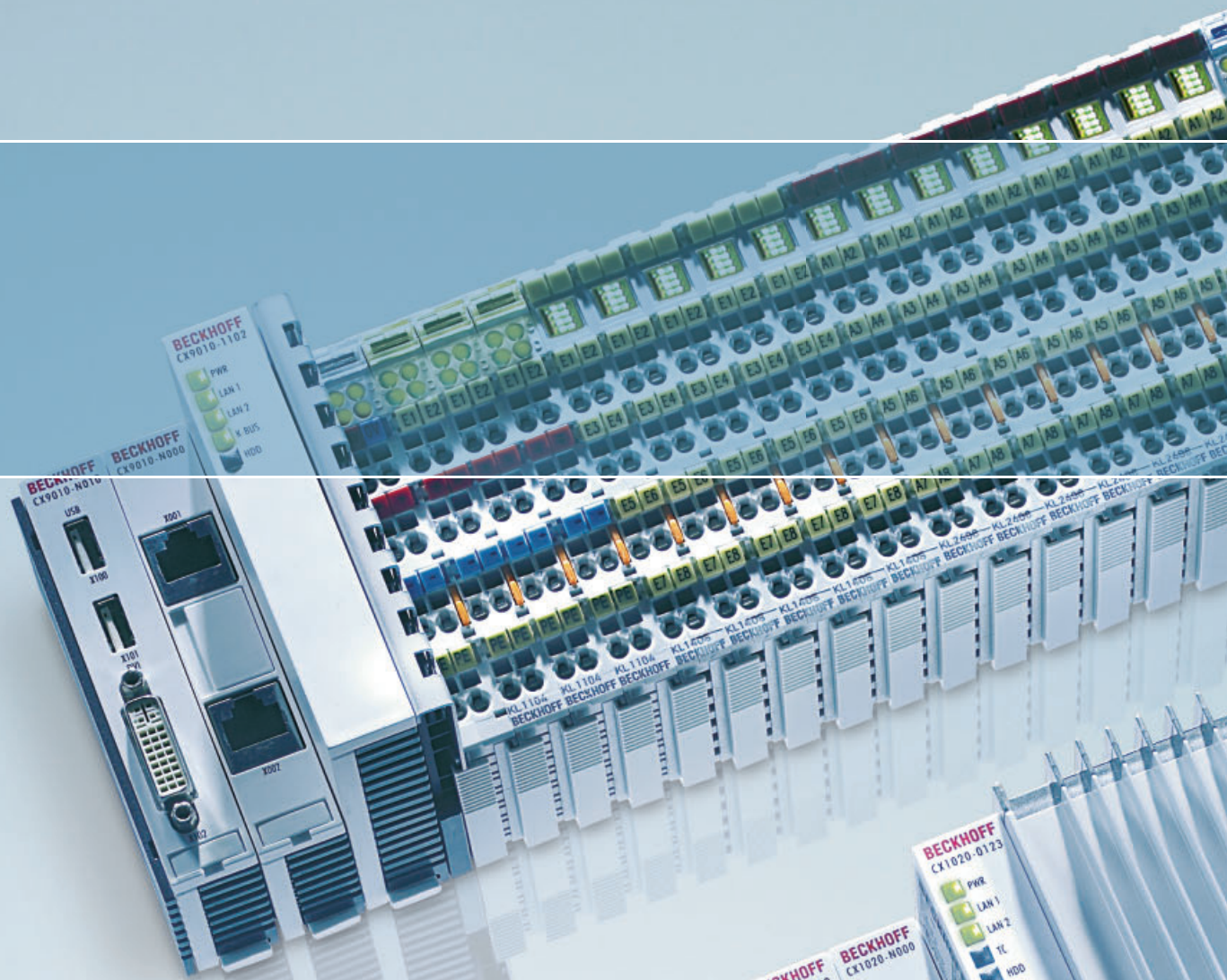
Dimensions		a	b	t	A	B	C	D	E	F
<b>Display only</b>										
CP7909	6.5" display	267.9 mm	173 mm	38 mm	241.9 mm	149 mm	160 mm	50 mm	50 mm	50 mm
CP7901	12" display	353.8 mm	326.3 mm	27.5 mm	327.6 mm	303.7 mm	33 mm	50 mm	12 mm	50 mm
CP7902	15" display	426 mm	395 mm	28.5 mm	399.8 mm	367.4 mm	35 mm	50 mm	18 mm	50 mm
CP7903	19" display	504 mm	455 mm	40 mm	474 mm	430 mm	30 mm	50 mm	20 mm	50 mm
CP7904	24" display	610 mm	435 mm	60 mm	580 mm	410 mm	517.4 mm	50 mm	10.5 mm	50 mm
<b>With function keys</b>										
CP7919	6.5" display	267.9 mm	213 mm	38 mm	241.9 mm	189 mm	60 mm	50 mm	151 mm	50 mm
CP7911	12" display	353.8 mm	326.3 mm	27.5 mm	327.6 mm	303.7 mm	33 mm	50 mm	12 mm	50 mm
CP7912	15" display	426 mm	395 mm	28.5 mm	399.8 mm	367.4 mm	35 mm	50 mm	18 mm	50 mm
CP7913	19" display	504 mm	455 mm	40 mm	474 mm	430 mm	30 mm	50 mm	20 mm	50 mm
<b>Numeric keyboard</b>										
CP7929	6.5" display	336 mm	213 mm	38 mm	310 mm	189 mm	30 mm	50 mm	15 mm	50 mm
CP7921-0002	12" display	439.8 mm	308.3 mm	27.5 mm	408.6 mm	280.7 mm	66 mm	50 mm	14 mm	50 mm
CP7922	15" display	515 mm	370.2 mm	28.5 mm	483.8 mm	342.6 mm	36 mm	50 mm	30 mm	50 mm
CP7923	19" display	563 mm	426 mm	40 mm	533 mm	401 mm	30 mm	50 mm	20 mm	50 mm
<b>Alphanumeric keyboard</b>										
CP7931-0002	12" display	426 mm	370.2 mm	27.5 mm	399.8 mm	342.6 mm	44 mm	50 mm	74 mm	50 mm
CP7932	15" display	483 mm	410.2 mm	28.5 mm	458.8 mm	387.6 mm	32 mm	50 mm	78 mm	50 mm
CP7933	19" display	504 mm	535 mm	40 mm	474 mm	510 mm	30 mm	50 mm	100 mm	50 mm
<b>Alphanumeric keyboard with PLC keys on the sides</b>										
CP7942	15" display	445 mm	450 mm	28.5 mm	418.8 mm	422.4 mm	40 mm	60 mm	25 mm	50 mm



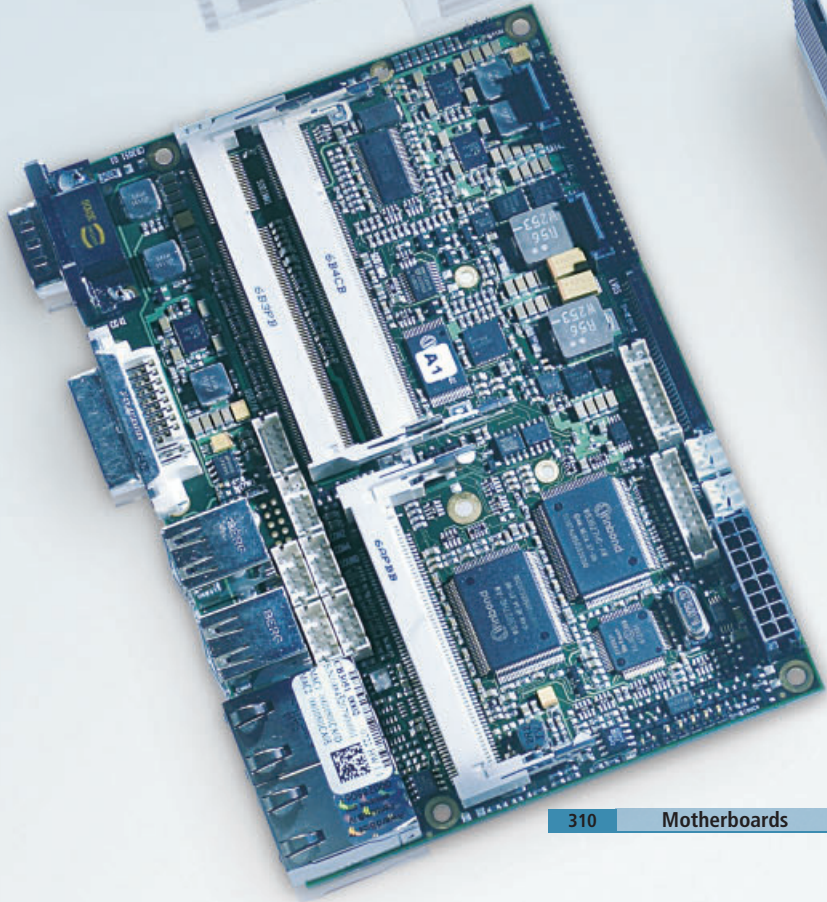
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Modular DIN rail IPCs and Industrial Motherboards





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- 280 Basic CPU module CX1010
- 282 System interfaces  
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### 283 Embedded PC series CX5010, CX5020 (x86)

- 284 Basic CPU module CX5010
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### 304 Fieldbus slaves

- 304 Lightbus CX1500-B200
- 304 PROFIBUS CX1500-B310
- 305 CANopen CX1500-B510
- 305 DeviceNet CX1500-B520

### 306 UPS

- 306 UPS module CX1100-09x0

### 310 Motherboards

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- 312 Product overview
- 314 System description
- 316 Features

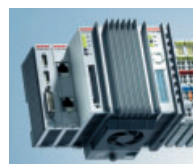
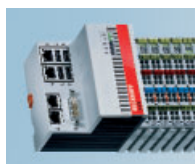
### 318 Industrial Motherboards

- 318 ATX Industrial Motherboards  
CB105x
- 324 Slot Industrial Motherboards  
CB205x
- 328 3½-inch Industrial Motherboards  
CB30xx
- 336 Compact Industrial Motherboards  
CB31x0
- 340 PC/104 Industrial Motherboards  
CB40xx

# Product overview Embedded PC


























Embedded PC			
Basic CPU	CX80xx <span style="float: right;">262</span>	CX9000, CX9010 <span style="float: right;">272</span>	CX1010 <span style="float: right;">280</span>
Processor	32 bit, 400 MHz, ARM9	Intel® IXP420 with XScale® technology, 266/533 MHz clock frequency, ARM9	Pentium® MMX-compatible, 500 MHz clock frequency
Flash memory	128 MB microSD	32 MB Flash (internal, not expandable)	64 MB Compact Flash card
Internal main memory	64 MB RAM	128 MB RAM (internal, not expandable)	256 MB DDR RAM (internal, not expandable)
Interfaces	1 x Ethernet 10/100 Mbit/s, 1 x USB device (behind the front flap)	2 x RJ 45 (Ethernet, internal switch), 10/100 Mbit/s	1 x RJ 45 (Ethernet), 10/100 Mbit/s
I/O interfaces	direct connection for K-bus or E-bus	direct connection for K-bus or E-bus	via power supply module (K-bus, K-bus/IP-Link, E-bus)
System interfaces	via EtherCAT Terminals	modularly expandable	modularly expandable
DVI/USB	–	CX9000-N010 <span style="float: right;">276</span> CX9010-N010 <span style="float: right;">276</span>	CX1010-N010 <span style="float: right;">282</span>
RS232	EL6001, EL6002 <span style="float: right;">794</span>	CX9000-N030 <span style="float: right;">276</span> CX9010-N030 <span style="float: right;">276</span>	CX1010-N030 (COM 1/2) <span style="float: right;">282</span> CX1010-N040 (COM 3/4) <span style="float: right;">282</span>
RS422/RS485	EL6021, EL6022 <span style="float: right;">795</span>	CX9000-N031 <span style="float: right;">276</span> CX9010-N031 <span style="float: right;">276</span>	CX1010-N031 (COM 1/2) <span style="float: right;">282</span> CX1010-N041 (COM 3/4) <span style="float: right;">282</span>
Audio	–	–	CX1010-N020 <span style="float: right;">282</span>
Ethernet	–	–	CX1010-N060 <span style="float: right;">282</span>
4-port USB hub	–	CX9000-N070 <span style="float: right;">276</span> CX9010-N070 <span style="float: right;">276</span>	–
Compact Flash	–	CX9000-A001 <span style="float: right;">276</span> CX9010-A001 <span style="float: right;">276</span>	–
Fieldbus interfaces	optionally integrated or via EtherCAT Terminals	via EtherCAT Terminals	modularly expandable
Lightbus	EL6720 master <span style="float: right;">804</span>	EL6720 master <span style="float: right;">804</span>	CX1500-M200 master <span style="float: right;">302</span> CX1500-B200 slave <span style="float: right;">304</span>
PROFIBUS	EL6731 master <span style="float: right;">805</span> EL6731-0010 slave <span style="float: right;">805</span>	EL6731 master <span style="float: right;">805</span> EL6731-0010 slave <span style="float: right;">805</span>	CX1500-M310 master <span style="float: right;">302</span> CX1500-B310 slave <span style="float: right;">304</span>
Interbus	EL6740-0010 slave <span style="float: right;">806</span>	EL6740-0010 slave <span style="float: right;">806</span>	–
CANopen	EL6751 master <span style="float: right;">807</span> EL6751-0010 slave <span style="float: right;">807</span>	EL6751 master <span style="float: right;">807</span> EL6751-0010 slave <span style="float: right;">807</span>	CX1500-M510 master <span style="float: right;">303</span> CX1500-B510 slave <span style="float: right;">305</span>
DeviceNet	EL6752 master <span style="float: right;">808</span> EL6752-0010 slave <span style="float: right;">808</span>	EL6752 master <span style="float: right;">808</span> EL6752-0010 slave <span style="float: right;">808</span>	CX1500-M520 master <span style="float: right;">303</span> CX1500-B520 slave <span style="float: right;">305</span>
SERCOS interface	–	–	CX1500-M750 master <span style="float: right;">303</span>
UPS	1-second UPS	–	CX1100-0910, -0900 <span style="float: right;">306</span>



CX5010, CX5020		CX1020		CX1030	
	284		290		292
Intel® Atom™, 1.1/1.6 GHz clock frequency		Intel® Celeron® M ULV, 1 GHz clock frequency		Intel® Pentium® M, 1.8 GHz clock frequency	
64 MB Compact Flash card		64 MB Compact Flash card		64 MB Compact Flash card	
512 MB RAM (internal, not expandable)		256 MB DDR RAM (expandable to 512 MB, 1 GB)		256 MB DDR RAM (expandable to 512 MB, 1 GB)	
2 x RJ 45, 10/100/1000 Mbit/s, DVI, 4 x USB 2.0, optional 1 x RS232/RS422/RS485		2 x RJ 45 (Ethernet, internal switch)		2 x RJ 45 (Ethernet, internal switch), 10/100 Mbit/s	
direct connection for K-bus or E-bus		via power supply module (K-bus, K-bus/IP-Link, E-bus)		via power supply module (K-bus, K-bus/IP-Link, E-bus)	
<b>via EtherCAT Terminals</b>		<b>modularly expandable</b>		<b>modularly expandable</b>	
–		CX1020-N010 294		CX1030-N010 295	
EL6001, EL6002 794		CX1020-N030 (COM 1/2) 294		CX1030-N030 (COM 1/2) 295	
		CX1020-N040 (COM 3/4) 294		CX1030-N040 (COM 3/4) 295	
EL6021, EL6022 795		CX1020-N031 (COM 1/2) 294		CX1030-N031 (COM 1/2) 295	
		CX1020-N041 (COM 3/4) 294		CX1030-N041 (COM 3/4) 295	
–		CX1020-N020 294		CX1030-N020 295	
–		CX1020-N060 294		CX1030-N060 295	
–		–		–	
–		–		–	
<b>optionally integrated or via EtherCAT Terminals</b>		<b>modularly expandable</b>		<b>modularly expandable</b>	
EL6720 master 804		CX1500-M200 master 302		CX1500-M200 master 302	
		CX1500-B200 slave 304		CX1500-B200 slave 304	
EL6731 master 805		CX1500-M310 master 302		CX1500-M310 master 302	
EL6731-0010 slave 805		CX1500-B310 slave 304		CX1500-B310 slave 304	
EL6740-0010 slave 806		–		–	
EL6751 master 807		CX1500-M510 master 303		CX1500-M510 master 303	
EL6751-0010 slave 807		CX1500-B510 slave 305		CX1500-B510 slave 305	
EL6752 master 808		CX1500-M520 master 303		CX1500-M520 master 303	
EL6752-0010 slave 808		CX1500-B520 slave 305		CX1500-B520 slave 305	
–		CX1500-M750 master 303		CX1500-M750 master 303	
<b>1-second UPS</b>		<b>CX1100-0920</b>		<b>CX1100-0930</b>	
			307		307

# System overview Embedded PC

**System overview CX80xx, CX90x0, CX50x0**

<p><b>CPU + fieldbus interface + power supply + I/O interface + UPS*</b></p>							
<p><b>CX8010</b> EtherCAT</p>  <p>Bus or EtherCAT Terminals</p>	<p><b>CX8031</b> PROFINET BUS</p>  <p>Bus or EtherCAT Terminals</p>	<p><b>CX8051</b> CANopen</p>  <p>Bus or EtherCAT Terminals</p>					
<p><b>CX8090</b> Ethernet</p>  <p>Bus or EtherCAT Terminals</p>	<p><b>CX8093</b> PROFINET BUS</p>  <p>Bus or EtherCAT Terminals</p>	<p><b>CX8095</b> EtherNet/IP</p>  <p>Bus or EtherCAT Terminals</p>					
<p><b>PC interfaces</b> CX9000-xxxx/CX9010-xxxx</p> <table border="0"> <tr> <td>  <p>RS422/ RS485 -N031</p> </td> <td>  <p>DVI/USB -N010</p> </td> </tr> <tr> <td>  <p>4-port USB hub -N070</p> </td> <td>  <p>RS232 -N030</p> </td> </tr> <tr> <td colspan="2">  <p>CF -A001</p> </td> </tr> </table>	 <p>RS422/ RS485 -N031</p>	 <p>DVI/USB -N010</p>	 <p>4-port USB hub -N070</p>	 <p>RS232 -N030</p>	 <p>CF -A001</p>		<p><b>CPU + power supply + I/O interface</b> CX9000/CX9010</p>  <p>Bus or EtherCAT Terminals</p>
 <p>RS422/ RS485 -N031</p>	 <p>DVI/USB -N010</p>						
 <p>4-port USB hub -N070</p>	 <p>RS232 -N030</p>						
 <p>CF -A001</p>							
<p><b>CPU + power supply + I/O interface + UPS*</b> CX5010/CX5020</p>  <p>Bus or EtherCAT Terminals</p>							

\*integrated 1-second UPS

## System overview CX10x0

### UPS

CX1100-0900



CX1100-0910



CX1100-0920



CX1100-0930



### Fieldbus interfaces

Masters CX1500-Mxxx



-M750 -M520 -M510 -M310 -M200



Slaves CX1500-Bxxx



-B520 -B510 -B310 -B200

### PC interfaces

CX1030-N0xx



RS232 -N030 DVI/USB -N010

CX1020-N0xx



RS232 -N030 DVI/USB -N010

CX1010-N0xx



RS232 -N030 DVI/USB -N010

### CPU

CX1030

CX1020

CX1010

### Power supply

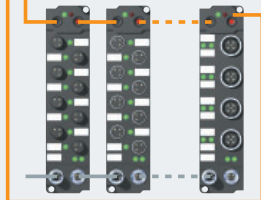
CX1100-00xx



-00x4 EtherCAT Terminals



-00x3 Bus Terminals



Fieldbus Box modules



-00x2 Bus Terminals



-0001 power supply module

# Beckhoff Embedded PC

## Modular DIN rail Industrial PCs

With the CX series of Embedded PCs, Beckhoff has combined PC technology and modular I/O level to form a DIN rail unit in the control cabinet. The CX device series combines the worlds of Industrial PC and hardware PLC and is suitable for medium-performance control tasks. The modular control system can be configured to match the task in hand and can be installed in the control cabinet or the terminal box.

The CX system covers the whole range of Beckhoff control technology both in terms of price and performance: this product range is designed for tasks requiring the characteristics and computing capacity of Industrial PCs, but whose budget does not stretch to full-blown Industrial PCs. The system only uses the components that are actually required. For example, a CX can be operated in "headless" mode, i.e. without display or keyboard; in this case, the associated interface is not required.

## Scalable performance classes

The CX family includes several basic CPU modules with different processors for optimum adaptation to the respective control task:

**CX1030:** high-performance CX with

Intel® Pentium® M CPU, 1.8 GHz processor

**CX1020:** high-performance CX with

Intel® Celeron® M ULV CPU, 1 GHz processor

**CX5020:** compact CX with Intel® Atom™

CPU, 1.6 GHz processor

**CX5010:** compact CX with Intel® Atom™

CPU, 1.1 GHz processor

**CX1010:** basic CX with Pentium® MMX-

compatible CPU, 500 MHz processor

**CX9010:** Ethernet controller with

Intel® IXP420 XScale® technology,

533 MHz processor

**CX9000:** Ethernet controller with

Intel® IXP420 XScale® technology,

266 MHz processor

**CX8000:** basic CX with ARM9 CPU,

400 MHz processor, and integrated

fieldbus interface

Apart from various CPUs, the individual CX types also have different system interfaces and power supply units. Via associated I/O interfaces the Embedded PCs support Beckhoff Bus Terminals and also EtherCAT Terminals as I/O system.

## The components

The individual system components of the CX series come as modules with single (19 mm) or double width (38 mm) that can be connected in series. The basic unit for the CX1030, CX1020 and CX1010 series consists of a CPU module and a power supply module. The CX8000, CX9000, CX9010, CX5010 and CX5020 devices integrate CPU and power supply in a single unit. Depending on the CX type, the controllers can be expanded through further system interfaces. The range of optional modules is complemented by fieldbus connections for PROFIBUS, CANopen, DeviceNet, SERCOS interface and Lightbus, both as master or slave versions.

In contrast to the other CX device families, the CX8000 and CX5000 series have a fixed, non-expandable number of system interfaces. The housing design for this series is optimised for robustness and compactness. No modular expandability for the left-hand side is provided. The devices from the CX8000 series are mainly used as programmable fieldbus slaves, while the CX5000 offers an optional master or slave interface. EtherCAT integration offers a wide range of expansion capability. Further master/slave fieldbus connections (PROFIBUS, CANopen, DeviceNet) or communication interfaces (RS232, RS422/RS485) and all other signal types accessible via EtherCAT can be directly connected as EtherCAT Terminals.

## The software

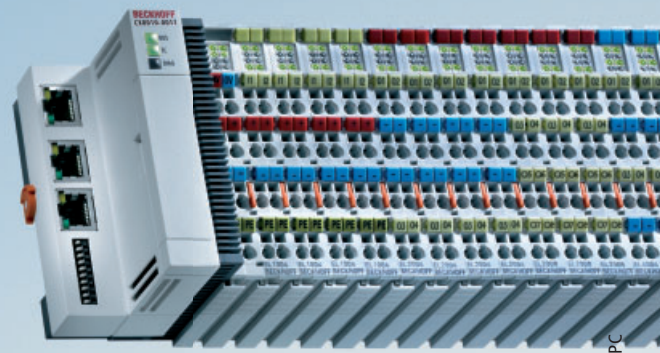
In combination with the TwinCAT automation software, the CX Embedded PC becomes a powerful IEC 61131-3 PLC that can also handle Motion Control tasks. Depending on

the required cycle time, it may be used to control several servo axes. With the CX1010, CX5010, CX5020, CX1020 or CX1030 even special functions such as "flying saw", "electronic gearbox" or "cam plate" can be realised. The CX thus becomes a controller that covers PLC, Motion Control and visualisation tasks with a single hardware. Under Windows CE, thanks to the real-time capability of the operating system, user tasks written in high-level languages can be processed in real-time in parallel with TwinCAT.

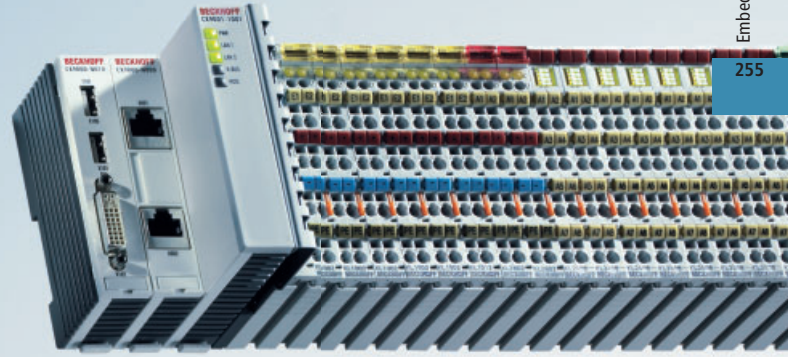
## Wide range of applications

Due to the design and the features of an industrial PC Control, the Embedded PCs can be used in a wide range of applications. Existing applications include mechanical engineering (automatic sawing machines, automatic assembly machines, paper cutting machines, screwdriver control, packing machines, sheet metal processing, handling equipment), process technology (water treatment, power generation, consumption logging), building services (room control, access control) and many more.

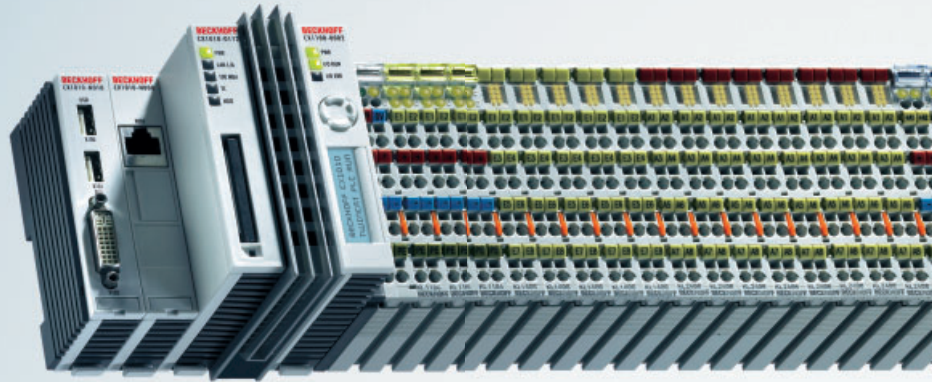
Embedded PC  
CX8000



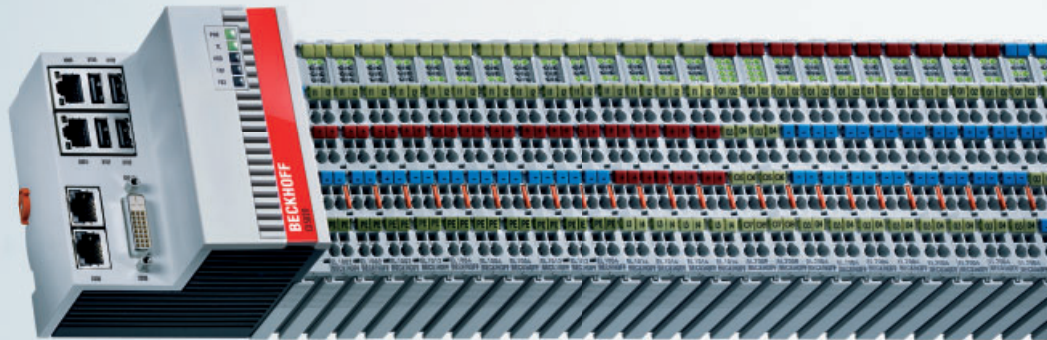
Embedded PC  
CX9000, CX9010



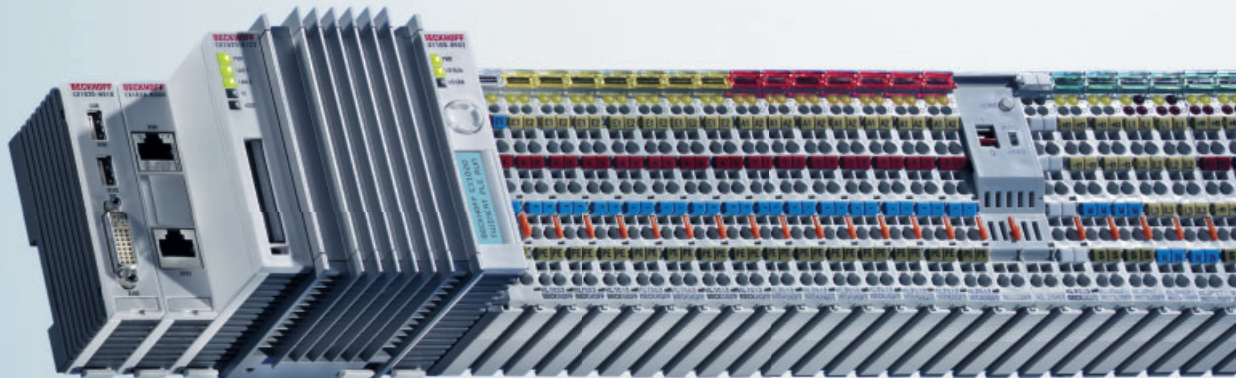
Embedded PC  
CX1010



Embedded PC  
CX5010, CX5020



Embedded PC  
CX1020, CX1030

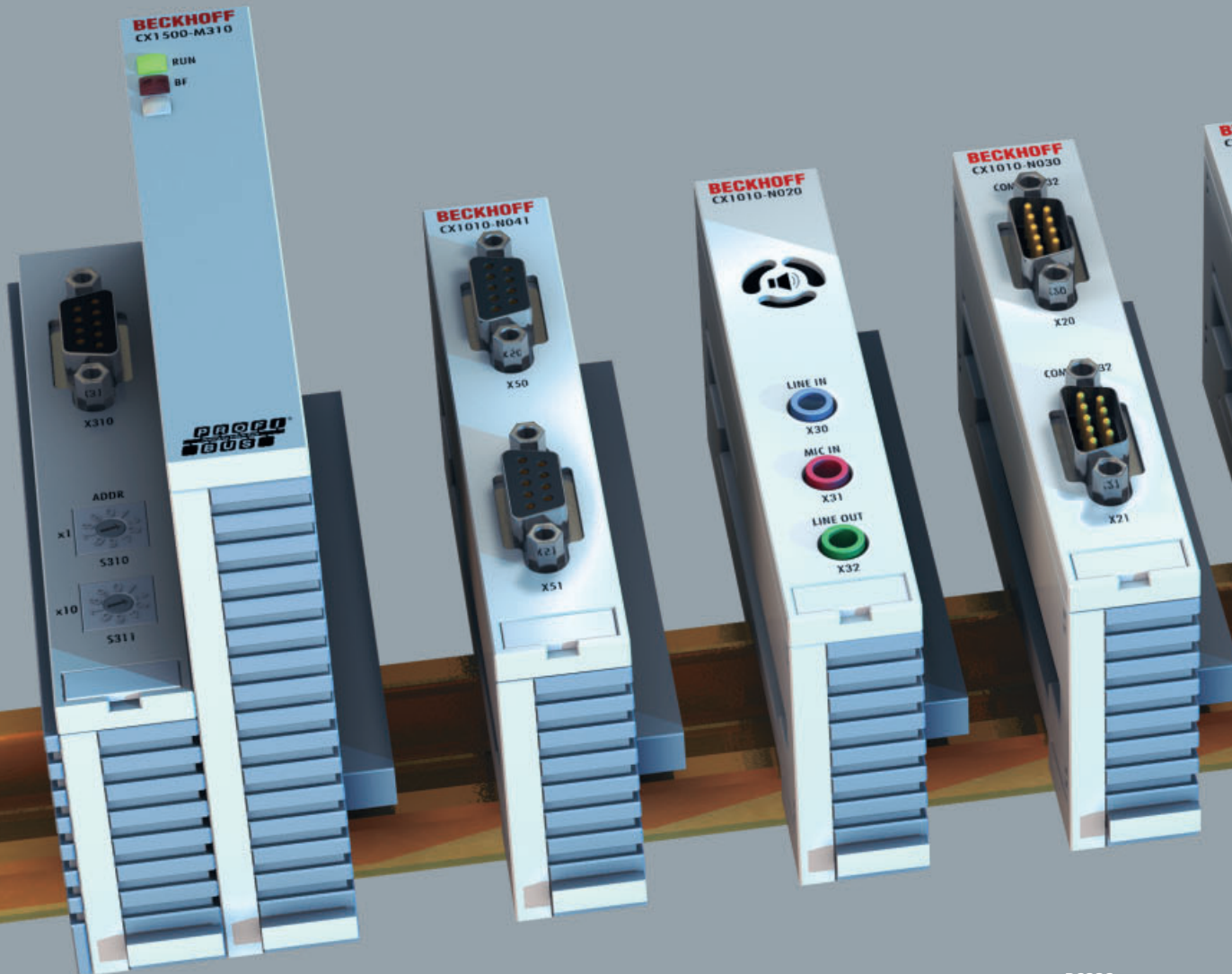




# Embedded PC features

## System interfaces

### Fieldbus interfaces



Master and slave connection

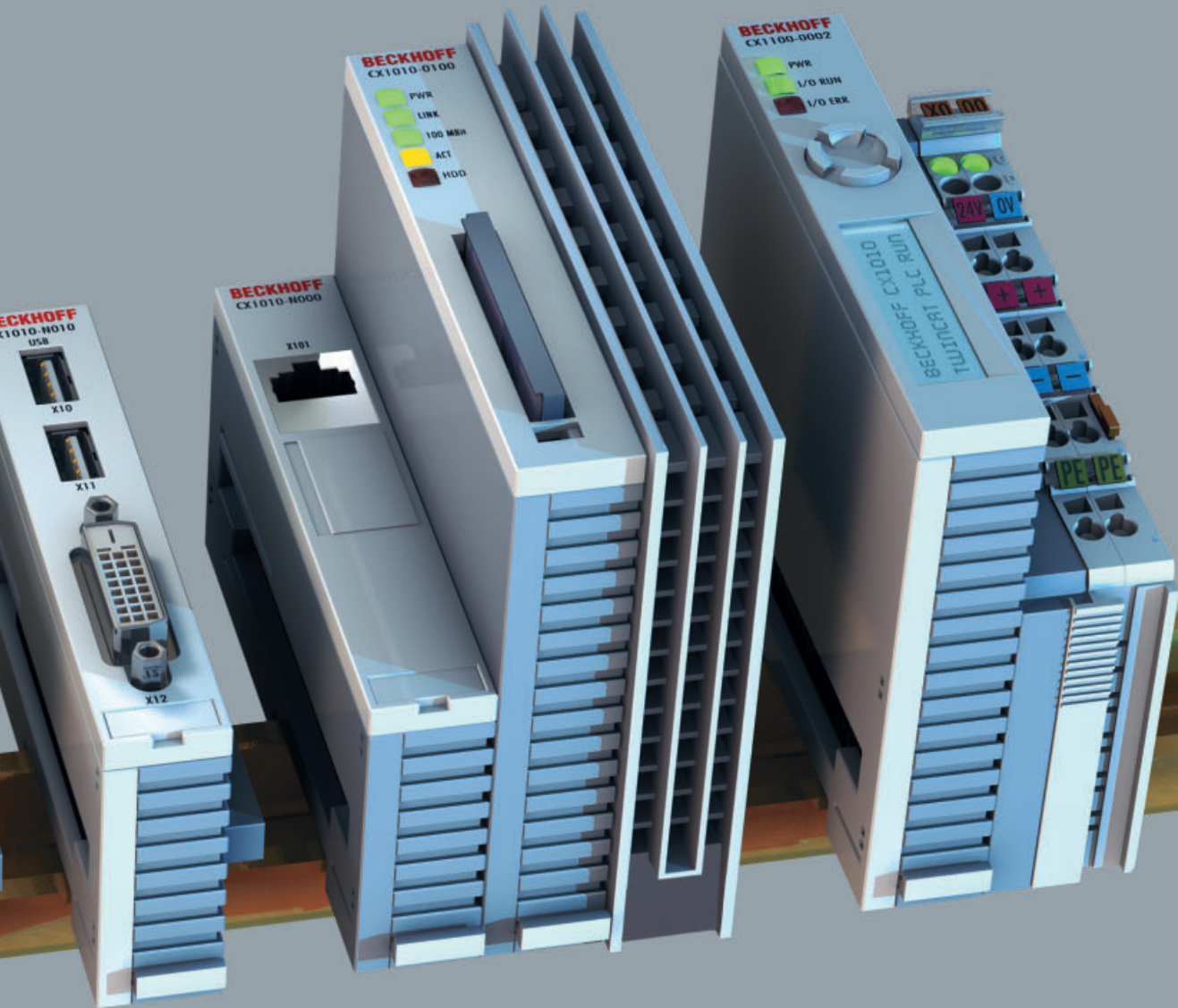
RS422/RS485 interface

Audio interface

RS232 interface

CPU

Power supply



USB/DVI  
interface

Basic CPU module

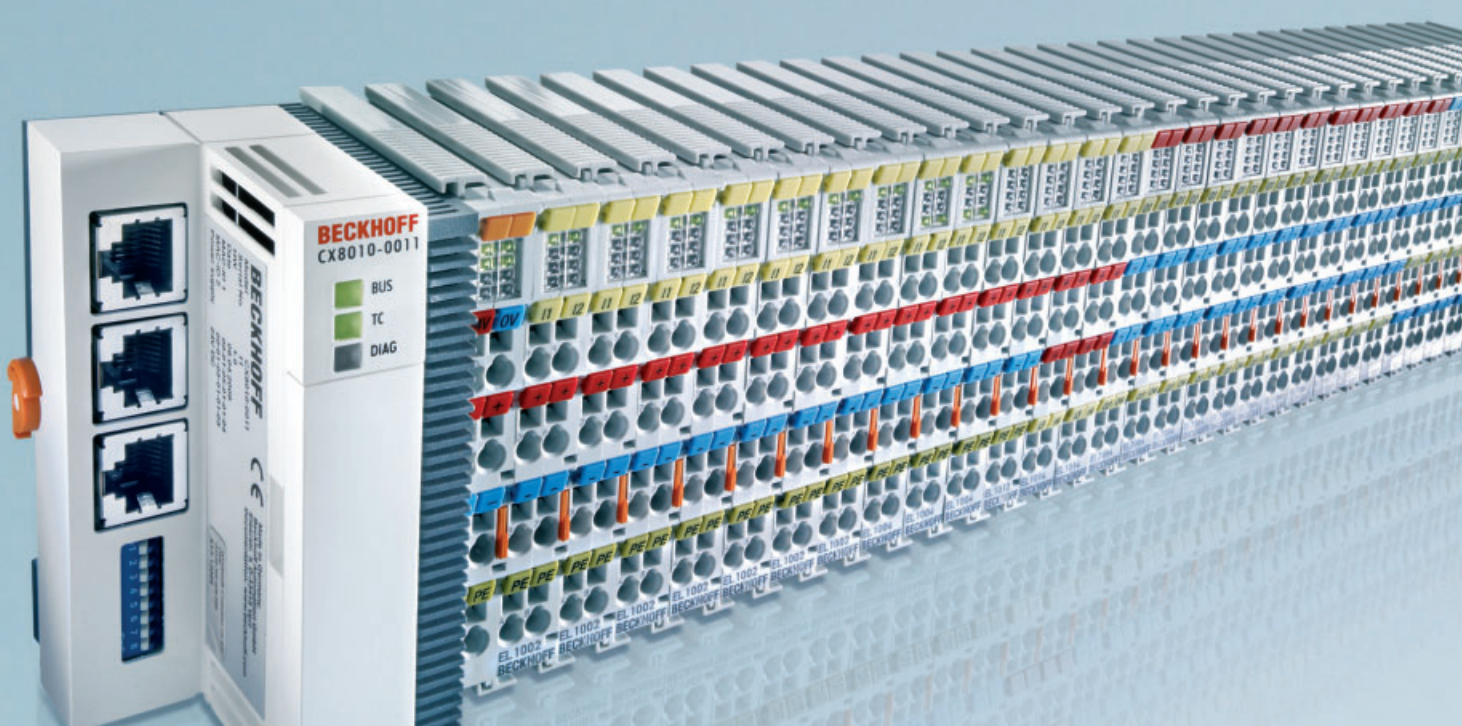
Power supply  
and I/O interface



# Embedded PC series CX8000

Embedded PC with Windows CE and fieldbus interface





## Embedded PC CX8000

CX8000 is a device family of programmable controllers with a 32 bit ARM-based CPU, which can be used for the processing of PLC programs or as slave devices for higher-level fieldbus systems. Unlike the non-programmable Bus Couplers of the EK series (EtherCAT Koppler [German for EtherCAT Coupler]), which only act as gateway between the associated fieldbus system and the connected EtherCAT Terminals, the CX8000 is programmable and able to run its own control program.

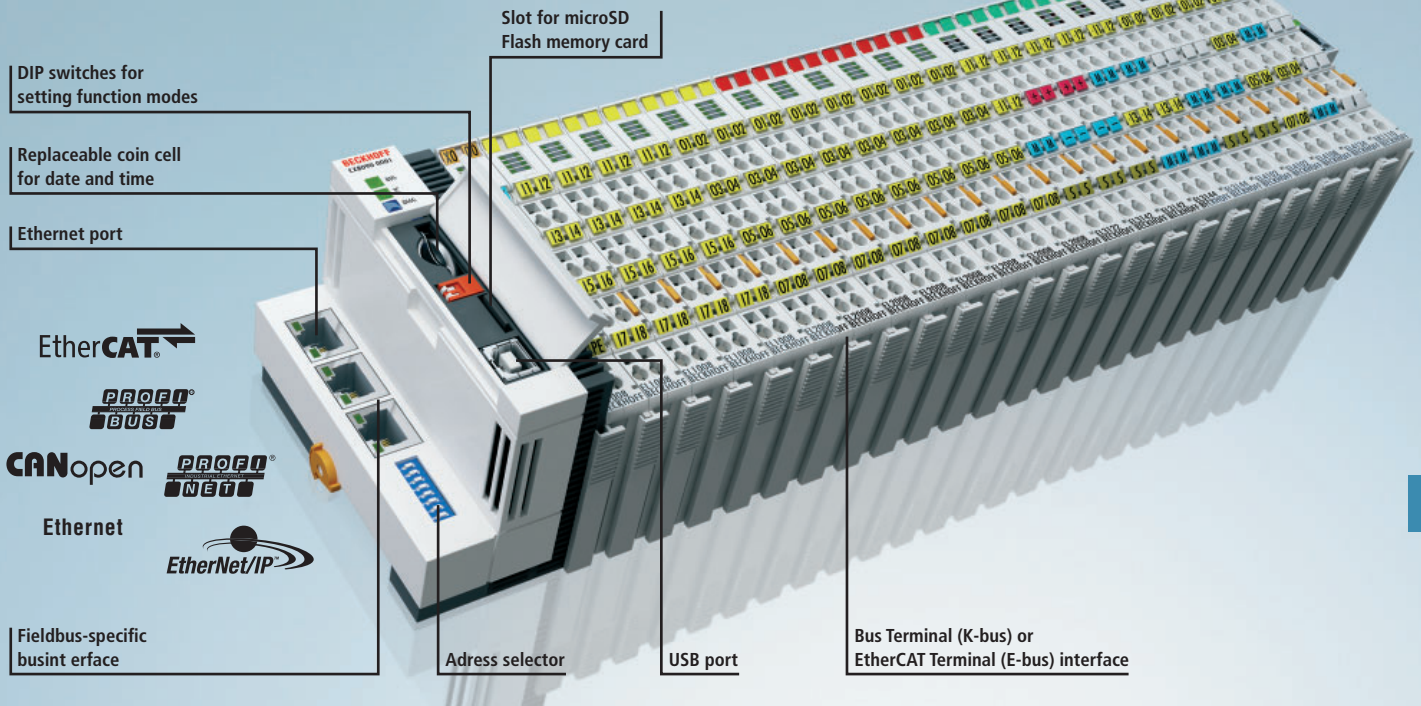
The CX8000 device series represents a further development of the familiar and proven 16 bit Bus Terminal Controllers from the BC series towards high-performance 32 bit processors. Just like the Bus Terminal Controller series, the CX8000 also ensures that the control system and the local program can still be processed in the event of an interruption of the higher-level fieldbus system. The CX8000 devices can therefore be used

as local controllers. Bus Terminals (K-bus) or EtherCAT Terminals (E-bus) can be connected. The application of EtherCAT opens up options, such as realisation of different topologies, integration of further bus systems such as CANopen, PROFIBUS and PROFINET, and the connection to the IP 67 world with the EtherCAT Box modules.

Like all CX products, the CX8000 devices are programmed and commissioned via the Ethernet interface, which can, of course, also be used for the connection of the control system with a regular network. Some Embedded PCs have additional Ethernet interfaces with switch functionality, so that a linear "daisy chain" topology can be established cost-effectively without additional hardware. The other connections on the lower plug level are fieldbus-specific. A replaceable coin cell for date and time, a number of dip switches for setting function modes, a slot for microSD flash memory cards and a USB port type B

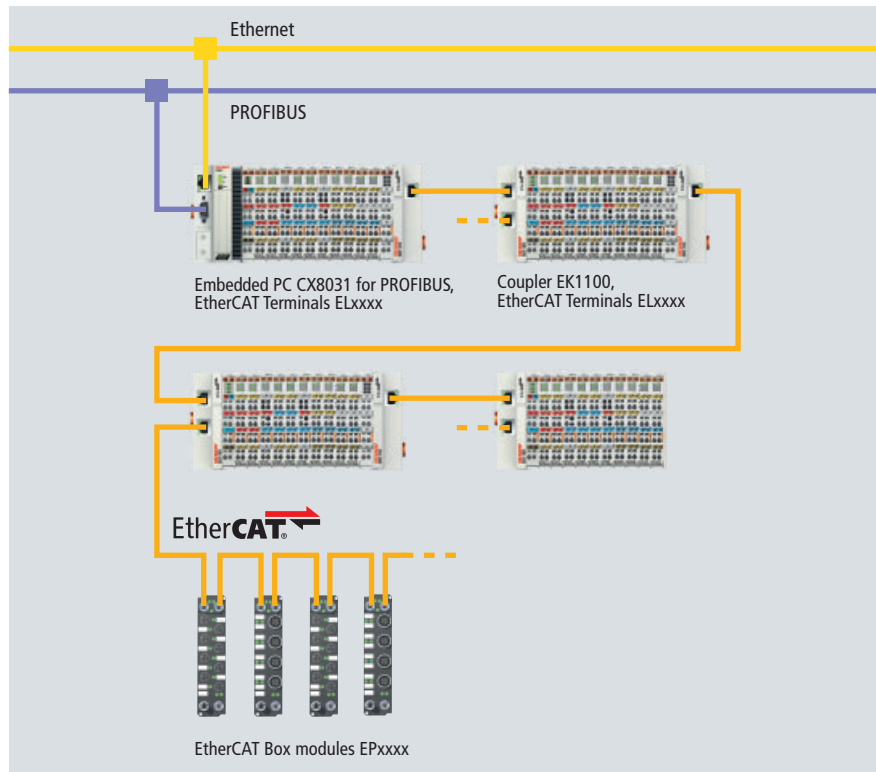
can be found under the front flap at the upper housing level. Thanks to their low electrical power consumption, the units are fanless.

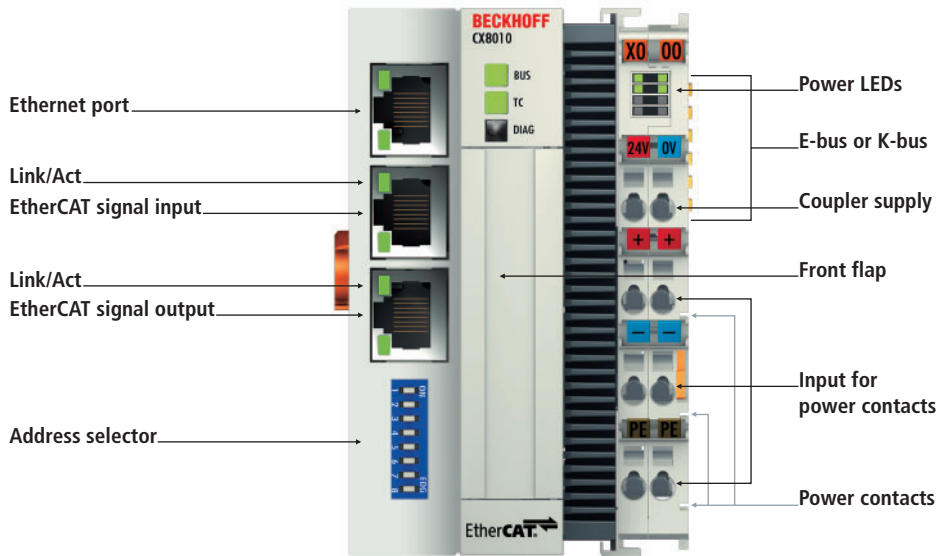
Microsoft Windows CE is used as the operating system. In the absence of a monitor port, the operating system and its "virtual" display can only be accessed via the network. As for all other Beckhoff devices, the TwinCAT software is used for system configuration and the programming of the PLC functionality. The CX8000 target device features a pre-installed TwinCAT PLC run-time environment. All software required for operating the device, including the operating system, the TwinCAT files and user files and data, is stored on the microSD Flash card. This means the unit is easy to replace if necessary. Commercial card readers can be used to access the card data. The size of the microSD flash card (e.g. 128 MB) can be chosen depending on the application and the quantity of data to be stored.



The CX8000 device family features an integrated, capacitive 1-second UPS, which in the event of a failure of the supply voltage provides sufficient energy for saving remanent data. Important data are thus preserved in a non-volatile manner without the need of a battery backup.

With a high-performance but nevertheless energy-saving 32 bit ARM processor, EtherCAT as I/O bus and TwinCAT PLC with extensive PLC libraries, the Embedded Controllers from the CX8000 series represent high-performance and versatile controllers with slave fieldbus connection.





## CX8010 | Embedded PC for EtherCAT

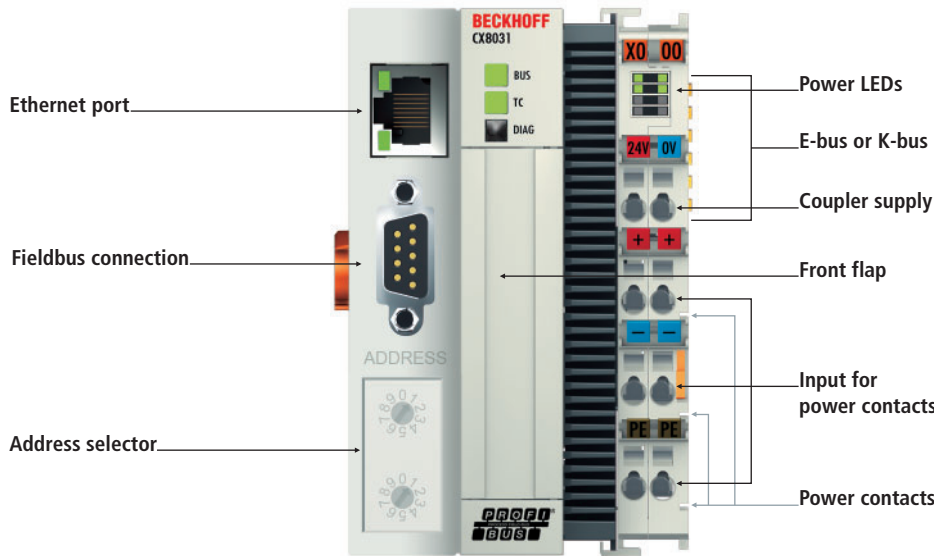


The CX8010 is a control system with EtherCAT slave interface, to which optional K-bus or E-bus terminals can be attached.

The control system is programmed with TwinCAT via the fieldbus interface or the additional Ethernet interface.

The DIP switch enables fixed or automatic addressing in the EtherCAT network.

Technical data	CX8010-0011	CX8010-1011
Processor	32 bit, 400 MHz	
Flash memory	128 MB microSD	
Internal main memory	64 MB RAM	
Protocol	EtherCAT (slave)	
Programming	TwinCAT PLC	
Programming languages	IEC 61131-3	
Online change	yes	
Up/down load code	yes/yes	
Interfaces	1 x Ethernet 10/100 Mbit/s, 1 x USB device (behind the front flap)	
Bus interface	EtherCAT IN and OUT (2 x RJ 45)	
I/O connection	E-bus (EtherCAT Terminals)	K-bus (Bus Terminals)
Clock	internal battery-backed clock for time and date (battery behind the front flap, exchangeable)	
UPS	1-second UPS	
Web-based management	yes	
Current supply I/O terminals	2 A	
Max. power loss	3 W	
Dimensions (W x H x D)	65 mm x 100 mm x 80 mm	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Further information	www.beckhoff.com/CX8010	



## CX8031 | Embedded PC for PROFIBUS



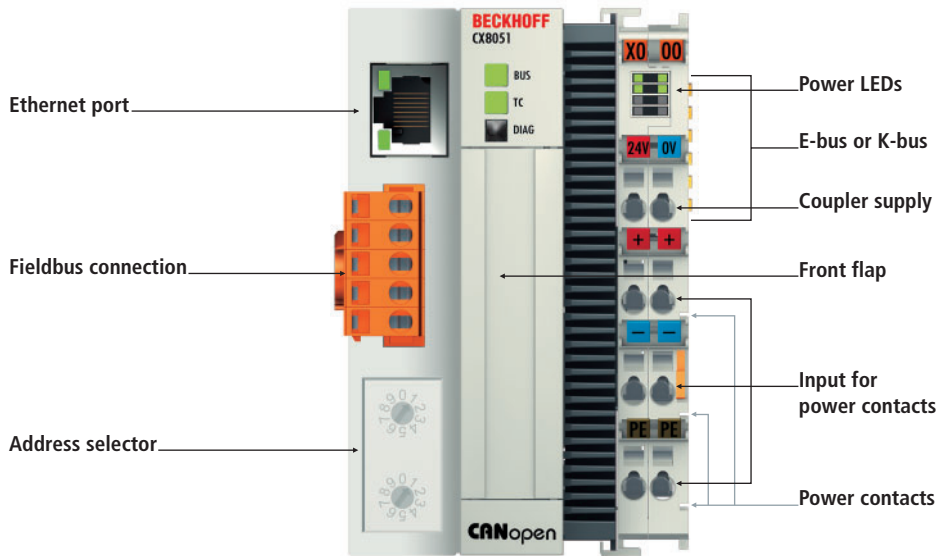
The CX8031 is a control system with PROFIBUS slave interface. The PROFIBUS address is set via two rotary selection switches.

The CX8031 offers automatic baud rate detection. K-bus or E-bus terminals can be attached as required. The control system

is programmed with TwinCAT via the fieldbus interface or the additional Ethernet interface.

Technical data	CX8031-0011	CX8031-1011
Processor	32 bit, 400 MHz	
Flash memory	128 MB microSD	
Internal main memory	64 MB RAM	
Protocol	PROFIBUS	
Programming	TwinCAT PLC	
Programming languages	IEC 61131-3	
Online change	yes	
Up/down load code	yes/yes	
Interfaces	1 x Ethernet 10/100 Mbit/s, 1 x USB device (behind the front flap)	
Bus interface	1 x D-sub 9-pin socket with shielding	
I/O connection	E-bus (EtherCAT Terminals)	K-bus (Bus Terminals)
Clock	internal battery-backed clock for time and date (battery behind the front flap, exchangeable)	
UPS	1-second UPS	
Web-based management	yes	
Current supply I/O terminals	2 A	
Max. power loss	3 W	
Dimensions (W x H x D)	65 mm x 100 mm x 80 mm	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Further information	www.beckhoff.com/CX8031	





## CX8051 | Embedded PC for CANopen

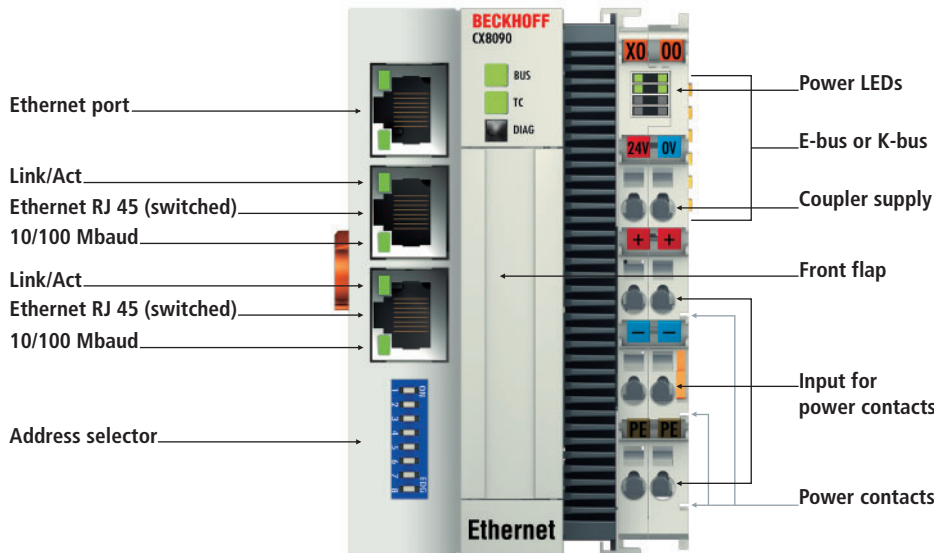
### CANopen

The CX8051 is a control system with CANopen slave interface. The CANopen address is set via two rotary selection switches.

The CX8051 offers automatic baud rate detection. K-bus or E-bus terminals can be attached as required. The control system

is programmed via the fieldbus interface or the additional Ethernet interface.

Technical data	CX8051-0011	CX8051-1011
Processor	32 bit, 400 MHz	
Flash memory	128 MB microSD	
Internal main memory	64 MB RAM	
Protocol	CANopen	
Programming	TwinCAT PLC	
Programming languages	IEC 61131-3	
Online change	yes	
Up/down load code	yes/yes	
Interfaces	1 x Ethernet 10/100 Mbit/s, 1 x USB device (behind the front flap)	
Bus interface	1 x open style connector, 5-pin, included	
I/O connection	E-bus (EtherCAT Terminals)	K-bus (Bus Terminals)
Clock	internal battery-backed clock for time and date (battery behind the front flap, exchangeable)	
UPS	1-second UPS	
Web-based management	yes	
Current supply I/O terminals	2 A	
Max. power loss	3 W	
Dimensions (W x H x D)	65 mm x 100 mm x 80 mm	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Further information	www.beckhoff.com/CX8051	



# CX8090 | Embedded PC for Ethernet

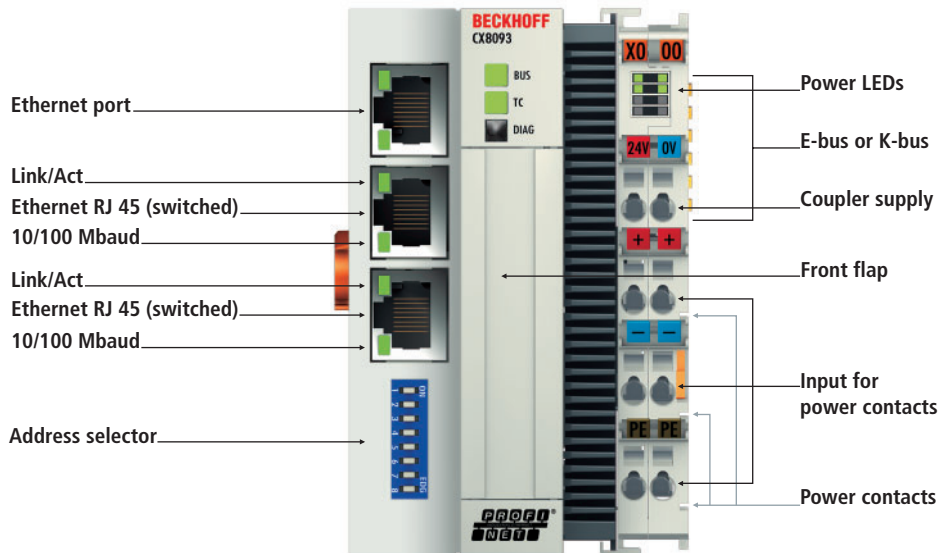
## Ethernet

The CX8090 is a control system with a switched Ethernet port. It supports protocols such as real-time Ethernet, ADS UDP/TCP,

Modbus TCP client/server or open TCP/IP-UDP/IP communication. K-bus or E-bus terminals can be attached as required.

The control system is programmed with TwinCAT via the fieldbus interface or the additional Ethernet interface.

Technical data	CX8090-0011	CX8090-1011
Processor	32 bit, 400 MHz	
Flash memory	128 MB microSD	
Internal main memory	64 MB RAM	
Protocol	real-time Ethernet, ADS UDP, ADS TCP, Modbus TCP, TCP/IP, UDP/IP	
Programming	TwinCAT PLC	
Programming languages	IEC 61131-3	
Online change	yes	
Up/down load code	yes/yes	
Interfaces	1 x Ethernet 10/100 Mbit/s, 1 x USB device (behind the front flap)	
Bus interface	2 x RJ 45 (switched)	
I/O connection	E-bus (EtherCAT Terminals)	K-bus (Bus Terminals)
Clock	internal battery-backed clock for time and date (battery behind the front flap, exchangeable)	
UPS	1-second UPS	
Web-based management	yes	
Current supply I/O terminals	2 A	
Max. power loss	3 W	
Dimensions (W x H x D)	65 mm x 100 mm x 80 mm	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Further information	www.beckhoff.com/CX8090	



## CX8093 | Embedded PC for PROFINET

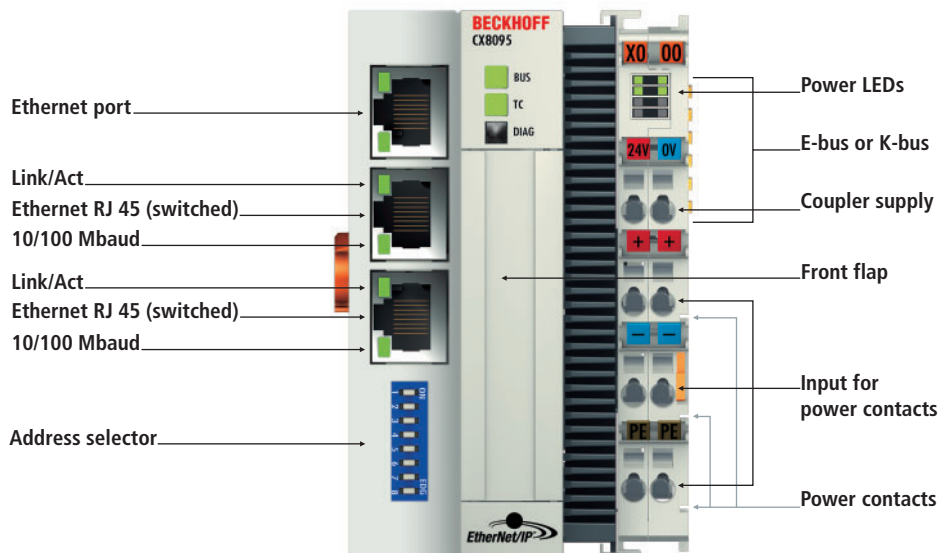


The CX8093 is a control system with PROFINET RT device interface. The PROFINET interface is designed as a 2-port switch

for realisation of daisy-chain cabling. K-bus or E-bus terminals can be attached as required. The control system is pro-

grammed with TwinCAT via the fieldbus interface or the additional Ethernet interface.

Technical data	CX8093-0011	CX8093-1011
Processor	32 bit, 400 MHz	
Flash memory	128 MB microSD	
Internal main memory	64 MB RAM	
Protocol	PROFINET RT device	
Programming	TwinCAT PLC	
Programming languages	IEC 61131-3	
Online change	yes	
Up/down load code	yes/yes	
Interfaces	1 x Ethernet 10/100 Mbit/s, 1 x USB device (behind the front flap)	
Bus interface	2 x RJ 45 (switched)	
I/O connection	E-bus (EtherCAT Terminals)	K-bus (Bus Terminals)
Clock	internal battery-backed clock for time and date (battery behind the front flap, exchangeable)	
UPS	1-second UPS	
Web-based management	yes	
Current supply I/O terminals	2 A	
Max. power loss	3 W	
Dimensions (W x H x D)	65 mm x 100 mm x 80 mm	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Further information	www.beckhoff.com/CX8093	



## CX8095 | Embedded PC for EtherNet/IP



The CX8095 is a control system with EtherNet/IP slave interface. The EtherNet/IP interface is designed as a 2-port switch

for realisation of daisy-chain cabling. K-bus or E-bus terminals can be attached as required. The control system is pro-

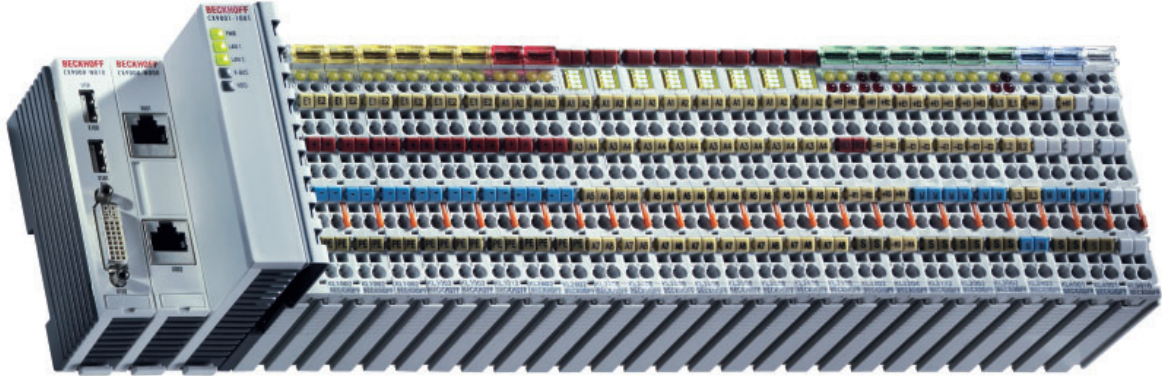
grammed with TwinCAT via the fieldbus interface or the additional Ethernet interface.

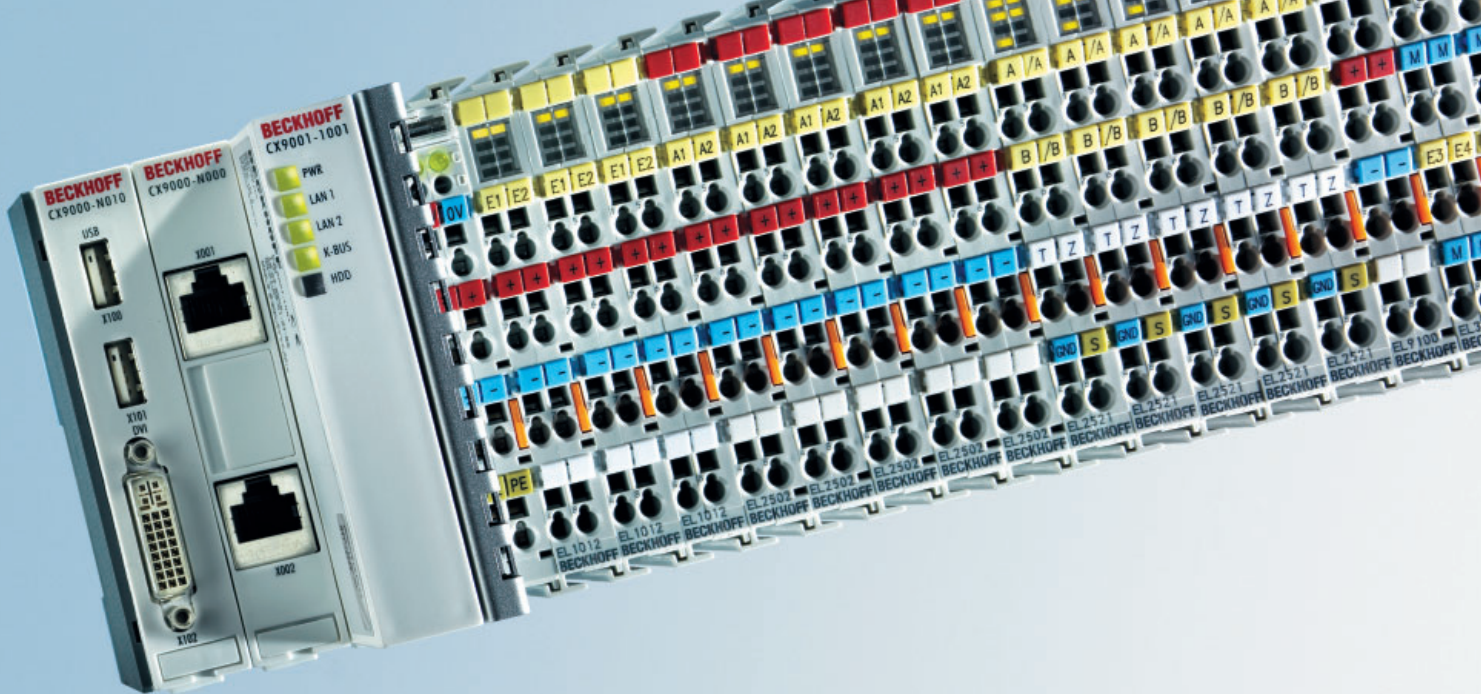
Technical data	CX8095-0011	CX8095-1011
Processor	32 bit, 400 MHz	
Flash memory	128 MB microSD	
Internal main memory	64 MB RAM	
Protocol	EtherNet/IP (slave)	
Programming	TwinCAT PLC	
Programming languages	IEC 61131-3	
Online change	yes	
Up/down load code	yes/yes	
Interfaces	1 x Ethernet 10/100 Mbit/s, 1 x USB device (behind the front flap)	
Bus interface	2 x RJ 45 (switched)	
I/O connection	E-bus (EtherCAT Terminals)	K-bus (Bus Terminals)
Clock	internal battery-backed clock for time and date (battery behind the front flap, exchangeable)	
UPS	1-second UPS	
Web-based management	yes	
Current supply I/O terminals	2 A	
Max. power loss	3 W	
Dimensions (W x H x D)	65 mm x 100 mm x 80 mm	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Further information	www.beckhoff.com/CX8095	



# Embedded PC series CX9000, CX9010

Small-format PLC with Windows CE





## Embedded PC CX9000, CX9010

The CX9000 and CX9010 Embedded PCs offer a compact and high-performance yet cost-effective PLC and Motion Control system for DIN rail installation. Within the Beckhoff control world, they are positioned between the Bus Terminal Controller series BX and the Embedded PC CX1010.

The main feature of these units is the energy-saving Intel® IXP420 CPU with XScale® technology and the Microsoft Windows CE operating system.

Two controllers with different processors are available:

**CX9010:** Intel® IXP420 with XScale® technology, 533 MHz

**CX9000:** Intel® IXP420 with XScale® technology, 266 MHz

They thus offer adequate computing capacity even for complex automation tasks. The CX9000 family requires no external storage media – the device boots the operating system from the internal flash. Due to the low power consumption, within the specified operating range no fan is required. The CX9000/CX9010 Embedded PCs require no rotating components. As usual for the

CX series, the device features a modular mechanical design. In its basic configuration, the compact device only measures 58 x 100 x 91 mm.

The CX9000/CX9010 controllers are available in two versions: with K-bus for direct connection of Bus Terminals and as an E-bus version for direct connection of EtherCAT Terminals.

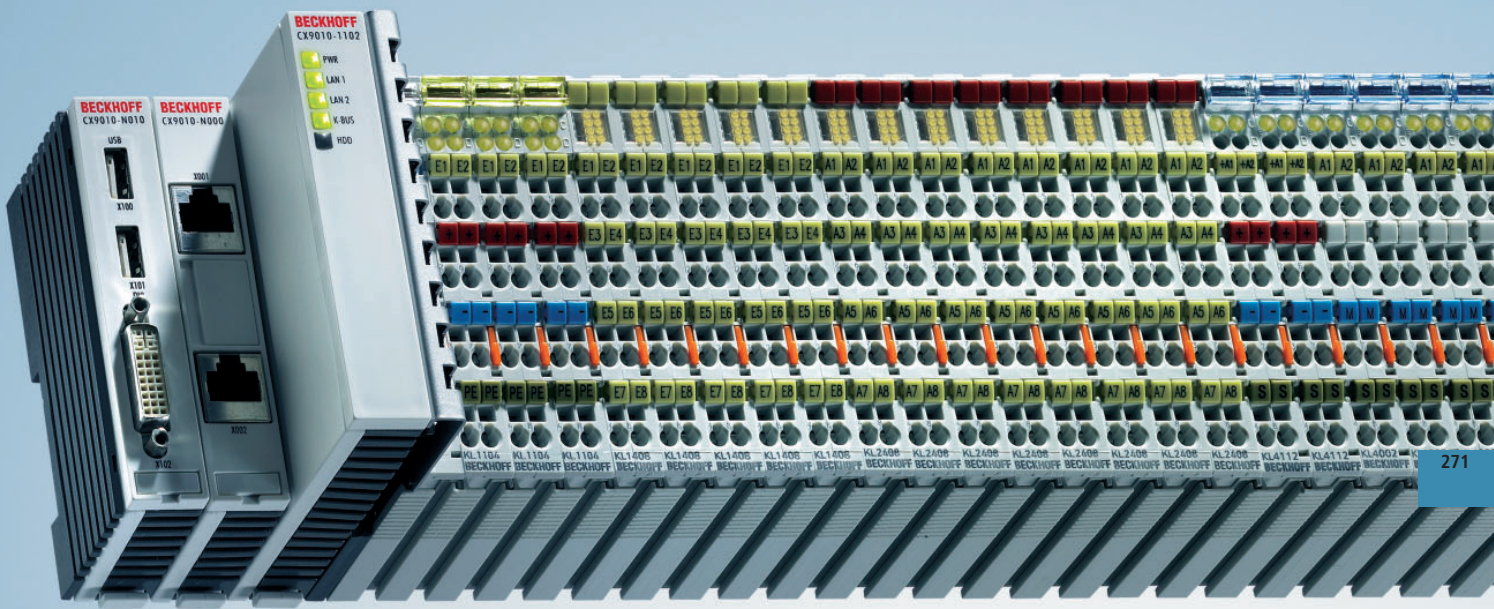
- CX9000-0000: Embedded PC with integrated EtherCAT Terminal interface (E-bus)
- CX9010-0000: Embedded PC with integrated EtherCAT Terminal interface (E-bus)
- CX9000-1000: Embedded PC with integrated Bus Terminal interface (K-bus)
- CX9010-1000: Embedded PC with integrated Bus Terminal interface (K-bus)

In the basic configuration, two RJ 45 sockets that are internally connected to an integrated switch are available as interfaces. This simplifies wiring of several CX9000/CX9010 within a line topology. No separate switch hardware is required. The two externally accessible Ethernet ports are independent

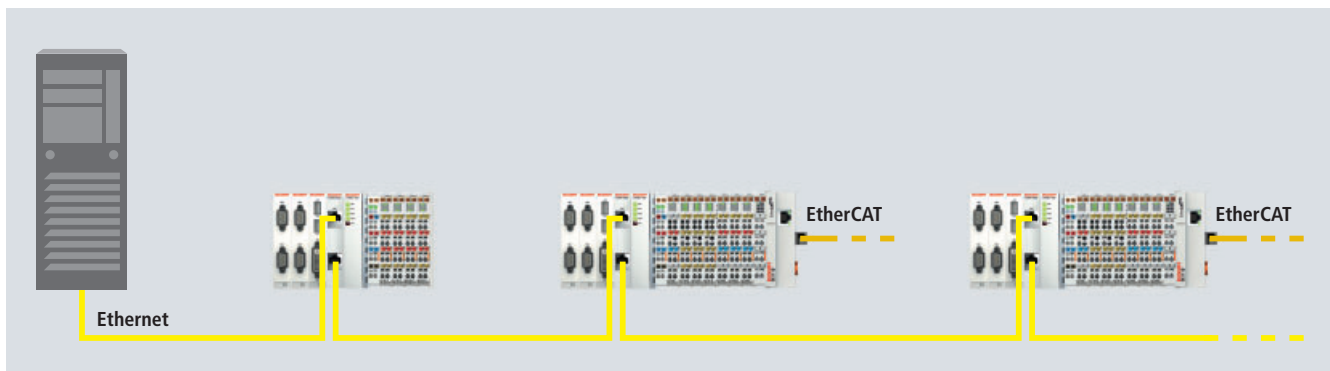
of the EtherCAT interface, which is served by a second MAC (Media Access Controller) provided by the CPU.

Further interfaces may be added ex factory as required: a screen display can be realised using a CX90x0-N010 device, i.e. a module combining DVI/VGA + 2 x USB 2.0. Because of the combination of DVI and USB, all types of Beckhoff Control Panels with DVI/USB interface can be used. Touch functionality is connected via USB. As further optional interfaces, two RS232 modules or two RS422/RS485 modules can be configured as COM1 and COM2. All serial interfaces are opto-decoupled. Mass storage in form of a Compact Flash card can be used via the CX9000-A001 module, which offers physical storage capacity in the range of several gigabytes.

Like for all Beckhoff controllers, TwinCAT is used for programming the Embedded PCs as an automation device. The device itself contains the run-time environment for PLC (CX9000/CX9010) and Motion Control (CX9010). One of the two Ethernet interfaces is used as programming interface.

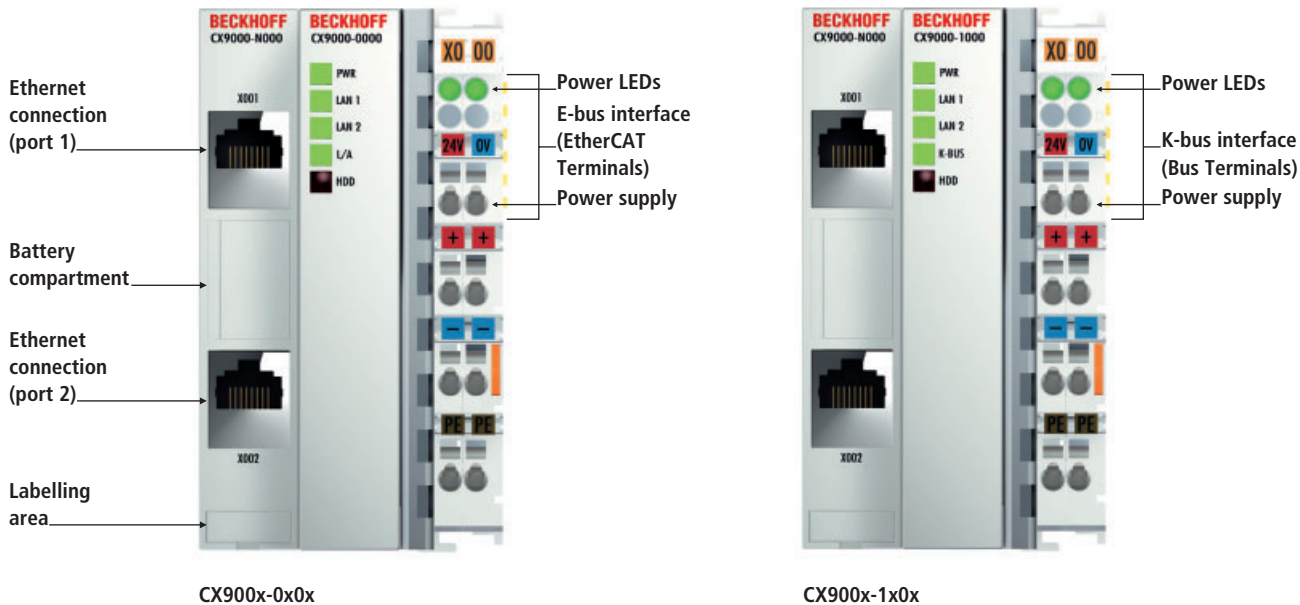


Microsoft Windows CE enables the creation of fully graphic user programs, which are able to satisfy high expectations thanks to the graphics chip integrated in the CX9000/ CX9010. The result is a compact Ethernet controller that enables short I/O cycle times in conjunction with EtherCAT Terminals and offers high-performance software in the form of Windows CE and TwinCAT.



The CX9000 and the CX9010 enable configuration of an IT line topology with subordinate EtherCAT devices.





## CX9000 | Basic CPU module

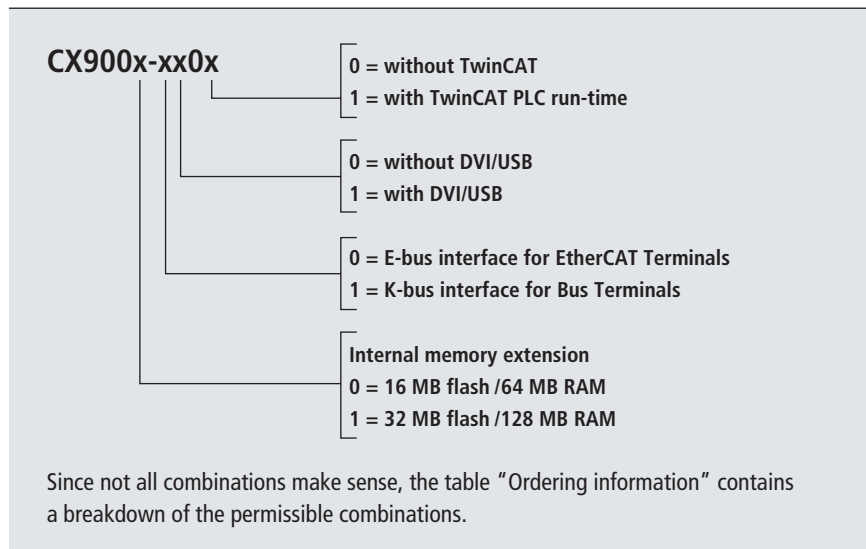
The CX9000 is a compact, DIN rail-mountable Ethernet controller with Intel® IXP420 with XScale® technology and 266 MHz clock frequency. The connection for the Beckhoff I/O systems is directly integrated in the CPU module. The CX9000 is available in two basic versions: one version for Bus Terminals with K-bus, the other one for EtherCAT Terminals with E-bus. The CX9000 comprises the CPU, the internal flash memory with two configuration options, the main memory (RAM) (available in two different sizes), and NOVDRAM as non-volatile memory. Two Ethernet RJ 45 interfaces are also part of the basic configuration.

These interfaces are connected to an internal switch and offer a simple option for creating a line topology without the need for additional Ethernet switches.

A memory medium in Compact Flash format I and II is available as an optional module. The operating system is Microsoft Windows CE. The TwinCAT automation software transforms a CX9000 system into a powerful PLC and Motion Control system that can be operated with or without visualisation. Further system interfaces can be connected to the CPU module ex factory. The CX9000-N010 option can be connected

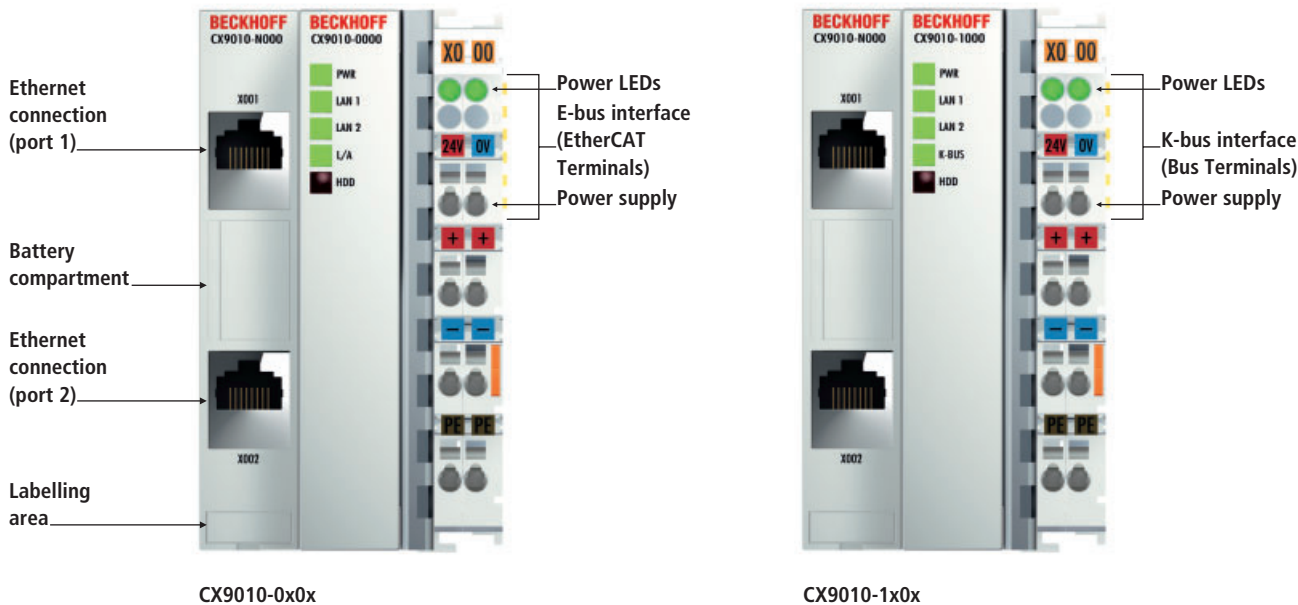
to Beckhoff Control Panels or standard monitors with DVI or VGA input via the DVI and USB interfaces. Devices such as printer, scanner, mouse, keyboard, mass storage, CR-RW, etc. can be connected via the USB 2.0 interfaces. The module CX9000-N030 offers two serial RS232 interfaces with a maximum transfer speed of 115 kbaud. These two interfaces can be implemented as RS422/RS485, in which case they are identified as CX9000-N031.

The order identifier of the basic CPU module is derived as follows:



Technical data	CX900x-0x0x	CX900x-1x0x
Processor	266 MHz Intel® IXP420 with XScale® technology	
Flash memory	16 MB flash (internal, optional 32 MB)	
Internal main memory	64 MB RAM (internal, optional 128 MB)	
Interfaces	2 x RJ 45 (Ethernet, internal switch), 10/100 Mbit/s	
Diagnostics LED	1 x power, 2 x LAN, 1 x L/A, 1 x flash access	1 x power, 2 x LAN, 1 x K-bus, 1 x flash access
Clock	internal battery-backed clock for time and date (battery exchangeable)	
Operating system	Microsoft Windows CE	
Control software	TwinCAT CE PLC run-time	
Power supply	24 V DC (-15 %/+20 %)	
Dielectric strength	500 V <sub>rms</sub> (supply/internal electronics)	
I/O connection	E-bus (EtherCAT Terminals)	K-bus (Bus Terminals)
NOVRAM	128 kbytes	
I/O-DPRAM	–	4 kbytes
Current supply I/O terminals	2 A	
Max. power loss	6 W (including the system interfaces CX9000-xxxx)	
Dimensions (W x H x D)	58 mm x 100 mm x 91 mm	
Weight	approx. 295 g (without fan cartridge), approx. 375 g (with fan cartridge for variants with DVI/USB interface)	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Further information	www.beckhoff.com/CX9000	

Ordering information	16 MB flash	32 MB flash	E-bus	K-bus	DVI/USB	no TwinCAT	TwinCAT PLC run-time
	64 MB RAM	128 MB RAM					
CX9000-0000	x	–	x	–	–	x	–
CX9000-0001	x	–	x	–	–	–	x
CX9001-0000	–	x	x	–	–	x	–
CX9001-0001	–	x	x	–	–	–	x
CX9001-0100	–	x	x	–	x	x	–
CX9001-0101	–	x	x	–	x	–	x
CX9000-1000	x	–	–	x	–	x	–
CX9000-1001	x	–	–	x	–	–	x
CX9001-1000	–	x	–	x	–	x	–
CX9001-1001	–	x	–	x	–	–	x
CX9001-1100	–	x	–	x	x	x	–
CX9001-1101	–	x	–	x	x	–	x



## CX9010 | Basic CPU module

The CX9010 is a compact, DIN rail-mountable Ethernet controller with Intel® IXP420 with XScale® technology and 533 MHz clock frequency. The connection for the Beckhoff I/O systems is directly integrated in the CPU module. The CX9010 is available in two basic versions: one version for Bus Terminals with K-bus, the other one for EtherCAT Terminals with E-bus. The CX9010 comprises the CPU, the internal flash memory, the main memory (RAM) and NOVRAM as non-volatile memory. Two Ethernet RJ 45 interfaces are also part of the basic configuration. These interfaces are connected to an internal switch and offer

a simple option for creating a line topology without the need for additional Ethernet switches.

A memory medium in Compact Flash format I and II is available as an optional module. The operating system is Microsoft Windows CE. The TwinCAT automation software transforms a CX9010 system into a powerful PLC and Motion Control system that can be operated with or without visualisation. Further system interfaces can be connected to the CPU module ex factory. The CX9010-N010 option can be connected to Beckhoff Control Panels or standard

monitors with DVI or VGA input via the DVI or USB interfaces. Devices such as printer, scanner, mouse, keyboard, mass storage, CD-RW, etc. can be connected via the USB 2.0 interfaces. The module CX9010-N030 offers two serial RS232 interfaces with a maximum transfer speed of 115 kbaud. These two interfaces can be implemented as RS422/RS485, in which case they are identified as CX9010-N031.

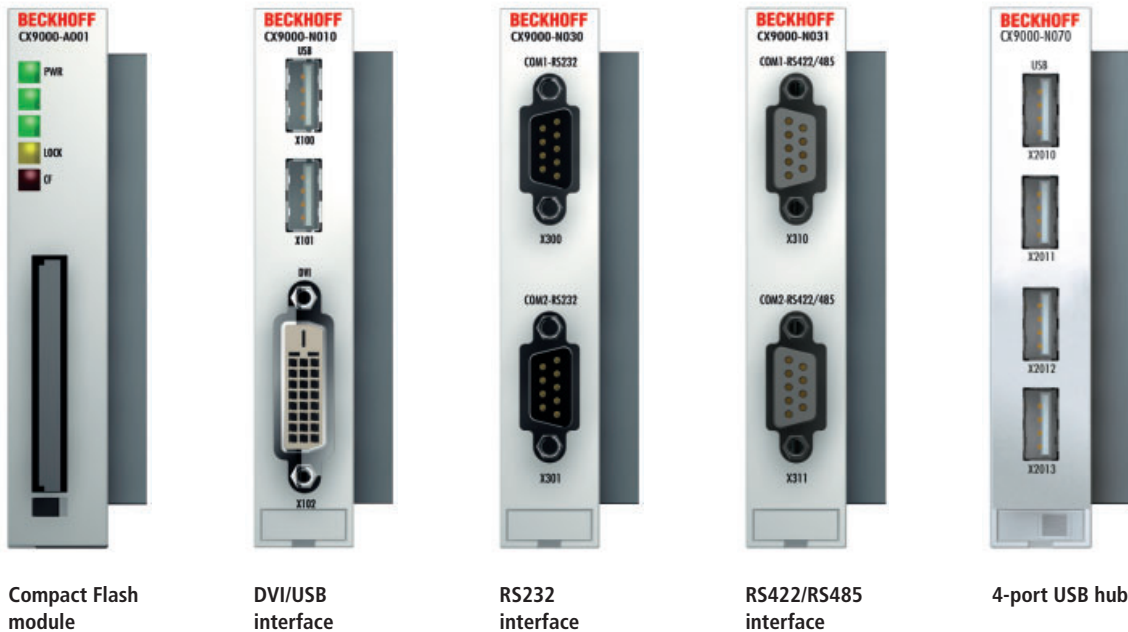
The order identifier of the basic CPU module is derived as follows:

CX9010-xx0x	
0	= without TwinCAT
1	= with TwinCAT PLC run-time
2	= with TwinCAT PLC/NC run-time
0	= without DVI/USB
1	= with DVI/USB
0	= E-bus interface for EtherCAT Terminals
1	= K-bus interface for Bus Terminals

Since not all combinations make sense, the table "Ordering information" contains a breakdown of the permissible combinations.

Technical data	CX9010-0x0x	CX9010-1x0x
Processor	Intel® IXP420 with XScale® technology, clock frequency 533 MHz	
Flash memory	32 MB Flash (internal, not expandable)	
Internal main memory	128 MB RAM (internal, not expandable)	
Interfaces	2 x RJ 45 (Ethernet, internal switch), 10/100 Mbit/s	
Diagnostics LED	1 x power, 2 x LAN, 1 x L/A, 1 x flash access	1 x power, 2 x LAN, 1 x K-bus, 1 x flash access
Clock	internal battery-backed clock for time and date (battery exchangeable)	
Operating system	Microsoft Windows CE	
Control software	TwinCAT CE PLC run-time or TwinCAT CE NC PTP run-time	
Power supply	24 V DC (-15 %/+20 %)	
Dielectric strength	500 V <sub>rms</sub> (supply/internal electronics)	
I/O connection	E-bus (EtherCAT Terminals)	K-bus (Bus Terminals)
NOVRAM	128 kbytes	
I/O-DPRAM	–	4 kbytes
Current supply I/O terminals	2 A	
Max. power loss	6 W (including the system interfaces CX9010-xxxx)	
Dimensions (W x H x D)	58 mm x 100 mm x 91 mm	
Weight	approx. 375 g	
Operating/storage temperature	0...+50 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Further information	www.beckhoff.com/CX9010	

Ordering information	E-bus	K-bus	DVI/USB	no TwinCAT	TwinCAT PLC run-time	TwinCAT NC run-time
CX9010-0000	x	–	–	x	–	–
CX9010-0001	x	–	–	–	x	–
CX9010-0002	x	–	–	–	x	x
CX9010-0100	x	–	x	x	–	–
CX9010-0101	x	–	x	–	x	–
CX9010-0102	x	–	x	–	x	x
CX9010-1000	–	x	–	x	–	–
CX9010-1001	–	x	–	–	x	–
CX9010-1002	–	x	–	–	x	x
CX9010-1100	–	x	x	x	–	–
CX9010-1101	–	x	x	–	x	–
CX9010-1102	–	x	x	–	x	x



## CX9000/CX9010-A001/N0xx | System interfaces

A number of optional interface modules are available for the CX9000/CX9010 Ethernet controller that can be connected to the basic module ex factory. The system interfaces cannot be retrofitted or expanded in the field. They are supplied ex factory in the specified configuration and cannot be separated from the CPU module. The power supply of the system interface modules is ensured via the internal bus.

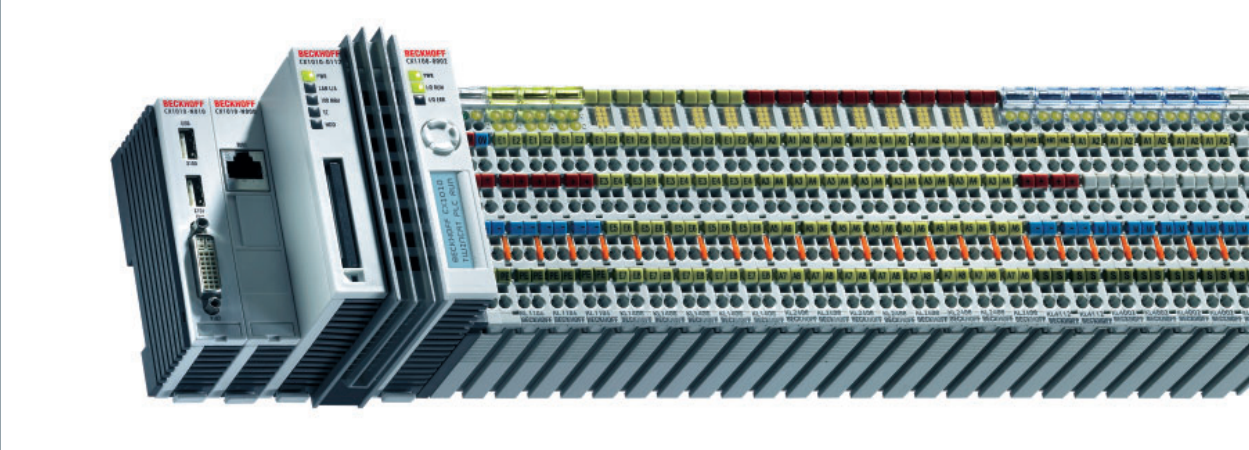
The CX90x0-N010 option connects Beckhoff Control Panels or standard monitors with DVI or VGA input via the DVI or USB interfaces. Devices such as printer, scanner, mouse, keyboard, etc. can be connected via the USB 2.0 interfaces. The CX90x0-N030 module offers two additional serial RS232 interfaces with a maximum transmission speed of 115 kbaud. Alternatively, the two serial interfaces are also available as RS422/RS485 signal types (CX90x0-N031). The CX90x0-N070 4-port USB hub extends the number of available USB 2.0 ports, whereby each port can handle a load of max. 500 mA (however, not all four at the same time). In this way, a total of six USB interfaces per CX are available to the user.

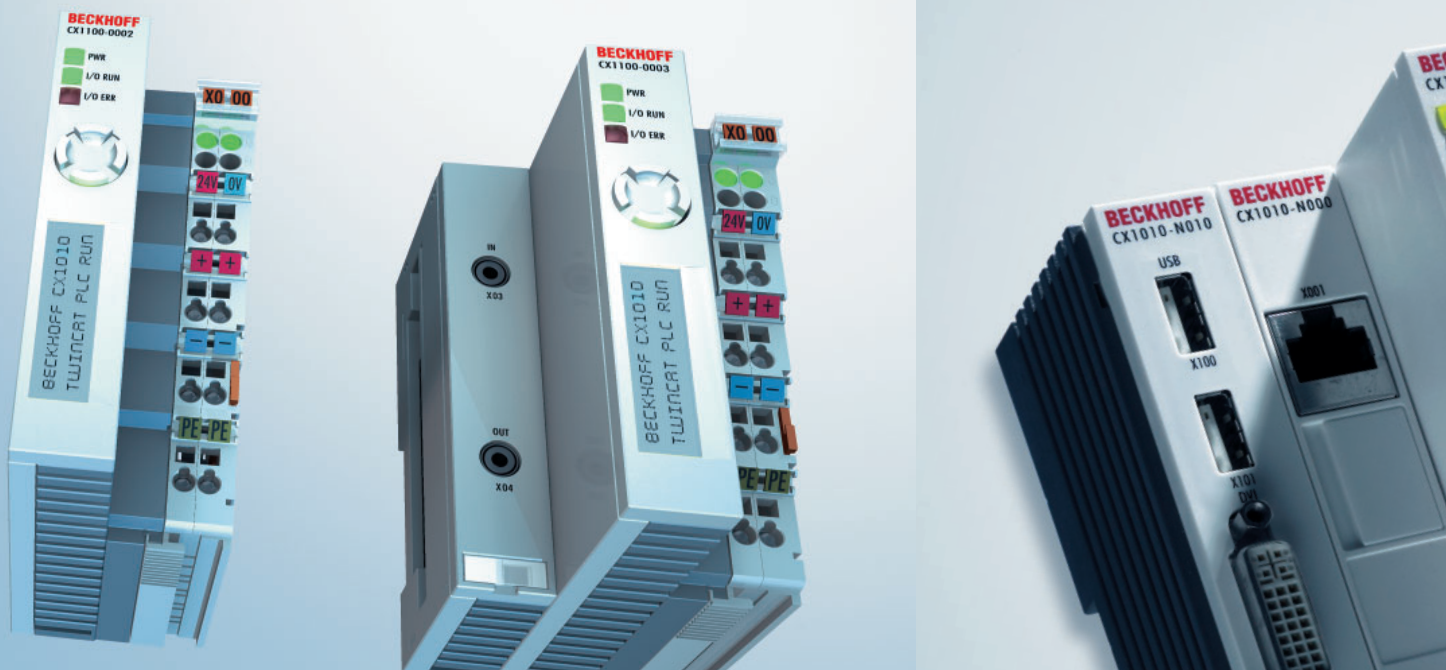
If additional mass storage is required, the CX90x0-A001 extension module provides a Compact Flash interface for type I or II CF cards. Unlike other system interfaces, this module can be upgraded in the field. Cards may only be inserted or removed when the system is switched off.

Technical data	CX9000-A001 CX9010-A001	CX9000-N010 CX9010-N010	CX9000-N030 CX9010-N030	CX9000-N031 CX9010-N031	CX9000-N070 CX9010-N070
Interfaces	Compact Flash module	1 x DVI + 2 x USB (max. 500 mA per port)	1 x COM1 + 1 x COM2, RS232	1 x COM1 + 1 x COM2, RS422/RS485	4 x USB 2.0
Type of connection	Compact Flash slot for type I + II cards	DVI-I 29-pin socket + 2 USB 2.0 ports type A	2 x D-sub plug, 9-pin	2 x D-sub socket, 9-pin	4 x USB ports type A
Properties	Compact Flash mass storage	DVI-I interface also carries out VGA signals (DVI-A)	max. baud rate 115 kbaud, cannot be used simultaneously with N031	max. baud rate 115 kbaud, cannot be used simultaneously with N030	max. baud rate 480 Mbit/s, max. output current per port 500 mA, max. total current 500 mA
Power supply	via system bus (through power supply unit in the CX9000/CX9010)				
Dimensions (W x H x D)	19 mm x 100 mm x 51 mm				
Weight	approx. 95 g				
Operating/storage temperature	0...+55 °C/-25...+85 °C				
Relative humidity	95 %, no condensation				
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				
Protection class	IP 20				
Further information	<a href="http://www.beckhoff.com/CX9000-A001">www.beckhoff.com/CX9000-A001</a>				

# Embedded PC series CX1010

The modular Industrial PC for mid-range control





## Embedded PC CX1010

The basic CX1010 module is the basic device of the CX family. With a 500 MHz Pentium® MMX-compatible processor it offers average CPU performance. Depending on the application, the CX1010 can also be operated in "headless" mode, i.e. without display and keyboard. While the resulting control system has no visualisation, it does have communications capability via the built-in Ethernet interface. If local visualisation is required, this can be implemented via a DVI (digital video interface), to which all Beckhoff Control Panels and all commercially available monitors with DVI or VGA input can be connected. The touch screen signal is read via one of the two available USB interfaces.

### The components

The modules of the CX series system are connected with each other via the standardised PC/104 bus (16 bit). The individual system components are modules with a width of 19 mm (single) or 38 mm (double) that can be arranged in series. The basic unit consists of a CPU (CX1010) module and a power supply module (CX1100-000x).

The CPU module is available in several variants, e.g.:

- operating system: Microsoft Windows CE or Microsoft Windows Embedded Standard
  - TwinCAT software (pre-installed): without a TwinCAT system, with TwinCAT CE PLC, TwinCAT CE NC PTP, or with the associated full version of the individual TwinCAT levels for PLC and NC PTP
- Power supply unit with integrated I/O interface**
- Four different types of power supply units are available:
- 24 V DC power supply without I/O interface (CX1100-0001)
  - 24 V DC power supply with terminal bus interface for connecting the Beckhoff Bus Terminals (CX1100-0002)
  - 24 V DC power supply with terminal bus interface for connecting the Beckhoff Bus Terminals and IP-Link connection for interfacing of the Beckhoff Fieldbus Box modules (CX1100-0003)
  - 24 V DC power supply with terminal bus interface for connecting the Beckhoff EtherCAT Terminals (CX1100-0004)
- All power supply variants have an illuminated, low-glare LC display with FSTN technology and two rows with 16 characters each for displaying status messages. The application programs can also use the display for displaying application-specific texts. 8 kB of non-volatile memory for remanent data are also included.

The range of optional modules is complemented by fieldbus connections for PROFIBUS, CANopen, DeviceNet, SERCOS interface and Lightbus, both as master or slave versions.

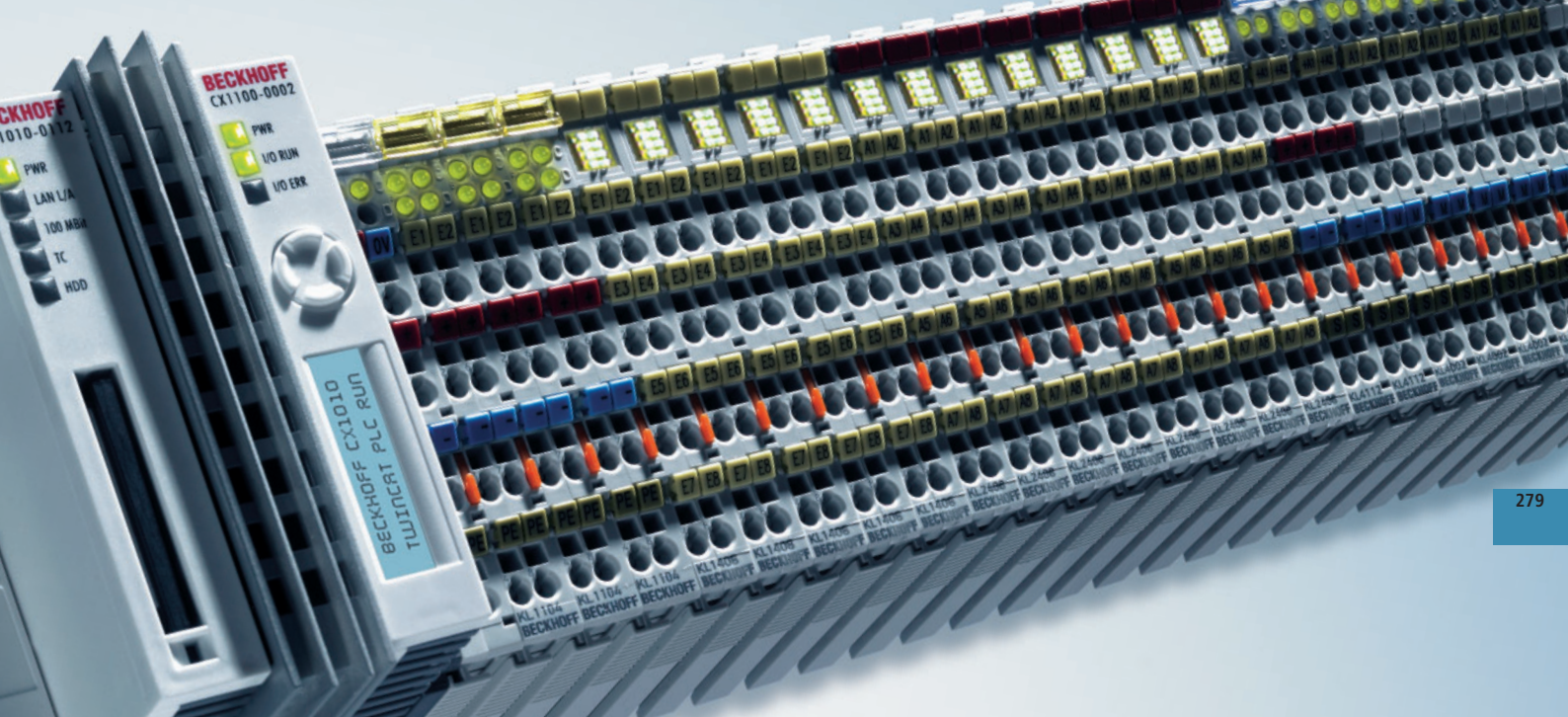
### PLC, Motion Control and visualisation

In combination with the TwinCAT automation software, the Embedded PC CX1010 becomes a powerful IEC 61131-3 PLC with up to four user tasks. Additionally, Motion Control tasks can also be executed. Depending on the required cycle time, several servo axes can be controlled. Even special functions such as "flying saw", "electronic gearbox" and "cam plate" can be realised. The CX1010 thus becomes a controller that covers PLC, Motion Control and visualisation tasks with a single hardware. Under Windows CE, thanks to the real-time capability of the operating system, user tasks written in high-level languages can be processed in real-time in parallel with TwinCAT.

### Remote programming via Ethernet

The CX1010 units are programmed via a laptop or a desktop PC that is connected with the CX1010 via Ethernet (network or crossover cable). The programs are developed on the laptop with a standard TwinCAT software licence and then loaded into the target device.

TwinCAT offers convenient network search functions for selection and commis-



sioning via Ethernet: all CX1010 stations available at the Ethernet are scanned. Even their periphery is detected, including all terminals and fieldbus modules. It is also possible to load the programs and settings that are active in the target device into the programming station, and to modify and subsequently reactivate them. This ensures that the current software version is used at all times.

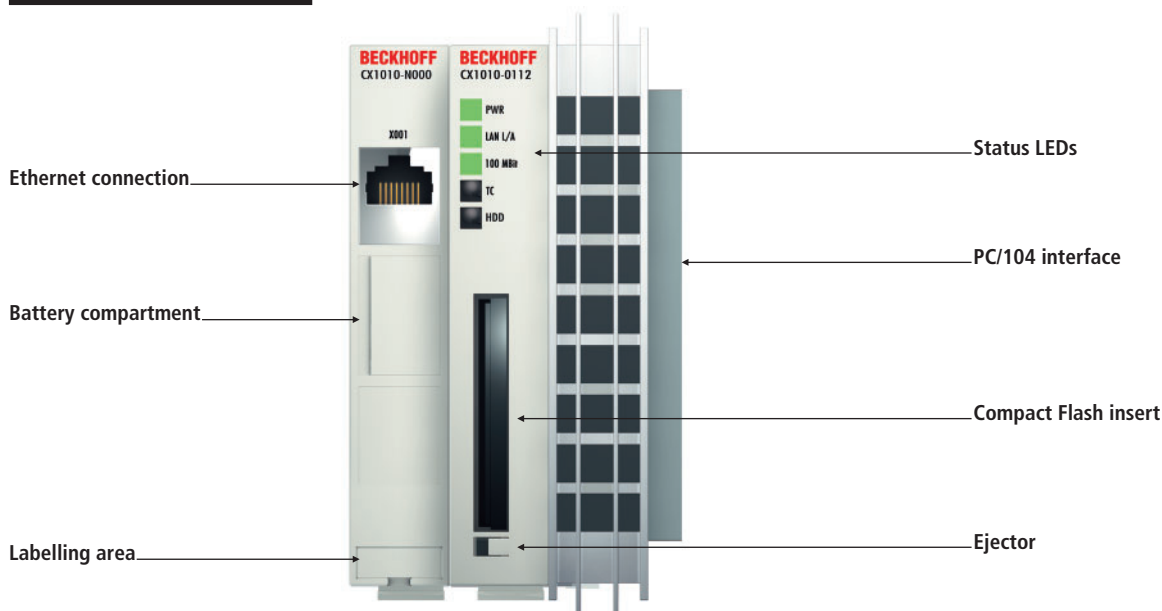
### Operating systems

The decision about which operating system version and which TwinCAT version to use in conjunction with the CX1010 system is depending on the application. If the focus is on comprehensive visualisation or if complex Windows NT/2000/XP programs already exist, Windows Embedded Standard is the right operating system, since these programs do not have to be adapted. If, however, no visualisation is required or simple visualisation is sufficient, if short run-up times are required and the total costs should be low, Windows CE as an operating system that is gentle on resources is ideal. Both versions have similar networking capabilities, since the Windows sockets enable comfortable IP communication via Ethernet. Furthermore, TwinCAT transforms every CX1010 system into an ADS device that can communicate with every other TwinCAT device in the network via this protocol. These communication options enable the creation and networking of com-

plex heterogeneous control networks using Beckhoff PCs, CX devices and Bus Terminal Controllers.

The Beckhoff OPC server is available for interfacing with SCADA software on both operating system variants Windows CE or Windows Embedded Standard. In other words, the CX1010 also offers unproblematic visualisation and simultaneous control in real-time on a single system.





## CX1010 | Basic CPU module

The CX1010 CPU module is the basic module of the CX system. It comprises the CPU and the internal flash memory in two implementation levels and offers the option to operate an additional memory medium in Compact Flash format II. An Ethernet interface is also part of the basic configuration. All other CX family components can be connected via the PC/104 interface that is available on both sides. The CPU module can be equipped with

different hardware and software options: the operating system can be Windows CE or Windows Embedded Standard.

The basic configuration of the CX1010 includes a 64 MB Compact Flash card. The TwinCAT automation software transforms a CX1010 system into a powerful PLC and Motion Control system that can be operated with or without visualisation. Further system interfaces or fieldbus connections can be

added to the basic CPU module. The passive cooling module CX1010-COOL is included in the scope of supply. The CPU module requires a CX1100 type power supply module.

The order identifier of the basic CPU module is derived as follows:

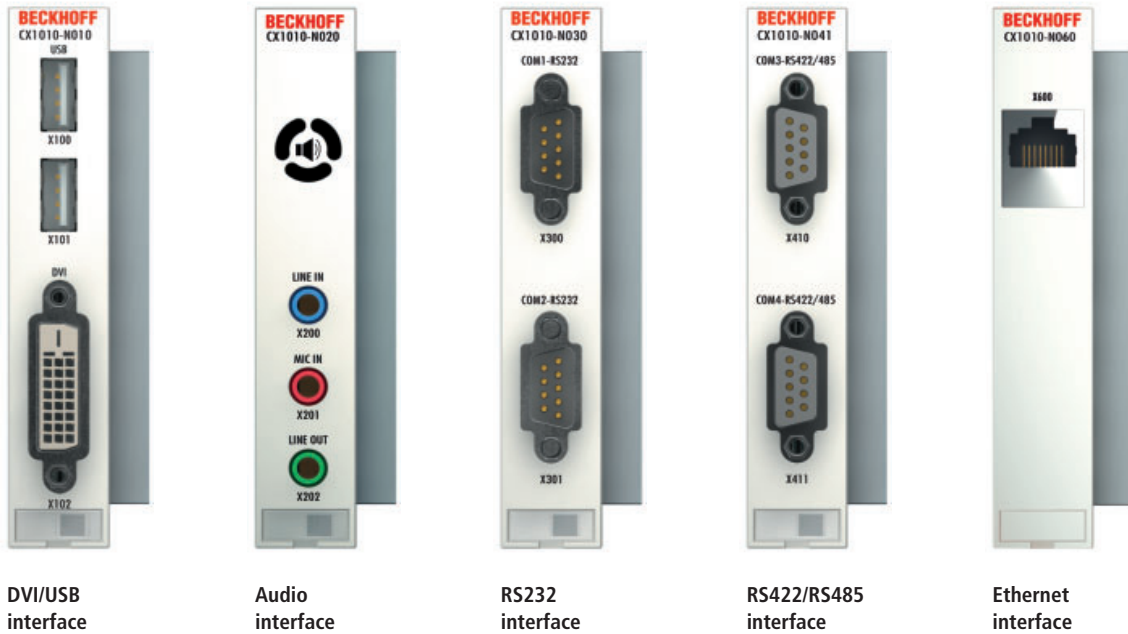
CX1010-0xxx	
0	without TwinCAT
1	with TwinCAT PLC run-time
2	with TwinCAT PLC/NC run-time
0	without operating system
1	operating system Windows CE
2	operating system Windows Embedded Standard
0	CPU with Ethernet
1	CPU with Ethernet + 2 x USB + DVI

Since not all combinations make sense, the table "Ordering information" contains a breakdown of the permissible combinations.

Technical data	CX1010-0xxx
Processor	compatible with Pentium® MMX, clock frequency 500 MHz
Flash memory	64 MB Compact Flash card
Internal main memory	256 MB DDR RAM (not expandable)
Interfaces	1 x RJ 45 (Ethernet), 10/100 Mbit/s
Diagnostics LED	1 x power, 1 x LAN speed, 1 x LAN activity, TC status, 1 x flash access
Expansion slot	1 x Compact Flash type II insert with ejector
Clock	internal battery-backed clock for time and date (battery exchangeable)
Operating system	Microsoft Windows CE or Microsoft Windows Embedded Standard
Control software	TwinCAT PLC run-time or TwinCAT NC PTP run-time
System bus	16 bit ISA (PC/104 standard)
Power supply	via system bus (through CX1100-xxxx power supply modules)
Max. power loss	6 W (including the system interfaces CX1010-N0xx)
Dimensions (W x H x D)	57 mm x 100 mm x 91 mm
Weight	approx. 350 g
Operating/storage temperature	0...+50 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protection class	IP 20
Further information	<a href="http://www.beckhoff.com/CX1010">www.beckhoff.com/CX1010</a>

Ordering information	DVI/USB	Windows CE	Windows Embedded Standard	TwinCAT PLC run-time	TwinCAT NC run-time
CX1010-0000	–	–	–	–	–
CX1010-0010	–	x	–	–	–
CX1010-0011	–	x	–	x	–
CX1010-0012	–	x	–	x	x
CX1010-0020	–	–	x	±	–
CX1010-0021	–	–	x	⊗	–
CX1010-0022	–	–	x	⊗	x
CX1010-0100	x	–	–	–	–
CX1010-0110	x	x	–	–	–
CX1010-0111	x	x	–	x	–
CX1010-0112	x	x	–	x	x
CX1010-0120	x	–	x	±	–
CX1010-0121	x	–	x	⊗	–
CX1010-0122	x	–	x	⊗	x

\*CX1010 systems with Microsoft Embedded Standard require Compact Flash with a capacity of at least 2 GB (must be ordered separately).



DVI/USB interface

Audio interface

RS232 interface

RS422/RS485 interface

Ethernet interface

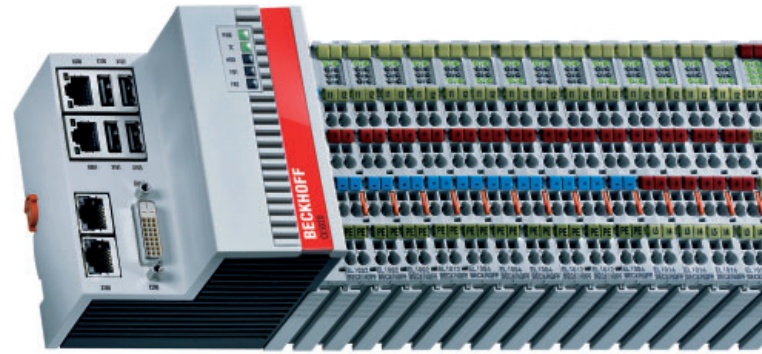
## CX1010-N0xx | System interfaces

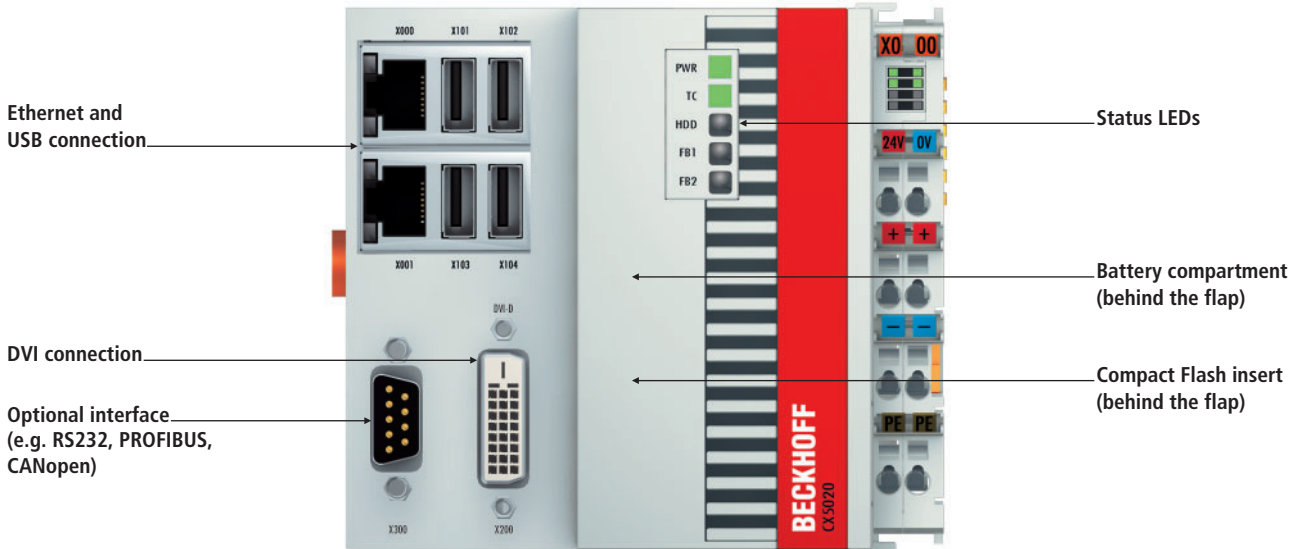
A number of optional interface modules are available for the basic CX1010 CPU module that can be installed ex factory. The CX1010-N010 option connects Beckhoff Control Panels or standard monitors with DVI or VGA input via the DVI or USB interfaces. Devices such as printer, scanner, mouse, keyboard, mass storage, CD-RW, etc. can be connected via the USB 2.0 interfaces. Multimedia capability is realised via the CX1010-N020 audio interface. The modules CX1010-N030 and CX1010-N040 offer a total of four serial RS232 interfaces with a maximum transfer speed of 115 kbaud. These four interfaces can be implemented in pairs as RS422/RS485, in which case they are identified as CX1010-N031 and CX1010-N041 respectively. The system interfaces cannot be retrofitted or expanded in the field. They are supplied ex factory in the specified configuration and cannot be separated from the CPU module. The internal PC/104 bus runs through the system interfaces, so that further CX components can be connected. The power supply of the system interface modules is ensured via the internal PC/104 bus.

Technical data	CX1010-N010	CX1010-N020	CX1010-N030 CX1010-N040	CX1010-N031 CX1010-N041	CX1010-N060
Interfaces	1 x DVI + 2 x USB (max. 500 mA per port)	Line IN, Line Mic IN, Line OUT	1 x COM1+2, RS232, 1 x COM3+4, RS232	1 x COM1+2, RS422/RS485, 1 x COM3+4, RS422/RS485	1 x Ethernet, 10/100 Mbit/s
Type of connection	DVI-I 29-pin socket + 2 USB 2.0 ports type A	3.5 mm socket for jack plug	2 x D-sub plug, 9-pin	2 x D-sub socket, 9-pin	1 x RJ 45
Properties	DVI-I interface also carries out VGA signals (DVI-A)	built-in PC beeper, Line OUT output, max. 200 mW, suitable for ear-phones	max. baud rate 115 kbaud, cannot be used simultaneously with N031/N041	max. baud rate 115 kbaud, cannot be used simultaneously with N030/N040	max. baud rate 100 Mbit/s, max. 20 m cable length CAT5, cannot be used simultaneously with CX1100-0004
Power supply	via system bus (through CX1100-xxxx power supply modules)				
Dimensions (W x H x D)	19 mm x 100 mm x 51 mm				
Weight	approx. 95 g				
Operating/storage temperature	0...+55 °C/-25...+85 °C				
Relative humidity	95 %, no condensation				
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				
Protection class	IP 20				
Further information	www.beckhoff.com/CX1010-N010				

# Embedded PC series CX5000

Embedded PC series with Intel® Atom™ processor





## CX5000 | Embedded PC series with Intel® Atom™ processor

The CX5000 series devices are DIN rail-mountable, fanless Embedded PCs with direct connection for Beckhoff Bus Terminals or EtherCAT Terminals. In contrast to the other CX device families, the CX5000 series has a fixed, non-expandable number of system interfaces. However, one slot is available for factory-provided options like a serial port or a fieldbus master/slave. The housing design for this series is optimised for robustness and compactness. EtherCAT integration offers a wide range of expansion capability. Further master/slave fieldbus connections (PROFIBUS, CANopen, DeviceNet) or commu-

nication interfaces (RS232, RS422/RS485) and all other signal types accessible via EtherCAT can be directly connected as EtherCAT Terminals.

Two independent gigabit Ethernet ports and four USB 2.0 interfaces are available. A Beckhoff Control Panel or a standard DVI monitor can be connected to the DVI-D interface. A serial port (RS232/RS422/RS485) or a fieldbus connection with master or slave function can be added as an optional interface as required.

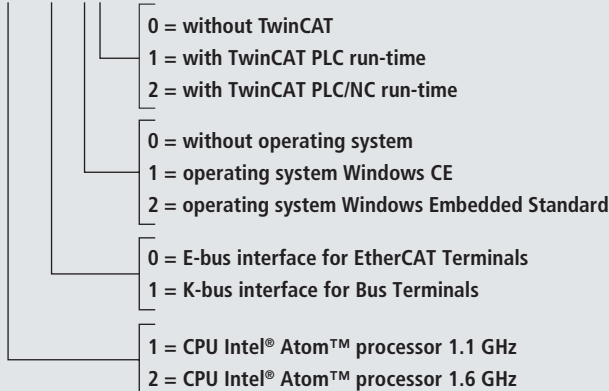
An interchangeable Compact Flash card located behind a flap that is accessible from

outside is used as boot and storage medium. The built-in capacitive 1-second UPS ensures secure backup of persistent application data on the Compact Flash card. Date and time are buffered via a replaceable battery.

The operating system can be Windows CE or Windows Embedded Standard. The TwinCAT automation software transforms a CX5000 system into a powerful PLC and Motion Control system that can be operated with or without visualisation.

The order identifier of the CX5000 devices is derived as follows:

### CX50x0-x1xx



Since not all combinations make sense, the table "Ordering information" contains a breakdown of the permissible combinations.

### Optional interfaces:

- CX50x0-N030 = RS232, D-sub plug
- CX50x0-N031 = RS422/RS485, D-sub socket
- CX50x0-M310 = PROFIBUS master, D-sub socket, 9-pin
- CX50x0-B310 = PROFIBUS slave, D-sub socket, 9-pin
- CX50x0-M510 = CANopen master, D-sub plug, 9-pin
- CX50x0-B510 = CANopen slave, D-sub plug, 9-pin
- CX50x0-M930 = PROFINET RT, controller
- CX50x0-B930 = PROFINET RT, device, Ethernet (2 x RJ 45 switch)
- CX50x0-B950 = EtherNet/IP slave, Ethernet (2 x RJ 45 switch)
- CX50x0-B110 = EtherCAT slave, EtherCAT IN and OUT (2 x RJ 45)

Technical data	CX5010-x1xx	CX5020-x1xx
Processor	processor Intel® Atom™ Z510, 1.1 GHz clock frequency	processor Intel® Atom™ Z530, 1.6 GHz clock frequency
Flash memory	64 MB Compact Flash card	
Internal main memory	512 MB RAM (internal, not expandable)	
Interfaces	2 x RJ 45, 10/100/1000 Mbit/s, DVI-D, 4 x USB 2.0, optional 1 x RS232/RS422/RS485	
Diagnostics LED	1 x power, 1 x TC status, 1 x flash access, 2 x bus status	
Clock	internal battery-backed clock for time and date (battery exchangeable)	
Operating system	Microsoft Windows CE or Microsoft Windows Embedded Standard	
Control software	TwinCAT PLC run-time or TwinCAT NC PTP run-time	
Power supply	24 V DC (-15 %/+20 %)	
Dielectric strength	500 V <sub>rms</sub> (supply/internal electronics)	
Current supply I/O terminals	2 A	
Max. power loss	12 W (including the system interfaces)	12.5 W (including the system interfaces)
Dimensions (W x H x D)	100 mm x 100 mm x 91 mm	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Further information	www.beckhoff.com/CX5010	

Ordering information	E-bus	K-bus	Windows CE	Windows Embedded Standard	TwinCAT PLC run-time	TwinCAT NC run-time
CX5010-0100	x	–	–	–	–	–
CX5010-0110	x	–	x	–	–	–
CX5010-0111	x	–	x	–	x	–
CX5010-0112	x	–	x	–	x	x
CX5010-0120	x	–	–	x	*	–
CX5010-0121	x	–	–	x	✗	–
CX5010-0122	x	–	–	x	✗	x
CX5010-1100	–	x	–	–	–	–
CX5010-1110	–	x	x	–	–	–
CX5010-1111	–	x	x	–	x	–
CX5010-1112	–	x	x	–	x	x
CX5010-1120	–	x	–	x	*	–
CX5010-1121	–	x	–	x	✗	–
CX5010-1122	–	x	–	x	✗	x

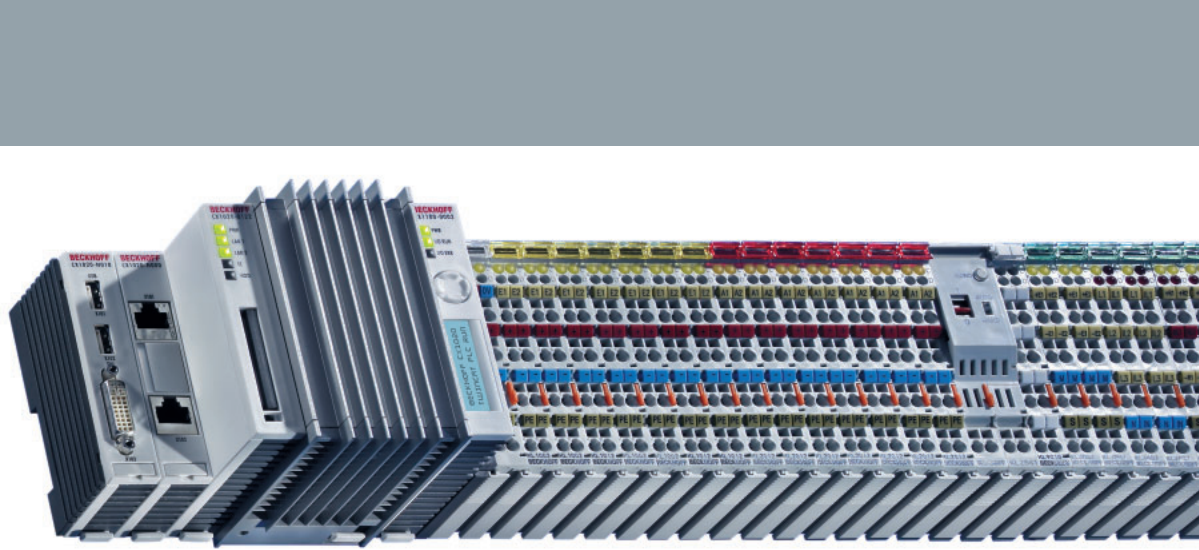
Ordering information	E-bus	K-bus	Windows CE	Windows Embedded Standard	TwinCAT PLC run-time	TwinCAT NC run-time
CX5020-0100	x	–	–	–	–	–
CX5020-0110	x	–	x	–	–	–
CX5020-0111	x	–	x	–	x	–
CX5020-0112	x	–	x	–	x	x
CX5020-0120	x	–	–	x	*	–
CX5020-0121	x	–	–	x	✗	–
CX5020-0122	x	–	–	x	✗	x
CX5020-1100	–	x	–	–	–	–
CX5020-1110	–	x	x	–	–	–
CX5020-1111	–	x	x	–	x	–
CX5020-1112	–	x	x	–	x	x
CX5020-1120	–	x	–	x	*	–
CX5020-1121	–	x	–	x	✗	–
CX5020-1122	–	x	–	x	✗	x

\*CX50x0 systems with Microsoft Embedded Standard require Compact Flash with a capacity of at least 2 GB (must be ordered separately).



# Embedded PC series CX1020, CX1030

The modular Industrial PC for mid-range control







CX1020

## Embedded PC CX1020, CX1030

The Embedded PCs CX1020 and CX1030 extend the CX product family by versions with higher CPU performance and enable the direct connection of Bus Terminals and EtherCAT Terminals. The CX1020 is equipped with a 1 GHz Intel® Celeron® M CPU. It is an energy-saving device that operates with ultra-low core voltage and features low thermal power dissipation of only 7 W TDP (thermal design power). As a result, no fan is required despite the compact design of the CX1020 Embedded PC. Since Compact Flash is used as boot and memory medium, no rotating media are required in the controller. This is an important aspect for increasing the MTBF (mean time between failures) of the overall system.

The CX1030 is equipped with a 1.8 GHz Intel® Pentium® M and is the most powerful device in the Embedded PC range. Apart from the cartridge (which is required due to the higher performance) and the CPU, the CX1030 and CX1020 feature identical hardware and software. The high-quality fan is supported by dual ball bearings and mounted in a tray so that it can be replaced in the field without tools or wiring, if required. The fan speed is monitored and can be queried via software. The combination of CX1030, EtherCAT and TwinCAT enables very fast control processes in the sub-millisecond range (eXtreme Fast Control Technology).

The basic CPU modules are equipped with two RJ 45 sockets and an integrated 3-port switch as standard. In practice, this often means that no separate switch is required, since a line topology can be configured conveniently: for example in building installations, where several room controls can be distributed across each floor, which otherwise would have to be networked via a star topology.

### The components

The modules of the CX series system are connected with each other via the standardised PC/104 bus (16 bit). The individual system components are modules with a width of 19 mm (single) or 38 mm (double) that can be arranged in series. The basic unit consists of a CPU module CX1020/CX1030 and a power supply module (CX1100-00xx).

The CPU module is available in several variants, e.g.:

- System interfaces: in addition to the two existing Ethernet ports, further interfaces can be integrated as an option. A DVI-I (= DVI-D + VGA) output, two USB 2.0 interfaces, up to four RS232 interfaces and audio are available. The four RS232 interfaces feature opto-decoupling and can be implemented in pairs as RS422/RS485.
- operating system: Microsoft Windows CE or Microsoft Windows Embedded Standard

- TwinCAT software (pre-installed): without a TwinCAT system, with TwinCAT CE PLC, TwinCAT CE NC PTP, or with the associated full version of the individual TwinCAT levels for PLC, NC PTP and NC interpolation

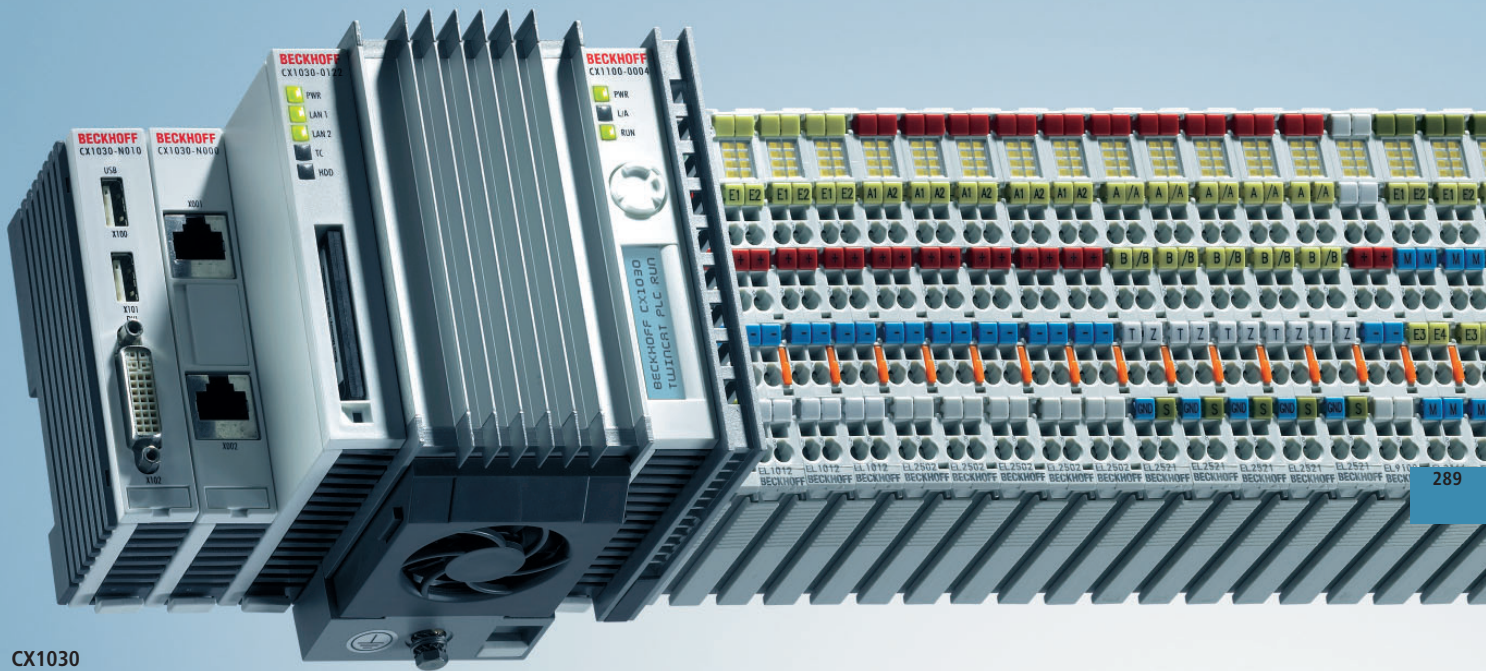
The range of optional modules is complemented by fieldbus connections for PROFIBUS, CANopen, DeviceNet, SERCOS interface and Lightbus, both as master or slave versions.

### Power supply unit with integrated I/O interface

Three or four different types of power supply units are available:

- 24 V DC power supply without I/O interface (CX1100-0001), only CX1020
- 24 V DC power supply with terminal bus interface for connecting the Beckhoff Bus Terminals (CX1100-00x2)
- 24 V DC power supply with terminal bus interface for connecting the Beckhoff Bus Terminals and IP-Link connection for interfacing of the Beckhoff Fieldbus Box modules (CX1100-00x3)
- 24 V DC power supply with terminal bus interface for connecting the Beckhoff EtherCAT Terminals (CX1100-00x4)

All power supply variants have an illuminated, low-glare LC display with FSTN technology and two rows with 16 characters each for



CX1030

displaying status messages. The application programs can also use the display for displaying application-specific texts. 8 kB of non-volatile memory for remanent data are also included.

**EtherCAT as a fast I/O system**

The Embedded PCs CX1020 and CX1030 were developed for optimum interaction with EtherCAT. The two Ethernet interfaces of the CPU module are not primarily intended for EtherCAT operation. The EtherCAT connection is established via the EtherCAT EK1110 extension terminal.

EtherCAT offers several options for connecting traditional fieldbus systems with the CX1020/CX1030: either as a CX1500 module directly at the CPU or as an EtherCAT device in terminal form. The PROFIBUS master is

available either as a CX1500-M310 or as an EL6731 EtherCAT Terminal. Both types offer the same performance characteristics – e.g. both support PROFIBUS DP-V2. In practice, this means that the PROFIBUS master can be positioned exactly where it is required within a machine. It no longer has to be implemented as a plug-in card in the IPC or a master controller in the control cabinet.

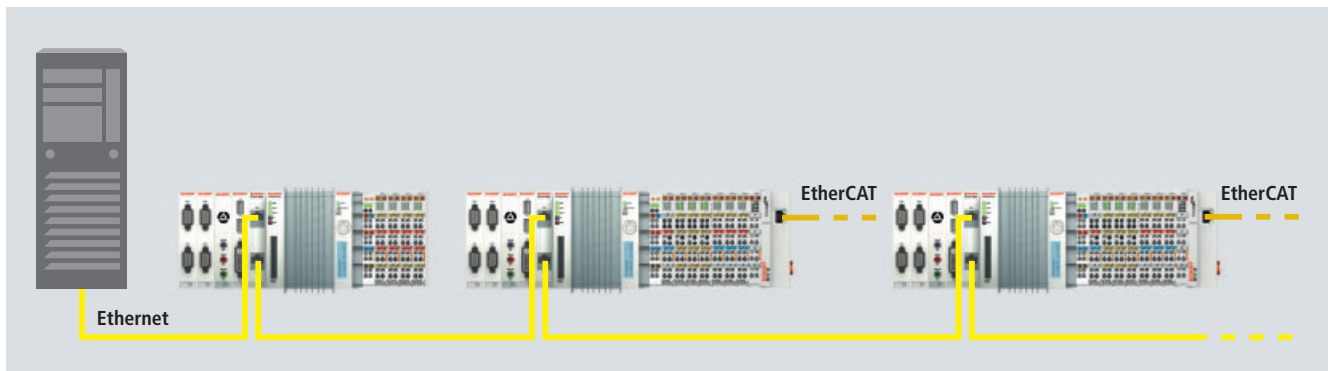
**PLC, Motion Control, interpolation and visualisation**

As a DIN rail IPC and in conjunction with the TwinCAT software from Beckhoff, the CX1020/CX1030 offers the same functionality as large Industrial PCs. In terms of PLC, up to four virtual IEC 61131 CPUs can be programmed with up to four tasks

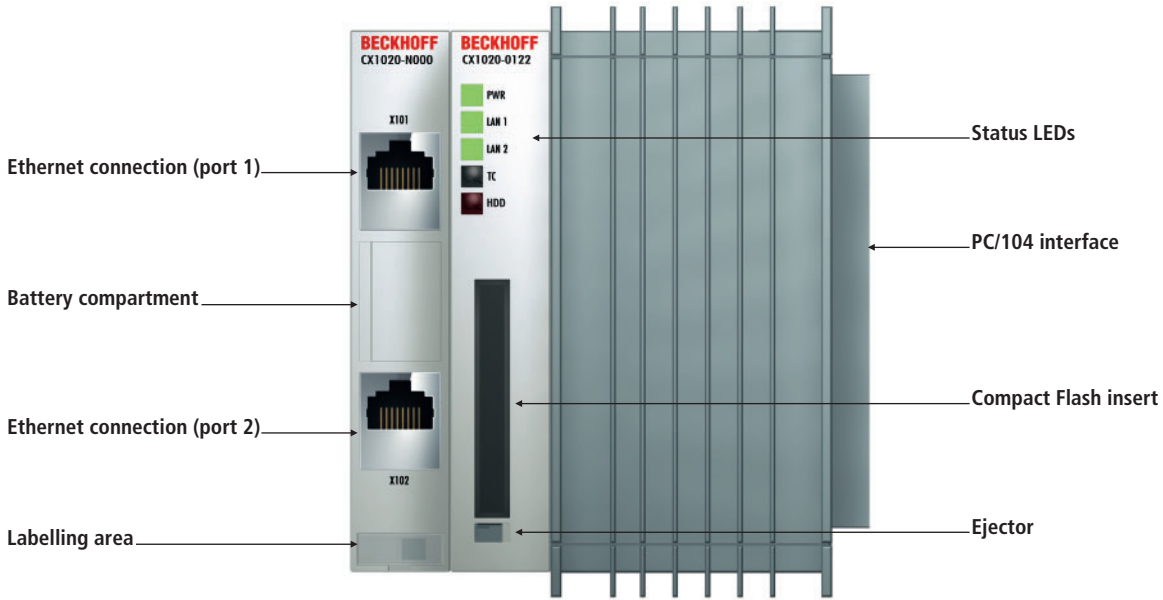
each, with a minimum cycle time of 50 µs. All IEC 61131-3 languages can be used.

Moreover, all TwinCAT functionalities are available for Motion Control applications: in theory, up to 256 axes can be controlled. In addition to simple point-to-point movements, more complex multi-axis functions such as “electronic gearbox”, “cam plate” and “flying saw” can be implemented. Thanks to the more powerful CPU, the CX1020 and CX1030 can also be used for interpolating 3-D path movements and DIN66025 programs.

In addition to real-time execution of control tasks, the TwinCAT real-time kernel ensures that enough time remains for the user interface (HMI) to communicate with the real-time components via software interfaces such as ADS or OPC.



The CX1020 and the CX1030 enable configuration of an IT line topology with subordinate EtherCAT devices.



## CX1020 | Basic CPU module

The basic CX1020 CPU module has a 1 GHz Intel® CPU. The controller does not require a fan or other rotating components. In addition to the CPU and the chipset, the CX1020 module also contains the main memory, which is available in different sizes. The controller boots from the Compact Flash.

The basic configuration of the CX1020 includes a 64 MB Compact Flash card and two Ethernet RJ 45 interfaces. These interfaces are connected to an internal switch and offer a simple option for creating a line topology without the need for additional Ethernet switches. All other CX family components can be connected via the PC/104 interface that is available on both sides. The passive cooling

module is included in the scope of supply. The operating system can be Windows CE or Windows Embedded Standard. The TwinCAT automation software transforms a CX1020 system into a powerful PLC and Motion Control system that can be operated with or without visualisation. In contrast to the CX1010, the CX1020 can also be used for interpolating axis movements with TwinCAT NC I.

Further system interfaces or fieldbus connections can be added to the basic CPU module. The CPU module requires a CX1100 type power supply module. All CX1500 fieldbus modules and all CX1100 power supplies from the CX series can be used in combination with the CX1020.

The Embedded PC CX1020 is also available as the ordering option CX1900-0320 with zero second level cache. Instead of the 1 GHz processor with 512 kB second level cache (L2), a less expensive variant of the processor without a second level cache (L2 = 0 kB) is used. Since the CX1900-0320 has the same 855 GME chipset as the CX1020, none of the basic characteristics of the CX1020 are changed, apart from the slightly lower CPU power.

The order identifier of the basic CPU module is derived as follows:

CX1020-0xxx	
0	without TwinCAT
1	with TwinCAT PLC run-time
2	with TwinCAT PLC/NC run-time
3	with TwinCAT PLC/NC I run-time
0	without operating system
1	operating system Windows CE
2	operating system Windows Embedded Standard
0	CPU with 2 Ethernet ports
1	CPU with 2 Ethernet ports + 2 x USB + DVI

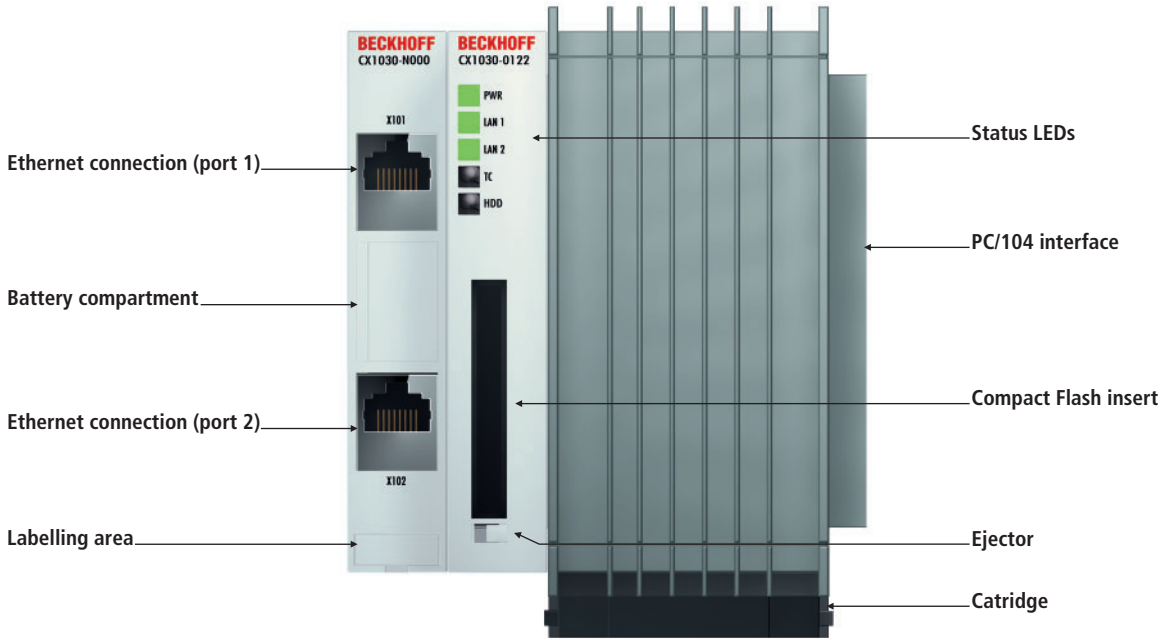
Since not all combinations make sense, the table "Ordering information" contains a breakdown of the permissible combinations.

Technical data	CX1020-0xxx
Processor	Intel® Celeron® M ULV, 1 GHz clock frequency
Flash memory	64 MB Compact Flash card
Internal main memory	256 MB DDR RAM (expandable to 512 MB, 1 Gbyte)
Interfaces	2 x RJ 45 (Ethernet, internal switch)
Diagnostics LED	1 x power, 2 x LAN link/activity, TC status, 1 x flash access
Expansion slot	1 x Compact Flash type I+II insert with eject mechanism
Clock	internal battery-backed clock for time and date (battery exchangeable)
Operating system	Microsoft Windows CE or Microsoft Windows Embedded Standard
Control software	TwinCAT PLC run-time, NC PTP run-time, NC I run-time
System bus	16 bit ISA (PC/104 standard)
Power supply	via system bus (through CX1100-xxxx power supply modules)
Max. power loss	11 W (including CX1020-N0xx system interfaces)
Dimensions (W x H x D)	96 mm x 112 mm x 98 mm
Weight	approx. 720 g
Operating/storage temperature	0...+50 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protection class	IP 20
Further information	www.beckhoff.com/CX1020

Ordering information	DVI/USB	no operating system	Windows CE	Windows Embedded Standard	no TwinCAT	TwinCAT PLC run-time	TwinCAT NC run-time	TwinCAT NC I run-time
CX1020-0000	–	X	–	–	X	–	–	–
CX1020-0010	–	–	X	–	X	–	–	–
CX1020-0011	–	–	X	–	–	X	–	–
CX1020-0012	–	–	X	–	–	X	X	–
CX1020-0013	–	–	X	–	–	X	X	X
CX1020-0100	X	X	–	–	X	–	–	–
CX1020-0110	X	–	X	–	X	–	–	–
CX1020-0111	X	–	X	–	–	X	–	–
CX1020-0112	X	–	X	–	–	X	X	–
CX1020-0113	X	–	X	–	–	X	X	X
CX1020-0020	–	–	–	X	⊗	–	–	–
CX1020-0021	–	–	–	X	⊗	X	–	–
CX1020-0022	–	–	–	X	⊗	X	X	–
CX1020-0023	–	–	–	X	⊗	X	X	X
CX1020-0120	X	–	–	X	⊗	–	–	–
CX1020-0121	X	–	–	X	⊗	X	–	–
CX1020-0122	X	–	–	X	⊗	X	X	–
CX1020-0123	X	–	–	X	⊗	X	X	X

Options	
CX1900-0320	option for basic CPU module: Intel® Celeron® M processor 1 GHz, zero second level cache
CX1900-0120	"Active cooling": factory conversion of the CX1020 CPU module for active cooling in order to enable flexible installation positions (see documentation). Active cooling takes place via a fan cartridge. This option requires the use of a power supply unit type CX1100-001x.

\*CX1020 systems with Microsoft Embedded Standard require Compact Flash with a capacity of at least 2 GB (must be ordered separately).



## CX1030 | Basic CPU module

The CX1030 basic CPU module offers Pentium® M power on the DIN rail. The CX1030 has a 1.8 GHz Intel® Pentium® M CPU. The CPU is cooled via the cooling module and an easily exchangeable fan cartridge located on the underside of the housing. The fan speed can be read via software and can therefore be monitored.

In addition to the CPU and the chipset, the CX1030 module also contains the RAM, which is available in different sizes. The controller boots from the Compact Flash. The basic configuration of the CX1030 includes a 64 MB Compact Flash card and two Ethernet

RJ 45 interfaces. These are connected to an internal switch and offer a simple option for creating a line topology without the need for additional Ethernet Switches. All other CX family components can be connected via the PC/104 interface that is available on both sides. The passive cooling module is included in the scope of supply.

The operating system can be Windows CE or Windows Embedded Standard. The TwinCAT automation software transforms a CX1030 system into a powerful PLC and Motion Control system that can be used with or without visualisation. In contrast to

the CX1010, the CX1030 can also be used for interpolating axis movements with TwinCAT NC I.

Further system interfaces or fieldbus connections can be added to the basic CPU module. The CPU module requires a CX1100-001x type power supply module. All CX1500 fieldbus modules and all CX1100-001x power supply units from the CX series can be used in combination with the CX1030.

The order identifier of the basic CPU module is derived as follows:

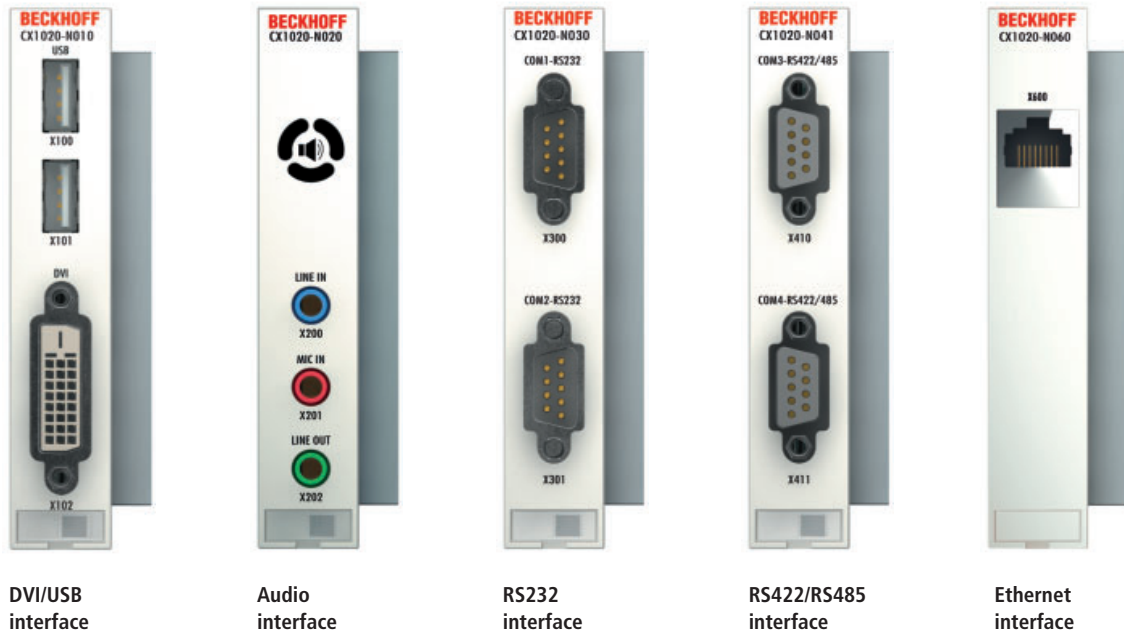
CX1030-0xxx	
0	without TwinCAT
1	with TwinCAT PLC run-time
2	with TwinCAT PLC/NC run-time
3	with TwinCAT PLC/NC I run-time
0	without operating system
1	operating system Windows CE
2	operating system Windows Embedded Standard
0	CPU with 2 Ethernet ports
1	CPU with 2 Ethernet ports + 2 x USB + DVI

Since not all combinations make sense, the table "Ordering information" contains a breakdown of the permissible combinations.

Technical data	CX1030-0xxx
Processor	Intel® Pentium® M, 1.8 GHz clock frequency
Flash memory	64 MB Compact Flash card
Internal main memory	256 MB DDR RAM (expandable to 512 MB, 1 Gbyte)
Interfaces	2 x RJ 45 (Ethernet, internal switch), 10/100 Mbit/s
Cooling	cooling module + fan cartridge featuring speed control with double ball bearing fans, easily replaceable
Diagnostics LED	1 x power, 2 x LAN link/activity, TC status, 1 x flash access
Expansion slot	1 x Compact Flash type I+II insert with eject mechanism
Clock	internal battery-backed clock for time and date (battery exchangeable)
Operating system	Microsoft Windows CE or Microsoft Windows Embedded Standard
Control software	TwinCAT PLC run-time, NC PTP run-time, NC I run-time
System bus	16 bit ISA (PC/104 standard)
Power supply	via system bus (through CX1100-0012 [K-bus], CX1100-0013 [K-bus, IP-Link], CX1100-014 [E-bus] power supply module)
Max. power loss	32 W (including CX1030-N0xx system interfaces)
Dimensions (W x H x D)	96 mm x 121 mm x 98 mm
Weight	approx. 750 g
Operating/storage temperature	0...+50 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protection class	IP 20
Further information	<a href="http://www.beckhoff.com/CX1030">www.beckhoff.com/CX1030</a>

Ordering information	DVI/USB	no operating system	Windows CE	Windows Embedded Standard	no TwinCAT	TwinCAT PLC run-time	TwinCAT NC run-time	TwinCAT NC I run-time
CX1030-0000	–	X	–	–	X	–	–	–
CX1030-0010	–	–	X	–	X	–	–	–
CX1030-0011	–	–	X	–	–	X	–	–
CX1030-0012	–	–	X	–	–	X	X	–
CX1030-0013	–	–	X	–	–	X	X	X
CX1030-0100	X	X	–	–	X	–	–	–
CX1030-0110	X	–	X	–	X	–	–	–
CX1030-0111	X	–	X	–	–	X	–	–
CX1030-0112	X	–	X	–	–	X	X	–
CX1030-0113	X	–	X	–	–	X	X	X
CX1030-0020	–	–	–	X	⊗	–	–	–
CX1030-0021	–	–	–	X	⊗	X	–	–
CX1030-0022	–	–	–	X	⊗	X	X	–
CX1030-0023	–	–	–	X	⊗	X	X	X
CX1030-0120	X	–	–	X	⊗	–	–	–
CX1030-0121	X	–	–	X	⊗	X	–	–
CX1030-0122	X	–	–	X	⊗	X	X	–
CX1030-0123	X	–	–	X	⊗	X	X	X

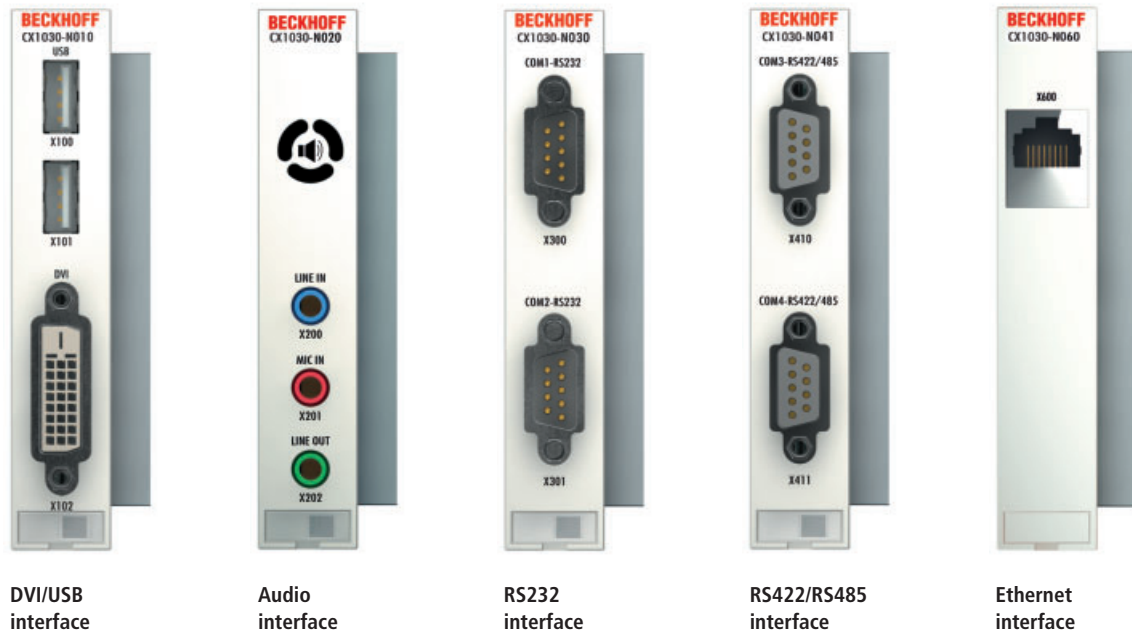
\*CX1030 systems with Microsoft Embedded Standard require Compact Flash with a capacity of at least 2 GB (must be ordered separately).

DVI/USB  
interfaceAudio  
interfaceRS232  
interfaceRS422/RS485  
interfaceEthernet  
interface

## CX1020-N0xx | System interfaces

A number of optional interface modules are available for the basic CX1020 CPU module that can be installed ex factory. The CX1020-N010 option connects Beckhoff Control Panels or standard monitors with DVI or VGA input via the DVI or USB interfaces. Devices such as printer, scanner, mouse, keyboard, mass storage, CR-RW, etc. can be connected via the USB 2.0 interfaces. Multimedia capability is realised via the CX1020-N020 audio interface. The modules CX1020-N030 and CX1020-N040 offer a total of four serial RS232 interfaces with a maximum transfer speed of 115 kbaud. These four interfaces can be implemented in pairs as RS422/RS485, in which case they are identified as CX1020-N031 and CX1020-N041 respectively. The system interfaces cannot be retrofitted or expanded in the field. They are supplied ex factory in the specified configuration and cannot be separated from the CPU module. The internal PC/104 bus runs through the system interfaces, so that further CX components can be connected. The power supply of the system interface modules is ensured via the internal PC/104 bus.

Technical data	CX1020-N010	CX1020-N020	CX1020-N030 CX1020-N040	CX1020-N031 CX1020-N041	CX1020-N060
Interfaces	1 x DVI + 2 x USB (max. 500 mA per port)	Line IN, Line Mic IN, Line OUT	1 x COM1+2, RS232, 1 x COM3+4, RS232	1 x COM1+2, RS422/ RS485, 1 x COM3+4, RS422/RS485	1 x Ethernet, 10/100 Mbit/s
Type of connection	DVI-I 29-pin socket + 2 USB 2.0 ports type A	3.5 mm socket for jack plug	2 x D-sub plug, 9-pin	2 x D-sub socket, 9-pin	1 x RJ 45
Properties	DVI-I interface also carries out VGA signals (DVI-A)	built-in PC beeper, Line OUT output, max. 200 mW, suitable for ear- phones	max. baud rate 115 kbaud, cannot be used simultaneously with N031/N041	max. baud rate 115 kbaud, cannot be used simultaneously with N030/N040	max. baud rate 100 Mbit/s, max. 20 m cable length CAT5, cannot be used simultaneously with CX1100-0004
Power supply	via system bus (through CX1100-xxxx power supply modules)				
Dimensions (W x H x D)	19 mm x 100 mm x 51 mm				
Weight	approx. 95 g				
Operating/storage temperature	0...+55 °C/-25...+85 °C				
Relative humidity	95 %, no condensation				
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				
Protection class	IP 20				
Further information	<a href="http://www.beckhoff.com/CX1020-N010">www.beckhoff.com/CX1020-N010</a>				

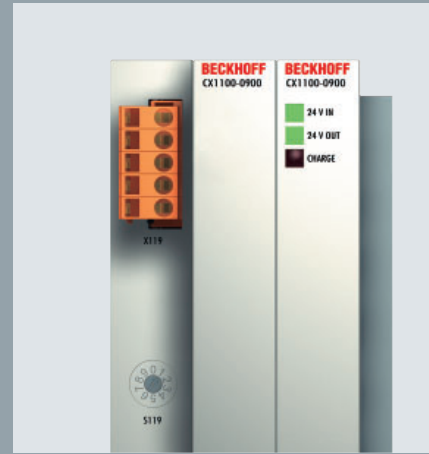


## CX1030-N0xx | System interfaces

A number of optional interface modules are available for the basic CX1030 CPU module that can be installed ex factory. The CX1030-N010 option connects Beckhoff Control Panels or standard monitors with DVI or VGA input via the DVI or USB interfaces. Devices such as printer, scanner, mouse, keyboard, mass storage, CD-RW, etc. can be connected via the USB 2.0 interfaces. Multimedia capability is realised via the CX1030-N020 audio interface. The modules CX1030-N030 and CX1030-N040 offer a total of four serial RS232 interfaces with a maximum transfer speed of 115 kbaud. These four interfaces can be implemented in pairs as RS422/RS485, in which case they are identified as CX1030-N031 and CX1030-N041 respectively. The system interfaces cannot be retrofitted or expanded in the field. They are supplied ex factory in the specified configuration and cannot be separated from the CPU module. The internal PC/104 bus runs through the system interfaces, so that further CX components can be connected. The power supply of the system interface modules is ensured via the internal PC/104 bus.

Technical data	CX1030-N010	CX1030-N020	CX1030-N030 CX1030-N040	CX1030-N031 CX1030-N041	CX1030-N060
<b>Interfaces</b>	1 x DVI + 2 x USB (max. 500 mA per port)	Line IN, Line Mic IN, Line OUT	1 x COM1+2, RS232, 1 x COM3+4, RS232	1 x COM1+2, RS422/ RS485, 1 x COM3+4, RS422/RS485	1 x Ethernet, 10/100 Mbit/s
<b>Type of connection</b>	DVI-I 29-pin socket + 2 USB 2.0 ports type A	3.5 mm socket for jack plug	2 x D-sub plug, 9-pin	2 x D-sub plug, 9-pin	RJ 45 socket
<b>Properties</b>	DVI-I interface also carries out VGA signals (DVI-A)	built-in PC beeper, Line OUT output, max. 200 mW, suitable for ear- phones	max. baud rate 115 kbaud, cannot be used simultaneously with N031/N041	max. baud rate 115 kbaud, cannot be used simultaneously with N030/N040	max. baud rate 100 Mbit/s, max. 20 m cable length CAT5, cannot be used simultaneously with CX1100-0004
<b>Power supply</b>	via system bus (through CX1100-xxxx power supply modules)				
<b>Dimensions (W x H x D)</b>	19 mm x 100 mm x 51 mm				
<b>Weight</b>	approx. 95 g				
<b>Operating/storage temperature</b>	0...+55 °C/-25...+85 °C				
<b>Relative humidity</b>	95 %, no condensation				
<b>Vibration/shock resistance</b>	conforms to EN 60068-2-6/EN 60068-2-27/29				
<b>EMC immunity/emission</b>	conforms to EN 61000-6-2/EN 61000-6-4				
<b>Protection class</b>	IP 20				
<b>Further information</b>	<a href="http://www.beckhoff.com/CX1030-N010">www.beckhoff.com/CX1030-N010</a>				





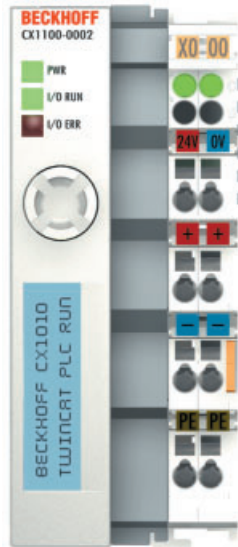
# Embedded PC interfaces

Power supply units, fieldbus masters/slaves, UPS modules

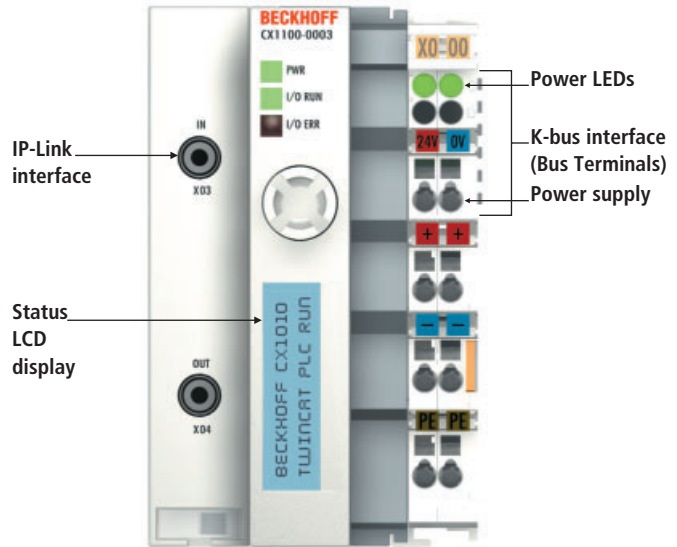




Power supply



Power supply with K-bus interface

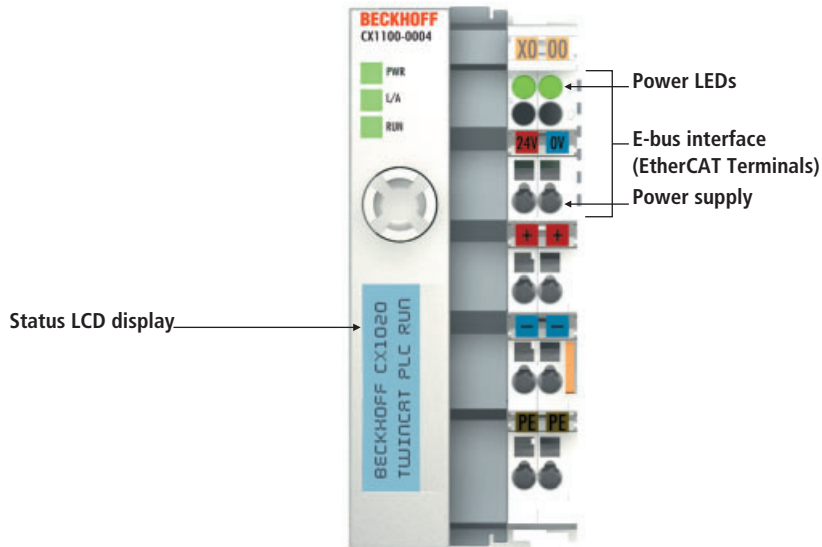


Power supply with K-bus/IP-Link interface

## CX1100-000x | Power supply units and I/O interfaces for CX1010/CX1020

One of four power supply modules can be selected for CX1010/CX1020 systems. The power supply of all other system components is ensured via the internal PC/104 bus; no separate supply lines are required. However, the CX1100 components offer further important characteristics that go beyond a pure power supply: an integrated NOVRAM enables the fail-safe storage of process data, an LC display with two lines of 16 characters each is used for displaying system and user messages. Local I/O signals are connected via the CX1100-0002 power supply variant, to which all Beckhoff Bus Terminals (KLxxxx) can be connected, or via CX1100-0003, which in addition to the Bus Terminals enables the connection of

Technical data	CX1100-0001	CX1100-0002	CX1100-0003
Power supply	24 V DC (-15 %/+20 %)		
Dielectric strength	500 V <sub>rms</sub> (supply/internal electronics)		
E-bus connection	–		
K-bus connection	–	yes (adapter terminal)	yes (adapter terminal)
IP-Link connection	–	–	yes
Supply current K-bus	–	2 A	2 A
Type of connection	1 x open pluggable connector, 5-pin	Cage Clamp® (adapter terminal)	Cage Clamp® (adapter terminal)
NOVRAM	8 kbytes		
Display	FSTN display 2 lines x 16 characters of text, illuminated		
I/O-DPRAM	–	4 kbytes	4 kbytes
Diagnostics LED	1 x PWR	1 x PWR, 1 x I/O Run, 1 x I/O Err	1 x PWR, 1 x I/O Run, 1 x I/O Err
Max. power consumption	2.5 W	3.5 W	4 W
Dimensions (W x H x D)	45 mm x 100 mm x 91 mm	39 mm x 100 mm x 91 mm	58 mm x 100 mm x 91 mm
Weight	approx. 180 g	approx. 200 g	approx. 265 g
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protection class	IP 20		
Further information	www.beckhoff.com/CX1100-0001		

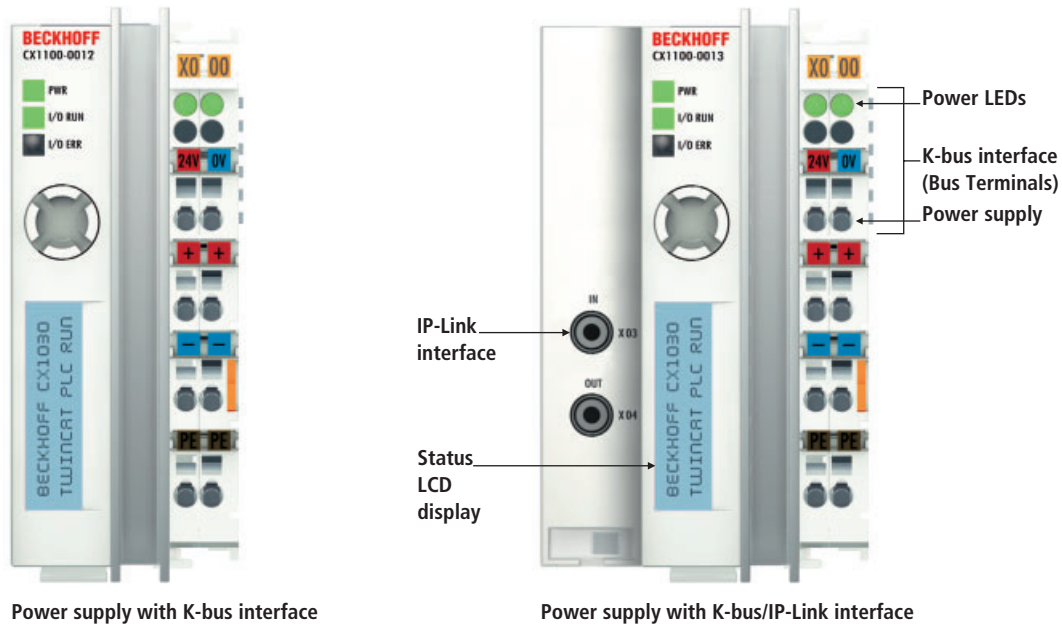


Power supply with E-bus interface

Extension Box IExxxx type Beckhoff Fieldbus Box modules. The option to connect Bus Terminals or Fieldbus Box modules creates a control system with a very variable, expandable I/O level with large signal variety. The I/O data are stored in a DPRAM, which is accessible by the CPU via the system bus. All EtherCAT Terminals (ELxxxx) can be connected via the CX1100-0004 power supply unit. With the CX1100-0004 the I/O data are stored directly in the main memory of the CPU; a DPRAM is no longer required. The power supplies of the CX system can be changed in the field.

Technical data	CX1100-0004
Power supply	24 V DC (-15 %/+20 %)
Dielectric strength	500 V <sub>rms</sub> (supply/internal electronics)
E-bus connection	yes (adapter terminal)
K-bus connection	–
IP-Link connection	–
E-bus power supply	2 A
Type of connection	Cage Clamp® (adapter terminal)
NOVRAM	8 kbytes
Display	FSTN display 2 lines x 16 characters of text, illuminated
I/O-DPRAM	–
Diagnostics LED	1 x PWR, 1 x L/A, 1 x Run
Max. power consumption	3.5 W
Dimensions (W x H x D)	39 mm x 100 mm x 91 mm
Weight	approx. 205 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protection class	IP 20
Further information	<a href="http://www.beckhoff.com/CX1100-0004">www.beckhoff.com/CX1100-0004</a>

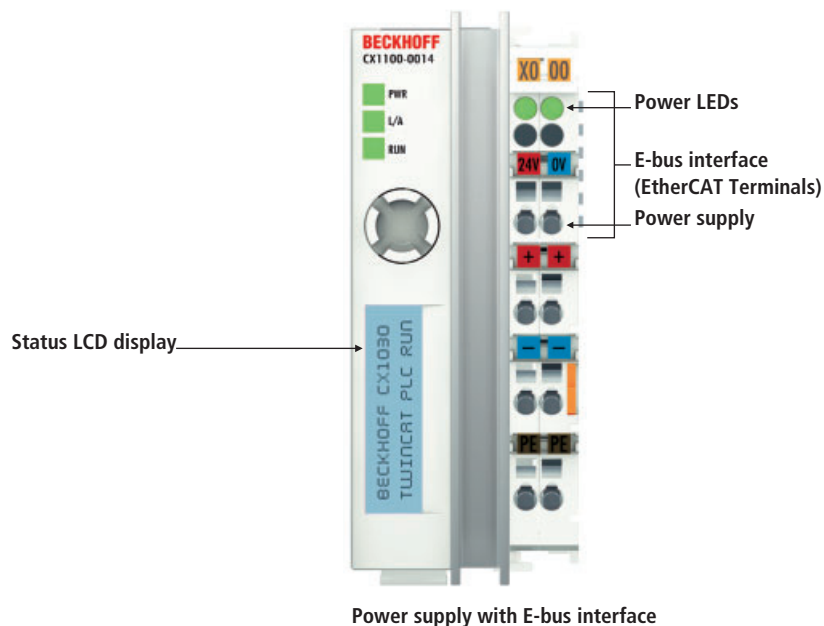
Bus Terminals see 474 , EtherCAT Terminals see 703 , Fieldbus Box modules see 864



## CX1100-001x | Power supply units and I/O interfaces for CX1030

One of three power supply modules can be selected for CX1030 systems. The power supply of all other system components is ensured via the internal PC/104 bus; no separate supply lines are required. However, the CX1100 components offer further important characteristics that go beyond a pure power supply: an integrated NOVRAM enables the fail-safe storage of process data, an LC display with two lines of 16 characters each is used for displaying system and user messages. Local I/O signals are connected via the CX1100-0012 power supply variant, to which all Beckhoff Bus Terminals (KLxxxx) can be connected, or via CX1100-0013, which in addition to the Bus Terminals enables the connection of Extension Box IExxxx type Beckhoff Fieldbus Box modules. The option to connect Bus Terminals or Fieldbus Box modules creates a control system

Technical data	CX1100-0012	CX1100-0013
Power supply	24 V DC (-15 %/+20 %)	
Dielectric strength	500 V <sub>rms</sub> (supply/internal electronics)	
E-bus connection	–	
K-bus connection	yes (adapter terminal)	
IP-Link connection	–	yes
Supply current K-bus	2 A	
Type of connection	Cage Clamp® (adapter terminal)	
NOVRAM	8 kbytes	
Display	FSTN display 2 lines x 16 characters of text, illuminated	
I/O-DPRAM	4 kbytes	
Diagnostics LED	1 x PWR, 1 x I/O Run, 1 x I/O Err	
Dimensions (W x H x D)	42 mm x 109 mm x 92 mm	61 mm x 109 mm x 92 mm
Weight	approx. 250 g	approx. 310 g
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Further information	<a href="http://www.beckhoff.com/CX1100-0012">www.beckhoff.com/CX1100-0012</a>	



Power supply with E-bus interface

with a very variable, expandable I/O level with large signal variety. The I/O data are stored in a DPRAM, which is accessible by the CPU via the system bus. All EtherCAT Terminals (ELxxxx) can be connected via the CX1100-0014 power supply unit. With the CX1100-0014 the I/O data are stored directly in the main memory of the CPU; a DPRAM is no longer required. The power supplies of the CX system can be changed in the field.

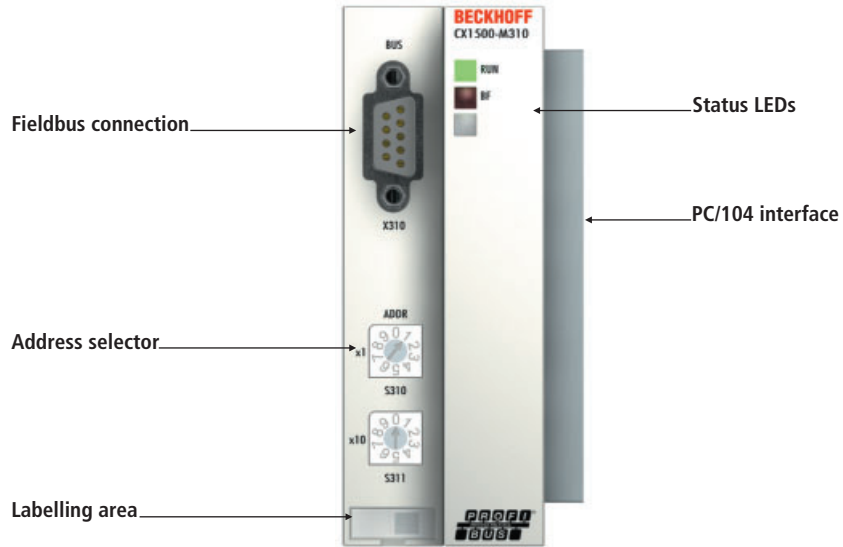
The CX1100-001x power supply units are electronically identical to the CX1100-000x power supply units, but with an internal heat sink and additional ventilation apertures. Although they are intended for use with the CX1030, these power supply units can also be used with the CX1020 and CX1010 in order to enable alternative mounting directions (see documentation).

Technical data	CX1100-0014
Power supply	24 V DC (-15 %/+20 %)
Dielectric strength	500 V <sub>rms</sub> (supply/internal electronics)
E-bus connection	yes (adapter terminal)
K-bus connection	–
IP-Link connection	–
E-bus power supply	2 A
Type of connection	Cage Clamp® (adapter terminal)
NOVRAM	8 kbytes
Display	FSTN display 2 lines x 16 characters of text, illuminated
I/O-DPRAM	–
Diagnostics LED	1 x PWR, 1 x L/A, 1 x Run
Dimensions (W x H x D)	42 mm x 109 mm x 92 mm
Weight	approx. 245 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protection class	IP 20
Further information	<a href="http://www.beckhoff.com/CX1100-0014">www.beckhoff.com/CX1100-0014</a>

Bus Terminals see [474](#) , EtherCAT Terminals see [703](#) , Fieldbus Box modules see [864](#)



Lightbus master



PROFIBUS master

## CX1500-Mxx0 | Master fieldbus connections

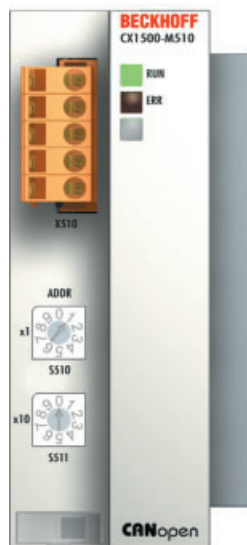
Fieldbus masters enable the distributed collection of process data and signals, even for distant machines or equipment. The use of fieldbus master modules in a CX1010/CX1020/CX1030 system enables the utilisation of all Beckhoff fieldbus components (e.g. Bus Coupler, Bus Terminal Controller, Drive Technology) as distributed control components for the assembly of complex systems. Parallel operation of several identical or different master connections is also possible, e.g. two PROFIBUS masters or one PROFIBUS master and one SERCOS interface master can exist simultaneously within the same system.

Mixed operation of master and slave connections is also possible. A CX system can thus assume the functionality of an intelligent gateway between different fieldbuses, receiving data from a fieldbus,

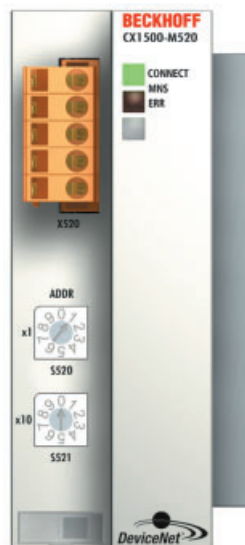
processing them via a program and then feeding them into another fieldbus. The performance data of the CX fieldbus master modules are nearly identical to those of the Beckhoff PC Fieldbus Cards, except for the fact that the CX variants are always single-channel types. The number of slaves that can be connected is only limited by the respective bus system. The use of master or slave connections enables networking of several CX systems with each other via the fieldbus level. In contrast to networking via Ethernet, strictly deterministic data transmission can be achieved in this case.

CX fieldbus modules can be upgraded or exchanged in the field and can be connected to an existing CX system via the PC/104 system bus. The power supply of the fieldbus connections is also ensured via the PC/104 bus. The software integration of the fieldbus connections

Technical data	CX1500-M200	CX1500-M310
Fieldbus	Lightbus	PROFIBUS DP, DP-V1, DP-V2 (MC)
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 µs	9.6 kbaud...12 Mbaud
Bus interface	2 x fibre optic	1 x D-sub socket, 9-pin
Bus device	max. 254 nodes with a max. of 65,280 I/O points	max. 125 slaves with up to 244 bytes input, output, parameter, configuration or diagnostic data per slave
Interface to the CPU	ISA plug and play, 2 kbyte DPRAM	
Max. power loss	2 W	1.8 W
Dimensions (W x H x D)	38 mm x 100 mm x 91 mm	
Weight	approx. 220 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Further information	www.beckhoff.com/CX1500-M200	



CANopen master



DeviceNet master



SERCOS interface master

into the TwinCAT automation software is done in the usual comfortable way: scanning and detection of the modules, parameterisation, configuration of the connected I/O components as well as online diagnosis of the process and fieldbus status are carried out in the familiar way through the TwinCAT System Manager.

### Features

**Lightbus** – process data communication can either be free running or synchronised.

**PROFIBUS** – different DP cycle times are possible for each slave; the error management for each user is freely configurable.

**CANopen** – supported PD communication types: event driven, time-controlled, synchronous, polling; emergency message handling,

guarding and heartbeat, boot-up according to DS302, Online Bus Load Monitor and Bus Trace, the error management for each user is freely configurable.

**DeviceNet** – supports DeviceNet I/O modes: polling, change of state, cyclic, strobed; Unconnected Message Manager, Offline Connection Set, Device Heartbeat + Shutdown Messages, Auto Device Replacement.

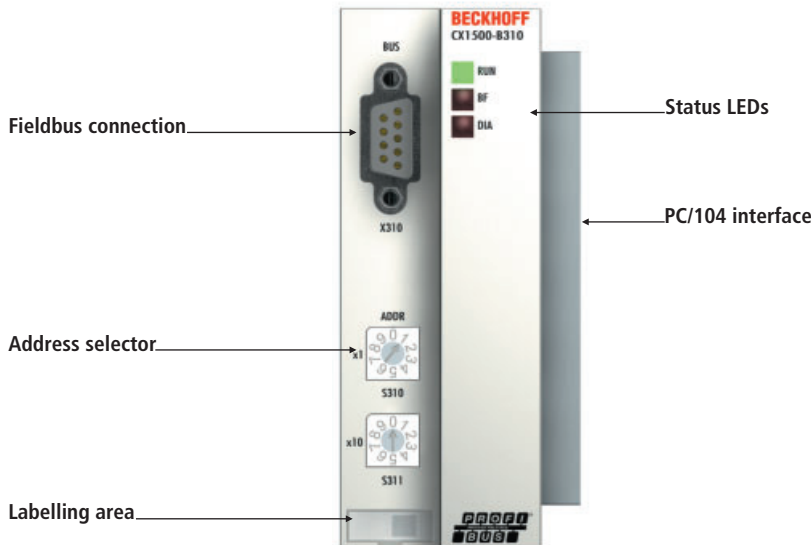
**SERCOS interface** – exact synchronisation between TwinCAT and SERCOS, any assignment and length of the I/O data, synchronous process data communication; only one SERCOS Master is allowed per CX configuration.

Technical data	CX1500-M510	CX1500-M520	CX1500-M750
Fieldbus	CANopen	DeviceNet	SERCOS interface
Data transfer rates	10, 20, 50, 100, 125, 250, 500, 800, 1,000 kbaud	125, 250, 500 kbaud	2, 4, 8, 16 Mbaud
Bus interface	open style connector, 5-pin	open style connector, 5-pin	F-SMA standard, IEC 872-2
Bus device	max. 127 slaves	max. 63 slaves	max. 254 slaves
Interface to the CPU	ISA plug and play, 2 kbyte DPRAM		
Max. power loss	1.8 W	1.8 W	1.3 W
Dimensions (W x H x D)	38 mm x 100 mm x 91 mm		
Weight	approx. 220 g		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protection class	IP 20		
Further information	<a href="http://www.beckhoff.com/CX1500-M510">www.beckhoff.com/CX1500-M510</a>		





Lightbus slave



PROFIBUS slave

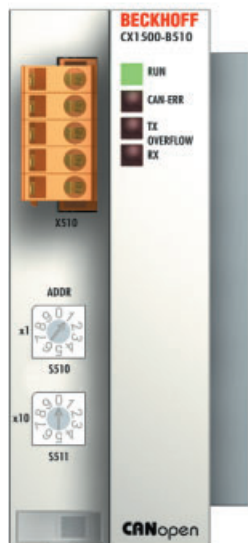
## CX1500-Bxx0 | Slave fieldbus connections

These connections enable the fieldbus integration of a CX1010/ CX1020/CX1030 system as a slave control that can receive or process data from the master, or send back data from its own process periphery to the master control, either directly or processed. Each slave connection in the CX system contains a DPRAM as an interface between the respective bus system and the CX CPU module. It serves as memory for I/O data and can be addressed by the CPU module via the internal ISA bus. The use of fieldbus slave modules enables the utilisation of a CX system as subordinate distributed control for the configuration of complex or modular systems. Parallel operation of several identical or different slave connections is also possible, e.g. two PROFIBUS slaves or one PROFIBUS slave and one CANopen slave can exist simultaneously within the same system.

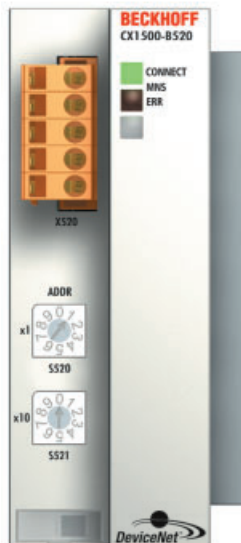
Mixed operation of master and slave connections is also possible. A CX system can thus assume the functionality of an intelligent gateway between different fieldbuses, receiving data from a fieldbus, processing them via a program and then feeding them into another fieldbus. The CX fieldbus slave modules are always single channel types. The number of slaves that can be connected is only limited by the respective bus system. The use of master or slave connections enables networking of several CX systems with each other via the fieldbus level. In contrast to networking via Ethernet, strictly deterministic data transmission can be achieved in this case.

CX fieldbus modules can be upgraded or exchanged in the field and can be connected to an existing CX system via the PC/104 system bus. The power supply of the fieldbus connections is also ensured via

Technical data	CX1500-B200	CX1500-B310
Fieldbus	Lightbus	PROFIBUS DP, DP-V1, DP-V2 (MC)
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 µs	9.6 kbaud...12 Mbaud
Bus interface	2 x fibre optic	1 x D-sub socket, 9-pin
Bus device	max. 255 slaves	max. 125 slaves
Max. number of bytes	max. 512 byte input/512 byte output	max. 244 byte input/244 byte output
Max. power loss	1.8 W	
Dimensions (W x H x D)	38 mm x 100 mm x 91 mm	
Weight	approx. 220 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Further information	www.beckhoff.com/CX1500-B200	



CANopen slave

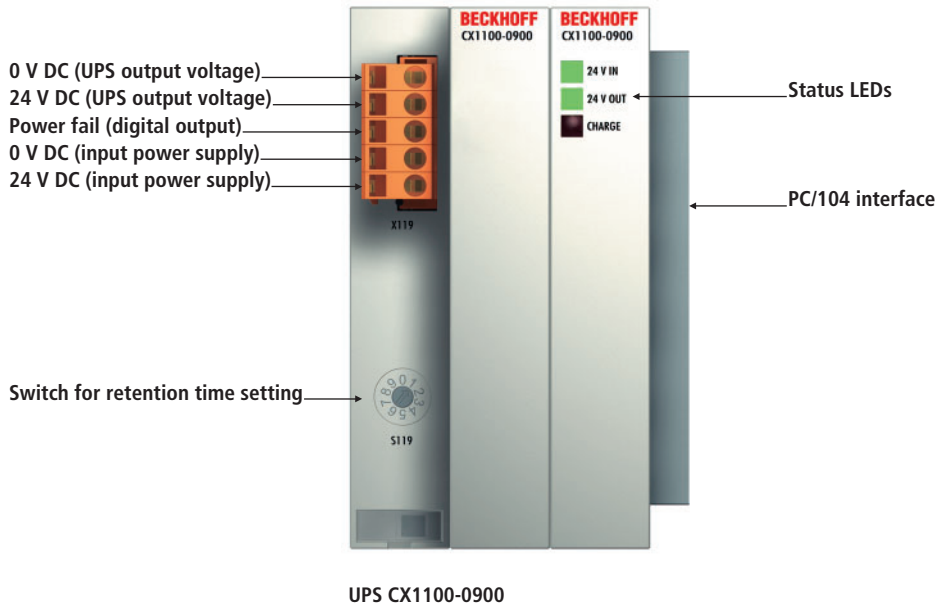


DeviceNet slave

the PC/104 bus. The software integration of the fieldbus connections into TwinCAT is done in the usual comfortable way: scanning and detection of the modules, parameterisation, configuration of the connected I/O components as well as online diagnosis of the process and fieldbus status are carried out in the familiar way through the TwinCAT System Manager.

The CX components are identified by means of identification labels that can be printed on a plotter and snapped onto the housing.

Technical data	CX1500-B510	CX1500-B520
Fieldbus	CANopen	DeviceNet
Data transfer rates	10, 20, 50, 100, 125, 250, 500, 800, 1,000 kbaud	125, 250, 500 kbaud
Bus interface	open style connector, 5-pin	
Bus device	max. 127 slaves	max. 63 slaves
Max. number of bytes	max. 1,536 byte input/1,536 byte output	max. 255 byte input/255 byte output
Max. power loss	1.8 W	
Dimensions (W x H x D)	38 mm x 100 mm x 91 mm	
Weight	approx. 220 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Further information	<a href="http://www.beckhoff.com/CX1500-B510">www.beckhoff.com/CX1500-B510</a>	



UPS CX1100-0900

## CX1100-09x0 | UPS modules

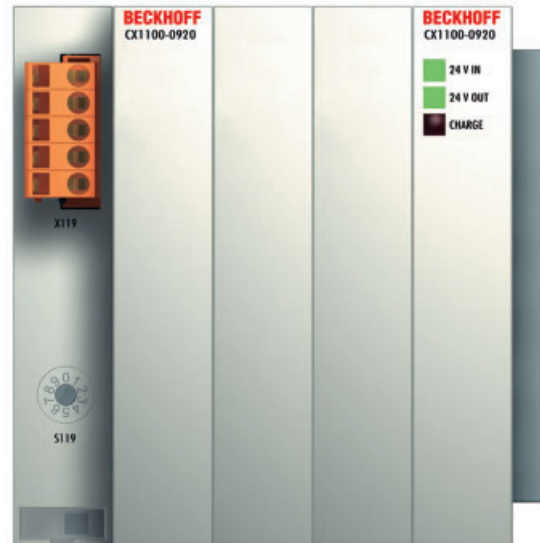
The UPS module is used for the uninterruptible power supply of CX CPUs and any connected CX components. In the event of a failure of the external supply, the module ensures that the application software can save important data, e.g. on a Compact Flash card, NOVRAM or in a database via the network. During the UPS retention time, the machine or process can be transferred into a defined state, and the operating system can be shut down. The retention time can be set via a rotary switch or via software. The use of state of the art capacitors makes this UPS module – unlike other battery-powered techniques –

absolutely maintenance-free and offers rapid charging. The module can simply be added to a CX system. Only a 24 V DC supply cable is needed. The 24 V DC output voltage of the UPS is protected against short circuit and overload. The CX1100-09x0 may be retrofitted on site. A DPRAM user interface provides options for settings and UPS status messages. The functionality of the UPS is therefore independent of the operating system to be used. No driver software is required. The TwinCAT System Manager recognises the UPS module automatically. The UPS signals are available to the PLC programmer.

Technical data	CX1100-0900
Power supply	24 V DC (-15 %/+20 %)
Storage technology	capacitive
Charge	20 As
Retention time	adjustable, load-dependent
Max. output current	550 mA (24 V DC)
Charging current	max. 4 A
Diagnostics LED	24 V DC input, 24 V DC output, Charge
Interface to the CPU	16 bit ISA (PC/104 standard)
Max. power loss	2 W
Dimensions (W x H x D)	57 mm x 100 mm x 91 mm
Weight	approx. 270 g
Operating temperature	0...55 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protection class	IP 20
Further information	<a href="http://www.beckhoff.com/CX1100-0900">www.beckhoff.com/CX1100-0900</a>



UPS CX1100-0910



UPS CX1100-0920, CX1100-0930

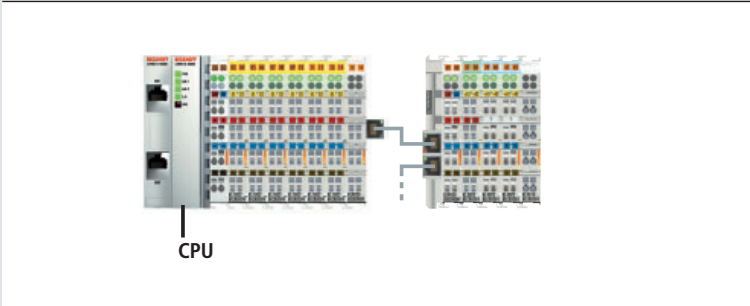
When dimensioning the UPS, the power consumption of the CX device being powered must be considered.

A controlled 24 V DC power supply unit with a minimum output current of 4 A is required. The CX1100-0920 UPS is recommended for UPS operation with a CX1020, the CX1100-0930 UPS is recommended for operation with a CX1030.

Technical data	CX1100-0910	CX1100-0920	CX1100-0930
Power supply	24 V DC (-15 %/+20 %)		
Storage technology	capacitive		
Charge	20 As	40 As	40 As
Retention time	adjustable, load-dependent		
Max. output current	1.1 A (24 V DC)	1.1 A (24 V DC)	2.0 A (24 V DC)
Charging current	max. 4 A		
Diagnostics LED	24 V DC input, 24 V DC output, Charge		
Interface to the CPU	16 bit ISA (PC/104 standard)		
Max. power loss	2 W		
Dimensions (W x H x D)	76 mm x 100 mm x 91 mm	95 mm x 100 mm x 91 mm	95 mm x 100 mm x 91 mm
Weight	approx. 480 g	approx. 625 g	approx. 630 g
Operating temperature	0...55 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protection class	IP 20		
Further information	<a href="http://www.beckhoff.com/CX1100-0910">www.beckhoff.com/CX1100-0910</a>		

# CX application examples

## “Headless” PLC system



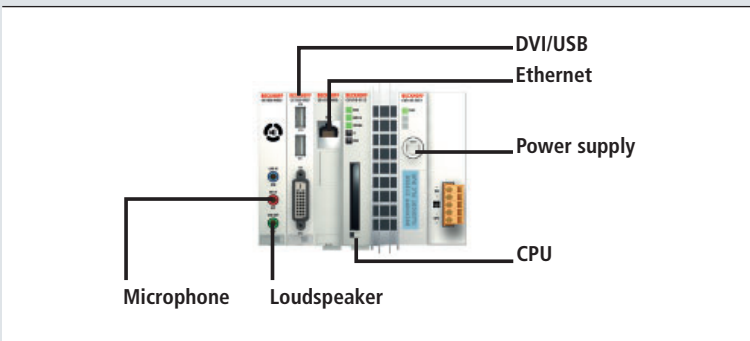
### Application

- PLC system without control panel
- Windows CE and TwinCAT PLC

### Components

- CPU CX9010-1001

## Multimedia system with audio connection



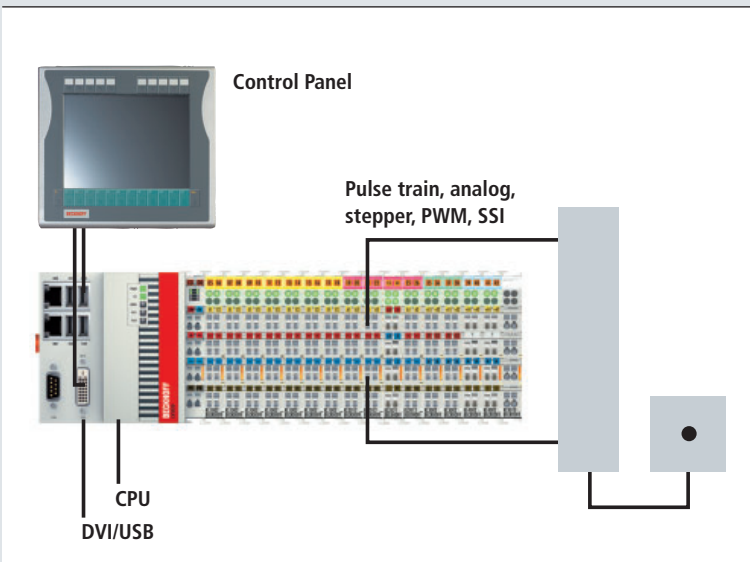
### Application

- multimedia system (e.g. building automation)
- audio interface
- Windows XP (no TwinCAT)

### Components

- CPU CX1010-0120 (DVI/USB, audio interface)
- power supply CX1100-0001

## PLC and Motion Control system with DVI/USB interface



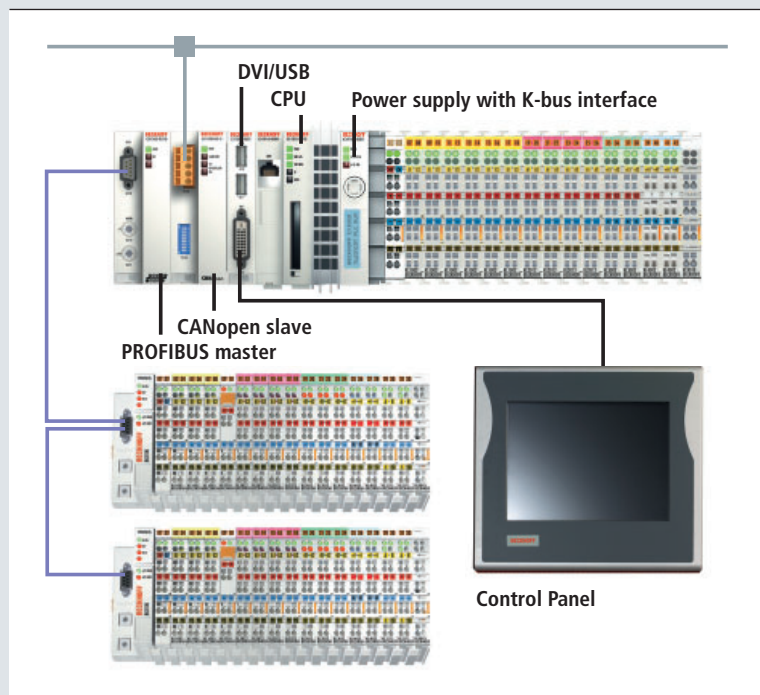
### Application

- PLC and Motion Control system
- Control Panel connection via DVI/USB
- Windows CE and TwinCAT NC

### Components

- CPU CX5020-0112

## PLC and Motion Control system with DVI/USB interface and fieldbus connection



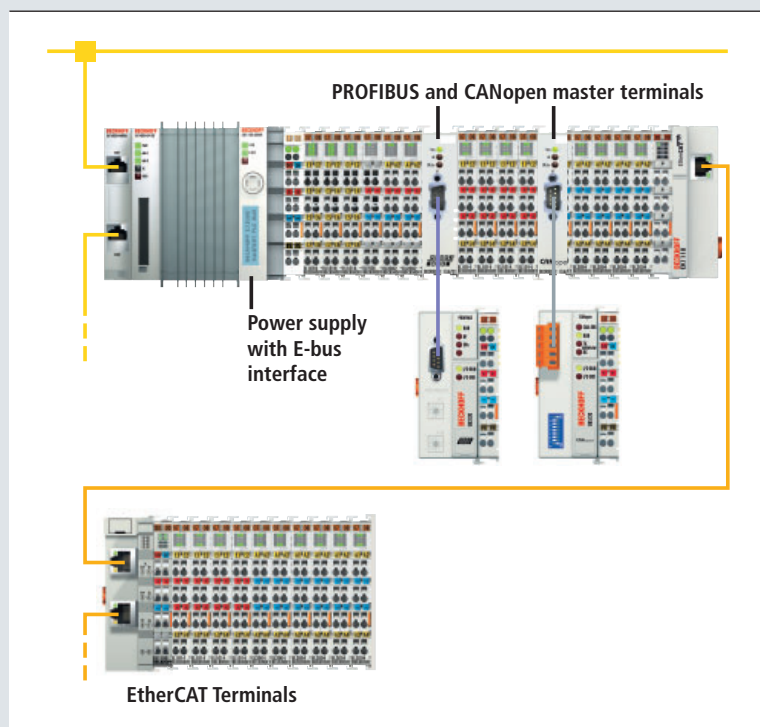
### Application

- PLC and Motion Control system
- Control Panel connection via DVI/USB
- fieldbus master connection e.g. PROFIBUS
- fieldbus slave connection e.g. CANopen
- Windows CE and TwinCAT NC

### Components

- CPU CX1010-0112 (DVI/USB interface)
- power supply CX1100-0002
- fieldbus master CX1500-M310 (PROFIBUS)
- fieldbus slave CX1500-B510 (CANopen)

## EtherCAT master with integrated fieldbus terminals

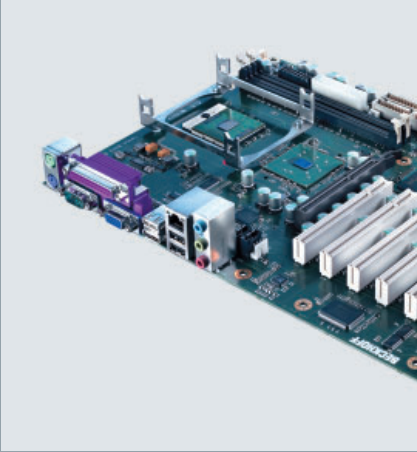


### Application

- PLC, Motion Control, interpolation
- direct EtherCAT I/O interface
- fieldbus master in the EtherCAT Terminal
- Windows Embedded Standard, TwinCAT NC I

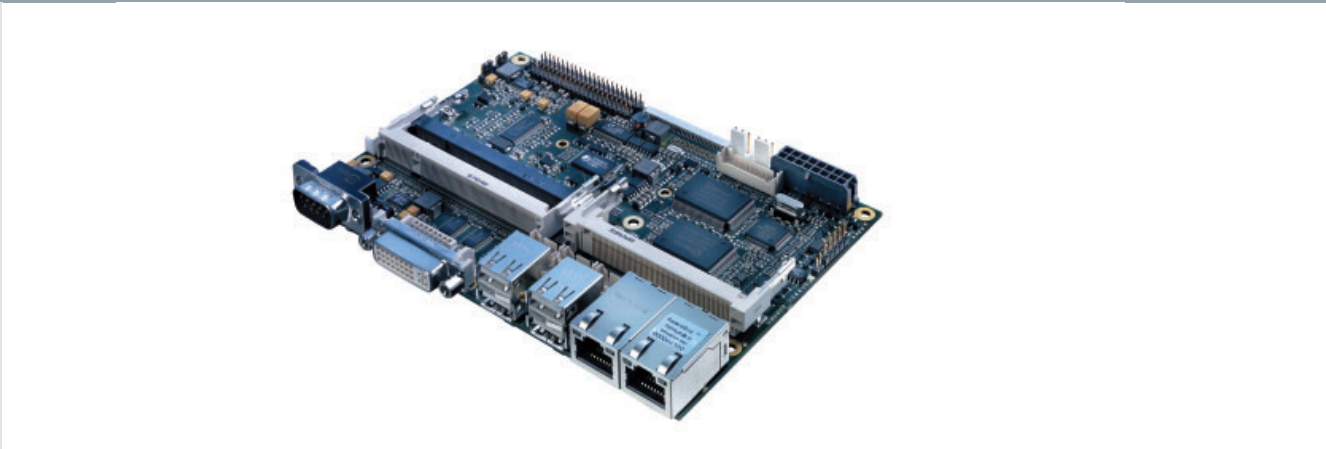
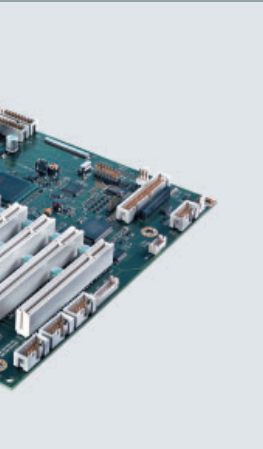
### Components

- CPU CX1020-0023
- power supply CX1100-0004
- EtherCAT fieldbus master EL6731 (PROFIBUS)
- EtherCAT fieldbus master EL6751 (CANopen)



# Industrial Motherboards

Motherboards with Intel® x86 and ARM architecture





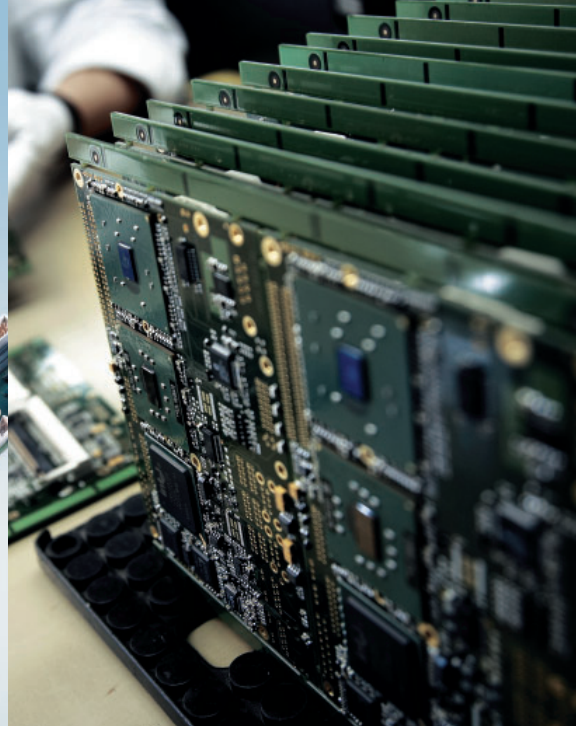
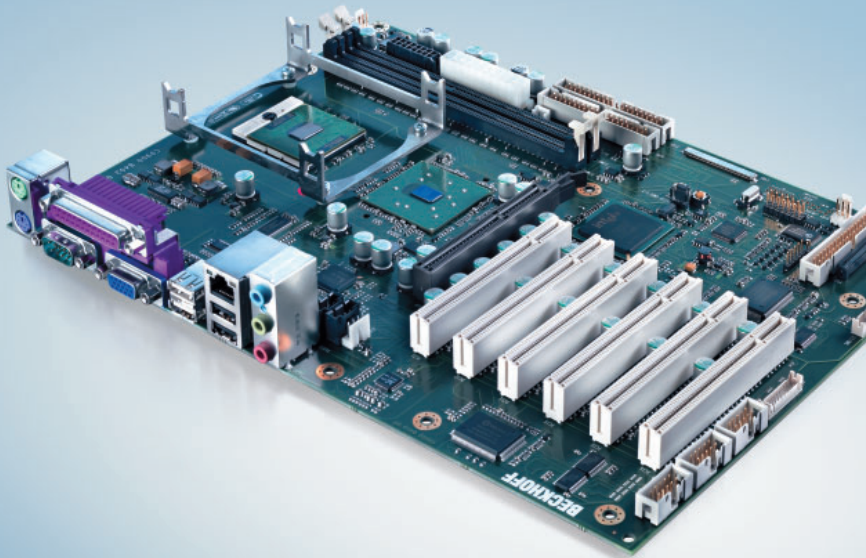
# Product overview Motherboards



	ATX			Slot		3 1/2-inch	
	CB1050 <small>318</small>	CB1051 <small>320</small>	CB1052 <small>322</small>	CB2050 <small>324</small>	CB2051 <small>326</small>	CB3050 <small>328</small>	CB3051 <small>330</small>
<b>CPU type</b>							
<b>CPU</b>	Intel® Pentium® M/Celeron® M	Intel® Celeron® M/Core™ Duo/Core™2 Duo	Intel® Core™ Duo/Core™2 Duo/Core™2 Quad	Intel® Pentium® M/Celeron® M	Intel® Celeron® M/Core™ Duo/Core™2 Duo	Intel® Pentium® M/Celeron® M	Intel® Celeron® M/Core™ Duo/Core™2 Duo
<b>FSB</b>	400 MHz	667 MHz	1066 MHz	400 MHz	667 MHz	400 MHz	667 MHz
<b>Performance</b>	1...1.8 GHz	1.07...2.16 GHz	1.07...2.53 GHz	1...1.8 GHz	1.07...2.16 GHz	1...1.8 GHz	1.07...2.16 GHz
<b>Chipset</b>							
<b>Northbridge</b>	Intel® 855GME	Intel® 945GME	Intel® GM45	Intel® 855GME	Intel® 945GME	Intel® 855GME	Intel® 945GME
<b>Southbridge</b>	Intel® ICH4	Intel® ICH7R	Intel® ICH9R	Intel® ICH4	Intel® ICH7R	Intel® ICH4	Intel® ICH7R
<b>ISA</b>	–	–	–	–	–	–	–
<b>Memory</b>							
<b>Type</b>	2 x DIMM184–2.5 V/DDR ECC	2 x DIMM240–1.8 V/DDR2	2 x DIMM240–1.5 V/DDR3	2 x SODIMM200–2.5 V/DDR ECC	2 x SODIMM200–1.8 V/DDR2	2 x SODIMM200–2.5 V/DDR ECC	2 x SODIMM200–1.8 V/DDR2
<b>Speed max.</b>	DDR 333	DDR2 667	DDR3 1066	DDR 333	DDR2 667	DDR 333	DDR2 667
<b>Graphic</b>							
<b>Controller</b>	Intel® 855GME integrated	Intel® 945GME integrated	Intel® GM45 integrated	Intel® 855GME integrated	Intel® 945GME integrated	Intel® 855GME integrated	Intel® 945GME integrated
<b>Memory</b>	32 MB UMA	8 MB UMA/ 224 MB DVMT	8 MB UMA/ 384 MB DVMT	32 MB UMA	8 MB UMA/ 224 MB DVMT	32 MB UMA	8 MB UMA/ 224 MB DVMT



Compact				PC/104			
CB3010 332	CB3053 334	CB3150 336	CB3110 338	CB4021 340	CB4050 342	CB4051 344	CB4053 346
Intel® IXP420	Intel® Atom™	Intel® Pentium® M/Celeron® M	Intel® IXP420	AMD LX800	Intel® Pentium® M/Celeron® M	Intel® Celeron® M/ Core™ Duo/ Core™2 Duo	Intel® Atom™
133 MHz 266/533 MHz	max. 533 MHz 1.1...1.6 GHz	400 MHz 1...1.8 GHz	133 MHz 266/533 MHz	133 MHz 500 MHz	400 MHz 1...1.8 GHz	667 MHz 1.07...2.16 GHz	max. 533 MHz 1.1...1.6 GHz
–	Intel® System Controller Hub	Intel® 855GME	–	AMD Geode CS5536	Intel® 855GME	Intel® 945GME	Intel® System Controller Hub
–	Intel® System Controller Hub	Intel® ICH4	–	AMD Geode CS5536	Intel® ICH4	Intel® ICH7R	Intel® System Controller Hub
–	–	–	–	Winbond W83626F LPC	Winbond W83626F LPC	–	Fintek F85226F
SDRAM soldered	SODIMM200–1.8 V/DDR2	SODIMM200–2.5 V/DDR ECC	SDRAM soldered	SODIMM200–2.5 V/DDR	SODIMM200–2.5 V/DDR ECC	SODIMM200–1.8 V/DDR2	SODIMM200–1.8 V/DDR2
SD 133	DDR2 533	DDR 333	SD 133	DDR 400	DDR 333	DDR2 667	DDR2 533
Silicon Motion SM502	Intel® IGD integrated	Intel® 855GME integrated	Silicon Motion SM502	AMD LX800 integrated	Intel® 855GME integrated	Intel® 945GME integrated	Intel® IGD integrated
8 MB	8 MB UMA/ 256 MB DVMT	32 MB UMA	8 MB	254 MB UMA	32 MB UMA	8 MB UMA/ 224 MB DVMT	8 MB UMA/ 256 MB DVMT



## Beckhoff Industrial Motherboards

### Motherboards with Intel® x86 and ARM architecture

Beckhoff has expanded the "Industrial Motherboards" line of business into an independent product segment, with in-house board development, design and production. Beckhoff can thus offer Industrial PCs and Embedded PCs in all performance classes with motherboards developed in-house.

In addition, the own motherboard and BIOS development initiatives enable Beckhoff to respond more quickly to new technologies in the PC market and to customer-specific requirements. Motherboards and accessories available as stand-alone products from Beckhoff are described below.

### Flexible PC BIOS software

Full BIOS source code access for Phoenix and Award BIOS makes it possible to adapt to special board functions or introduce specific customer requirements. BIOS functionality very much depends on the field of usage for a motherboard: commercial applications typically require a balance between power dissipation and program load, the industrial usage often requires full CPU availability at any time. For example, settings for speed stepping and thermal monitoring need to be adapted in the BIOS to reflect the different usage modes.

### Standard and specialised form factors, optimised for space

ATX, slot CPU, 3½-inch and PC/104 are the supported standard form factors. More standards will follow shortly. One special format – the "compact" board – features outer dimensions of only 80 x 120 mm, with integrated 24 V DC power supply and all signals routed to connectors. Thus, all user interface connectors can be positioned specifically to the device and easily connected through cables. Hence, no baseboard or other electronics are required to build a ready-to-use device.

In general, Beckhoff will aim at providing all form factors with one chipset: the chipset Intel® 855, for example, is available on all of the above mentioned board shapes. This allows the construction of a family with architecture-identical devices.

### Simple cooling adaptation

The layout of the boards is optimised for simple and efficient cooling adaptation: all parts that need cooling are arranged on one side of the board. In order to facilitate the engineering of fanless devices, Beckhoff is offering boards with low-voltage and ultra low-voltage CPUs with low thermal design power. A very low TDP can be achieved by using CPUs with ARM-based architecture, while still having the luxury of running a Windows CE operating system.

### Design compatibility throughout board generations

Board size and connector positions are kept identical as much as technologically possible for the different generations of one board, making devices easily upgradeable. Of course this cannot be done to a 100 % because new technologies often generate new connectors, which have to be integrated as well.

### Long-term availability

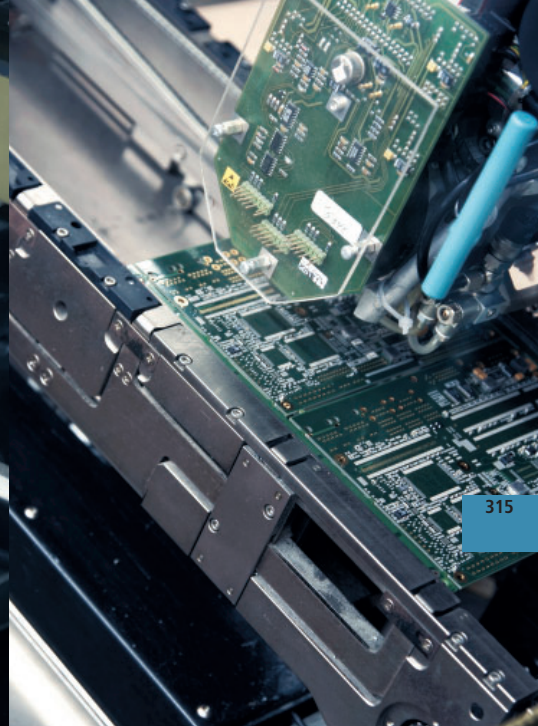
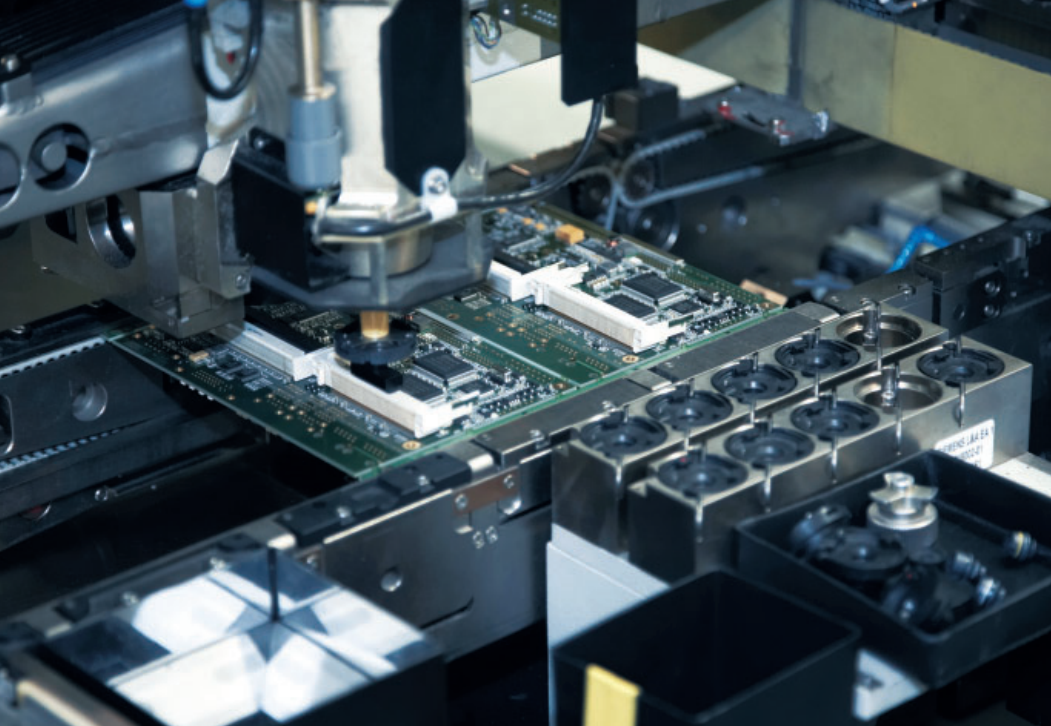
Boards are made available for a minimum of five years, based on the general market availability of the components. All components are selected according to the longevity of supply. CPUs and chipsets, for example, are selected only if they are part of the embedded product line of the manufacturer.

### EtherCAT-compatible

The Ethernet ports of the boards are well suited to run EtherCAT, the real-time Ethernet fieldbus featuring extreme fast control performance, flexible topology and simple configuration. EtherCAT together with a powerful CPU can be utilised for submillisecond control cycles in all areas.

### Auxiliary on-board interfaces

On-board touch screen controller, I<sup>2</sup>C, SMB, and GPIO reduce the overall bill of material



for a device. Some boards integrate a Mini PCI socket: Beckhoff has a range of useful cards for this socket like fieldbus master/slaves (PROFIBUS, CANopen, DeviceNet, SERCOS), Ethernet with 10/100/1,000 Mbit/s, and cards with non-volatile memory (NOVRAM) with 128, 256 and 512 kB in size.

#### **Operating system support**

Beckhoff supports all Microsoft operating systems like Windows NT, 2000, XP, XP Embedded, Windows 7 and Windows CE. In the community of Embedded System, Beckhoff is a Microsoft Embedded Gold Partner, recognized for excellence as a proven industry leader with exceptional expertise in building and enabling Windows embedded solutions. While the board hardware may be suitable to run other operating systems like Linux, QNX, etc., the support for this is left with third parties or the customer. In these cases, Beckhoff can help only with the technical details of the hardware and the BIOS. Of course, ARM-based architectures will not run the "huge" operating systems like Windows XP or Windows 7 – but they are able to run Windows CE with the appropriate board support package BSP. If desired, Beckhoff can build and supply the ready-to-use device preinstalled with the operating system software and licence.

#### **Manufacturing quality**

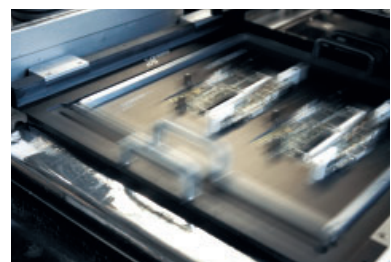
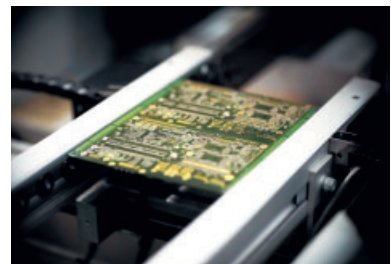
Since Beckhoff is using many of the motherboard products in their own PCs, quality is the number one goal. The focus is robustness and reliability; only high quality electronic components are used. All boards must pass a visual, electrical and functional inspection. The manufacturing date and serial number are clearly marked on the boards.

#### **Customer-specific adaptation and integration services**

Board and BIOS can be adapted to meet the needs of a customized device. Furthermore, Beckhoff is experienced in designing and producing complete embedded units, including the housing, display, various other electrical and mechanical interfaces, operating systems and application software.

#### **Beckhoff Motherboards – Hightech from Westphalia, Germany**

The complete engineering and design cycle as well as manufacturing of the boards takes place in Westphalia, Germany, at three locations: Münster, Dortmund and in the Beckhoff headquarters in Verl. This local geographical context ensures short turnaround cycles between engineering, production and quality control. It also ensures that reaction time on customer feedback is the shortest possible.



# Beckhoff Industrial Motherboards

## Motherboards with Intel® x86 and ARM architecture

Operating system support | Beckhoff supports all Microsoft operating systems like Windows NT, 2000, XP, XP Embedded, Windows 7 and Windows CE.

Simple cooling adaptation | The layout of the boards is optimised for simple and efficient cooling.

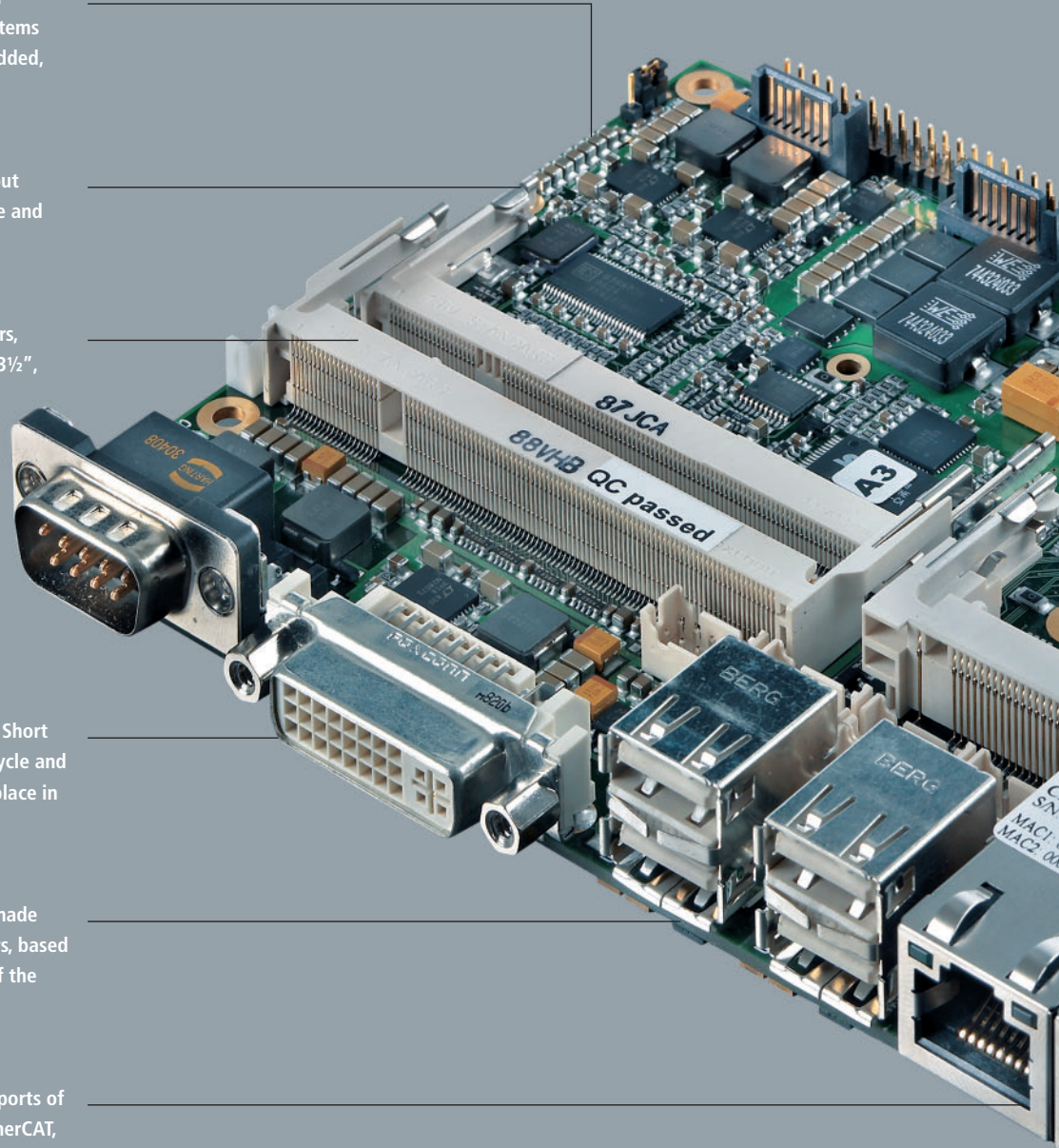
Standard and specialised form factors, optimised for space | ATX, slot CPU, 3½", PC/104 and "compact" boards

Motherboards "made in Germany" | Short reaction time: engineering, design cycle and manufacturing of the boards takes place in Westphalia, Germany.

Long-term availability | Boards are made available for a minimum of five years, based on the general market availability of the components.

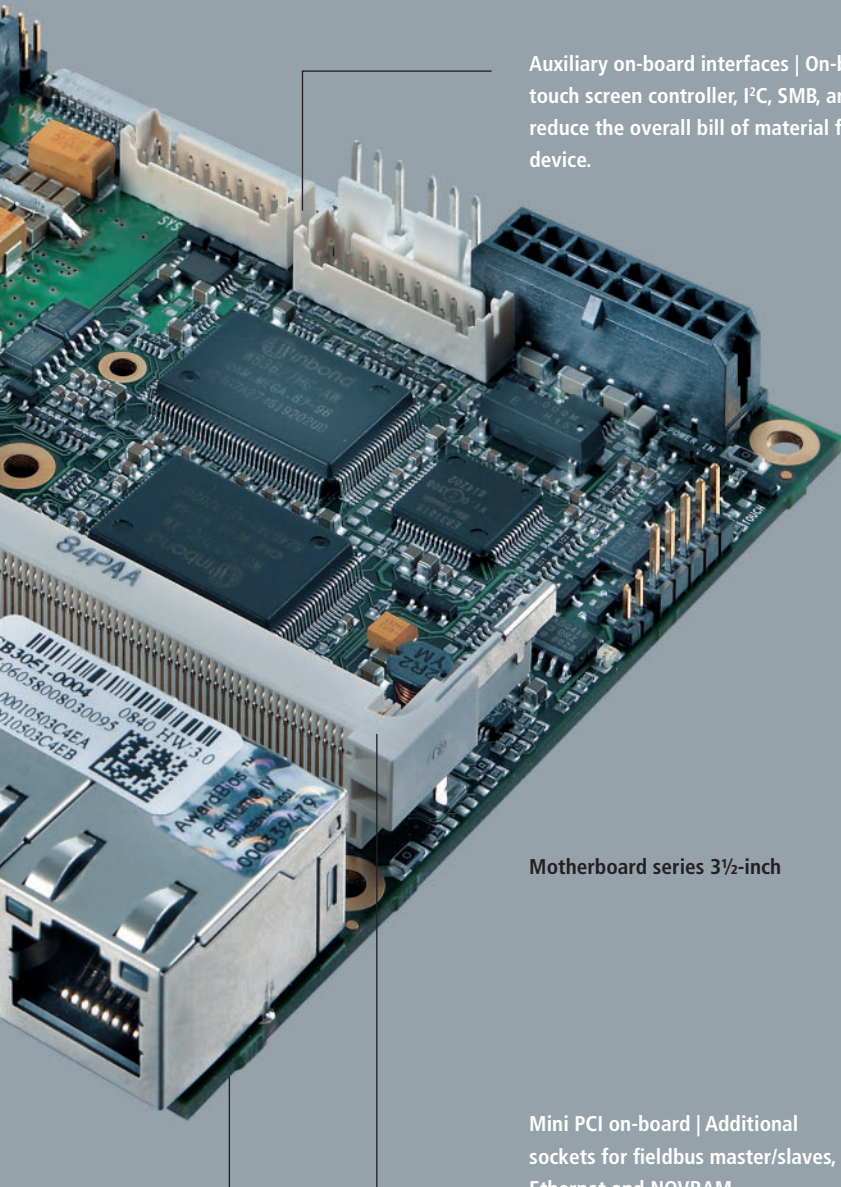
EtherCAT-compatible | The Ethernet ports of the boards are well suited to run EtherCAT, featuring extreme fast control performance.

Flexible PC BIOS software | Full BIOS source code access for Phoenix and Award BIOS makes it possible to adapt to special board functions or introduce specific customer requirements.





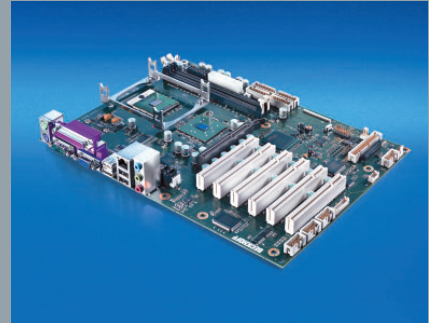
Beckhoff is Microsoft Embedded Gold Partner and recognized for excellence as a proven industry leader with exceptional expertise in building and enabling Windows embedded solutions.



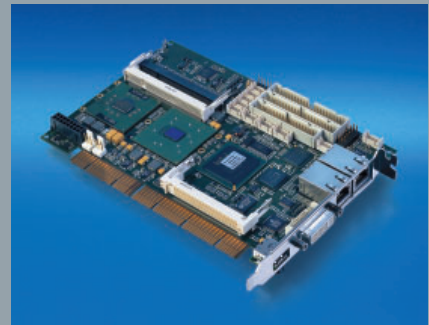
Auxiliary on-board interfaces | On-board touch screen controller, I<sup>2</sup>C, SMB, and GPIO reduce the overall bill of material for a device.

Motherboard series 3½-inch

Mini PCI on-board | Additional sockets for fieldbus master/slaves, Ethernet and NOVRAM



Motherboard series ATX



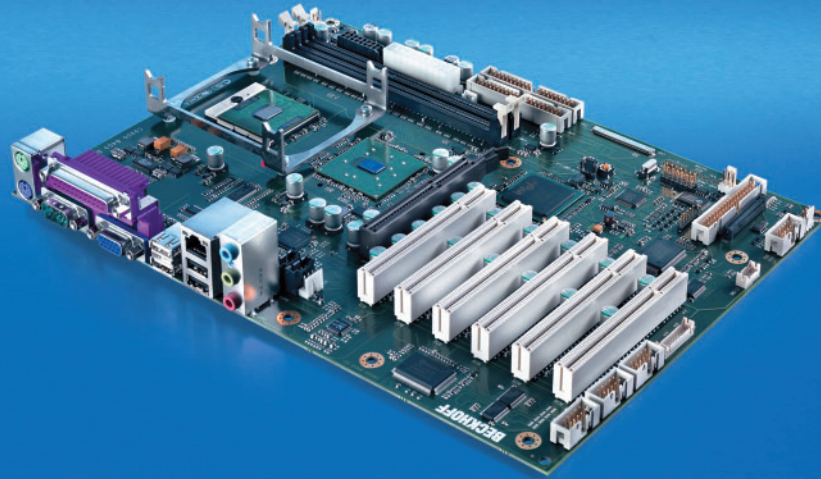
Motherboard series Slot



Motherboard series Compact



Motherboard series PC/104



## CB1050 | ATX Industrial Motherboard

### CPU type

- CPU: Intel® Pentium® M/Celeron® M
- Socket: mPGA479M
- FSB: 400 MHz
- Performance: 1...1.8 GHz

### Chipset

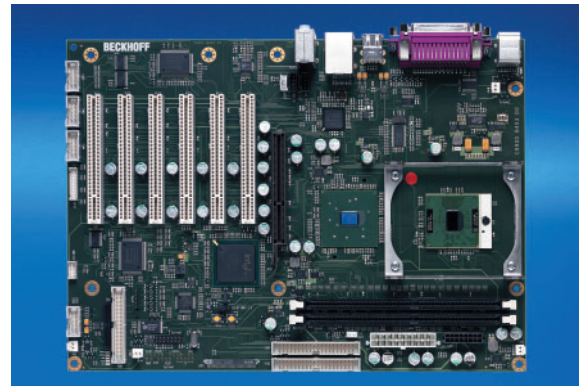
- Northbridge: Intel® 855GME
- Southbridge: Intel® ICH4

### Memory

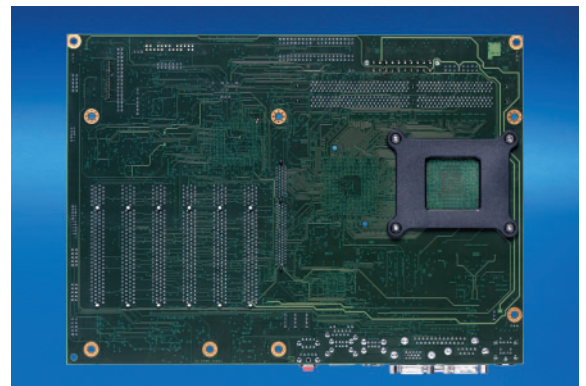
- Type: 2 x DIMM184–2.5 V/DDR ECC
- Speed max.: DDR 333

### Graphic

- Controller: Intel® 855GME integrated
- Memory: 32 MB UMA



Front side



Back side

## Technical data

CPU type	
CPU	Intel® Pentium® M/ Celeron® M
Socket	mPGA479M
2 <sup>nd</sup> level cache	512 kB/1,024 kB/2,048 kB
FSB	400 MHz
Performance	1...1.8 GHz

Chipset	
Northbridge	Intel® 855GME
Southbridge	Intel® ICH4
Super IO1	Winbond W83627H
Super IO2	Winbond W83627H
ISA	–
Hardware monitoring	Super IO1 + Super IO2

Memory	
Type	2 x DIMM184–2.5 V/DDR ECC
Size max. (MB)	2,048 MB
Speed max.	DDR 333
On-board flash	–
On-board NOVRAM	–

Graphic	
Controller	Intel® 855GME integrated
Video BIOS	Intel® IEGD
Memory	32 MB UMA
CRT	yes
CRT resolution	2048 x 1536
DVI	– (AGP-Riser)
LCD TTL	–
LCD LVDS	18/24/36/48
LCD resolution	1600 x 1200

BIOS	
Manufacturer	Phoenix Award 6.1
BIOS chip	2 x FWH
Power management APM/ACPI	yes/yes
SpeedStep®/ATM	yes/–
Selectable fixed frequency	yes
Power states	S0/S3/S4/S5

Buses	
ISA	–
PCI	6 x PCI32 slot
AGP 3.3 V/1.5 V	–/yes
PCIe x1/x4/x16	–

Audio	
Controller and codec	Intel® ICH4/Realtek ALC655
Support for 2/6/8 channels (2.0/5.1/7.1)	yes/yes/–
Analog input	Line/CD/Mic1/Mic2/PCBeep
Analog output Line/Mono out	yes/–
Digital input/output	yes/yes
Amplifier	–

LAN	
LAN1 controller	Intel® ICH4/562GZ Phy
LAN1	10/100
LAN1 boot option	RPL/PXE/WOL
LAN2 controller	Intel® 82541ER
LAN2	10/100/1000
LAN2 boot option	WOL

ATA/SATA interfaces	
ATA primary/secondary	yes/yes
ATA RAID	–
PIO	0/1/2/3/4
DMA	33/66/100
SATA	–
SATA RAID	–
1.5 Gbs/3.0 Gbs	–
Compact Flash socket	–

USB interfaces	
Boot	HD/FDD/CD-ROM/FD/ZIP
USB channels	6
USB	1.0/2.0/host
Specials/options	(USB6: touch)

Serial interfaces	
COM1/2	(TTL)/RS232
COM3/4	(TTL)/RS232

Parallel interfaces	
LPT1	Uni/ECP/EPP/FDC
LPT2	–

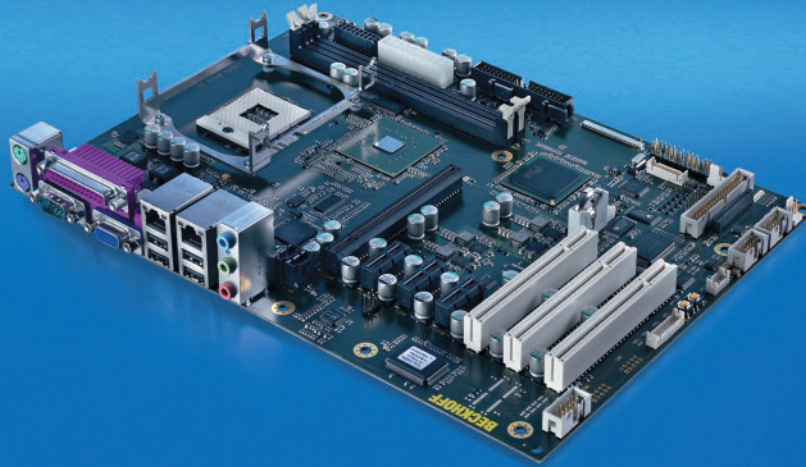
Interfaces	
PS/2 keyboard/mouse	yes/yes
Floppy interface FCC/LPT	yes/yes
Touch controller ELO resistive	yes
TPM	–
Watchdog	yes

Power supply	
Supply voltage	ATX

Cooling	
Cooling mode	passive/active
Operating temperature	0...60 °C
Extended temperature	on request
Storage temperature	-20...+70 °C

Dimensions	
Format	ATX
Dimensions (W x H x D)	305 mm x 41 mm x 220 mm
Further information	<a href="http://www.beckhoff.com/CB1050">www.beckhoff.com/CB1050</a>





## CB1051 | ATX Industrial Motherboard

### CPU type

- CPU: Intel® Celeron® M/Core™ Duo/Core™2 Duo
- Socket: mPGA479M
- FSB: 667 MHz
- Performance: 1.07...2.16 GHz

### Chipset

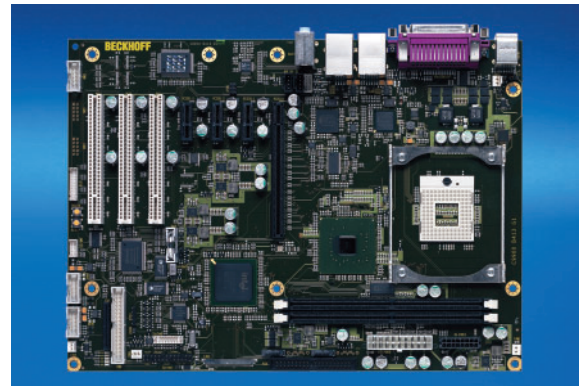
- Northbridge: Intel® 945GME
- Southbridge: Intel® ICH7R

### Memory

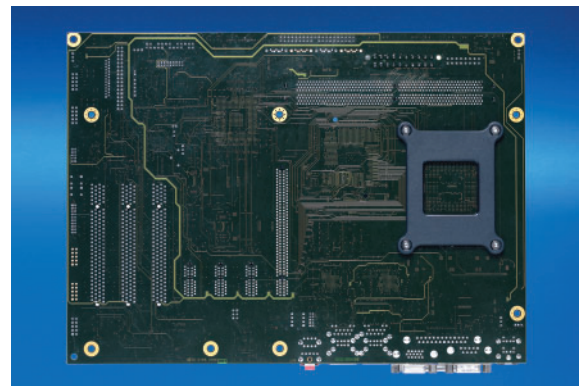
- Type: 2 x DIMM240–1.8 V/DDR2
- Speed max.: DDR2 667

### Graphic

- Controller: Intel® 945GME integrated
- Memory: 8 MB UMA/224 MB DVMT



Front side



Back side

## Technical data

CPU type	
CPU	Intel® Celeron® M/Core™ Duo/ Core™2 Duo
Socket	mPGA479M
2 <sup>nd</sup> level cache	1,024 kB/2,048 kB/4,096 kB
FSB	667 MHz
Performance	1.07...2.16 GHz

Chipset	
Northbridge	Intel® 945GME
Southbridge	Intel® ICH7R
Super IO1	Winbond W83627H
Super IO2	Winbond W83627H
ISA	–
Hardware monitoring	Super IO1 + Super IO2

Memory	
Type	2 x DIMM240–1.8 V/DDR2
Size max. (MB)	4,096 MB
Speed max.	DDR2 667
On-board flash	–
On-board NOVRAM	–

Graphic	
Controller	Intel® 945GME integrated
Video BIOS	Intel® IEGD
Memory	8 MB UMA/224 MB DVMT
CRT	yes
CRT resolution	2048 x 1536
DVI	– (PCIe x 16 Riser)
LCD TTL	–
LCD LVDS	18/36
LCD resolution	1600 x 1200

BIOS	
Manufacturer	Phoenix Award 6.1
BIOS chip	2 x FWH (SPI-Flash)
Power management APM/ACPI	yes/yes
SpeedStep®/ATM	yes/(yes)
Selectable fixed frequency	yes
Power states	S0/S3/S4/S5

Buses	
ISA	–
PCI	3 x PCI32 slot
AGP 3.3 V/1.5 V	–
PCIe x1/x4/x16	3x/–/1x

Audio	
Controller and codec	Intel® ICH7R/Realtek ALC655
Support for 2/6/8 channels (2.0/5.1/7.1)	yes/yes/–
Analog input	Line/CD/Mic1/Mic2/PCBeep
Analog output Line/Mono out	yes/–
Digital input/output	yes/yes
Amplifier	–

LAN	
LAN1 controller	Intel® ICH7R/562GZ Phy
LAN1	10/100
LAN1 boot option	RPL/PXE/WOL
LAN2 controller	Intel® 82573E
LAN2	10/100/1000
LAN2 boot option	RPL/PXE/WOL

ATA/SATA interfaces	
ATA primary/secondary	yes/–
ATA RAID	–
PIO	0/1/2/3/4
DMA	33/66/100
SATA	4
SATA RAID	0/1/5/10
1.5 Gbs/3.0 Gbs	yes/yes
Compact Flash socket	–

USB interfaces	
Boot	HD/FDD/CD-ROM/FD/ZIP
USB channels	8
USB	1.0/2.0/host
Specials/options	(USB8: touch)

Serial interfaces	
COM1/2	(TTL)/RS232
COM3/4	(TTL)/RS232

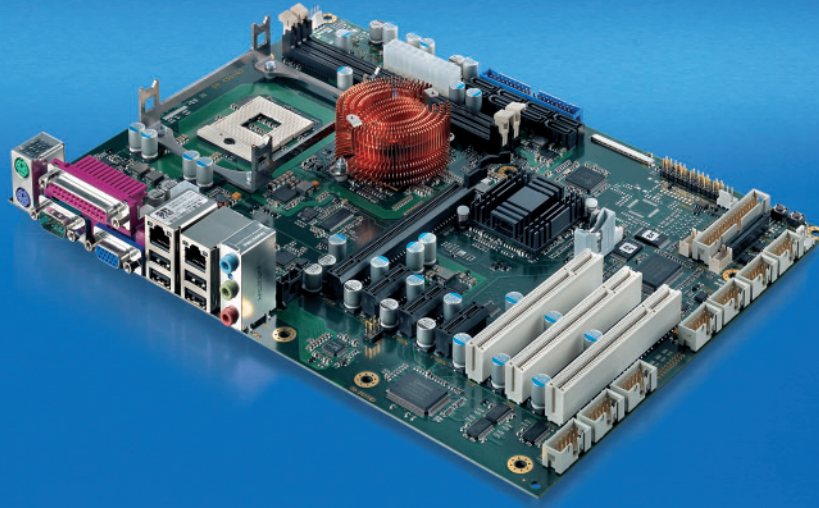
Parallel interfaces	
LPT1	Uni/ECP/EPP/FDC
LPT2	–

Interfaces	
PS/2 keyboard/mouse	yes/yes
Floppy interface FCC/LPT	yes/yes
Touch controller ELO resistive	yes
TPM	–
Watchdog	yes

Power supply	
Supply voltage	ATX

Cooling	
Cooling mode	passive/active
Operating temperature	0...60 °C
Extended temperature	on request
Storage temperature	-20...+70 °C

Dimensions	
Format	ATX
Dimensions (W x H x D)	305 mm x 41 mm x 220 mm
Further information	<a href="http://www.beckhoff.com/CB1051">www.beckhoff.com/CB1051</a>



## CB1052 | ATX Industrial Motherboard

### CPU type

- CPU: Intel® Core™ Duo/Core™2 Duo/  
Core™2 Quad
- Socket: mPGA479M
- FSB: 1066 MHz
- Performance: 1.07...2.53 GHz

### Chipset

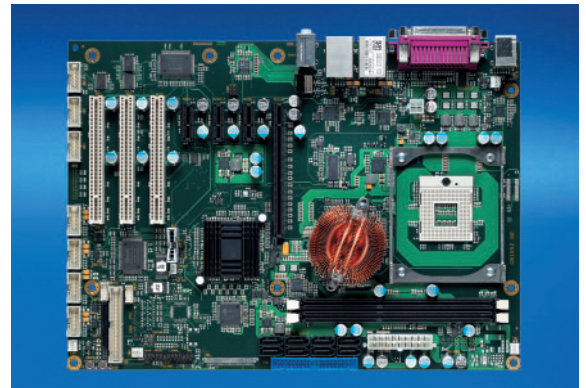
- Northbridge: Intel® GM45
- Southbridge: Intel® ICH9R

### Memory

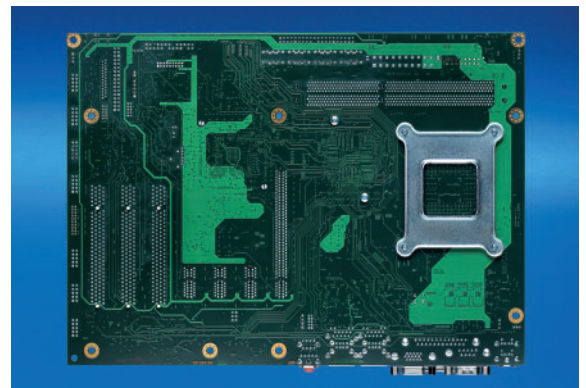
- Type: 2 x DIMM240–1.5 V/DDR3
- Speed max.: DDR3 1066

### Graphic

- Controller: Intel® GM45 integrated
- Memory: 8 MB UMA/384 MB DVMT



Front side



Back side

## Technical data

CPU type	
CPU	Intel® Core™ Duo/Core™2 Duo/ Core™2 Quad
Socket	mPGA479M
2 <sup>nd</sup> level cache	1,024 kB/2,048 kB/4,096 kB
FSB	1066 MHz
Performance	1.07...2.53 GHz

Chipset	
Northbridge	Intel® GM45
Southbridge	Intel® ICH9R
Super IO1	Winbond W83627HG
Super IO2	Winbond W83627HG
ISA	–
Hardware monitoring	Super IO1 + Super IO2

Memory	
Type	2 x DIMM240–1.5 V/DDR3
Size max. (MB)	4,096 MB
Speed max.	DDR3 1066
On-board flash	–
On-board NOVRAM	–

Graphic	
Controller	Intel® GM45 integrated
Video BIOS	Intel® IEGD
Memory	8 MB UMA/384 MB DVMT
CRT	yes
CRT resolution	2048 x 1536
DVI	– (PCIe x 16 Riser)
LCD TTL	–
LCD LVDS	18/24/36/48
LCD resolution	1600 x 1200

BIOS	
Manufacturer	Phoenix Award 6.1
BIOS chip	2 x FWH (SPI-Flash)
Power management APM/ACPI	yes/yes
SpeedStep®/ATM	yes/(yes)
Selectable fixed frequency	yes
Power states	S0/S3/S4/S5

Buses	
ISA	–
PCI	3 x PCI32 slot
AGP 3.3 V/1.5 V	–
PCIe x1/x4/x16	3x/–/1x

Audio	
Controller and codec	Intel® ICH9R/Realtek ALC885
Support for 2/6/8 channels (2.0/5.1/7.1)	yes/yes/yes
Analog input	Line/CD/Mic1/Mic2/PCBeep
Analog output Line/Mono out	yes/–
Digital input/output	yes/yes
Amplifier	–

LAN	
LAN1 controller	Intel® ICH9R/567GZ Phy
LAN1	10/100/1000
LAN1 boot option	RPL/PXE/WOL
LAN2 controller	Intel® 82574C
LAN2	10/100/1000
LAN2 boot option	RPL/PXE/WOL

ATA/SATA interfaces	
ATA primary/secondary	yes/–
ATA RAID	0/1
PIO	0/1/2/3/4
DMA	33/66/100
SATA	8
SATA RAID	0/1/5/10
1.5 Gbs/3.0 Gbs	yes/yes
Compact Flash socket	–

USB interfaces	
Boot	HD/FDD/CD-ROM/FD/ZIP
USB channels	12
USB	1.0/2.0/host
Specials/options	(USB12: touch)

Serial interfaces	
COM1/2	(TTL)/RS232
COM3/4	(TTL)/RS232

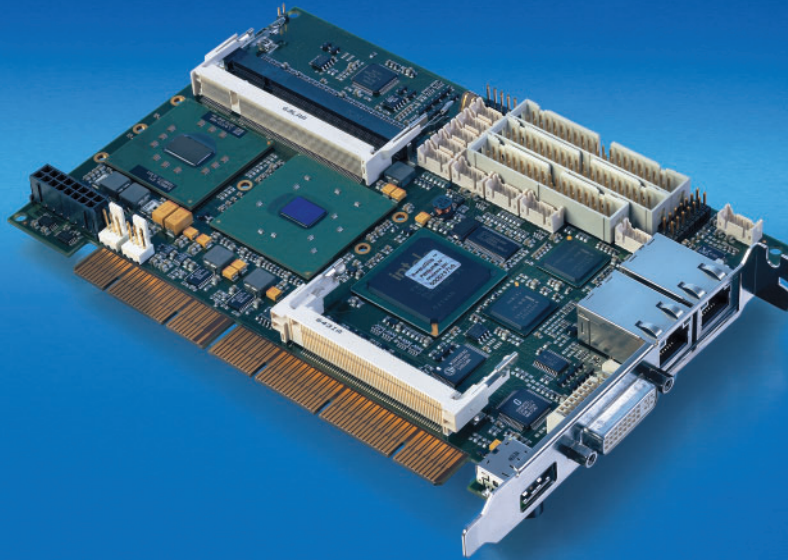
Parallel interfaces	
LPT1	Uni/ECP/EPP/FDC
LPT2	–

Interfaces	
PS/2 keyboard/mouse	yes/yes
Floppy interface FCC/LPT	yes/yes
Touch controller ELO resistive	yes
TPM	–
Watchdog	yes

Power supply	
Supply voltage	ATX

Cooling	
Cooling mode	passive/active
Operating temperature	0...60 °C
Extended temperature	on request
Storage temperature	-20...+70 °C

Dimensions	
Format	ATX
Dimensions (W x H x D)	305 mm x 41 mm x 220 mm
Further information	<a href="http://www.beckhoff.com/CB1052">www.beckhoff.com/CB1052</a>



## CB2050 | Slot Industrial Motherboard

### CPU type

- CPU: Intel® Pentium® M/Celeron® M
- FSB: 400 MHz
- Performance: 1...1.8 GHz

### Chipset

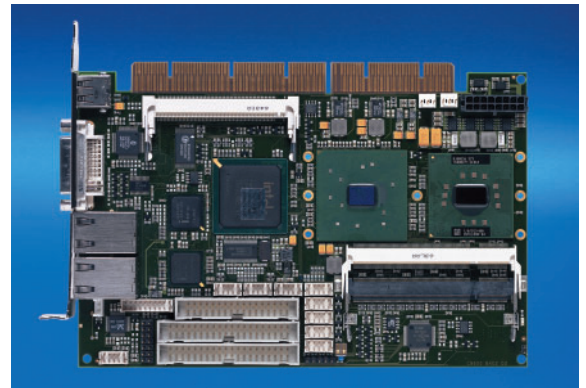
- Northbridge: Intel® 855GME
- Southbridge: Intel® ICH4

### Memory

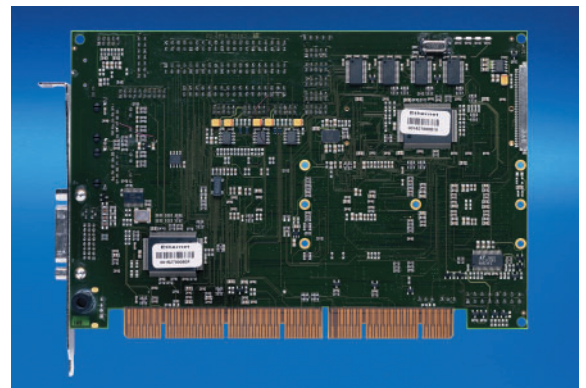
- Type: 2 x SODIMM200–2.5 V/DDR ECC
- Speed max.: DDR 333

### Graphic

- Controller: Intel® 855GME integrated
- Memory: 32 MB UMA



Front side



Back side

## Technical data

CPU type	
CPU	Intel® Pentium® M/ Celeron® M
Socket	no (soldered)
2 <sup>nd</sup> level cache	512 kB/1,024 kB/2,048 kB
FSB	400 MHz
Performance	1...1.8 GHz

Chipset	
Northbridge	Intel® 855GME
Southbridge	Intel® ICH4
Super IO1	Winbond W83627H
Super IO2	Winbond W83627H
ISA	–
Hardware monitoring	Super IO1 + Super IO2

Memory	
Type	2 x SODIMM200–2.5 V/DDR ECC
Size max. (MB)	2,048 MB
Speed max.	DDR 333
On-board flash	–
On-board NOVRAM	–

Graphic	
Controller	Intel® 855GME integrated
Video BIOS	Intel® IEGD
Memory	32 MB UMA
CRT	yes
CRT resolution	2048 x 1536
DVI	yes
LCD TTL	–
LCD LVDS	18/24/36/48
LCD resolution	1600 x 1200

BIOS	
Manufacturer	Phoenix Award 6.1
BIOS chip	FWH
Power management APM/ACPI	yes/yes
SpeedStep®/ATM	yes/–
Selectable fixed frequency	yes
Power states	S0/S3/S4/S5

Buses	
ISA	–
PCI	slot, Mini PCI
AGP 3.3 V/1.5 V	–
PCIe x1/x4/x16	–

Audio	
Controller and codec	Intel® ICH4/Realtek ALC655
Support for 2/6/8 channels (2.0/5.1/7.1)	yes/yes/–
Analog input	Line/Mic1/Mic2/PCBeep
Analog output Line/Mono out	yes/–
Digital input/output	yes/yes
Amplifier	–

LAN	
LAN1 controller	Intel® ICH4/562GZ Phy
LAN1	10/100
LAN1 boot option	RPL/PXE/WOL
LAN2 controller	Intel® 82541ER
LAN2	10/100/1000
LAN2 boot option	WOL

ATA/SATA interfaces	
ATA primary/secondary	yes/yes
ATA RAID	–
PIO	0/1/2/3/4
DMA	33/66/100
SATA	–
SATA RAID	–
1.5 Gbs/3.0 Gbs	–
Compact Flash socket	–

USB interfaces	
Boot	HD/FDD/CD-ROM/FD/ZIP
USB channels	6
USB	1.0/2.0/host
Specials/options	(USB6: touch)

Serial interfaces	
COM1/2	(TTL)/RS232
COM3/4	(TTL)/(RS232)

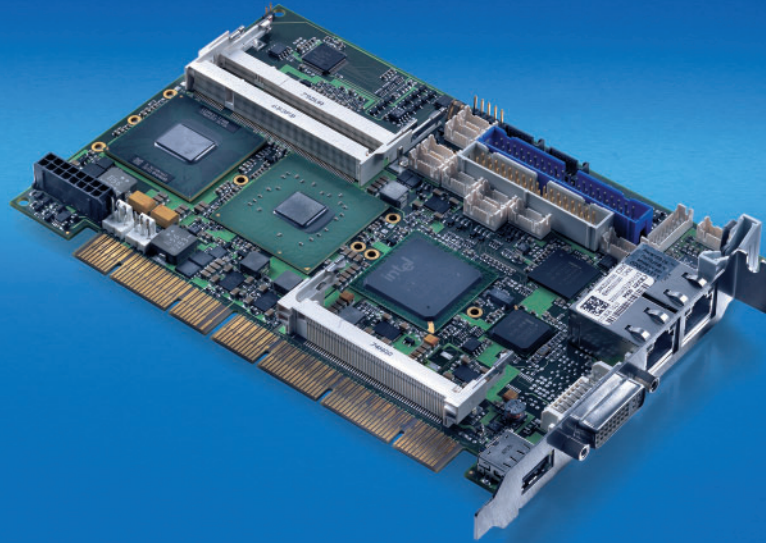
Parallel interfaces	
LPT1	–
LPT2	–

Interfaces	
PS/2 keyboard/mouse	yes/yes
Floppy interface FCC/LPT	–/yes
Touch controller ELO resistive	yes
TPM	–
Watchdog	yes

Power supply	
Supply voltage	5 V and 5 V standby (12 V for fans)

Cooling	
Cooling mode	passive/active
Operating temperature	0...60 °C
Extended temperature	on request
Storage temperature	-20...+70 °C

Dimensions	
Format	Slot
Dimensions (W x H x D)	185 mm x 21 mm x 125 mm
Further information	<a href="http://www.beckhoff.com/CB2050">www.beckhoff.com/CB2050</a>



## CB2051 | Slot Industrial Motherboard

### CPU type

- CPU: Intel® Celeron® M/Core™ Duo/Core™2 Duo
- FSB: 667 MHz
- Performance: 1.07...2.16 GHz

### Chipset

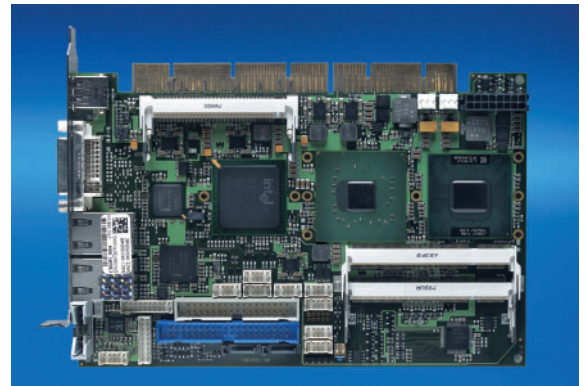
- Northbridge: Intel® 945GME
- Southbridge: Intel® ICH7R

### Memory

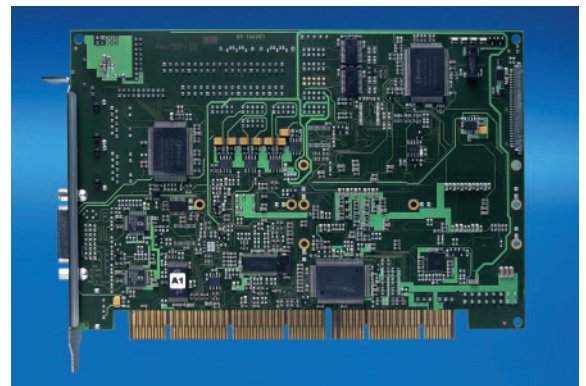
- Type: 2 x SODIMM200–1.8 V/DDR2
- Speed max.: DDR2 667

### Graphic

- Controller: Intel® 945GME integrated
- Memory: 8 MB UMA/224 MB DVMT



Front side



Back side

## Technical data

CPU type	
CPU	Intel® Celeron® M/Core™ Duo/ Core™2 Duo
Socket	no (soldered)
2 <sup>nd</sup> level cache	1,024 kB/2,048 kB/4,096 kB
FSB	667 MHz
Performance	1.07...2.16 GHz

Chipset	
Northbridge	Intel® 945GME
Southbridge	Intel® ICH7R
Super IO1	Winbond W83627H
Super IO2	Winbond W83627H
ISA	–
Hardware monitoring	Super IO1 + Super IO2

Memory	
Type	2 x SODIMM200–1.8 V/DDR2
Size max. (MB)	4,096 MB
Speed max.	DDR2 667
On-board flash	–
On-board NOVRAM	–

Graphic	
Controller	Intel® 945GME integrated
Video BIOS	Intel® IEGD
Memory	8 MB UMA/224 MB DVMT
CRT	yes
CRT resolution	2048 x 1536
DVI	yes
LCD TTL	–
LCD LVDS	18/36
LCD resolution	1600 x 1200

BIOS	
Manufacturer	Phoenix Award 6.1
BIOS chip	FWH
Power management APM/ACPI	yes/yes
SpeedStep®/ATM	yes/–
Selectable fixed frequency	yes
Power states	S0/S3/S4/S5

Buses	
ISA	–
PCI	slot, Mini PCI
AGP 3.3 V/1.5 V	–
PCIe x1/x4/x16	–

Audio	
Controller and codec	Intel® ICH7R/Realtek ALC655
Support for 2/6/8 channels (2.0/5.1/7.1)	yes/yes/–
Analog input	Line/Mic1/Mic2/PCBeep
Analog output Line/Mono out	yes/–
Digital input/output	yes/yes
Amplifier	–

LAN	
LAN1 controller	Intel® ICH7R/562GZ Phy
LAN1	10/100
LAN1 boot option	RPL/PXE/WOL
LAN2 controller	Intel® 82573E
LAN2	10/100/1000
LAN2 boot option	RPL/PXE/WOL

ATA/SATA interfaces	
ATA primary/secondary	yes/–
ATA RAID	–
PIO	0/1/2/3/4
DMA	33/66/100
SATA	2
SATA RAID	0/1/5/10
1.5 Gbs/3.0 Gbs	yes/yes
Compact Flash socket	–

USB interfaces	
Boot	HD/FDD/CD-ROM/FD/ZIP
USB channels	8
USB	1.0/2.0/host
Specials/options	(USB8: touch)

Serial interfaces	
COM1/2	(TTL)/RS232
COM3/4	(TTL)/(RS232)

Parallel interfaces	
LPT1	–
LPT2	–

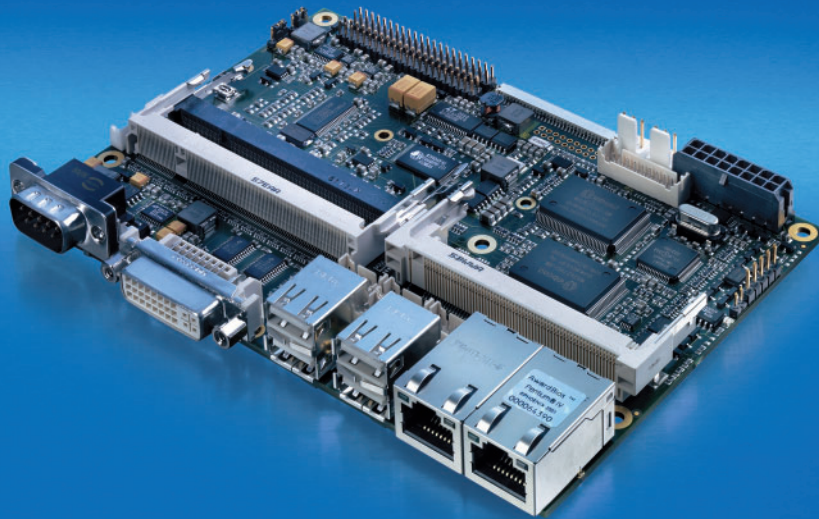
Interfaces	
PS/2 keyboard/mouse	yes/yes
Floppy interface FCC/LPT	–/yes
Touch controller ELO resistive	yes
TPM	–
Watchdog	yes

Power supply	
Supply voltage	5 V and 5 V standby (12 V for fans)

Cooling	
Cooling mode	passive/active
Operating temperature	0...60 °C
Extended temperature	on request
Storage temperature	-20...+70 °C

Dimensions	
Format	Slot
Dimensions (W x H x D)	185 mm x 21 mm x 125 mm
Further information	<a href="http://www.beckhoff.com/CB2051">www.beckhoff.com/CB2051</a>





## CB3050 | 3½-inch Industrial Motherboard

### CPU type

- CPU: Intel® Pentium® M/Celeron® M
- FSB: 400 MHz
- Performance: 1...1.8 GHz

### Chipset

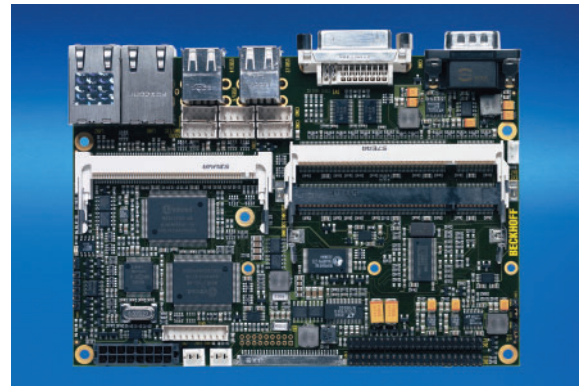
- Northbridge: Intel® 855GME
- Southbridge: Intel® ICH4

### Memory

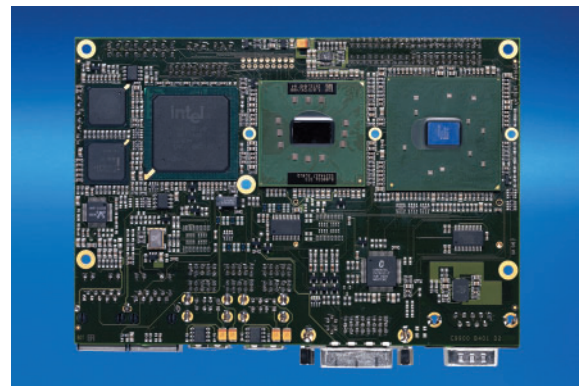
- Type: 2 x SODIMM200–2.5 V/DDR ECC
- Speed max.: DDR 333

### Graphic

- Controller: Intel® 855GME integrated
- Memory: 32 MB UMA



Front side



Back side

## Technical data

CPU type	
CPU	Intel® Pentium® M/ Celeron® M
Socket	no (soldered)
2 <sup>nd</sup> level cache	512 kB/1,024 kB/2,048 kB
FSB	400 MHz
Performance	1...1.8 GHz

Chipset	
Northbridge	Intel® 855GME
Southbridge	Intel® ICH4
Super IO1	Winbond W83627H
Super IO2	Winbond W83627H
ISA	–
Hardware monitoring	Super IO1 + Super IO2

Memory	
Type	2 x SODIMM200–2.5 V/DDR ECC
Size max. (MB)	2,048 MB
Speed max.	DDR 333
On-board flash	–
On-board NOVRAM	–

Graphic	
Controller	Intel® 855GME integrated
Video BIOS	Intel® IEGD
Memory	32 MB UMA
CRT	yes
CRT resolution	2048 x 1536
DVI	yes
LCD TTL	–
LCD LVDS	18/24/36/48
LCD resolution	1600 x 1200

BIOS	
Manufacturer	Phoenix Award 6.1
BIOS chip	FWH
Power management APM/ACPI	yes/yes
SpeedStep®/ATM	yes/–
Selectable fixed frequency	yes
Power states	S0/S3/S4/S5

Buses	
ISA	–
PCI	Mini PCI
AGP 3.3 V/1.5 V	–
PCIe x1/x4/x16	–

Audio	
Controller and codec	Intel® ICH4/Realtek ALC655
Support for 2/6/8 channels (2.0/5.1/7.1)	yes/yes/–
Analog input	Line/Mic1/Mic2/PCBeep
Analog output Line/Mono out	yes/–
Digital input/output	yes/yes
Amplifier	–

LAN	
LAN1 controller	Intel® ICH4/562GZ Phy
LAN1	10/100
LAN1 boot option	RPL/PXE/WOL
LAN2 controller	Intel® 82541ER
LAN2	10/100/1000
LAN2 boot option	WOL

ATA/SATA interfaces	
ATA primary/secondary	yes/yes
ATA RAID	–
PIO	0/1/2/3/4
DMA	33/66/100
SATA	–
SATA RAID	–
1.5 Gbs/3.0 Gbs	–
Compact Flash socket	–

USB interfaces	
Boot	HD/FDD/CD-ROM/FD/ZIP
USB channels	6
USB	1.0/2.0/host
Specials/options	(USB6: touch)

Serial interfaces	
COM1/2	(TTL)/RS232
COM3/4	(TTL)/(RS232)

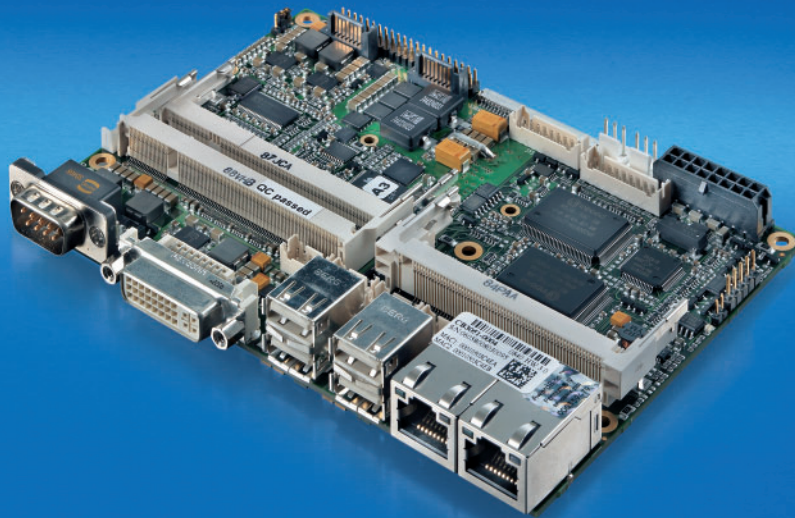
Parallel interfaces	
LPT1	–
LPT2	–

Interfaces	
PS/2 keyboard/mouse	(yes)/(yes)
Floppy interface FCC/LPT	–
Touch controller ELO resistive	yes
TPM	–
Watchdog	yes

Power supply	
Supply voltage	5 V and 5 V standby (12 V for fans)

Cooling	
Cooling mode	passive/active
Operating temperature	0...60 °C
Extended temperature	on request
Storage temperature	-20...+70 °C

Dimensions	
Format	3½-inch
Dimensions (W x H x D)	147 mm x 20 mm x 102 mm
Further information	<a href="http://www.beckhoff.com/CB3050">www.beckhoff.com/CB3050</a>



## CB3051 | 3½-inch Industrial Motherboard

### CPU type

- CPU: Intel® Celeron® M/Core™ Duo/Core™2 Duo
- FSB: 667 MHz
- Performance: 1.07...2.16 GHz

### Chipset

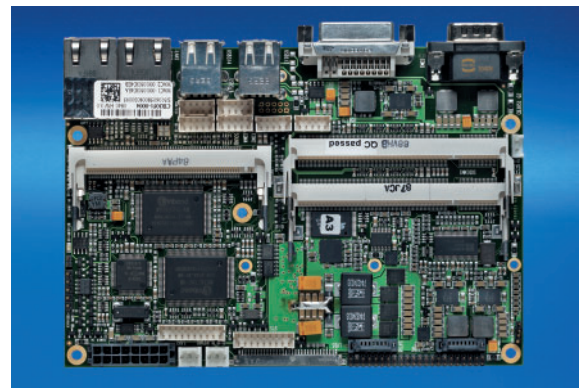
- Northbridge: Intel® 945GME
- Southbridge: Intel® ICH7R

### Memory

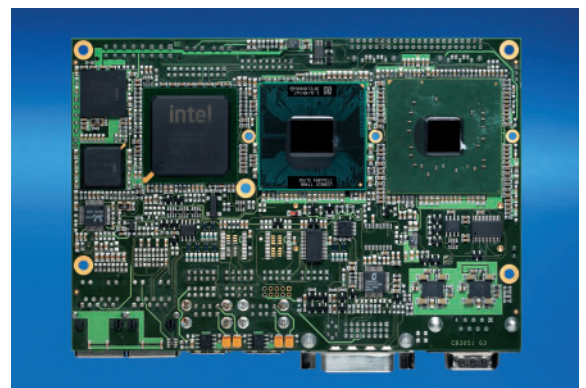
- Type: 2 x SODIMM200–1.8 V/DDR2
- Speed max.: DDR2 667

### Graphic

- Controller: Intel® 945GME integrated
- Memory: 8 MB UMA/224 MB DVMT



Front side



Back side

## Technical data

CPU type	
CPU	Intel® Celeron® M/Core™ Duo/ Core™2 Duo
Socket	no (soldered)
2 <sup>nd</sup> level cache	1,024 kB/2,048 kB/4,096 kB
FSB	667 MHz
Performance	1.07...2.16 GHz

Chipset	
Northbridge	Intel® 945GME
Southbridge	Intel® ICH7R
Super IO1	Winbond W83627H
Super IO2	Winbond W83627H
ISA	–
Hardware monitoring	Super IO1 + Super IO2

Memory	
Type	2 x SODIMM200–1.8 V/DDR2
Size max. (MB)	4,096 MB
Speed max.	DDR2 667
On-board flash	–
On-board NOVRAM	–

Graphic	
Controller	Intel® 945GME integrated
Video BIOS	Intel® IEGD
Memory	8 MB UMA/224 MB DVMT
CRT	yes
CRT resolution	2048 x 1536
DVI	yes
LCD TTL	–
LCD LVDS	18/36
LCD resolution	1600 x 1200

BIOS	
Manufacturer	Phoenix Award 6.1
BIOS chip	FWH
Power management APM/ACPI	yes/yes
SpeedStep®/ATM	yes/–
Selectable fixed frequency	yes
Power states	S0/S3/S4/S5

Buses	
ISA	–
PCI	Mini PCI
AGP 3.3 V/1.5 V	–
PCIe x1/x4/x16	–

Audio	
Controller and codec	Intel® ICH7R/Realtek ALC655
Support for 2/6/8 channels (2.0/5.1/7.1)	yes/yes/–
Analog input	Line/Mic1/Mic2/PCBeep
Analog output Line/Mono out	yes/–
Digital input/output	yes/yes
Amplifier	–

LAN	
LAN1 controller	Intel® ICH7R/562GZ Phy
LAN1	10/100
LAN1 boot option	RPL/PXE/WOL
LAN2 controller	Intel® 82573E
LAN2	10/100/1000
LAN2 boot option	RPL/PXE/WOL

ATA/SATA interfaces	
ATA primary/secondary	yes/–
ATA RAID	–
PIO	0/1/2/3/4
DMA	33/66/100
SATA	2
SATA RAID	0/1/5/10
1.5 Gbs/3.0 Gbs	yes/yes
Compact Flash socket	–

USB interfaces	
Boot	HD/FDD/CD-ROM/FD/ZIP
USB channels	8
USB	1.0/2.0/host
Specials/options	(USB8: touch)

Serial interfaces	
COM1/2	(TTL)/RS232
COM3/4	(TTL)/(RS232)

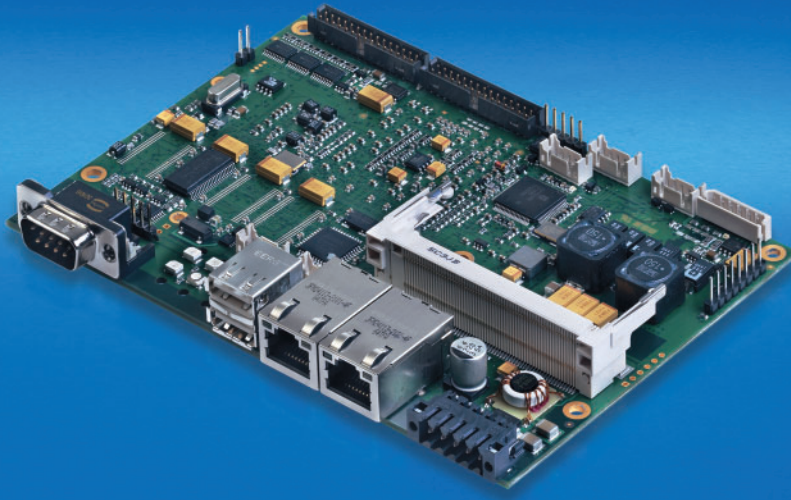
Parallel interfaces	
LPT1	–
LPT2	–

Interfaces	
PS/2 keyboard/mouse	(yes)/(yes)
Floppy interface FCC/LPT	–
Touch controller ELO resistive	yes
TPM	–
Watchdog	yes

Power supply	
Supply voltage	5 V and 5 V standby (12 V for fans)

Cooling	
Cooling mode	passive/active
Operating temperature	0...60 °C
Extended temperature	on request
Storage temperature	-20...+70 °C

Dimensions	
Format	3½-inch
Dimensions (W x H x D)	147 mm x 20 mm x 102 mm
Further information	<a href="http://www.beckhoff.com/CB3051">www.beckhoff.com/CB3051</a>



## CB3010 | 3½-inch Industrial Motherboard

### CPU type

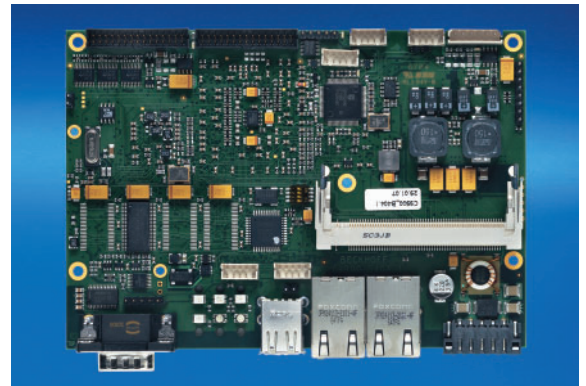
- CPU: Intel® IXP420
- FSB: 133 MHz
- Performance: 533 MHz

### Memory

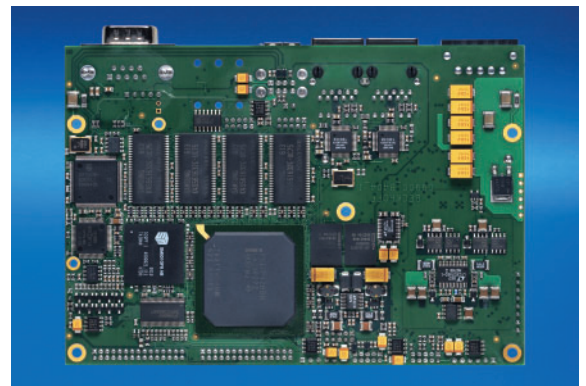
- Type: SDRAM soldered
- Speed max.: SD 133

### Graphic

- Controller: Silicon Motion SM502
- Memory: 8 MB



Front side



Back side

## Technical data

CPU type	
CPU	Intel® IXP420
Socket	no (soldered)
2 <sup>nd</sup> level cache	–
FSB	133 MHz
Performance	533 MHz

Chipset	
Northbridge	–
Southbridge	–
Super IO1	–
Super IO2	–
ISA	–
Hardware monitoring	–

Memory	
Type	SDRAM soldered
Size max. (MB)	128 MB
Speed max.	SD 133
On-board flash	32 MB
On-board NOVRAM	128 kB (optional)

Graphic	
Controller	Silicon Motion SM502
Video BIOS	–
Memory	8 MB
CRT	–
CRT resolution	–
DVI	–
LCD TTL	yes
LCD LVDS	18/24
LCD resolution	1280 x 1024

BIOS	
Manufacturer	–
BIOS chip	–
Power management APM/ACPI	–
SpeedStep®/ATM	–
Selectable fixed frequency	–
Power states	–

Buses	
ISA	–
PCI	Mini PCI
AGP 3.3 V/1.5 V	–
PCIe x1/x4/x16	–

Audio	
Controller and codec	–
Support for 2/6/8 channels (2.0/5.1/7.1)	–
Analog input	–
Analog output Line/Mono out	–
Digital input/output	–
Amplifier	–

LAN	
LAN1 controller	IXP420NPE1/Micrel KS8721 BL
LAN1	10/100
LAN1 boot option	RPL/PXE
LAN2 controller	IXP420NPE2/Micrel KS8721 BL
LAN2	10/100
LAN2 boot option	–

ATA/SATA interfaces	
ATA primary/secondary	–
ATA RAID	–
PIO	–
DMA	–
SATA	–
SATA RAID	–
1.5 Gbs/3.0 Gbs	–
Compact Flash socket	–

USB interfaces	
Boot	–
USB channels	6
USB	1.0/2.0/host
Specials/options	(USB touch)

Serial interfaces	
COM1/2	(TTL)/RS232
COM3/4	–

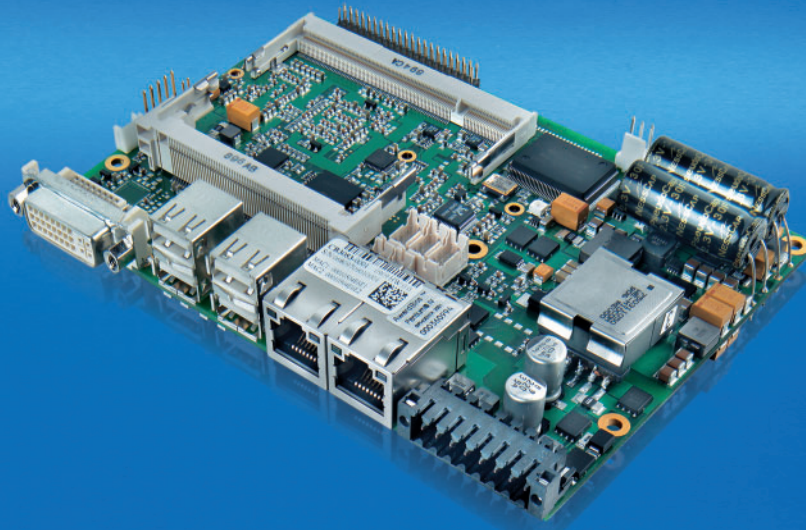
Parallel interfaces	
LPT1	–
LPT2	–

Interfaces	
PS/2 keyboard/mouse	–
Floppy interface FCC/LPT	–
Touch controller ELO resistive	yes
TPM	yes
Watchdog	yes

Power supply	
Supply voltage	24 V

Cooling	
Cooling mode	passive/active
Operating temperature	0...60 °C
Extended temperature	on request
Storage temperature	-20...+70 °C

Dimensions	
Format	3½-inch
Dimensions (W x H x D)	147 mm x 20 mm x 102 mm
Further information	<a href="http://www.beckhoff.com/CB3010">www.beckhoff.com/CB3010</a>



## CB3053 | 3½-inch Industrial Motherboard

### CPU type

- CPU: Intel® Atom™
- FSB: max. 533 MHz
- Performance: 1.1...1.6 GHz

### Chipset

- Northbridge: Intel® System Controller Hub US15W
- Southbridge: Intel® System Controller Hub US15W

### Memory

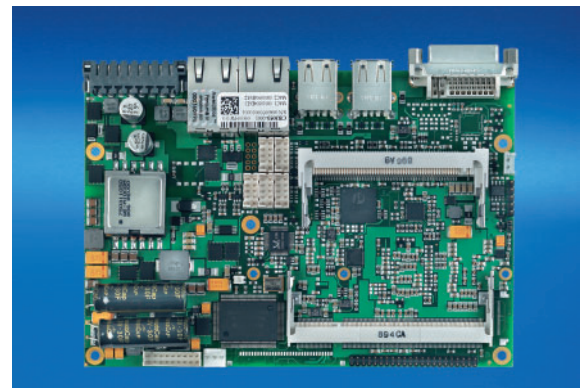
- Type: SODIMM200–1.8 V/DDR2
- Speed max.: DDR2 533

### Graphic

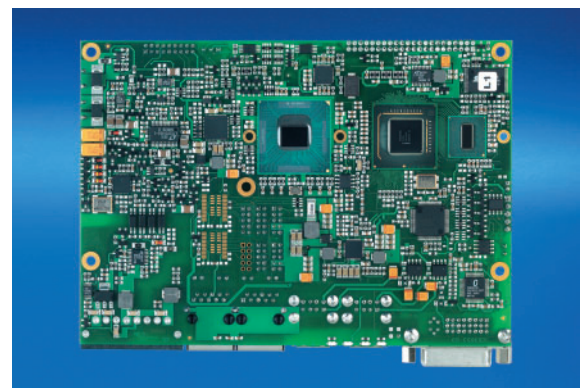
- Controller: Intel® IGD integrated
- Memory: 8 MB UMA/256 MB DVMT

### Power supply

- Power supply unit: 24 V power supply on-board
- UPS: 1-second UPS integrated



Front side



Back side

## Technical data

CPU type	
CPU	Intel® Atom™
Socket	no (soldered)
2 <sup>nd</sup> level cache	512 kB
FSB	max. 533 MHz
Performance	1.1...1.6 GHz

Chipset	
Northbridge	Intel® System Controller Hub US15W
Southbridge	Intel® System Controller Hub US15W
Super IO1	Winbond W83627H
Super IO2	–
ISA	–
Hardware monitoring	Super IO1

Memory	
Type	SODIMM200–1.8 V/DDR2
Size max. (MB)	2,048 MB
Speed max.	DDR2 533
On-board flash	–
On-board NOVRAM	–

Graphic	
Controller	Intel® IGD integrated
Video BIOS	Intel® IGD
Memory	8 MB UMA/256 MB DVMT
CRT	–
CRT resolution	–
DVI	DVI-D
LCD TTL	–
LCD LVDS	18/24
LCD resolution	1600 x 1200

BIOS	
Manufacturer	Phoenix Award
BIOS chip	FWH
Power management APM/ACPI	yes/yes
SpeedStep®/ATM	yes/–
Selectable fixed frequency	yes
Power states	S0/S4/S5

Buses	
ISA	–
PCI	Mini PCI
AGP 3.3 V/1.5 V	–
PCIe x1/x4/x16	–/–/–

Audio	
Controller and codec	Intel® SCH + Realtek ALC885
Support for 2/6/8 channels (2.0/5.1/7.1)	yes/yes/–
Analog input	Line/Mic1/Mic2/PCBeep
Analog output Line/Mono out	yes/–
Digital input/output	yes/yes
Amplifier	–

LAN	
LAN1 controller	Intel® 82575EB
LAN1	10/100/1000
LAN1 boot option	RPL/PXE
LAN2 controller	Intel® 82575EB
LAN2	10/100/1000
LAN2 boot option	RPL/PXE

ATA/SATA interfaces	
ATA primary/secondary	yes/–
ATA RAID	–
PIO	0/1/2/3/4
DMA	33/66/100
SATA	–
SATA RAID	–
1.5 Gbs/3.0 Gbs	–
Compact Flash socket	–

USB interfaces	
Boot	HD/FDD/CD-ROM/FD/ZIP
USB channels	8
USB	1.0/2.0/host/device
Specials/options	–

Serial interfaces	
COM1/2	RS232/(RS485)/(RS422)
COM3/4	–

Parallel interfaces	
LPT1	Uni/EPP/FDC
LPT2	–

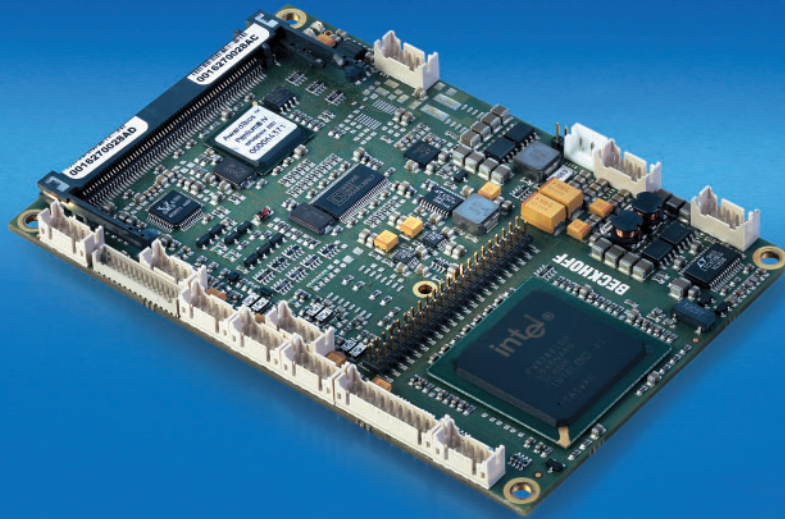
Interfaces	
PS/2 keyboard/mouse	yes/yes
Floppy interface FCC/LPT	–
Touch controller ELO resistive	–
TPM	–
Watchdog	yes

Power supply	
Supply voltage	24 V
Power supply unit	24 V power supply on-board
UPS	1-second UPS integrated

Cooling	
Cooling mode	passive/active
Operating temperature	0...60 °C
Extended temperature	on request
Storage temperature	-20...+70 °C

Dimensions	
Format	3½-inch
Dimensions (W x H x D)	147 mm x 20 mm x 102 mm
Further information	<a href="http://www.beckhoff.com/CB3053">www.beckhoff.com/CB3053</a>





## CB3150 | Compact Industrial Motherboard

### CPU type

- CPU: Intel® Pentium® M/Celeron® M
- FSB: 400 MHz
- Performance: 1...1.8 GHz

### Chipset

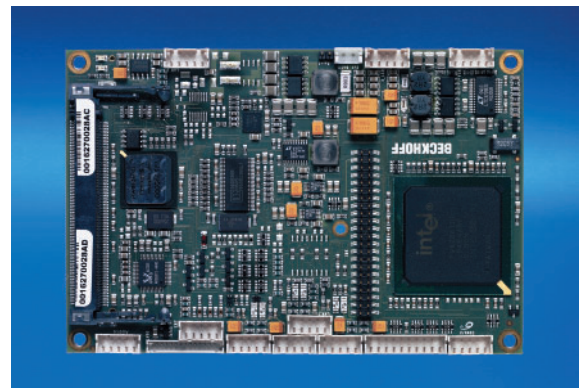
- Northbridge: Intel® 855GME
- Southbridge: Intel® ICH4

### Memory

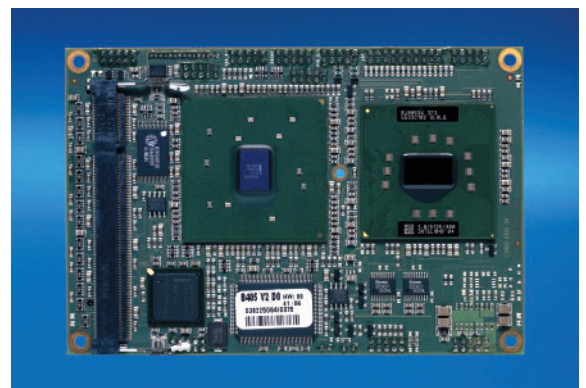
- Type: SODIMM200–2.5 V/DDR ECC
- Speed max.: DDR 333

### Graphic

- Controller: Intel® 855GME integrated
- Memory: 32 MB UMA



Front side



Back side

## Technical data

CPU type	
CPU	Intel® Pentium® M/ Celeron® M
Socket	no (soldered)
2 <sup>nd</sup> level cache	512 kB/1,024 kB/2,048 kB
FSB	400 MHz
Performance	1...1.8 GHz

Chipset	
Northbridge	Intel® 855GME
Southbridge	Intel® ICH4
Super IO1	Winbond W83627H
Super IO2	–
ISA	–
Hardware monitoring	Super IO1

Memory	
Type	SODIMM200–2.5 V/DDR ECC
Size max. (MB)	1,024 MB
Speed max.	DDR 333
On-board flash	–
On-board NOVRAM	–

Graphic	
Controller	Intel® 855GME integrated
Video BIOS	Intel® IEGD
Memory	32 MB UMA
CRT	yes
CRT resolution	2048 x 1536
DVI	yes
LCD TTL	–
LCD LVDS	18/24/36/48
LCD resolution	1600 x 1200

BIOS	
Manufacturer	Phoenix Award 6.1
BIOS chip	FWH
Power management APM/ACPI	yes/yes
SpeedStep®/ATM	yes/–
Selectable fixed frequency	yes
Power states	S0/S3/S4/S5

Buses	
ISA	–
PCI	Mini PCI
AGP 3.3 V/1.5 V	–
PCIe x1/x4/x16	–

Audio	
Controller and codec	Intel® ICH4/Realtek ALC655
Support for 2/6/8 channels (2.0/5.1/7.1)	yes/yes/–
Analog input	Line/Mic1/Mic2/PCBeep
Analog output Line/Mono out	yes/–
Digital input/output	yes/yes
Amplifier	–

LAN	
LAN1 controller	Intel® ICH4/562GZ Phy
LAN1	10/100
LAN1 boot option	RPL/PXE/WOL
LAN2 controller	Intel® 82551ER
LAN2	10/100
LAN2 boot option	WOL

ATA/SATA interfaces	
ATA primary/secondary	yes/–
ATA RAID	–
PIO	0/1/2/3/4
DMA	33/66/100
SATA	–
SATA RAID	–
1.5 Gbs/3.0 Gbs	–
Compact Flash socket	–

USB interfaces	
Boot	HD/FDD/CD-ROM/FD/ZIP
USB channels	4
USB	1.0/2.0/host
Specials/options	–

Serial interfaces	
COM1/2	(TTL)/RS232
COM3/4	–

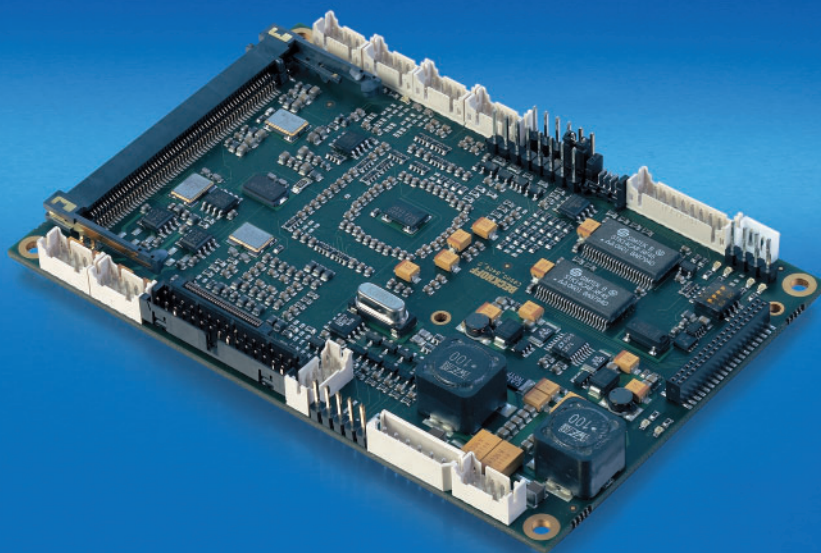
Parallel interfaces	
LPT1	Uni/ECP/EPP/FDC
LPT2	–

Interfaces	
PS/2 keyboard/mouse	(yes)/(yes)
Floppy interface FCC/LPT	–
Touch controller ELO resistive	yes
TPM	–
Watchdog	yes

Power supply	
Supply voltage	5 V and 5 V standby (12 V for fans)

Cooling	
Cooling mode	passive/active
Operating temperature	0...60 °C
Extended temperature	on request
Storage temperature	-20...+70 °C

Dimensions	
Format	Compact
Dimensions (W x H x D)	120 mm x 10 mm x 80 mm
Further information	<a href="http://www.beckhoff.com/CB3150">www.beckhoff.com/CB3150</a>



## CB3110 | Compact Industrial Motherboard

### CPU type

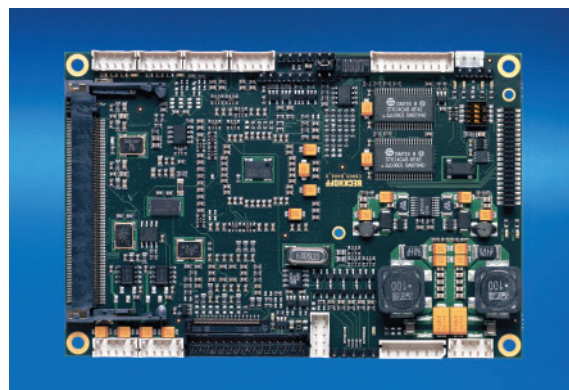
- CPU: Intel® IXP420
- FSB: 133 MHz
- Performance: 533 MHz

### Memory

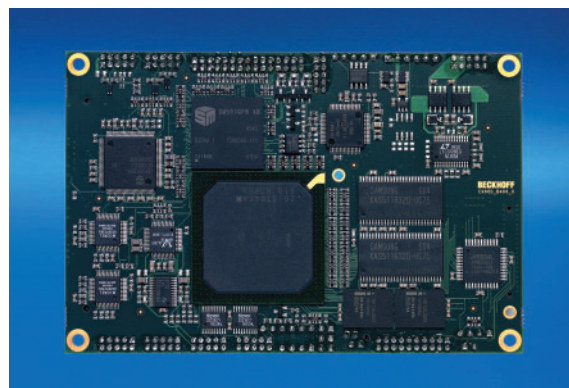
- Type: SDRAM soldered
- Speed max.: SD 133

### Graphic

- Controller: Silicon Motion SM502
- Memory: 8 MB



Front side



Back side

## Technical data

CPU type	
CPU	Intel® IXP420
Socket	no (soldered)
2 <sup>nd</sup> level cache	–
FSB	133 MHz
Performance	533 MHz

Chipset	
Northbridge	–
Southbridge	–
Super IO1	–
Super IO2	–
ISA	–
Hardware monitoring	–

Memory	
Type	SDRAM soldered
Size max. (MB)	128 MB
Speed max.	SD 133
On-board flash	32 MB
On-board NOVRAM	128 kB (optional)

Graphic	
Controller	Silicon Motion SM502
Video BIOS	–
Memory	8 MB
CRT	yes
CRT resolution	1280 x 1024
DVI	–
LCD TTL	yes
LCD LVDS	–
LCD resolution	1280 x 1024

BIOS	
Manufacturer	–
BIOS chip	–
Power management APM/ACPI	–
SpeedStep®/ATM	–
Selectable fixed frequency	–
Power states	–

Buses	
ISA	–
PCI	Mini PCI
AGP 3.3 V/1.5 V	–
PCIe x1/x4/x16	–

Audio	
Controller and codec	SM502/ALC203
Support for 2/6/8 channels (2.0/5.1/7.1)	yes/–/–
Analog input	Line/Mic1/Mic2
Analog output Line/Mono out	yes/–
Digital input/output	–
Amplifier	1.5 W/channel (optional)

LAN	
LAN1 controller	IXP420NPE1/Micrel KS8721 BL
LAN1	10/100
LAN1 boot option	–
LAN2 controller	IXP420NPE2/Micrel KS8721 BL
LAN2	10/100
LAN2 boot option	–

ATA/SATA interfaces	
ATA primary/secondary	–
ATA RAID	–
PIO	–
DMA	–
SATA	–
SATA RAID	–
1.5 Gbs/3.0 Gbs	–
Compact Flash socket	–

USB interfaces	
Boot	–
USB channels	3 (4)
USB	1.0/2.0/host
Specials/options	(USB4: touch)

Serial interfaces	
COM1/2	(TTL)/RS232
COM3/4	–

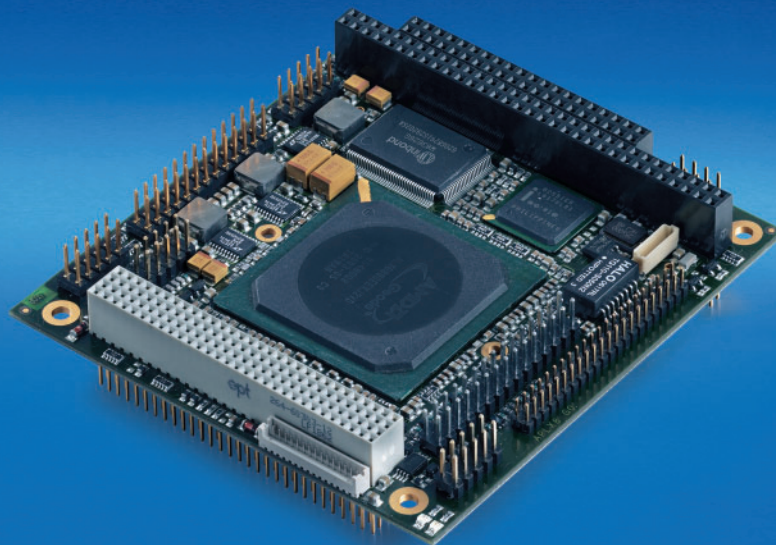
Parallel interfaces	
LPT1	–
LPT2	–

Interfaces	
PS/2 keyboard/mouse	–
Floppy interface FCC/LPT	–
Touch controller ELO resistive	yes
TPM	–
Watchdog	yes

Power supply	
Supply voltage	24 V

Cooling	
Cooling mode	passive
Operating temperature	0...60 °C
Extended temperature	on request
Storage temperature	-20...+70 °C

Dimensions	
Format	Compact
Dimensions (W x H x D)	120 mm x 15 mm x 80 mm
Further information	<a href="http://www.beckhoff.com/CB3110">www.beckhoff.com/CB3110</a>



## CB4021 | PC/104 Industrial Motherboard

### CPU type

- CPU: AMD LX800
- FSB: 133 MHz
- Performance: 500 MHz

### Chipset

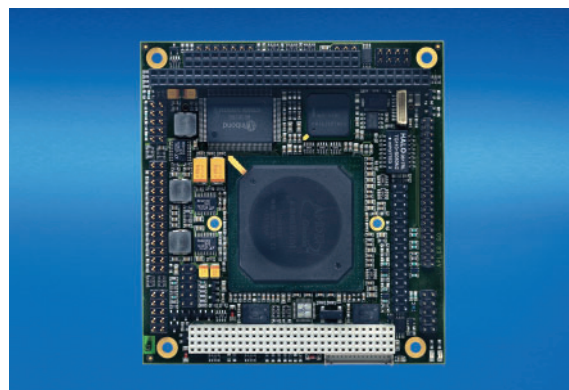
- Northbridge: AMD Geode CS5536
- Southbridge: AMD Geode CS5536

### Memory

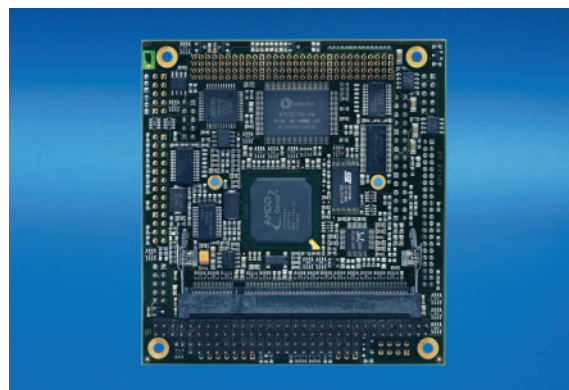
- Type: SODIMM200–2.5 V/DDR
- Speed max.: DDR400

### Graphic

- Controller: AMD LX800 integrated
- Memory: 254 MB UMA



Front side



Back side

## Technical data

CPU type	
CPU	AMD LX800
Socket	no (soldered)
2 <sup>nd</sup> level cache	128 kB
FSB	133 MHz
Performance	500 MHz

Chipset	
Northbridge	AMD Geode CS5536
Southbridge	AMD Geode CS5536
Super IO1	Winbond W83627H
Super IO2	–
ISA	Winbond W83626F LPC
Hardware monitoring	Super IO1

Memory	
Type	SODIMM200–2.5 V/DDR
Size max. (MB)	1,024 MB
Speed max.	DDR 400
On-board flash	optional, 2 GB or 4 GB
On-board NOVRAM	–

Graphic	
Controller	AMD LX800 integrated
Video BIOS	AMD BIOS
Memory	254 MB UMA
CRT	yes
CRT resolution	1920 x 1440
DVI	–
LCD TTL	–
LCD LVDS	18
LCD resolution	1600 x 1200

BIOS	
Manufacturer	Phoenix Award 6.1
BIOS chip	FWH
Power management APM/ACPI	yes/yes
SpeedStep®/ATM	–
Selectable fixed frequency	yes
Power states	S0/S4/S5

Buses	
ISA	PC/104
PCI	PC/104+
AGP 3.3 V/1.5 V	–
PCIe x1/x4/x16	–

Audio	
Controller and codec	AMD CS5536/Realtek ALC655
Support for 2/6/8 channels (2.0/5.1/7.1)	yes/yes/–
Analog input	Line/Mic1/Mic2/PCBeep
Analog output Line/Mono out	yes/–
Digital input/output	yes/yes
Amplifier	–

LAN	
LAN1 controller	Intel® 551ER
LAN1	10/100
LAN1 boot option	–
LAN2 controller	–
LAN2	–
LAN2 boot option	–

ATA/SATA interfaces	
ATA primary/secondary	yes/–
ATA RAID	–
PIO	0/1/2/3/4
DMA	33/66/100
SATA	–
SATA RAID	–
1.5 Gbs/3.0 Gbs	–
Compact Flash socket	–

USB interfaces	
Boot	HD/FDD/CD-ROM/FD/ZIP
USB channels	4
USB	1.0/2.0/host/(USB4)
Specials/options	(USB4:device)

Serial interfaces	
COM1/2	RS232/RS485/RS422
COM3/4	–

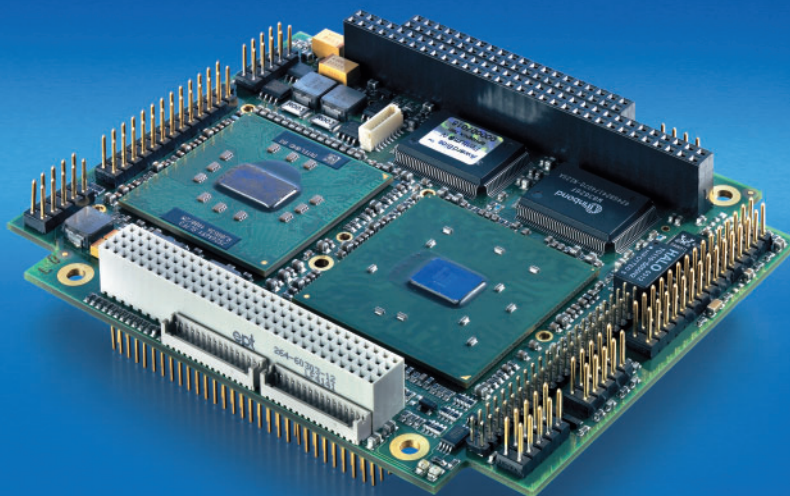
Parallel interfaces	
LPT1	Uni/ECP/EPP/FDC
LPT2	–

Interfaces	
PS/2 keyboard/mouse	yes/yes
Floppy interface FCC/LPT	–/yes
Touch controller ELO resistive	–
TPM	yes
Watchdog	yes

Power supply	
Supply voltage	5 V

Cooling	
Cooling mode	passive
Operating temperature	0...60 °C
Extended temperature	on request
Storage temperature	-20...+70 °C

Dimensions	
Format	PC/104+
Dimensions (W x H x D)	90 mm x 24 mm x 96 mm
Further information	<a href="http://www.beckhoff.com/CB4021">www.beckhoff.com/CB4021</a>



## CB4050 | PC/104 Industrial Motherboard

### CPU type

- CPU: Intel® Pentium® M/Celeron® M
- FSB: 400 MHz
- Performance: 1...1.8 GHz

### Chipset

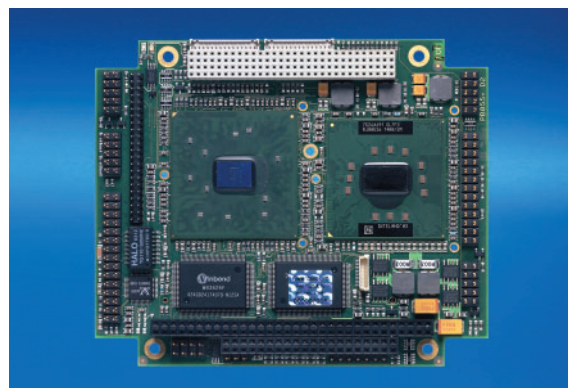
- Northbridge: Intel® 855GME
- Southbridge: Intel® ICH4

### Memory

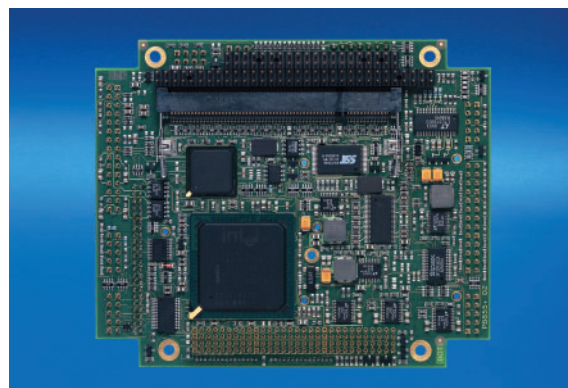
- Type: 1 x SODIMM200–2.5 V/DDR ECC
- Speed max.: DDR 333

### Graphic

- Controller: Intel® 855GME integrated
- Memory: 32 MB UMA



Front side



Back side

## Technical data

CPU type	
CPU	Intel® Pentium® M/ Celeron® M
Socket	no (soldered)
2 <sup>nd</sup> level cache	512 kB/1,024 kB/2,048 kB
FSB	400 MHz
Performance	1...1.8 GHz

Chipset	
Northbridge	Intel® 855GME
Southbridge	Intel® ICH4
Super IO1	Winbond W83627H
Super IO2	–
ISA	Winbond W83626F LPC
Hardware monitoring	Super IO1

Memory	
Type	SODIMM200–2.5 V/DDR ECC
Size max. (MB)	1,024 MB
Speed max.	DDR 333
On-board flash	–
On-board NOVRAM	–

Graphic	
Controller	Intel® 855GME integrated
Video BIOS	Intel® Extreme BIOS
Memory	32 MB UMA
CRT	yes
CRT resolution	2048 x 1536
DVI	–
LCD TTL	–
LCD LVDS	18/24/36/48
LCD resolution	1600 x 1200

BIOS	
Manufacturer	Phoenix Award 6.1
BIOS chip	FWH
Power management APM/ACPI	yes/yes
SpeedStep®/ATM	yes/–
Selectable fixed frequency	yes
Power states	S0/S4/S5

Buses	
ISA	PC/104
PCI	PC/104+
AGP 3.3 V/1.5 V	–
PCIe x1/x4/x16	–

Audio	
Controller and codec	Intel® ICH4/Realtek ALC655
Support for 2/6/8 channels (2.0/5.1/7.1)	yes/yes/–
Analog input	Line/Mic1/Mic2/PCBeep
Analog output Line/Mono out	yes/–
Digital input/output	yes/yes
Amplifier	–

LAN	
LAN1 controller	Intel® ICH4/562GZ Phy
LAN1	10/100
LAN1 boot option	RPL/PXE
LAN2 controller	–
LAN2	–
LAN2 boot option	–

ATA/SATA interfaces	
ATA primary/secondary	yes/–
ATA RAID	–
PIO	0/1/2/3/4
DMA	33/66/100
SATA	–
SATA RAID	–
1.5 Gbs/3.0 Gbs	–
Compact Flash socket	–

USB interfaces	
Boot	HD/FDD/CD-ROM/FD/ZIP
USB channels	4
USB	1.0/2.0/host
Specials/options	–

Serial interfaces	
COM1/2	(TTL)/RS232
COM3/4	–

Parallel interfaces	
LPT1	Uni/ECP/EPP/FDC
LPT2	–

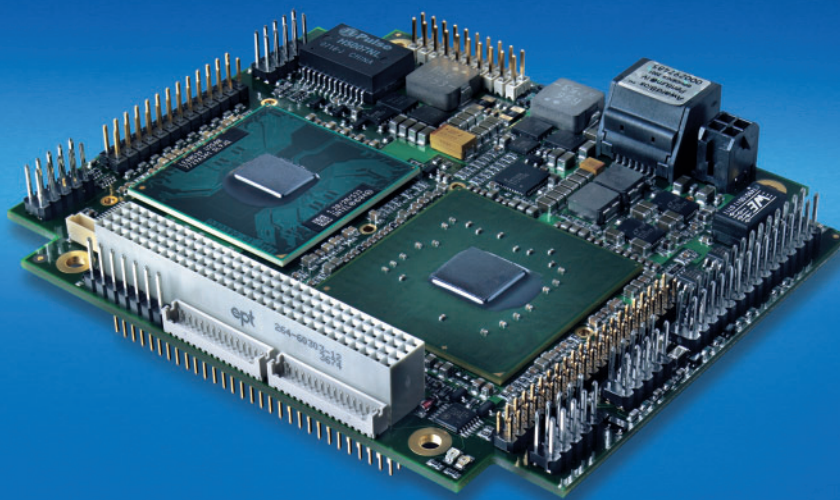
Interfaces	
PS/2 keyboard/mouse	yes/yes
Floppy interface FCC/LPT	–/yes
Touch controller ELO resistive	–
TPM	–
Watchdog	yes

Power supply	
Supply voltage	5 V

Cooling	
Cooling mode	passive/active
Operating temperature	0...60 °C
Extended temperature	on request
Storage temperature	-20...+70 °C

Dimensions	
Format	PC/104+
Dimensions (W x H x D)	116 mm x 24 mm x 96 mm
Further information	<a href="http://www.beckhoff.com/CB4050">www.beckhoff.com/CB4050</a>





## CB4051 | PC/104 Industrial Motherboard

### CPU type

- CPU: Intel® Celeron® M/Core™ Duo/Core™2 Duo
- FSB: 667 MHz
- Performance: 1.07...2.16 GHz

### Chipset

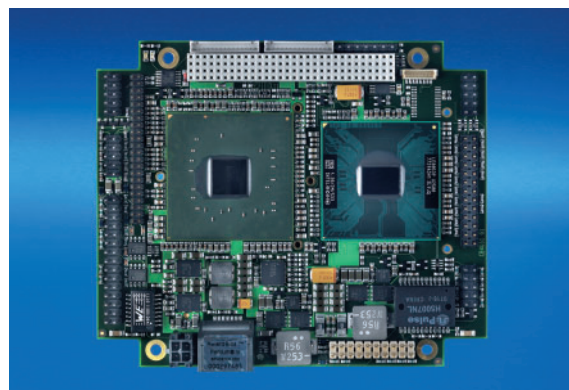
- Northbridge: Intel® 945GME
- Southbridge: Intel® ICH7R

### Memory

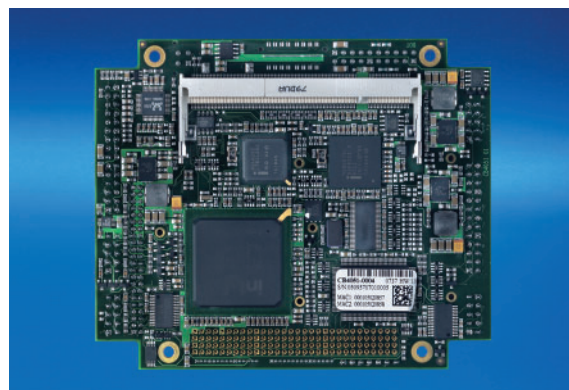
- Type: SODIMM200–1.8 V/DDR2
- Speed max.: DDR2 667

### Graphic

- Controller: Intel® 945GME integrated
- Memory: 8 MB UMA/224 MB DVMT



Front side



Back side

## Technical data

CPU type	
CPU	Intel® Celeron® M/Core™ Duo/ Core™2 Duo
Socket	no (soldered)
2 <sup>nd</sup> level cache	1,024 kB/2,048 kB/4,096 kB
FSB	667 MHz
Performance	1.07...2.16 GHz

Chipset	
Northbridge	Intel® 945GME
Southbridge	Intel® ICH7R
Super IO1	Winbond W83627H
Super IO2	Winbond W83627H
ISA	–
Hardware monitoring	Super IO1 + Super IO2

Memory	
Type	SODIMM200–1.8 V/DDR2
Size max. (MB)	2,048 MB
Speed max.	DDR2 667
On-board flash	–
On-board NOVRAM	–

Graphic	
Controller	Intel® 945GME integrated
Video BIOS	Intel® IEGD
Memory	8 MB UMA/224 MB DVMT
CRT	yes
CRT resolution	2048 x 1536
DVI	–
LCD TTL	–
LCD LVDS	18/36
LCD resolution	1600 x 1200

BIOS	
Manufacturer	Phoenix Award 6.1
BIOS chip	FWH
Power management APM/ACPI	yes/yes
SpeedStep®/ATM	yes/–
Selectable fixed frequency	yes
Power states	S0/S4/S5

Buses	
ISA	–
PCI	PC/104+
AGP 3.3 V/1.5 V	–
PCIe x1/x4/x16	3x/–/–

Audio	
Controller and codec	Intel® ICH7R/Realtek ALC655
Support for 2/6/8 channels (2.0/5.1/7.1)	yes/yes/–
Analog input	Line/Mic1/Mic2/PCBeep
Analog output Line/Mono out	yes/–
Digital input/output	yes/yes
Amplifier	–

LAN	
LAN1 controller	Intel® ICH7R/562GZ Phy
LAN1	10/100
LAN1 boot option	RPL/PXE
LAN2 controller	Intel® 82573E
LAN2	10/100/1000
LAN2 boot option	RPL/PXE/WOL

ATA/SATA interfaces	
ATA primary/secondary	yes/–
ATA RAID	–
PIO	–
DMA	–
SATA	2
SATA RAID	0/1/5/10
1.5 Gbs/3.0 Gbs	yes/yes
Compact Flash socket	–

USB interfaces	
Boot	HD/FDD/CD-ROM/FD/ZIP
USB channels	4
USB	1.0/2.0/host
Specials/options	–

Serial interfaces	
COM1/2	(TTL)/RS232
COM3/4	–

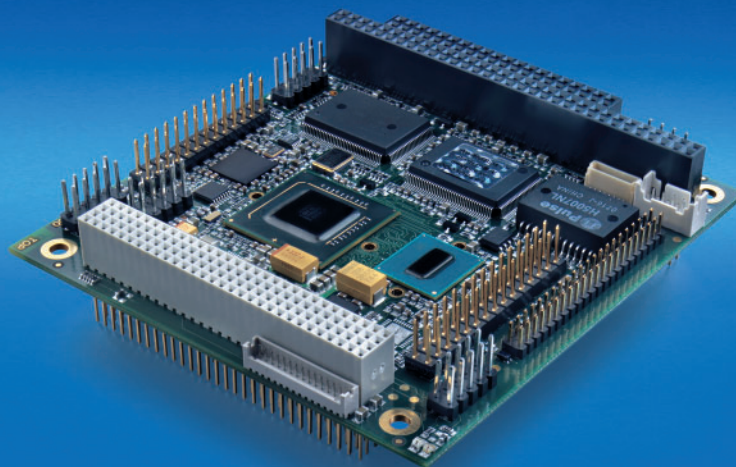
Parallel interfaces	
LPT1	Uni/ECP/EPP/FDC
LPT2	–

Interfaces	
PS/2 keyboard/mouse	yes/yes
Floppy interface FCC/LPT	–/yes
Touch controller ELO resistive	–
TPM	–
Watchdog	yes

Power supply	
Supply voltage	5 V

Cooling	
Cooling mode	passive/active
Operating temperature	0...60 °C
Extended temperature	on request
Storage temperature	-20...+70 °C

Dimensions	
Format	PC/104+
Dimensions (W x H x D)	116 mm x 24 mm x 96 mm
Further information	<a href="http://www.beckhoff.com/CB4051">www.beckhoff.com/CB4051</a>



## CB4053 | PC/104 Industrial Motherboard

### CPU type

- CPU: Intel® Atom™
- FSB: max. 533 MHz
- Performance: 1.1...1.6 GHz

### Chipset

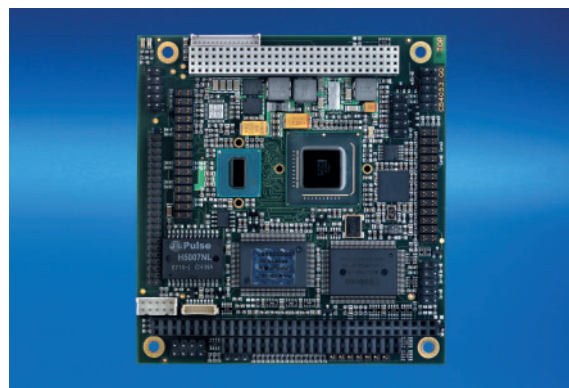
- Northbridge: Intel® System Controller Hub
- Southbridge: Intel® System Controller Hub

### Memory

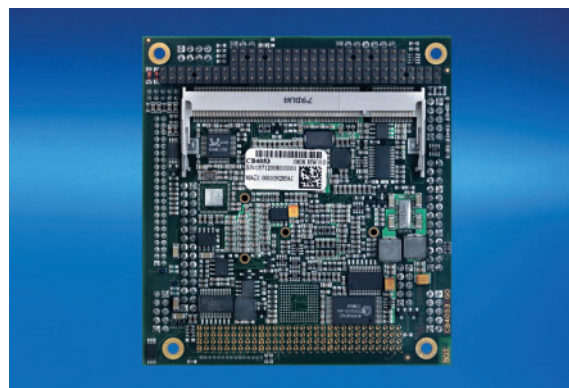
- Type: SODIMM200–1.8 V/DDR2
- Speed max.: DDR2 533

### Graphic

- Controller: Intel® IGD integrated
- Memory: 8 MB UMA/256 MB DVMT



Front side



Back side

## Technical data

CPU type	
CPU	Intel® Atom™
Socket	no (soldered)
2 <sup>nd</sup> level cache	512 kB
FSB	max. 533 MHz
Performance	1.1...1.6 GHz

Chipset	
Northbridge	Intel® System Controller Hub
Southbridge	Intel® System Controller Hub
Super IO1	Winbond W83627H
Super IO2	–
ISA	Fintek F85226F
Hardware monitoring	Super IO1

Memory	
Type	SODIMM200–1.8 V/DDR2
Size max. (MB)	1,024 MB
Speed max.	DDR2 533
On-board flash	optional, up to 8 GB
On-board NOVRAM	–

Graphic	
Controller	Intel® IGD integrated
Video BIOS	Intel® IGD
Memory	8 MB UMA/256 MB DVMT
CRT	yes
CRT resolution	1600 x 1200
DVI	–
LCD TTL	–
LCD LVDS	18/24
LCD resolution	1600 x 1200

BIOS	
Manufacturer	Phoenix Award
BIOS chip	FWH
Power management APM/ACPI	yes/yes
SpeedStep®/ATM	yes/–
Selectable fixed frequency	yes
Power states	S0/S4/S5

Buses	
ISA	PC/104
PCI	PC/104+
AGP 3.3 V/1.5 V	–
PCIe x1/x4/x16	–/–/–

Audio	
Controller and codec	Intel® SCH + Realtek ALC885
Support for 2/6/8 channels (2.0/5.1/7.1)	yes/yes/–
Analog input	Line/Mic1/Mic2/PCBeep
Analog output Line/Mono out	yes/–
Digital input/output	yes/yes
Amplifier	–

LAN	
LAN1 controller	Intel® 82574L
LAN1	10/100/1000
LAN1 boot option	RPL/PXE
LAN2 controller	–
LAN2	–
LAN2 boot option	–

ATA/SATA interfaces	
ATA primary/secondary	yes/–
ATA RAID	–
PIO	0/1/2/3/4
DMA	33/66/100
SATA	–
SATA RAID	–
1.5 Gbs/3.0 Gbs	–
Compact Flash socket	–

USB interfaces	
Boot	HD/FDD/CD-ROM/FD/ZIP
USB channels	8
USB	1.0/2.0/host/device
Specials/options	–

Serial interfaces	
COM1/2	RS232/(RS485)/(RS422)
COM3/4	–

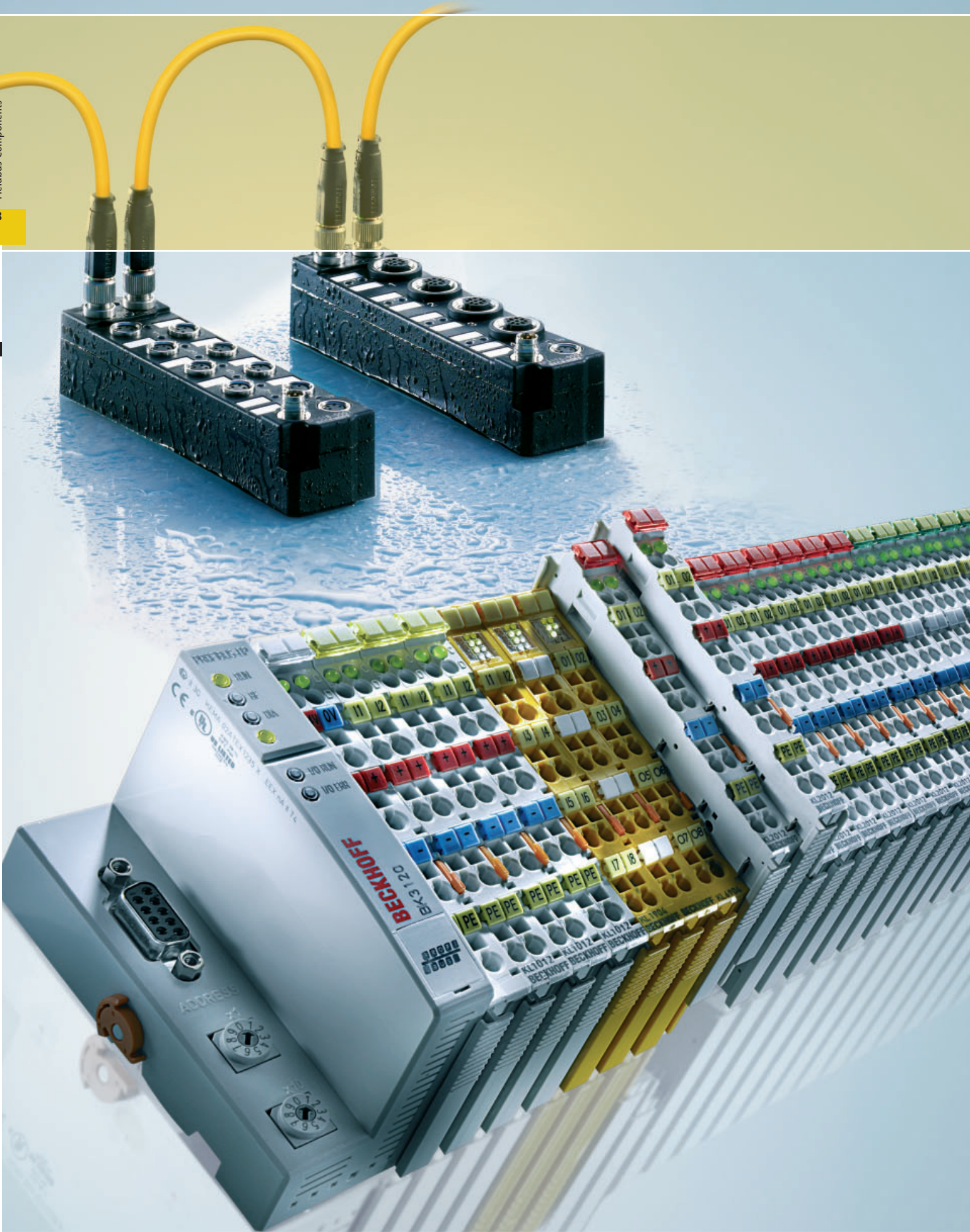
Parallel interfaces	
LPT1	Uni/EPP/FDC
LPT2	–

Interfaces	
PS/2 keyboard/mouse	yes/yes
Floppy interface FCC/LPT	–
Touch controller ELO resistive	–
TPM	–
Watchdog	yes

Power supply	
Supply voltage	5 V

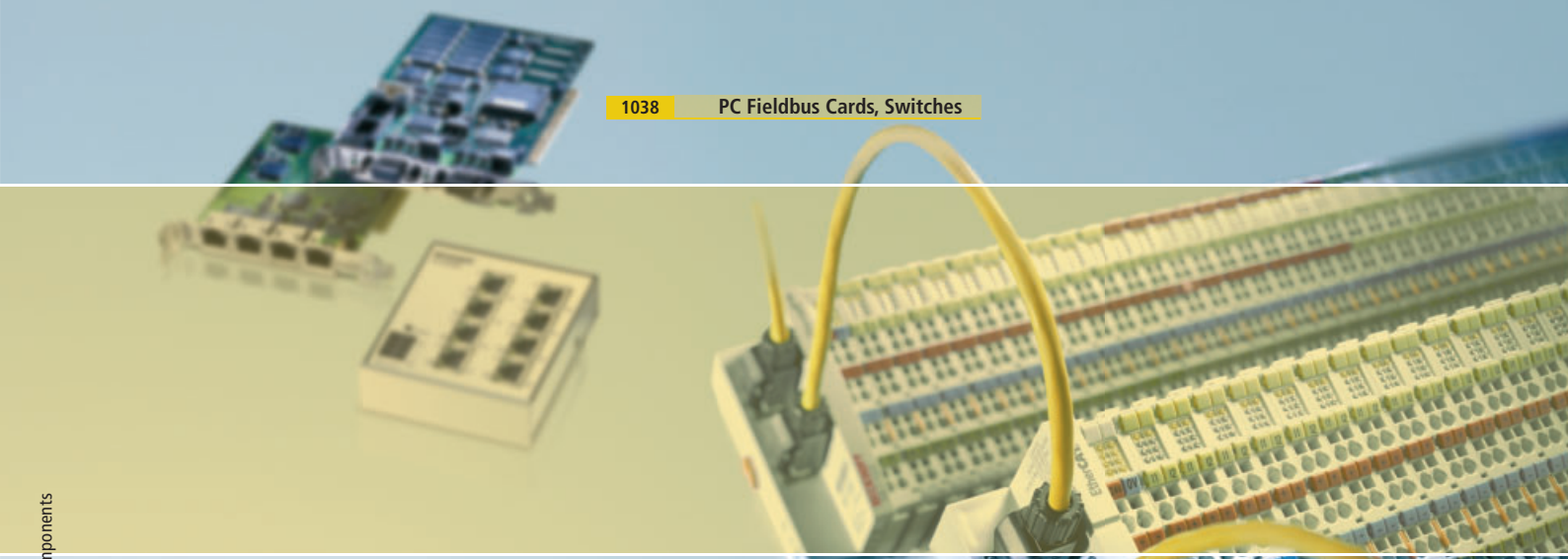
Cooling	
Cooling mode	passive/active
Operating temperature	0...60 °C
Extended temperature	on request
Storage temperature	-20...+70 °C

Dimensions	
Format	PC/104+
Dimensions (W x H x D)	90 mm x 24 mm x 96 mm
Further information	<a href="http://www.beckhoff.com/CB4053">www.beckhoff.com/CB4053</a>

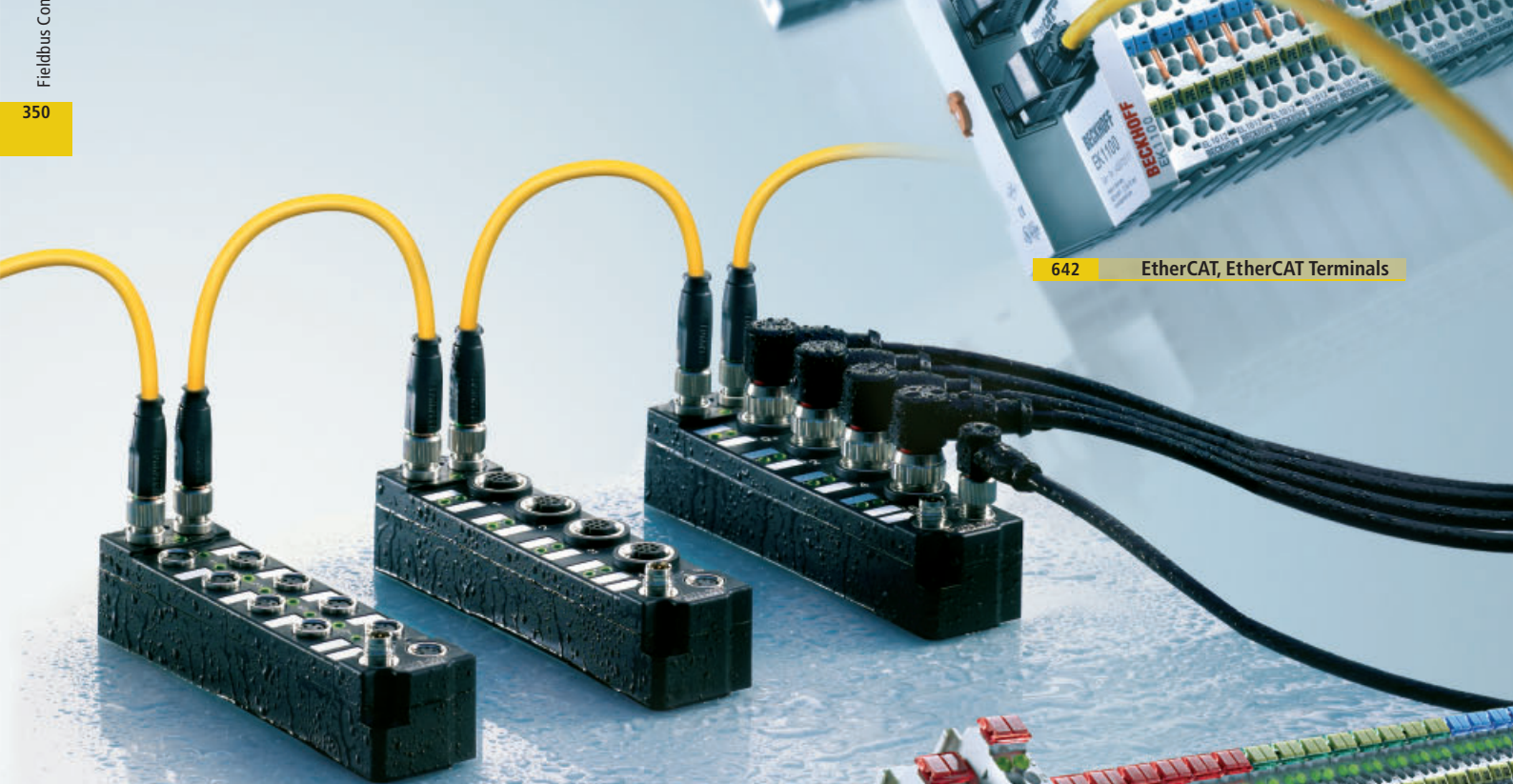


# Fieldbus Components

I/Os for all common fieldbus systems



642 EtherCAT, EtherCAT Terminals



840 Fieldbus Box, EtherCAT Box



358 Bus Terminal

# Fieldbus Components

I/Os for all common fieldbus systems

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Configuration software for extended project design, commissioning and parameterisation
- 1065 KS8000  
Communication library for serial fieldbus components
- 1146 TwinCAT PLC  
Software PLC and IEC 61131-3 programming system
- 1154 TwinCAT I/O  
Configuration tool and driver for fieldbus components



# The fieldbus toolkit

Beckhoff provides an extensive range of fieldbus components for all common I/O and fieldbus systems. The wide choice of I/O components means that the bus system best suited to the particular application can be chosen:

## EtherCAT

EtherCAT (Ethernet for Control Automation Technology) is the Ethernet solution for industrial automation, characterised by outstanding performance and particularly simple handling.

## Ethernet

Ethernet is the dominant standard in the office world. The advantages of Ethernet, such as high data transmission rates, easy methods of integration into existing networks, and a wide range of services and interfaces are also found in the Beckhoff Ethernet products.

## Lightbus

This well proven fibre optics bus system from Beckhoff is characterised by particularly good immunity to EMI, easy installation and a very fast, cyclic and deterministic data flow.

## PROFIBUS

PROFIBUS is widely used as a fast bus for decentralised peripheral components (PROFIBUS DP). In addition to PROFIBUS DP and FMS, Beckhoff also supports the standard for drive communication, PROFIBUS MC.

## PROFINET

PROFINET is the open Industrial Ethernet standard of the PNO (PROFIBUS users organisation). Internationally established IT standards such as TCP/IP are used for communication.

## EtherNet/IP

EtherNet/IP is the Industrial Ethernet standard of the ODVA (Open DeviceNet Vendor Association). EtherNet/IP is based on Ethernet TCP/IP and UDP/IP.

## CANopen

The effective utilisation of the bus bandwidth allows CANopen to achieve a short system reaction time at comparatively low data rates.

The typical advantages of CAN, such as high data security and multi-master capability are retained.

## DeviceNet

DeviceNet is a sensor/actuator bus system that originated in the USA, but which meanwhile is increasingly being used in Europe and Asia. DeviceNet is CAN based (Controller Area Network).

## Interbus

Interbus is easy to configure, fast and reliable. The shift register protocol of the master/slave system offers high efficiency in cyclic communication.

## SERCOS interface

SERCOS was originally developed as a fast fibre optic bus system for drives. Thanks to the Beckhoff SERCOS Bus Coupler, the advantages such as high data rate and short cycle times can now be provided for the I/O peripherals too.

## ControlNet

ControlNet is an open, standardised fieldbus system. The protocol allows both cyclic and acyclic data to be exchanged over the bus without affecting each other.

## CC-Link

CC-Link (Control & Communication Link) is an open bus system for communication between the control and fieldbus level. It is predominately used in Asia.

## Fipio

FIP complies with the European standard EN 50170 and receives manufacturer-independent support from the WorldFIP organisation. Through periodic and aperiodic exchange of variables and messages, the performance of the bus can be adjusted to the application.

## USB

USB has grown into a standard interface for PC technology. Thanks to its high transmission rate, flexible topology through integrated hubs and the Beckhoff USB Bus Coupler, this system can be used as a substitute for a fieldbus when distances are small.

## Modbus

Modbus is an open, serial communications protocol based on the master/slave architecture. Since it is extremely easy to implement on all kinds of serial interfaces, it has gained wide acceptance.

## RS232/RS485

The "classic" serial interfaces, RS232 and RS485, continue in wide use. The Beckhoff RS485/RS232 I/O modules use a simple, published serial communication protocol that is easy to implement.

## AS-Interface

AS-Interface connects sensors and actuators with the higher control level via a simple and low-priced wiring method. AS-Interface is internationally standardised through EN 50295 and IEC 62026-2.

## IO-Link

IO-Link serves to connect sensors and actuators to the control level by means of an inexpensive point-to-point connection. As an open interface, IO-Link can be integrated in all common fieldbus systems.

## DALI

The "Digital Addressable Lighting Interface" is a building automation standard for the digital control of electronic ballasts. DALI is used as a subsystem, e.g. for controlling lighting, blinds or temperature, and can communicate directly with the building management system.

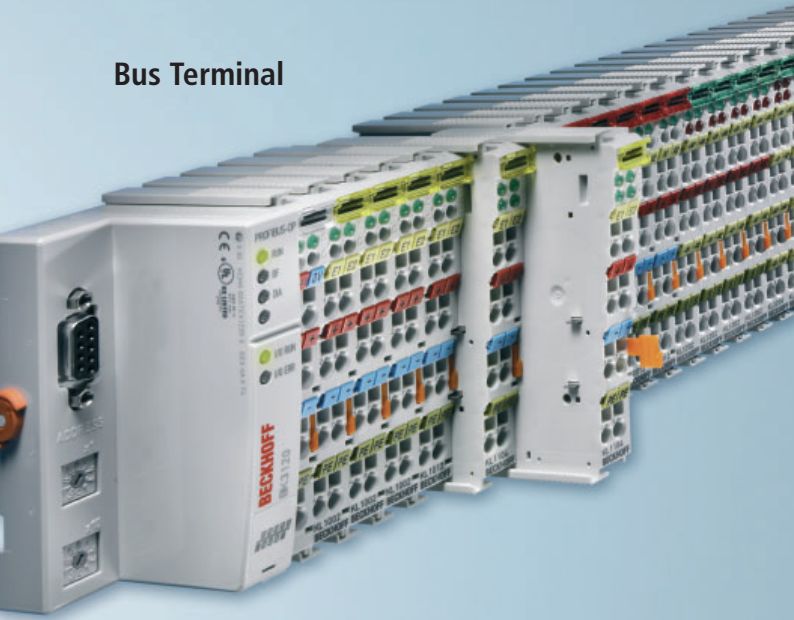
## EIB

EIB (European Installation Bus) is widely and mainly used in Europe as a bus system for cabling in buildings.

## LON

LON (Local Operating Network) is a multi-network-capable communication system for distributed applications. It is predominately used for automation applications in commercial buildings.

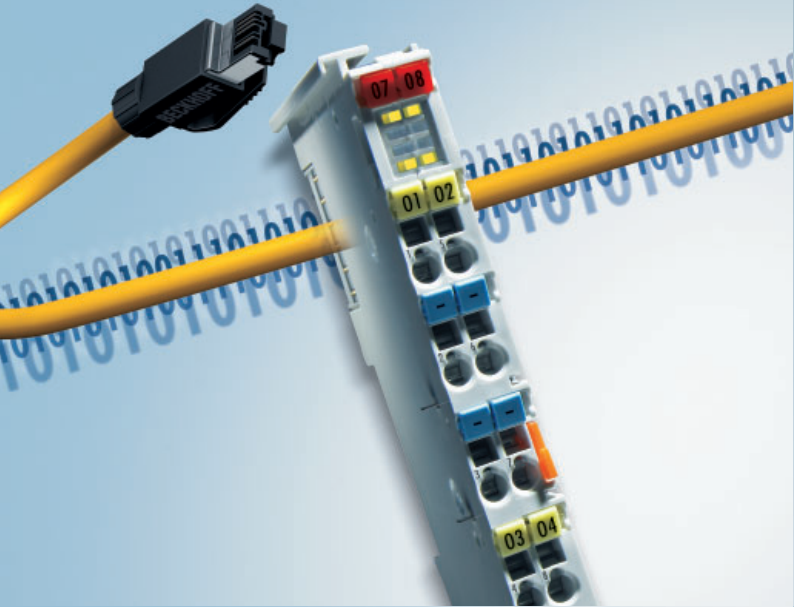
Bus Terminal



Fieldbus Box, EtherCAT Box



EtherCAT Terminals



PC Fieldbus Cards



TwinSAFE



ControlNet

CANopen



Ethernet TCP/IP



Fipio

EtherCAT

LIGHTBUS



Certified! No.099



Modbus

DALI

LON



CC-Link

EIB



# Fieldbus overview

Fieldbus	Bus Terminal <span style="float: right;">358</span>				EtherCAT Terminals <span style="float: right;">642</span>		Fieldbus Box <span style="float: right;">840</span>			
	Bus Couplers		PLC (IEC 61131-3)		Couplers/Gateways		Compact Box	Coupler Box	PLC Box (IEC 61131-3)	
<b>EtherCAT</b>	BK1120	394			EK1xxx	684		IL230x-B110	866	
	BK1250	396								
<b>LIGHTBUS</b>	BK2xx0	398	BC2000	444	EL6720 master terminal	804	IPxxxx-B200	IL230x-B200	870	
<b>PROFIBUS</b>	BK3xx0	400	BC31x0	446	EK3100	696	IPxxxx-B31x	IL230x-B31x	IL230x-C31x	874
	LC3100	407	BX3100	448	EL6731	805				
					master/slave terminal					
<b>INTERBUS</b> <small>Certified No.099</small>	BK4xx0	408	BC4000	450	EL6740	806	IPxxxx-B400	IL230x-B400	878	
					slave terminal					
<b>CANopen</b>	BK51xx	412	BC5150	452	EK5100	697	IPxxxx-B51x	IL230x-B51x	882	
	LC5100	415	BX5100	454	EL6751	807				
					master/slave terminal					
<b>DeviceNet</b>	BK52x0	416	BC5250	456	EK5200	698	IPxxxx-B52x	IL230x-B52x	886	
	LC5200	419	BX5200	458	EL6752	808				
					master/slave terminal					
<b>ControlNet</b>	BK7000	420								
<b>CC-Link</b>	BK7150	422								
<b>Modbus</b>	BK73x0	424	BC7300	460			IPxxxx-B730	IL230x-B730	890	
<b>Fipio</b>	BK7420	426								
<b>SERCOS interface</b>	BK75x0	428			EK9700	702				
<b>RS485</b>	BK8000	430	BC8000	462	EL6021, EL6022	795	IPxxxx-B800	IL230x-B800	894	
				BX8000						464
<b>RS232</b>	BK8100	430	BC81x0	462	EL6001, EL6002	794	IPxxxx-B810	IL230x-B810	IL230x-C810	898
<b>Ethernet TCP/IP</b>	BK9xx0	432	BC9xx0	466	EK9000	699		IL230x-B90x	IL230x-C900	902
				BX9000	472	EL6601, EL6614				
					switch port					
<b>PROFIBUS NET</b>	BK9103	436			EK9300	700		IL230x-B903	906	
					EL6631	801				
					IO controller/device terminal					
<b>EtherNet/IP</b>	BK9105	438			EK9500	701		IL230x-B905	910	
<b>USB B</b>	BK9500	440								
<b>AS INTERFACE</b>	KL/KS62x1	597			EL6201	798				
		master terminal			master terminal					
<b>IO-Link</b>	KL/KS6224	598			EL6224	799				
		master terminal			master terminal					
<b>EIB</b>	KL/KS6301	599								
		EIB Bus Terminal								
<b>LON</b>	KL/KS6401	600								
		LON Bus Terminal								
<b>MP-Bus</b>	KL/KS6771	604								
		master terminal								
<b>DALI/DSI</b>	KL/KS6811	605								
		master terminal								
<b>IEEE 1588</b>					EL6688 master/slave terminal	802				
<b>DMX</b>					EL6851 master terminal	809				

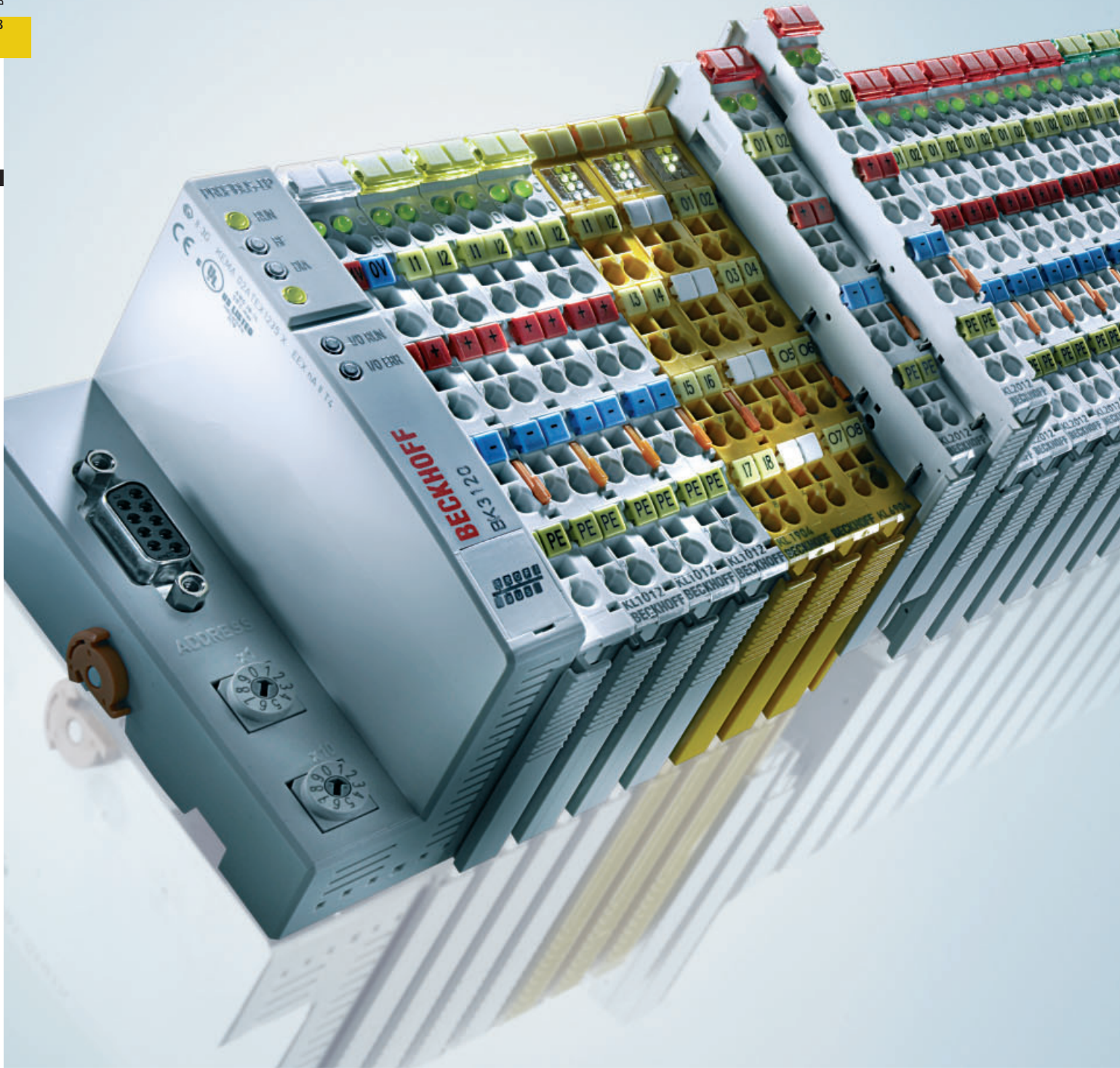
EtherCAT Box Modules	Fieldbus Modules	PC Fieldbus Cards, Switches	Embedded PC	Drive Technology	Accessories	I/O terminal demokits
970	1008	1038	246	1066		
Modules	Modules	Interface	Master/Slave	Servo Drives	Connectors/ Cables	
EPxxx 972		FC90xx, FC1100 1048 CU20xx, CU2508 1058 Ethernet Switch	CXxxx 246	AX5xxx 1072 AX20xx-B110 1098	ZS1090-000x 836 ZK1090-00xx 836	TC9910-B110 839 TC9910-B111 839
		FC200x 1043	CX1500-M/B200 302	AX2xxx-B200 1098	Z1xxx 1036	TC9910-B/C200 639
	FM33xx-B310 1010	FC31xx 1044	CXxxx 246 CX1500-M/B310 302	AX2xxx-B310 1098	ZB3100 634 ZK/ZS1031 634	TC9910-B310 639 TC9910-C310 639
					ZB4200 636	TC9910-B400 639 TC9910-C400 639
		FC51xx 1045	CXxxx 246 CX1500-M/B510 303	AX20xx 1098 AX25xx-B510 1100	ZS1052 634 ZK/ZS1052 634	TC9910-B510 639
		FC52xx 1046	CX1500-M/B520 303	AX20xx-B520 1098	ZS1052 634 ZK/ZS1052 634	TC9910-B520 639
			CXxxx 246		ZK/ZS1031 634	TC9910-C730 639
		FC75xx 1047	CX1500-M750 303	AX2xxx-B750 1098	Z1xxx 634	TC9910-B750 639
			CXxxx 246	AX20xx 1098	ZK/ZS1031 634	TC9910-B800 639 TC9910-C800 639
			CXxxx 246	AX20xx 1098	ZK/ZS1031 634	TC9910-B/C810 639 TC9910-C815 639
		FC90xx 1048 CU20xx, CU2508 1058 Ethernet Switch	CXxxx 246	AX2xxx-B900 1098	ZS1090 836 ZB90x0 636	TC9910-B900 639 TC9910-C900 639
		CU2508 1061	CXxxx 246			TC9910-B903 639
		CU2508 1061	CXxxx 246			

# Signal overview

Signal	Bus Terminal <span style="float: right;">358</span>				Terminal Modules	EtherCAT Terminals
	1-, 2-channel	4-channel	8-channel	16-channel		
<b>Digital input</b>						
5 V DC		KL/KS1124 <span>480</span>				
12 V DC						
24 V DC	KL/KS1xx2 <span>476</span>	KL/KS1xx4 <span>479</span>	KL/KS1xx8 <span>492</span>	KL18xx <span>498</span>	KM11xx <span>503</span>	EL/ES1xx2 <span>705</span>
48 V DC	KL/KS1032 <span>477</span>					
60 V DC	KL/KS1712 <span>495</span>					
120 V AC/DC						EL/ES1712 <span>722</span>
230 V AC	KL/KS17x2 <span>495</span>					EL/ES17x2 <span>722</span>
Safety		KL1904 <span>502</span>				
Namur	KL/KS1352 <span>487</span>					
Counter	KL/KS15xx <span>493</span>					EL/ES15x2 <span>723</span>
<b>Digital output</b>						
5 V DC		KL/KS2124 <span>509</span>				
12 V DC						
24 V DC	KL/KS2xx2 <span>507</span>	KL/KS2xx4 <span>508</span>	KL/KS24x8 <span>513</span>	KL28xx <span>537</span>	KM20xx <span>541</span>	EL/ES2xx2 <span>726</span>
125 V AC/DC	KL/KS2612 <span>524</span>					
230 V AC	KL/KS2xx1 <span>524</span>				KM2xxx <span>545</span>	EL/ES2xx2 <span>742</span>
400 V AC	KL/KS2631 <span>525</span>					
Safety		KL2904 <span>540</span>				EL2902 <span>739</span>
PWM	KL/KS25xx <span>516</span>					EL/ES25xx <span>745</span>
<b>Digital combi</b>						
24 V DC						
<b>Analog input</b>						
0...2 V, ±2 V	KL/KS31x2 <span>556</span>					
0...10 V	KL/KS3x6x <span>552</span>	KL/KS3x64 <span>553</span>	KL/KS3468 <span>570</span>			EL/ES3x6x <span>750</span>
±10 V	KL/KS3xxx <span>548</span>	KL/KS3404 <span>570</span>	KL/KS3408 <span>570</span>			EL/ES3x0x <span>753</span>
0...20 mA	KL/KS3xxx <span>549</span>	KL/KS3x44 <span>551</span>	KL/KS3448 <span>571</span>			EL/ES3xxx <span>759</span>
4...20 mA	KL/KS3xxx <span>549</span>	KL/KS3x54 <span>551</span>	KL/KS3458 <span>572</span>			EL/ES3xxx <span>764</span>
Thermocouple	KL331x <span>562</span>	KL3314 <span>563</span>				EL331x <span>768</span>
Resistance thermometer	KL/KS32xx <span>558</span>	KL/KS3204 <span>559</span>	KL/KS3228 <span>561</span>			EL/ES320x <span>770</span>
Resistor bridge	KL/KS335x <span>564</span>					EL/ES335x <span>773</span>
Power measurement	KL/KS3xxx <span>568</span>					EL/ES3xxx <span>776</span>
Condition Monitoring						EL/ES3632 <span>775</span>
Pressure measurement	KM37xx <span>573</span>					
<b>Analog output</b>						
0...10 V	KL/KS400x <span>576</span>	KL/KS4x04 <span>577</span>	KL/KS4408 <span>583</span>		KM4602 <span>586</span>	EL/ES4x0x <span>780</span>
±10 V	KL/KS4x3x <span>579</span>	KL/KS4xx4 <span>580</span>	KL/KS4438 <span>583</span>			EL/ES4x3x <span>782</span>
0...20 mA	KL/KS4x1x <span>578</span>	KL/KS4414 <span>584</span>	KL/KS4418 <span>584</span>			EL/ES4x1x <span>785</span>
4...20 mA	KL/KS402x <span>578</span>	KL/KS4424 <span>584</span>	KL/KS4428 <span>584</span>			EL/ES4x2x <span>788</span>
<b>Special functions</b>						
SSI sensor interface	KL/KS50x1 <span>588</span>					EL/ES500x <span>790</span>
Incremental encoder in.	KL/KS5x1x <span>589</span>					EL/ES51xx <span>792</span>
RS232	KL/KS60x1 <span>593</span>					EL/ES600x <span>794</span>
RS485	KL/KS60x1 <span>595</span>					EL/ES602x <span>795</span>
TTY	KL/KS6011 <span>594</span>					
Motion Control	KL/KS2xxx <span>519</span>					EL/ES7xxx <span>811</span>

KLxxx/ELxxx: Standard Terminals, KSxxx/ESxxx: Terminals with plugable wiring terminal

642			Fieldbus Box 840		EtherCAT Box 970	Fieldbus Modules 1008	Lightbus Modules 1012
4-channel	8-channel	16-channel	Compact Box Coupler/PLC Box	Extension Box	Modules	Modules	Modules
EL/ES1124 704							
EL/ES1144 704							
EL/ES1xx4 705	EL/ES10x8 705	EL18xx 706	IP10xx-Bxxx 914	IE10xx 944	EP1xxx 973		M1110/1400 1027
EL/ES1134 704							
EL19x4 720							
			IP1502-Bxxx 915	IE1502 945			
EL/ES2124 725							
EL/ES2024 732							
EL/ES20x4 726	EL/ES20x8 726	EL2xxx 727	IP20xx-Bxxx 916	IE2xxx 946	EP2xxx 976		M1110/1400 1027
EL2624 743							
EL29x4 740							
			IP2512-Bxxx 919	IE2512 950			
			IP/IL2xxx-Bxxx 920	IE2xxx 951	EP23xx 979		M1400/2400 1028
			IL230x-Cxxx 940				
EL/ES3x64 752	EL/ES3068 752						M2510 1030
EL/ES3x04 754	EL/ES3008 754		IP3102-Bxxx 924	IE3102 956	EP3174 982		M2510 1030
EL/ES3xx4 761	EL/ES3048 762		IP3112-Bxxx 925	IE3112 957	EP3174 982		
EL/ES3xx4 766	EL/ES3058 767						M2510 1030
EL3314 769			IP3312-Bxxx 927	IE3312 959	EP3314 984	FM33xx 1010	
EL/ES3204 771			IP3202-Bxxx 926	IE3202 958	EP3204 983		
EL/ES4x04 781	EL/ES4008 781						
EL/ES4x34 783	EL/ES4038 783		IP4132-Bxxx 929	IE4132 961	EP4174 985		M2510 1030
EL/ES4x14 786	EL/ES4018 786		IP4112-Bxxx 928	IE4112 960	EP4174 985		
EL/ES4x24 789	EL/ES4028 789						
			IP5009-Bxxx 930	IE5009 962			
			IP5109-Bxxx 931	IE5109 963			M31x0 1032
			IP6002-Bxxx 933	IE6002 964			
			IP6022-Bxxx 935	IE6022 966			
			IP6012-Bxxx 934	IE6012 965			
					EP7041 986		



# Bus Terminal

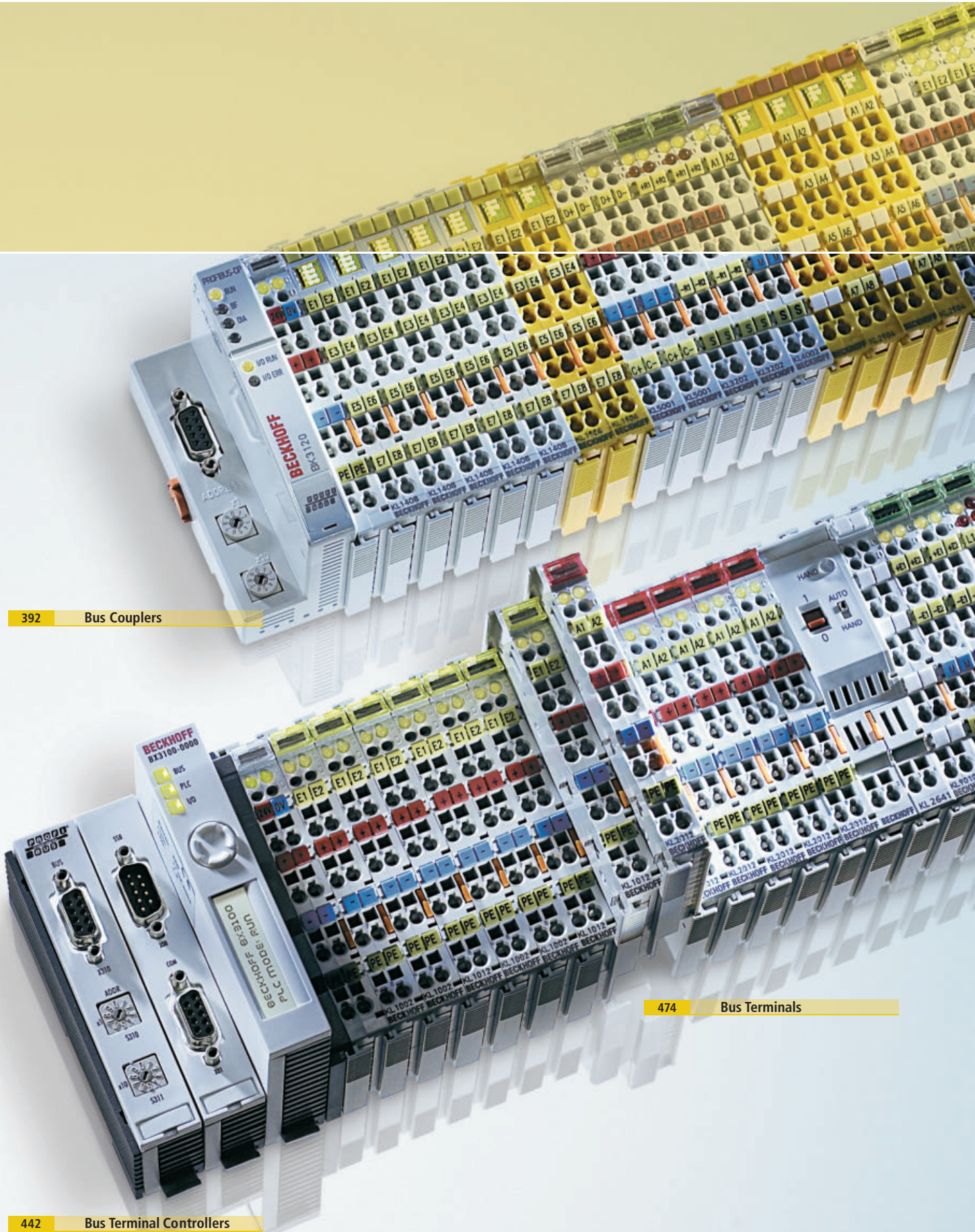
The modular fieldbus system for automation



392 Bus Couplers

474 Bus Terminals

442 Bus Terminal Controllers



# Bus Terminal

Independence from signals and fieldbuses with one system

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442	<b>Bus Terminal Controllers</b>
444	Lightbus BC2000
446	PROFIBUS BC31x0, BX3100
450	Interbus BC4000
452	CANopen BC5150, BX5100
456	DeviceNet BC5250, BX5200
460	Modbus BC7300
462	RS232/RS485 BC8xx0, BX8000
466	Ethernet TCP/IP BC9xx0, BX9000

502	<b>Safety terminals</b>
502	TwinSAFE terminals KLx904
612	<b>System terminals</b>
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392	<b>Bus Couplers</b>
394	EtherCAT BK1120, BK1250
398	Lightbus BK2xx0
400	PROFIBUS BK3xx0, LC3100
408	Interbus BK4xx0
412	CANopen BK51xx, LC5100
416	DeviceNet BK52x0, LC5200
420	ControlNet BK7000
422	CC-Link BK7150
424	Modbus BK73x0
426	Fipio BK7420
428	SERCOS interface BK75x0
430	RS232/RS485 BK8x00
432	Ethernet TCP/IP BK9xx0
436	PROFINET BK9103
438	EtherNet/IP BK9105
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474	<b>Bus Terminals digital I/O</b>
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1062	<b>Software</b>
1064	Configuration software KS2000
1146	Programming system TwinCAT

588	<b>Bus Terminals special functions</b>
588	Position measurement KL5xxx, KS5xxx
593	Communication, master terminals KL6xxx, KS6xxx, KM6551
608	Power terminals KL8xxx

# System overview Bus Couplers

Bus Coupler						PLC	
Features	Standard BKxx00	Economy BKxx10	Economy plus BKxx20	Compact BKxx50	Low Cost LCxx00	Controller BCxx00	BCxx50
							
<b>Function</b>	fieldbus slave	fieldbus slave	fieldbus slave	fieldbus slave	fieldbus slave	fieldbus slave, with integrated IEC 61131-3 PLC	fieldbus slave, with integrated IEC 61131-3 PLC
<b>Program memory</b>	–	–	–	–	–	32/96 kbyte	48 kbyte
<b>Power supply</b>	1750 mA	500 mA	1750 mA	1000 mA	500 mA	1750 mA	1000 mA
<b>Fieldbus connection</b>	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	direct to the spring-loaded terminals	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)
<b>Supported Bus Terminals</b>	all	only digital I/Os (except KL15xx, KL25xx, KL2692, KL27x1)	all	all	only digital I/Os (except KL15xx, KL25xx, KL2692, KL27x1)	all	all
<b>Maximum number of Bus Terminals</b>	64	64	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	64	64	64 (255 with terminal bus extension)
<b>Electrical isolation</b>	between fieldbus/ power contacts/ supply voltage	between fieldbus/ power contacts/ supply voltage	between fieldbus/ power contacts/ supply voltage	between fieldbus/ power contacts/ supply voltage	PROFIBUS: yes, CANopen and DeviceNet: no	between fieldbus/ power contacts/ supply voltage	between fieldbus/ power contacts/ supply voltage

		Industrial PC					
	BCxx20	BXxx00	Embedded PC				
			CX80xx	CX9xxx	CX1010	CX50xx	CX1020, CX1030
							
	fieldbus slave, with integrated IEC 61131-3 PLC	fieldbus slave, with integrated IEC 61131-3 PLC	Embedded PC, fieldbus slave, with integrated IEC 61131-3 PLC	Embedded PC, with integrated IEC 61131-3 PLC Motion Control, visualisation	Embedded PC, with integrated IEC 61131-3 PLC Motion Control, visualisation	Embedded PC, with integrated IEC 61131-3 PLC Motion Control, visualisation	Embedded PC, with integrated IEC 61131-3 PLC Motion Control, visualisation
	128 kbyte	256 kbyte	64 Mbyte	64...128 Mbyte	256 Mbyte DDR	512 Mbyte	256 Mbyte... 1 Gbyte DDR
	1750 mA	1450 mA	2000 mA	2000 mA	2000 mA	2000 mA	2000 mA
	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	–	optional, plug (design depends on the fieldbus)	optional, plug (design depends on the fieldbus)	optional, plug (design depends on the fieldbus)
	all	all	all	all	all	all	all
	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)
	between fieldbus/ power contacts/ supply voltage	between fieldbus/ power contacts/ supply voltage	between supply voltage and K-bus	between supply voltage and K-bus	between supply voltage and K-bus	between supply voltage and K-bus	between supply voltage and K-bus

Embedded PC see 246

# Product overview Bus Couplers

Bus Coupler						PLC	
Fieldbus slave	Standard	Economy only digital I/O	Economy plus	Compact	Low Cost only digital I/O	Controller (IEC 61131-3)	
						Program memory 32/96 kbyte	Program memory 48 kbyte
<b>EtherCAT</b>			<b>BK1120</b> 394	<b>BK1250</b> 396			
<b>LIGHTBUS</b>	<b>BK2000</b> 398 <b>BK2500</b> 398 RS485 interface	<b>BK2010</b> 398	<b>BK2020</b> 398			<b>BC2000</b> 444	
<b>PROFINET</b>		<b>BK3010</b> 400 1.5 Mbaud					
	<b>BK3100</b> 400 12 Mbaud <b>BK3500</b> 404 1.5 Mbaud, fibre optic	<b>BK3110</b> 400 12 Mbaud	<b>BK3120</b> 402 12 Mbaud <b>BK3520</b> 406 12 Mbaud, fibre optic	<b>BK3150</b> 403 12 Mbaud	<b>LC3100</b> 407 12 Mbaud	<b>BC3100</b> 446 12 Mbaud	<b>BC3150</b> 446 12 Mbaud
<b>INTERBUS</b> Certified No.099	<b>BK4000</b> 408 <b>BK4500</b> 410 fibre optic	<b>BK4010</b> 408	<b>BK4020</b> 408			<b>BC4000</b> 450	
<b>CANopen</b>		<b>BK5110</b> 412	<b>BK5120</b> 412	<b>BK5150</b> 414 <b>BK5151</b> 414	<b>LC5100</b> 415		<b>BC5150</b> 452
<b>DeviceNet</b>	<b>BK5200</b> 416	<b>BK5210</b> 416	<b>BK5220</b> 416	<b>BK5250</b> 418	<b>LC5200</b> 419		<b>BC5250</b> 456
<b>ControlNet</b>	<b>BK7000</b> 420						
<b>CC-Link</b>				<b>BK7150</b> 422			
<b>Modbus</b>	<b>BK7300</b> 424			<b>BK7350</b> 424		<b>BC7300</b> 460	<b>BC8150</b> 462
<b>Fipio</b>			<b>BK7420</b> 426				
<b>SERCOS interface</b>	<b>BK7500</b> 428		<b>BK7520</b> 428				
<b>RS485</b>	<b>BK8000</b> 430					<b>BC8000</b> 462	
<b>RS232</b>	<b>BK8100</b> 430					<b>BC8100</b> 462	<b>BC8150</b> 462
<b>Ethernet TCP/IP</b>	<b>BK9000</b> 432 <b>BK9100</b> 434 2-channel switch			<b>BK9050</b> 432		<b>BC9000</b> 466 <b>BC9100</b> 470 2-channel switch	<b>BC9050</b> 466
<b>PROFINET</b>	<b>BK9103</b> 436 2-channel switch						
<b>EtherNet/IP</b>	<b>BK9105</b> 438 2-channel switch						
<b>USB</b>	<b>BK9500</b> 440						

		Industrial PC				
		Embedded PC				
Program memory 128 kbyte	Program memory 256 kbyte	CX80xx	CX9xxx	CX1010	CX50xx	CX1020, CX1030
		<b>CX8010</b> 262			optional <sup>(2)</sup>	
				optional <sup>(1)</sup>		optional <sup>(1)</sup>
	<b>BX3100</b> 448 12 Mbaud	<b>CX8031</b> 263		optional <sup>(1)</sup>	optional <sup>(2)</sup>	optional <sup>(1)</sup>
	<b>BX5100</b> 454	<b>CX8051</b> 264		optional <sup>(1)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>
	<b>BX5200</b> 458					
			optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(3)</sup>
	<b>BX8000</b> 464		optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>
	<b>BX8000</b> 464		optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>
<b>BC9020</b> 468 <b>BC9120</b> 468 2-channel switch	<b>BX9000</b> 472	<b>CX8090</b> 265	<b>CX9000</b> 272 <b>CX9010</b> 274	<b>CX1010</b> 280	<b>CX5010</b> 284 <b>CX5020</b> 284	<b>CX1020</b> 290 <b>CX1030</b> 292
		<b>CX8093</b> 266	optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(2)</sup>	optional <sup>(3)</sup>
		<b>CX8095</b> 267	optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(2)</sup>	optional <sup>(3)</sup>

<sup>(1)</sup>via modular fieldbus interface, <sup>(2)</sup>via system interface, <sup>(3)</sup>via software library | Embedded PC see 246

# Product overview Bus Terminals

Digital input: KL1xxx   KS1xxx			
Signal	2-channel		4-channel
<b>5 V DC</b>			<b>KL1124</b>   KS1124 <b>480</b> filter 0.2 ms
<b>24 V DC</b>	<b>KL1002</b>   KS1002 <b>476</b> filter 3.0 ms  <b>KL1052</b>   KS1052 <b>478</b> filter 3.0 ms, p/n-switching  <b>KL1212</b>   KS1212 <b>483</b> filter 3.0 ms, short-circuit-protected sensor supply  <b>KL1302</b>   KS1302 <b>485</b> filter 3.0 ms, type 2 sensors  <b>KL1402</b>   KS1402 <b>490</b> filter 3.0 ms, type 3  <b>KL1232</b>   KS1232 <b>484</b> pulse expansion  <b>KL1362</b>   KS1362 <b>488</b> break-in alarm  <b>KL1382</b>   KS1382 <b>489</b> thermistor	<b>KL1012</b>   KS1012 <b>476</b> filter 0.2 ms    <b>KL1312</b>   KS1312 <b>485</b> filter 0.2 ms, type 2 sensors  <b>KL1412</b>   KS1412 <b>490</b> filter 0.2 ms, type 3	<b>KL1104</b>   KS1104 <b>479</b> filter 3.0 ms  <b>KL1114</b>   KS1114 <b>479</b> filter 0.2 ms  <b>KL1154</b>   KS1154 <b>481</b> filter 3.0 ms, p/n-switching  <b>KL1184</b>   KS1184 <b>482</b> filter 3.0 ms, n-switching  <b>KL1304</b>   KS1304 <b>486</b> filter 3.0 ms, type 2 sensors  <b>KL1404</b>   KS1404 <b>491</b> filter 3.0 ms, 4 x 2-wire connection  <b>KL1434</b>   KS1434 <b>491</b> filter 0.2 ms, type 2 sensors, 4 x 2-wire connection  <b>KL1804</b> <b>496</b> 8 x 24 V, 4 x 0 V, 3.0 ms, type 3  <b>KL1904</b> <b>502</b> TwinSAFE, 4 safe inputs
<b>≥ 48 V DC</b>	<b>KL1032</b>   KS1032 <b>477</b> filter 3.0 ms	<b>KL1712-0060</b> <b>495</b> power contacts	
<b>120 V AC/DC</b>	<b>KL1712</b>   KS1712 <b>495</b> power contacts		
<b>230 V AC</b>	<b>KL1702</b>   KS1702 <b>495</b> power contacts	<b>KL1722</b>   KS1722 <b>495</b> no power contacts	
<b>Namur</b>	<b>KL1352</b>   KS1352 <b>487</b>		
<b>Counter</b>	<b>KL1501</b>   KS1501 <b>493</b> up/down, 24 V DC, 100 kHz	<b>KL1512</b>   KS1512 <b>494</b> up/down, 24 V DC, 1 kHz, 16 bit	

KLxxxx: Standard Bus Terminals, KSxxxx: Bus Terminals with pluggable wiring level  
 EN 61131-2 specification: [www.beckhoff.com/EN61131-2](http://www.beckhoff.com/EN61131-2)

		KM1xxx	
8-channel	16-channel	4-, 16-, 32-, 64-channel	
<b>KL1408</b>   KS1408 <span style="float: right;">492</span> filter 3.0 ms	<b>KL1862</b> <span style="float: right;">500</span> filter 3.0 ms, flat-ribbon cable connection, type 3	<b>KM1002</b> <span style="float: right;">503</span> filter 3.0 ms, 16-channel	
<b>KL1418</b>   KS1418 <span style="float: right;">492</span> filter 0.2 ms	<b>KL1862-0010</b> <span style="float: right;">500</span> filter 3.0 ms, flat-ribbon cable connection, type 3, 0 V (ground) switching	<b>KM1012</b> <span style="float: right;">503</span> filter 0.2 ms, 16-channel	
<b>KL1488</b>   KS1488 <span style="float: right;">492</span> filter 3.0 ms, n-switching	<b>KL1872</b> <span style="float: right;">500</span> filter 0.2 ms, flat-ribbon cable connection, type 3	<b>KM1004</b> <span style="float: right;">504</span> filter 3.0 ms, 32-channel	
<b>KL1498</b>   KS1498 <span style="float: right;">492</span> filter 0.2 ms, n-switching		<b>KM1014</b> <span style="float: right;">504</span> filter 0.2 ms, 32-channel	
<b>KL1808</b> <span style="float: right;">497</span> 8 x 24 V DC, 3.0 ms, type 3	<b>KL1809</b> <span style="float: right;">498</span> filter 3.0 ms, type 3	<b>KM1008</b> <span style="float: right;">505</span> filter 3.0 ms, 64-channel	
	<b>KL1819</b> <span style="float: right;">498</span> filter 0.2 ms, type 3	<b>KM1018</b> <span style="float: right;">505</span> filter 0.2 ms, 64-channel	
	<b>KL1859</b> <span style="float: right;">499</span> 8 inputs, 8 outputs, filter 3.0 ms, type 3, $I_{max} = 0.5 A$		
	<b>KL1889</b> <span style="float: right;">501</span> filter 3.0 ms, 0 V (ground) switching	<b>KM1644</b> <span style="float: right;">506</span> manual operation, 4-channel	



# Product overview Bus Terminals

Digital output: KL2xxx   KS2xxx					
Signal	1-channel	2-channel	4-channel		
5 V DC			KL2124   KS2124 509		
24 V DC		KL2012   KS2012 507 <small>I<sub>MAX</sub> = 0.5 A</small> KL2032   KS2032 507 <small>I<sub>MAX</sub> = 0.5 A, reverse voltage protection</small> KL2442 514 <small>2 x 4 A/1 x 8 A</small>	KL2022   KS2022 507 <small>I<sub>MAX</sub> = 2.0 A</small> KL2212   KS2212 511 <small>I<sub>MAX</sub> = 0.5 A, diagnostic, protected sensor supply</small>	KL2114   KS2114 508 <small>I<sub>MAX</sub> = 0.5 A</small> KL2184   KS2184 510 <small>I<sub>MAX</sub> = 0.5 A, n-switching</small> KL2404   KS2404 512 <small>I<sub>MAX</sub> = 0.5 A, 4 x 2-wire</small> KL2904 540 <small>TwinSAFE, 4 safe outputs</small>	KL2134   KS2134 508 <small>I<sub>MAX</sub> = 0.5 A, reverse voltage protection</small> KL2424   KS2424 512 <small>I<sub>MAX</sub> = 2.0 A, 4 x 2-wire</small>
24 V AC/DC			KL2784   KS2784 532 <small>I<sub>MAX</sub> = 1.0 A, solid state</small>	KL2794   KS2794 533 <small>I<sub>MAX</sub> = 1.0 A, solid state, potential-free contacts</small>	
125 V AC		KL2612   KS2612 524 <small>relay, change-over</small>			
230 V AC	KL2641 526 <small>relay, make contact, manual operation, 16 A</small> KL2751   KS2751 534 <small>universal dimmer, 300 W</small> KL2761   KS2761 535 <small>universal dimmer, 600 W</small> KL2701   KS2701 529 <small>solid state load relay, 3 A</small>	KL2602   KS2602 524 <small>relay, make contact</small> KL2652   KS2652 527 <small>relay, change-over</small> KL2712   KS2712 531 <small>triac</small> KL2732   KS2732 531 <small>triac, mutually locked outputs, no power contacts</small>	KL2622   KS2622 524 <small>relay, make contact, no power contacts</small> KL2702   KS2702 530 <small>solid state relay, 0.3 A</small> KL2722   KS2722 531 <small>triac, mutually locked outputs</small> KL2692   KS2692 528 <small>cycle monitoring (watchdog)</small>		
400 V AC	KL2631   KS2631 525 <small>relay, make contact</small>				
PWM		KL2502   KS2502 516 <small>24 V DC, 0.1 A</small> KL2535   KS2535 517 <small>24 V DC, 1 A, current-controlled</small>	KL2512   KS2512 516 <small>24 V DC, 1.5 A, n-switching</small> KL2545   KS2545 518 <small>50 V DC, 3.5 A, current-controlled</small>		
Pulse train	KL2521 515				
Stepper motor	KL2531   KS2531 519 <small>I<sub>MAX</sub> = 1.5 A</small> KL2541   KS2541 520 <small>I<sub>MAX</sub> = 5 A</small>				
DC motor output stage		KL2532   KS2532 521 <small>24 V DC, 1 A</small>	KL2552   KS2552 522 <small>50 V DC, 5 A</small>		
AC motor speed controller	KL2791   KS2791 523 <small>230 V AC, 200 VA</small>				

KLxxxx: Standard Bus Terminals, KSxxxx: Bus Terminals with pluggable wiring level

		KM2xxx	
8-channel	16-channel	4-, 16-, 32-, 64-channel	
<b>KL2408</b>   KS2408 <span style="float: right;">513</span> I <sub>MAX</sub> = 0.5 A <b>KL2488</b>   KS2488 <span style="float: right;">513</span> I <sub>MAX</sub> = 0.5 A, n-switching <b>KL2808</b> <span style="float: right;">536</span> I <sub>MAX</sub> = 0.5 A, 8 x 0 V	<b>KL2872</b> <span style="float: right;">538</span> I <sub>MAX</sub> = 0.5 A, flat-ribbon cable connection  <b>KL1859</b> <span style="float: right;">499</span> 8 inputs, 8 outputs, filter 3.0 ms, type 3, I <sub>MAX</sub> = 0.5 A <b>KL2809</b> <span style="float: right;">537</span> I <sub>MAX</sub> = 0.5 A	<b>KL2872-0010</b> <span style="float: right;">538</span> I <sub>MAX</sub> = 0.5 A, flat-ribbon cable connection, 0 V (ground) switching  <b>KL2889</b> <span style="float: right;">539</span> I <sub>MAX</sub> = 0.5 A, 0 V (ground) switching	<b>KM2002</b> <span style="float: right;">541</span> I <sub>MAX</sub> = 0.5 A, 16-channel <b>KM2004</b> <span style="float: right;">542</span> I <sub>MAX</sub> = 0.5 A, 32-channel <b>KM2008</b> <span style="float: right;">543</span> I <sub>MAX</sub> = 0.5 A, 64-channel <b>KM2042</b> <span style="float: right;">544</span> I <sub>MAX</sub> = 0.5 A, 16-channel, D-sub connection  <b>KM2604</b> <span style="float: right;">545</span> relay, 16 A, 4-channel <b>KM2614</b> <span style="float: right;">545</span> relay, 16 A, 4-channel, manual operation <b>KM2642</b> <span style="float: right;">546</span> relay, 6 A, manual/automatic operation <b>KM2774</b> <span style="float: right;">547</span> triac outputs for 4 blind motors

# Product overview Bus Terminals

Analog input: KL3xxx   KS3xxx, KM3xxx					
Signal	1-channel	2-channel	4-channel	8-channel	
0...2 V, 0...500 mV		KL3172   KS3172 556 0...2 V, 16 bit, 0.05 %	KL3172-0500 556 0...500 mV, 16 bit, 0.05 %		
		KL3182   KS3182 556 16 bit, 0.05 %			
± 2 V					
0...10 V	KL3061   KS3061 552 single-ended, 12 bit	KL3062   KS3062 552 single-ended, 12 bit	KL3064   KS3064 553 single-ended, 12 bit	KL3468   KS3468 570 8 x 1-wire connection, 12 bit	
		KL3162   KS3162 556 16 bit, 0.05 %	KL3464   KS3464 570 4 x 2-wire connection, 12 bit	KL3408   KS3408 570 8 x 1-wire connection, 12 bit	
± 10 V	KL3001   KS3001 548 differential input, 12 bit	KL3002   KS3002 548 differential input, 12 bit	KL3404   KS3404 570 4 x 2-wire connection, 12 bit	KL3408   KS3408 570 8 x 1-wire connection, 12 bit	
		KL3102   KS3102 554 differential input, 16 bit	KL3132   KS3132 556 16 bit, 0.05 %		
0...20 mA	KL3011   KS3011 549 differential input, 12 bit	KL3012   KS3012 549 differential input, 12 bit	KL3112   KS3112 555 differential input, 16 bit	KL3444   KS3444 571 4 x 2-wire connection, 12 bit	KL3448   KS3448 571 8 x 1-wire connection, 12 bit
	KL3041   KS3041 550 terminal supply, 12 bit	KL3042   KS3042 550 terminal supply, 12 bit	KL3142   KS3142 557 16 bit, 0.05 %	KL3044   KS3044 551 12 bit	
4...20 mA	KL3021   KS3021 549 differential input, 12 bit	KL3022   KS3022 549 differential input, 12 bit	KL3052   KS3052 550 terminal supply, 12 bit	KL3454   KS3454 572 4 x 2-wire connection, 12 bit	KL3458   KS3458 572 8 x 1-wire connection, 12 bit
	KL3051   KS3051 550 terminal supply, 12 bit	KL3122   KS3122 555 differential input, 16 bit	KL3152   KS3152 557 16 bit, 0.05 %	KL3054   KS3054 551 12 bit	
Thermocouples	KL3311 562 type J, K, L, ...U, 16 bit	KL3312 562 type J, K, L, ...U, 16 bit		KL3314 563 type J, K, L, ...U, 16 bit	
Resistance thermometer (RTD)	KL3201   KS3201 558 PT100...1000, Ni100, 16 bit	KL3202   KS3202 558 PT100...1000, Ni100, 16 bit	KL3222 560 PT100, 4-wire connection	KL3204   KS3204 559 PT100...1000, Ni100, 16 bit	KL3228   KS3228 561 PT1000, Ni1000, PTC
Resistor bridge	KL3351   KS3351 564 strain gauge, 16 bit				
	KL3356   KS3356 565 strain gauge, 16 bit, self-calibration				
Oscilloscope	KL3361   KS3361 566 oscilloscope terminal, ±20 mV	KL3362   KS3362 567 oscilloscope terminal, ±10 V			
Measurement	KL3681   KS3681 568 digital multimeter terminal, 18 bit	KL3403   KS3403 569 3-phase power measurement terminal, 1 A	KL3403-0010 569 3-phase power measurement terminal, 5 A		
Pressure measuring	KM3701 573 differential measuring, -100...+100 hPa	KM3702 574 absolute measuring, 7,500 hPa	KM3712 575 absolute measuring, -1,000...+1,000 hPa		
	KM3701-0340 573 different. measuring, up to 340 hPa				

KLxxx: Standard Bus Terminals, KSxxx: Bus Terminals with pluggable wiring level

Analog output: KL4xxx   KS4xxx					KM4xxx
Signal	1-channel	2-channel	4-channel	8-channel	2-channel
<b>0...10 V</b>	<b>KL4001</b>   KS4001 <b>576</b> 12 bit	<b>KL4002</b>   KS4002 <b>576</b> 12 bit	<b>KL4004</b>   KS4004 <b>577</b> 12 bit  <b>KL4404</b>   KS4404 <b>583</b> 4 x 2-wire connection, 12 bit	<b>KL4408</b>   KS4408 <b>583</b> 8 x 1-wire connection, 12 bit	<b>KM4602</b> <b>586</b> manual/automatic operation
<b>± 10 V</b>	<b>KL4031</b>   KS4031 <b>579</b> 12 bit	<b>KL4032</b>   KS4032 <b>579</b> 12 bit  <b>KL4132</b>   KS4132 <b>582</b> 16 bit	<b>KL4034</b>   KS4034 <b>580</b> 12 bit  <b>KL4434</b>   KS4434 <b>583</b> 4 x 2-wire connection, 12 bit  <b>KL4494</b>   KS4494 <b>585</b> 2 x input, 2 x output, 12 bit	<b>KL4438</b>   KS4438 <b>583</b> 8 x 1-wire connection, 12 bit	
<b>0...20 mA</b>	<b>KL4011</b>   KS4011 <b>578</b> 12 bit	<b>KL4012</b>   KS4012 <b>578</b> 12 bit  <b>KL4112</b>   KS4112 <b>581</b> 16 bit	<b>KL4414</b>   KS4414 <b>584</b> 4 x 2-wire connection, 12 bit	<b>KL4418</b>   KS4418 <b>584</b> 8 x 1-wire connection, 12 bit	
<b>4...20 mA</b>	<b>KL4021</b>   KS4021 <b>578</b> 12 bit	<b>KL4022</b>   KS4022 <b>578</b> 12 bit	<b>KL4424</b>   KS4424 <b>584</b> 4 x 2-wire connection, 12 bit	<b>KL4428</b>   KS4428 <b>584</b> 8 x 1-wire connection, 12 bit	

KLxxxx: Standard Bus Terminals, KSxxxx: Bus Terminals with pluggable wiring level

# Product overview Bus Terminals

	Special functions: KL/KS5xxx, KL/KS6xxx		Power terminals: KL8xxx		Safety terminals: KLx904	
Signal			Signal			
<b>Position measurement</b>	<b>KL5001</b>   KS5001   588 SSI encoder interface	<b>KL5051</b>   KS5051   588 bidirectional SSI encoder interface	<b>400 V AC 3~</b>	<b>KL8001</b>   608 switching capacity 5.5 kW, nominal current 0.9 to 9.9 A, connection mechanism for Siemens contactors (Sirius 3R series)	<b>24 V DC</b>	<b>KL1904</b>   502 TwinSAFE, 4-channel digital input terminal, IEC 61508 SIL 3, EN 954 Kat. 4 and DIN EN ISO 13849 PL <sub>e</sub>
	<b>KL5101</b>   KS5101   589 incremental encoder interface, differential input	<b>KL5111</b>   KS5111   590 incremental encoder interface				<b>KL2904</b>   540 TwinSAFE, 4-channel digital output terminal, IEC 61508 SIL 3, EN 954 Kat. 4 and DIN EN ISO 13849 PL <sub>e</sub>
	<b>KL5151</b>   KS5151   592 incremental encoder interface, 32 bit	<b>KL5152</b>   KS5152   592 2-channel incremental encoder interface, 32 bit with programmable outputs		<b>KL8601</b>   610 communication module for Schneider TeSys model U		
<b>Communication</b>	<b>KL6001</b>   KS6001   593 serial interface RS232, 19.2 kbaud	<b>KL6031</b>   KS6031   593 serial interface RS232, 115.2 kbaud		<b>KL8610</b>   611 adapter terminal for Schneider TeSys model U	<b>Controller</b>	<b>KL6904</b>   606 TwinSAFE Logic Bus Terminal, with 4 digital outputs, IEC 61508 SIL 3, EN 954 Cat. 4 and DIN EN ISO 13849 PL <sub>e</sub>
	<b>KL6011</b>   KS6011   594 serial interface TTY, 20 mA current loop	<b>KL6224</b>   KS6224   598 IO-Link master				
	<b>KL6021</b>   KS6021   595 serial interface RS422/RS485, 19.2 kbaud	<b>KL6041</b>   KS6041   595 serial interface RS422/RS485, 115.2 kbaud				
	<b>KL6023</b>   601 wireless adapter for EnOcean radio technology	<b>KM6551</b>   607 wireless data exchange terminal				
	<b>KL6581</b>   602 EnOcean master	<b>KL6583</b>   603 EnOcean transmitter and receiver				
	<b>KL6051</b>   KS6051   596 data exchange terminal, 32 bit					
	<b>KL6201</b>   KS6201   597 AS-Interface master terminal	<b>KL6211</b>   KS6211   597 AS-Interface master terminal with power contacts				
	<b>KL6301</b>   KS6301   599 EIB Bus Terminal	<b>KL6401</b>   KS6401   600 LON Bus Terminal				
	<b>KL6771</b>   KS6771   604 MP-Bus master terminal	<b>KL6811</b>   KS6811   605 DALI/DSI master and power supply terminal				

KLxxxx: Standard Bus Terminals, KSxxxx: Bus Terminals with pluggable wiring level

## System terminals: KL9xxx | KS9xxx

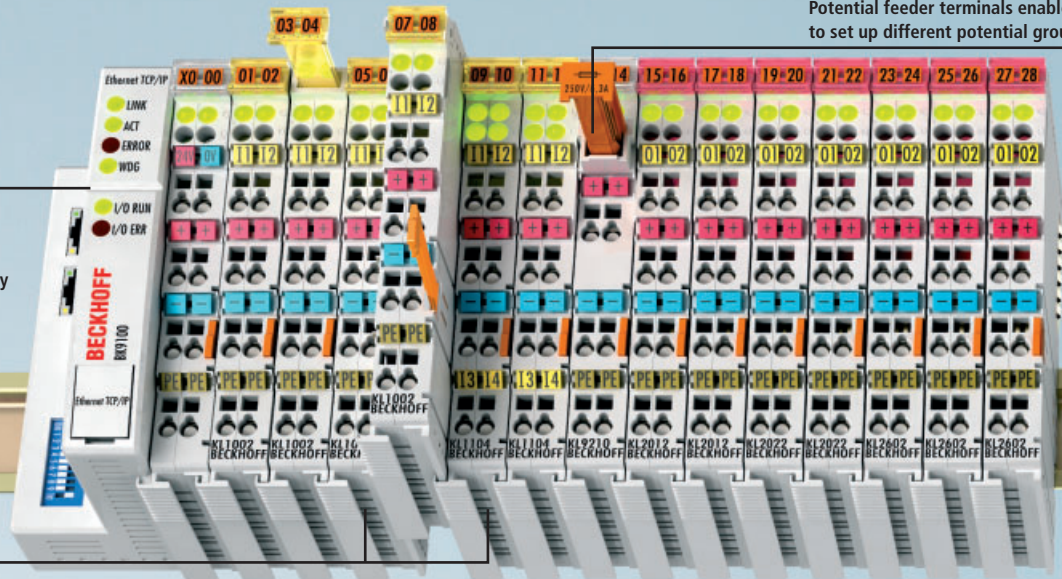
Signal	System	Signal	Potential supply	Power supply and accessories	
<b>System</b>	<b>KL9010</b> 621 bus end terminal	<b>24 V DC</b>	<b>KL9100</b>   KS9100 620	<b>KL9400</b>   KS9400 622 input 24 V DC, K-bus power supply, 2 A	
	<b>KL9020</b> 612 terminal bus extension end terminal		<b>KL9110</b>   KS9110 620 diagnostic	<b>KL9505</b>   KS9505 623 input 24 V DC, output 5 V DC, 1 A	
	<b>KL9050</b> 613 terminal bus extension coupler terminal		<b>KL9200</b> 621 with fuse	<b>KL9508</b>   KS9508 623 input 24 V DC, output 8 V DC, 0.5 A	
	<b>KL9060</b> 614 adapter terminal for power terminal KL8xxx		<b>KL9210</b> 621 diagnostic, with fuse	<b>KL9510</b>   KS9510 623 input 24 V DC, output 10 V DC, 0.5 A	
	<b>KL9070</b>   KS9070 615 shield terminal		<b>50 V DC</b>	<b>KL9512</b>   KS9512 623 input 24 V DC, output 12 V DC, 0.5 A	
	<b>KL9080</b> 621 isolation terminal			<b>KL9515</b>   KS9515 623 input 24 V DC, output 15 V DC, 0.5 A	
	<b>KL9180</b>   KS9180 621 potential distribution terminal			<b>KL9528</b>   KS9528 625 AS-Interface power supply terminal	
	<b>KL9184</b> 618 potential distribution, 8 x 24 V DC, 8 x 0 V DC			<b>KL9560</b>   KS9560 627 input 24 V DC, output 24 V DC, 0.1 A, with electrical isolation	
	<b>KL9185</b>   KS9185 621 potential distribution terminal, only 2 power contacts			<b>120...230 V AC</b>	<b>KL9150</b>   KS9150 620 diagnostic
	<b>KL9186</b>   KS9186 617 potential distribution, 8 x 24 V				<b>KL9160</b>   KS9160 620 diagnostic
	<b>KL9187</b>   KS9187 617 potential distribution, 8 x 0 V			<b>KL9250</b> 621 with fuse	<b>up to 400 V AC</b>
	<b>KL9188</b> 618 potential distribution, 16 x 24 V DC			<b>KL9260</b> 621 diagnostic, with fuse	
	<b>KL9189</b> 618 potential distribution, 16 x 0 V DC			<b>KL9190</b>   KS9190 620 with fuse	
	<b>KL9195</b>   KS9195 621 shield terminal				
	<b>Filter</b>		<b>KL9540</b>   KS9540 626 surge filter terminal for field supply		
			<b>KL9550</b>   KS9550 626 surge filter terminal for system/field supply		
	<b>Diode array</b>		<b>KL9300</b>   KS9300 616 4 diodes, potential-free		
			<b>KL9301</b>   KS9301 616 7 diodes, common cathode		
			<b>KL9302</b>   KS9302 616 7 diodes, common anode		

KLxxxx: Standard Bus Terminals, KSxxxx: Bus Terminals with pluggable wiring level

Potential feeder terminals enable to set up different potential groups.

Bus Coupler:  
the link between  
Bus Terminals  
and fieldbus

Bus Terminals in  
1-, 2-, 4-, 8- and  
16-channel modularity  
with combinations  
of any desired types  
of signal



## The Bus Terminal system

The I/O signals are wired in a decentralised way to fieldbus devices or centrally to the controller. The available manufacturer-specific fieldbus devices with fixed input/output configurations and design often make it necessary to use an entire group of devices with similar functions. This costly method of signal acquisition gives rise to high material, installation, planning and documentation costs as well as high costs for subsequent modification or expansion. Inventory management and service staff are put under unnecessary strain.

### Flexible and stable

The Beckhoff Bus Terminal is an open and fieldbus-neutral I/O system consisting of electronic terminal blocks. The head of an electronic terminal block is the Bus Coupler with the interface to the fieldbus. Bus Couplers are available for the following bus systems:

- **EtherCAT**, the fast real-time Ethernet fieldbus,
- **Lightbus**, the fast fibre optic fieldbus,
- **PROFIBUS DP/FMS** conforms to the European standard EN 50170,
- **Interbus**, which has been on the market since 1987,
- **CANopen**, multi-masters in the actuator/sensor area,
- **DeviceNet**, the device bus with CAN technology,
- **ControlNet**, the standardised fieldbus,
- **Modbus**, the open fieldbus,

- **Fipio**, the fieldbus according to the WorldFIP standard,
- **CC-Link**, the fieldbus for the Asian market,
- **SERCOS interface**, the bus from the drives engineering field,
- **RS232/RS485**, the network for the most economical solution,
- **Ethernet TCP/IP**, the network bus,
- **Ethernet/IP**, Industrial Ethernet solution from ODVA,
- **PROFINET**, Industrial Ethernet solution from PNO,
- **USB**, the fast interface for the laboratory.

With the master terminals, fieldbus functionalities are also available in form of a standard Bus Terminal. This is particularly advantageous for bus systems that are integrated as subsystems into a higher-level system. It means that only one system is required for the subsystem and for the higher-level bus interface. Master terminals are available for the following bus systems:

- **AS-Interface**, the sensor/actuator bus for the lower control level,
- **EIB, LON, DALI**, i.e. the communication standards in building automation.

### Automation standard

The Beckhoff Bus Terminal ensures that control cabinets and terminal boxes are constructed more economically. Using the 4-wire terminating system, all of the usual sensors

and actuators with different types of signals can be connected directly without other connection systems. It is no longer necessary to wire the field devices between the first terminal connection in the control cabinet or in the terminal box and the controller. This significantly reduces the costs involved in controller design and saves space, material, work, and money.

The field devices can be wired using the Beckhoff Bus Terminal system on site where the signals occur. Installation and wiring of the Beckhoff Bus Terminal is thus simple and compact like that of a standard terminal block. The Bus Terminal can be connected to the controller by connecting a Bus Coupler via the fieldbus as required.

The Beckhoff Bus Terminals have been tried and tested in a wide range of sectors worldwide, from machine construction to building management. Beckhoff Bus Terminal technology makes design, construction, wiring, commissioning and maintenance of equipment and machines very cost-effective.

### Design

The robust housing, secure contacts and the solidly built electronics are prominent features of our components. A station consists of one Bus Coupler and up to 64 electronic terminal blocks. With the K-bus extension it is possible to operate up to 255 Bus Terminals on one Bus Coupler.

Operation of up to 64 Bus Terminals on one Bus Coupler (255 with K-bus extension KL9020 and KL9050)

Fast and secure data connections by means of a serial terminal bus

Power contacts for automatic transfer of supply voltage



The electronic terminal blocks are clipped onto the Bus Coupler. They connect by simply latching together. This means that each electronic terminal block can be exchanged separately and can be mounted on a standard mounting rail. In addition to horizontal type mounting, all other mounting types are permitted.

The Beckhoff Bus Terminal with its outside contour adjusts perfectly to the measurements of terminal boxes. The clear front panel of the terminal with light-emitting diodes for status display, plug-in contact labelling and detachable labelling fields guarantee clarity. The 3-wire system supplemented by a protective conductor terminal makes it possible to wire sensors/actuators directly.

### Free mix of signals

The Beckhoff I/O system supports about 400 Bus Terminals and is thus probably the most comprehensive system on the market. The components enable users to operate mixed signal configurations without restriction at each station. This means that a single non-central input/output node can map all the necessary signals.

Appropriate Bus Terminals are available for any digital or analog automation signal type, for currents and voltages with standardised signal levels and for PT100 and thermocouple signals. Intelligent devices can be connected via Bus Terminals with serial interfaces in accordance with RS232, RS485 or 20 mA TTY.

The fine granularity of the Bus Terminals enables bit-precise composition of the required I/O channels. The digital Bus Terminals are available as 2-, 4-, 8- or 16-channel terminals. In the 16-channel variant, digital input and output signals are arranged in an ultra-compact way within a standard Bus Terminal housing across a width of only 12 mm. The standard analog signals of  $\pm 10$  V, 0 V...+10 V, 0...20 mA and 4...20 mA are all available as 1-, 2-, 4- and 8-channel variants within a standard housing. The system is thus highly modular and can be projected cost-effectively with an accuracy down to a single channel.

The KMxxxx terminal modules with plug-in wiring combine 16, 32 or 64 digital I/Os within a very small space and with high packing density.

### Economical and small

For the user, Beckhoff Bus Terminals offer independence from the particular fieldbus and terminal block design. Digital and analog signals can be mixed without restriction, starting with one or two signals per terminal. Beckhoff Bus Terminals replace manufacturer-specific designs and all the intermediate terminal positions. The Bus Terminal ensures transparency and flexibility. Distributors and terminal boxes become smaller, more economical, and in some cases can be omitted. Plants and machinery equipped with Beckhoff Bus Terminals offer significant competitive advantages.

### Project engineering and parameterisation

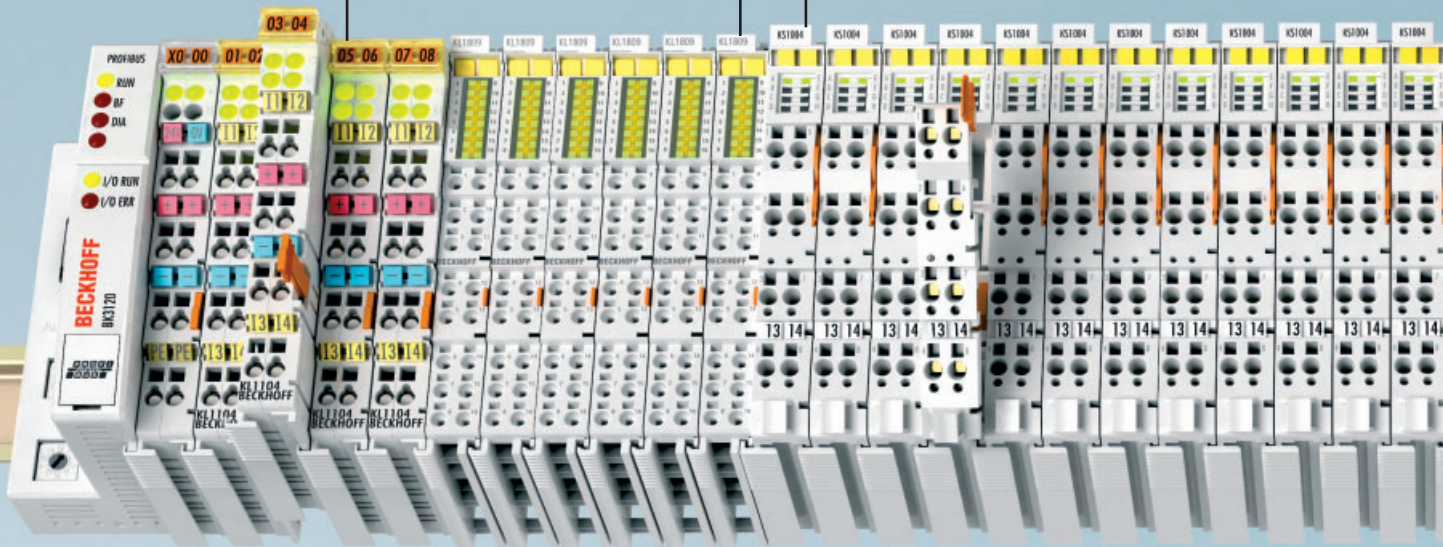
If the TwinCAT automation software from Beckhoff is used, the I/O stations can be integrated and parameterised conveniently via the TwinCAT System Manager. As a "configuration centre", the System Manager links the PLC programs and the connected I/O channels.



KLxxxx | The standard KL type Bus Terminals include electronics and connection level in a single housing.

KLx8xx | The Bus Terminals with 16 connection points offers a very high packing density in 12 mm.

KSxxxx | The KS series Bus Terminals feature a pluggable connection level enabling the complete wiring to be removed as a plug connector from the top of the housing for servicing.



## Flexible connection system

### KLxxxx | Standard wiring



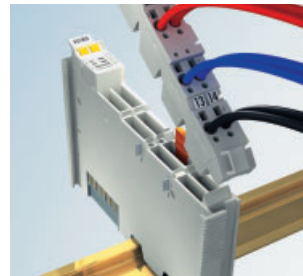
The Bus Terminal system offers different connection options for optimum adaptation to the respective application. The KLxxxx Bus Terminals include electronics and connection level in a single enclosure. The KSxxxx type Bus Terminals feature a pluggable connection level. The KM modules integrate a wide range of I/Os within a very small area. All terminal types are bus-neutral and can be combined as required.

The standard KL Bus Terminals have been tried and tested for years. They feature integrated screwless Cage Clamp® technology for fast and simple assembly.



The Bus Terminals from the KLx8xx series with 16 connection points are distinguished by a particularly compact design, as the packaging density is twice as large as that of the standard Bus Terminals. Single-wire conductors can be inserted directly into the spring loaded terminal point without tools.

### KSxxxx | Pluggable wiring



The KS type Bus Terminals feature a pluggable connection level. The assembly and wiring procedure for the KS series is the same as for the KL series. The KS series Bus Terminals enable the complete wiring to be removed as a plug connector from the top of the housing for servicing. The lower section can be removed from the Bus Terminal assembly by pulling the unlocking tab. Insert the new component and plug in the connector with the wiring. This reduces the installation time and eliminates the risk of wires being mixed up.

The familiar dimensions of the Bus Terminal only had

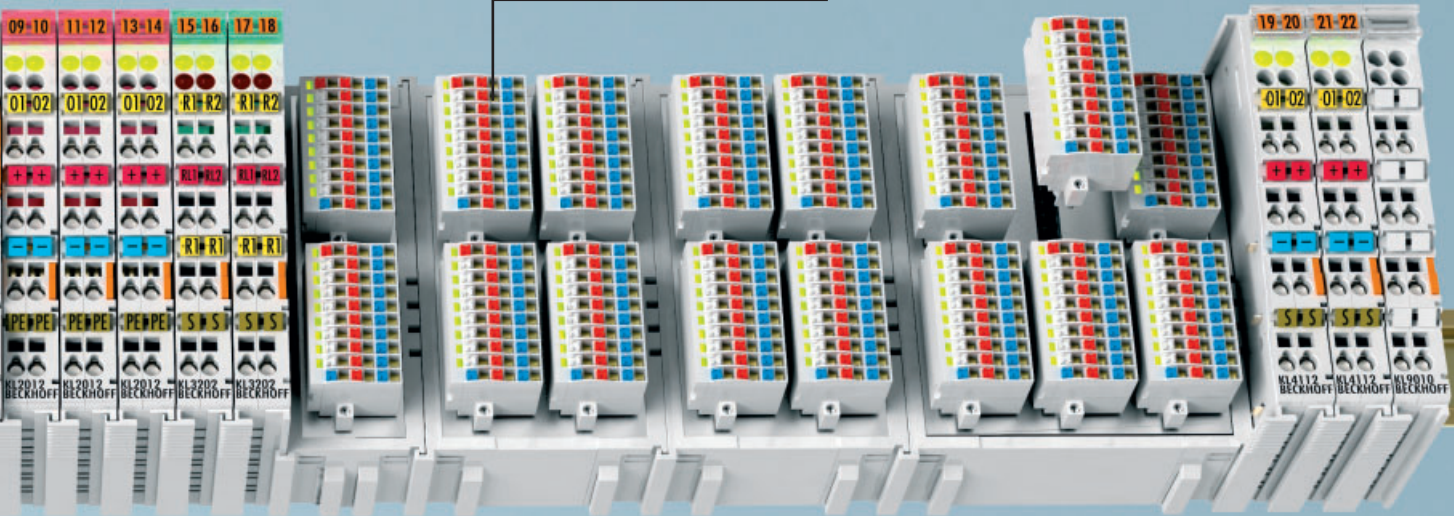
to be changed slightly. The new connector adds about 3 mm. The maximum height of the Bus Terminal remains unchanged.

The overview and nomenclature of the product names has been retained: The plug connector variant is identified in the part number by an additional letter.

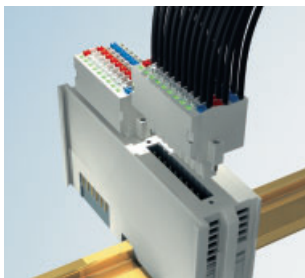
Conductor cross sections between 0.08 mm<sup>2</sup> and 2.5 mm<sup>2</sup> can continue to be used with the proven Cage Clamp® technology.

A tab for strain relief of the cable simplifies assembly in many applications and prevents tangling of individual connection wires when the connector is removed.

KMxxxx | The KM type terminal modules feature pluggable wiring, combining 16, 32 or 64 digital I/Os in a very small area with high packing density.



## KMxxxx | Pluggable wiring with high packing density



More sensor and actuator functionality makes machines and systems more and more powerful. The Bus Terminal reliably meets increased requirements for I/O signals through its modularity and compact design. The existing Bus Terminal system is complemented by the compact version of the KMxxxx terminal module with increased packing density. In many areas of application, cost benefits can be realised through lower overall installed size and application-specific signal mix.

The terminal modules are fully system-compatible. Like the Bus Terminals, they are

bus-neutral and can therefore be operated with any Beckhoff Bus Coupler or Bus Terminal Controller. Like the standard Bus Terminals, the KM modules are integrated in the I/O system and connected with the internal terminal bus (K-bus). Bus Terminals and terminal modules can be combined without restriction.

Like for the Bus Terminals, no tools are required for the wiring. Spring-loaded terminals are used, however with connectors (cable cross section 0.5...1.5 mm<sup>2</sup>).

The terminal modules combine 16, 32 or 64 digital inputs or outputs on a very small area. This compact and slimline design enables very high packing densities, leading to smaller control cabinets and terminal boxes.

### Digital I/O modules with up to 64 channels

The KM modules are used, for example, in applications with high demand for standard

signal types such as digital I/Os. The very compact digital KM1xxx and KM2xxx input/output terminal modules have 16, 32 or 64 channels. Each I/O connector has eight inputs or outputs. LEDs integrated in the connector indicate the signal state for each channel directly at the wire. Depending on the connection type, the terminal modules are available with 1- or 3-pin plug connector and enable connection with 1, 2 or 3 wires.

### Customer-specific signal mix

In addition to the standard I/O types, the terminal modules are also available as customer-specific types, e.g. for use in production machines with identical I/O combinations. The combination terminal modules consolidate typical automation signal combinations. This enables smaller physical size and quantity of parts with significant cost savings.

### Interface standards within the Bus Terminal

In addition to plug-in wiring, sensor-specific plug connectors such as D-sub, RJ 45 or BNC will in future further simplify the application of the Bus Terminal system. Sensors and actuators with pre-assembled connectors can be connected directly and quickly with the Bus Terminal system.

Relay or power modules are also in preparation, which will either be equipped with standard relays or with integrated electronics to connect wattages up to 16 A.

# Bus Terminal features

Status LEDs for reliable and fast startup

Marking material for standard terminal blocks

Supply point for downstream inputs and outputs

Detachable labelling fields for clear text labels

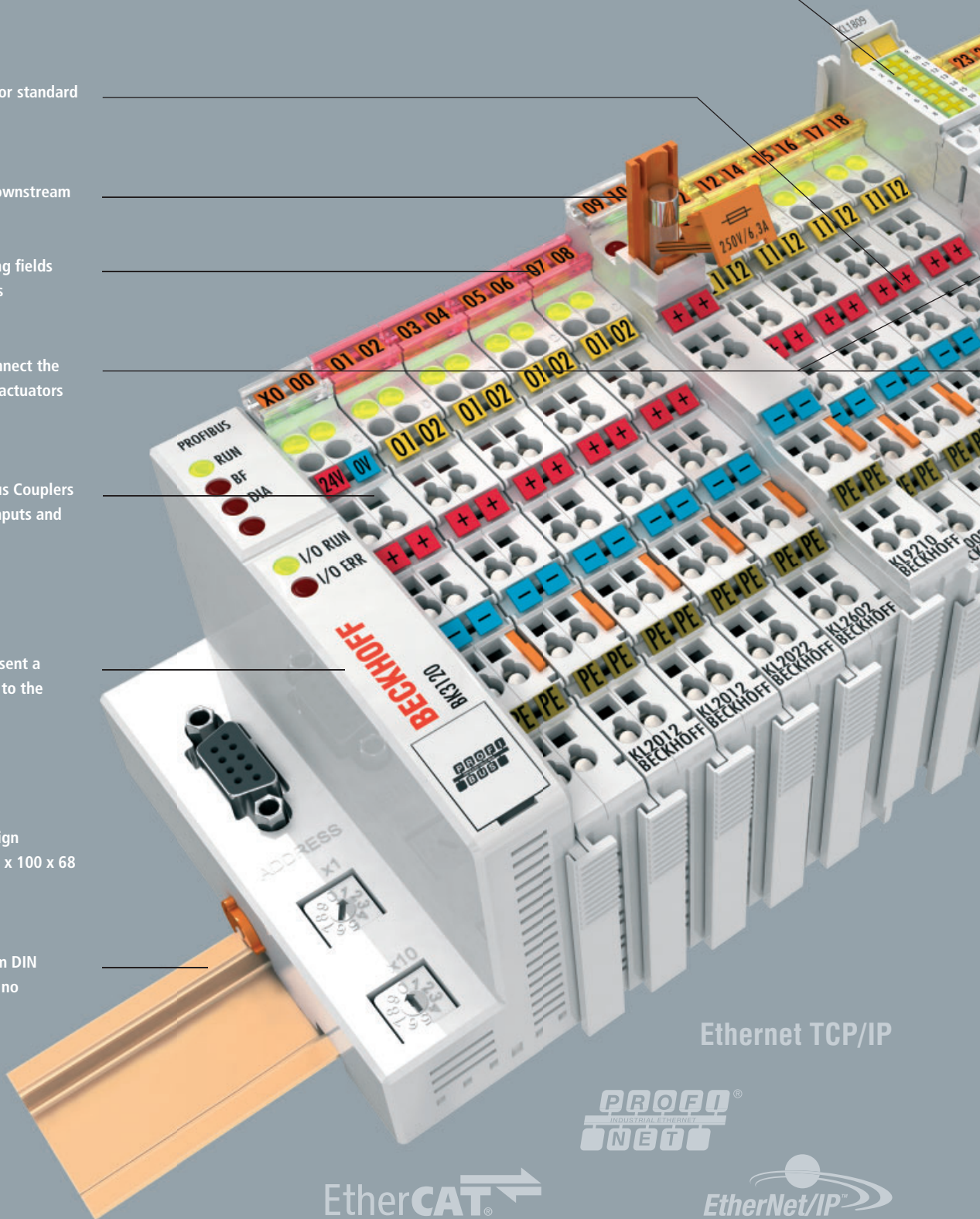
Power contacts connect the supply for sensors/actuators automatically.

Supply point for Bus Couplers and downstream inputs and outputs

Bus Couplers represent a universal interface to the fieldbuses.

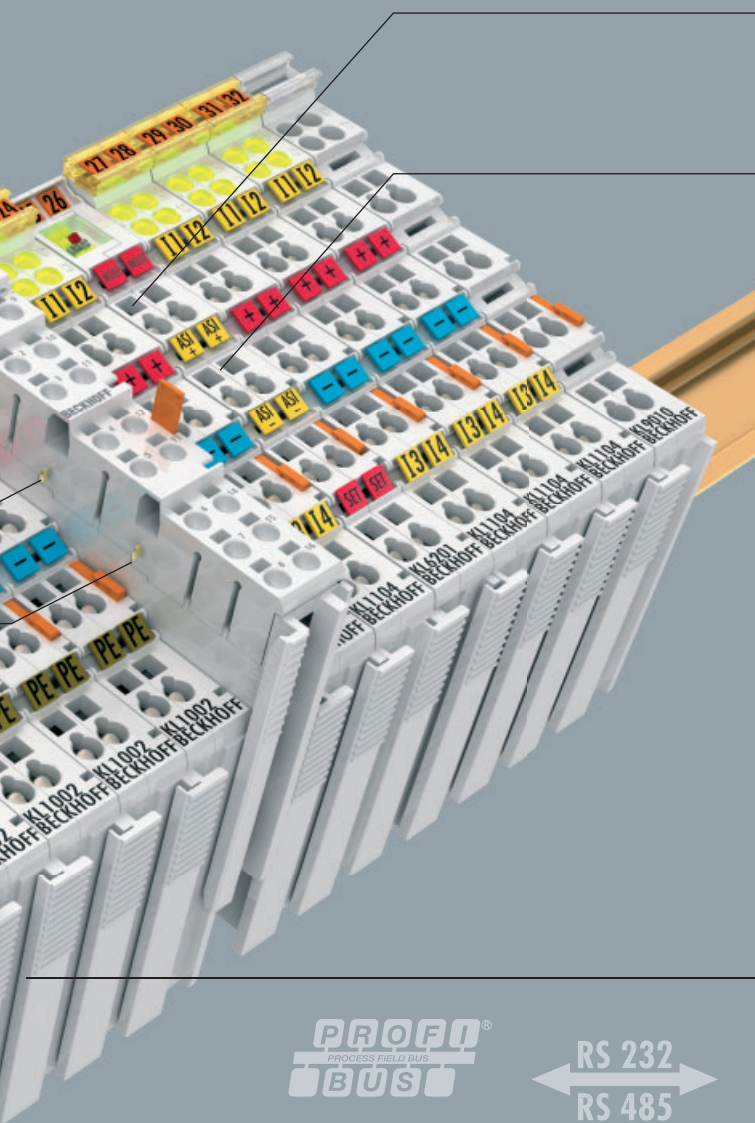
Terminal block design  
W x H x D (mm): 12 x 100 x 68

Assembly on 35 mm DIN mounting rail with no accessories

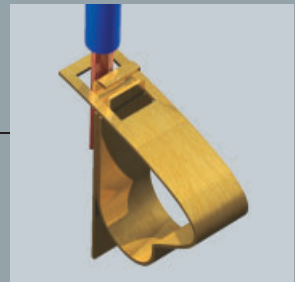


Ethernet TCP/IP

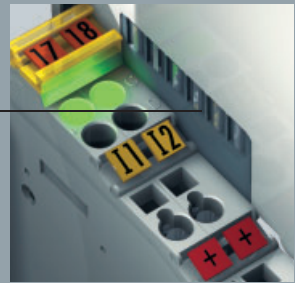




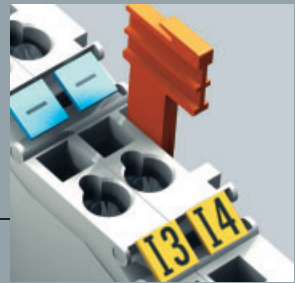
Screwless connection:  
using the reliable Cage  
Clamp® technology with  
vertical cable inlet



Master terminals enable  
the integration of subsystems  
such as AS-Interface.



Contacts for data trans-  
mission and power supply  
to the K-bus



Symmetric release enables  
vertical removal from terminal  
strip; release slide does not  
require a tool.

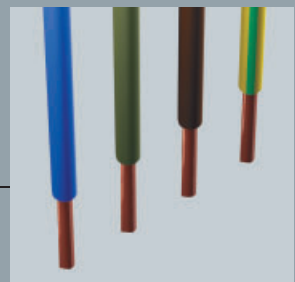
Tongue and groove  
connection makes terminal  
strip structure secure and  
stable.



Leading PE power contact



The 4-wire terminating  
system (signal, 24 V DC,  
0 V, PE) reduces assembly  
costs.



# Beckhoff Bus Terminals: The complete automation kit



Bus Coupler series BK, the link between Bus Terminals and fieldbus



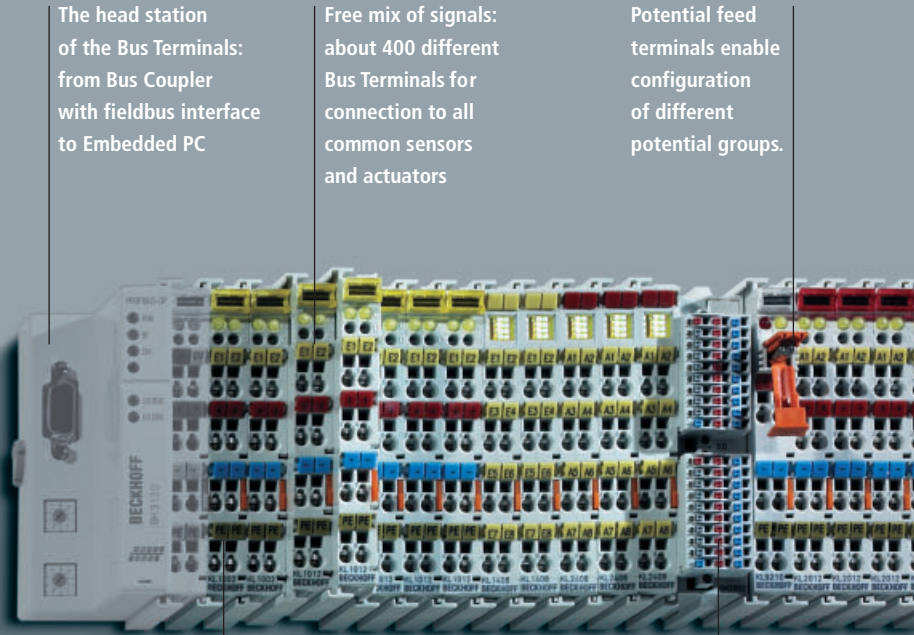
Bus Terminal Controller series BC with integrated IEC 61131-3 PLC



Bus Terminal Controller series BX with integrated IEC 61131-3 PLC and extended interfaces



Embedded PC series CX for PLC and Motion Control applications



The head station of the Bus Terminals: from Bus Coupler with fieldbus interface to Embedded PC

Free mix of signals: about 400 different Bus Terminals for connection to all common sensors and actuators

Potential feed terminals enable configuration of different potential groups.

Bus Terminals in 1-, 2-, 4-, 8- and 16-channel modularity, no restriction on mixing of signal types

The terminal modules with plug-in wiring combine 16, 32 or 64 digital I/Os within a very small space and with high packing density.



3-phase power measurement capability enables all relevant electrical data of the supply network to be measured.

Integrated safety: the TwinSAFE Bus Terminals enable the connection of all common safety sensors and actuators.

Bus Terminals with a maximum measurement error of  $\pm 0.01\%$  expand the range of applications to high-precision measurement technology.

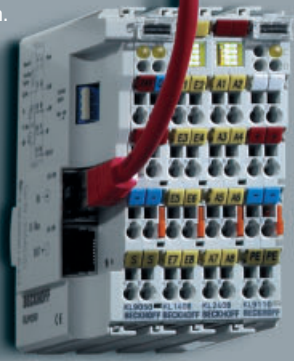
Communication terminals enable the integration of subsystems such as AS-Interface, RS232 and RS485.



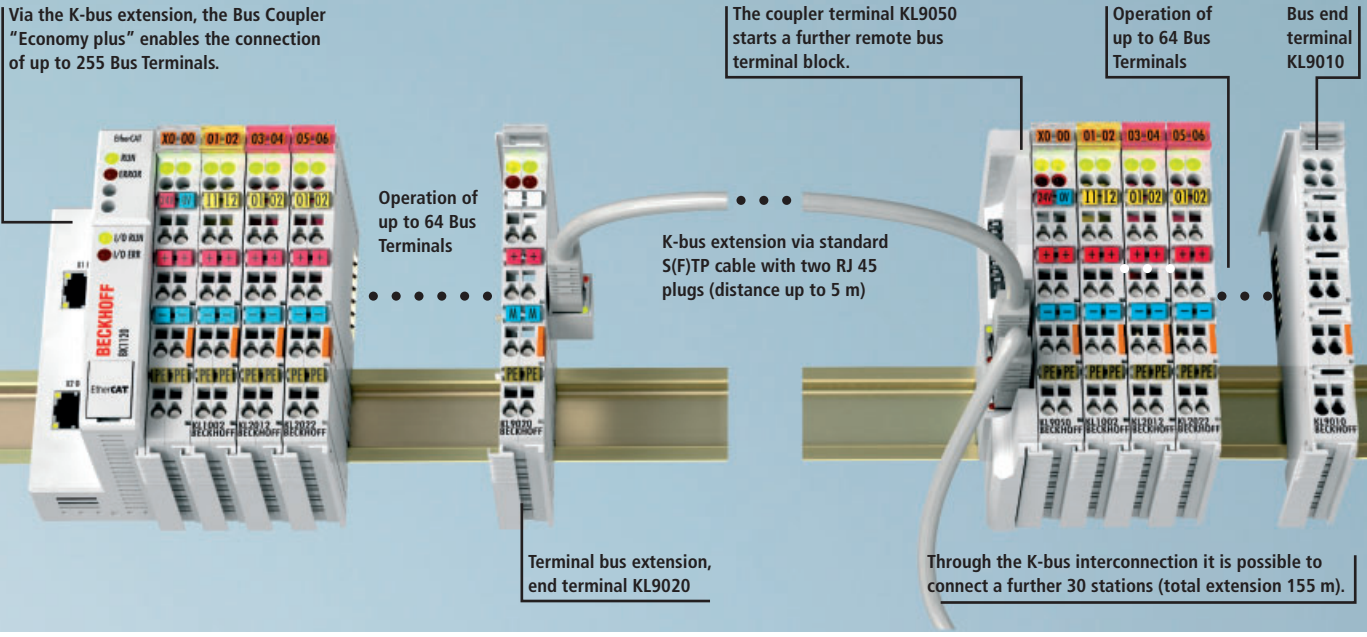
Bus end terminal



The terminal bus extension enables the connection of up to 255 Bus Terminals (instead of 64) to a single station.



The power terminal transforms a standard contactor into a motor protection relay with comprehensive diagnostic functions.



## Terminal bus extension

The BKxxxx Bus Coupler links the bus systems to the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number of terminals between 1 and 64, and a bus end terminal. The BKxx10 and BKxx20 economy versions allow operators to create particularly low cost peripheral connections. Up to 64 digital Bus Terminals can be attached to the BKxx10 series. The "Economy plus" series supports all Bus Terminals of the Beckhoff system. It is also possible to operate up to 255 Bus Terminals on this Bus Coupler series with the K-bus extension.

The Bus Terminal extension allows Bus Terminals to be located in up to 31 blocks in the control cabinet or in the application. With a distance of up to 5 m between the Bus Terminal blocks, the Bus Terminal system can be used over a wider area and helps save costs.

The Bus Coupler recognises the terminals to which it is connected, and performs the assignment of the inputs and outputs to the bytes of the process image automatically. The blocks with terminal bus extensions are treated as one unit by the Bus Coupler. The extension is transparent for the fieldbus and higher-level systems.

The system of Bus Coupler and Bus Terminal can be extended by replacing the end terminal KL9010 with the extension KL9020. The KL9020 makes available the K-bus signals in a RJ 45 socket for transmission onwards via an Industrial Ethernet cable.

The coupler terminal KL9050 starts a further remote Bus Terminal block and provides the logical connection to the Bus Coupler via the Ethernet cable. 24 V, electrically isolated, for the field level can be input at this coupler terminal. The internal K-bus shares the

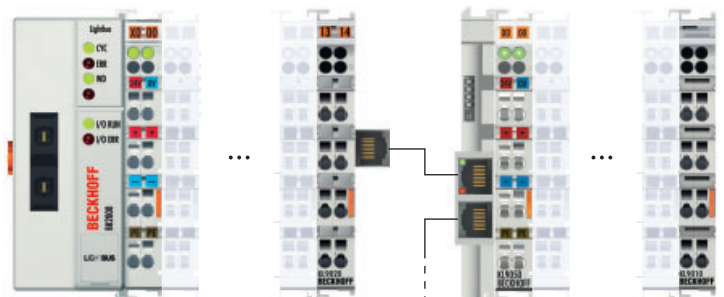
same potential as the K-bus of the coupler. The KL9050 can be used via a second socket for the extension to the next Bus Terminal block. This Bus Terminal block starts in the same way as the one with a coupler terminal KL9050. This coupling works at up to 31 stations.

The maximum distance between two Bus Terminal blocks is 5 m and allows a total extension of 155 m. The system uses S(F)TP cable with two RJ 45 plugs for the transmission. The cable is supplied ready-made in different lengths and can be made-to-measure for applications with conventional Ethernet tools.

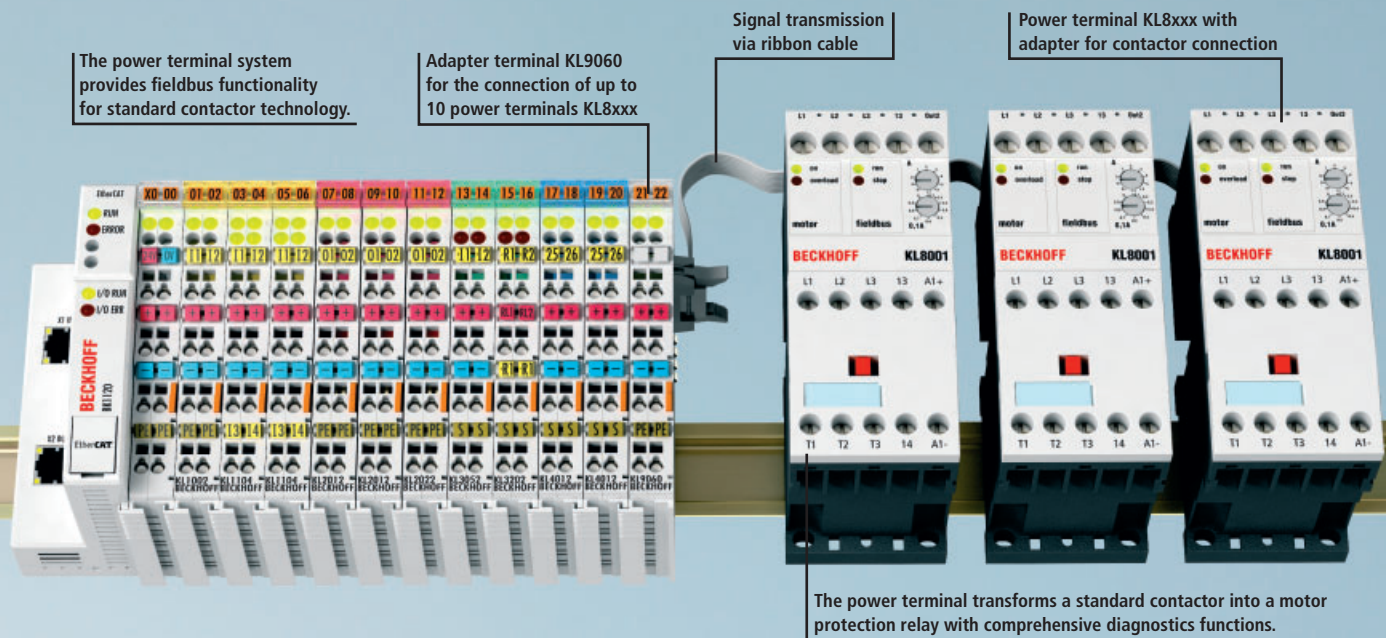
Data transfer is based on the interference-free and RS485 industry standard in a double-screened cable.



Operation with up to 64 Bus Terminals to one Bus Coupler with KL9010 bus end terminal



Operation with up to 255 Bus Terminals to one Bus Coupler with terminal bus extension end terminal KL9020 and coupler terminal KL9050



## Power terminal system

### Power in the terminal

The KL8001 power terminal, together with a power contactor, forms a complete distributed motor starter with any fieldbus connection. Apart from all the protective functions of a motor protection relay, the power terminal contains comprehensive diagnostics. By means of values such as current, voltage, active-power input and apparent power consumption or load condition, the control programmer is able to regulate the drive or a machine component in the best possible way and to protect them from damage and failure. At first sight the power terminal looks to the control engineer like a conventional motor protection relay and is fitted to a contactor in exactly the same way. The additional functions are available with little effort. The Bus Terminal block is fitted with a KL9060 adapter terminal instead of a KL9010 end terminal. The KL9060 is connected to a power terminal using a simple ribbon cable. Up to ten power terminals can be driven by one KL9060. No other wiring is necessary apart from a ground cable. The power terminal is supplied using the K-bus and the 24 V control voltage. The status of the contactor is mapped by a bit in the process image. A setting range for the nominal motor current from 0.9 A to 9.9 A covers a wide range normal motors operating on three-phase 400 V AC mains. That represents a motor rating from approximately 300 W up to the maximum switching capacity of the contactor being used (typically 4 kW to

5.5 kW). The connection mechanism of the KL8001 power terminal of the KL8xxx series is particularly suitable for Siemens contactors of the Sirius 3R series. Other power terminals are adapted for other contactor manufacturers. The power terminal switches the installed contactor and takes over all the functions of the motor protection relay. The power terminal can imitate the standard class 5, 10, 15, 20, 25 and 30 trip classes and switch the overloaded motor off via the contactor. Further motor operation is possible only after a cooling-down period and switching on again via the controller. The protective response is configurable using software and makes it possible to achieve optimum compatibility of the motor to the application. A write protection in the power terminal prevents inadvertent alteration of the set values. It is possible to set the motor current directly on the power terminal manually and this has a higher priority than the software settings. Apart from its purely protective function of switching-off the motor when overloaded, the power terminal can carry out numerous diagnostic functions on the motor. Apart from the function of measuring the current, the power terminal can also indicate the supply voltage. From the current and voltage the power terminal calculates the apparent and active power of the connected motor. These values can be transmitted as instantaneous values for an application with very critical loading of the motor and make it possible to react very rapidly to changes. The calcula-

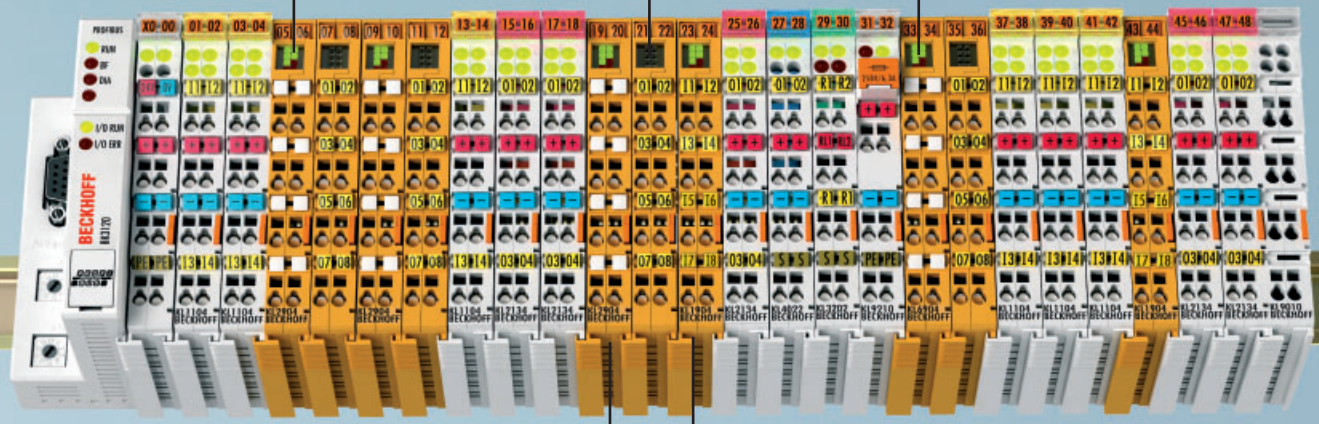
tion of the true effective value in the power terminal makes useful information available in the process image, which does not presuppose high computing power on the part of the controller. Even non-sinusoidal voltage and current curves can be read-in with a practical accuracy of 1 % to 5 %, depending on the type of curve. The cut-off frequency of the calculations amounts to 2 kHz. The evaluation for each of the three phases takes place independently. The power terminal recognises failure of one conductor or unbalanced current. Earth leakages with a fault current of more than 0.5 A are recognised and lead to the immediate switching-off of the motor. Using a status word, the controller can ascertain the condition of the motor with a few program steps. Even after the motor has been switched off, the information is retained through the power terminal, simplifying the fault finding.



The TwinSAFE Bus Terminals enable the connection of all common safety sensors and actuators.

Certification: all TwinSAFE devices are subjected to a prototype test according to IEC 61508, EN 954 and DIN EN ISO 13849.

The KL6904 TwinSAFE Logic Bus Terminal enables communication with up to 15 TwinSAFE devices. The Bus Terminal features certified safety blocks for functions such as emergency stop, safety door monitoring, etc. In addition, the TwinSAFE Logic Bus Terminal has four safe digital 24 V DC outputs.



The KL2904 Safety Bus Terminal is a digital output terminal with four channels. The terminal switches 24 V DC actuators with up to 2 A total current.

The KL1904 digital input terminal for sensors with potential-free contacts for 24 V DC: the Safety Bus Terminal has 4 fail-safe inputs.

## TwinSAFE: Safety and I/O technology in one system

Advanced electronic safety technology offers a wide range of benefits in terms of flexibility, handling, diagnostics, and, of course, wiring effort. However, genuine added value only comes from an integrated system offering optimum synergy between standard automation and safety technology. TwinSAFE – the safety solution from Beckhoff – integrates safety functionalities into the existing control architecture.

Conventionally, automation and safety technology are often implemented separately. TwinSAFE from Beckhoff provides a consist-

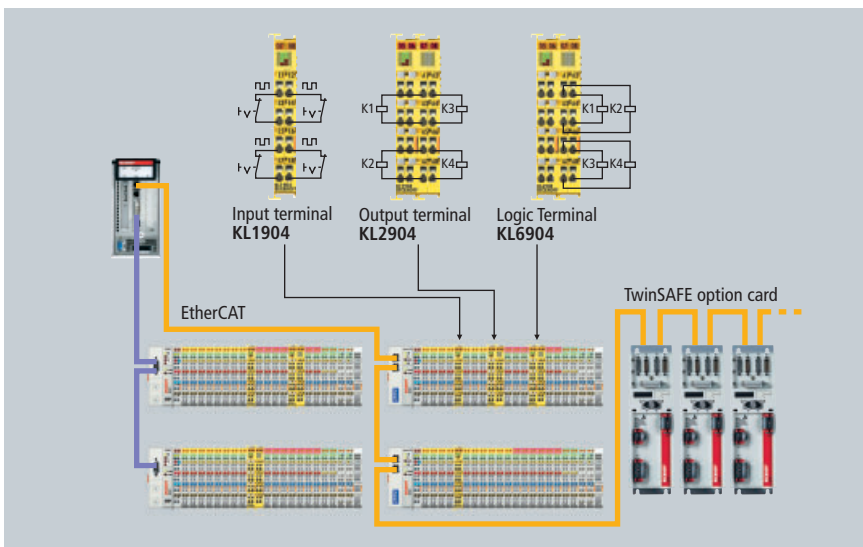
ent hardware and software technology for achieving integrated and simplified handling, ranging from safe input and output terminals and safe miniature controllers for the Bus Terminal system to the AX5000 Servo Drives. On the software side, the TwinSAFE technology is fully integrated with the TwinCAT automation software, enabling convenient configuration of safety functionality. Together with the Beckhoff TwinSAFE/FSOe protocol, holistic and very flexible integrated solutions according to SIL3 can be implemented.

### The I/O construction kit is extended safely

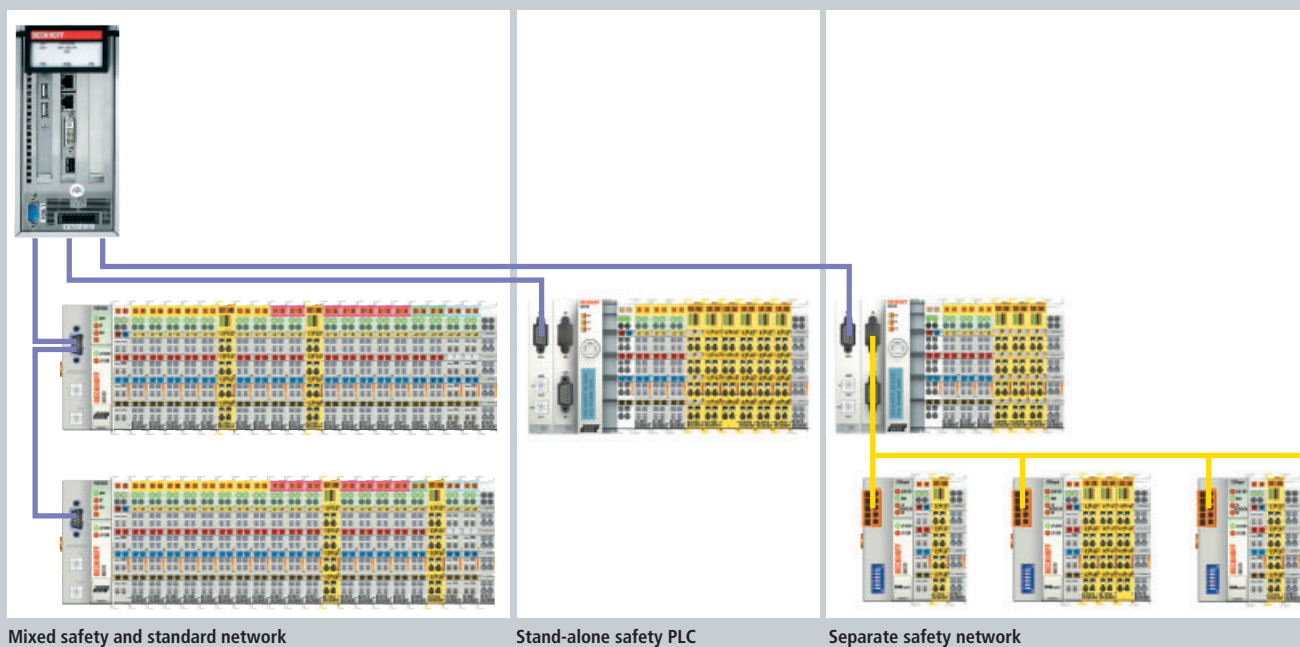
With the TwinSAFE system, Beckhoff offers the option of simply expanding the IP 20 I/O systems, and to transfer the complete cabling for the safety circuit into the already existing fieldbus network. TwinSAFE is available for Bus Terminals (K-bus) as well as EtherCAT Terminals (E-bus). Safe signals can be mixed with standard signals without restriction. This saves design effort, installation and material. Maintenance is simplified significantly through faster diagnosis and simple replacement of only a few components. The TwinSAFE Terminals only include three basic functionalities: digital inputs: KL1904 and EL1904, digital outputs: KL2904, EL2902 and EL2904, as well as the KL6904 Logic Terminal and the EL6900 TwinSAFE PLC. For a large number of applications, all sensors and actuators can be wired on these terminals. The required logical link of the inputs and the outputs is handled by the KL6904 TwinSAFE controller or the EL6900 TwinSAFE PLC. For small configurations, the tasks of a fail-safe PLC can thus be handled within the Bus Terminal system.

### TwinSAFE architecture

The TwinSAFE concept enables a wide range of safety tasks to be realised. Structures with mixed standard and safety-relevant signals are possible.



Open control technology for safety integration: the TwinSAFE protocol enables transfer of safety-relevant data via any medium.



Mixed safety and standard network

Stand-alone safety PLC

Separate safety network

Configuration of separate networks is also possible. Alternatively, the TwinSAFE system can be operated as a stand-alone solution or as a decentralised pre-processing system with safe communication between a higher-level safety controller. The KL6904 TwinSAFE Logic Terminals or EL6900 TwinSAFE PLCs are networked via the TwinCAT System Manager. Safety-relevant networking of the machines can thus simply and cost-effectively be realised via bus systems or existing Ethernet connections. The TwinSAFE system facilitates encapsulation and decoupling of individual

production or manufacturing cells. System extensions or changeovers can be implemented quickly and without wiring effort.

#### TwinSAFE Bus Terminals

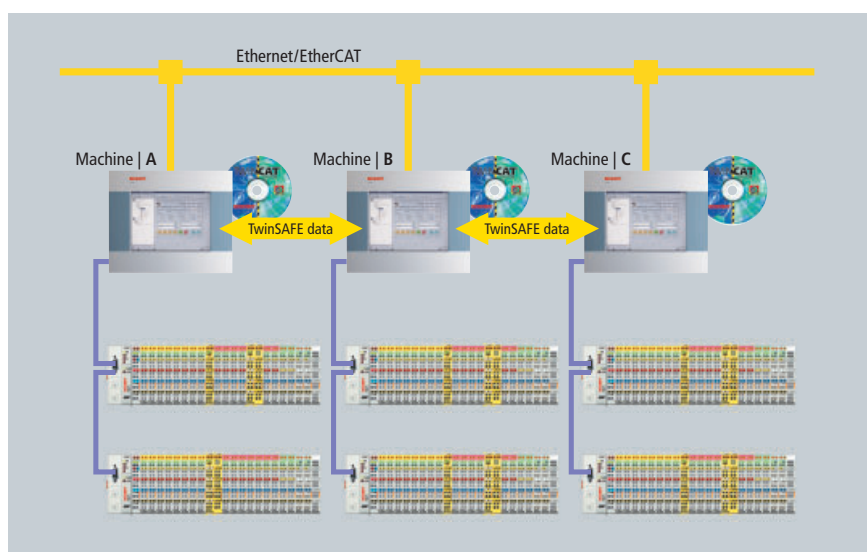
The TwinSAFE Bus Terminals enable connection of all common safety sensors and actuators. They can be operated with the TwinSAFE Logic. The TwinSAFE/FSoE protocol (Fail Safe over EtherCAT) is used for secure communication. The TwinSAFE Logic Bus Terminal or the TwinSAFE PLC EL6900 is the link unit between the TwinSAFE input and output ter-

minals. It enables the configuration of a simple, flexible and cost-effective decentralised safety control system. Therefore, there are no safety requirements for the higher-level control. The typical safety functions required for the automation of machines, such as emergency stop, safety door, etc., are already permanently included in the respective logic. The user can configure the terminal according to the safety requirements of his application.

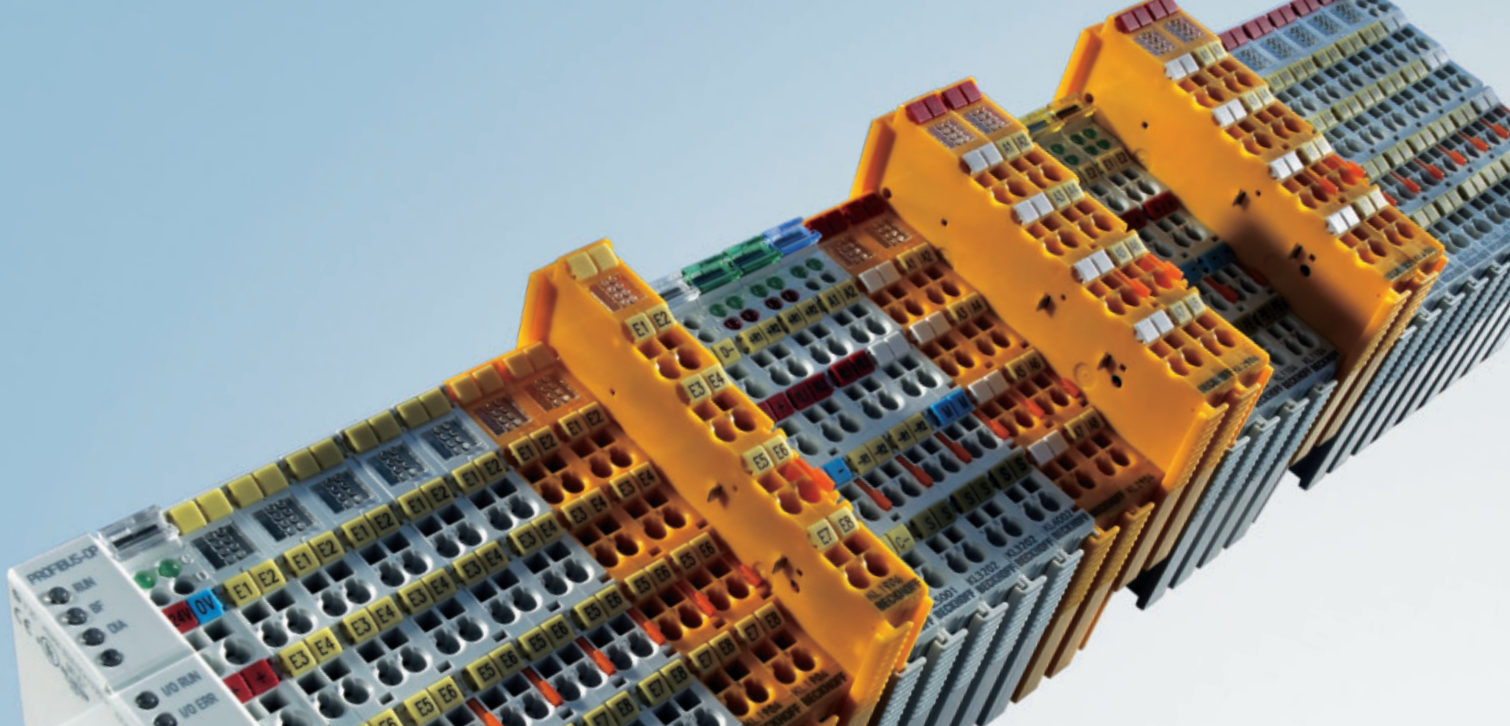
#### Safe system networking

A further significant system benefit is the fact that inter-system communication can be realised with little effort. In most systems consisting of several individual machines, it is a problem to transfer safety-relevant signals between different sections. System communication is generally based on standard signals and shared by the Beckhoff system for safety-relevant data. This is made possible by the KL6904 Logic Terminal or the EL6900 TwinSAFE PLC, which can communicate not only with safe inputs and outputs, but also with other safety and logic units.

Networking of individual TwinSAFE Logic Terminals or TwinSAFE PLCs enables simple and cost-effective safety-relevant networking of machines via bus systems. The TwinSAFE system facilitates encapsulation and decoupling of individual production or manufacturing cells. System extensions or changeovers can be implemented quickly and without



System-wide communication of safety-relevant signals via the KL6904 Logic Terminals. TwinCAT deals with data routing and establishes the communication connection between machines or controllers.



wiring effort. All fieldbus systems including real-time Ethernet or EtherCAT are suitable for this type of machine-to-machine (M2M) communication. Communication is monitored as follows: each logic and I/O terminal offers different mechanisms for local communication monitoring. As the central unit, TwinCAT deals with data routing and provides an "envelope" for the communication connection between two machines or two controllers. The system transfers safety-relevant data within this "envelope".

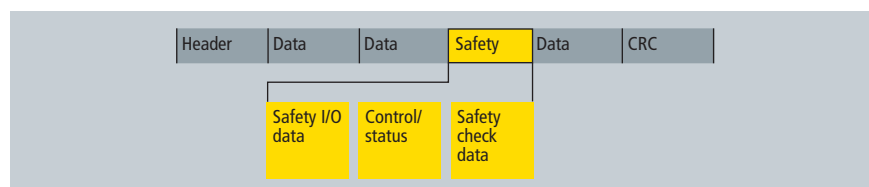
### The TwinSAFE protocol

The TwinSAFE protocol developed by Beckhoff is an open technology in the EtherCAT Technology Group (ETG) under the name FSoE (Fail Safe over EtherCAT). It enables safety-relevant data to be transferred via any medium ("genuine black channel"), since the transfer medium does not contribute to the safety of the system. Fieldbus systems such as PROFIBUS, CANopen or Ethernet systems such as EtherCAT can be used in conjunction with TwinSAFE. All of these systems can also be mixed without restriction. Since advanced automation communication networks (either in the form of a fieldbus or an Ethernet connection) invariably also include a number of non-safety-relevant devices, these must obviously not influence the safety of the system. Document GS-ET-26 "Prüfgrundsätze

Bussysteme für die Übertragung sicherheitsrelevanter Nachrichten" (rules for testing bus systems for the transmission of safety-relevant messages, available only in German) describes the following fault scenarios that have to be considered: repetition, loss, insertion, wrong sequence, corruption of messages, delay, coupling of safety-relevant and non-safety-relevant transfer functions. The TwinSAFE protocol can handle these and other fault scenarios. The residual fault rate of the TwinSAFE protocol meets the requirements of IEC 61508 SIL 3 and is therefore suitable for typical industrial automation applications. The protocol is variable and automatically adapts to the data lengths to be transferred. For example, the TwinSAFE

protocol enables Ethernet with 100 Mbit/s or a serial interface with 10 kbit/s to be used for transferring safety-relevant data. The communication system is not burdened with unnecessary overhead.

The TwinSAFE protocol is suitable for a range of devices such as digital I/Os, drive controllers, measuring transducers or laser scanners. All safety- and non-safety-relevant data are available to the non-safety-relevant controller (TwinCAT) for further processing or analysis. Excellent diagnostic functions enable very effective debugging, thereby increasing system availability. Standard and safety controller and standard and safety bus no longer have to be separated, which opens up new opportunities.

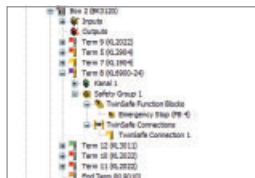


FSoE/TwinSAFE telegram structure



## Configuring instead of wiring: the TwinSAFE configurator

The complete TwinSAFE system is configured via the TwinCAT System Manager. All bus parameters can be edited and displayed in the System Manager (unless they were already set automatically by the system).

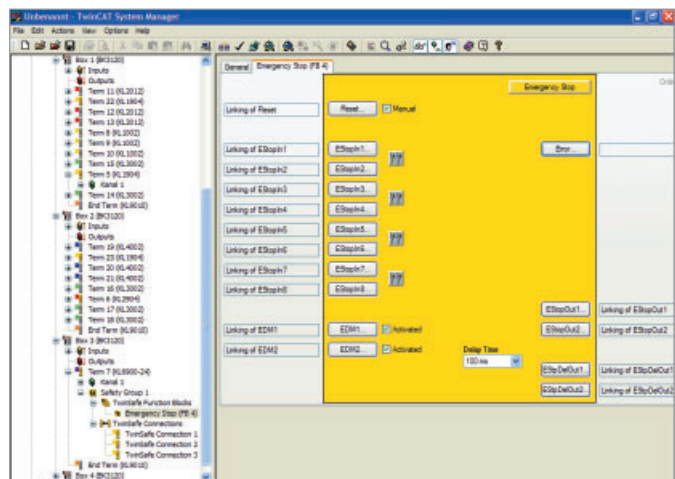


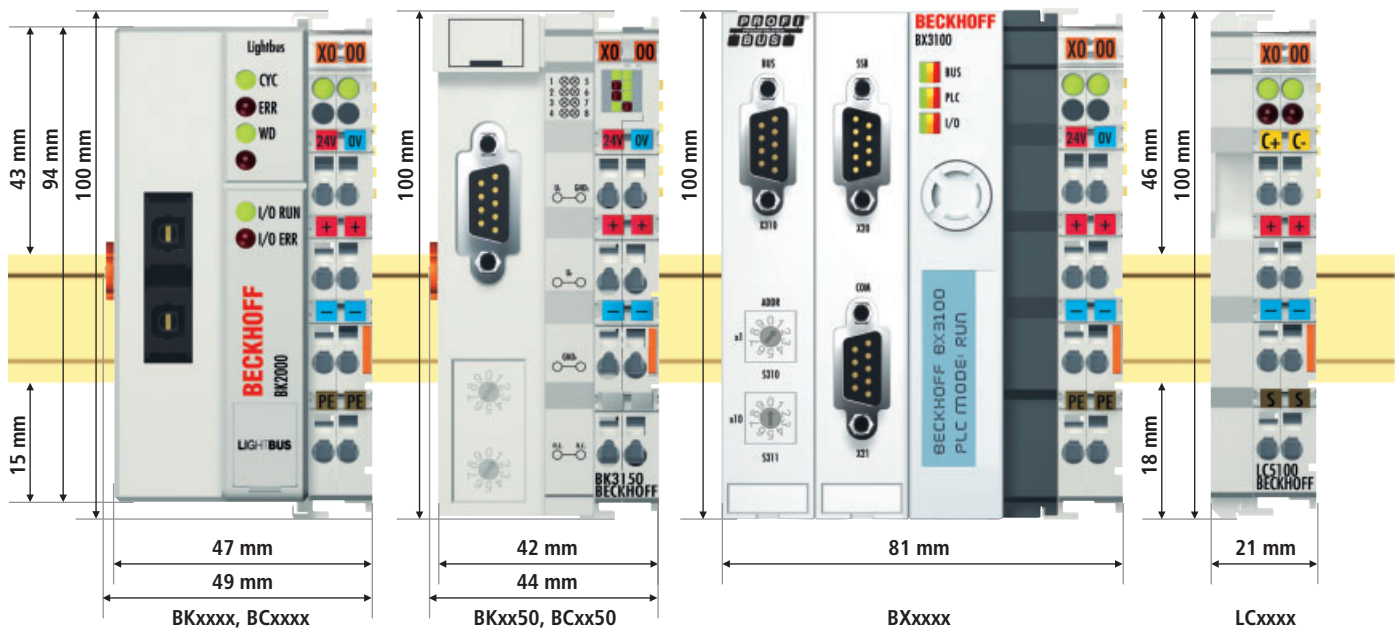
Parameter	F	Kind	Req.	Status	Type	Value	Default Value
F_S_Lower	1	42	0	UNF10	1:1	1:1	1:1
F_Source_Address	1	42	0	UNF10	2:0	1	1
F_Destination_Address	1	42	0	UNF10	2:0	1	1
F_Homing_Time	1	44	0	UNF10	2:0	100	100
Kind 1	1	47	0	EDF	0:1	active	active
Kind 2	1	47	1	EDF	0:1	active	active
Kind 3	1	47	0	EDF	0:1	active	active
Kind 4	1	47	3	EDF	0:1	active	active
Terminated Kind 1	1	47	0	EDF	0:1	active	active
Terminated Kind 2	1	47	0	EDF	0:1	active	active
Terminated Kind 3	1	47	10	EDF	0:1	active	active
Terminated Kind 4	1	47	11	EDF	0:1	active	active
Kind 1 on 2	1	48	0	EDF	0:1	emergency_Accumulation	emergency_Accumulation

The safety application is simply realised with function blocks that have already been certified, such as E\_Stop, M\_Mon, etc. To this end, the required function blocks are selected and linked with the required safe inputs and outputs. Simple handling and machine safety-typical function blocks facilitate projecting and implementation. Complex functions can be implemented by linking the function blocks via operators such as AND, OR, etc.

The finished safety application is loaded into the KL6904 TwinSAFE Logic Terminal or the EL6900 TwinSAFE PLC via any fieldbus connection or via Ethernet. The terminal features its own user administration that prevents unauthorised access. Manipulation or unauthorised modification of the application can thus be prevented. The KL6904 TwinSAFE Logic Terminal and EL6900 TwinSAFE PLC also feature automatic version checking.

Via the TwinCAT System Manager, the safety-relevant signals are available to the TwinCAT PLC in read access mode. Read access to these data has no effect on safety and means that no signal contacts (which would otherwise be required) are needed. Analysis of the status messages from all safety-relevant terminals offers unsurpassed diagnostic depth.

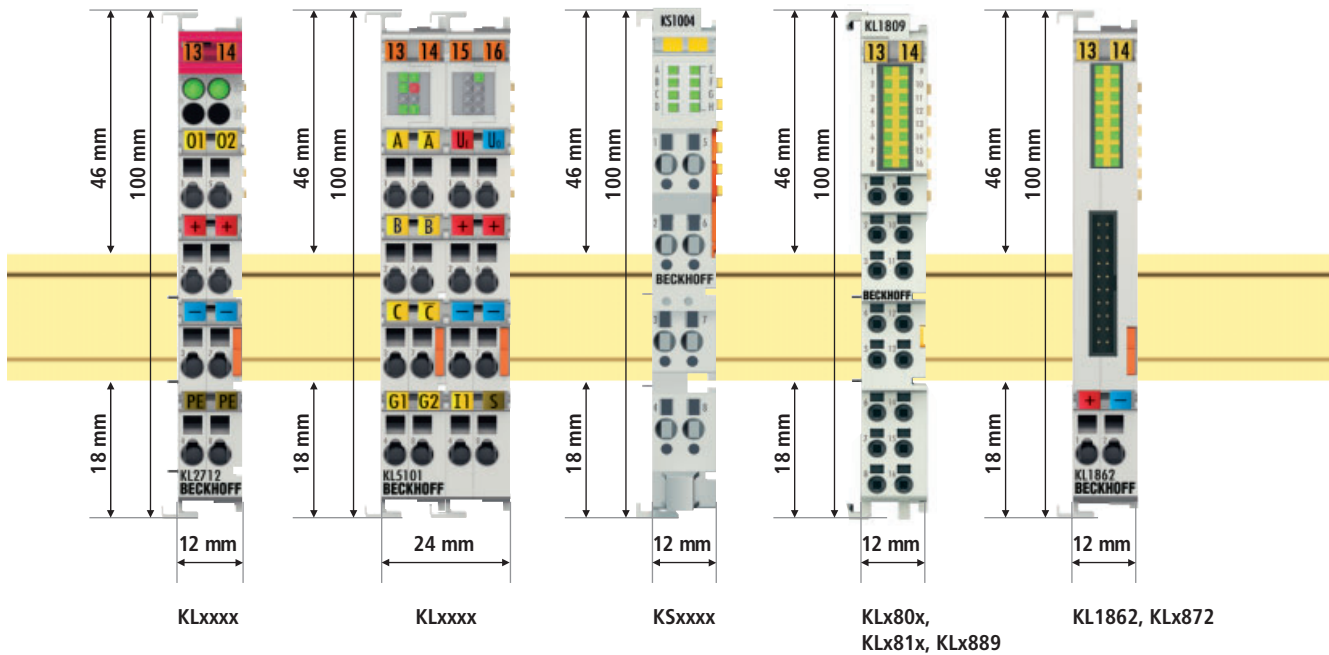




## Technical data – Bus Coupler housing

The Beckhoff Bus Coupler electronics can be mounted in a variety of housings. A housing has three power contacts, which, if the application requires, automatically implement a continued connection, carrying the potential of the power circuit to the next Bus Terminal. The supply voltage that is connected to the Bus Coupler spring-loaded terminals is 24 V DC. If a different voltage is required for the power contacts, the appropriate power feed terminal must be inserted after the Bus Coupler.

Mechanical data	BKxxxx, BCxxxx	BKxx50, BCxx50	BXxxxx	LCxxxx
Design form	compact terminal housing with signal LED			
Material	polycarbonate			
Dimensions (W x H x D)	49 mm x 100 mm x 68 mm	44 mm x 100 mm x 68 mm	81 mm x 100 mm x 89 mm (BX8000: 61 mm x 100 mm x 89 mm)	21 mm x 100 mm x 68 mm
Installation	on 35 mm C-rail, conforming to EN 50022 with lock			
Side by side mounting by means of	double slot and key connection			
Marking	standard terminal block marking			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Connection	BKxxxx, BCxxxx	BKxx50, BCxx50	BXxxxx	LCxxxx
Wiring	Cage Clamp® spring-loaded technique			
Connection cross-section	0.08...2.5 mm², AWG 28-14, stranded wire, solid wire			
Stripping length	8...9 mm			
Fieldbus connection	depending on fieldbus	depending on fieldbus	depending on fieldbus	spring-loaded terminals
Power contacts	3 spring contacts			
Current load	I <sub>max</sub> : 10 A (125 A short-circuit)			
Nominal voltage	24 V DC			



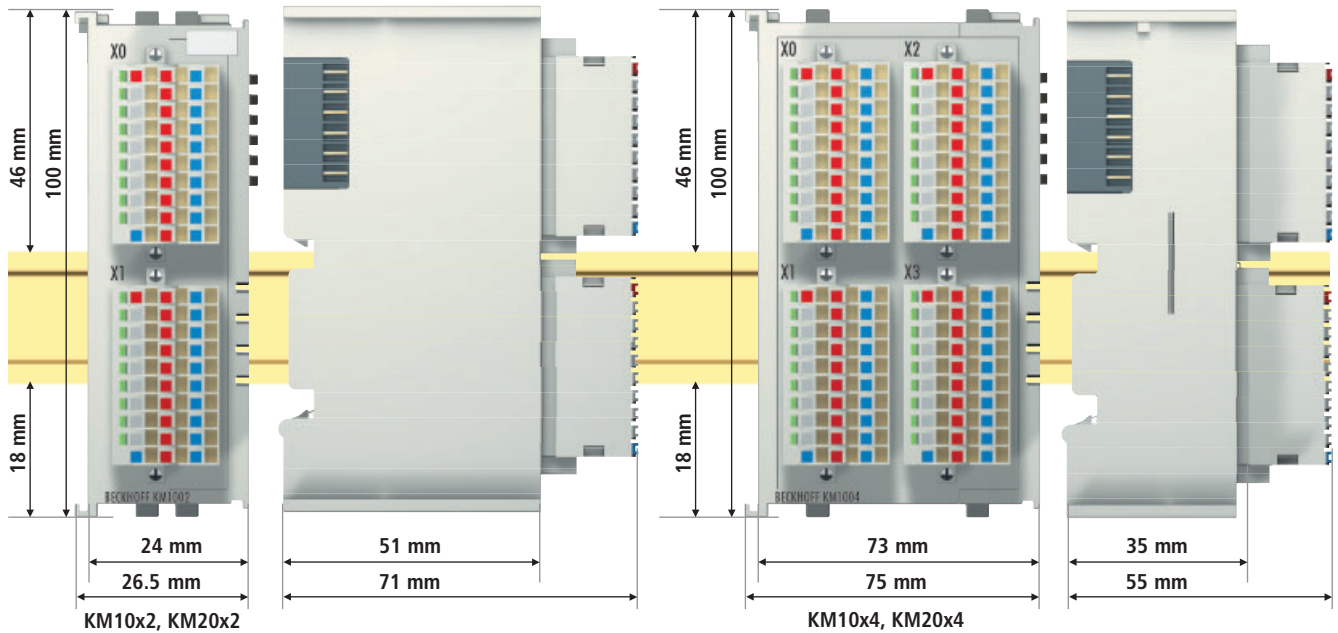
## Technical data – Bus Terminal housing

The Beckhoff Bus Terminal electronics can be mounted in a variety of housings. Bus Terminals are available with up to three power contacts, and can have a variety of voltages. Care should be taken to ensure that a change in voltage always starts with a power feed terminal.

Mechanical data	KLxxxx	KL5101	KL5102	KSxxxx	KLx80x, KLx81x, KLx889	KL1862, KLx872
Design form	compact terminal housing with signal LED	compact terminal housing with signal LED	compact terminal housing with signal LED	terminal housing with pluggable wiring level	compact terminal housing with signal LED	compact terminal housing with signal LED
Material	polycarbonate					
Dimensions (W x H x D)	12 mm x 100 mm x 68 mm	24 mm x 100 mm x 68 mm	24 mm x 100 mm x 68 mm	12/24 mm x 100 mm x 71 mm	12 mm x 100 mm x 68 mm	12 mm x 100 mm x 68 mm
Installation	on 35 mm C-rail, conforming to EN 50022 with lock					
Side by side mounting by means of	double slot and key connection					
Marking	standard terminal block marking	standard terminal block marking	standard terminal block marking	standard terminal block marking	–	standard terminal block marking
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29					
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4					

Connection	KLxxxx	KL5101	KL5102	KSxxxx	KLx80x, KLx81x, KLx889	KL1862, KLx872
Wiring	Cage Clamp® spring-loaded technique	Cage Clamp® spring-loaded technique	Cage Clamp® spring-loaded technique	Cage Clamp® spring-loaded technique	direct plug-in technique	flat-ribbon cable connection
Connection cross-section	s, st*: 0.08... 2.5 mm <sup>2</sup> , AWG 28-14	s, st*: 0.08... 2.5 mm <sup>2</sup> , AWG 28-14	s, st*: 0.08... 2.5 mm <sup>2</sup> , AWG 28-14	s, st*: 0.08... 1.5 mm <sup>2</sup> , AWG 28-16	s*: 0.08... 1.5 mm <sup>2</sup> ; st: 0.25...1.5 mm <sup>2</sup> ; f: 0.14...0.75 mm <sup>2</sup>	common flat-ribbon cables
Stripping length	8...9 mm	8...9 mm	8...9 mm	9...10 mm	8...9 mm	–
Power contacts	up to 3 blade/spring contacts	none	2 blade/spring contacts	2 blade/spring contacts	2 blade/spring contacts	none
Current load	I <sub>MAX</sub> : 10 A (125 A short-circuit)					
Nominal voltage	depends on Bus Terminal type					

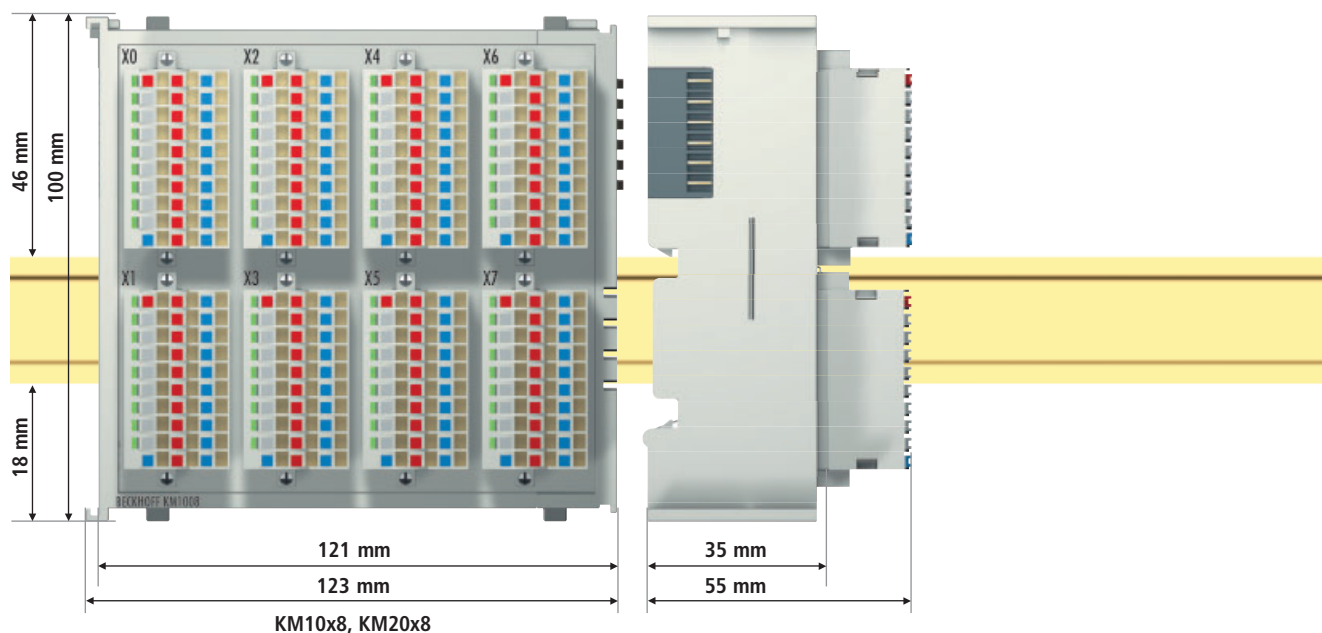
\*s: solid wire; st: stranded wire; f: ferrule



## Technical data – Terminal module housing

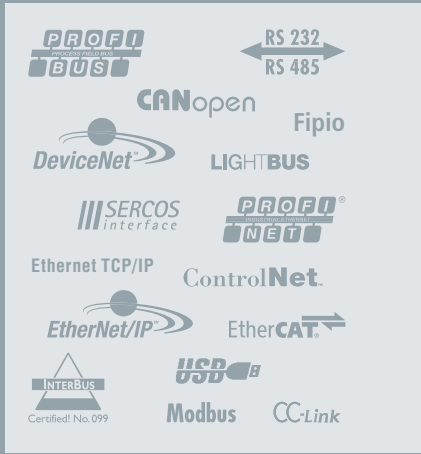
The Beckhoff terminal modules with pluggable connection level are mounted in enclosures of different size. Like for the Bus Terminals, spring-loaded terminals are used and no tools are required for the wiring.

Mechanical data	KMx0x2	KMx0x4
Design form	compact terminal module with pluggable wiring level	
Dimensions (W x H x D)	26.5 mm x 100 mm x 71 mm	75 mm x 100 mm x 55 mm
Installation	on 35 mm C-rail, conforming to EN 50022 with lock	
Side by side mounting by means of	double slot and key connection	
Marking	standard terminal block marking	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Connection	KMx0x2, KMx0x4	
Wiring	spring-loaded technique	
Connection cross-section	0.08...1.5 mm <sup>2</sup> , stranded wire, solid wire	
Stripping length	8 mm	
Power contacts	none	
Nominal voltage	depends on Bus Terminal type	



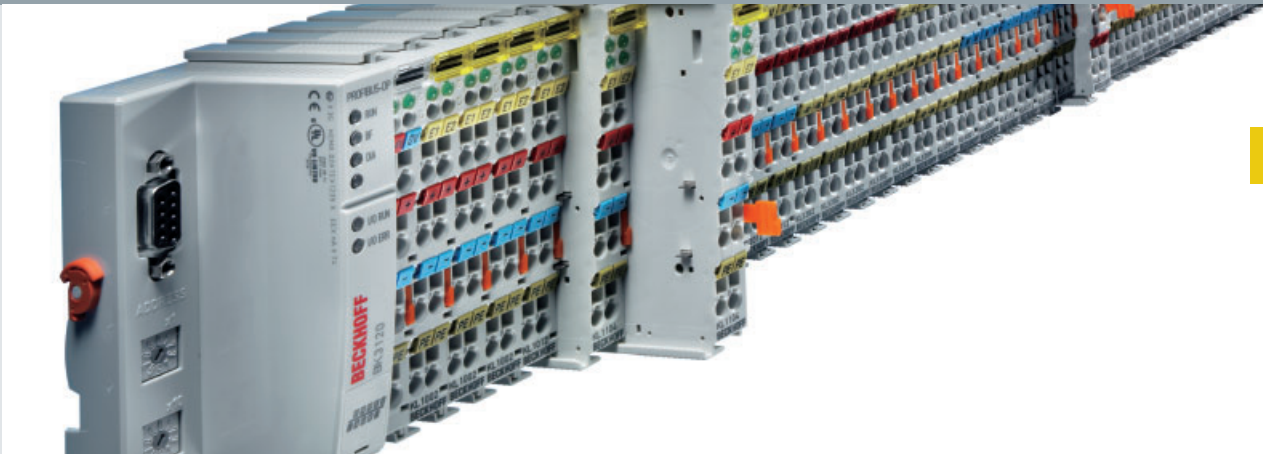
Mechanical data	KMx0x8
Design form	compact terminal module with pluggable wiring level
Dimensions (W x H x D)	123 mm x 100 mm x 55 mm
Installation	on 35 mm C-rail, conforming to EN 50022 with lock
Side by side mounting by means of	double slot and key connection
Marking	standard terminal block marking
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Connection	KMx0x8
Wiring	spring-loaded technique
Connection cross-section	0.08...1.5 mm <sup>2</sup> , stranded wire, solid wire
Stripping length	8 mm
Power contacts	none
Nominal voltage	depends on Bus Terminal type

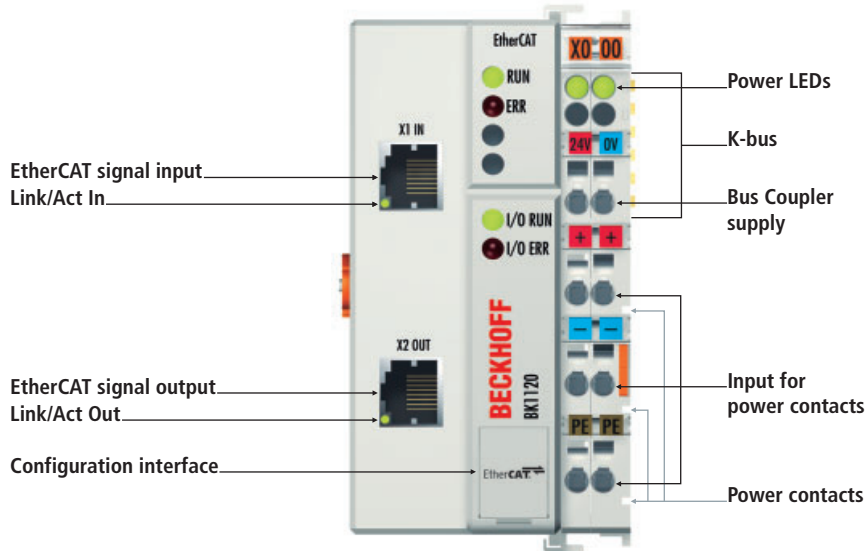




# Bus Couplers

The interface between fieldbus and terminals





## BK1120 | EtherCAT Bus Coupler

**EtherCAT** 

The BK1120 Bus Coupler connects EtherCAT, the real-time Ethernet system, with the modular, extendable electronic terminal blocks. A unit consists of a Bus Coupler, any number (between 1 and 64) of terminals (255 with K-bus extension) and one end terminal.

The Bus Coupler recognises the connected Bus Terminals and automatically allocates them into the EtherCAT process image. The Bus Coupler is connected to the network via the upper Ethernet interface. The lower RJ 45 socket may be used to connect further EtherCAT devices in the same strand.

In the EtherCAT network, the BK1120 Bus Coupler can be installed anywhere in the

Ethernet signal transfer section (100BASE-TX) – except directly at the switch. The Bus Couplers BK9000 (for K-bus components) or EK1000 (for EtherCAT Terminals) are suitable for installation at the switch.

EtherCAT (Ethernet Control Automation Technology) is the Ethernet solution for industrial automation, characterised by outstanding performance and particularly simple handling. EtherCAT enables the Ethernet star topology to be replaced with a simple line structure. Optionally, EtherCAT may also be wired in the “classic” way using switches, in order to integrate further Ethernet devices. The master requires no special plug-in card and can be implemented on any

existing Ethernet controller using a very simple interface. EtherCAT is therefore also well suited to small and medium control applications, where it will also open up new areas of application for distributed I/Os.

For EtherCAT a separate I/O system in protection class IP 20 is available in the form of EtherCAT Terminals. In contrast to Bus Terminals, where the fieldbus signal is implemented within the Bus Coupler on the internal, fieldbus-independent terminal bus, the EtherCAT protocol remains fully intact down to the individual terminal. The ELxxxx EtherCAT Terminals are connected via associated EKxxxx-type EtherCAT Couplers (see EtherCAT section).

Ordering information	Description
BK1120	EtherCAT “Economy plus” Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)
CX8010	EtherCAT Embedded PC

## Complex signal processing for analog I/Os, position measurement, ...

The BK1120 Bus Coupler supports the operation of all Bus Terminals. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.

The analog and multi-functional Bus Terminals can

be adapted to each specific application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

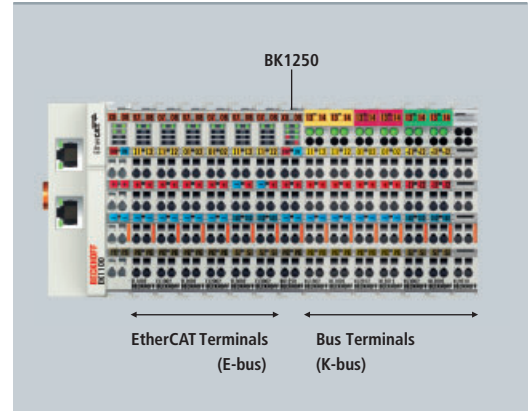
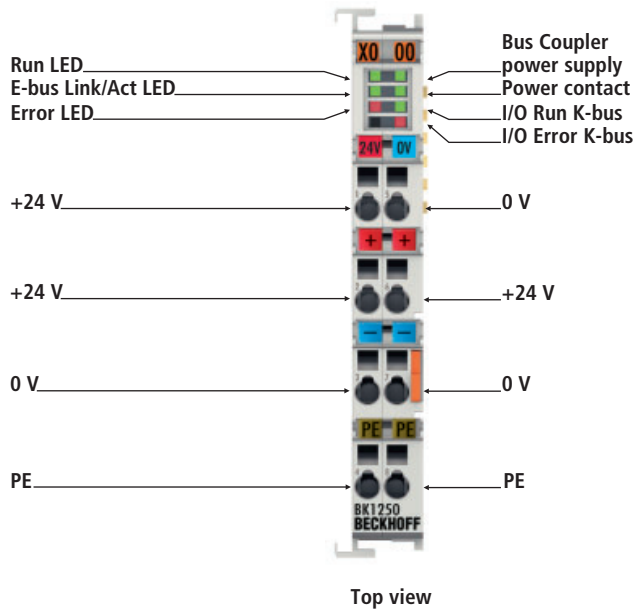
Optionally, the Bus Terminals can also be controlled by the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handles configuration of the complete periphery during the start up phase. If required, the controller can upload the decentrally created configuration data in order to centrally manage and

store this data. Therefore, new adjustments are not necessary in the event of replacement of a Bus Terminal. The controller automatically sets the required setting on power up.

System data	EtherCAT   BK1120
Number of I/O stations	65,535
Number of I/O points	depending on controller
Data transfer medium	Ethernet/EtherCAT CAT5 cable
Max. cable length	100 m (100BASE-TX)
Data transfer rates	100 Mbaud
Data transfer time	0.01 ms in the case of 10 modules for 32 bit inputs and outputs each (without K-bus run-time)

Technical data	BK1120
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	1,024 byte input and 1,024 byte output
Configuration possibility	via KS2000 or EtherCAT (ADS)
Bus interface	2 x RJ 45
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current) /4, 500 mA max.
Starting current	approx. 2.5 x continuous current
Recommended fuse	≤ 10 A
Supply current K-bus	1,750 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/Ethernet)
Distance between stations	100 m (100BASE-TX)
Weight	approx. 150 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/BK1120">www.beckhoff.com/BK1120</a>

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	632
FC90xx	PC Fieldbus Cards with PCI interface	1048



## BK1250 | “Compact” Coupler between E-bus and K-bus Terminals

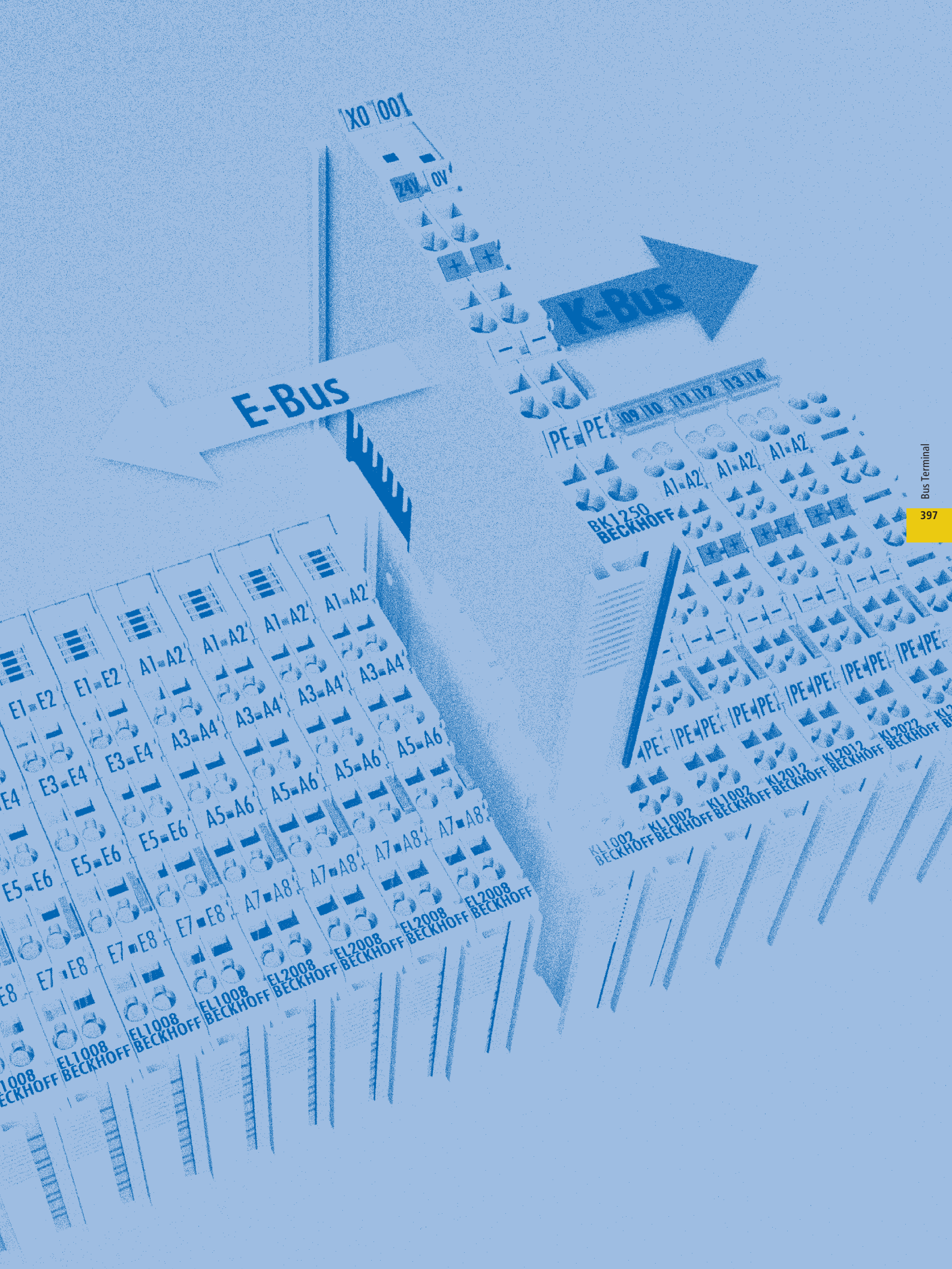
**EtherCAT** 

The BK1250 is a “Bus Coupler in terminal housing” for mixed application of EtherCAT Terminals (ELxxxx) and standard Bus Terminals (KLxxxx) in a bus station. It enables implementation of compact and cost-effective

control solutions. The wide range of Bus Terminals can thus be optimally combined with the communication speed and large bandwidth of EtherCAT Terminals. Up to 64 Bus Terminals (with K-bus extension up to 255)

can be connected to a BK1250. The Bus Coupler recognises the connected Bus Terminals and automatically allocates them into the EtherCAT process image.

Technical data	BK1250
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	1,024 byte input and 1,024 byte output
Digital peripheral signals	8,192 inputs/outputs
Analog peripheral signals	256 inputs/outputs
Protocol	EtherCAT
Configuration possibility	via KS2000 or EtherCAT (ADS)
Data transfer rates	100 Mbaud
Bus interface	via E-bus contacts
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 200 mA max.
Starting current	approx. 2.5 x continuous current
Recommended fuse	≤ 10 A
Supply current K-bus	max. 500 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/Ethernet)
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/BK1250">www.beckhoff.com/BK1250</a>



E-BUS

K-BUS

X0 001

24V 0V

PE-PE

BK1250  
BECKHOFF

A1-A2

A1-A2

E1-E2

E1-E2

A1-A2

A1-A2

A1-A2

A1-A2

E4

E3-E4

E3-E4

A3-A4

A3-A4

A3-A4

A3-A4

E5-E6

E5-E6

E5-E6

A5-A6

A5-A6

A5-A6

A5-A6

E8

E7-E8

E7-E8

E7-E8

A7-A8

A7-A8

A7-A8

A7-A8

EL1008  
BECKHOFF

EL1008  
BECKHOFF

EL1008  
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EL2008  
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KL1002  
BECKHOFF

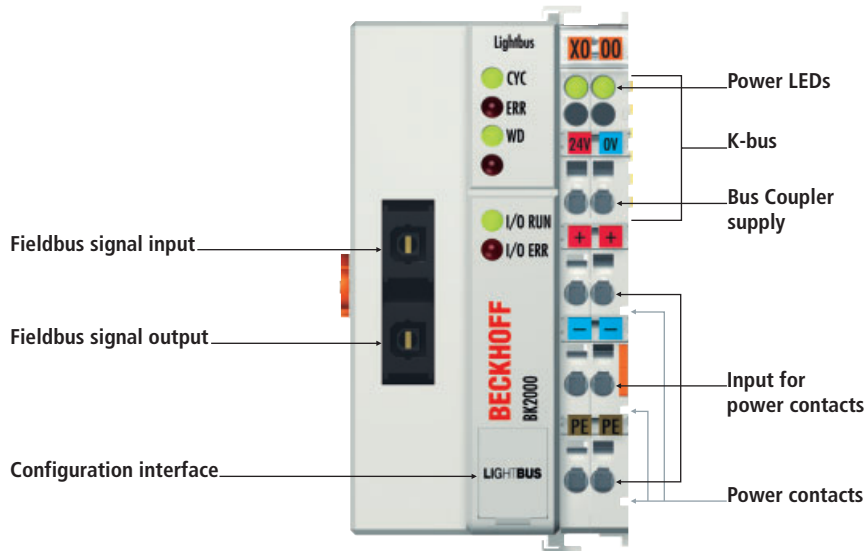
KL1002  
BECKHOFF

KL1002  
BECKHOFF

KL2012  
BECKHOFF

KL2012  
BECKHOFF

KL2022  
BECKHOFF



## BK2000, BK2010, BK2020 | Lightbus Bus Couplers

### LIGHTBUS

The BK2000, BK2010 and BK2020 Bus Couplers connect the Lightbus system to the electronic terminal blocks, which can be expanded in modular fashion. One unit consists of one Bus Coupler, any number of up to 64 terminals and one end terminal. The BK2010 economy variant permits particularly economical creation of peripheral interfacing connections. Up to 64 digital input/output terminals can be connected.

With the K-bus extension technology, the "Economy plus" Bus Coupler BK2020 allows the connection of up to 255 spatially distributed Bus Terminals to one

Bus Coupler. The "Economy plus" series supports all Beckhoff system Bus Terminals. It can process in its full configuration 1,020 digital signals and a maximum of 128 analog input and output channels per slave.

The Bus Coupler recognises the connected terminals and automatically generates the affiliations of the inputs/outputs to the bytes of the process image. The first input/output signal is inserted in the first bit of one byte (LSB), beginning from the left. The Bus Coupler inserts further signals in this byte. Inputs and outputs are clearly separated. The Bus Coupler automat-

ically begins a further byte if the number of inputs or outputs exceeds 8 bits.

The Lightbus System is a rapid and safe serial fieldbus system. The Lightbus has a ring structure; up to 254 stations can be operated in a ring. Easy-to-operate standard fibre optic technology is used for data transmission, which represents excellent value. Thanks to an optimised, efficient telegram structure, the Lightbus achieves a very high user data transmission rate. For the exchange of 32 bit information 25 µs transmission time is required.

Ordering information	Description
BK2000	Lightbus Bus Coupler for up to 64 Bus Terminals
BK2010	Lightbus Bus Coupler for up to 64 digital Bus Terminals
BK2020	Lightbus "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)
BC2000	Lightbus Bus Terminal Controller

## Complex signal processing for analog I/Os, position measurement, ...

The BK2000 and BK2020 Bus Couplers support the operation of all Bus Terminals. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.

The analog and multi-functional Bus Terminals can be adapted to each specific

application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

Optionally, the Bus Terminals can also be controlled by

the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handles configuration of the complete periphery during the start-up phase. If required, the controller can upload the decentrally created configuration data in order to centrally manage and store this data. Therefore, new adjustments are not necessary in the event of replacement of

a Bus Terminal. The controller automatically sets the required setting on power up.

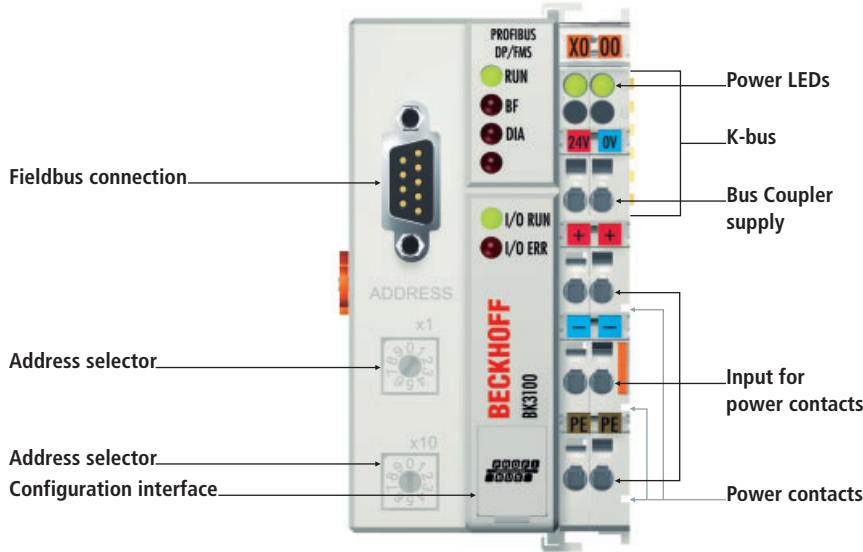
Thanks to the high-speed access method employed by the Lightbus, it is possible to access specific peripheral data and to read or write the required data only. Data is exchanged with the required priorities without producing any overhead.

System data	Lightbus   BK2000, BK2010, BK2020
Number of I/O stations	254
Number of I/O points	16,192
Data transfer medium	fibre optic conductor: APF (plastic) fibre (1,000 µm) or HCS fibre (200 µ)
Distance between stations	45 m for APF fibre, 300 m HCS fibre
Data transfer rates	2.5 Mbaud
Data transfer time	0.26 ms in the case of 10 modules for 32 bit inputs and outputs each (without K-bus run-time)

Technical data	BK2000	BK2010	BK2020
Number of Bus Terminals	64	64	64 (255 with K-bus extension)
Max. number of bytes fieldbus	512 byte input and 512 byte output	32 byte input and 32 byte output	512 byte input and 512 byte output
Digital peripheral signals	512 inputs/outputs	512 inputs/outputs	1,020 inputs/outputs
Analog peripheral signals	128 inputs/outputs	–	128 inputs/outputs
Configuration possibility	via KS2000 or the controller		
Bus interface	2 x standard fibre optic connector Z1000 (plastic fibre), Z1010 (HCS fibre)		
Power supply	24 V DC (-15 %/+20 %)		
Input current	70 mA + (total K-bus current)/4, 500 mA max.	70 mA + (total K-bus current)/4, 200 mA max.	70 mA + (total K-bus current)/4, 500 mA max.
Starting current	approx. 2.5 x continous current		
Recommended fuse	≤ 10 A		
Supply current K-bus	1,750 mA	500 mA	1,750 mA
Power contacts	24 V DC max./10 A max.		
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage)		
Distance between stations	45 m for APF fibre, 300 m HCS fibre		
Weight	approx. 150 g	approx. 130 g	approx. 150 g
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Further information	www.beckhoff.com/BK2000		

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	632
FC200x	PC Fieldbus Cards with PCI interface	1043
FC1xxx	PC Fieldbus Cards with ISA, VME bus, S5 interface	1023





## BK3010, BK3100, BK3110 | PROFIBUS Bus Couplers



The BK3010, BK3100 and BK3110 Bus Couplers connect the PROFIBUS system to the electronic terminal blocks, which can be extended in modular fashion. One unit consists of the Bus Coupler, any number of up to 64 terminals and one end terminal. The BK3010 and BK3110 economy variants permit particularly economical creation of peripheral interfacing connec-

tions. Up to 64 digital input/output terminals can be connected.

The Bus Coupler recognises the connected terminals and automatically generates the affiliations of the inputs/outputs to the bytes of the process image. The first input/output signal is inserted in the first bit of one byte (LSB), beginning from the left. The Bus Coupler inserts further signals in this byte.

Inputs and outputs are clearly separated. The Bus Coupler automatically begins a further byte if the number of inputs or outputs exceeds 8 bits.

Ordering information	Description	
BK3010	PROFIBUS Bus Coupler for up to 64 digital Bus Terminals, 1.5 Mbaud	
BK3100	PROFIBUS DP/FMS Bus Coupler for up to 64 Bus Terminals, 12 Mbaud	
BK3110	PROFIBUS Bus Coupler for up to 64 digital Bus Terminals, 12 Mbaud	
BK3120	PROFIBUS "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension), 12 Mbaud	402
BK3150	PROFIBUS "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension), 12 Mbaud	403
BK3500	PROFIBUS Bus Coupler with fibre optic connection for up to 64 Bus Terminals, 1.5 Mbaud	404
BK3520	PROFIBUS "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension), 12 Mbaud	406
LC3100	PROFIBUS "Low Cost" Bus Coupler for up to 64 digital Bus Terminals, 12 Mbaud	407
BC31x0, BX3100	PROFIBUS Bus Terminal Controller	446
CX8031	PROFIBUS Embedded PC	263

## Complex signal processing for analog I/Os, position measurement, ...

The BK3100 Bus Coupler supports the operation of all Bus Terminals. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.

The analog and multi-functional Bus Terminals can be adapted to each specific

application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

Optionally, the Bus Terminals can also be controlled by

the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handles configuration of the complete periphery during the start up phase. If required, the controller can upload the decentrally created configuration data in order to centrally manage and store this data. Therefore, new adjustments are not necessary in the event of replacement of

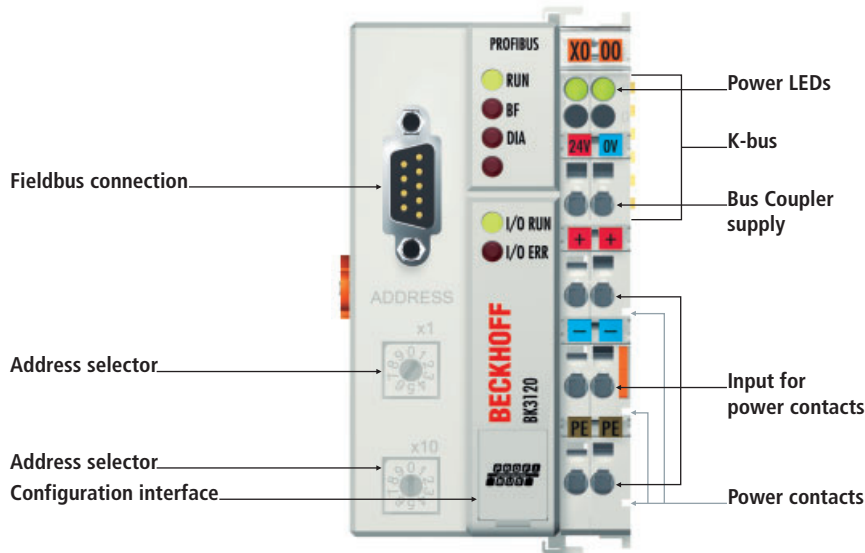
a Bus Terminal. The controller automatically sets the required setting on power up.

The Beckhoff GSE and type data files to the Bus Couplers support the Bus Terminal options and can be loaded in the corresponding master configuration software to facilitate planning and design. Various configurations and parameters for the Bus Coupler can be selected via GSE and type data files.

System data	PROFIBUS   BK3010, BK3100, BK3110				
Number of I/O stations	100 with repeater				
Number of I/O points	approx. 6,000, depending on the master				
Data transfer medium	shielded copper cable, 2 x 0.25 mm <sup>2</sup>				
Max. cable length	1,200 m	1,000 m	400 m	200 m	100 m
Data transfer rates	9.6/19.2/93.75 kbaud	187.5 kbaud	500 kbaud	1,500 kbaud	...3, 6, 12 Mbaud
Data transfer time	approx. 3 ms (10 stations for 32 bit input and output each)			approx. 0.5 ms	

Technical data	BK3010	BK3100	BK3110
Number of Bus Terminals	64		
Max. number of bytes fieldbus	64 byte input and 64 byte output	64 byte input and 64 byte output (DP and FMS mode), 128 byte input and 128 byte output (only DP mode)	64 byte input and 64 byte output
Digital peripheral signals	512 inputs/outputs		
Analog peripheral signals	–	64 inputs/outputs (only DP mode)	–
Configuration possibility	via KS2000 or the controller		
Data transfer rates	automatic detection up to max. 1.5 Mbaud	12 Mbaud	12 Mbaud
Bus interface	1 x D-sub 9-pin socket with shielding		
Power supply	24 V DC (-15 %/+20 %)		
Input current	70 mA + (total K-bus current)/4, 500 mA max.		
Starting current	2.5 x continuous current		
Recommended fuse	≤ 10 A		
Supply current K-bus	500 mA	1,750 mA	500 mA
Power contacts	24 V DC max./10 A max.		
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)		
Weight	approx. 150 g	approx. 170 g	approx. 150 g
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Further information	www.beckhoff.com/BK3010		

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	632
FC310x	PC Fieldbus Cards with PCI interface	1044



## BK3120 | PROFIBUS “Economy plus” Bus Coupler



The “Economy plus” version extends the existing PROFIBUS Bus Coupler series BK3xx0. The K-bus extension technology allows the connection of up to 255 spatially distributed Bus Terminals to one Bus Coupler. The BK3120 has been designed to accommodate automation requirements. The PROFIBUS protocols omit FMS operation

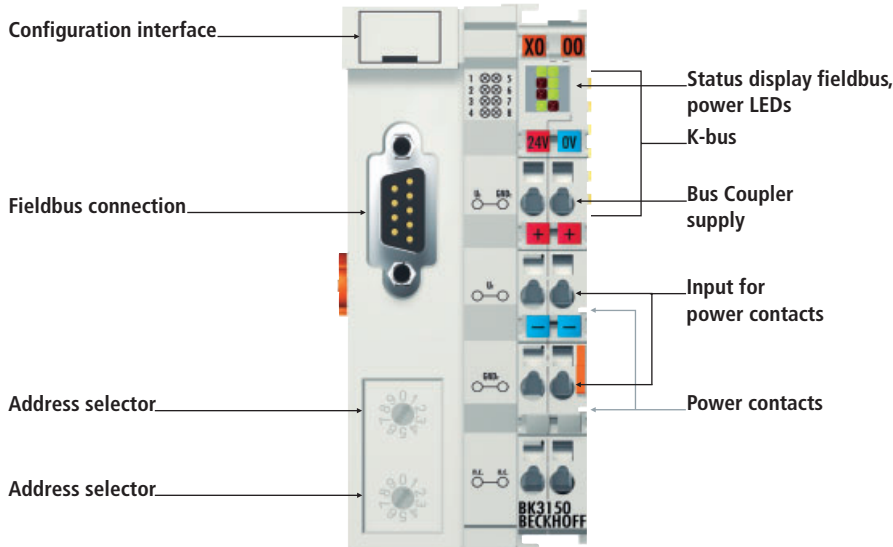
in order to be able to transfer more user data in DP mode, which for this Bus Coupler type can be 128 byte inputs and 128 byte outputs. The BK3120 incorporates the PROFIBUS DP V1 services. These services allow direct access to the Bus Coupler register and the complex Bus Terminals in order, for example, to change the parameterisation

or to set/correct limit values for analog Bus Terminals.

Baud rates of up to 12 Mbaud are automatically recognised by the Bus Coupler, allowing the transmission speed to be adapted to meet the needs of the particular technical process.

Technical data	BK3120
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	128 byte input and 128 byte output
Data transfer rates	automatic detection up to 12 Mbaud
Bus interface	1 x D-sub 9-pin socket with shielding
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Supply current K-bus	1,750 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)
Weight	approx. 170 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/BK3120

For system data see 401



## BK3150 | PROFIBUS "Compact" Bus Coupler

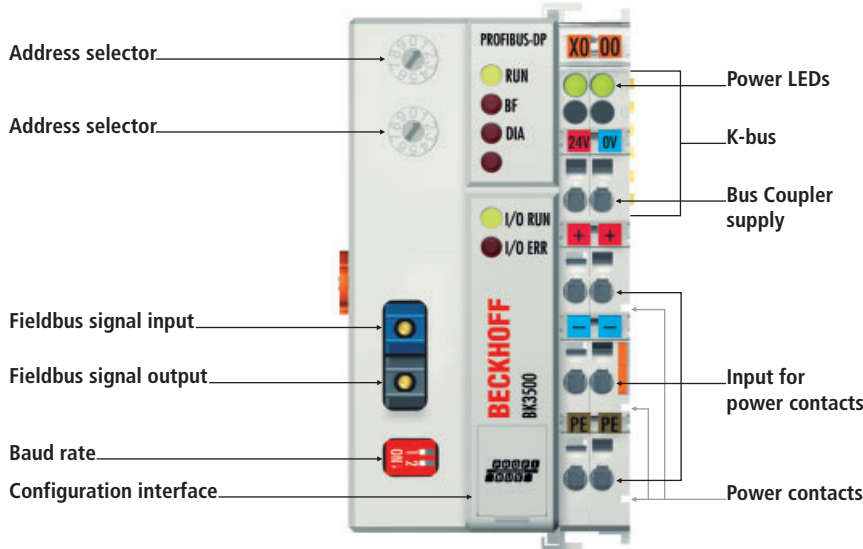


The "Compact" Bus Coupler BK3150 for PROFIBUS extends the Beckhoff Bus Terminal system by a cost-optimised version in a compact housing. Up to 64 Bus Terminals are supported; with the terminal bus extension, up to 255 Bus Terminals can be connected. The PROFIBUS Bus Coupler

offers automatic baud rate detection up to 12 Mbaud and two address selection switches for address assignment. For the fieldbus connection, a D-sub 9-pin socket for the ZS1031-3000 or ZB3100 PROFIBUS connectors is available.

Technical data	BK3150
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	128 byte input and 128 byte output
Data transfer rates	automatic detection up to 12 Mbaud
Bus interface	1 x D-sub 9-pin socket with shielding
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Supply current K-bus	1,000 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)
Weight	approx. 100 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/BK3150">www.beckhoff.com/BK3150</a>

For system data see **401**



## BK3500 | PROFIBUS Bus Coupler, fibre optic, 1.5 Mbaud



The BK3500 Bus Coupler connects the PROFIBUS system to the electronic terminal blocks, which can be extended in modular fashion. One unit consists of the Bus Coupler, any number of up to 64 terminals and one end terminal.

The particular feature of the BK3500 Bus Coupler is its fibre optic connection. The fibre optics mean that the transmission is particularly safe from interference and has absolute electrical isolation.

In order to operate a BK3500 in the PROFIBUS, an interface module is required to translate between the physical properties of RS485 to those of an underlying

fibre optic ring. A sub ring may contain up to ten BK3500 or other fibre optic modules. The baud rate is set by means of two DIP switches on the Bus Coupler. The fibre optic connection of the BK3500 Bus Coupler behaves like an OLP (Optical Link Plug).

The Bus Coupler recognises the connected terminals and automatically generates the affiliations of the inputs/outputs to the bytes of the process image. The first input/output signal is inserted in the first bit of one byte (LSB), beginning from the left. The Bus Coupler inserts further signals in this byte. Inputs and outputs are clearly

separated. The Bus Coupler automatically begins a further byte if the number of inputs or outputs exceeds 8 bits.

PROFIBUS is an open fieldbus system with European standards. The PROFIBUS has a bus structure; up to 126 stations can be operated in a system. Baud rates of up to 1.5 Mbaud are selectable, so that the transmission speed can be adjusted to the demands of the technical process.

**Ordering information**

BK3500

**Description**

PROFIBUS Bus Coupler with fibre optic connection for up to 64 Bus Terminals, 1.5 Mbaud

## Complex signal processing for analog I/Os, position measurement, ...

The BK3500 Bus Coupler supports the operation of all Bus Terminals. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.

The analog and multi-functional Bus Terminals can be adapted to each specific

application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals registers contain temperature ranges, gain values and linearisation characteristics. Using the KS2000 software, the required parameters can be set on a PC. The Bus Terminal stores settings permanently and in a fail-safe manner.

Optionally, the Bus Terminals can also be controlled by

the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handles configuration of the complete periphery during the start up phase. If required, the controller can upload the decentrally created configuration data in order to centrally manage and store this data. Therefore, new adjustments are not necessary in the event of replacement of

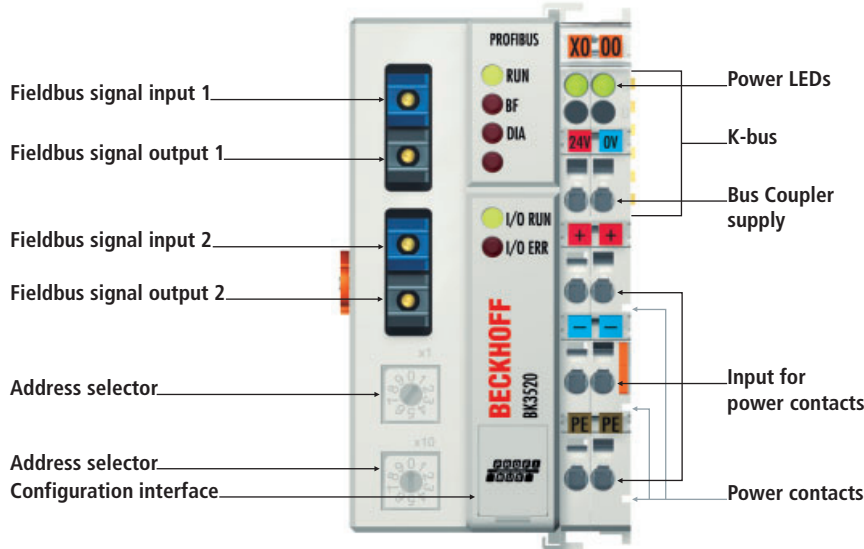
a Bus Terminal. The controller automatically sets the required setting on power up.

The Beckhoff GSE and type data files to the Bus Couplers support the Bus Terminal options and can be loaded in the corresponding master configuration software to facilitate planning and design. Various configurations and parameters for the Bus Coupler can be selected via GSE and type data files.

System data	PROFIBUS   BK3500			
Number of I/O stations	100 with repeater			
Number of I/O points	approx. 6,000, depending on the master			
Data transfer medium	APF (plastic) fibre (1,000 µm)			
Distance between stations	1...25 m			
Data transfer rates	93.75 kbaud	187.5 kbaud	500 kbaud	1,500 kbaud
Switch settings	S1 = 0, S2 = 0	S1 = 0, S2 = 1	S1 = 1, S2 = 0	S1 = 1, S2 = 1
Data transfer time	approx. 3 ms (10 stations for 32 bit input and output each)			approx. 0.5 ms
Topology	sub ring			
Implementation	single fibre ring			
Fibre optic/copper converter	OLM/P3, OLM/P4			

Technical data	BK3500
Number of Bus Terminals	64
Max. number of bytes fieldbus	128 byte input and 128 byte output
Digital peripheral signals	512 inputs/outputs
Analog peripheral signals	128 inputs/outputs
Configuration possibility	via KS2000 or the controller
Data transfer rates	automatic detection up to max. 1.5 Mbaud
Bus interface	2 x HP-Simplex sockets (HP-Simplex plugs included)
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continuous current
Recommended fuse	≤ 10 A
Supply current K-bus	1,750 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)
Distance between stations	1...25 m
Weight	approx. 170 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/BK3500

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	632



## BK3520 | PROFIBUS “Economy plus” Bus Coupler, fibre optic



The BK3520 “Economy plus” Bus Coupler links a fibre optic PROFIBUS system to the modular, extendable electronic Bus Terminal system. With the K-bus extension technology up to 255 spatially distributed Bus Terminals can be connected to one Bus Coupler.

The particular feature for the BK3520 Bus Coupler is its fibre optic connection and its high transmission rate of up to 12 Mbaud. The fibre optic link guarantees that the transmis-

sion is free from electromagnetic interference and provides full electrical isolation.

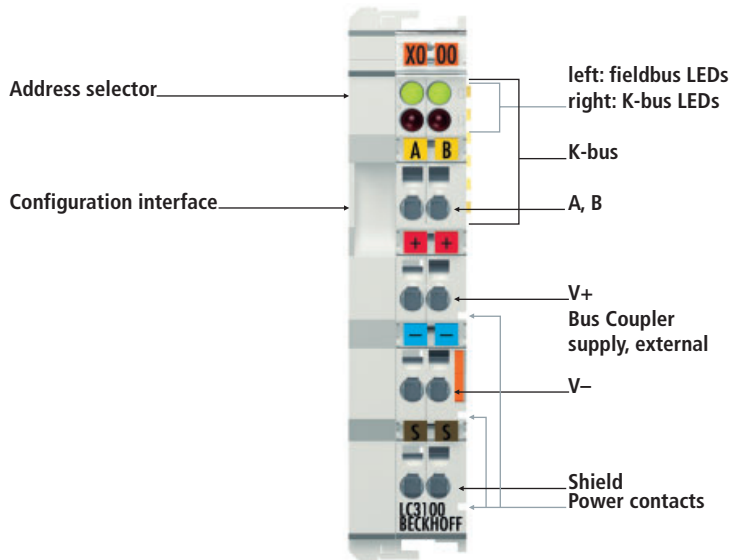
An interface-module is necessary to translate between the physical properties of RS485 to those of an underlying optical fibre ring. The topology corresponds with the RS485 physics (line topology). For this reason, the BK3520 possesses two transmitters and two receivers. The address is set by the address selection switch. The baud rate is automatically recognised.

Baud rates of up to 12 Mbaud are supported, so that the transmission speed can be adapted to meet the needs of the particular technical process.

The “Economy plus” Bus Coupler has been designed to accommodate automation requirements. PROFIBUS protocols omit FMS operation in order to be able to transfer more user data in DP mode. The BK3520 incorporates the PROFIBUS DP V1 services.

Technical data	BK3520
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	128 byte input and 128 byte output
Digital peripheral signals	1,020 inputs/outputs
Analog peripheral signals	64 inputs/outputs
Data transfer rates	automatic detection up to 12 Mbaud
Bus interface	4 x HP-Simplex sockets (HP-Simplex plugs Z51031-3500 included)
Topology	line topology
Data transfer medium	APF (plastic fibre (1,000 µm)
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)
Distance between stations	40 m
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/BK3520

For system data see 401



## LC3100 | PROFIBUS “Low Cost” Bus Coupler



The LC3100 “Low Cost” Bus Coupler is marked by a smaller design and a more economical connection method. Its functions correspond to those of the PROFIBUS BK3110 Bus Coupler in relation to operation with Bus Terminals and to the fieldbus properties. Up to 64 digital input/output terminals can be

connected. The firmware can be updated via the configuration interface.

The LC3100 Bus Coupler is particularly suitable for use in small, low-price stations. The 24 V DC supply voltage feeds the peripheral devices via the power contacts. It also feeds the Bus Coupler and K-bus electron-

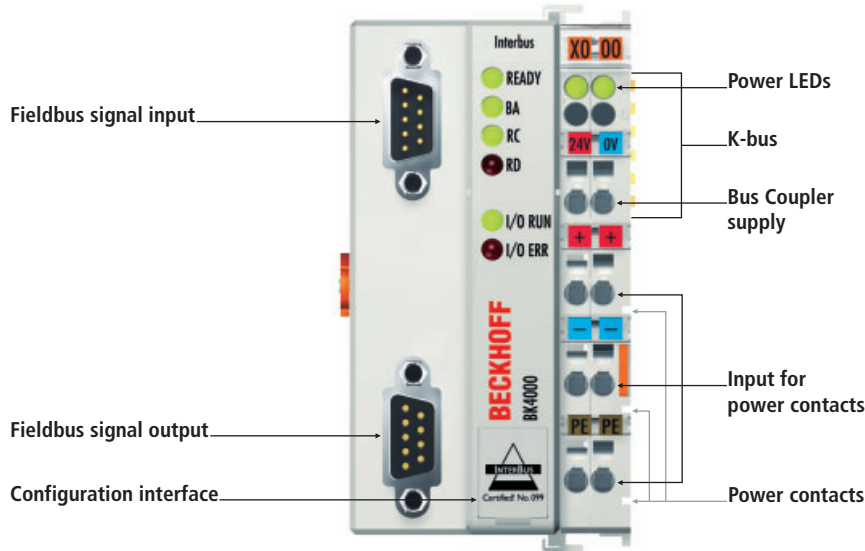
ics. Electrical isolation from the I/O level is omitted from the Bus Coupler, but can if necessary be implemented by means of a power feed terminal.

The LC3100 Bus Coupler can be replaced by a Bus Coupler from the BK3110 series.

Technical data	LC3100
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Supply current K-bus	500 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	between power supply/field bus, none between power supply/power contacts
Connection method	directly to spring-loaded terminals
Dimensions (W x H x D)	similar to the Bus Terminal housing, width 21 mm
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/LC3100">www.beckhoff.com/LC3100</a>

For system data see **401**





## BK4000, BK4010, BK4020 | Interbus Bus Couplers



The BK4000, BK4010 and BK4020 Bus Couplers connect the Interbus bus system to the electronic terminal blocks, which can be extended in modular fashion. One unit consists of one Bus Coupler, any number of up to 64 terminals and one end terminal. The BK4010 „Economy“ variant permits particularly economical creation of peripheral interfacing connections. Up to 64 digital input/output terminals can be connected.

With the K-bus extension technology, the „Economy plus“ Bus Coupler BK4020 allows the connection of up to 255 spatially distributed Bus Terminals to one Bus Coupler. The „Economy plus“ coupler supports all Beckhoff system Bus Terminals and can

process 512 bit digital inputs and outputs per slave. The number of analog channels is limited by the Interbus protocol to a maximum of 32 input and 32 output channels. The transmission rate is 500 kbaud. Slave devices can be spaced up to 400 m from each other as the fieldbus interface acts as repeater. The overall length of an Interbus ring is limited to 13 km.

The identification code and the length code are determined by the Bus Coupler automatically after starting, depending upon the connected Bus Terminal, and are read out by the master. It is not necessary to parameterise the slave.

The Bus Coupler recognises the connected terminals and

automatically generates the affiliations of the inputs/outputs to the bytes of the process image. The first input/output signal is inserted in the first bit of one word (LSB), beginning from the left. The Bus Coupler inserts further signals in this word. Inputs and outputs are clearly separated.

Interbus has been established as an open fieldbus system since 1987. Interbus has a ring structure, and up to 256 stations can be operated in a ring. Data transmission takes place at 500 kbaud. Due to the efficient data transmission, sensor and actuator data can be transferred over great distances.

Ordering information	Description	
BK4000	Interbus Bus Coupler for up to 64 Bus Terminals	
BK4010	Interbus Bus Coupler for up to 64 digital Bus Terminals	
BK4020	Interbus „Economy plus“ Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	
BK4500	Interbus Bus Coupler with fibre optic connection for up to 64 Bus Terminals	410
BC4000	Interbus Bus Terminal Controller	450

## Complex signal processing for analog I/Os, position measurement, ...

The BK4000 and BK4020 Bus Couplers support the operation of all Bus Terminals. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.

The analog and multi-functional Bus Terminals can be adapted to each specific

application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

Optionally, the Bus Terminals can also be controlled by

the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handles configuration of the complete periphery during the start-up phase. If required, the controller can upload the decentrally created configuration data in order to centrally manage and store this data. Therefore, new adjustments are not necessary in the event of replacement of a Bus Terminal.

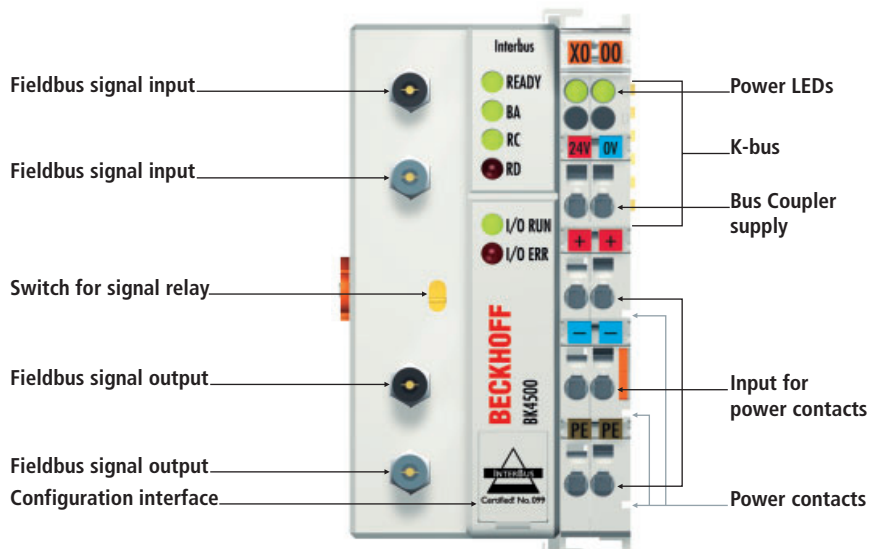
The controller automatically sets the required setting on power up. This functionality is achievable through the use of the KS2000 software.

The Interbus coupler works with the protocol chip SUP13 and supports the extended diagnostics of the Interbus master. Byte-by-byte addressing in the master is supported as from generation G4.

System data	Interbus   BK4000, BK4010, BK4020
Number of I/O stations	256
Number of I/O points	4,096
Data transfer medium	LiYCY 3 x 2 x 0.22 mm <sup>2</sup>
Max. cable length	max. 400 m
Data transfer rates	500 kbaud
Data transfer time	approx. 1 ms in the case of 10 modules for 32 bit input and output each

Technical data	BK4000	BK4010	BK4020
Number of Bus Terminals	64	64	64 (255 with K-bus extension)
Max. number of bytes fieldbus	64 byte input and 64 byte output	8 byte input and 8 bytes output	64 byte input and 64 byte output
Digital peripheral signals	512 inputs/outputs	64 inputs/outputs	512 inputs/outputs
Analog peripheral signals	32 inputs/outputs	–	32 inputs/outputs
Configuration possibility	via KS2000		
Data transfer rates	500 kbaud		
Bus interface	2 x D-sub plug, 9-pin, plug and socket with screening and vibration lock		
Power supply	24 V DC (-15 %/+20 %)		
Input current	70 mA + (total K-bus current)/4, 500 mA max.	70 mA + (total K-bus current)/4, 200 mA max.	70 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continuous current		
Recommended fuse	≤ 10 A		
Supply current K-bus	1,750 mA	500 mA	1,750 mA
Power contacts	24 V DC max./10 A max.		
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)		
Weight	approx. 170 g	approx. 150 g	approx. 170 g
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Further information	www.beckhoff.com/BK4000		

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	632



## BK4500 | Interbus Bus Coupler with fibre optic interface



The particular feature for the BK4500 Bus Coupler is its fibre optic connection. Its functions correspond to those of the BK4000 Bus Coupler in relation to the Bus Terminals and the fieldbus properties. The fibre optics mean that the transmission is particularly safe from interference, and has absolute electrical isolation.

After a conversion from copper cable to fibre optic the BK4500 Bus Coupler can be used at any location in the ring. An RS422 or fibre optic converter can be plugged into both of the interfaces of the BK4000 Bus Coupler. The interfaces on the Bus Coupler provide the necessary 5 V voltage. If the BK4500 is the last slave in the fibre optic ring, the signal relay switch must be switched on.

### Ordering information

BK4500

### Description

Interbus Bus Coupler with fibre optic connection for up to 64 Bus Terminals

## Complex signal processing for analog I/Os, position measurement, ...

The BK4500 Bus Coupler supports the operation of all Bus Terminals. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.

The analog and multi-functional Bus Terminals can be adapted to each specific

application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

Optionally, the Bus Terminals can also be controlled by

the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handles configuration of the complete periphery during the start-up phase. If required, the controller can upload the decentrally created configuration data in order to centrally manage and store this data. Therefore, new adjustments are not necessary in the event of replacement of a Bus Terminal.

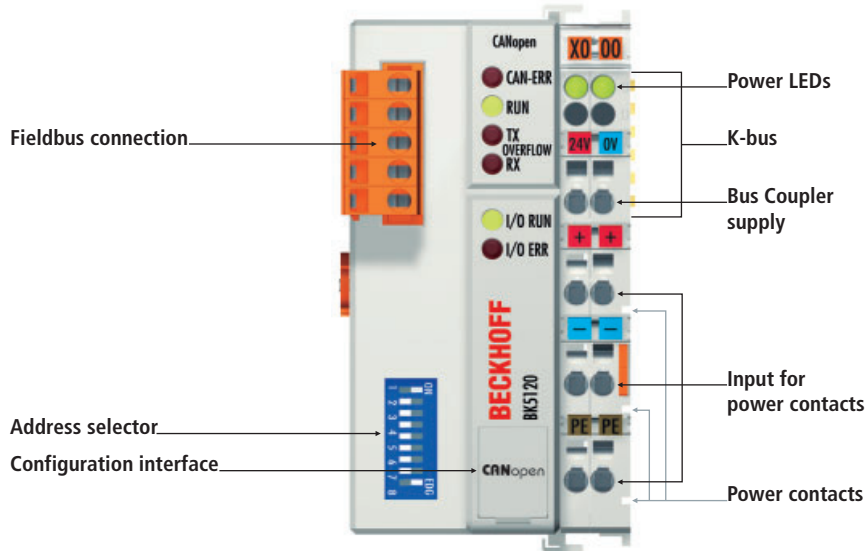
The controller automatically sets the required setting on power up. This functionality is achievable through the use of the KS2000 software.

The Interbus coupler works with the protocol chip SUP13 and supports the extended diagnostics of the Interbus master. Byte-by-byte addressing in the master is supported as from generation G4.

System data	Interbus   BK4500
Number of I/O stations	256
Number of I/O points	4,096
Data transfer medium	APF (plastic) fibre (1,000 µm)
Distance between stations	1 m...40 m
Data transfer rates	500 kbaud
Data transfer time	approx. 1 ms in the case of 10 modules for 32 bit input and output each
Topology	ring
Implementation	double fibre optic ring
Fibre optic/copper converter	RS422/fibre optic plug

Technical data	BK4500
Number of Bus Terminals	64
Max. number of bytes fieldbus	64 byte input and 64 byte output
Digital peripheral signals	512 inputs/outputs
Analog peripheral signals	32 inputs/outputs
Configuration possibility	via KS2000
Fibre optic connector	F-SMA
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continuous current
Recommended fuse	≤ 10 A
Supply current K-bus	1,750 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)
Weight	approx. 170 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/BK4500

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	632



## BK5110, BK5120 | CANopen Bus Couplers

### CANopen

The BK51x0 Bus Couplers connect the CAN bus system to the electronic terminal blocks, which can be extended in modular fashion. One unit consists of one Bus Coupler, any number of up to 64 terminals and one end terminal. The BK5110 "Economy" variant permits particularly economical creation of peripheral interfacing connections. Up to 64 digital input/output terminals can be connected.

With the K-bus extension technology, the "Economy plus" Bus Coupler BK5120 allows the connection of up to 255 spatially distributed Bus Terminals to one Bus Coupler. The Bus Coupler works on the CAN protocol basis as defined in ISO 11898. In addition to network services, CANopen also determines the data allocation for automation systems applications and has established itself as an open

CAN application layer. The Bus Couplers support all types of CANopen communications and can also be used without difficulty in manufacturer-specific CAN environments due to the simple structure of this protocol definition. The firmware can be updated via the configuration interface.

Ordering information	Description	
BK5110	CANopen Coupler for up to 64 digital Bus Terminals	
BK5120	CANopen "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension); still available: BK5100	
BK5150	CANopen "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	414
BK5151	CANopen "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	414
LC5100	CANopen "Low Cost" Bus Coupler for up to 64 digital Bus Terminals (255 with K-bus extension)	415
BC5150, BX5100	CANopen "Compact" Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	452
CX8051	CANopen Embedded PC	264

## Complex signal processing for analog I/Os, position measurement, ...

The BK5120 Bus Coupler supports the operation of all Bus Terminals. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.

The analog and multi-functional Bus Terminals can be adapted to each specific

application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

Optionally, the Bus Terminals can also be controlled by

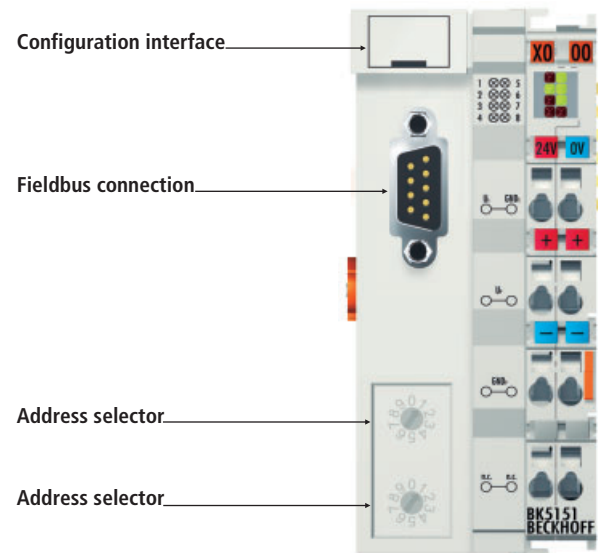
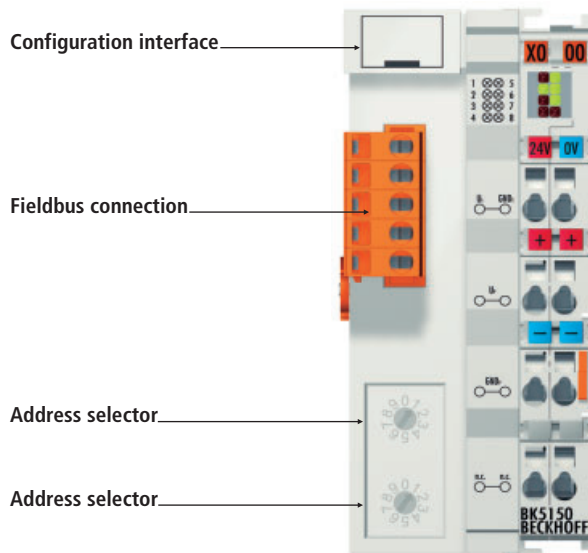
the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handles configuration of the complete periphery during the start-up phase. If required, the controller can upload the decentrally created configuration data in order to centrally manage and store this data. Therefore, new adjustments are not necessary in the event of replacement of a Bus Terminal.

Parameterising can also be carried out using any CANopen configuration tools. For this, EDS data files are available, which describe all the setting options for the CANopen coupler. For most applications, however, no configuration is necessary, as CANopen provides practical default values for all parameters.

System data	CANopen   BK5110, BK5120							
Number of I/O stations	64 (BK5120: 255 with K-bus extension)							
Number of I/O points	depends on the structure							
Data transfer medium	screened, twisted copper cable, 2 x signal, 1 x ground (recommended)							
Max. cable length	5,000 m	2,500 m	1,000 m	500 m	250 m	100 m	40 m	
Data transfer rates	10 kbaud	20 kbaud	50 kbaud	100/125 kbaud	250 kbaud	500 kbaud	1,000 kbaud	
PDO modes	synchron, cyclic, event driven, polling							

Technical data	BK5110	BK5120
Number of Bus Terminals	64	64 (255 with K-bus extension)
Max. number of bytes fieldbus	32 byte input and 32 byte output	512 byte input and 512 byte output
Digital peripheral signals	256 inputs/outputs	960 inputs/outputs
Analog peripheral signals	–	60 inputs/outputs
Configuration possibility	via KS2000 or the controller	
Number of PDOs (CANopen)	5 Tx/5 Rx	16 Tx/16 Rx
Additional CANopen features	life, node guarding, emergency object, variable mapping, store/restore	
Bus interface	1 x open style connector, 5-pole, included	
Power supply	24 V DC (-15 %/+20 %)	
Input current	70 mA + (total K-bus current)/4, 200 mA max.	70 mA + (total K-bus current)/4, 500 mA max.
Starting current	approx. 2.5 x continuous current	
Recommended fuse	≤ 10 A	
Supply current K-bus	500 mA	1,750 mA
Power contacts	24 V DC max./10 A max.	
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage Bus Coupler)	
Weight	approx. 130 g	approx. 150 g
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/BK5110	

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	632
FC510x	PC Fieldbus Cards with PCI interface	1045



## BK5150, BK5151 | CANopen "Compact" Bus Couplers

### CANopen

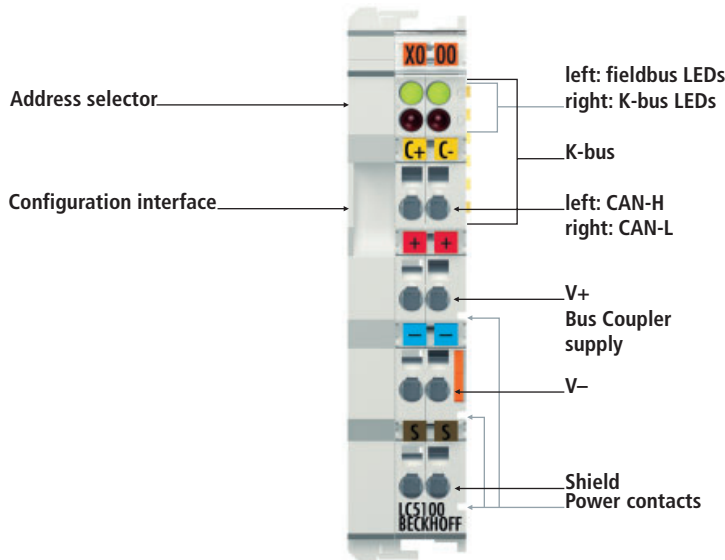
The "Compact" Bus Coupler BK5150 for CANopen extends the Beckhoff Bus Terminal system by a cost-optimised version in a compact housing. Up to 64 Bus Terminals are supported; with the terminal bus extension, up to 255 Bus Terminals can be connected. The CANopen Bus Coupler offers automatic baud rate detection up to 1 Mbaud

and two address selection switches for address assignment. A 5-pin connector for the fieldbus connection is included in the scope of supply. Optionally, the ZS1052-3000 connector with integrated terminating resistor can be connected.

In contrast to the BK5150, the BK5151 has a 9-pin D-sub connector as a bus interface.

Technical data	BK5150	BK5151
Number of Bus Terminals	64 (255 with K-bus extension)	
Number of PDOs (CANopen)	16 Tx/Rx PDOs	
Additional CANopen features	life, node guarding, emergency object, variable mapping, store/restore	
Data transfer rates	automatic detection up to 1 Mbaud	
Bus interface	open style connector, 5-pin	D-sub 9-pin socket
Power supply	24 V DC (-15 %/+20 %)	
Serial interface	configuration interface	
Diagnostics LED	2 x power supply, 2 x K-bus, 2 x fieldbus	
Supply current K-bus	1,000 mA	
Weight	approx. 100 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/BK5150	

For system data see [413](#)



## LC5100 | CANopen “Low Cost” Bus Coupler

### CANopen

The LC5100 “Low Cost” Bus Coupler is marked by a smaller design and a more economical connection method. Its functions correspond to those of the BK5110 CAN Bus Coupler in relation to operation with Bus Terminals and to the fieldbus properties. Up to 64 digital input/output terminals can be connected. The firmware can be updated via the configuration interface.

The LC5100 Bus Coupler is particularly suitable for use in small, low-price stations. The 24 V DC supply voltage feeds the peripheral devices via the power contacts, as well as the Bus Coupler electronics and the K-bus electronics. Electrical isolation from the I/O level is omitted from the Bus Coupler, but can if necessary be implemented by means of a power feed terminal.

The LC5100 Bus Coupler can be replaced by a Bus Coupler from the BK5110 series.

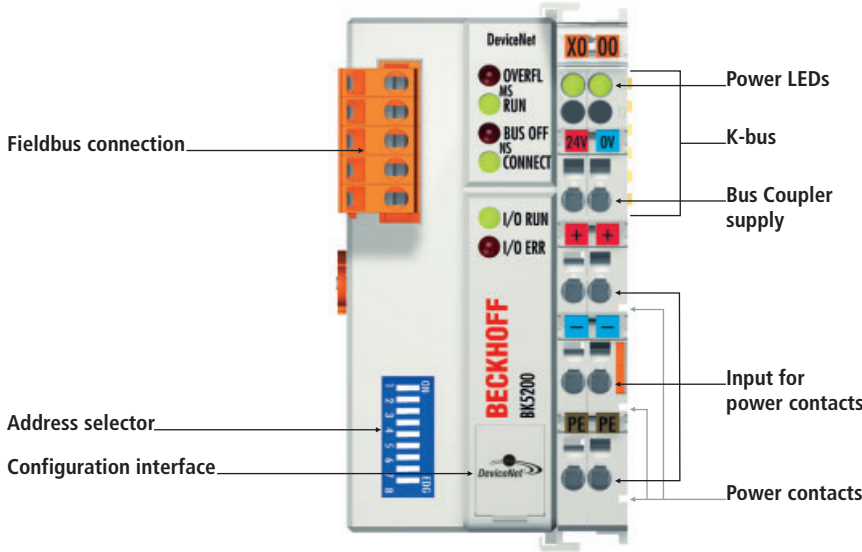
### “Low Cost” Bus Coupler for digital signals

All the bit-oriented terminals can be connected to the “Low Cost” Bus Coupler. All the digital input and output terminals are supported with the exception of the KL15xx, KL25x2, KL2692 and KL27x1 terminals. All the system terminals, with and without diagnostics, can also be connected.

Technical data	LC5100
Additional CANopen features	life, node guarding, emergency object, variable mapping, store/restore
Power supply	24 V DC (-15 %/+20 %)
Supply current K-bus	500 mA
Electrical isolation	none between power supply/fieldbus/power contacts
Connection method	directly to spring-loaded terminals
Dimensions (W x H x D)	similar to the Bus Terminal housing, width 21 mm
Weight	approx. 100 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/LC5100">www.beckhoff.com/LC5100</a>

For system data see **413**





## BK5200, BK5210, BK5220 | DeviceNet Bus Couplers



The BK5200, BK5210 and BK5220 Bus Couplers connect the DeviceNet bus system to the electronic terminal blocks, which can be extended in modular fashion. One unit consists of one Bus Coupler, any number of up to 64 terminals and one end terminal. The BK5210 "Economy" variant permits particularly economical creation of peripheral interfacing connections. Up to 64 digital input/output terminals can be connected.

With the K-bus extension technology, the "Economy plus" Bus Coupler BK5220 allows the

connection of up to 255 spatially distributed Bus Terminals to one Bus Coupler. The "Economy plus" series supports all Beckhoff system Bus Terminals and it can process in its full configuration 1,020 digital signals and a maximum of 256 analog input and output channels per slave.

The Bus Coupler operates on the basis of the CAN protocol. The DeviceNet standard on which the BK52x0 Bus Coupler is based allows the operation of diverse DeviceNet devices in one network. DeviceNet is based on a definition of communication

objects for the exchange of data from the sensor/actuator area that is especially oriented to automation technology.

The Bus Couplers and Bus Terminals can be parameterised on a PC using the KS2000 configuration set. Commissioning is also possible without the KS2000.

Ordering information	Description	
BK5200	DeviceNet Bus Coupler for up to 64 Bus Terminals	
BK5210	DeviceNet Bus Coupler for up to 64 digital Bus Terminals	
BK5220	DeviceNet "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	
BK5250	DeviceNet "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	418
LC5200	DeviceNet "Low Cost" Bus Coupler for up to 64 digital Bus Terminals (255 with K-bus extension)	419
BC5250, BX5200	DeviceNet Bus Terminal Controller	456

## Complex signal processing for analog I/Os, position measurement, ...

The BK5200 and BK5220 Bus Couplers support the operation of all Bus Terminals. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.

The analog and multi-functional Bus Terminals can

be adapted to each specific application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

Optionally, the Bus Terminals can also be controlled by the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handles configuration of the complete periphery during the start-up phase. If required, the controller can upload the decentrally created configuration data in order to centrally manage and store this

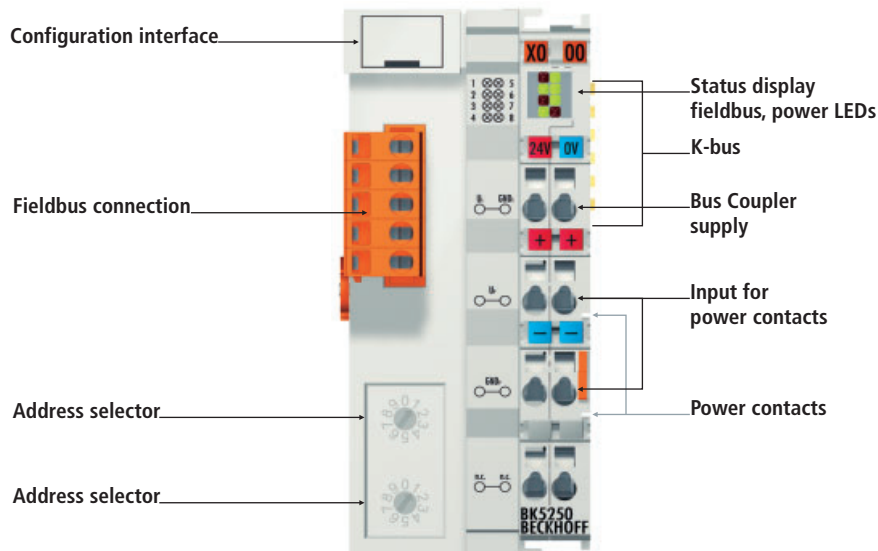
data. Therefore, new adjustments are not necessary in the event of replacement of a Bus Terminal.

Corresponding EDS data files are available for DeviceNet configuration tools.

System data	DeviceNet   BK5200, BK5210, BK5220		
Number of I/O stations	64		
Data transfer medium	screened, twisted copper wire with power supply, 5-pin		
Max. cable length	500 m	250 m	100 m
Data transfer rates	125 kbaud	250 kbaud	500 kbaud
Operating modes	bit strobe, polling, cyclic, change of state (COS)		
DeviceNet type	communications adapter		

Technical data	BK5200	BK5210	BK5220
Number of Bus Terminals	64	64	64 (255 with K-bus extension)
Max. number of bytes fieldbus	512 byte input and 512 byte output	32 byte input and 32 byte output	512 byte input and 512 byte output
Digital peripheral signals	512 inputs/outputs	256 inputs/outputs	1,020 inputs/outputs
Analog peripheral signals	256 inputs/outputs	–	256 inputs/outputs
Configuration possibility	via KS2000 or the controller		
Data transfer rates	via Dip switch	via Dip switch	automatic detection
Bus interface	1 x open pluggable connector, 5-pin, included		
Power supply	24 V DC (-15 %/+20 %), through bus cable 11...25 V (conforms to DeviceNet specification)		
Input current	70 mA + (total K-bus current)/4, 500 mA max.		
Starting current	approx. 2.5 x continuous current		
Recommended fuse	≤ 10 A		
Supply current K-bus	1,750 mA	500 mA	1,750 mA
Power contacts	24 V DC max./10 A max.		
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage Bus Coupler)		
Weight	approx. 150 g	approx. 130 g	approx. 130 g
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Further information	www.beckhoff.com/BK5200		

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	632
FC520x	PC Fieldbus Cards with PCI interface	1046



## BK5250 | DeviceNet "Compact" Bus Coupler

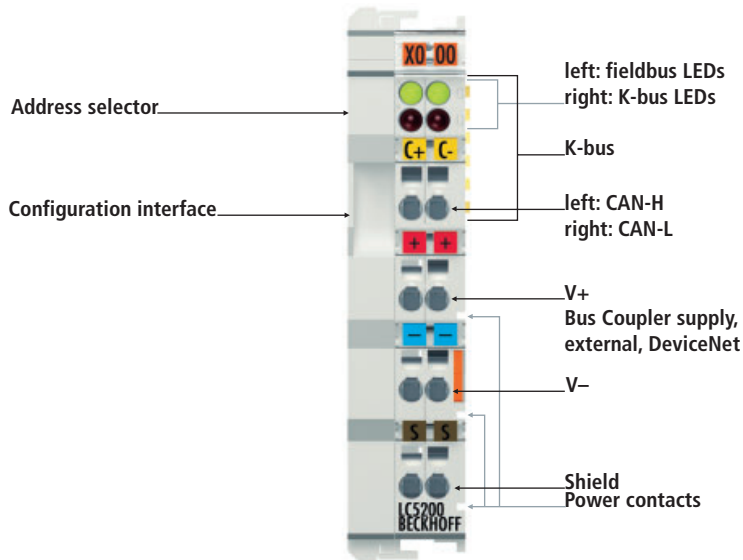


The "Compact" Bus Coupler BK5250 for DeviceNet extends the Beckhoff Bus Terminal system by a cost-optimised version in a compact housing. Up to 64 Bus Terminals are supported; with the terminal bus extension, up to 255 Bus Terminals can be connected. The DeviceNet Bus Coupler offers automatic

baud rate detection up to 500 kbaud and two address selection switches for address assignment. A 5-pin connector for the fieldbus connection is included in the scope of supply. Optionally, the ZS1052-3000 connector with integrated terminating resistor can be connected.

Technical data	BK5250
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	512 byte input and 512 byte output
Data transfer rates	automatic detection up to 500 kbaud
Bus interface	open style connector, 5-pin
Power supply	24 V DC (-15 %/+20 %), through bus cable 11...25 V (conforms to DeviceNet specification)
Serial interface	configuration interface
Diagnostics LED	2 x power supply, 2 x K-bus, 2 x fieldbus
Supply current K-bus	1,000 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage Bus Coupler)
Weight	approx. 100 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/BK5250">www.beckhoff.com/BK5250</a>

For system data see [417](#)



## LC5200 | DeviceNet “Low Cost” Bus Coupler



The LC5200 “Low Cost” Bus Coupler is marked by a smaller design and a more economical connection method. Its functions correspond to those of the BK5210 DeviceNet Bus Coupler in relation to operation with Bus Terminals and to the fieldbus properties. Up to 64 digital input/output terminals can be connected. The firmware can be updated via the configuration interface.

The LC5200 Bus Coupler is particularly suitable for use in small, low-price stations. The 24 V DC supply voltage feeds the peripheral devices via the power contacts, as well as the Bus Coupler electronics and the K-bus electronics. Electrical isolation from the I/O level is omitted from the Bus Coupler, but can if necessary be implemented by means of a power feed terminal.

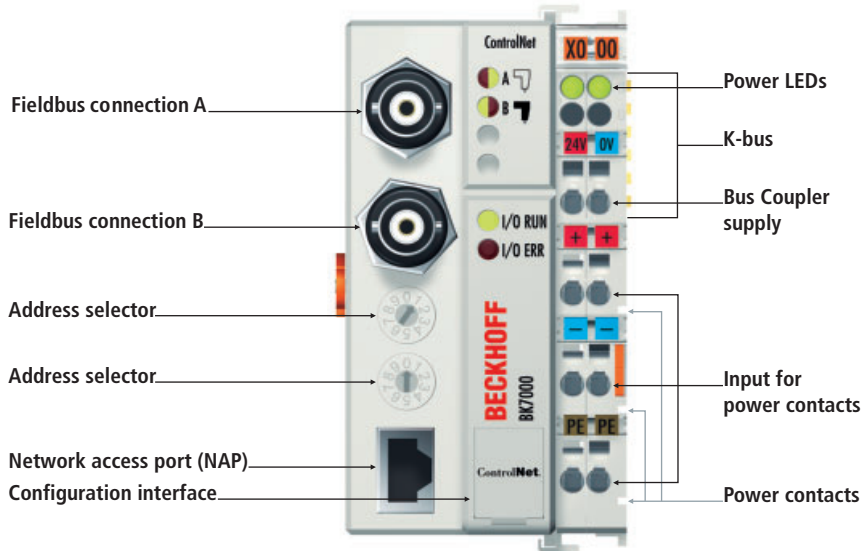
The LC5200 Bus Coupler can be replaced by a Bus Coupler from the BK5210 series.

### “Low Cost” Bus Coupler for digital signals

All the bit-oriented terminals can be connected to the “Low Cost” Bus Coupler. All the digital input and output terminals are supported with the exception of the KL15xx, KL25x2, KL2692 and KL27x1 terminals. All the system terminals, with and without diagnostics, can also be connected.

Technical data	LC5200
Power supply	24 V DC (-15 %/+20 %), through bus cable 11...25 V (conforms to DeviceNet specification)
Supply current K-bus	500 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	none between power supply/fieldbus/power contacts
Connection method	directly to spring-loaded terminals
Dimensions (W x H x D)	similar to the Bus Terminal housing, width 21 mm
Weight	approx. 100 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/LC5200">www.beckhoff.com/LC5200</a>

For system data see **417**



## BK7000 | ControlNet Bus Coupler

### ControlNet™

The Bus Coupler BK7000 connects the ControlNet bus system with the electronic terminal blocks, which can be extended in modular fashion. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal.

The Bus Coupler recognises the connected terminals and automatically generates the affiliations of the inputs/outputs to the bytes of the process image. The first input/output signal is inserted in the first bit of one word (LSB), beginning

from the left. The Bus Coupler inserts further signals in this word. Inputs and outputs are clearly separated. The Bus Coupler automatically begins a further word if the number of inputs or outputs exceeds 16 bits.

ControlNet has been an open fieldbus system since 1997. The ControlNet system has a bus structure, and up to 99 stations can be operated in one system. Transmission speed is 5 Mbit/s, and coax cables are used as the data transfer medium. The ControlNet protocol allows

both cyclic and non cyclic data to be exchanged via the bus without cross-influence between them. The Bus Coupler BK7000 supports the use of redundant bus cables and has an integrated network access port (NAP) for the direct connecting of ControlNet tools.

#### Ordering information

BK7000

#### Description

ControlNet Bus Coupler for up to 64 Bus Terminals

## Complex signal processing for analog I/Os, position measurement, ...

The BK7000 Bus Coupler supports the operation of all Bus Terminals. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.

The analog and multi-functional Bus Terminals can be adapted to each specific application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set

on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

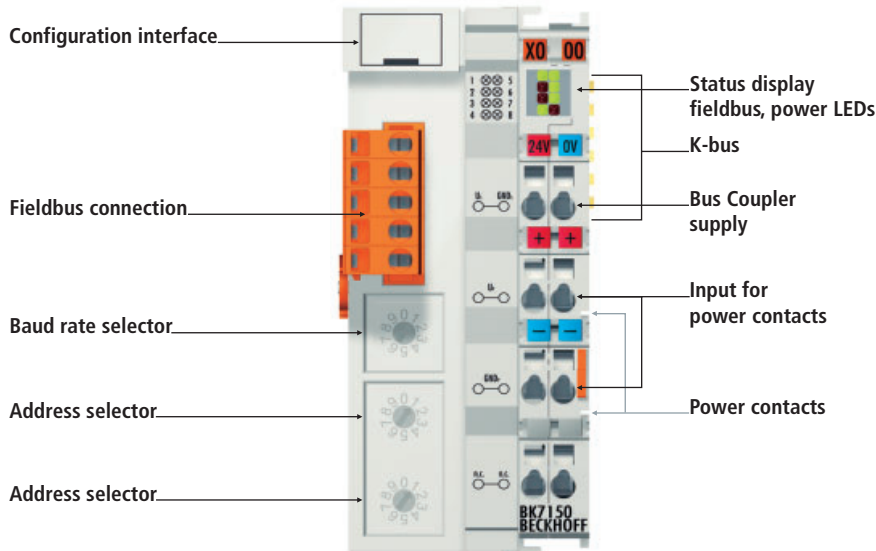
Optionally, the Bus Terminals can also be controlled by the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handles configuration of the complete

periphery during the start-up phase. If required, the controller can upload the decentrally created configuration data in order to centrally manage and store this data. Therefore, new adjustments are not necessary in the event of replacement of a Bus Terminal.

System data	ControlNet   BK7000
Number of I/O stations	99 (per link)
Number of I/O points	depending on controller
Data transfer medium	coax cable RG-6, optionally redundant
Max. cable length	250...1,000 m per segment
Data transfer rates	5 Mbaud

Technical data	BK7000
Number of Bus Terminals	64
Max. number of bytes fieldbus	512 byte input and 512 byte output
Digital peripheral signals	512 inputs/outputs
Analog peripheral signals	256 inputs/outputs
Configuration possibility	via KS2000
Data transfer rates	5 Mbaud
Bus interface	2 x BNC female connector + NAP
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continuous current
Recommended fuse	≤ 10 A
Supply current K-bus	1,750 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/K-bus)
Weight	approx. 170 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/BK7000

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	632



## BK7150 | CC-Link "Compact" Bus Coupler

### CC-Link

The "Compact" Bus Coupler BK7150 connects the CC-Link system to the electronic terminal blocks, which can be extended in modular fashion. One unit consists of the Bus Coupler, any number of up to 64 terminals and one end terminal. The K-bus extension technology allows the connection of up to 255 spatially distributed Bus Terminals to one Bus Coupler.

The Bus Coupler recognises the connected terminals and automatically generates the

affiliations of the inputs/outputs to the bytes of the process image. The first input/output signal is inserted in the first bit of one byte (LSB), beginning from the left. The Bus Coupler inserts further signals in this byte. Inputs and outputs are clearly separated. The Bus Coupler automatically begins a further byte if the number of controller inputs or outputs exceeds 8 bits.

CC-Link is an open fieldbus system. Baud rates up to

10 Mbaud can be selected via a switch, so that the transfer speed can be adapted to the requirement of the technical process.

**Ordering information**

**Description**

BK7150

CC-Link "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)

## Complex signal processing for analog I/Os, position measurement, ...

The BK7150 Bus Coupler supports the operation of all Bus Terminals. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.

The analog and multi-functional Bus Terminals can

be adapted to each specific application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

Optionally, the Bus Terminals can also be controlled by the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handles configuration of the complete periphery during the start-up phase. If required, the controller can upload the decentrally created configuration data in order to centrally manage and store

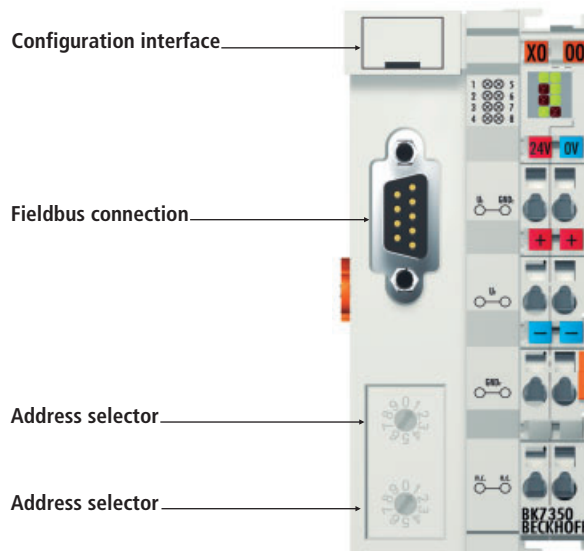
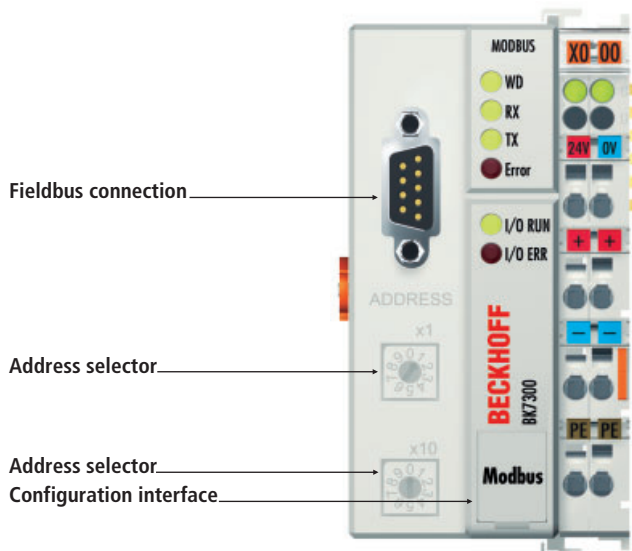
this data. Therefore, new adjustments are not necessary in the event of replacement of a Bus Terminal. The controller carries out the desired setting automatically after switching on.

System data	CC-Link   BK7150				
Number of I/O stations	64 (per link)				
Number of I/O points	depending on controller				
Data transfer medium	shielded 3-core, twisted pair cable				
Max. cable length	1,200 m	900 m	400 m	160 m	100 m
Data transfer rates	156 kbaud	625 kbaud	2.5 Mbaud	5 Mbaud	10 Mbaud

Technical data	BK7150				
Number of Bus Terminals	64 (255 with K-bus extension)				
Max. number of bytes fieldbus	32 byte input and 32 byte output				
Digital peripheral signals	112 inputs/outputs				
Analog peripheral signals	16 inputs/outputs				
Configuration possibility	via KS2000				
Data transfer rates	156 kbaud...10 Mbaud				
Bus interface	1 x open style connector, 5-pole, included				
Power supply	24 V DC (-15 %/+20 %)				
Input current	70 mA + (total K-bus current)/4, 500 mA max.				
Starting current	2.5 x continuous current				
Recommended fuse	≤ 10 A				
Supply current K-bus	1,000 mA				
Power contacts	24 V DC max./10 A max.				
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)				
Weight	approx. 100 g				
Operating/storage temperature	0...+55 °C/-25...+85 °C				
Relative humidity	95 %, no condensation				
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				
Protect. class/installation pos.	IP 20/variable				
Further information	www.beckhoff.com/BK7150				

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	632





## BK7300, BK7350 | Modbus Bus Couplers

### Modbus

The BK73x0 Bus Couplers connect the Modbus bus system to the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal. The "Compact" BK7350 Bus Coupler is a cost-optimised version with compact housing. With the K-bus extension, up to 255 Bus Terminals can be connected.

The Bus Couplers recognise the terminals to which they are connected, and perform the assignment of the inputs and outputs to the words of the process image automatically. The first input/output signal

will be added to the first bit of a word (LSB), beginning from the left. The Bus Coupler adds further signals to the word. A clear separation is maintained between inputs and outputs. If the number of inputs or outputs is greater than 16 bits, the Bus Coupler automatically begins a new word.

Modbus has a line topology based on the RS485 interface. The Modbus protocol is published. The BK73x0 support the RTU and ASCII protocols. The baud rate is variable and can be set directly via the rotary selection switch on Bus Coupler, i.e. without configuration software.

The Modbus Bus Couplers support various Modbus functions that enable direct access to digital and analog signals. The BK7300 and BK7350 also support the diagnostic Modbus function that enables faults to be detected and counted. In addition, the Bus Couplers diagnose faulty or erroneous telegrams and respond to the controller with an error. BK7300 and BK7350 enable broadcast access, which means that several Bus Couplers can be addressed simultaneously with a single telegram.

Ordering information	Description
BK7300	Modbus Bus Coupler for up to 64 Bus Terminals
BK7350	Modbus "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)
BC7300	Modbus Bus Terminal Controller

## Complex signal processing for analog I/Os, position measurement, ...

The BK7300 and BK7350 Bus Couplers support the operation of all Bus Terminals. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.

The analog and multi-functional Bus Terminals can be adapted to each specific

application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

Optionally, the Bus Terminals can also be controlled by

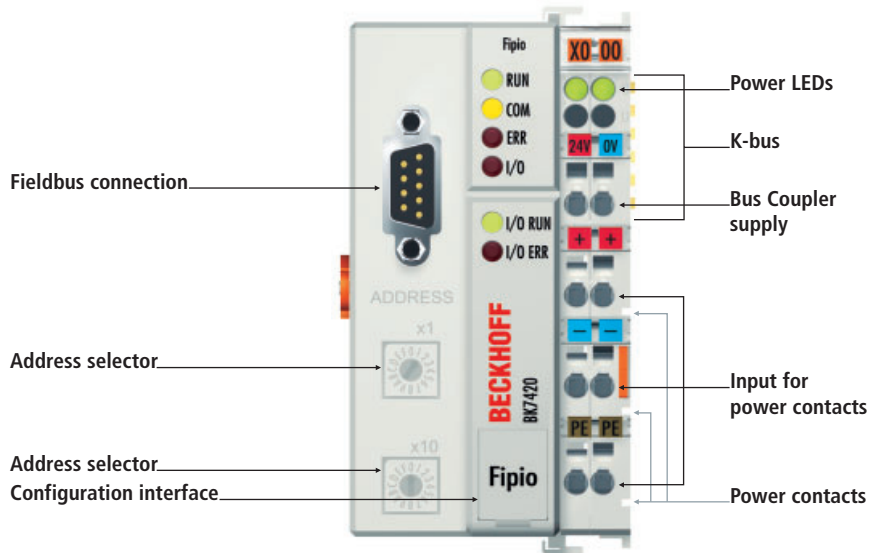
the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handles configuration of the complete periphery during the start-up phase. If required, the controller can upload the decentrally created configuration data in order to centrally manage and store this data. Therefore, new adjustments are not necessary in the event of replacement of a Bus

Terminal. The controller carries out the desired setting automatically after switching on.

System data	Modbus   BK7300, BK7350
Number of I/O stations	99
Number of I/O points	depending on controller
Data transfer medium	screened, twisted copper cable 2 x 0.25 mm <sup>2</sup> (RS485)
Max. cable length	1,200 m
Data transfer rates	150 baud...38,400 baud
I/O communication types	read/write access, optionally bit oriented or word oriented

Technical data	BK7300	BK7350
Number of Bus Terminals	64	64 (255 with K-bus extension)
Max. number of bytes fieldbus	512 byte input and 512 byte output	
Digital peripheral signals	512 inputs/outputs	1,020 inputs/outputs
Analog peripheral signals	256 inputs/outputs	
Protocol	RTU/ASCII (default: RTU)	
Configuration possibility	by rotary switch or KS2000	
Data transfer rates	150, 300, 600, 1,200, 2,400, 4,800, 9,600, 19,200, 38,400 baud (default: 9,600 baud)	
Bus interface	D-sub 9-pin, RS485	
Power supply	24 V DC (-15 %/+20 %)	
Input current	70 mA + (total K-bus current)/4, 500 mA max.	320 mA max.
Starting current	2.5 x continuous current	
Recommended fuse	≤ 10 A	
Supply current K-bus	1,750 mA	1,000 mA
Power contacts	24 V DC max./10 A max.	
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)	
Weight	approx. 170 g	approx. 100 g
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/BK7300	

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	632



## BK7420 | Fipio “Economy plus” Bus Coupler

# Fipio

The BK7420 Bus Coupler links the Fipio bus system to the modular, extendable electronic terminal blocks. One unit consists of a Bus Coupler, any number of Bus Terminals between 1 and 64, and up to 255 terminals with the K-bus extension. The Bus Coupler automatically recognises the connected terminals and activates the relevant transfer profile.

The Fipio fieldbus corresponds to the WorldFIP standard and is disclosed via the Schneider Alliances partner program. The typical number of participating devices is 32 per segment for the electrical connection; up to four segments with repeaters are permitted. The address is set via two hexadecimal address switches. The maximum baud rate for the communication with the Bus

Coupler is 1 Mbaud. The Bus Coupler automatically detects the rate. The fieldbus connection is established via a 9-pin D-sub socket.

### Ordering information

BK7420

### Description

Fipio “Economy plus” Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)

## Complex signal processing for analog I/Os, position measurement, ...

The BK7420 Bus Coupler supports the operation of all Bus Terminals. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.

The analog and multi-functional Bus Terminals can

be adapted to each specific application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

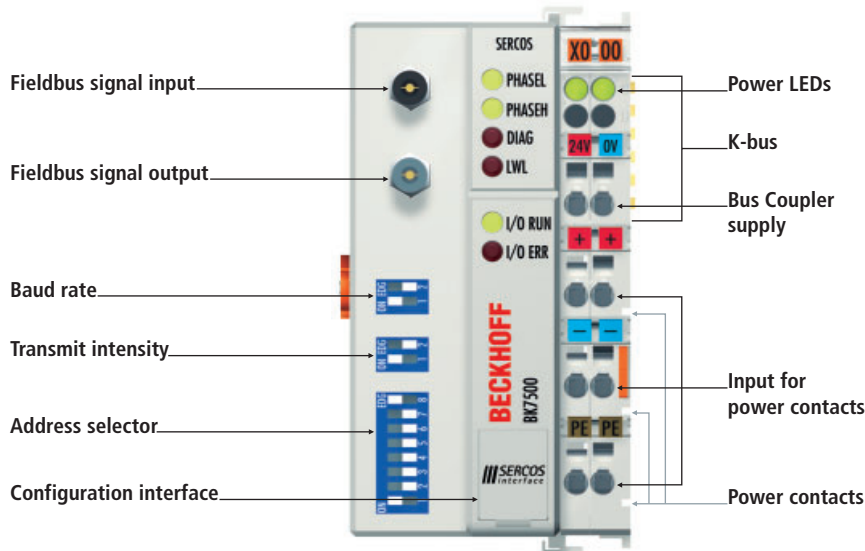
Optionally, the Bus Terminals can also be controlled by the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handles configuration of the complete periphery during the start-up phase. If required, the controller can upload the decentrally created configuration data in order to centrally manage and

store this data. Therefore, new adjustments are not necessary in the event of replacement of a Bus Terminal. The controller automatically sets the required setting on power up.

System data	Fipio   BK7420
Number of I/O stations	256
Number of I/O points	depending on the master
Data transfer medium	shielded, twisted two-wire cable (150 Ω characteristic impedance)
Max. cable length	1,000 m without amplifier
Data transfer rates	1 Mbaud
Transfer profile	automatic switching FRD (4 bytes), FSD (16 bytes) and FED (64 bytes)

Technical data	BK7420
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	64 byte input and 64 byte output
Digital peripheral signals	512 inputs/outputs
Analog peripheral signals	32 inputs/outputs
Configuration possibility	via KS2000
Data transfer rates	automatic detection up to max. 1 Mbaud
Bus interface	1 x D-sub 9-pin socket with shielding
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continuous current
Recommended fuse	≤ 10 A
Supply current K-bus	1,750 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)
Weight	approx. 170 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/BK7420">www.beckhoff.com/BK7420</a>

Accessories		
KS2000	configuration software for extended parameterisation	1064



## BK7500, BK7520 | SERCOS interface Bus Couplers



The Bus Couplers BK7500 and BK7520 connect the SERCOS bus system with the electronic terminal blocks, which can be extended in modular fashion. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal.

Compared with the Bus Coupler BK7500, the BK7520 allows, with the K-bus extension technology, the connection of up to 255 Bus Terminals to one Bus Coupler. The Bus Coupler recognises the connected terminals and automatically generates the affiliations of the inputs/outputs to the bytes of the process image.

SERCOS interface is a fibre optic bus that was developed for use in drive technology as a digital drive interface for drives. SERCOS is an open fieldbus system, which since 1995 has been subject to the international standard IEC 61491 for numerically controlled machines. It is widely used in the drive technology sector.

The bus consists of a master and of a number of slaves. In SERCOS, most of the slaves are drive amplifiers. The bus topology is a ring system, in which it is possible to operate up to 254 stations. The transmission speed is 2 and 4 Mbaud. The

BK7520 supports additionally 8 and 16 Mbaud. There are basically three types of telegrams. The master SYNC telegram is received by all the slaves at the same time, and is used for synchronisation. The master data telegram is also received by all the slaves, and contains the cyclic data and the service data. The slaves send their data in what is known as a drive telegram.

Ordering information	Description
BK7500	SERCOS interface Bus Coupler for up to 64 Bus Terminals
BK7520	SERCOS interface "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)

## Complex signal processing for analog I/Os, position measurement, ...

The BK7500 and BK7520 Bus Couplers support the operation of all Bus Terminals and have been specified in accordance with SERCOS I/O and SERCOS interface.

The analog and multi-functional Bus Terminals can be adapted to each specific application using the KS2000

configuration set. Depending on the type, the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

Optionally, the Bus Terminals can also be controlled by the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handles configuration of the complete periphery during the start-up phase. If required, the controller can upload the decentrally creat-

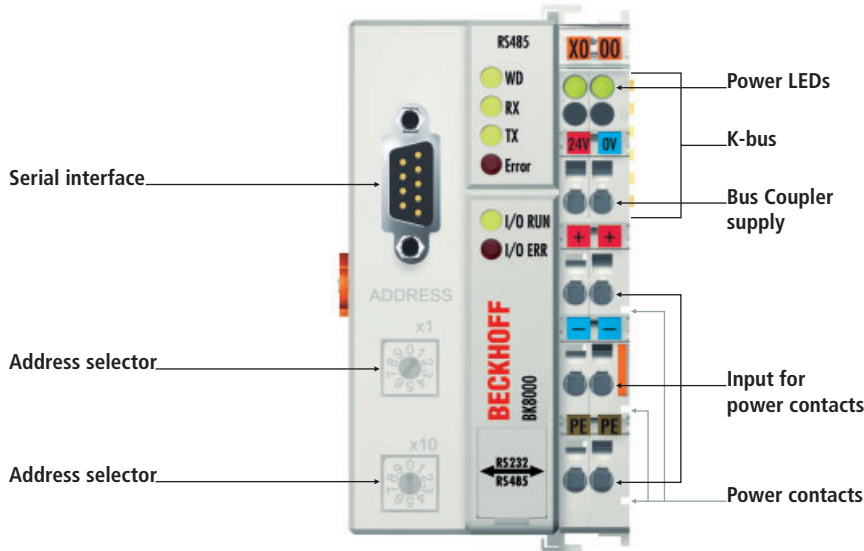
ed configuration data in order to centrally manage and store this data. Therefore, new adjustments are not necessary in the event of replacement of a Bus Terminal.

Parameterisation can also be carried out via the SERCOS interface.

System data	SERCOS interface   BK7500	BK7520
Number of I/O stations	254	
Number of I/O points	depending on controller	
Data transfer medium	1,000 µm plastic fibre optic	
Distance between stations	40 m plastic fibre optic	
Data transfer rates	2/4 Mbaud	2/4/8/16 Mbaud

Technical data	BK7500	BK7520
Number of Bus Terminals	64	64 (255 with K-bus extension)
Max. number of bytes fieldbus	32 byte input/32 byte output for the cyclic interface (depending on the master)	254 word I/O for the cyclic interface (depending on the master)
Digital peripheral signals	256 inputs/outputs	1,020 inputs/outputs
Analog peripheral signals	128 inputs/outputs	254 inputs/outputs
Configuration possibility	via KS2000	
Data transfer rates	2/4 Mbaud, adjustable by means of configuration switch	2/4/8/16 Mbaud, adjustable by means of configuration switch
Bus interface	F-SMA standard, IEC 872-2	
Power supply	24 V DC (-15 %/+20 %)	
Input current	70 mA + (total K-bus current)/4, 500 mA max.	
Starting current	2.5 x continuous current	
Recommended fuse	≤ 10 A	
Supply current K-bus	1,750 mA	
Power contacts	24 V DC max./10 A max.	
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)	
Weight	approx. 170 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/BK7500	

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	632
FC750x	PC Fieldbus Cards with PCI interface	1047



## BK8000, BK8100 | RS485/RS232 Bus Couplers



The Bus Couplers BK8000 and BK8100 use the physics of the RS485 or RS232C (V.24) specification for data transmission. Application of the Bus Coupler with a serial interface is suited to those cases in which the use of a fieldbus system can be omitted. The RS485 or RS232 interface can be used by any automation device (e.g. a PC with RS232 interface) to gain access to the Bus Coupler. Data exchange is made via an open, documented protocol. An ActiveX control and a DLL (KS8000) are available for Windows NT/2000/XP

applications. The ActiveX control handles the necessary protocol for the exchange of data with the Bus Couplers, permitting the application to be implemented quickly. KS8000 LV also makes an interface available for the graphical programming system LabVIEW from National Instruments. The data is transmitted in a fixed format binary string secured by a checksum.

Another mode of operation is for the Bus Coupler to function in master/slave mode as a fieldbus multiplexer. The input data from one device are copied

directly to the outputs of the other, without the aid of an additional master – and vice versa.

The BK8000 Bus Coupler communicates via an RS485 interface. This permits a bus to be constructed with up to 99 participating devices (addresses can be set with an address selector).

The BK8100 Bus Coupler has an RS232C interface, and has been designed particularly for peer-to-peer connection.

Ordering information	Description	
BK8000	RS485 Bus Coupler for up to 64 Bus Terminals	
BK8100	RS232 Bus Coupler for up to 64 Bus Terminals	
BK8100-0060	RS232 Bus Coupler for up to 64 Bus Terminals, watchdog special setting 60 s	
BK8100-1001	RS232 Bus Coupler for up to 64 Bus Terminals, watchdog special setting 10 s	
BC8000	RS485 Bus Terminal Controller	462
BC8100, BC8150	RS232 Bus Terminal Controller	462

## Complex signal processing for analog I/Os, position measurement, ...

The BK8000 and BK8100 Bus Couplers support the operation of all Bus Terminal types.

The analog and multi-functional Bus Terminals can be adapted to each specific application using the KS2000 configuration set. Depending on the type,

the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

Optionally, the Bus Terminals can also be controlled by the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handles configuration of the complete periphery during the start-up

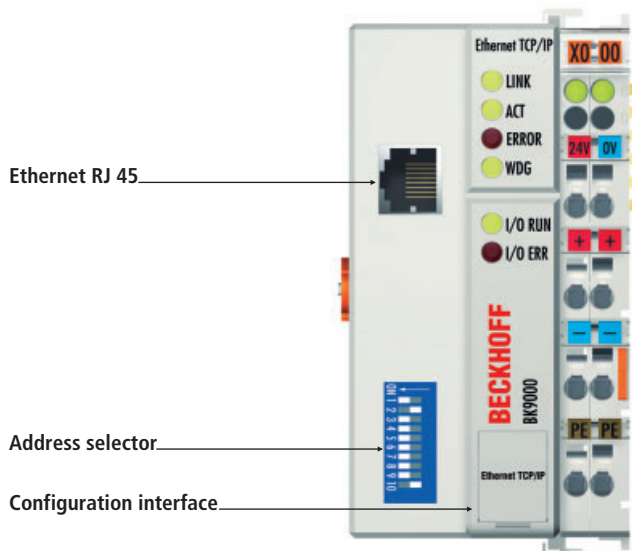
phase. If required, the controller can upload the decentrally created configuration data in order to centrally manage and store this data. Therefore, new adjustments are not necessary in the event of replacement of a Bus Terminal.

System data	RS485   BK8000	RS232   BK8100
Number of I/O stations	99	1 (peer-to-peer connection)
Number of I/O points	depending on controller	
Data transfer medium	screened, twisted copper cable 2 x 0.25 mm <sup>2</sup> (RS485)	shielded copper cable 3 x 0.25 mm <sup>2</sup> (RS232)
Max. cable length	1,200 m	15 m
Data transfer rates	9.6 kbaud, 19.2 kbaud, 38.4 kbaud	

Technical data	BK8000	BK8100
Number of Bus Terminals	64	
Max. number of bytes fieldbus	512 byte input and 512 byte output	
Digital peripheral signals	512 inputs/outputs	
Analog peripheral signals	256 inputs/outputs	
Protocol	open, documented protocol	
Configuration possibility	via KS2000	
Data transfer rates	automatic detection	
Bus interface	RS485 D-sub	RS232 D-sub
Power supply	24 V DC (-15 %/+20 %)	
Input current	70 mA + (total K-bus current)/4, 500 mA max.	
Starting current	2.5 x continuous current	
Recommended fuse	≤ 10 A	
Supply current K-bus	1,750 mA	
Power contacts	24 V DC max./10 A max.	
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)	
Weight	approx. 170 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/BK8000	

Accessories		
KS2000	configuration software for extended parameterisation	1064
KS8000	Active-X control, DLL and LabView interface	1065
Cordsets	cordsets and connectors	632

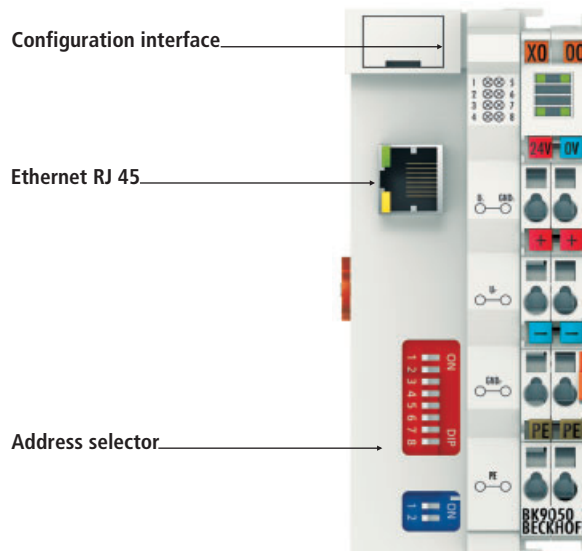




Ethernet RJ 45

Address selector

Configuration interface



Configuration interface

Ethernet RJ 45

Address selector

## BK9000, BK9050 | Ethernet TCP/IP Bus Couplers

### Ethernet TCP/IP

The BK90x0 Bus Couplers connect Ethernet with the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal. The "Compact" BK9050 Bus Coupler is a cost-optimised version with compact housing. With the K-bus extension, up to 255 Bus Terminals can be connected.

The Bus Couplers recognise the terminals to which they are connected, and perform the assignment of the inputs and outputs to the words of the

process image automatically. The BK9000 and BK9050 Bus Couplers support 10 Mbit/s and 100 Mbit/s Ethernet. Connection is through normal RJ 45 connectors. The IP address is set on the DIP switch (offset to a freely selectable start address). In networks with DHCP (a service for the allocation of the logical IP address to the physical node address [MAC-ID]) the Bus Coupler obtains its IP address from the DHCP server.

The BK9000 and BK9050 Bus Couplers support ADS TwinCAT system communication.

TwinCAT I/O makes available configuration tools and Windows NT/2000/XP drivers for programs in any desired high-level language (DLLs) and for Visual Basic applications (ActiveX). Applications with OPC interfaces can access ADS (and therefore the BK9000 or BK9050) via an OPC server. In addition to ADS the Bus Coupler supports Open Modbus (Modbus TCP), a simple, widespread master/slave protocol based on TCP/IP.

Ordering information	Description	
BK9000	Ethernet TCP/IP Bus Coupler for up to 64 Bus Terminals	
BK9050	Ethernet TCP/IP "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	
BK9100	Ethernet TCP/IP Bus Coupler for up to 64 Bus Terminals (with integrated 2-channel switch)	434
BC9000, BC9100, BX9000	Ethernet TCP/IP Bus Terminal Controller	466
CX8090	Ethernet Embedded PC	265

## Complex signal processing for analog I/Os, position measurement, ...

The BK9000 and BK9050 Bus Couplers support the operation of all Bus Terminal types.

The analog and multi-functional Bus Terminals can be adapted to each specific application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' regis-

ters contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

Optionally, the Bus Terminals can also be controlled by

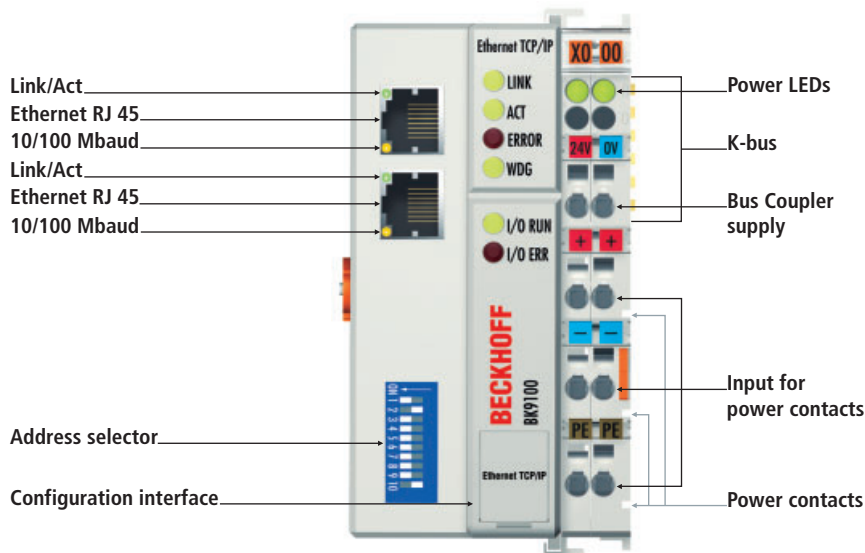
the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handles configuration of the complete periphery during the start-up phase. If required, the controller can upload the decentrally created configuration data in order

to centrally manage and store this data. Therefore, new adjustments are not necessary in the event of replacement of a Bus Terminal. The controller carries out the desired setting automatically after switching on.

System data	Ethernet TCP/IP   BK9000, BK9050
Number of I/O stations	only limited by IP addresses
Number of I/O points	depending on controller
Data transfer medium	4 x 2 twisted pair copper cable; category 3 (10 Mbaud), category 5 (100 Mbaud)
Distance between stations	100 m between hub/switch and Bus Coupler
Data transfer rates	10/100 Mbaud
Topology	star wiring

Technical data	BK9000	BK9050
Number of Bus Terminals	64	64 (255 with K-bus extension)
Max. number of bytes fieldbus	512 byte input and 512 byte output	
Digital peripheral signals	512 inputs/outputs	1,020 inputs/outputs
Analog peripheral signals	128 inputs/outputs	
Protocol	TwinCAT ADS, Modbus TCP, Beckhoff real-time Ethernet	
Configuration possibility	via KS2000	
Data transfer rates	10/100 Mbaud, automatic recognition of the transmission rate	
Bus interface	1 x RJ 45	
Power supply	24 V DC (-15 %/+20 %)	
Input current	70 mA + (total K-bus current)/4, 500 mA max.	320 mA max.
Starting current	2.5 x continuous current	
Recommended fuse	≤ 10 A	
Supply current K-bus	1,750 mA	1,000 mA
Power contacts	24 V DC max./10 A max.	
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)	
Weight	approx. 170 g	approx. 100 g
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/BK9000	

Accessories		
KS2000	configuration software for extended parameterisation	1064
FC90xx	PC Fieldbus Cards with PCI interface	1048



## BK9100 | Ethernet TCP/IP Bus Coupler

### Ethernet TCP/IP

The BK9100 Bus Coupler connects Ethernet with the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal.

The Bus Couplers recognise the terminals to which they are connected, and perform the assignment of the inputs and outputs to the words of the process image automatically. The BK9100 Bus Coupler supports 10 Mbit/s and 100 Mbit/s Ethernet. Connection is through normal RJ 45 connectors. The IP address is set on the DIP switch (offset to a freely selectable start

address). In networks with DHCP (a service for the allocation of the logical IP address to the physical node address [MAC-ID]) the Bus Coupler obtains its IP address from the DHCP server.

Unlike the BK9000, the BK9100 has an additional RJ 45 port. Both Ethernet ports operate as 2-channel switches. The I/O stations can thus be configured with a line topology, instead of the classic star topology. In many applications this significantly reduces the wiring effort and the cabling costs. The maximum distance between two couplers is 100 m. Up to 20 BK9100 Bus Couplers are cascable, so that

a maximum line length of 2 km can be achieved.

The BK9100 supports ADS TwinCAT system communication. TwinCAT I/O makes available configuration tools and Windows NT/2000/XP drivers for programs in any desired high-level language (DLLs) and for Visual Basic applications (ActiveX). Applications with OPC interfaces can access ADS (and therefore the BK9100 or BK9050) via an OPC server. In addition to ADS, the Bus Coupler supports Open Modbus (Modbus TCP), a simple, widespread master/slave protocol based on TCP/IP.

#### Ordering information

#### Description

BK9100	Ethernet TCP/IP Bus Coupler for up to 64 Bus Terminals (with integrated 2-channel switch)
BC9100	Ethernet TCP/IP Bus Terminal Controller for up to 64 Bus Terminals (with integrated 2-channel switch)

## Complex signal processing for analog I/Os, position measurement, ...

The BK9100 Bus Coupler supports the operation of all Bus Terminal types.

The analog and multi-functional Bus Terminals can be adapted to each specific application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' regis-

ters contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

Optionally, the Bus Terminals can also be controlled by

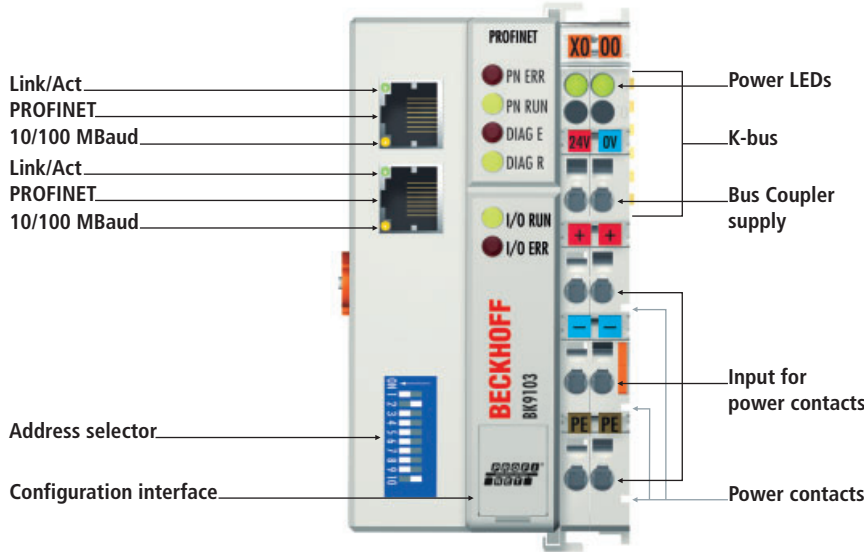
the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handles configuration of the complete periphery during the start-up phase. If required, the controller can upload the decentrally created configuration data in order

to centrally manage and store this data. Therefore, new adjustments are not necessary in the event of replacement of a Bus Terminal. The controller carries out the desired setting automatically after switching on.

System data	Ethernet TCP/IP   BK9100
Number of I/O stations	only limited by IP addresses
Number of I/O points	depending on controller
Data transfer medium	4 x 2 twisted pair copper cable; category 3 (10 Mbaud), category 5 (100 Mbaud)
Distance between stations	100 m between hub/switch and Bus Coupler or between Bus Coupler and Bus Coupler
Data transfer rates	10/100 Mbaud
Topology	line or star wiring
Cascading	up to 20 BK9100 or max. line length 2 km

Technical data	BK9100
Number of Bus Terminals	64
Max. number of bytes fieldbus	512 byte input and 512 byte output
Digital peripheral signals	512 inputs/outputs
Analog peripheral signals	128 inputs/outputs
Protocol	TwinCAT ADS, Modbus TCP, Beckhoff real-time Ethernet
Configuration possibility	via KS2000
Data transfer rates	10/100 Mbaud, automatic recognition of the transmission rate
Bus interface	2 x RJ 45 (2-channel switch)
Topology	line or star wiring
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continuous current
Recommended fuse	≤ 10 A
Supply current K-bus	1,750 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)
Weight	approx. 170 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/BK9100

Accessories		
KS2000	configuration software for extended parameterisation	1064
FC90xx	PC Fieldbus Cards with PCI interface	1048



## BK9103 | PROFINET Bus Coupler



The BK9103 Bus Coupler connects PROFINET IO with the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number from 1 to 64 terminals (255 with K-bus extension) and one end terminal.

The Bus Couplers recognise the terminals to which they are connected, and perform the assignment of the inputs and outputs to the words of the process image automatically. The BK9103 Bus Coupler supports 10 Mbit/s and 100 Mbit/s Ethernet. Connection is through normal RJ 45 connectors. The IP

address is set on the DIP switch (offset to a freely selectable start address). In networks with DHCP (a service for the allocation of the logical IP address to the physical node address [MAC-ID]) the Bus Coupler obtains its IP address from the DHCP server.

The BK9103 contains a 3-port switch. Two ports operate external on RJ 45 connectors and can be utilised. The I/O stations can thus be configured with a line topology instead of the classic star topology. In many applications this significantly reduces the wiring effort and the cabling costs. The maximum

distance between two couplers is 100 m. Up to 20 BK9103 Bus Couplers are cascable, so that a maximum line length of 2 km can be achieved.

PROFINET is the open Industrial Ethernet standard of the PNO (PROFIBUS User Organisation). Internationally established IT standards such as TCP/IP are used for communication. PROFINET IO describes the data exchange between controllers and field devices and can be used in standard Ethernet networks. Commercial switches are used for networking purposes.

Ordering information	Description
BK9103	PROFINET Bus Coupler for up to 64 Bus Terminals (with integrated 2-channel switch)
CX8093	PROFINET Embedded PC

## Complex signal processing for analog I/Os, position measurement, ...

The BK9103 Bus Coupler supports the operation of all Bus Terminal types.

The analog and multi-functional Bus Terminals can be adapted to each specific application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' regis-

ters contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

Optionally, the Bus Terminals can also be controlled by

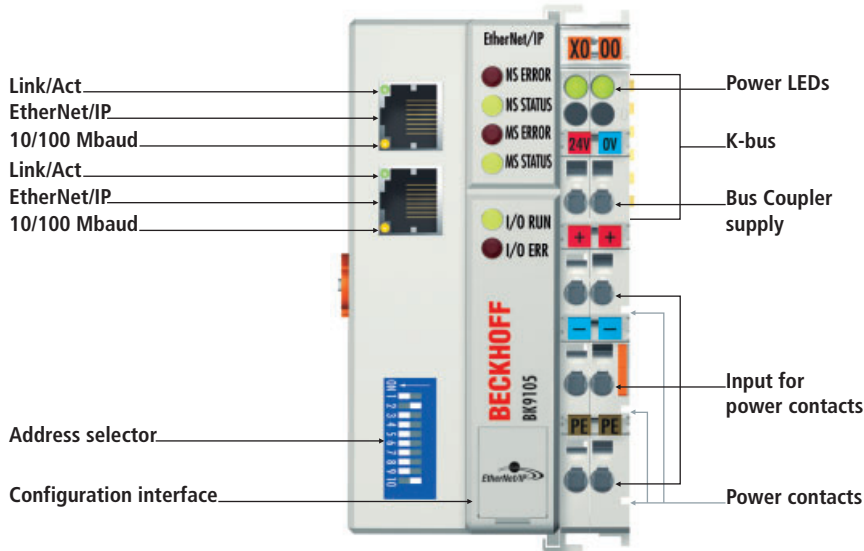
the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handle configuration of the complete periphery during the start-up phase. If required, the controller can upload the decentrally created configuration data in order

to centrally manage and store this data. Therefore, new adjustments are not necessary in the event of replacement of a Bus Terminal. The controller carries out the desired setting automatically after switching on.

System data	PROFINET   BK9103
Number of I/O stations	only limited by IP addresses
Number of I/O points	depending on controller
Data transfer medium	4 x 2 twisted pair copper cable; category 3 (10 Mbaud), category 5 (100 Mbaud)
Distance between stations	100 m between hub/switch and Bus Coupler or between Bus Coupler and Bus Coupler
Data transfer rates	10/100 Mbaud
Topology	line or star wiring
Cascading	up to 20 BK9103 or max. line length 2 km

Technical data	BK9103
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	512 byte input and 512 byte output
Digital peripheral signals	512 inputs/outputs
Analog peripheral signals	256 inputs/outputs
Protocol	PROFINET IO
Configuration possibility	via KS2000
Data transfer rates	10/100 Mbaud, automatic recognition of the transmission rate
Bus interface	2 x RJ 45 (2-channel switch)
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continuous current
Recommended fuse	≤ 10 A
Supply current K-bus	1,750 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)
Weight	approx. 170 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/BK9103

Accessories		
TwinCAT PROFINET IO Controller	licence for using the TwinCAT PROFINET IO Controller	1164
KS2000	configuration software for extended parameterisation	1064
FC90xx	PC Fieldbus Cards with PCI interface	1048



## BK9105 | EtherNet/IP Bus Coupler



The BK9105 Bus Coupler connects EtherNet/IP with the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number from 1 to 64 terminals (255 with K-bus extension) and one end terminal.

The Bus Coupler recognises the terminals to which it is connected, and performs the assignment of the inputs and outputs to the words of the process image automatically. The BK9105 Bus Coupler supports 10 Mbit/s and 100 Mbit/s Ethernet. Connection is through normal RJ 45 connectors. The IP address is set

on the DIP switch (offset to a freely selectable start address). In networks with DHCP (a service for the allocation of the logical IP address to the physical node address [MAC-ID]) the Bus Coupler obtains its IP address from the DHCP server.

The BK9105 contains a 3-port switch. Two ports operate external on RJ 45 connectors and can be utilised. The I/O stations can thus be configured with a line topology, instead of the classic star topology. In many applications this significantly reduces the wiring effort and the cabling costs. The maximum

distance between two couplers is 100 m. Up to 20 BK9105 Bus Couplers are cascable, so that a maximum line length of 2 km can be achieved.

Ethernet/IP is the Industrial Ethernet standard of ODVA (Open DeviceNet Vendor Association). Ethernet/IP is based on Ethernet TCP/IP and UDP/IP – IP stands for Industrial Protocol. Essentially, the CIP (Common Industrial Protocol) used in ControlNet and DeviceNet was ported to Ethernet TCP/IP and UDP/IP.

Ordering information	Description
BK9105	EtherNet/IP Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)
CX8095	EtherNet/IP Embedded PC

## Complex signal processing for analog I/Os, position measurement, ...

The BK9105 Bus Coupler supports the operation of all Bus Terminal types.

The analog and multi-functional Bus Terminals can be adapted to each specific application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' regis-

ters contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

Optionally, the Bus Terminals can also be controlled by

the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handle configuration of the complete periphery during the start-up phase. If required, the controller can upload the decentrally created configuration data in order

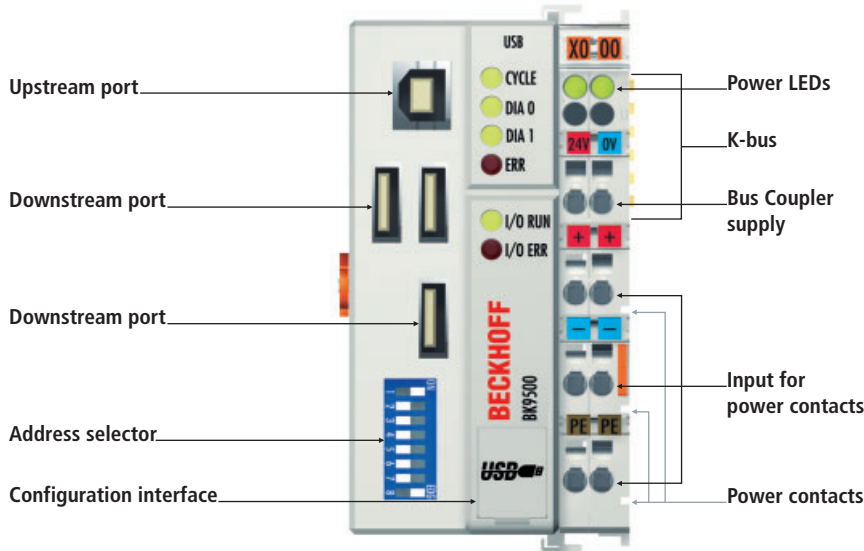
to centrally manage and store this data. Therefore, new adjustments are not necessary in the event of replacement of a Bus Terminal. The controller carries out the desired setting automatically after switching on.

System data	EtherNet/IP   BK9105
Number of I/O stations	only limited by IP addresses
Number of I/O points	depending on controller
Data transfer medium	4 x 2 twisted pair copper cable; category 3 (10 Mbaud), category 5 (100 Mbaud)
Distance between stations	100 m between hub/switch and Bus Coupler or between Bus Coupler and Bus Coupler
Data transfer rates	10/100 Mbaud
Topology	line or star wiring
Cascading	up to 20 BK9105 or max. line length 2 km

Technical data	BK9105
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	512 byte input and 512 byte output
Digital peripheral signals	512 inputs/outputs
Analog peripheral signals	256 inputs/outputs
Protocol	EtherNet/IP
Configuration possibility	via KS2000
Data transfer rates	10/100 Mbaud, automatic recognition of the transmission rate
Bus interface	2 x RJ 45 (2-channel switch)
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continuous current
Recommended fuse	≤ 10 A
Supply current K-bus	1,750 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)
Weight	approx. 170 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/BK9105

Accessories		
KS2000	configuration software for extended parameterisation	1064
FC90xx	PC Fieldbus Cards with PCI interface	1048





## BK9500 | Universal Serial Bus (USB) Bus Coupler



The Bus Coupler BK9500 connects the Universal Serial Bus (USB) system with the electronic terminal blocks, which can be extended in modular fashion. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal.

The Bus Coupler recognises the connected Bus Terminals and automatically generates the affiliations of the inputs/outputs to the bytes of the process image. The first input/output signal is inserted in the first bit of one word (LSB), beginning from the left. The Bus Coupler inserts further signals in this word. Inputs and outputs are clearly

separated. The Bus Coupler automatically begins a further word if the number of inputs or outputs exceeds 16 bits.

Universal Serial Bus is the new standard for transmitting signals between a PC and the PC periphery (e.g. cameras, keypads, input devices). The USB involves serial data transmission. The high baud rate and the short data cables make the USB bus suitable for data acquisition in measuring systems and for the construction of laboratory applications. The connection to the fast periphery bus is achieved over the standardised USB plug. The peripheral devices are arranged with the aid of distri-

bution hubs, with which a bus system with a maximum of 127 devices can be constructed. The data transmission is divided into what are known as frames, each with a duration of 1 ms. One frame can therefore contain up to 1,500 bytes of data. Some of this data is required for the protocol and for control information, so that in the worst case about 1,100 bytes of user data are available in each frame. The data is transmitted over twisted pair wires. The maximum extension of the bus system is 30 metres.

Starting from TwinCAT 2.8 a USB driver is available.

### Ordering information

BK9500

### Description

USB Bus Coupler for up to 64 Bus Terminals

## Complex signal processing for analog I/Os, position measurement, ...

The BK9500 Bus Coupler supports the operation of all Bus Terminal types. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.

The analog and multi-functional Bus Terminals can

be adapted to each specific application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

Optionally, the Bus Terminals can also be controlled by the control system. Via function blocks (FBs), the programmable logic controller (PLC) or the Industrial PC (IPC) handle configuration of the complete periphery during the start-up phase. If required, the controller can upload the decentrally created configuration data in order to centrally manage and store

this data. Therefore, new adjustments are not necessary in the event of replacement of a Bus Terminal. The controller carries out the desired setting automatically after switching on.

System data	USB   BK9500
Number of I/O stations	127
Number of I/O points	depending on controller
Data transfer medium	1 x 2 twisted pair (28 AWG) copper cable, 1 x 2 power supply
Distance between stations	30 m, 5 m from BK9500 to BK9500
Data transfer rates	12 Mbaud

Technical data	BK9500
Number of Bus Terminals	64
Max. number of bytes fieldbus	512 byte input and 512 byte output
Digital peripheral signals	512 inputs/outputs
Analog peripheral signals	256 inputs/outputs
Configuration possibility	via KS2000
Data transfer rates	12 Mbaud
Bus interface	1 x B type (upstream), 3 x A type (downstream)
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continuous current
Recommended fuse	≤ 10 A
Supply current K-bus	1,750 mA (less downstream current)
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)
Weight	approx. 170 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/BK9500

Accessories	
KS2000	configuration software for extended parameterisation



CANopen

*DeviceNet*

LIGHTBUS

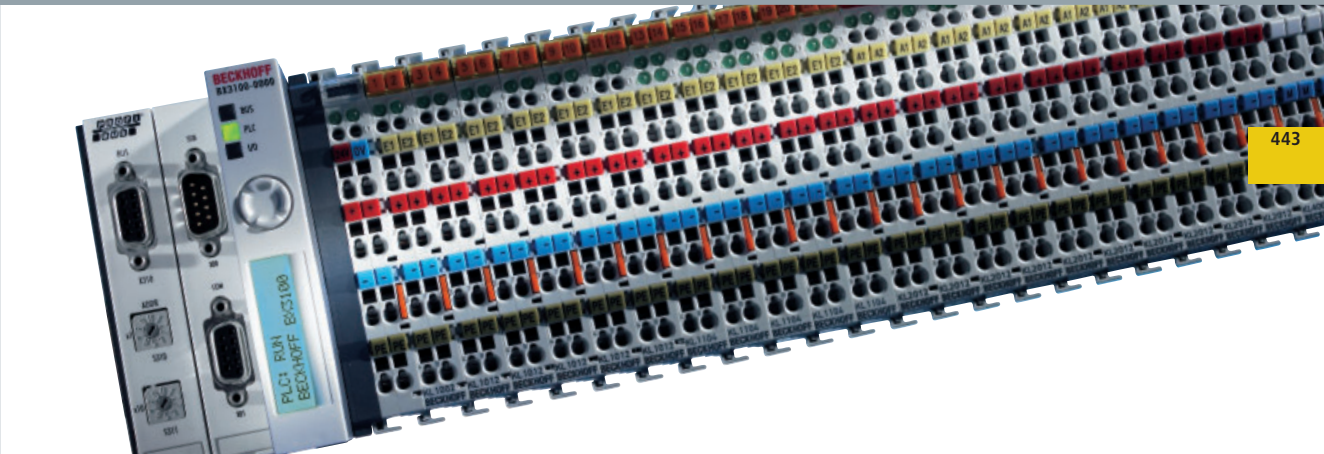
Ethernet TCP/IP

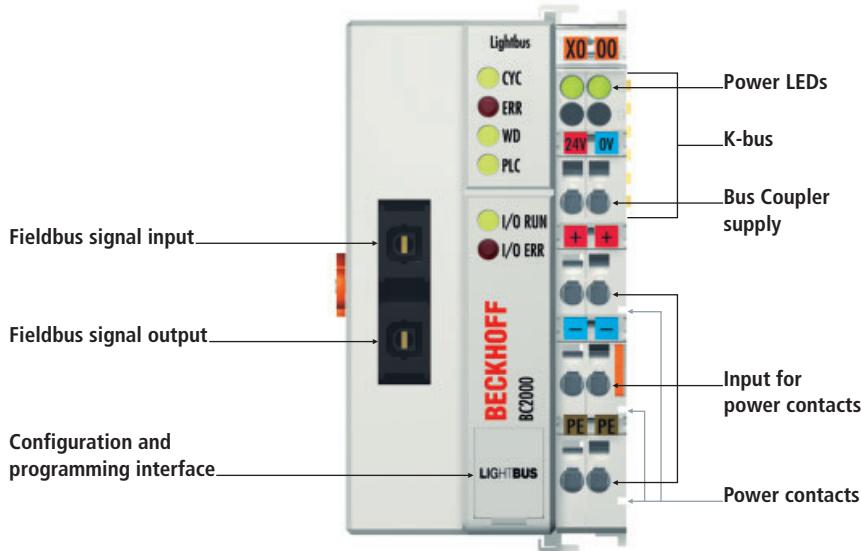


Modbus

# Bus Terminal Controllers

Controllers with fieldbus interface





## BC2000 | Lightbus Bus Terminal Controller

### LIGHTBUS

The Bus Terminal Controller BC2000 is a Bus Coupler with integrated PLC functionality and has a fieldbus interface for the Lightbus. The BC2000 is an intelligent slave and can be used as a non-central intelligence in the Lightbus system. One unit consists of the Bus Terminal Controller, any number of terminals between 1 and 64, and a bus end terminal. The Bus Terminal

Controller is programmed using the TwinCAT programming system according to IEC 61131-3. The configuration/programming interface of the BC2000 is used to load the PLC program. If the software PLC TwinCAT is in use, the PLC program can also be loaded via the fieldbus.

The inputs and outputs of the connected Bus Terminals are assigned in the Bus Terminal

Controller's default setting. Each Bus Terminal can be configured in such a way that it exchanges data directly through the fieldbus with the higher-level automation device. Similarly, pre-processed data can be exchanged between the Bus Terminal Controller and the higher-level controller via the fieldbus.

Ordering information	Description
BC2000	Lightbus Bus Terminal Controller for up to 64 Bus Terminals
BK20x0	Lightbus Bus Coupler

## Controller for distributed signal processing

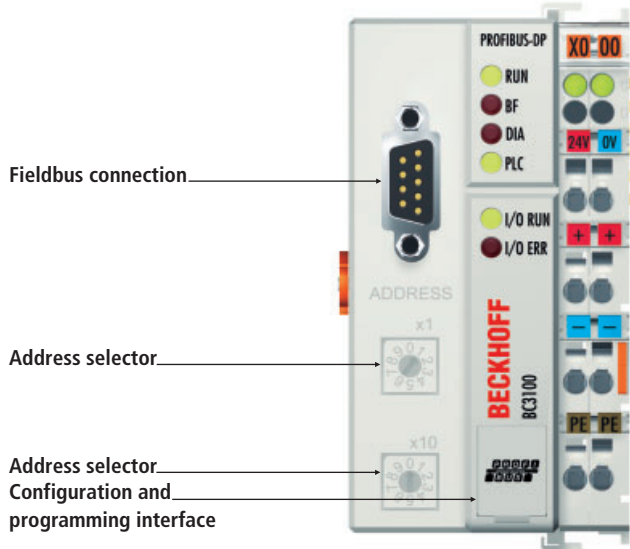
The programming system TwinCAT for the BC2000 operates, independently of the manufacturer, in accordance with IEC 61131-3. The PLC programs can be written in five different programming languages (IL, FBD,

LD, SFC, ST). In addition, TwinCAT offers extensive debug functionalities (breakpoint, single step, monitoring, ...), which facilitate commissioning. It is also possible to perform adjustment and measurement of the cycle time.

PLC data	Lightbus   BC2000
Programming	TwinCAT (via programming interface or fieldbus)
Program memory	32/96 kbytes
Data memory	32/64 kbytes
Remanent data	512 bytes
Run-time system	1 PLC task
PLC cycle time	approx. 3 ms for 1,000 instructions (without I/O cycle, K-bus)
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)

Technical data	BC2000
Number of Bus Terminals	64
Max. number of bytes fieldbus	512 byte input and 512 byte output
Max. number of bytes process image	512 byte input and 512 byte output
Digital peripheral signals	512 inputs/outputs
Analog peripheral signals	128 inputs/outputs
Configuration possibility	via KS2000 or fieldbus
Data transfer rates	2.5 Mbaud
Bus interface	2 x standard fibre optic connector Z1000 (plastic fibre), Z1010 (HCS fibre)
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Starting current	approx. 2.5 x continous current
Supply current K-bus	1,750 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage)
Weight	170 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/BC2000

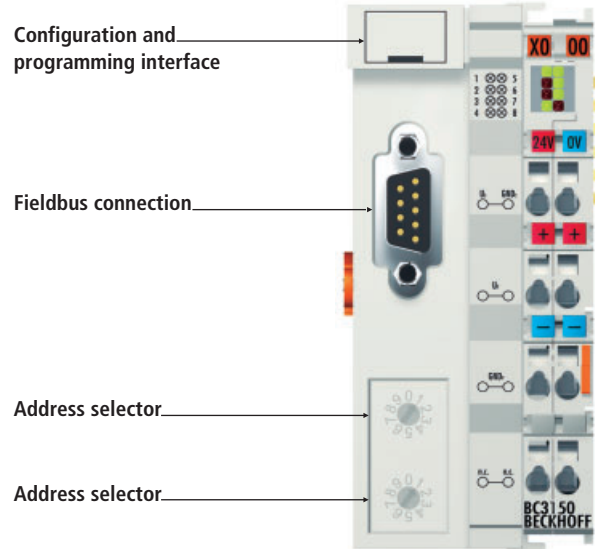
Accessories		
KS2000	configuration software for extended parameterisation	1064
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
Cordsets	cordsets and connectors	632
FC200x	PC Fieldbus Cards with PCI interface	1043
C1xxx	PC Fieldbus Cards with ISA, VME bus, S5 interface	1023



Fieldbus connection

Address selector

Address selector  
Configuration and programming interface



Configuration and programming interface

Fieldbus connection

Address selector

Address selector

## BC3100, BC3150 | PROFIBUS Bus Terminal Controllers



The Bus Terminal Controllers BC3100 and BC3150 are Bus Couplers with integrated PLC functionality and have a fieldbus interface for PROFIBUS. They are intelligent slaves and can be used as distributed intelligence in the PROFIBUS system. In the BC3100 Bus Terminal Controller, one unit consists of the controller, between 1 and 64 terminals, and a bus end terminal.

The "Compact" BC3150 Bus Terminal Controller is housed in a cost-optimised and compact housing. Unlike the BC3100, the

BC3150 supports up to 255 Bus Terminals via the K-bus extension. Both PROFIBUS controllers offer automatic baud rate detection up to 12 Mbaud and two address selection switches for address assignment.

The Bus Terminal Controller is programmed using the TwinCAT programming system according to IEC 61131-3. The configuration/programming interface of the BC31xx is used to load the PLC program. If the software PLC TwinCAT is in use, the PLC program can

also be loaded via the fieldbus. The inputs and outputs of the connected Bus Terminals are assigned in the default setting of the PLC. Each Bus Terminal can be configured in such a way that it exchanges data directly through the fieldbus with the higher-level automation device. Similarly, pre-processed data can be exchanged between the Bus Terminal Controller and the higher-level controller via the fieldbus.

Ordering information	Description	
BC3100	PROFIBUS Bus Terminal Controller for up to 64 Bus Terminals, 12 Mbaud	
BC3150	PROFIBUS "Compact" Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension), 12 Mbaud	
BX3100	PROFIBUS Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension), 12 Mbaud	448
BK3xx0, LC3100	PROFIBUS Bus Coupler	400
CX8031	PROFIBUS Embedded PC	263

## Controller for distributed signal processing

The programming system TwinCAT for the BC3100 and BC3150 operates, independently of the manufacturer, in accordance with IEC 61131-3. The PLC programs can be written in five different programming languages (IL, FBD, LD, SFC, ST).

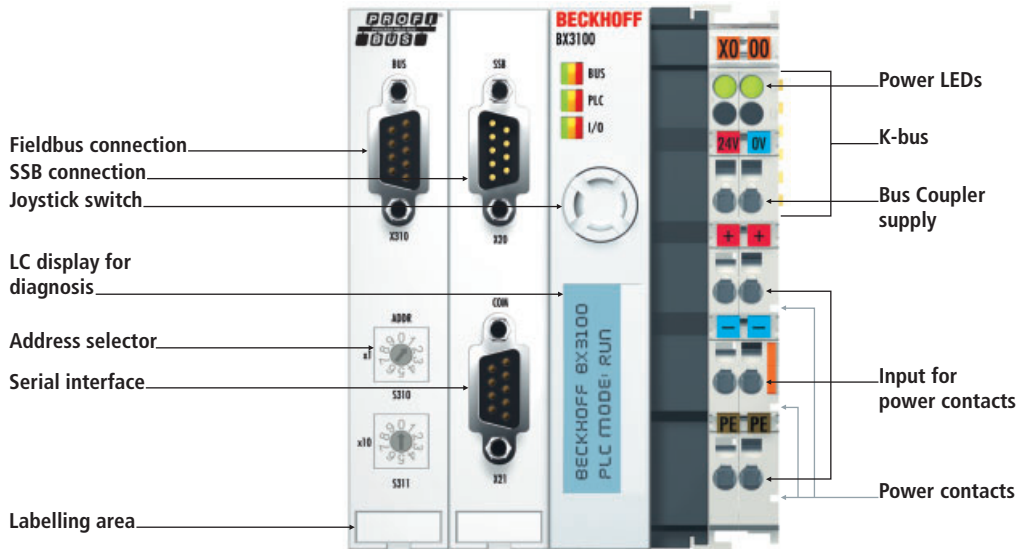
In addition, TwinCAT offers extensive debug functionalities (breakpoint, single step, monitoring, ...), which facilitate commissioning. It is also possible to perform adjustment and measurement of the cycle time.

PLC data	PROFIBUS   BC3100	BC3150
Programming	TwinCAT (via programming interface or fieldbus)	
Program memory	32/96 kbytes	48 kbytes
Data memory	32/64 kbytes	32 kbytes
Remanent data	512 bytes	2 kbytes
Run-time system	1 PLC task	
PLC cycle time	approx. 3 ms for 1,000 instructions (without I/O cycle, K-bus)	
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)	
Online change	no	yes

Technical data	BC3100	BC3150
Number of Bus Terminals	64	64 (255 with K-bus extension)
Max. number of bytes fieldbus	128 byte input and 128 byte output	
Max. number of bytes process image	512 byte input and 512 byte output	
Digital peripheral signals	512 inputs/outputs	2,040 inputs/outputs
Analog peripheral signals	128 inputs/outputs	
Configuration possibility	via KS2000 or fieldbus	
Data transfer rates	automatic detection up to 12 Mbaud	
Bus interface	1 x D-sub socket, 9-pin	
Power supply	24 V DC (-15 %/+20 %)	
Input current	70 mA + (total K-bus current)/4, 500 mA max.	320 mA max.
Starting current	2.5 x continous current	
Supply current K-bus	1,750 mA	1,000 mA
Power contacts	24 V DC max./10 A max.	
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage)	
Weight	typ. 170 g	typ. 100 g
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/BC3100	

Accessories		
KS2000	configuration software for extended parameterisation	1064
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
Cordsets	cordsets and connectors	632
FC310x	PC Fieldbus Cards with PCI interface	1044





## BX3100 | PROFIBUS Bus Terminal Controller



The BX3100 Bus Terminal Controller has a PROFIBUS slave interface with automatic baud rate detection up to 12 Mbaud and an address selection switch for address assignment. Up to 244 byte of input and 244 byte of output can be exchanged with the controller.

One unit consists of the BX3100 Bus Terminal Controller with up to 64 Bus Terminals and a bus end terminal. With the terminal bus extension system, the connection of up to 255 Bus Terminals is possible. The controller is programmed via the COM1 or via the PROFIBUS interface of the FC310x PC Fieldbus Card.

In terms of their equipment and performance, the BX series Bus Terminal Controllers are

positioned between the BC series Bus Terminal Controllers and the CX series Embedded PCs. The main features distinguishing BC and BX are the larger memory and the expanded interfaces of the BX. Additionally, two serial interfaces are integrated for programming and for the connection of further serial devices. The device itself comprises an illuminated LC display with two lines of 16 characters each, a joystick switch and a real-time clock. Further peripheral devices, e.g. displays, can be connected via the integrated Beckhoff Smart System Bus (SSB).

The BX family is particularly suitable for a modular machine concept. Within a network, the Bus Terminal Controller can

exchange data with other system parts via the fieldbus interfaces. The real-time clock enables decentralised applications, for which the day of the week or the time play an important role. The areas of application of this series are similar to that of the BC series, but due to the larger memory the BX can execute significantly more complex and larger programs and can manage more data locally (e.g. history and trend data recording), which are then successively fetched over the fieldbus.

Ordering information	Description	
BX3100	PROFIBUS Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension), 12 Mbaud	
BK3xx0, LC3100	PROFIBUS Bus Coupler	400
CX8031	PROFIBUS Embedded PC	263

# Controller for distributed signal processing

Like for all other Beckhoff controllers, the TwinCAT automation software is the basis for parameterisation and programming. The BX devices are programmed according to the powerful IEC 61131-3 standard in the programming languages IL,

FBD, LD, SFC or ST. Users therefore have the familiar TwinCAT tools available, e.g. the PLC programming interface, the System Manager and TwinCAT Scope. Data is exchanged optionally via the serial port (COM1) or via the

fieldbus through Beckhoff FC310x PC Fieldbus Cards.

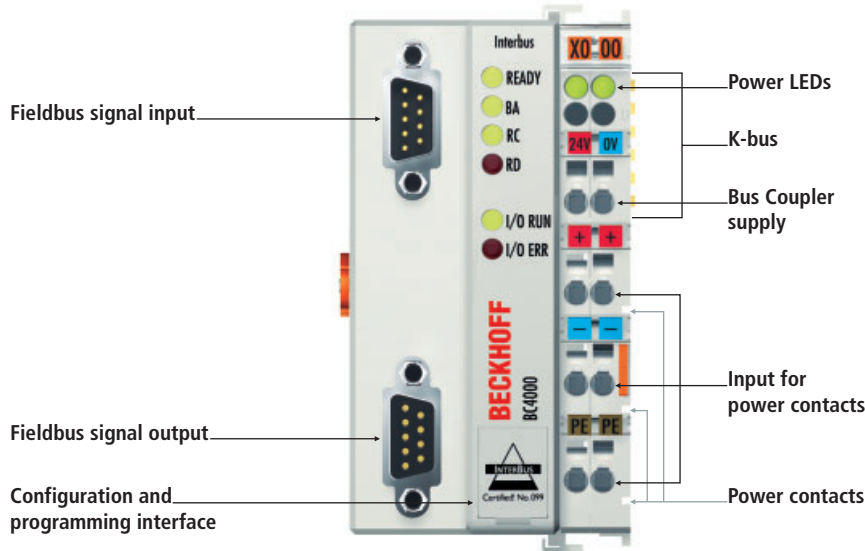
The configuration is also carried out using TwinCAT. The fieldbus interface, the SSB bus and the real-time clock can be configured and parameterised via the System Manager.

The System Manager can read all connected devices and Bus Terminals. After the parameterisation, the configuration is saved on the BX via the serial interface and can be accessed again later.

PLC data	PROFIBUS   BX3100
Programming	TwinCAT (via programming interface or fieldbus)
Program memory	256 kbytes
Data memory	256 kbytes
Remanent data	2 kbytes
Persistent data	1 kbyte
Run-time system	1 PLC task
PLC cycle time	approx. 1 ms for 1,000 instructions (without I/O cycle, K-bus)
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)
Online change	yes
Up/down load code	yes/yes

Technical data	BX3100
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	244 byte input and 244 byte output
Max. number of bytes process image	2,048 byte input and 2,048 byte output
Digital peripheral signals	2,040 inputs/outputs
Analog peripheral signals	512 inputs/outputs
Data transfer rates	automatic detection up to 12 Mbaud
Bus interface	1 x D-sub socket, 9-pin
Serial interface	COM1: 1 x RS232, COM2: 1 x RS232 or RS485
SSB	CANopen-based subsidiary bus system for the connection of further peripheral devices
Diagnostics LED	2 x power supply, 2 x K-bus
Display	FSTN display with 2 x 16 characters for diagnosis or own texts, illuminated
Switch	joystick switch for parameterisation and diagnosis
Clock	battery-powered real-time clock for time and date
Power supply	24 V DC (-15 %/+20 %)
Input current	140 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continous current
Supply current K-bus	1,450 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage)
Weight	typ. 250 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/BX3100

Accessories		
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
Cordsets	cordsets and connectors	632
FC310x	PC Fieldbus Cards with PCI interface	1044



## BC4000 | Interbus Bus Terminal Controller



The Bus Terminal Controller BC4000 is a Bus Coupler with integrated PLC functionality and has a fieldbus interface for the Interbus. The BC4000 is an intelligent slave and can be used as a decentralised intelligence in the Interbus system. Interbus has been established as an open fieldbus system since 1987. It has a ring structure, and up to 256 stations can be operated in a ring. Data transmission takes place at 500 kbaud. Therefore sensor and actuator data can be transferred over great distances.

One unit consists of the Bus Terminal Controller, any number of terminals between 1 and 64, and a bus end terminal. The Bus Terminal Controller is programmed using the TwinCAT programming system according to IEC 61131-3. The configuration and programming interface on the BC4000 is used to load the PLC program.

The controller recognises the connected terminals and automatically generates the affiliations of the inputs/outputs to the bytes of the process image.

The first input/output signal is inserted in the first bit of one word (LSB), beginning from the left. The controller inserts further signals in this word. Inputs and outputs are clearly separated. The controller automatically begins a further word if the number of inputs or outputs exceeds 16 bits.

Ordering information	Description
BC4000	Interbus Bus Terminal Controller for up to 64 Bus Terminals
BK4xx0	Interbus Bus Coupler

## Controller for distributed signal processing

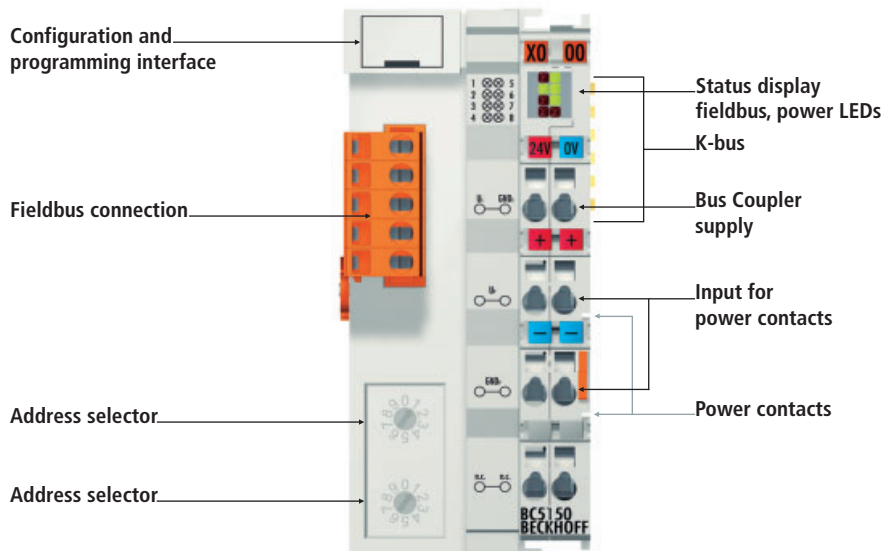
The programming system TwinCAT for the BC4000 operates, independently of the manufacturer, in accordance with IEC 61131-3. The PLC programs can be written in five different programming languages (IL, FBD,

LD, SFC, ST). In addition, TwinCAT offers extensive debug functionalities (breakpoint, single step, monitoring, ...), which facilitate commissioning. It is also possible to perform adjustment and measurement of the cycle time.

PLC data	Interbus   BC4000
Programming	TwinCAT (via programming interface or fieldbus)
Program memory	32/96 kbytes
Data memory	32/64 kbytes
Remanent data	508 bytes
Run-time system	1 PLC task
PLC cycle time	approx. 3 ms for 1,000 instructions (without I/O cycle, K-bus)
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)

Technical data	BC4000
Number of Bus Terminals	64
Max. number of bytes fieldbus	64 byte input and 64 byte output
Max. number of bytes process image	512 byte input and 512 byte output
Digital peripheral signals	512 inputs/outputs
Analog peripheral signals	128 inputs/outputs
Configuration possibility	via KS2000
Bus interface	2 x D-sub plug, 9-pin, plug and socket with screening and vibration lock
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continous current
Recommended fuse	≤ 10 A
Supply current K-bus	1,750 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)
Weight	approx. 170 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/BC4000">www.beckhoff.com/BC4000</a>

Accessories		
KS2000	configuration software for extended parameterisation	1064
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
Cordsets	cordsets and connectors	632



## BC5150 | CANopen "Compact" Bus Terminal Controller

### CANopen

The Bus Terminal Controllers are Bus Couplers with integrated PLC functionality. The "Compact" BC5150 Bus Terminal Controller for CANopen extends the Beckhoff small controller series by a cost-optimised version in a compact housing. The CANopen controller offers automatic baud rate detection up to 1 Mbaud and two address selection switches for address assignment.

The Bus Terminal Controller is programmed using the TwinCAT programming system according to IEC 61131-3. The configuration/programming interface on the BC5150 is used to load the PLC program. If the software PLC TwinCAT is in use, the PLC program can also be loaded via the fieldbus. The inputs and outputs of the connected Bus Terminals are assigned in the default set-

ting of the PLC. Each Bus Terminal can be configured in such a way that it exchanges data directly through the fieldbus with the higher-level automation device. Similarly, pre-processed data can be exchanged between the Bus Terminal Controller and the higher-level controller via the fieldbus.

Ordering information	Description	
BC5150	CANopen "Compact" Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	
BX5100	CANopen Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	454
BK51x0	CANopen Bus Coupler	412
CX8051	CANopen Embedded PC	264

## Controller for distributed signal processing

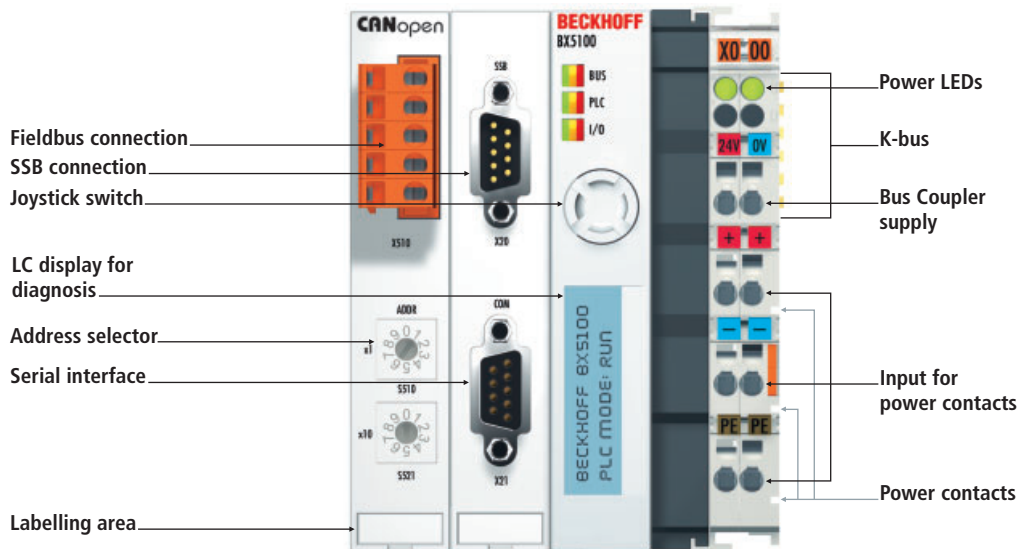
The programming system TwinCAT for the BC5150 operates, independently of the manufacturer, in accordance with IEC 61131-3. The PLC programs can be written in five different programming languages (IL, FBD,

LD, SFC, ST). In addition, TwinCAT offers extensive debug functionalities (breakpoint, single step, monitoring, ...), which facilitate commissioning. It is also possible to perform adjustment and measurement of the cycle time.

PLC data	CANopen   BC5150
Programming	TwinCAT (via programming interface or fieldbus)
Program memory	48 kbytes
Data memory	32 kbytes
Remanent data	2 kbytes
Run-time system	1 PLC task
PLC cycle time	approx. 3 ms for 1,000 instructions (without I/O cycle, K-bus)
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)
Online change	yes

Technical data	BC5150
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	16 Tx/Rx PDOs
Max. number of bytes process image	512 byte input and 512 byte output
Digital peripheral signals	512 inputs/outputs
Analog peripheral signals	128 inputs/outputs
Data transfer rates	automatic detection up to 1 Mbaud
Bus interface	open style connector, 5-pin
Serial interface	programming and configuration interface
Configuration	via KS2000 or fieldbus
Power supply	24 V DC (-15 %/+20 %)
Input current	320 mA max.
Supply current K-bus	1,000 mA
Power contacts	max. 10 A
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage)
Weight	typ. 100 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/BC5150">www.beckhoff.com/BC5150</a>

Accessories		
KS2000	configuration software for extended parameterisation	1064
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
Cordsets	cordsets and connectors	632
FC510x	PC Fieldbus Cards with PCI interface	1045



## BX5100 | CANopen Bus Terminal Controller

### CANopen

The BX5100 Bus Terminal Controller has a CANopen slave interface. It has automatic baud rate detection up to 1 Mbaud and an address selection switch for address assignment. Up to 16 Tx PDOs and 16 Rx PDOs can be exchanged with the control.

One unit consists of the BX5100 Bus Terminal Controller with up to 64 Bus Terminals and a bus end terminal. With the terminal bus extension system, the connection of up to 255 Bus Terminals is possible. The controller is programmed via the COM1 or via the CANopen interface of the FC510x PC Fieldbus Card.

In terms of their equipment and performance, the BX series Bus Terminal Controllers are

positioned between the BC series Bus Terminal Controllers and the CX series Embedded PCs. The main features distinguishing BC and BX are the larger memory and the expanded interfaces of the BX. Additionally, two serial interfaces are integrated for programming and for the connection of further serial devices. The device itself comprises an illuminated LC display with two lines of 16 characters each, a joystick switch and a real-time clock. Further peripheral devices, e.g. displays, can be connected via the integrated Beckhoff Smart System Bus (SSB).

The BX family is particularly suitable for a modular machine concept. Within a network, the

Bus Terminal Controller can exchange data with other system parts via the fieldbus interfaces. The real-time clock enables decentralised applications, for which the day of the week or the time play an important role. The areas of application of this series are similar to that of the BC series, but due to the larger memory the BX can execute significantly more complex and larger programs and can manage more data locally (e.g. history and trend data recording), which are then successively fetched over the fieldbus.

Ordering information	Description	
BX5100	CANopen Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	
BK51x0	CANopen Bus Coupler	412
CX8051	CANopen Embedded PC	264

# Controller for distributed signal processing

Like for all other Beckhoff controllers, the TwinCAT automation software is the basis for parameterisation and programming. The BX devices are programmed according to the powerful IEC 61131-3 standard in the programming languages IL,

FBD, LD, SFC or ST. Users therefore have the familiar TwinCAT tools available, e.g. the PLC programming interface, the System Manager and TwinCAT Scope. Data is exchanged optionally via the serial port (COM1) or via the

fieldbus through Beckhoff FC510x PC Fieldbus Cards.

The configuration is also carried out using TwinCAT. The fieldbus interface, the SSB bus and the real-time clock can be configured and parameterised via the System Manager.

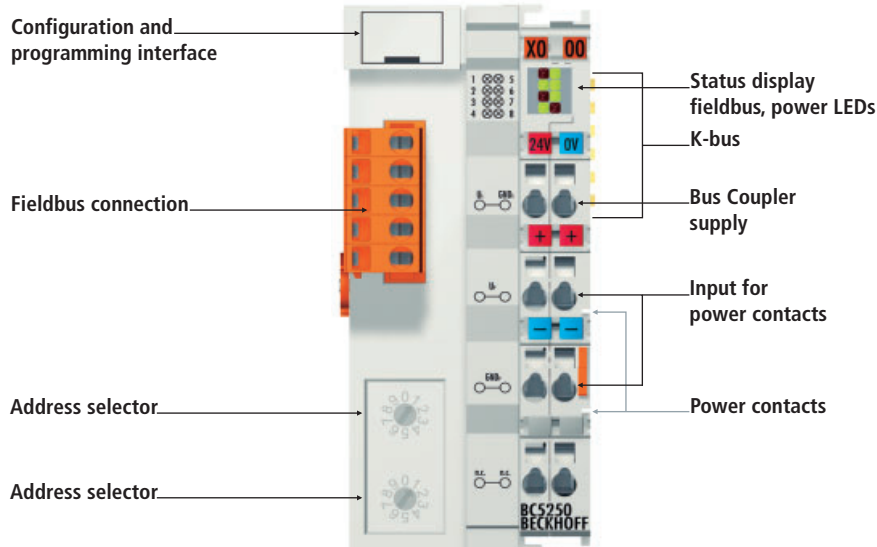
The System Manager can read all connected devices and Bus Terminals. After the parameterisation, the configuration is saved on the BX via the serial interface and can be accessed again later.

PLC data	CANopen   BX5100
Programming	TwinCAT (via programming interface or fieldbus)
Program memory	256 kbytes
Data memory	256 kbytes
Remanent data	2 kbytes
Persistent data	1 kbyte
Run-time system	1 PLC task
PLC cycle time	approx. 1 ms for 1,000 instructions (without I/O cycle, K-bus)
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)
Online change	yes
Up/down load code	yes/yes

Technical data	BX5100
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	16 Tx/Rx PDOs
Max. number of bytes process image	2,048 byte input and 2,048 byte output
Digital peripheral signals	2,040 inputs/outputs
Analog peripheral signals	512 inputs/outputs
Data transfer rates	automatic detection up to 1 Mbaud
Bus interface	open style connector, 5-pin
Serial interface	COM1: 1 x RS232, COM2: 1 x RS232 or RS485
SSB	CANopen-based subsidiary bus system for the connection of further peripheral devices
Diagnostics LED	2 x power supply, 2 x K-bus
Display	FSTN display with 2 x 16 characters for diagnosis or own texts, illuminated
Switch	joystick switch for parameterisation and diagnosis
Clock	battery-powered real-time clock for time and date
Power supply	24 V DC (-15 %/+20 %)
Input current	140 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continous current
Supply current K-bus	1,450 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage)
Weight	typ. 250 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/BX5100

Accessories		
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
Cordsets	cordsets and connectors	632
FC510x	PC Fieldbus Cards with PCI interface	1045





## BC5250 | DeviceNet "Compact" Bus Terminal Controller



The Bus Terminal Controllers are Bus Couplers with integrated PLC functionality. The "Compact" BC5250 Bus Terminal Controller for DeviceNet extends the Beckhoff small controller series by a cost-optimised version in a compact housing. The DeviceNet Controller offers automatic baud rate detection up to 500 kbaud and two address selection switches for address assignment.

The Bus Terminal Controller is programmed using the TwinCAT programming system according to IEC 61131-3. The configuration/programming interface on the BC5250 is used to load the PLC program. If the software PLC TwinCAT is in use, the PLC program can also be loaded via the fieldbus. The inputs and outputs of the connected Bus Terminals are assigned in the default setting of the PLC. Each Bus Termi-

nal can be configured in such a way that it exchanges data directly through the fieldbus with the higher-level automation device. Similarly, pre-processed data can be exchanged between the Bus Terminal Controller and the higher-level controller via the fieldbus.

Ordering information	Description	
BC5250	DeviceNet "Compact" Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	
BX5200	DeviceNet Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	458
BK52x0	DeviceNet Bus Coupler	416

## Controller for distributed signal processing

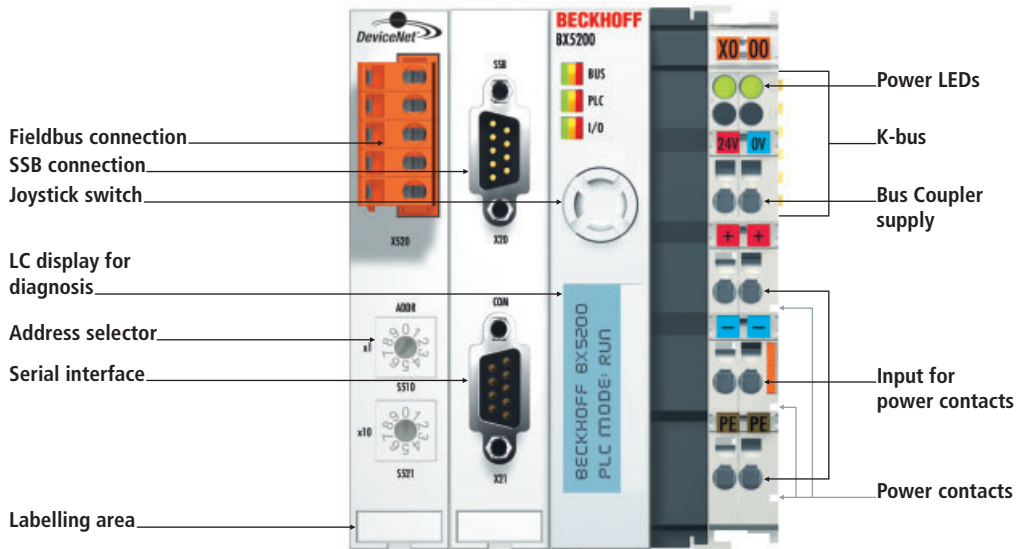
The programming system TwinCAT for the BC5250 operates, independently of the manufacturer, in accordance with IEC 61131-3. The PLC programs can be written in five different programming languages (IL, FBD,

LD, SFC, ST). In addition, TwinCAT offers extensive debug functionalities (breakpoint, single step, monitoring, ...), which facilitate commissioning. It is also possible to perform adjustment and measurement of the cycle time.

PLC data	DeviceNet   BC5250
Programming	TwinCAT (via programming interface or fieldbus)
Program memory	48 kbytes
Data memory	32 kbytes
Remanent data	2 kbytes
Run-time system	1 PLC task
PLC cycle time	approx. 3 ms for 1,000 instructions (without I/O cycle, K-bus)
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)
Online change	yes

Technical data	BC5250
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	512 byte input and 512 byte output
Max. number of bytes process image	512 byte input and 512 byte output
Digital peripheral signals	512 inputs/outputs
Analog peripheral signals	128 inputs/outputs
Configuration possibility	via KS2000 or fieldbus
Data transfer rates	automatic detection up to 500 kbaud
Bus interface	open style connector, 5-pin
Serial interface	programming and configuration interface
Power supply	24 V DC (-15 %/+20 %)
Input current	320 mA max.
Supply current K-bus	1,000 mA
Power contacts	max. 10 A
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage)
Weight	typ. 100 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/BC5250">www.beckhoff.com/BC5250</a>

Accessories		
KS2000	configuration software for extended parameterisation	1064
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
Cordsets	cordsets and connectors	632
FC520x	PC Fieldbus Cards with PCI interface	1045



## BX5200 | DeviceNet Bus Terminal Controller



The BX5200 Bus Terminal Controller has a DeviceNet slave interface. It has automatic baud rate detection up to 500 kbaud and an address selection switch for address assignment. Up to 512 byte of input and 512 byte of output can be exchanged with the controller.

One unit consists of the BX5200 Bus Terminal Controller with up to 64 Bus Terminals and a bus end terminal. With the terminal bus extension system, the connection of up to 255 Bus Terminals is possible. The controller is programmed via the COM1 or via the DeviceNet interface of the FC510x PC Fieldbus Card.

In terms of their equipment and performance, the BX series

Bus Terminal Controllers are positioned between the BC series Bus Terminal Controllers and the CX series Embedded PCs. The main features distinguishing BC and BX are the larger memory and the expanded interfaces of the BX. Additionally, two serial interfaces are integrated for programming and for the connection of further serial devices. The device itself comprises an illuminated LC display with two lines of 16 characters each, a joystick switch and a real-time clock. Further peripheral devices, e.g. displays, can be connected via the integrated Beckhoff Smart System Bus (SSB).

The BX family is particularly suitable for a modular machine

concept. Within a network, the Bus Terminal Controller can exchange data with other system parts via the fieldbus interfaces. The real-time clock enables decentralised applications, for which the day of the week or the time play an important role. The areas of application of this series are similar to that of the BC series, but due to the larger memory the BX can execute significantly more complex and larger programs and can manage more data locally (e.g. history and trend data recording), which are then successively fetched over the fieldbus.

Ordering information	Description
BX5200	DeviceNet Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)
BK52x0	DeviceNet Bus Coupler

## Controller for distributed signal processing

Like for all other Beckhoff controllers, the TwinCAT automation software is the basis for parameterisation and programming. The BX devices are programmed according to the powerful IEC 61131-3 standard in the programming languages IL,

FBD, LD, SFC or ST. Users therefore have the familiar TwinCAT tools available, e.g. the PLC programming interface, the System Manager and TwinCAT Scope. Data is exchanged optionally via the serial port (COM1) or via the

fieldbus through Beckhoff FC520x PC Fieldbus Cards.

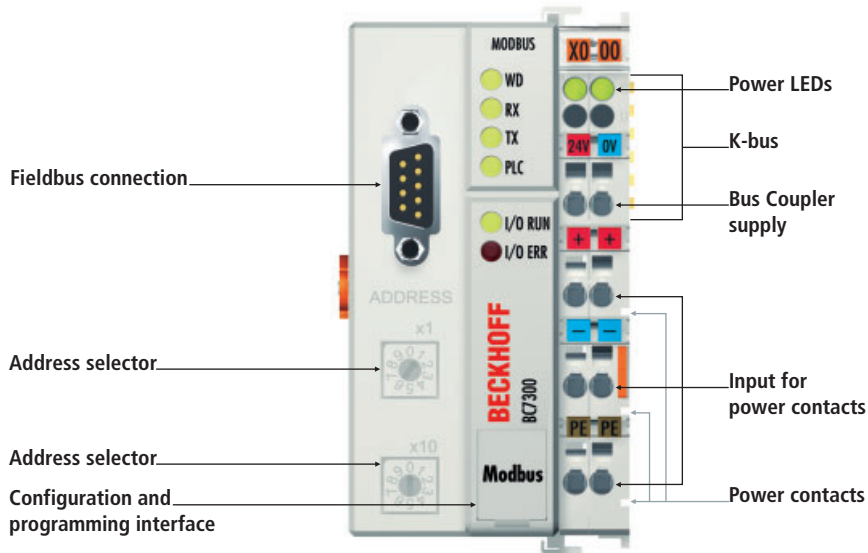
The configuration is also carried out using TwinCAT. The fieldbus interface, the SSB bus and the real-time clock can be configured and parameterised via the System Manager.

The System Manager can read all connected devices and Bus Terminals. After the parameterisation, the configuration is saved on the BX via the serial interface and can be accessed again later.

PLC data	DeviceNet   BX5200
Programming	TwinCAT (via programming interface or fieldbus)
Program memory	256 kbytes
Data memory	256 kbytes
Remanent data	2 kbytes
Persistent data	1 kbyte
Run-time system	1 PLC task
PLC cycle time	approx. 1 ms for 1,000 instructions (without I/O cycle, K-bus)
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)
Online change	yes
Up/down load code	yes/yes

Technical data	BX5200
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	512 byte input and 512 byte output
Max. number of bytes process image	2,048 byte input and 2,048 byte output
Digital peripheral signals	2,040 inputs/outputs
Analog peripheral signals	512 inputs/outputs
Data transfer rates	automatic detection up to 500 kbaud
Bus interface	open style connector, 5-pin
Serial interface	COM1: 1 x RS232, COM2: 1 x RS232 or RS485
SSB	CANopen-based subsidiary bus system for the connection of further peripheral devices
Diagnostics LED	2 x power supply, 2 x K-bus
Display	FSTN display with 2 x 16 characters for diagnosis or own texts, illuminated
Switch	joystick switch for parameterisation and diagnosis
Clock	battery-powered real-time clock for time and date
Power supply	24 V DC (-15 %/+20 %)
Input current	140 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continous current
Supply current K-bus	1,450 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage)
Weight	typ. 250 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/BX5200

Accessories		
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
Cordsets	cordsets and connectors	632
FC520x	PC Fieldbus Cards with PCI interface	1045



## BC7300 | Modbus Bus Terminal Controller

### Modbus

The Bus Terminal Controller BC7300 is a Bus Coupler with integrated PLC functionality and has a fieldbus interface for Modbus. The BC7300 is an intelligent slave and can be used as a non-central intelligence in the Modbus system. One unit consists of the Bus Terminal Controller, any number of terminals between 1 and 64, and a bus end terminal. Because of the low baud rate used by the Modbus protocol, use of the BC7300 may

be of value to reduce the bus communication. Time-critical connections can also be programmed directly at the Bus Terminal Controller.

The Bus Terminal Controller is programmed using the TwinCAT programming system according to IEC 61131-3. The configuration/programming interface on the BC7300 is used to load the PLC program.

The inputs and outputs of the connected Bus Terminals are

assigned in the PLC's default setting. Each Bus Terminal can be configured in such a way that it exchanges data directly through the fieldbus with the higher-level automation device. Similarly, pre-processed data can be exchanged between the Bus Terminal Controller and the higher-level controller via the fieldbus. Configuration is performed using the KS2000 configuration software.

#### Ordering information

#### Description

BC7300	Modbus Bus Terminal Controller for up to 64 Bus Terminals
BK73x0	Modbus Bus Coupler

## Controller for distributed signal processing

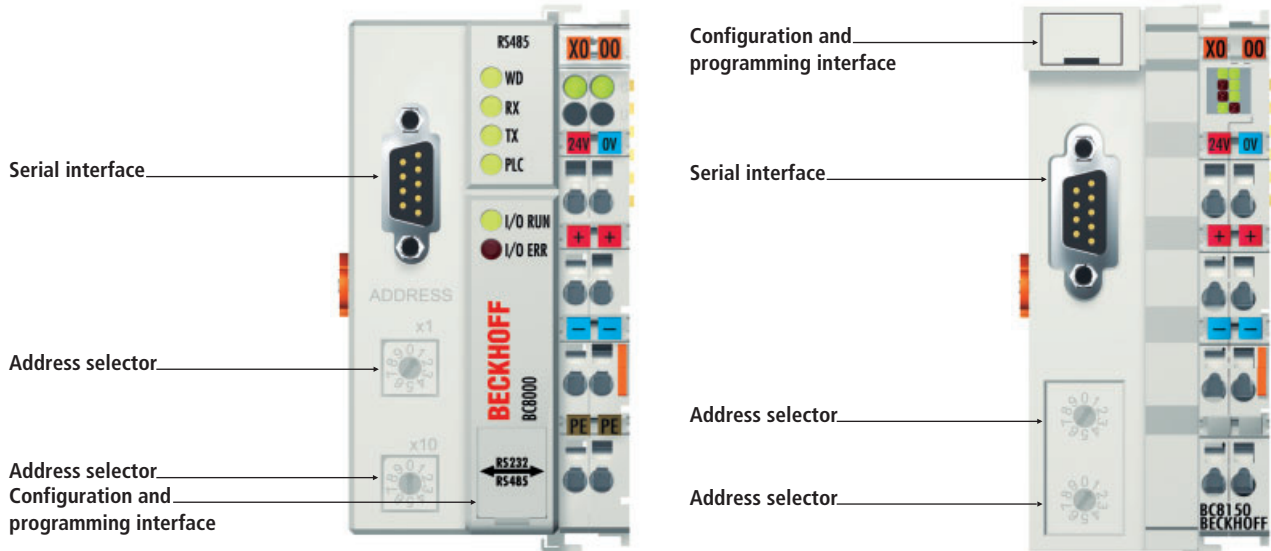
The programming system TwinCAT for the BC7300 operates, independently of the manufacturer, in accordance with IEC 61131-3. The PLC programs can be written in five different programming languages (IL, FBD,

LD, SFC, ST). In addition, TwinCAT offers extensive debug functionalities (breakpoint, single step, monitoring, ...), which facilitate commissioning. It is also possible to perform adjustment and measurement of the cycle time.

PLC data	Modbus   BC7300
Programming	TwinCAT (via programming interface or fieldbus)
Program memory	32/96 kbytes
Data memory	32/64 kbytes
Remanent data	512 bytes
Run-time system	1 PLC task
PLC cycle time	approx. 3 ms for 1,000 instructions (without I/O cycle, K-bus)
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)

Technical data	BC7300
Number of Bus Terminals	64
Max. number of bytes fieldbus	512 byte input and 512 byte output
Digital peripheral signals	256 inputs/outputs
Analog peripheral signals	128 inputs/outputs
Protocol	RTU/ASCII (default: RTU)
Configuration possibility	by rotary switch or KS2000
Data transfer rates	150, 300, 600, 1,200, 2,400, 4,800, 9,600, 19,200, 38,400 baud (default: 9,600 baud)
Bus interface	D-sub 9-pin, RS485
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continous current
Recommended fuse	≤ 10 A
Supply current K-bus	1,750 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)
Weight	approx. 170 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/BC7300">www.beckhoff.com/BC7300</a>

Accessories		
KS2000	configuration software for extended parameterisation	1064
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
Cordsets	cordsets and connectors	632



## BC8000, BC8100, BC8150 | RS485/RS232 Bus Terminal Controllers



The Bus Terminal Controllers BC8000 and BC8100 are Bus Couplers with integrated PLC functionality and have a free serial interface. In the case of the BC8000 controller it is an RS485 interface, through which a number of serial devices can be addressed. The BC8100 controller has a RS232 interface, with which peer-to-peer connection is possible. The programmable interface is suitable for

the connection of serial devices. The protocol can be freely programmed, so that displays, scanners, measuring systems, BK8x00 or a PC can be connected. The serial interface then functions as a master. A serial terminal, which is removed after the programming, is needed in order to test the interface.

The "Compact" BC8150 Bus Terminal Controller with serial RS232 interface extends

the Beckhoff small controller series by a cost-optimised version in a compact housing. An open serial protocol – like in the BK8x00 Bus Couplers – and the Modbus RTU/ASCII protocol are implemented. The address and the protocol are selected via the two rotary selection switches.

Ordering information	Description	
BC8000	RS485 Bus Terminal Controller for up to 64 Bus Terminals	
BC8100	RS232 Bus Terminal Controller for up to 64 Bus Terminals	
BC8150	RS232 "Compact" Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	
BX8000	RS232/RS485 Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	464
BK8x00	RS232/RS485 Bus Coupler	430

## Controller for stand-alone applications

The Bus Terminal Controller is programmed using the TwinCAT programming system conforms to IEC 61131-3. The PLC programs can be written in five different programming languages

(IL, FBD, LD, SFC, ST). In addition, TwinCAT offers extensive debug functionalities (breakpoint, single step, monitoring, ...), which facilitate commissioning. It is also possible to perform adjust-

ment and measurement of the cycle time. The inputs and outputs of the connected Bus Terminals are assigned in the PLC. Data is exchanged with the interface on the Bus Terminal Con-

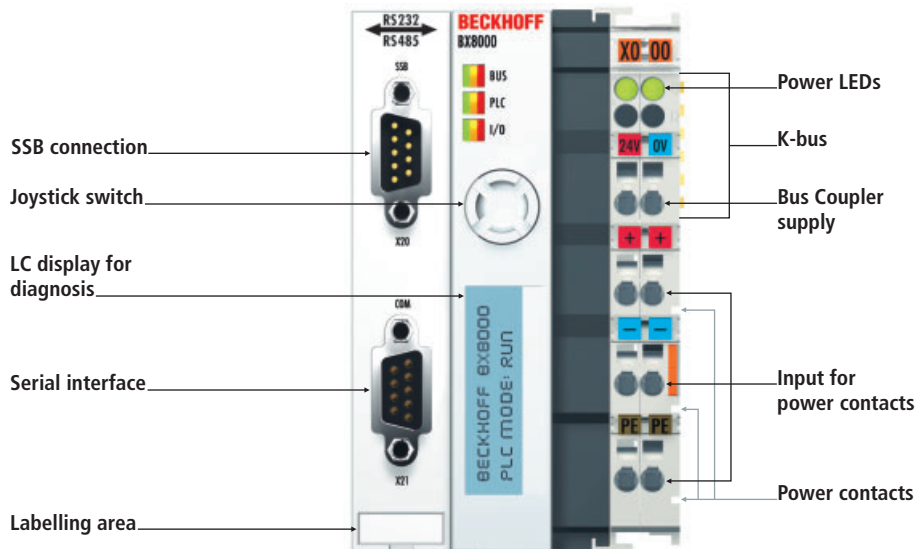
troller with the aid of a control and status byte, through which a handshake must be executed. A serial communication function block for TwinCAT is available for this purpose.

PLC data	RS485   BC8000	RS232   BC8100	RS232   BC8150
Programming	TwinCAT (via programming interface or fieldbus)		
Program memory	32/96 kbytes	32/96 kbytes	48 kbytes
Data memory	32/64 kbytes	32/64 kbytes	32 kbytes
Remanent data	512 bytes	512 bytes	2 kbytes
Run-time system	1 PLC task		
PLC cycle time	approx. 3 ms for 1,000 instructions (without I/O cycle, K-bus)		
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)		
Online change	no	no	yes

Technical data	BC8000	BC8100	BC8150
Number of Bus Terminals	64	64	64 (255 with K-bus extension)
Max. number of bytes process image	512 byte input and 512 byte output		
Digital peripheral signals	512 inputs/outputs	512 inputs/outputs	1,020 inputs/outputs
Analog peripheral signals	128 inputs/outputs		
Protocol	KS8000 protocol (open, serial protocol), customised serial protocols can be implemented.	KS8000 protocol (open, serial protocol), customised serial protocols can be implemented.	KS8000 protocol (open, serial protocol) – Modbus RTU/Modbus ASCII can be selected via address switch, serial ADS.
Data transfer rates	1.2 kbaud...57.6 kbaud	1.2 kbaud...57.6 kbaud	1.2 kbaud...38.4 kbaud
Bus interface	RS485 D-sub	RS232 D-sub	RS232 D-sub
Power supply	24 V DC (-15 %/+20 %)		
Input current	70 mA + (total K-bus current)/4, 500 mA max.	70 mA + (total K-bus current)/4, 500 mA max.	320 mA max.
Starting current	2.5 x continous current		
Supply current K-bus	1,750 mA	1,750 mA	1,000 mA
Power contacts	24 V DC max./10 A max.		
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage)		
Weight	typ. 170 g	typ. 170 g	typ. 100 g
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Further information	www.beckhoff.com/BC8000		

Accessories		
KS2000	configuration software for extended parameterisation	1064
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
TwinCAT PLC Serial Communication	IEC 61131-3 software library for TwinCAT PLC for communication via serial Bus Terminals or PC COM ports	1170
KL6001-0020	RS232 Bus Terminal for testing the serial interface with 5 bytes of user data	593
KL6021-0020	RS485 Bus Terminal for testing the serial interface with 5 bytes of user data	595
Cordsets	cordsets and connectors	632





## BX8000 | RS232/RS485 Bus Terminal Controller



The BX8000 Bus Terminal Controller is a stand-alone PLC. One unit consists of the BX8000 Bus Terminal Controller with up to 64 Bus Terminals and a bus end terminal. With the terminal bus extension system, the connection of up to 255 Bus Terminals is possible.

The controller is programmed via the COM1 interface. In addition, the BX8000 has a second COM port, optionally RS232 or RS485. This can be used for connecting serial devices, such as displays. In terms of their equipment and

performance, the BX series Bus Terminal Controllers are positioned between the BC series Bus Terminal Controllers and the CX series Embedded PCs. The main features distinguishing BC and BX are the larger memory and the expanded interfaces of the BX. Additionally, two serial interfaces are integrated for programming and for the connection of further serial devices. The device itself comprises an illuminated LC display with two lines of 16 characters each, a joystick switch and a real-time clock. Further peripheral devices,

e.g. displays, can be connected via the integrated Beckhoff Smart System Bus (SSB).

The real-time clock enables decentralised applications, for which the day of the week or the time play an important role. The areas of application for this series are similar to that for the BC series, but due to the larger memory the BX can process significantly more complex and larger programs and can manage more data locally.

Ordering information	Description
BX8000	RS232/RS485 Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)
BK8x00	RS232/RS485 Bus Coupler

# Controller for stand-alone applications

Like for all other Beckhoff controllers, the TwinCAT automation software is the basis for parameterisation and programming. The BX devices are programmed according to the powerful IEC 61131-3 standard

in the programming languages IL, FBD, LD, SFC or ST. Users therefore have the familiar TwinCAT tools available, e.g. the PLC programming interface, the System Manager and TwinCAT Scope. Data are

exchanged via the serial port (COM1).

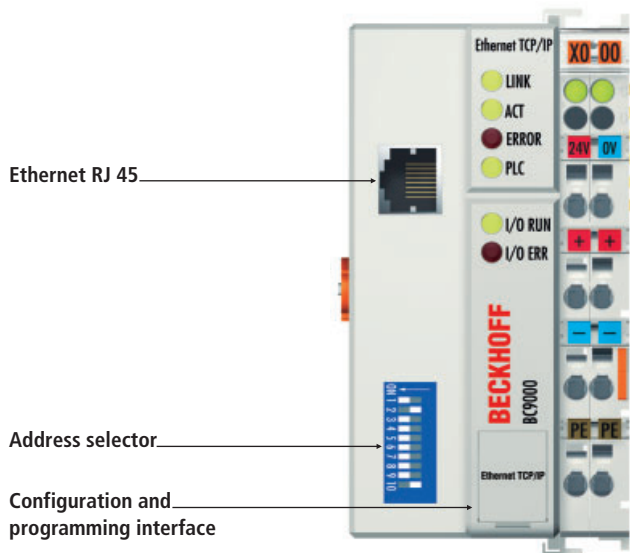
The configuration is also carried out using TwinCAT. The fieldbus interface, the SSB bus and the real-time clock can be configured and parameter-

ised via the System Manager. The System Manager can read all connected devices and Bus Terminals. After the parameterisation, the configuration is saved on the BX via the serial interface and can be accessed again later.

PLC data	RS232/RS485   BX8000
Programming	TwinCAT (via programming interface or fieldbus)
Program memory	256 kbytes
Data memory	256 kbytes
Remanent data	2 kbytes
Persistent data	1 kbyte
Run-time system	1 PLC task
PLC cycle time	approx. 1 ms for 1,000 instructions (without I/O cycle, K-bus)
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)
Online change	yes
Up/down load code	yes/yes

Technical data	BX8000
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes process image	2,048 byte input and 2,048 byte output
Digital peripheral signals	2,040 inputs/outputs
Analog peripheral signals	512 inputs/outputs
Data transfer rates	300 baud...115 kbaud
Serial interface	COM1: 1 x RS232, COM2: 1 x RS232 or RS485
SSB	CANopen-based subsidiary bus system for the connection of further peripheral devices
Diagnostics LED	2 x power supply, 2 x K-bus
Display	FSTN display with 2 x 16 characters for diagnosis or own texts, illuminated
Switch	joystick switch for parameterisation and diagnosis
Clock	battery-powered real-time clock for time and date
Power supply	24 V (-15 %/+20 %)
Input current	140 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continous current
Supply current K-bus	1,450 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage)
Weight	typ. 250 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/BX8000

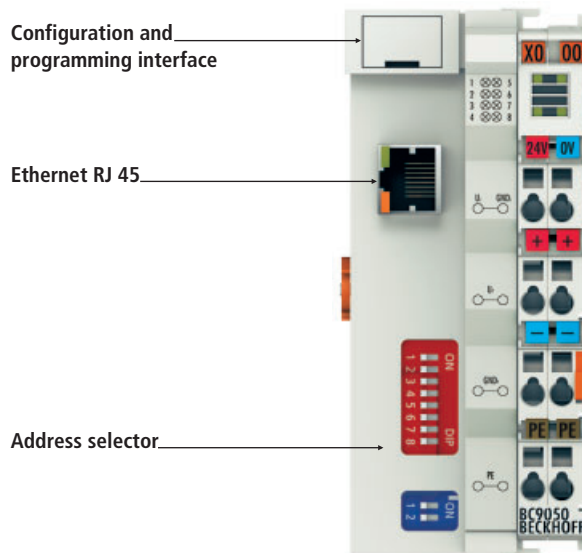
Accessories		
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
Cordsets	cordsets and connectors	632



Ethernet RJ 45

Address selector

Configuration and programming interface



Configuration and programming interface

Ethernet RJ 45

Address selector

## BC9000, BC9050 | Ethernet TCP/IP Bus Terminal Controllers

### Ethernet TCP/IP

The Bus Terminal Controllers BC90x0 are Bus Couplers with integrated PLC functionality and have a fieldbus interface for Ethernet. They are intelligent slaves that can be used as a non-central intelligence in the Ethernet system. One unit consists of the Bus Terminal Controller, any number of terminals between 1 and 64, and a bus end terminal. The "Compact" BK9050 Bus Terminal Controller is a cost-optimised version with

compact housing. With the K-bus extension, up to 255 Bus Terminals can be connected.

The Bus Terminal Controller is programmed using the TwinCAT programming system according to IEC 61131-3. The configuration/programming interface of the BC9000 or BC9050 is used for loading the PLC program. If the software PLC TwinCAT is in use, the PLC program can also be loaded via Ethernet.

In the default setting the inputs and outputs of the connected Bus Terminals are assigned to the controller. Each Bus Terminal can be configured in such a way that it exchanges data directly through the fieldbus with the higher-level automation device.

Ordering information	Description	
BC9000	Ethernet Bus Terminal Controller for up to 64 Bus Terminals	
BC9050	Ethernet "Compact" Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	
BC9100	Ethernet Bus Terminal Controller for up to 64 Bus Terminals (with integrated 2-channel switch)	470
BX9000	Ethernet Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	472
BK9xx0	Ethernet Bus Coupler	432
CX8090	Ethernet Embedded PC	265

## Controller for distributed signal processing

The BC9000 and BC9050 Bus Terminal Controllers support the operation of all Bus Terminal types. As far as the user is concerned, the inputs and outputs are not handled any differently from the way they are by other coupler series. The information is made available for use as a byte array in the process image of the automation device.

The analog and multi-functional Bus Terminals can be adapted to each specific application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store

settings permanently and in a fail-safe manner.

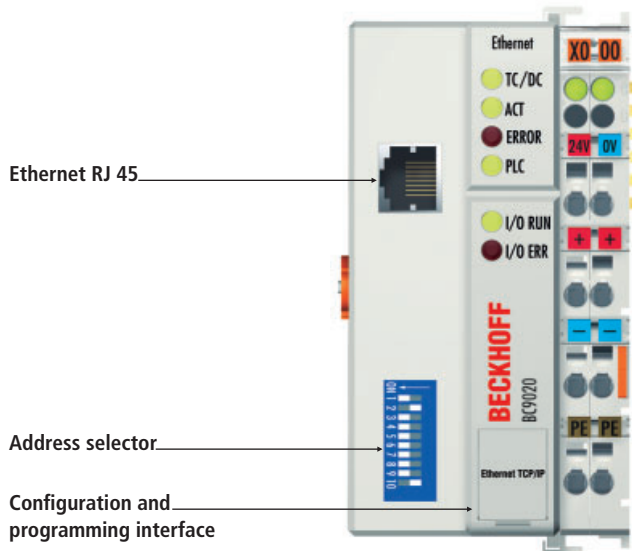
Having the controller (PLC, IPC) carry out the configuration of the Bus Terminals is a further option. The PLC or IPC uses function blocks (FB) to take care of the configuration of all the peripherals during the start-up phase. The controller can, if required, upload the

non-centrally generated configuration data in order to manage and store them centrally. This means that it is not necessary to carry out the setting procedure again if a Bus Terminal is exchanged. The controller carries out the desired setting automatically after switching on.

PLC data	Ethernet TCP/IP   BC9000	BC9050
Programming	via TwinCAT and programming interface or Ethernet	
Program memory	64/96 kbytes	48 kbytes
Data memory	64/128 kbytes	32 kbytes
Remanent data	4,080 bytes	2 kbytes
Run-time system	1 PLC task	
PLC cycle time	approx. 1.5 ms for 1,000 instructions (without I/O cycle, K-bus)	
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)	

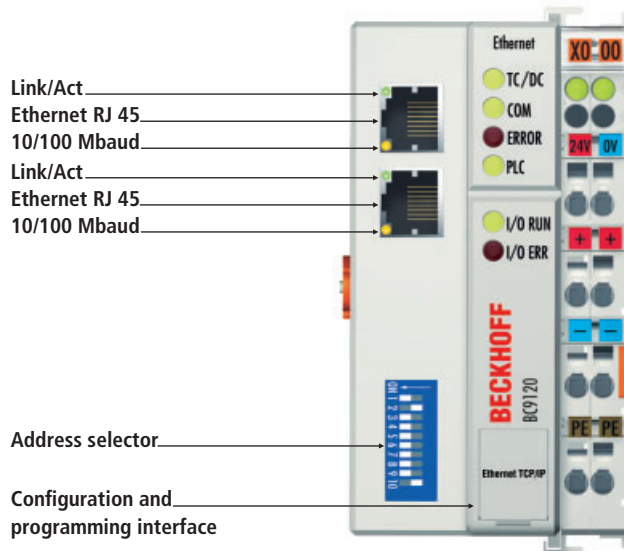
Technical data	BC9000	BC9050
Number of Bus Terminals	64	64 (255 with K-bus extension)
Max. number of bytes process image	512 byte input and 512 byte output	
Digital peripheral signals	512 inputs/outputs	2,040 inputs/outputs
Analog peripheral signals	128 inputs/outputs	512 inputs/outputs
Protocol	TwinCAT ADS, Modbus TCP	
Configuration possibility	via KS2000 or Ethernet	
Data transfer rates	10/100 Mbaud, automatic recognition of the transmission rate	
Bus interface	1 x RJ 45	
Power supply	24 V DC (-15 %/+20 %)	
Input current	70 mA + (total K-bus current)/4, 500 mA max.	320 mA max.
Starting current	2.5 x continous current	
Recommended fuse	≤ 10 A	
Supply current K-bus	1,750 mA	1,000 mA
Power contacts	24 V DC max./10 A max.	
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/BC9000	

Accessories		
KS2000	configuration software for extended parameterisation	1064
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
Cordsets	cordsets and connectors	632
FC90xx	PC Fieldbus Cards with PCI interface	1048



Ethernet RJ 45

Address selector

Configuration and  
programming interface

Link/Act

Ethernet RJ 45

10/100 Mbaud

Link/Act

Ethernet RJ 45

10/100 Mbaud

Address selector

Configuration and  
programming interface

## BC9020, BC9120 | Ethernet TCP/IP “Economy plus” Bus Terminal Controllers

### Ethernet TCP/IP

The Bus Terminal Controllers BC9x20 are Bus Couplers with integrated PLC functionality and have a bus interface for Ethernet. They are intelligent slaves and can be used as decentralised intelligence in the Ethernet system. In conjunction with the K-bus extension, the “Economy plus” controllers enable connection of up to 255 Bus Terminals to a controller.

In terms of performance, the BC9020 and BC9120 Bus Terminal Controllers lie between the BC9050 and the BX9000. The BX series Bus Terminal Controllers have a larger memory and additional interfaces for the integration of further peripheral devices.

In contrast to the BC9020, the BC9120 has an additional RJ 45 port. Both Ethernet ports operate as 2-channel switches. The I/O stations can thus be configured with a line topology, instead of the classic star topology. In many applications, this significantly reduces the wiring effort and the cabling costs. The maximum distance between two couplers/controllers is 100 m. Up to 20 BC9120 Bus Controllers are cascable, resulting in a maximum line length of 2 km.

The Bus Terminal Controller is programmed using the TwinCAT programming system according to IEC 61131-3. The configuration/programming interface on the BC9x20 is used

to load the PLC program. If the software PLC TwinCAT is in use, the PLC program can also be loaded via Ethernet.

The inputs and outputs of the connected Bus Terminals are allocated to the mini PLC in the default settings. Each Bus Terminal can be configured in such a way that it exchanges data directly through the fieldbus with the higher-level automation device.

Ordering information	Description
BC9020	Ethernet TCP/IP “Economy plus” Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)
BC9120	Ethernet TCP/IP “Economy plus” Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension, with integrated 2-channel switch)
CX8090	Ethernet Embedded PC

## Controller for distributed signal processing

The BC9020 and BC9120 Bus Terminal Controllers support the operation of all Bus Terminal types. As far as the user is concerned, the inputs and outputs are not handled any differently from the way they are by other coupler series. The information is made available for use as a byte array in the process image of the automation device.

The analog and multi-functional Bus Terminals can be adapted to each specific application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store

settings permanently and in a fail-safe manner.

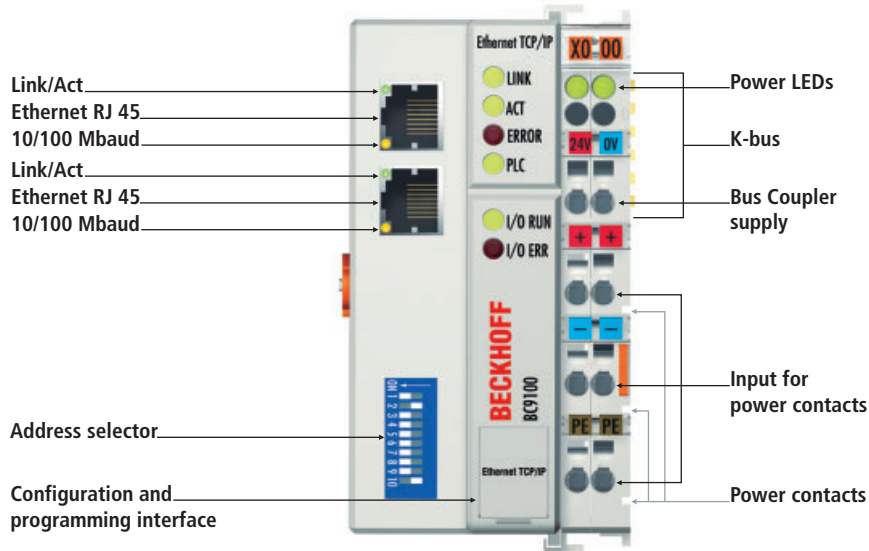
Having the controller (PLC, IPC) carry out the configuration of the Bus Terminals is a further option. The PLC or IPC uses function blocks (FB) to take care of the configuration of all the peripherals during the start-up phase. The controller can, if required, upload the

non-centrally generated configuration data in order to manage and store them centrally. This means that it is not necessary to carry out the setting procedure again if a Bus Terminal is exchanged. The controller carries out the desired setting automatically after switching on.

PLC data	Ethernet TCP/IP   BC9020, BC9120
Programming	via TwinCAT and programming interface or Ethernet
Program memory	128 kbytes
Data memory	128 kbytes
Remanent data	2 kbytes
Persistent data	1 kbyte
Run-time system	1 PLC task
PLC cycle time	approx. 1 ms for 1,000 instructions (without I/O cycle, K-bus)
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)
Online change	yes
Up/down load code	yes/yes

Technical data	BC9020	BC9120
Number of Bus Terminals	64 (255 with K-bus extension)	
Max. number of bytes fieldbus	2,048 byte input and 2,048 byte output	
Digital peripheral signals	2,040 inputs/outputs	
Analog peripheral signals	512 inputs/outputs	
Protocol	TwinCAT ADS, Modbus TCP	
Configuration possibility	via KS2000 or Ethernet	
Data transfer rates	10/100 Mbaud, automatic recognition of the transmission rate	
Bus interface	1 x RJ 45	2 x RJ 45 (2-channel switch)
Power supply	24 V DC (-15 %/+20 %)	
Input current	70 mA + (total K-bus current)/4, 500 mA max.	
Starting current	2.5 x continous current	
Recommended fuse	≤ 10 A	
Supply current K-bus	1,750 mA	
Power contacts	24 V DC max./10 A max.	
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/BC9020	

Accessories		
KS2000	configuration software for extended parameterisation	1064
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
Cordsets	cordsets and connectors	632
FC90xx	PC Fieldbus Cards with PCI interface	1048



## BC9100 | Ethernet TCP/IP Bus Terminal Controller

### Ethernet TCP/IP

The Bus Terminal Controller BC9100 is a Bus Coupler with integrated PLC functionality and has a fieldbus interface for Ethernet. The BC9100 is an intelligent slave and can be used as a non-central intelligence in the Ethernet system. One unit consists of the Bus Terminal Controller, any number of terminals between 1 and 64, and a bus end terminal.

The Bus Terminal Controller is programmed using the TwinCAT programming system conforms to IEC 61131-3. The configuration/programming interface on the BC9100 is used to load the PLC program. If the

software PLC TwinCAT is in use, the PLC program can also be loaded via Ethernet.

The inputs and outputs of the connected Bus Terminals are assigned in the PLC's default setting. Each Bus Terminal can be configured in such a way that it exchanges data directly through the fieldbus with the higher-level automation device. Similarly, pre-processed data can be exchanged between the Bus Terminal Controller and the higher-level controller via the fieldbus.

In contrast to the BC9000, the BC9100 has an additional RJ 45 port. Both Ethernet ports

operate as 2-channel switches. The I/O stations can thus be configured in a line topology, rather than the classic star topology. In many applications this significantly reduces the wiring effort and the cabling costs. The maximum distance between two Bus Terminal Controllers is 100 m. Up to 20 BC9100 Ethernet controllers are cascadable, so that a maximum line length of 2 km can be achieved.

Ordering information	Description
BC9100	Ethernet Bus Terminal Controller for up to 64 Bus Terminals (with integrated 2-channel switch)
CX8090	Ethernet Embedded PC

## Controller for distributed signal processing

The BC9100 Bus Terminal Controller supports the operation of all Bus Terminal types. As far as the user is concerned, the inputs and outputs are not handled any differently from the way they are by other coupler series. The information is made available for use as a byte array in the process image of the automation device.

The analog and multi-functional Bus Terminals can

be adapted to each specific application using the KS2000 configuration set. Depending on the type, the analog Bus Terminals' registers contain temperature ranges, gain values and linearisation characteristics. With the KS2000, the required parameters can be set on a PC. The Bus Terminals store settings permanently and in a fail-safe manner.

Having the controller (PLC, IPC) carry out the configuration of the Bus Terminals is a further option. The PLC or IPC uses function blocks (FB) to take care of the configuration of all the peripherals during the start-up phase. The controller can, if required, upload the non-centrally generated configuration data in order to manage and store them centrally. This means that it is not

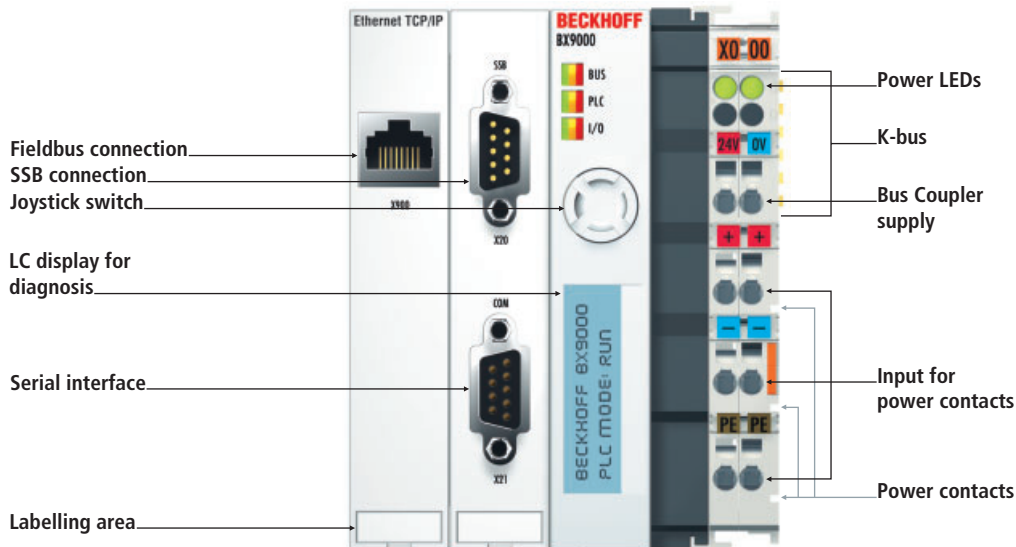
necessary to carry out the setting procedure again if a Bus Terminal is exchanged. The controller carries out the desired setting automatically after switching on.

PLC data	Ethernet TCP/IP   BC9100
Programming	via TwinCAT and programming interface or Ethernet
Program memory	64/96 kbytes
Data memory	64/128 kbytes
Remanent data	4,080 bytes
Run-time system	1 PLC task
PLC cycle time	approx. 1.5 ms for 1,000 instructions (without I/O cycle, K-bus)
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)

Technical data	BC9100
Number of Bus Terminals	64
Max. number of bytes process image	512 byte input and 512 byte output
Digital peripheral signals	512 inputs/outputs
Analog peripheral signals	128 inputs/outputs
Protocol	TwinCAT ADS, Modbus TCP
Configuration possibility	via KS2000 or Ethernet
Data transfer rates	10/100 Mbaud, automatic recognition of the transmission rate
Bus interface	2 x RJ 45 (2-channel switch)
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continous current
Recommended fuse	≤ 10 A
Supply current K-bus	1,750 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)
Operating/storage temperature	0...+55 °C/-25...+85 °C
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/BC9100

Accessories		
KS2000	configuration software for extended parameterisation	1064
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
Cordsets	cordsets and connectors	632
FC90xx	PC Fieldbus Cards with PCI interface	1048





## BX9000 | Ethernet TCP/IP Bus Terminal Controller

### Ethernet TCP/IP

The BX9000 Bus Terminal Controller has an Ethernet slave/master interface. The controller has automatic baud rate detection up to 100 Mbaud. The address can optionally be entered via DHCP, BootP, ARP or with the joystick switch. Up to 2 kbytes of input and 2 kbytes of output can be exchanged with the controller. The ModbusTCP and the ADS/TCP and ADS/UDP protocols are implemented.

One unit consists of the BX9000 Bus Terminal Controller with up to 64 Bus Terminals and

a bus end terminal. With the terminal bus extension system, the connection of up to 255 Bus Terminals is possible.

The controller is programmed via the COM1 or via the Ethernet interface. In terms of their equipment and performance, the BX series Bus Terminal Controllers are positioned between the BC series Bus Terminal Controllers and the CX series Embedded PCs. The main features distinguishing BC and BX are the larger memory and the expanded interfaces of the

BX. Additionally, two serial interfaces are integrated for programming and for the connection of further serial devices. The device itself comprises an illuminated LC display with two lines of 16 characters each, a joystick switch and a real-time clock. Further peripheral devices, e.g. displays, can be connected via the integrated Beckhoff Smart System Bus (SSB).

Ordering information	Description	
BX9000	Ethernet Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	
BK9xx0	Ethernet Bus Coupler	432
CX8090	Ethernet Embedded PC	265

# Controller for distributed signal processing

Like for all other Beckhoff controllers, the TwinCAT automation software is the basis for parameterisation and programming. The BX devices are programmed according to the powerful IEC 61131-3 standard in the

programming languages IL, FBD, LD, SFC or ST. Users therefore have the familiar TwinCAT tools available, e.g. the PLC programming interface, the System Manager and TwinCAT Scope. Data is exchanged optionally

via the serial port (COM1) or via the Ethernet interface.

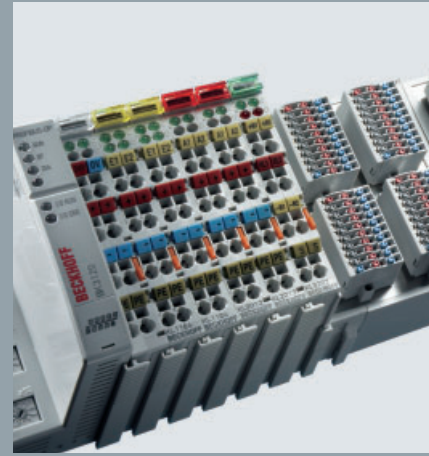
The configuration is also carried out using TwinCAT. The fieldbus interface, the SSB bus and the real-time clock can be configured and parameter-

ised via the System Manager. The System Manager can read all connected devices and Bus Terminals. After the parameterisation, the configuration is saved on the BX via the serial interface and can be accessed again later.

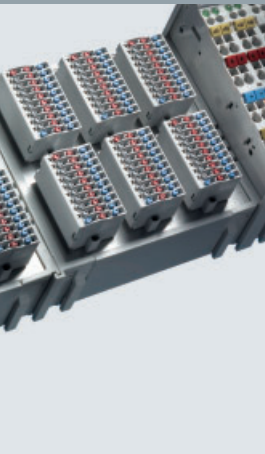
PLC data	Ethernet TCP/IP   BX9000
Programming	via TwinCAT and programming interface or Ethernet
Program memory	256 kbytes
Data memory	256 kbytes
Remanent data	2 kbytes
Persistent data	1 kbyte
Run-time system	1 PLC task
PLC cycle time	approx. 1 ms for 1,000 instructions (without I/O cycle, K-bus)
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)
Online change	yes
Up/down load code	yes/yes

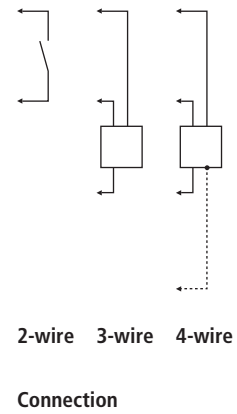
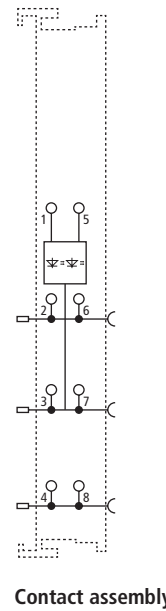
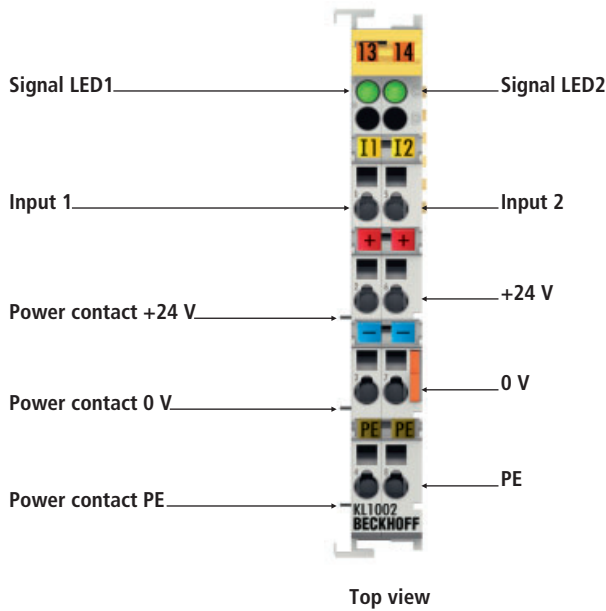
Technical data	BX9000
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	2,048 byte input and 2,048 byte output
Max. number of bytes process image	2,048 byte input and 2,048 byte output
Digital peripheral signals	2,040 inputs/outputs
Analog peripheral signals	512 inputs/outputs
Protocol	TwinCAT ADS, Modbus TCP
Data transfer rates	10/100 Mbaud, automatic recognition of the transmission rate
Bus interface	RJ 45
Serial interface	COM1: 1 x RS232, COM2: 1 x RS232 or RS485
SSB	CANopen-based subsidiary bus system for the connection of further peripheral devices
Diagnostics LED	2 x power supply, 2 x K-bus
Display	FSTN display with 2 x 16 characters for diagnosis or own texts, illuminated
Switch	joystick switch for parameterisation and diagnosis
Clock	battery-powered real-time clock for time and date
Power supply	24 V DC (-15 %/+20 %)
Input current	140 mA + (total K-bus current)/4, 500 mA max.
Starting current	2.5 x continous current
Supply current K-bus	1,450 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage)
Weight	typ. 250 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/BX9000

Accessories		
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
FC90xx	PC Fieldbus Cards with PCI interface	1048



# Bus Terminals

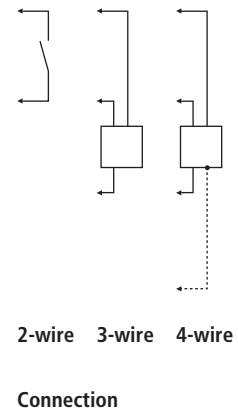
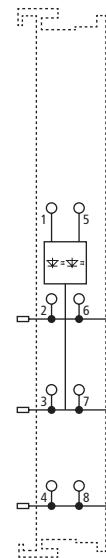
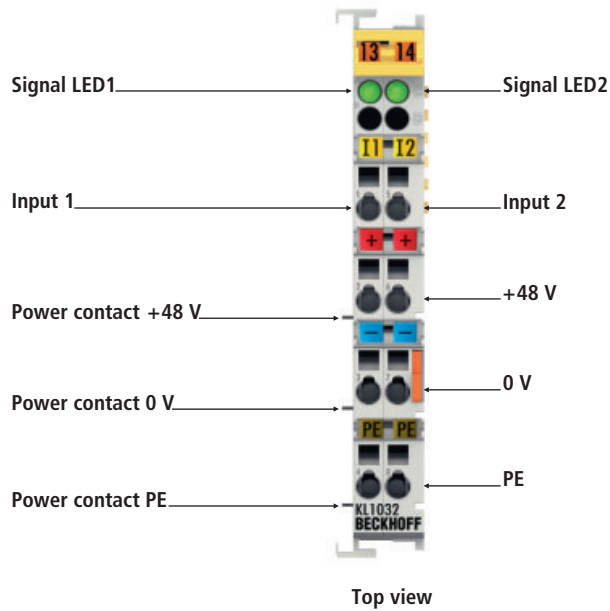




## KL1002, KL1012 | 2-channel digital input terminals 24 V DC

The KL1002 and KL1012 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation unit. The KL1002 and KL1012 versions have input filters of different speeds. The Bus Terminals contain two channels that indicate their signal state by means of light emitting diodes.

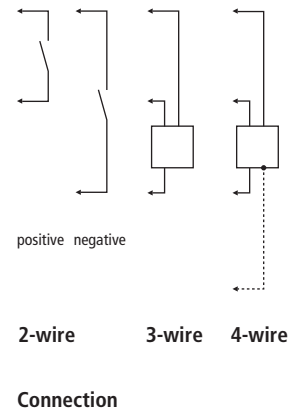
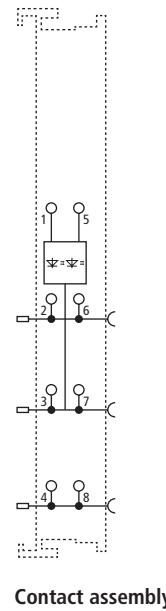
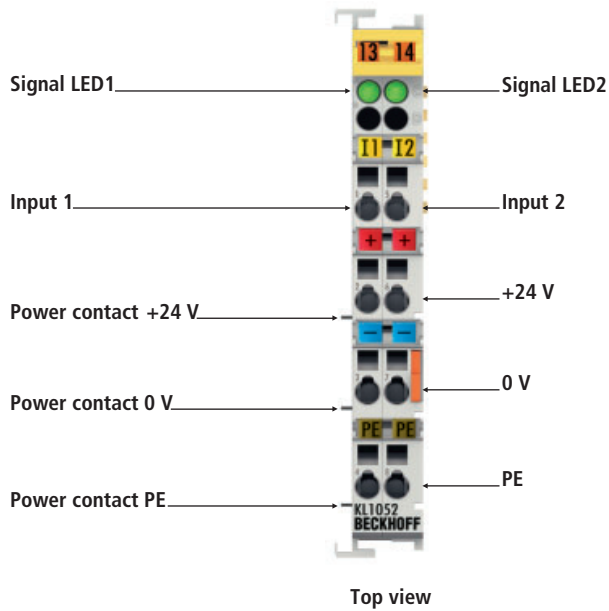
Technical data	KL1002   KS1002	KL1012   KS1012
Number of inputs	2	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	-3...+5 V	
"1" signal voltage	15...30 V	
Input filter	3.0 ms	0.2 ms
Input current	typ. 5 mA	
Current consumption K-bus	typ. 3 mA	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Bit width in the process image	2 inputs	
Configuration	no address or configuration setting	
Weight	approx. 50 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL1002	



## KL1032 | 2-channel digital input terminal 48 V DC

The KL1032 digital input terminal acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation unit. The Bus Terminal contains two channels that indicate their signal state by means of light emitting diodes. Further voltage values are available on request.

Technical data	KL1032   KS1032
Number of inputs	2
Nominal voltage	48 V DC (-15 %/+20 %)
"0" signal voltage	-6...+10 V
"1" signal voltage	34...60 V
Input filter	3.0 ms
Input current	typ. 3.5 mA
Current consumption K-bus	typ. 3 mA
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Bit width in the process image	2 inputs
Configuration	no address or configuration setting
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL1032">www.beckhoff.com/KL1032</a>

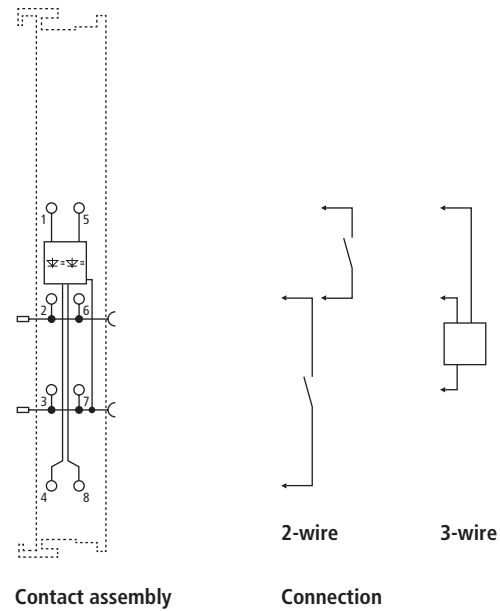
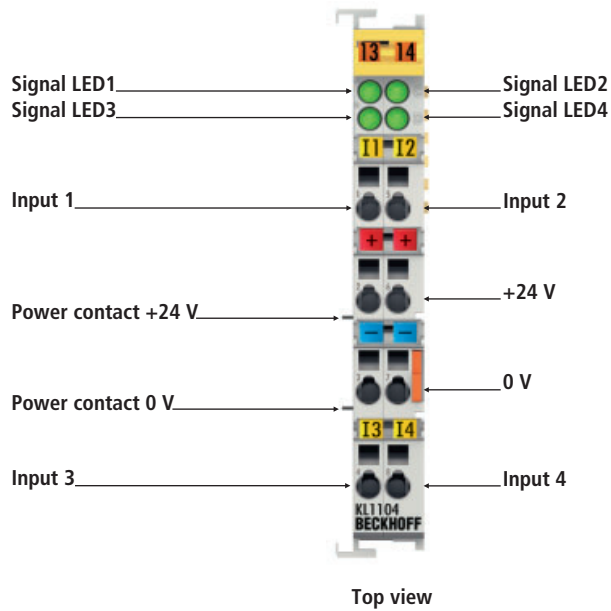


## KL1052 | 2-channel digital input terminal 24 V DC, switching to positive and negative potentials

The KL1052 digital input terminal acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation unit. Sensors that switch to the positive potential or to 0 V (ground) can be connected to the KL1052 version. The Bus Terminal contains two channels that indicate their signal state by means of light emitting diodes.

Technical data	KL1052   KS1052
Number of inputs	2
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	7.6...17.4 V
"1" signal voltage	0...7 V and 18...30 V
Input filter	3.0 ms
Input current	typ. 3 mA
Current consumption K-bus	typ. 8 mA
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Bit width in the process image	2 inputs
Configuration	no address or configuration setting
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	www.beckhoff.com/KL1052

Special terminals	
KL1052-0010	96 V DC positive and negative switching, not in accordance with the EN 61131-2 specifications: I high = 3 mA, I low = 0.5 mA

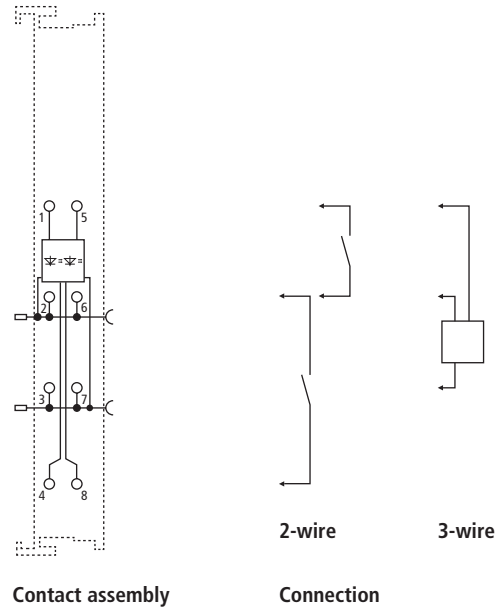
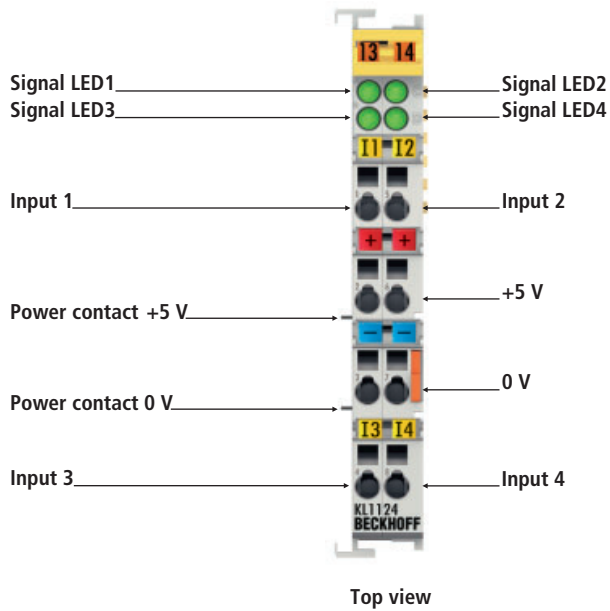


## KL1104, KL1114 | 4-channel digital input terminals 24 V DC

The KL1104 and KL1114 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation unit. The KL1104 and KL1114 versions have input filters of different speeds. The Bus Terminals contain four channels that indicate their signal state by means of light emitting diodes. The KL1104 and KL1114 are particularly useful for space-saving use in control cabinets.

Technical data	KL1104   KS1104	KL1114   KS1114
Number of inputs	4	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	-3...+5 V	
"1" signal voltage	15...30 V	
Input filter	3.0 ms	0.2 ms
Input current	typ. 5 mA	
Current consumption K-bus	typ. 5 mA	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Bit width in the process image	4 inputs	
Configuration	no address or configuration setting	
Weight	approx. 55 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL1104	

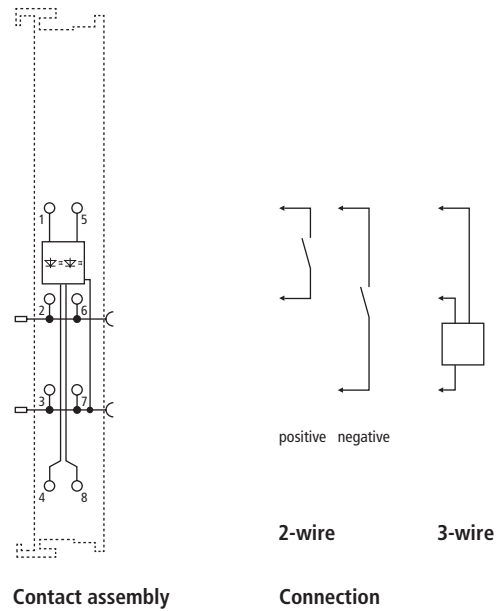
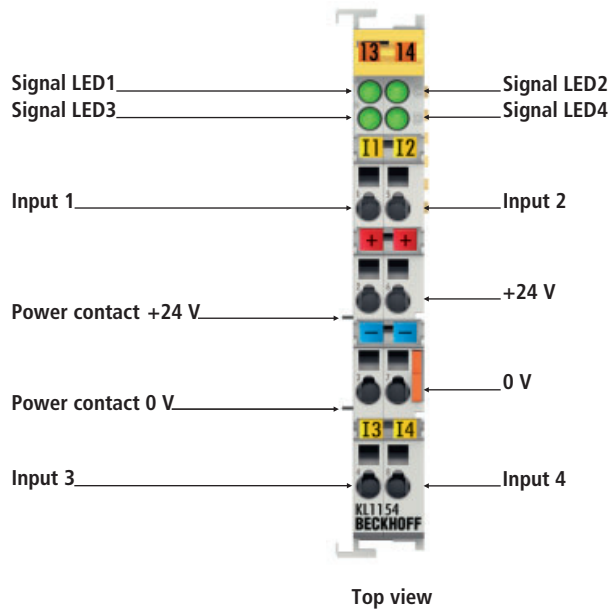




## KL1124 | 4-channel digital input terminal 5 V DC

The KL1124 digital input terminal acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation unit. The Bus Terminal contains four channels that indicate their signal state by means of light emitting diodes. The 5 V supply voltage can be generated with the KL9505 power supply unit terminal, and fed into the power contacts.

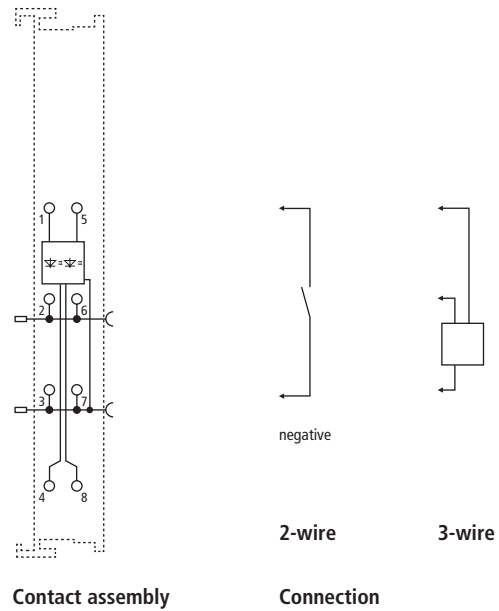
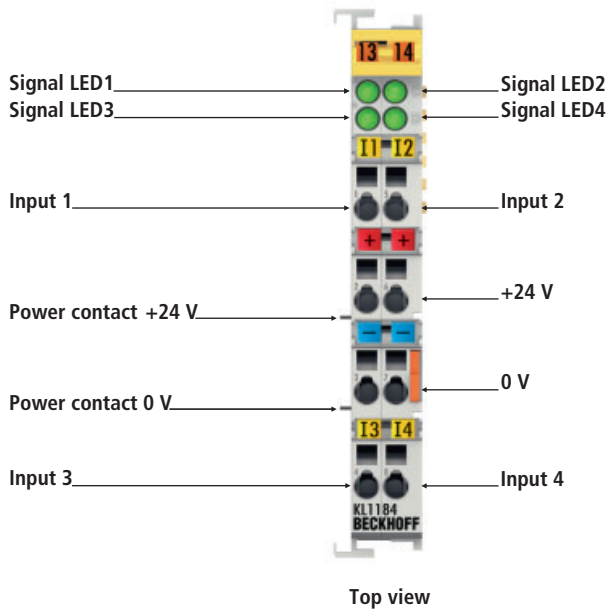
Technical data	KL1124   KS1124
Number of inputs	4
Nominal voltage	5 V DC
"0" signal voltage	< 0.8 V
"1" signal voltage	> 2.4 V
Input filter	0.2 ms
Input current	typ. 50 $\mu$ A
Current consumption K-bus	typ. 5 mA
Current consumption power contacts	< 1 mA
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Bit width in the process image	4 inputs
Configuration	no address or configuration setting
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL1124">www.beckhoff.com/KL1124</a>



## KL1154, KL1164 | 4-channel digital input terminals 24 V DC, switching to positive and negative potentials

The KL1154 and KL1164 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation unit. The KL1154 and KL1164 versions have input filters of different speeds. Sensors that switch to the positive potential or to 0 V (ground) can be connected to the KL1154 and KL1164 versions. The Bus Terminals contain four channels that indicate their signal state by means of light emitting diodes.

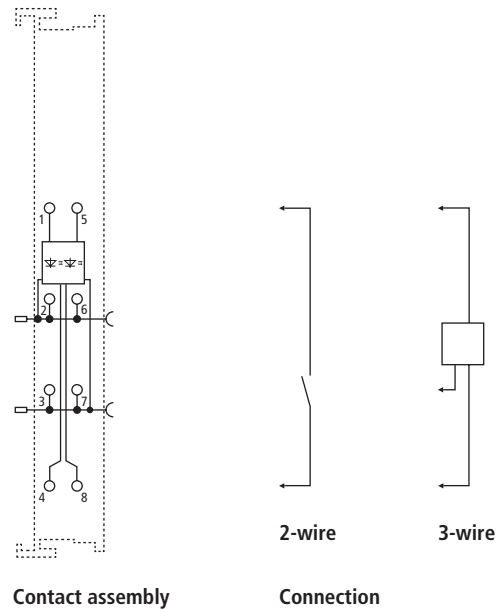
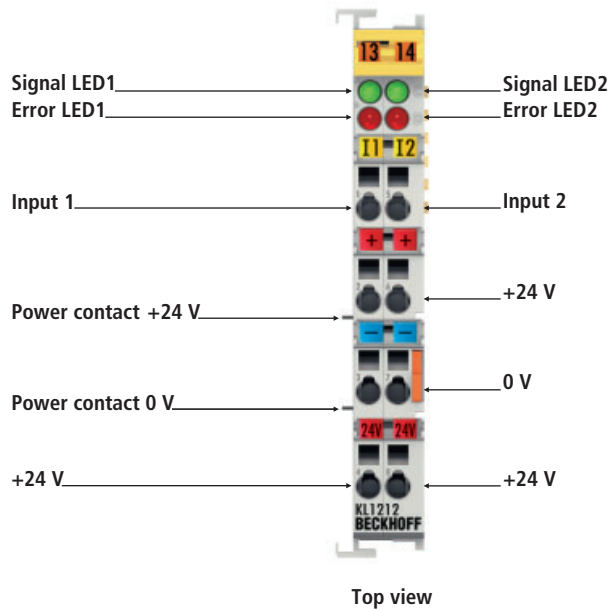
Technical data	KL1154   KS1154	KL1164   KS1164
Number of inputs	4	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	7.6...17.4 V	
"1" signal voltage	0...7 V and 18...30 V	
Input filter	3.0 ms	0.2 ms
Input current	typ. 5 mA	
Current consumption K-bus	typ. 8 mA	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Bit width in the process image	4 inputs	
Configuration	no address or configuration setting	
Weight	approx. 55 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL1154	



# KL1184, KL1194 | 4-channel digital input terminals 24 V DC, switching to negative potential

The KL1184 and KL1194 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation unit. The KL1184 and KL1194 versions have input filters of different speeds. Sensors that switch to 0 V (ground) can be connected to the KL1184 and KL1194 versions. The Bus Terminals contain four channels that indicate their signal state by means of light emitting diodes.

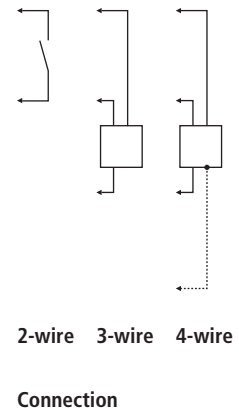
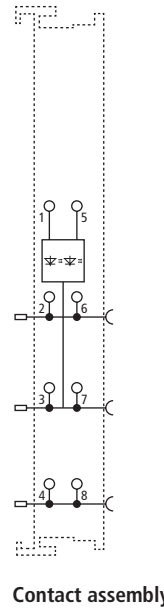
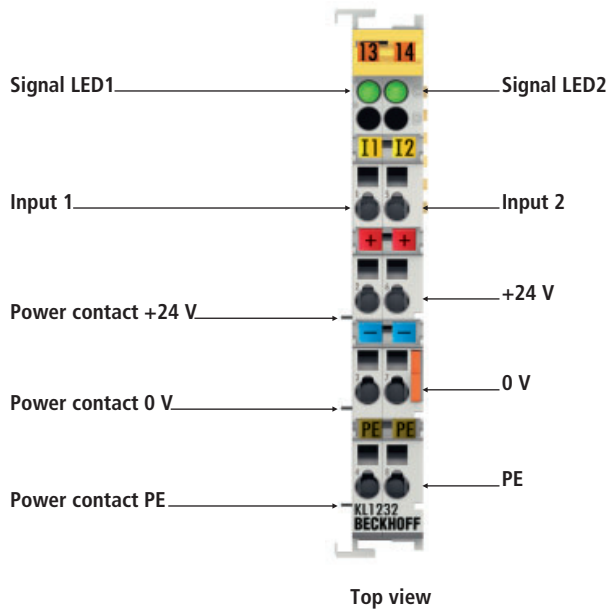
Technical data	KL1184   KS1184	KL1194   KS1194
Number of inputs	4	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	18...30 V	
"1" signal voltage	0...7 V	
Input filter	3.0 ms	0.2 ms
Input current	typ. 5 mA	
Current consumption K-bus	typ. 8 mA	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Bit width in the process image	4 inputs	
Configuration	no address or configuration setting	
Weight	approx. 55 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL1184	



## KL1212 | 2-channel digital input terminal 24 V DC with short-circuit protected sensor supply and diagnostics

The KL1212 digital input terminal acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation unit. The KL1212 generates a short-circuit protected 24 V DC supply voltage for sensors. The sensor outputs can be switched on or off by the controller. A short-circuit or an open lead in the sensor supply is detected, and the terminal status is relayed to the controller via the K-bus. The Bus Terminal contains two channels that indicate their signal state and errors by means of LEDs.

Technical data	KL1212   KS1212
Number of inputs	2
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V
"1" signal voltage	15...30 V
Input filter	3.0 ms
Input current	typ. 5 mA
Sensor supply max.	0.5 A (short-circuit-proof)
Current consumption K-bus	typ. 8 mA
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Bit width in the process image	input/output: 4 inputs (2 error bits/2 signal bits); 2 outputs (2 sensor supply)
Input/output bit assignments	input: bit 3 bit 2 bit 1 bit 0 err. 2 err. 1 on 2 on 1 output: bit 1 bit 0 off 2 off 1
Configuration	no address or configuration setting
Weight	55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	www.beckhoff.com/KL1212

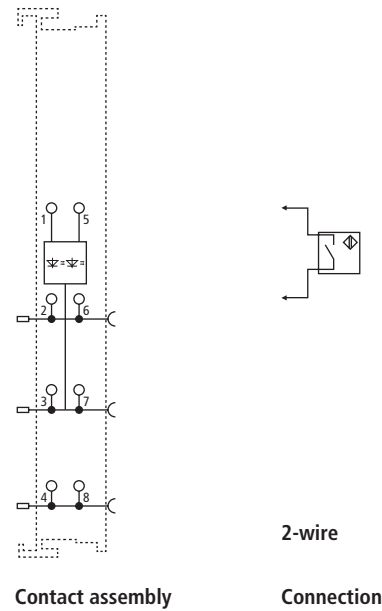
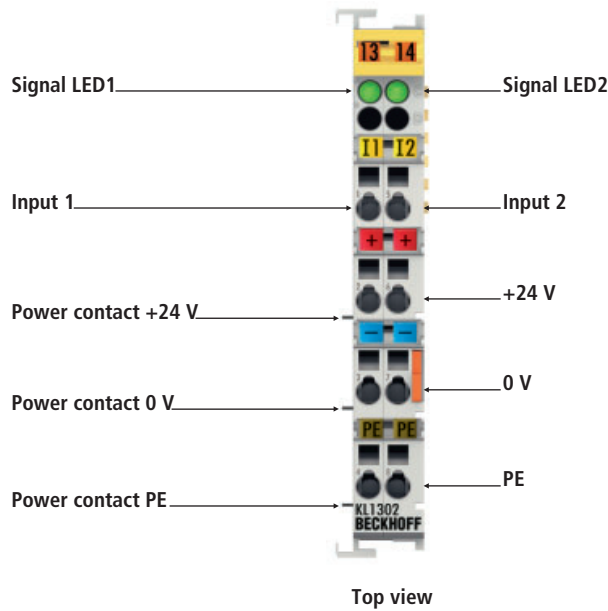


## KL1232 | 2-channel digital input terminal 24 V DC with edge triggered pulse expansion

The KL1232 digital input terminal acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation unit. The KL1232 has an input circuit that extends plus-switched signals, triggered on the rising edge, to 100 ms. The Bus Terminal contains two channels that indicate their signal state by means of LEDs. The KL1232 is particularly suitable for recording very short signals in control systems with a longer processing time than the signal length.

Technical data	KL1232   KS1232
Number of inputs	2
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V
"1" signal voltage	15...30 V
Input filter	0.2 ms
Input current	typ. 5 mA
Pulse expansion	100 ms
Current consumption K-bus	typ. 5 mA
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Bit width in the process image	2 inputs
Configuration	no address or configuration setting
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL1232">www.beckhoff.com/KL1232</a>

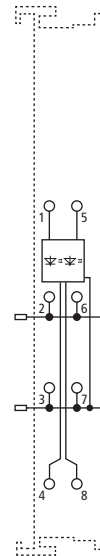
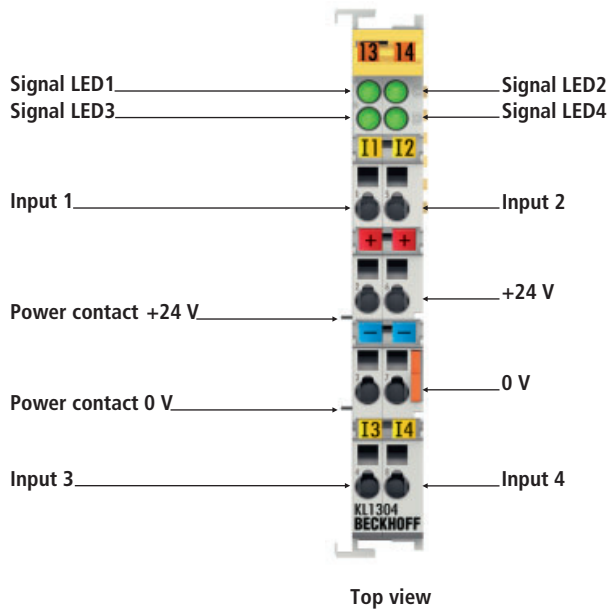
Special terminals	
KL1232-xxxx	for special terminals see page



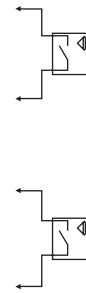
## KL1302, KL1312 | 2-channel digital input terminals 24 V DC for type 2 sensors

The KL1302 and KL1312 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation unit. The KL1302 and KL1312 versions have input filters of different speeds. The Bus Terminals contain two channels that indicate their signal state by means of light emitting diodes. The input signal corresponds to the standard EN 61131-2, type 2. So it is possible to connect 2-wire sensors.

Technical data	KL1302   KS1302	KL1312   KS1312
Number of inputs	2	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	-3...+5 V (EN 61131-2, type 2)	
"1" signal voltage	11...30 V (EN 61131-2, type 2)	
Input filter	3.0 ms	0.2 ms
Input current	typ. 6 mA (EN 61131-2, type 2)	
Current consumption K-bus	typ. 3 mA	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Bit width in the process image	2 inputs	
Configuration	no address or configuration setting	
Weight	approx. 50 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL1302	



Contact assembly



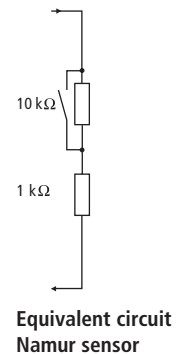
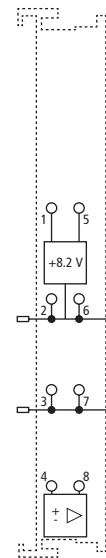
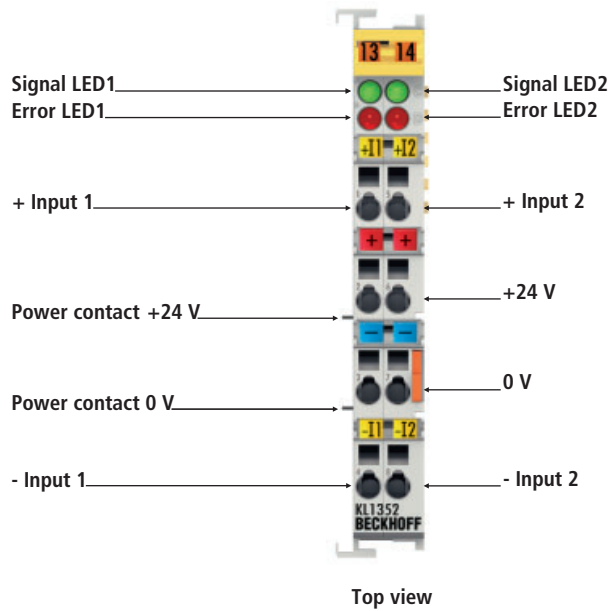
2-wire

Connection

## KL1304, KL1314 | 4-channel digital input terminals 24 V DC for type 2 sensors

The KL1304 and KL1314 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation unit. The KL1304 and KL1314 versions have input filters of different speeds. The Bus Terminals contain four channels that indicate their signal state by means of light emitting diodes. The KL1304 and KL1314 are particularly useful for space-saving use in control cabinets. The input signal corresponds to the standard EN 61131-2, type 2. So it is possible to connect 2-wire sensors.

Technical data	KL1304   KS1304	KL1314   KS1314
Number of inputs	4	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	-3...+5 V (EN 61131-2, type 2)	
"1" signal voltage	11...30 V (EN 61131-2, type 2)	
Input filter	3.0 ms	0.2 ms
Input current	typ. 6 mA (EN 61131-2, type 2)	
Current consumption K-bus	typ. 3 mA	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Bit width in the process image	4 inputs	
Configuration	no address or configuration setting	
Weight	approx. 50 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL1304	

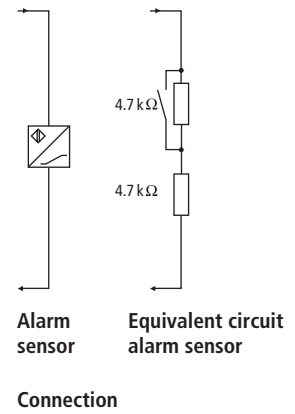
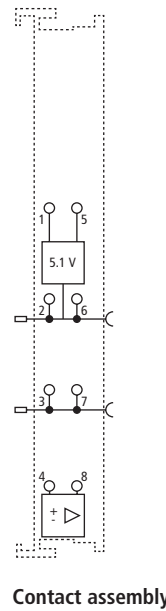
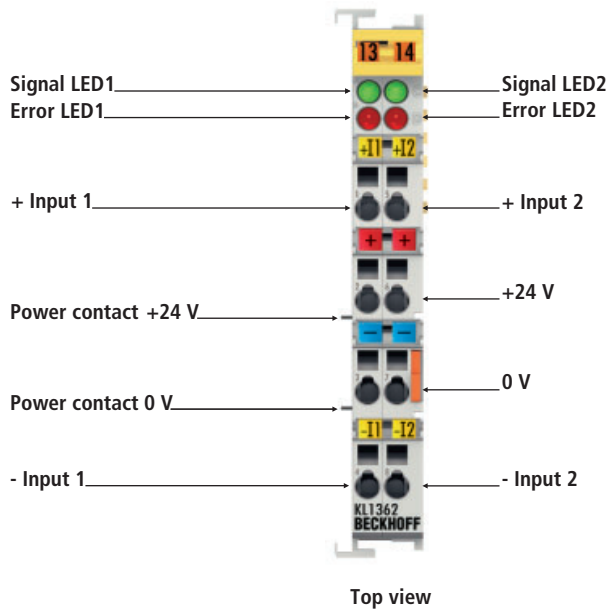


## KL1352 | 2-channel digital input terminal 24 V DC for Namur sensors

The digital input terminal KL1352 analyses the input signal from Namur sensors in accordance with EN 50277 (previously DIN 19234). One bit indicates the sensor's signal state in the process image. Another bit signals short-circuits or open leads. Red or green LEDs indicate the state of the two input bits.

Technical data	KL1352   KS1352
Number of inputs	2
Nominal voltage	24 V (-15 %/+20 %)
"0" signal current	≤ 1.2 mA
"1" signal current	≥ 2.1 mA
Switching hysteresis	0.2 mA
Short circuit current	< 8.2 mA
Short circuit detection	> 6.5 mA
Input filter	3.0 ms
Current consumption K-bus	typ. 5 mA
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Bit width in the process image	4 inputs
Configuration	no address or configuration setting
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL1352">www.beckhoff.com/KL1352</a>

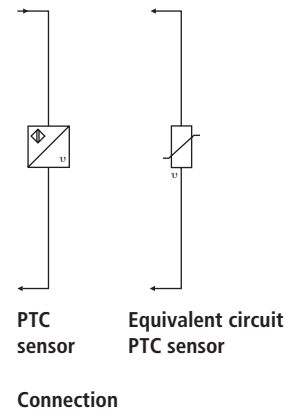
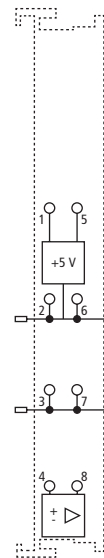
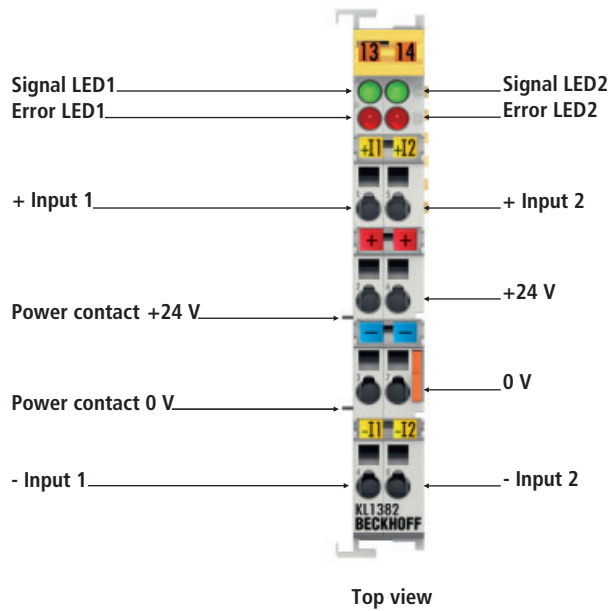




## KL1362 | 2-channel digital input terminal for break-in alarm

The digital KL1362 input terminal analyses the input signals of break-in sensors with the aid of a current loop. Alarm contacts with a fixed resistance ratio can be monitored safely. In the process image, the state of the sensor is indicated by one bit each. A further bit reports short-circuits or line interruptions. Red or green LEDs indicate the state of the two input bits.

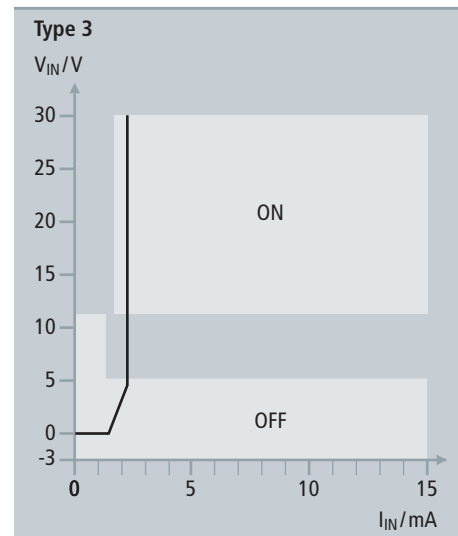
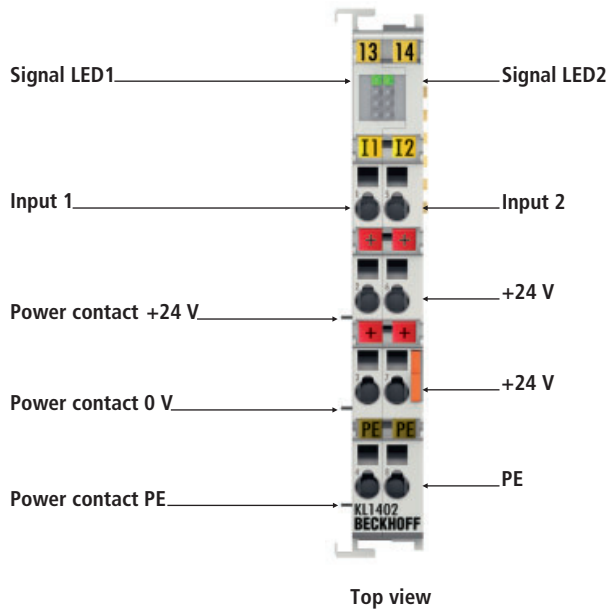
Technical data	KL1362   KS1362
Number of inputs	2
Nominal voltage	24 V (-15 %/+20 %)
"0" signal current	≤ 1 mA
"1" signal current	≥ 1 mA
Operating voltage	5.1 V
Line interruption	< 0.1 mA
Short circuit	> 3 mA
Cable resistance	≤ 200 Ω
Input filter	3.0 ms
Current consumption K-bus	typ. 5 mA
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Bit width in the process image	4 inputs
Configuration	no address or configuration setting
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL1362">www.beckhoff.com/KL1362</a>



## KL1382 | 2-channel digital input terminal thermistor

The digital KL1382 input terminal analyses the input signal of thermistor sensors with the aid of a current loop and a voltage < 5 V. The KL1382 is a monitoring device for the thermal machine protection of PTC sensors, suitable for the direct monitoring of motors, bearings and equipment. In the process image, the state of the sensor is indicated by one bit each. A further bit reports short-circuits or line interruptions. Red or green LEDs indicate the state of the two input bits.

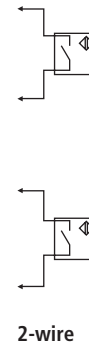
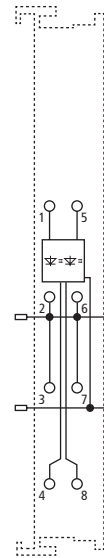
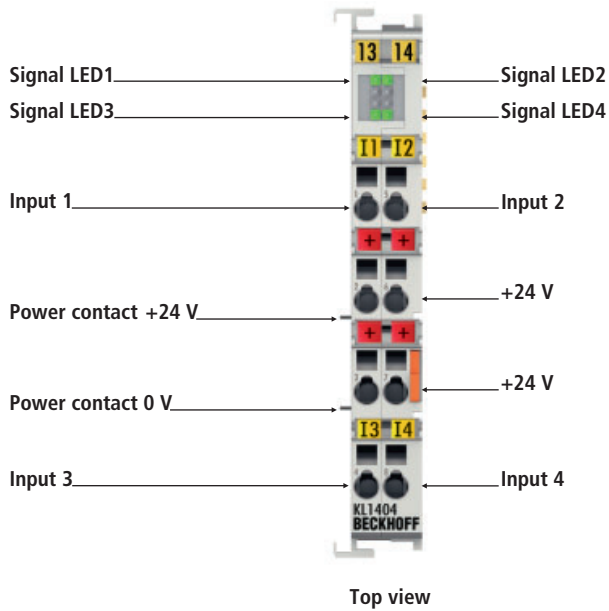
Technical data	KL1382   KS1382
Number of inputs	2
Nominal voltage	24 V (-15 %/+20 %)
Signal "0" release	≤ 1.5 kΩ
Signal "1" excess temperature	≥ 3 kΩ
Sensor voltage	≤ 5 V
Diagnostics	open-circuit monitoring > 8 kΩ, short-circuit diagnostic < 25 Ω
Input filter	30 ms
Current consumption K-bus	typ. 5 mA
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Bit width in the process image	4 inputs
Configuration	no address or configuration setting
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL1382">www.beckhoff.com/KL1382</a>



## KL1402, KL1412 | 2-channel digital input terminals 24 V DC, type 3

The KL1402 and KL1412 complement the proven KL1404, KL1414, KL1408 and KL1418 digital input terminals with their type 3 specification. The current/voltage characteristics have been optimised for 2-wire sensors. The input current in low state is increased to a minimum value of 1.5 mA and therefore supports the majority of commercially available 2-wire sensors. A typical value for the energy-saving high current is 2.2 mA. The input complies with the EN 61131-2 type 3 standard and is compatible with type 1.

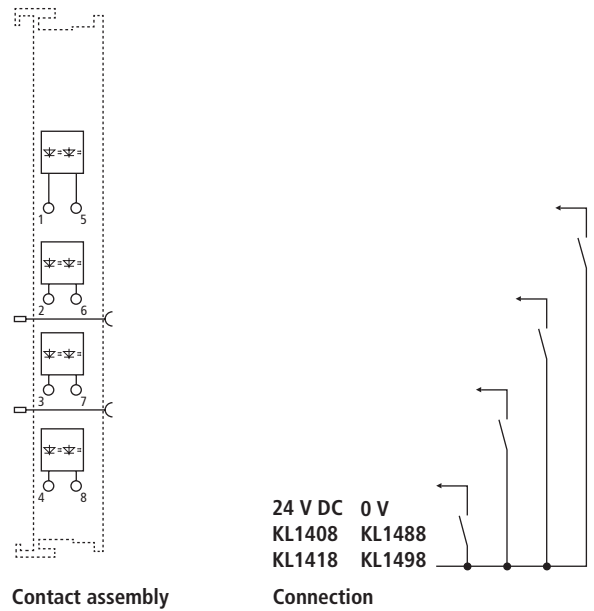
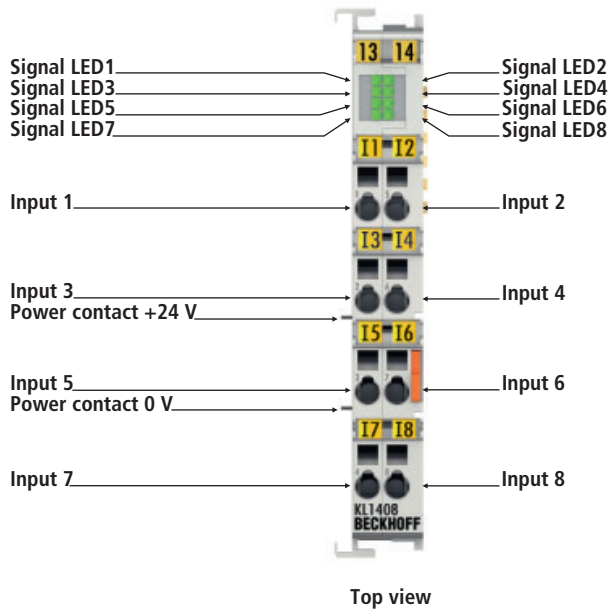
Technical data	KL1402   KS1402	KL1412   KS1412
Number of inputs	2	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	-3...+5 V (EN 61131-2, type 1/3)	
"1" signal voltage	11...30 V (EN 61131-2, type 3)	
"0" signal current	0...1.5 mA	
"1" signal current	2.0...2.5 mA	
Input filter	3 ms	0.2 ms
Current consumption K-bus	typ. 3 mA	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Bit width in the process image	2 inputs	
Configuration	no address or configuration setting	
Weight	approx. 50 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	<a href="http://www.beckhoff.com/KL1402">www.beckhoff.com/KL1402</a>	



## KL1404, KL1414, KL1434 | 4-channel digital input terminals 24 V DC

The KL1404, KL1414 and KL1434 digital input terminals acquire the binary 24 V control signals and transmit them, in an electrically isolated form, to the higher-level automation unit. The Bus Terminals contain four channels that indicate their signal state by means of LEDs. The KL1404, KL1414 and KL1434 versions have different input filters. The input signal of the KL1404 and KL1414 corresponds to EN 61131-2 type 3 and is compatible with type 1. The input signal of the KL1434 corresponds to type 2. Additionally, the 4-channel Bus Terminals enable the direct connection of four 2-wire sensors. Four +24 V connection points are provided.

Technical data	KL1404   KS1404	KL1414   KS1414	KL1434   KS1434
Number of inputs	4		
Nominal voltage	24 V DC (-15 %/+20 %)		
"0" signal voltage	-3...+5 V (EN 61131-2, type 1/3)	-3...+5 V (EN 61131-2, type 1/3)	-3...+5 V (EN 61131-2, type 2)
"1" signal voltage	11...30 V (EN 61131-2, type 3)	11...30 V (EN 61131-2, type 3)	11...30 V (EN 61131-2, type 2)
"0" signal current	0...1.5 mA	0...1.5 mA	–
"1" signal current	2.0...2.5 mA	2.0...2.5 mA	typ. 6 mA (EN 61131-2, type 2)
Input filter	3.0 ms	0.2 ms	0.2 ms
Current consumption K-bus	typ. 3 mA		
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)		
Bit width in the process image	4 inputs		
Configuration	no address or configuration setting		
Weight	approx. 50 g		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all KSxxxx Bus Terminals		
Further information	www.beckhoff.com/KL1404		

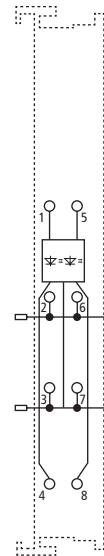
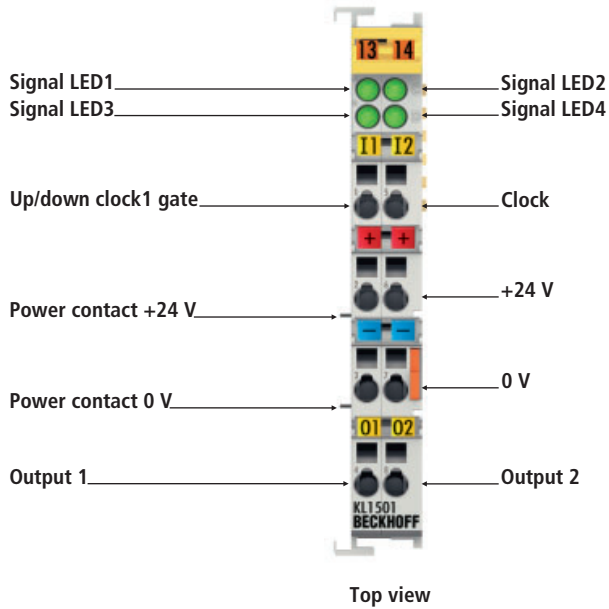


## KL1408/18/88/98 | 8-channel digital input terminals 24 V DC

The digital input terminals KL1408 and KL1418 (positive switching) and KL1488 and KL1498 (negative switching) acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation unit. The Bus Terminals contain eight channels which indicate their signal state by means of light emitting diodes. They are particularly suitable for space-saving use in control cabinets. By using the single-ended connection technique, a multi-channel sensor can be connected in the smallest space with a minimum amount of wiring. The power contacts are looped through.

For the KL1408 and KL1418 Bus Terminals, the reference ground for all inputs is the 0 V power contact. For the KL1488 and KL1498 Bus Terminals, the reference point for all inputs is the 24 V power contact. These versions have input filters with different speeds.

Technical data	KL1408   KS1408	KL1418   KS1418	KL1488   KS1488	KL1498   KS1498
Number of inputs	8			
Nominal voltage	24 V DC (-15 %/+20 %)			
"0" signal voltage	-3...+5 V (EN 61131-2, type 1/3)	-3...+5 V (EN 61131-2, type 1/3)	18...30 V	18...30 V
"1" signal voltage	11...30 V (EN 61131-2, type 3)	11...30 V (EN 61131-2, type 3)	0...7 V	0...7 V
"0" signal current	0...1.5 mA	0...1.5 mA	–	–
"1" signal current	2.0...2.5 mA	2.0...2.5 mA	typ. 3 mA	typ. 3 mA
Input filter	3.0 ms	0.2 ms	3.0 ms	0.2 ms
Current consumption K-bus	typ. 5 mA			
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)			
Bit width in the process image	8 inputs			
Configuration	no address or configuration setting			
Weight	approx. 55 g			
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 20/variable			
Pluggable wiring	for all KSxxxx Bus Terminals			
Further information	www.beckhoff.com/KL1408			



Contact assembly



No output connection



With output connection

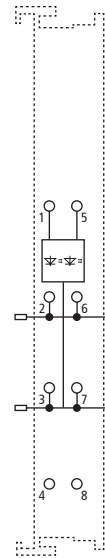
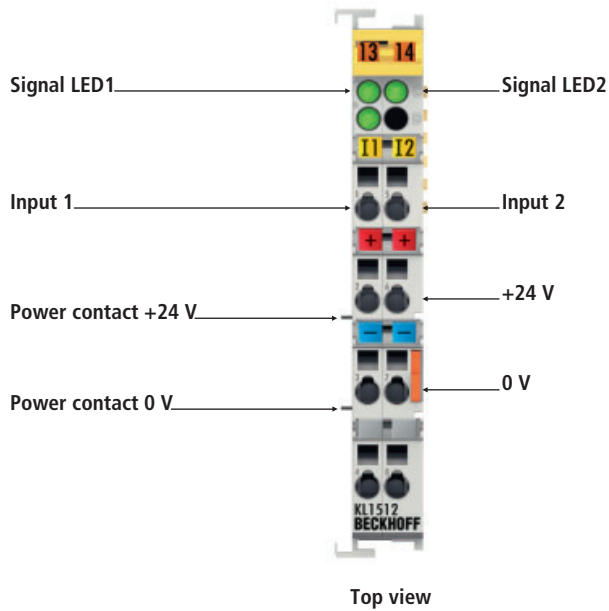
Connection

## KL1501 | Up/down counter 24 V DC, 100 kHz

The up/down counter counts binary pulses, and transmits the counter state, in an electrically isolated form, to the higher-order automation device. Using the up/down input, the (32 bit) counting direction of the KL1501 Bus Terminal can be changed. The gate connection can be used to control the triggering. Using the clock1 input, it is possible to implement two (16 bit) counters. The Bus Terminal contains two inputs that indicate their signal state by means of light emitting diodes. Both outputs are switched conform to the counter state, so that they can be used as fast control signals for field devices.

Technical data	KL1501   KS1501
Number of counters	1 or 2
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V
"1" signal voltage	15...30 V
Counting frequency	100 kHz (2 kHz for switching between up and down)
Counter depth	32 bits
Input current	typ. 5 mA
Max. output current	0.5 A typ. (short-circuit-proof) per channel
Current consumption K-bus	typ. 50 mA
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Bit width in the process image	40 inputs/outputs: 32 bit data, 8 bit control/status
Configuration	no address setting, configuration via Bus Coupler or controller
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL1501">www.beckhoff.com/KL1501</a>

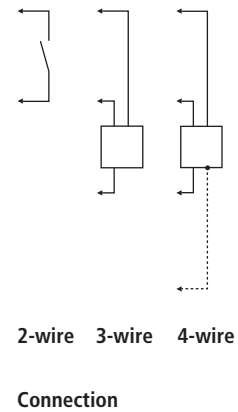
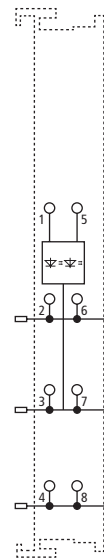
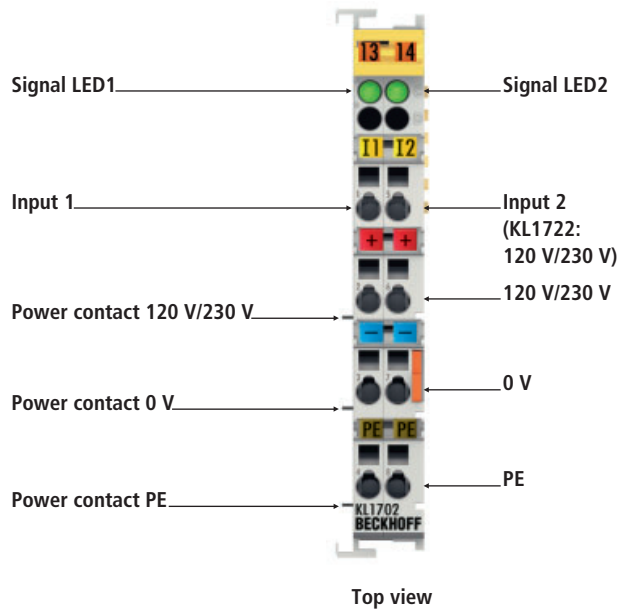
Special terminals	
KL1501-0010	gate-counter with auto-reset and setting A0
KL1501-0011	up/down counter with 5 V inputs



## KL1512 | 2-channel up/down counter, 24 V DC, 1 kHz, 16 bit

The up/down counter counts binary pulses, and transmits the counter state, in an electrically isolated form, to the higher-level automation device. Optionally the KL1512 Bus Terminal can be set up as an up or down counter (16 bit). The Bus Terminal contains two inputs that indicate their signal state by means of light emitting diodes. The KL1512 is particularly suitable for simple counting tasks, e.g. in connection with flow meters.

Technical data	KL1512   KS1512
Number of inputs	2
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V
"1" signal voltage	15...30 V
Counting frequency	max. 1 kHz
Counter depth	16 bits
Input filter	0.2 ms
Input current	typ. 5 mA
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Bit width in the process image	input/output: 16 bit data, 8 bit control/status
Configuration	via the Bus Coupler or the controller
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL1512">www.beckhoff.com/KL1512</a>



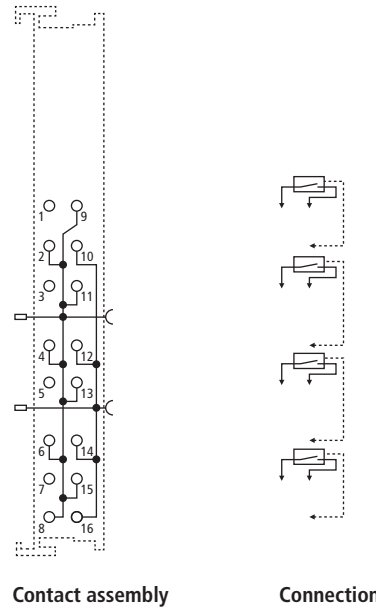
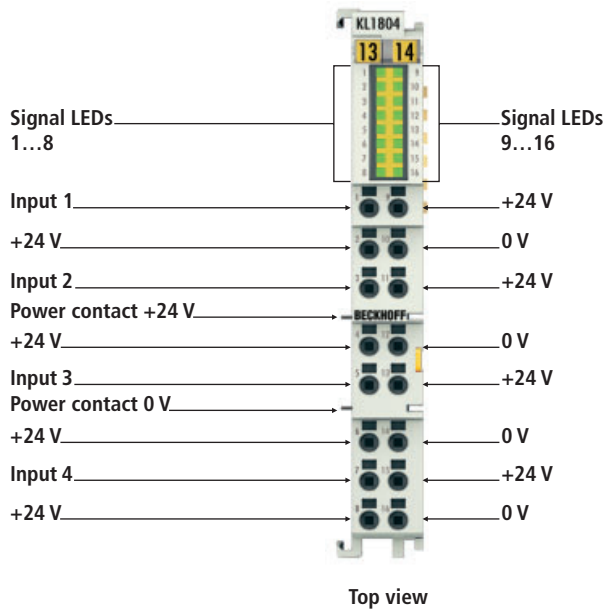
## KL1702, KL1712, KL1722 | 2-channel digital input terminals 120...230 V AC

The KL1702, KL1712, KL1712-0060 and KL1722 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation unit. It is possible to connect 60 V DC or 120 V/230 V AC actuators directly. The Bus Terminals contain two channels that indicate their signal state by means of light emitting diodes. The KL1722 version does not have any power contacts. This makes it possible to create individual potential groups. The voltage between input 1 and input 2 must not exceed the max. nominal voltage of 230 V AC.

Technical data	KL1702   KS1702	KL1712   KS1712	KL1712-0060   KS1712-0060	KL1722   KS1722
Number of inputs	2	2	2	2 (no power contacts)
Nominal voltage	120 V AC/230 V AC	120 V AC/DC	60 V DC	120 V AC/230 V AC
"0" signal voltage	0...40 V	0...40 V	0...20 V	0...40 V
"1" signal voltage	79...260 V	80...140 V	40...70 V	79...260 V
Input current	> 3 mA, typ. 6 mA			
Current consumption K-bus	typ. 3 mA			
Switching times	10 ms			
Electrical isolation	500 V <sub>rms</sub> (K-bus/mains voltage); 3,750 V AC, 1 min.			
Bit width in the process image	2 inputs			
Configuration	no address or configuration setting			
Weight	approx. 60 g			
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 20/variable			
Pluggable wiring	for all KSxxxx Bus Terminals			
Further information	www.beckhoff.com/KL1702			

Special terminals	
KL1702-0010	230 V AC input circuit with type 2 characteristics
KL1712-0010	24 V AC/DC input circuit





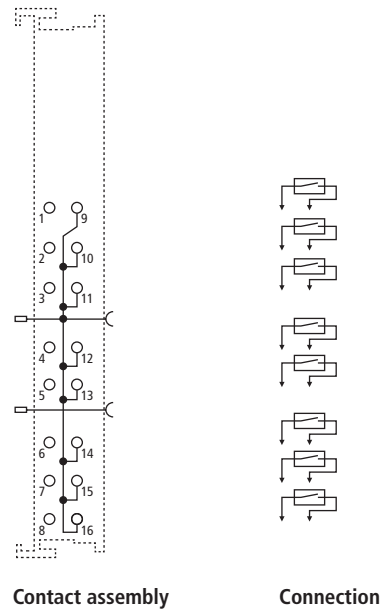
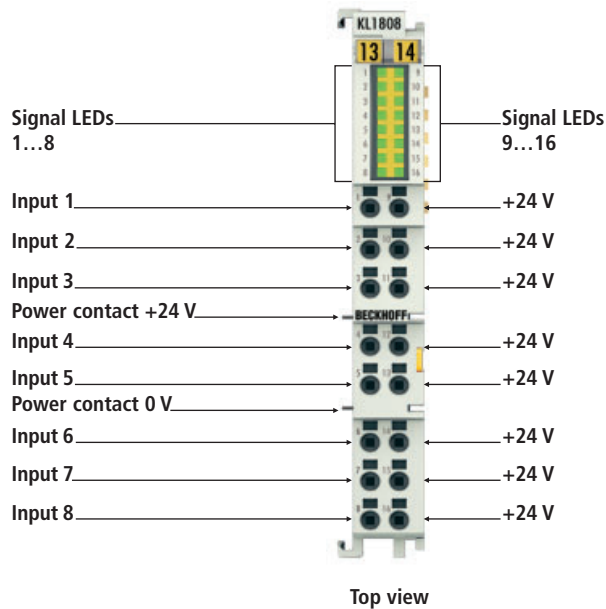
## KL1804, KL1814 | 4-channel digital input terminals 24 V DC, 3-wire connection

The KL1804 and KL1814 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation device. The Bus Terminals each contain four channels, consisting of a signal input, 24 V DC and 0 V. The signal states are displayed by LEDs. The power contacts are looped through.

For the KL1804 and KL1814 Bus Terminals, the reference ground for all inputs is the 0 V power contact. The versions have input filters with different speeds. The wires can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	KL1804	KL1814
Number of inputs	4	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	-3...+5 V (EN 61131-2, type 1/3)	
"1" signal voltage	11...30 V (EN 61131-2, type 3)	
"0" signal current	0...1.5 mA	
"1" signal current	2.0...2.5 mA	
Input filter	3.0 ms	0.2 ms
Current consumption K-bus	typ. 10 mA	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Bit width in the process image	4 inputs	
Configuration	no address or configuration setting	
Conductor types	solid wire, stranded wire and ferrule	
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver	
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5 mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>	
Weight	approx. 60 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable (see documentation)	
Further information	www.beckhoff.com/KL1804	

**i** For availability status see Beckhoff website at: [www.beckhoff.com/KL1804](http://www.beckhoff.com/KL1804)

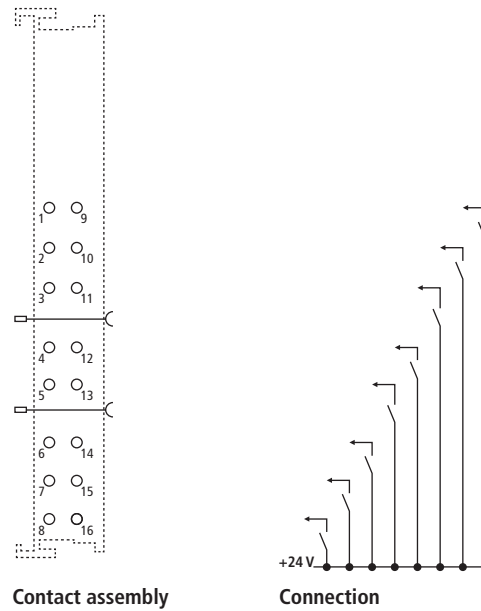
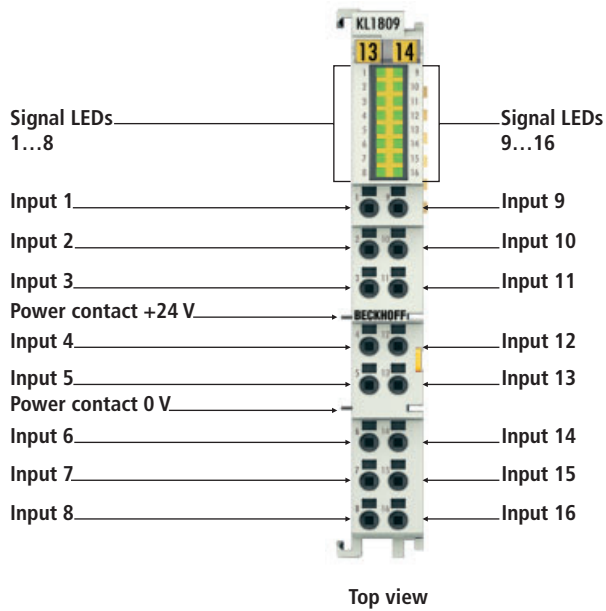


## KL1808 | 8-channel digital input terminal 24 V DC, 2-wire connection

The KL1808 digital input terminal acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation device. The Bus Terminal contains eight channels, consisting of a signal input and 24 V DC. The signal states are displayed by LEDs. The power contacts are looped through.

For the KL1808 Bus Terminal, the reference ground for all inputs is the 0 V power contact. The wires can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	KL1808
Number of inputs	8
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V (EN 61131-2, type 1/3)
"1" signal voltage	11...30 V (EN 61131-2, type 3)
"0" signal current	0...1.5 mA
"1" signal current	2.0...2.5 mA
Input filter	3.0 ms
Current consumption K-bus	typ. 15 mA
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Bit width in the process image	8 inputs
Configuration	no address or configuration setting
Conductor types	solid wire, stranded wire and ferrule
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable (see documentation)
Further information	<a href="http://www.beckhoff.com/KL1808">www.beckhoff.com/KL1808</a>



## KL1809, KL1819 | 16-channel digital input terminals 24 V DC

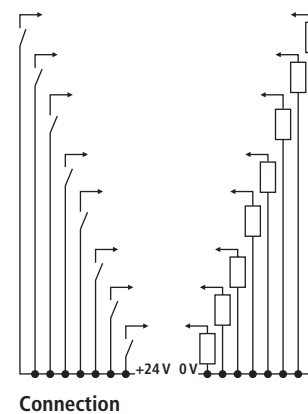
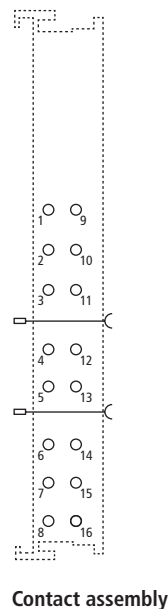
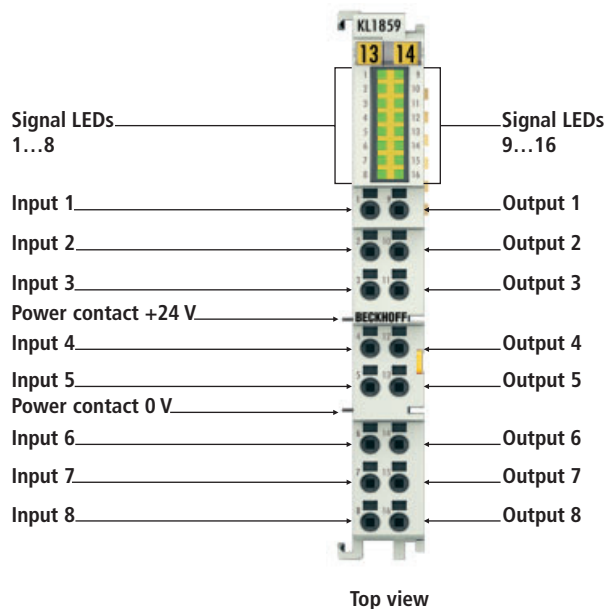
The KL1809 and KL1819 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation device. The Bus Terminals each contain 16 channels, whose signal states are displayed by LEDs. The terminals are particularly suitable for space-saving use in control cabinets. By using the single-conductor connection technique, a multi-channel sensor can be connected in the smallest space with a minimum amount of wiring. The power contacts are looped through.

For the KL1809 and KL1819 Bus Terminals, the reference ground for all inputs is the 0 V power contact. The versions have input filters with different speeds. The conductors can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	KL1809	KL1819
Number of inputs	16	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	-3...+5 V (EN 61131-2, type 1/3)	
"1" signal voltage	11...30 V (EN 61131-2, type 3)	
"0" signal current	0...1.5 mA	
"1" signal current	2.0...2.5 mA	
Input filter	3.0 ms	0.2 ms
Current consumption K-bus	typ. 20 mA	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Bit width in the process image	16 inputs	
Configuration	no address or configuration setting	
Conductor types	solid wire, stranded wire and ferrule	
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver	
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5 mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>	
Weight	approx. 60 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable (see documentation)	
Further information	www.beckhoff.com/KL1809	



For availability status of the KL1819 see Beckhoff website at: [www.beckhoff.com/KL1819](http://www.beckhoff.com/KL1819)



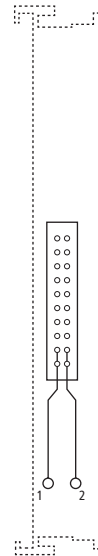
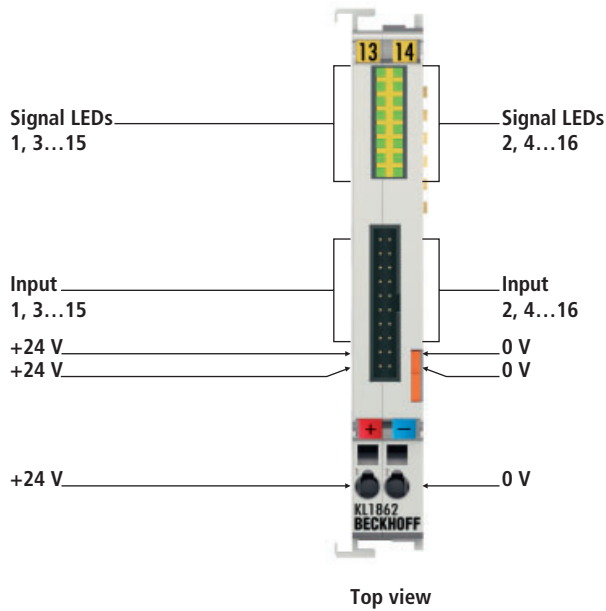
## KL1859 | 8-channel digital input + 8-channel digital output 24 V DC

The digital KL1859 Bus Terminal combines eight digital inputs and eight digital outputs in one device. The inputs have a filter of 3.0 ms. The outputs process load currents up to 0.5 A, are short-circuit-proof and protected against polarity reversal. The signal states are displayed by LEDs.

The reference ground for all inputs is the 0 V power contact, the outputs are fed via the 24 V power contact. The conductors can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	KL1859
Number of channels	8 inputs + 8 outputs
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V (EN 61131-2, type 1/3)
"1" signal voltage	11...30 V (EN 61131-2, type 3)
"0" signal current	0...1.5 mA
"1" signal current	2.0...2.5 mA
Input filter	3.0 ms
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A (per channel)
Reverse voltage protection	yes
Current consumption K-bus	typ. 25 mA
Current consumption power contacts	typ. 120 mA
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Bit width in the process image	8 inputs + 8 outputs
Configuration	no address or configuration setting
Conductor types	solid wire, stranded wire and ferrule
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Protect. class/installation pos.	IP 20/variable (see documentation)
Further information	<a href="http://www.beckhoff.com/KL1859">www.beckhoff.com/KL1859</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/KL1859](http://www.beckhoff.com/KL1859)



Top view

Contact assembly

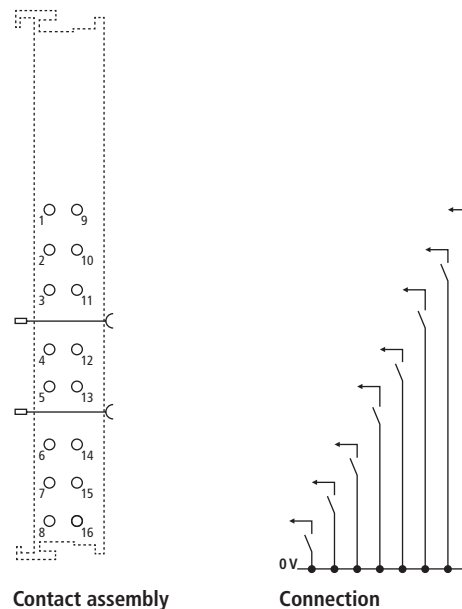
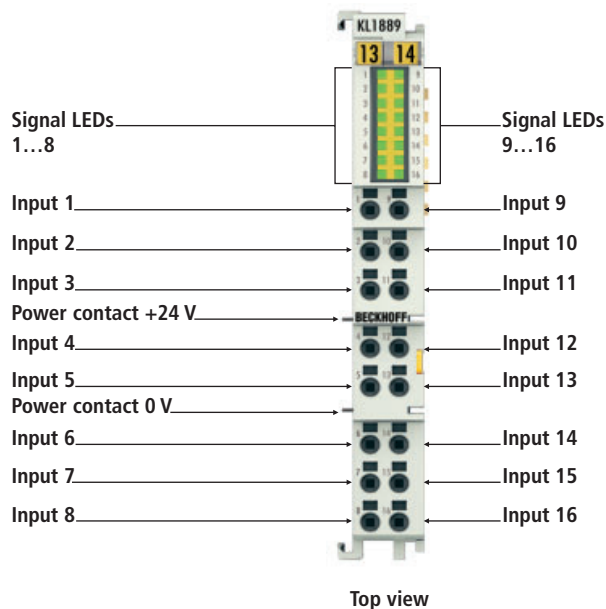
## KL1862, KL1872 | 16-channel digital input terminals 24 V DC, type 3, flat-ribbon cable connection

The KL1862 and KL1872 digital input terminals offer a very compact design with their 16 channels. A 20-pin connector enables the secure connection of plug connectors using insulation displacement contact, as is usual for ribbon cables and special round cables. This significantly simplifies the wiring of many channels. The input characteristic conforms to the type 3 specification and guarantees minimum power dissipation. 16 LEDs display the logical signal states of the inputs.

Technical data	KL1862	KL1872
Number of inputs	16	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	-3...+5 V (EN 61131-2, type 1/3)	
"1" signal voltage	11...30 V (EN 61131-2, type 3)	
"0" signal current	0...1.5 mA	
"1" signal current	2.0...2.5 mA	
Input filter	typ. 3.0 ms	typ. 0.2 ms
Current consumption K-bus	typ. 3 mA	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Bit width in the process image	16 inputs	
Configuration	no address or configuration setting	
Weight	approx. 50 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/KL1862	

### Special terminals

KL1862-0010	16-channel digital input 24 V DC, 3.0 ms, flat-ribbon cable connection, switching to ground potential
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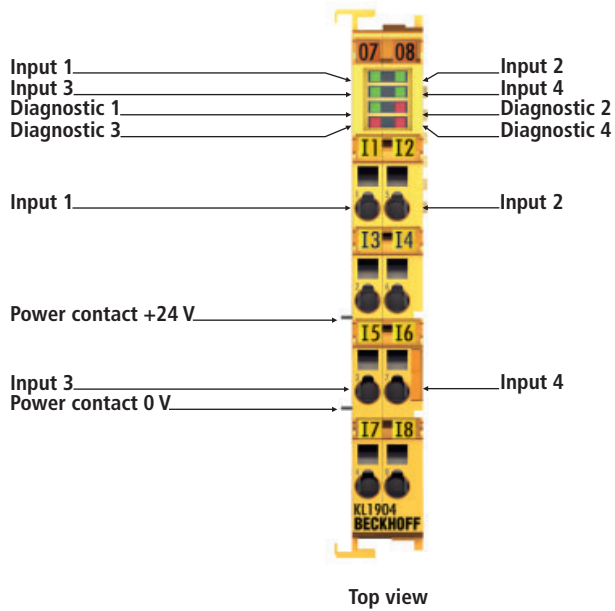
## KL1889 | 16-channel digital input terminal 24 V DC, 0 V (ground) switching

The KL1889 digital input terminal acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation device. The Bus Terminal contains 16 channels, whose signal states are displayed by LEDs. The terminal is particularly suitable for space-saving use in control cabinets. By using the single-conductor connection technique, a multi-channel sensor can be connected in the smallest space with a minimum amount of wiring. The power contacts are looped through.

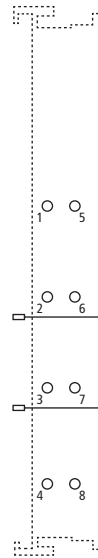
The KL1889 Bus Terminal takes the 24 V power contact as its reference for all inputs. The conductors can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	KL1889
Number of inputs	16
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	18...30 V
"1" signal voltage	0...7 V
"0" signal current	–
"1" signal current	typ. 3 mA
Input filter	3.0 ms
Current consumption K-bus	typ. 20 mA
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Bit width in the process image	16 inputs
Configuration	no address or configuration setting
Conductor types	solid wire, stranded wire and ferrule
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable (see documentation)
Further information	<a href="http://www.beckhoff.com/KL1889">www.beckhoff.com/KL1889</a>

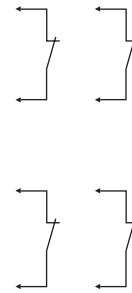
**i** For availability status see Beckhoff website at: [www.beckhoff.com/KL1889](http://www.beckhoff.com/KL1889)



Top view



Contact assembly

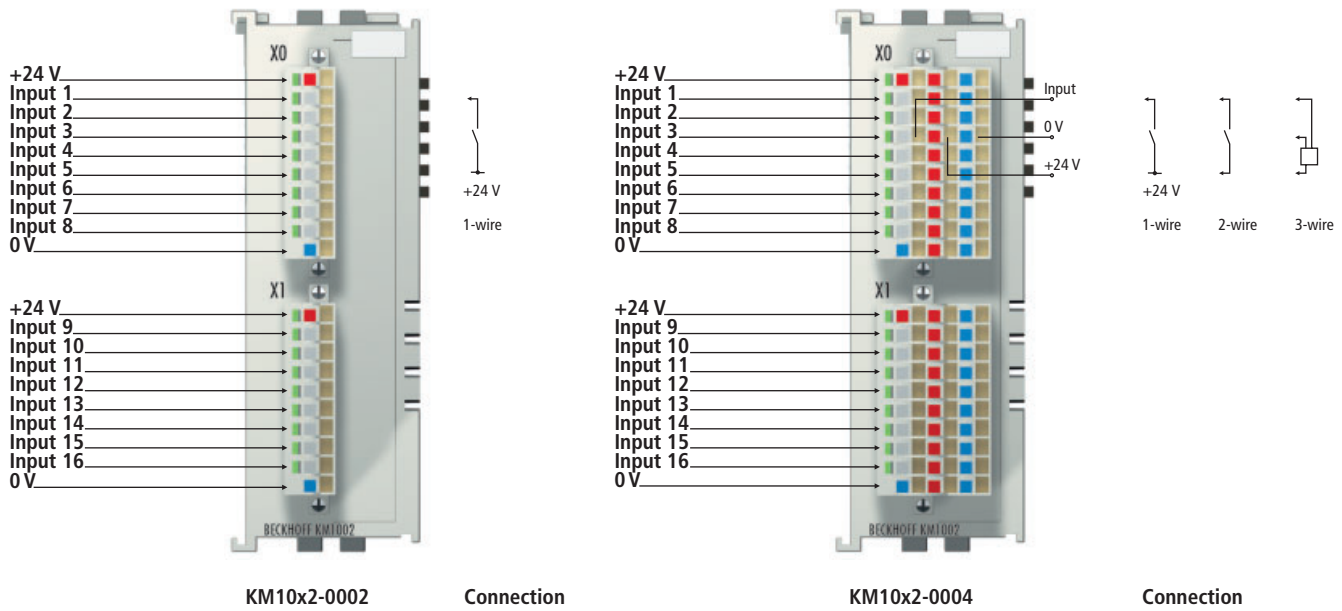


Connection

## KL1904 | 4-channel digital input terminal, TwinSAFE, 24 V DC

The KL1904 safety Bus Terminal is a digital input terminal for sensors with potential-free contacts for 24 V DC and has four fail-safe inputs. The KL1904 meets the requirements of IEC 61508 SIL 3, EN 954 Cat. 4 and DIN EN ISO 13849 PL e.

Technical data	KL1904
Number of inputs	4
Protocol	TwinSAFE
Status display	8 LEDs: 1 per input, 4 diagnostic
Response time	typ. 4 ms (read input/write to K-bus)
Current consumption K-bus	48 mA
Fault response time	≤ watchdog time (parameterisable)
Bit width in the process image	6 byte input/6 byte output
Supply voltage	24 V DC (-15 %/+20 %)
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+70 °C
Permiss. degree of contamin.	2
Climate class EN60721-3-3	3K3
Electrical interference	EN 61000-6-2/EN 61000-6-4
Vibration/shock resistance	EN 60068-2-6/EN 60068-2-27/29
Installation position	horizontal
Protection class	IP 20
Further information	<a href="http://www.beckhoff.com/KL1904">www.beckhoff.com/KL1904</a>



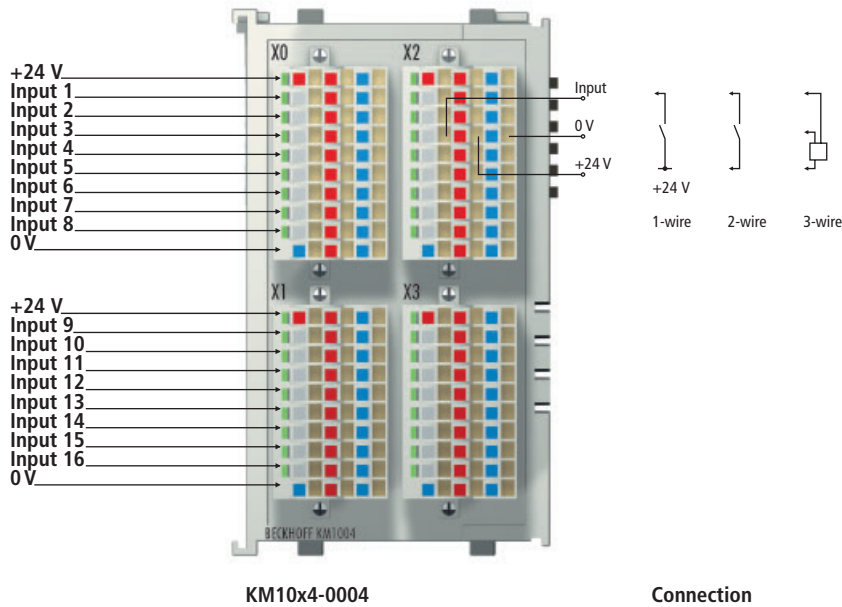
## KM1002, KM1012 | 16-channel digital input 24 V DC

The terminal modules KM1002 and KM1012 combine 16 digital inputs with eight channels per plug connector in a compact design with high packing density. The control signals are transmitted (electrically isolated) to the higher-level automation device. Like the standard Bus Terminals, the terminal modules are integrated in the I/O system. Plug connectors with spring connections enable plug-in wiring and are available with 1 or 3 pins. LEDs integrated in the connector indicate the signal state for each channel directly at the wire. The KM1002 and KM1012 versions have input filters with different speeds.

Technical data	KM1002	KM1012
Number of inputs	16 (2 x 8)	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	-3...+5 V	
"1" signal voltage	15...30 V	
Input filter	3.0 ms	0.2 ms
Input current	typ. 5 mA	
Current consumption K-bus	typ. 3 mA	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Bit width in the process image	16 inputs	
Configuration	no address or configuration setting	
Dimensions (W x H x D)	26.5 mm x 100 mm x 71 mm	
Weight	approx. 90 g with 1-pin connector, approx. 110 g with 3-pin connector	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/KM1002	

Ordering information	KM1002-000x	KM1012-000x
KM10x2-0000	16-channel DI (3.0 ms), without connector	16-channel DI (0.2 ms), without connector
KM10x2-0001	16-channel DI (3.0 ms), 1-pin connector (no status LED)	16-channel DI (0.2 ms), 1-pin connector (no status LED)
KM10x2-0002	16-channel DI (3.0 ms), 1-pin connector (with status LED)	16-channel DI (0.2 ms), 1-pin connector (with status LED)
KM10x2-0004	16-channel DI (3.0 ms), 3-pin connector (with status LED)	16-channel DI (0.2 ms), 3-pin connector (with status LED)





KM10x4-0004

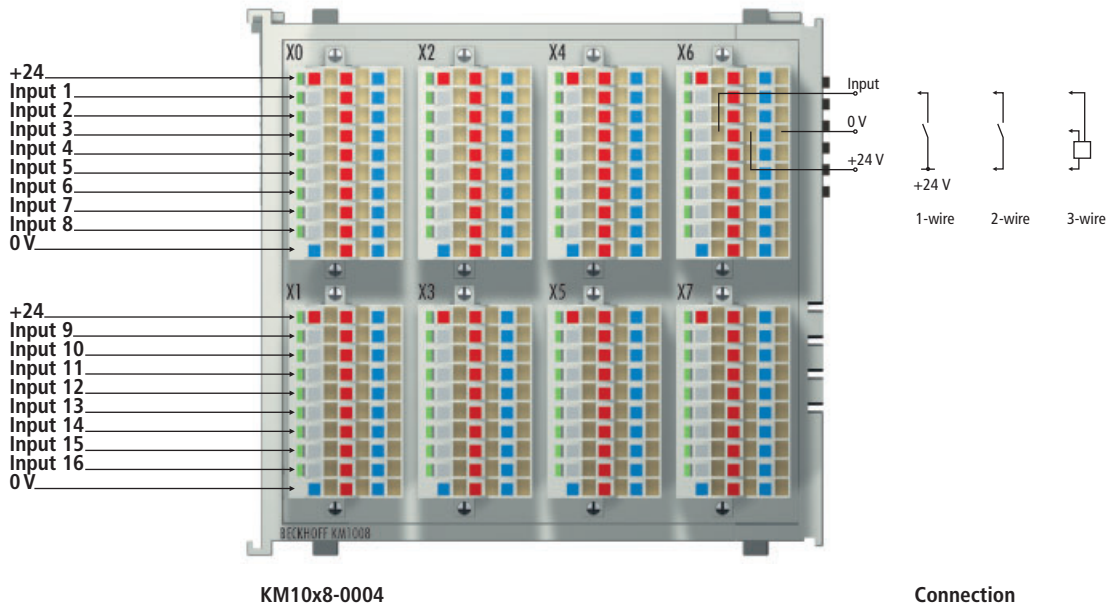
Connection

## KM1004, KM1014 | 32-channel digital input 24 V DC

The terminal modules KM1004 and KM1014 combine 32 digital inputs with eight channels per plug connector in a compact design with high packing density. The control signals are transmitted (electrically isolated) to the higher-level automation device. Like the standard Bus Terminals, the terminal modules are integrated in the I/O system. Plug connectors with spring connections enable plug-in wiring and are available with 1 or 3 pins. LEDs integrated in the connector indicate the signal state for each channel directly at the wire. The KM1004 and KM1014 versions have input filters with different speeds.

Technical data	KM1004	KM1014
Number of inputs	32 (4 x 8)	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	-3...+5 V	
"1" signal voltage	15...30 V	
Input filter	3.0 ms	0.2 ms
Input current	typ. 5 mA	
Current consumption K-bus	typ. 3 mA	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Bit width in the process image	32 inputs	
Configuration	no address or configuration setting	
Dimensions (W x H x D)	75 mm x 100 mm x 55 mm	
Weight	approx. 90 g with 1-pin connector, approx. 110 g with 3-pin connector	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/KM1004	

Ordering information	KM1004-000x	KM1014-000x
KM10x4-0000	32-channel DI (3.0 ms), without connector	32-channel DI (0.2 ms), without connector
KM10x4-0001	32-channel DI (3.0 ms), 1-pin connector (no status LED)	32-channel DI (0.2 ms), 1-pin connector (no status LED)
KM10x4-0002	32-channel DI (3.0 ms), 1-pin connector (with status LED)	32-channel DI (0.2 ms), 1-pin connector (with status LED)
KM10x4-0004	32-channel DI (3.0 ms), 3-pin connector (with status LED)	32-channel DI (0.2 ms), 3-pin connector (with status LED)

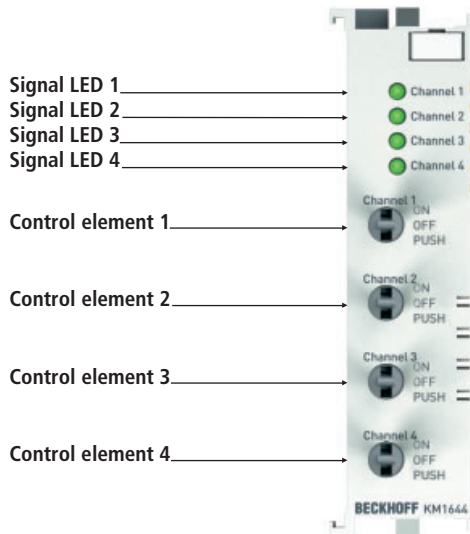


## KM1008, KM1018 | 64-channel digital input 24 V DC

The terminal modules KM1008 and KM1018 combine 64 digital inputs with eight channels per plug connector in a compact design with high packing density. The control signals are transmitted (electrically isolated) to the higher-level automation device. Like the standard Bus Terminals, the terminal modules are integrated in the I/O system. Plug connectors with spring connections enable plug-in wiring and are available with 1 or 3 pins. LEDs integrated in the connector indicate the signal state for each channel directly at the wire. The KM1008 and KM1018 versions have input filters with different speeds.

Technical data	KM1008	KM1018
Number of inputs	64 (8 x 8)	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	-3...+5 V	
"1" signal voltage	15...30 V	
Input filter	3.0 ms	0.2 ms
Input current	typ. 5 mA	
Current consumption K-bus	typ. 3 mA	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Bit width in the process image	64 inputs	
Configuration	no address or configuration setting	
Dimensions (W x H x D)	123 mm x 100 mm x 55 mm	
Weight	approx. 310 g with 1-pin connector, approx. 390 g with 3-pin connector	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/KM1008	

Ordering information	KM1008-000x	KM1018-000x
KM10x8-0000	64-channel DI (3.0 ms), without connector	64-channel DI (0.2 ms), without connector
KM10x8-0001	64-channel DI (3.0 ms), 1-pin connector (no status LED)	64-channel DI (0.2 ms), 1-pin connector (no status LED)
KM10x8-0002	64-channel DI (3.0 ms), 1-pin connector (with status LED)	64-channel DI (0.2 ms), 1-pin connector (with status LED)
KM10x8-0004	64-channel DI (3.0 ms), 3-pin connector (with status LED)	64-channel DI (0.2 ms), 3-pin connector (with status LED)

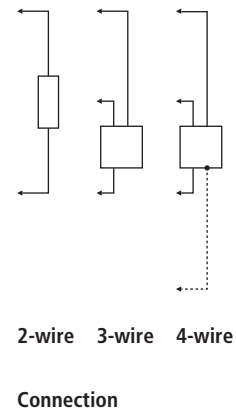
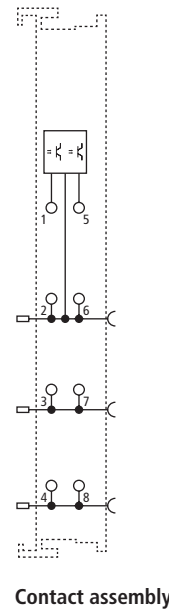
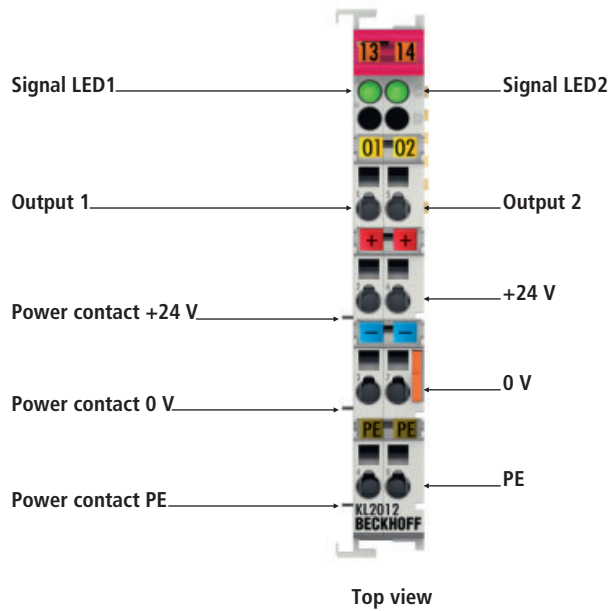


Top view

## KM1644 | 4-channel manual operation

The digital KM1644 input terminal is used for manual input directly in the process data. The four switches supply their status to the control system as digital bit information. The four LEDs indicate the four output bits from the process data and cannot be activated directly via the switches.

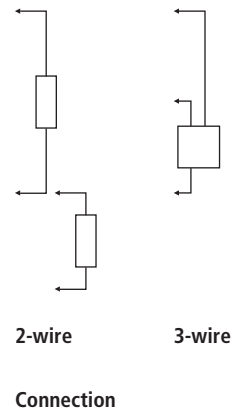
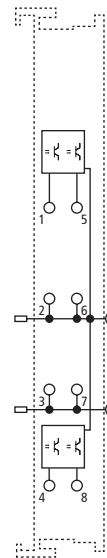
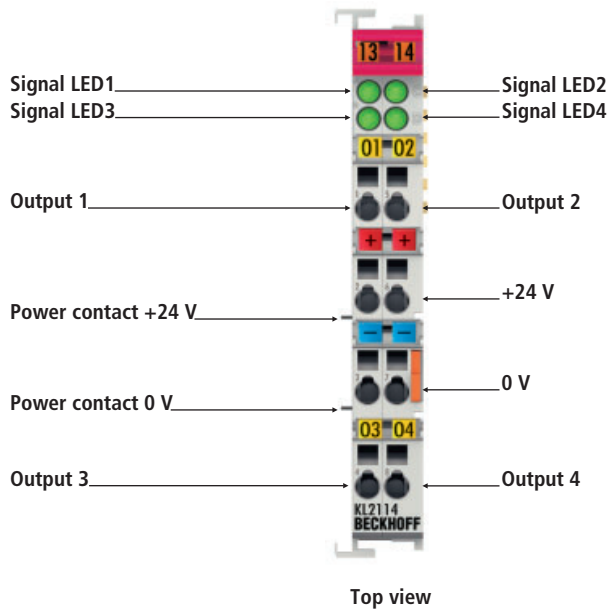
Technical data	KM1644
Number of channels	4
Number of inputs	4
Number of outputs	4
Bit width in the process image	4 inputs + 4 outputs
Weight	approx. 65 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KM1644">www.beckhoff.com/KM1644</a>



## KL2012, KL2022, KL2032 | 2-channel digital output terminals 24 V DC

The KL2012, KL2022 and KL2032 digital output terminals connect the binary control signals from the automation unit on to the actuators at the process level with electrical isolation. The KL2012 and KL2022 versions handle different load currents, and their outputs are protected against overload (only KL2012) and short-circuit. The KL2032 is protected against reverse polarity connection. The Bus Terminals contain two channels that indicate their signal state by means of light emitting diodes.

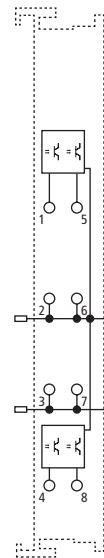
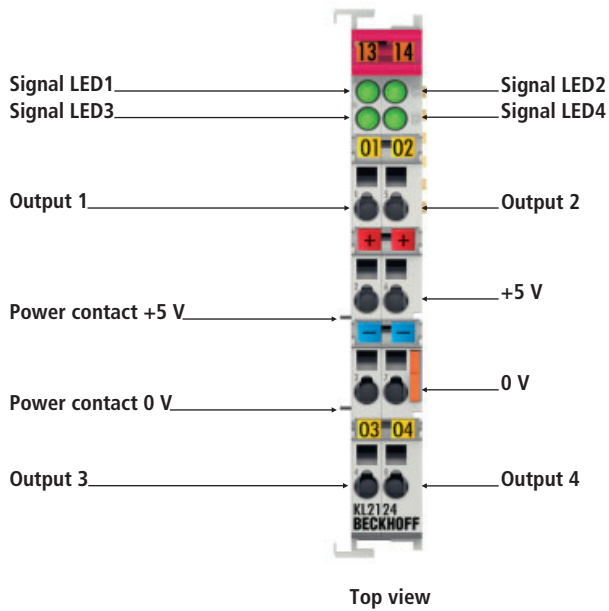
Technical data	KL2012   KS2012	KL2022   KS2022	KL2032   KS2032
Number of outputs	2		
Rated load voltage	24 V DC (-15 %/+20 %)		
Load type	ohmic, inductive, lamp load		
Max. output current	0.5 A (short-circuit-proof) per channel	2.0 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel
Short circuit current	0.6...1.0 A	22...35 A, typ. 13 A	0.7...1.7 A
Breaking energy	< 150 mJ/channel	< 1.7 J/channel	no data
Reverse voltage protection	no	no	yes
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)		
Current consumption power contacts	typ. 15 mA	typ. 20 mA	typ. 20 mA
Current consumption K-bus	typ. 5 mA		
Bit width in the process image	2 outputs		
Configuration	no address or configuration setting		
Weight	approx. 55 g		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all KSxxxx Bus Terminals		
Further information	www.beckhoff.com/KL2012		



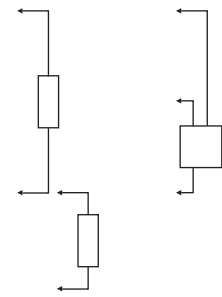
## KL2114, KL2134 | 4-channel digital output terminals 24 V DC

The KL2114 and KL2134 digital output terminals connect the binary control signals from the automation unit on to the actuators at the process level with electrical isolation. The load current output of the KL2114 version is protected against overload and short-circuit. The KL2134 is protected against reverse polarity connection. The Bus Terminals contain four channels that indicate their signal state by means of light emitting diodes.

Technical data	KL2114   KS2114	KL2134   KS2134
Number of outputs	4	
Rated load voltage	24 V DC (-15 %/+20 %)	
Load type	ohmic, inductive, lamp load	
Max. output current	0.5 A (short-circuit-proof) per channel	
Reverse voltage protection	no	yes
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Current consumption power contacts	typ. 30 mA	
Current consumption K-bus	typ. 9 mA	
Bit width in the process image	4 outputs	
Configuration	no address or configuration setting	
Weight	approx. 70 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL2114	



Contact assembly



2-wire

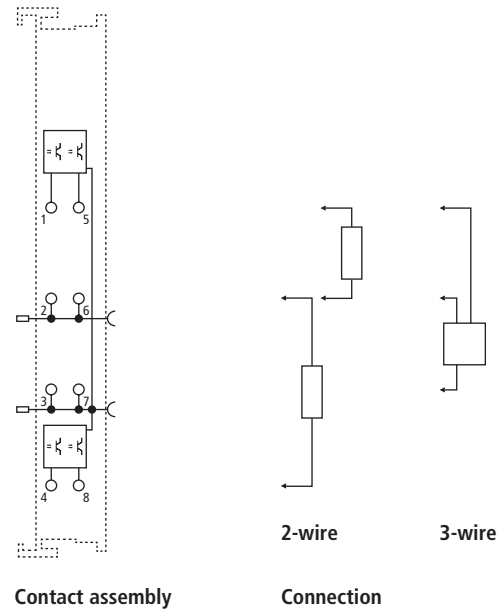
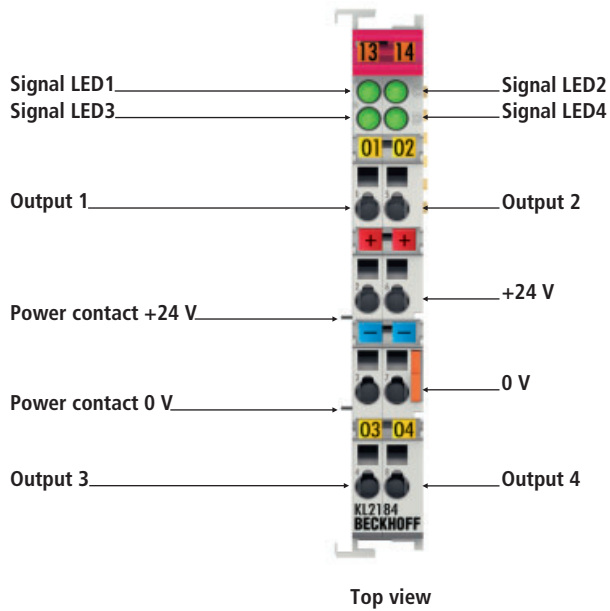
3-wire

Connection

## KL2124 | 4-channel digital output terminal 5 V DC

The KL2124 digital output terminal connects the binary control signals from the automation unit on to the actuators at the process level with electrical isolation. The load current outputs of the KL2124 version are protected against overload and short-circuit. The Bus Terminal contains four channels that indicate their signal state by means of light emitting diodes.

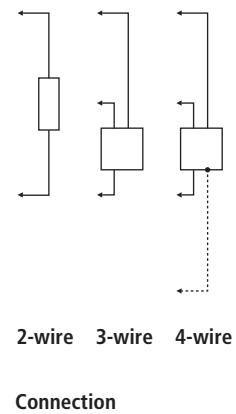
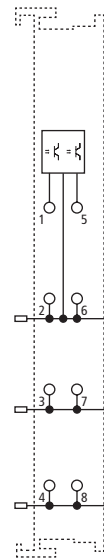
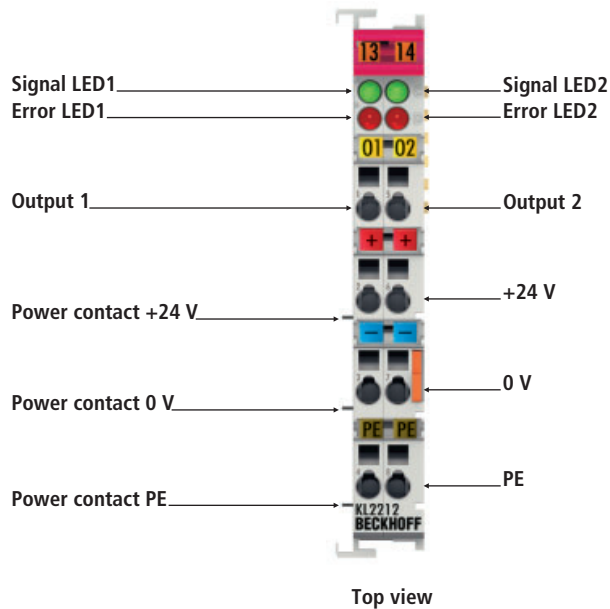
Technical data	KL2124   KS2124
Number of outputs	4
Rated load voltage	5 V DC
Load type	ohmic, inductive, lamp load
Max. output current	±20 mA (short-circuit-proof) per channel, 8 mA signal current
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption power contacts	typ. 16 mA
Current consumption K-bus	typ. 14 mA
Bit width in the process image	4 outputs
Configuration	no address or configuration setting
Weight	approx. 70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2124">www.beckhoff.com/KL2124</a>



## KL2184 | 4-channel digital output terminal 24 V DC, switching to negative potential

The KL2184 digital output terminal connects the binary control signals from the automation unit on to the actuators at the process level with electrical isolation. The KL2184 version has four 0 V (ground) switching outputs and generates load currents with outputs that are resistant to overload and short-circuit. The Bus Terminal contains four channels that indicate their signal state by means of light emitting diodes.

Technical data	KL2184   KS2184
Number of outputs	4
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A (short-circuit-proof) per channel
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption power contacts	30 mA
Current consumption K-bus	9 mA
Bit width in the process image	4 outputs
Configuration	no address or configuration setting
Weight	approx. 70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2184">www.beckhoff.com/KL2184</a>

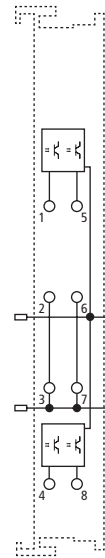
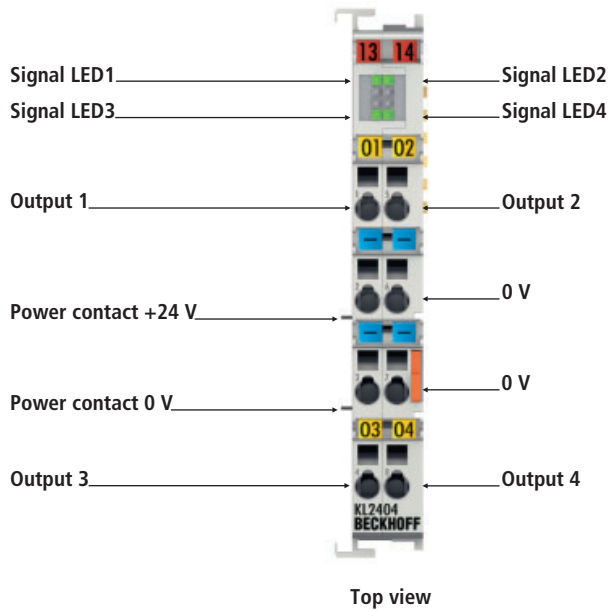


## KL2212 | 2-channel digital output terminal 24 V DC with diagnostics

The KL2212 digital output terminal connects the binary control signals from the automation unit on to the actuators at the process level with electrical isolation. The load current output of the KL2212 version is protected against overload and short-circuit. A short-circuit or an open lead is detected, and the terminal status is relayed to the controller via the K-bus. The Bus Terminals each contain two channels that indicate their signal state and errors by means of light emitting diodes.

Technical data	KL2212   KS2212	
Number of outputs	2	
Rated load voltage	24 V DC (-15 %/+20 %)	
Load type	ohmic, inductive, lamp load	
Max. output current	0.5 A (short-circuit-proof) per channel	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Current consumption power contacts	typ. 15 mA	
Current consumption K-bus	typ. 15 mA	
Bit width in the process image	4 inputs/4 outputs (2 outputs with no significance)	
Meaning of the diagnostic bits (2 bits per channel)	00 no error	10 short-circuit to GND
	01 short-circuit to VCC	11 undervoltage
Configuration	no address or configuration setting	
Weight	approx. 60 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL2212	

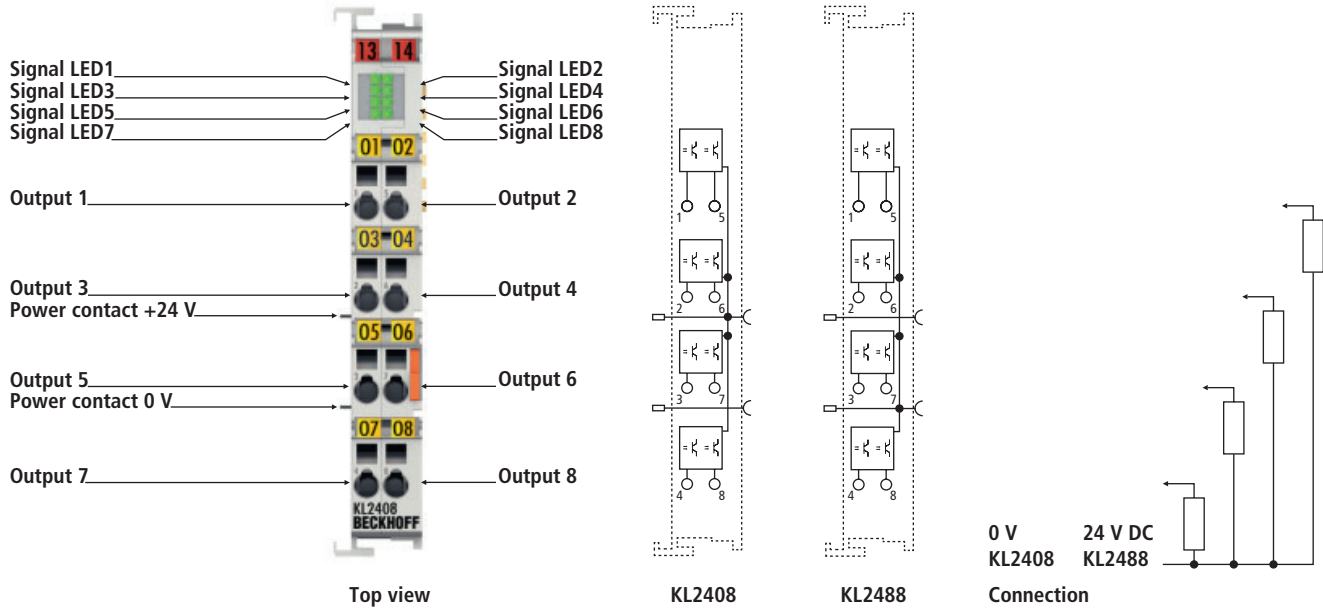




## KL2404, KL2424 | 4-channel digital output terminals 24 V DC

The KL2404 and KL2424 digital output terminals connect the binary 24 V control signals electrically isolated with the actuators. The Bus Terminals contain four channels that indicate their signal state by means of LEDs. The variants KL2404 and KL2424 have different maximum output currents. The 4-channel Bus Terminals enable the direct connection of four 2-wire sensors. Four ground connection points are provided.

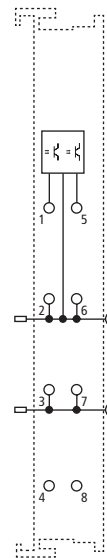
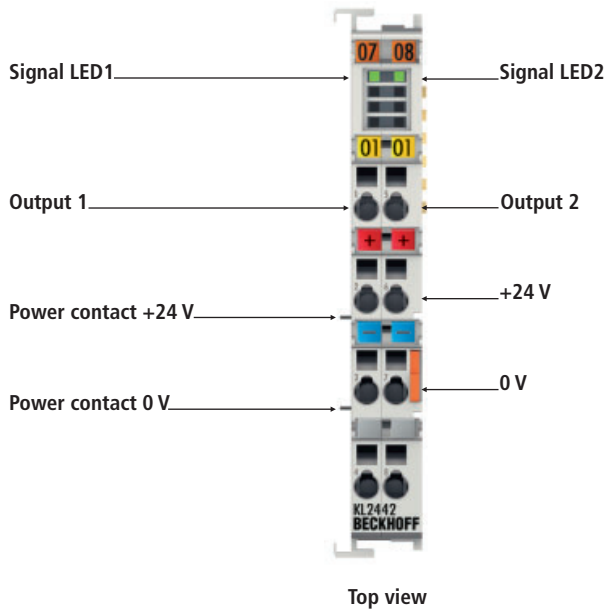
Technical data	KL2404   KS2404	KL2424   KS2424
Number of outputs	4	
Rated load voltage	24 V DC (-15 %/+20 %)	
Load type	ohmic, inductive, lamp load	
Max. output current	0.5 A (short-circuit-proof) per channel	2.0 A (short-circuit-proof) per channel
Short circuit current	0.7...1.7 A	22...35 A
Reverse voltage protection	yes	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Current consumption power contacts	typ. 30 mA	
Current consumption K-bus	typ. 9 mA	
Bit width in the process image	4 outputs	
Configuration	no address or configuration setting	
Weight	approx. 70 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL2404	



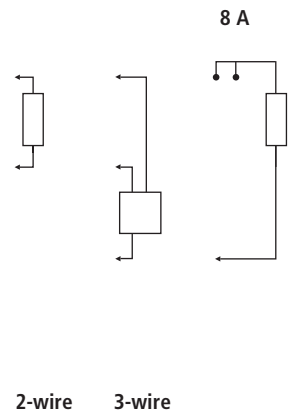
# KL2408, KL2488 | 8-channel digital output terminals 24 V DC

The KL2408 (positive switching) and KL2488 (negative switching) digital output terminals connect the binary control signals from the automation unit on to the actuators at the process level with electrical isolation. The KL2408/KL2488 variants are protected against reverse polarity connection. They handle load currents with outputs that are protected against overload and short-circuit. The Bus Terminals contain eight channels which indicate their signal state by means of light emitting diodes. They are particularly suitable for space-saving use in control cabinets. The connection technology is optimised for single-ended inputs. All components have to use the same reference point as the KL2408 or KL2488. The power contacts are looped through. In the KL2408 model, the outputs are supplied by the 24 V power contact. In the KL2488 model, they are supplied via the 0 V power contact.

Technical data	KL2408   KS2408, KL2488   KS2488
Number of outputs	8
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A (short-circuit-proof) per channel, total current 3 A
Reverse voltage protection	yes
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption power contacts	typ. 60 mA
Current consumption K-bus	typ. 18 mA
Bit width in the process image	8 outputs
Configuration	no address or configuration setting
Weight	approx. 70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	www.beckhoff.com/KL2408



Contact assembly

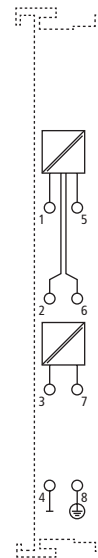
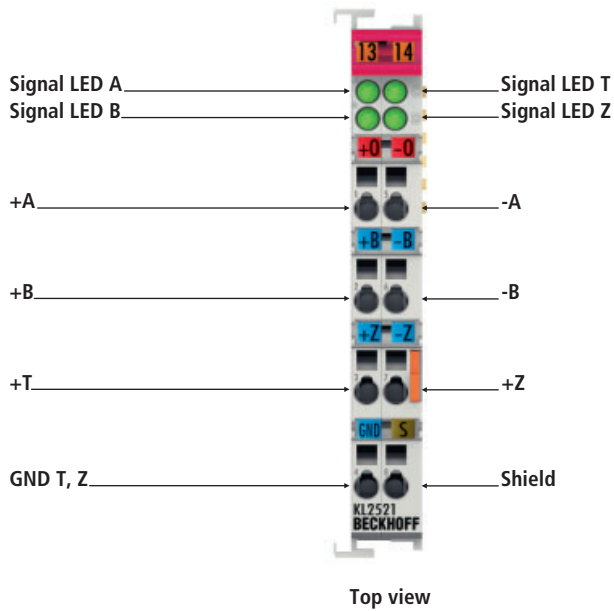


2-wire 3-wire  
Connection

## KL2442 | 2-channel digital output terminal 24 V DC, 2 x 4 A/1 x 8 A

The KL2442 digital output terminal connects the binary 24 V control signals, electrically isolated, with the actuators. Two channels are available and indicate their signal state via LEDs. The KL2442 enables connection of loads with current consumption up to 8 A if the outputs are connected in parallel.

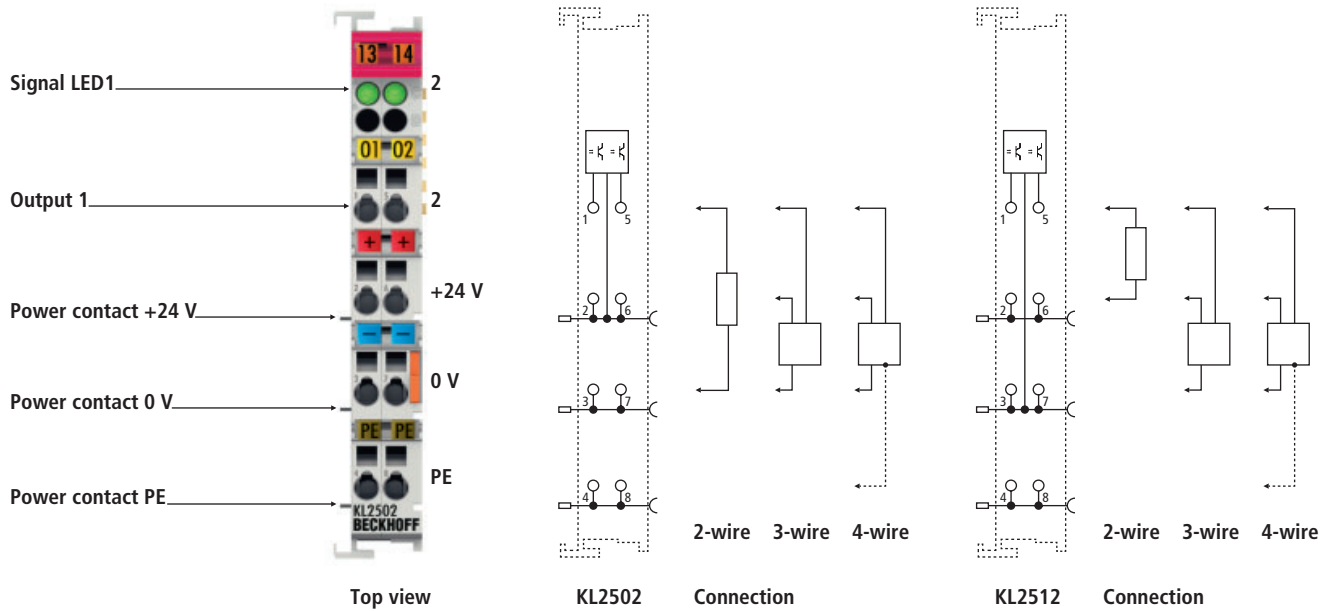
Technical data	KL2442
Number of outputs	2
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	4.0 A (short-circuit-proof) per channel, 8 A for parallel connection
Reverse voltage protection	yes
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption power contacts	typ. 30 mA
Current consumption K-bus	typ. 9 mA
Bit width in the process image	2 outputs
Configuration	no address or configuration setting
Weight	approx. 70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/KL2442



## KL2521 | 1-channel pulse train output terminal RS422/24 V DC

The KL2521 output terminal alters the frequency of a binary signal and (electrically isolated from the K-bus) outputs it. The frequency is preset by a 16 bit value from the automation unit. The output stage is RS422 compatible and, in the version KL2521-0024, can be driven with 24 V DC signals. The Bus Terminal indicates its signal state by means of light emitting diodes. The LEDs are driven in time with the outputs and each displays an active output.

Technical data	KL2521   KS2521	KL2521-0024   KS2521-0024
Number of outputs	1 channel (2 differential outputs A, B)	
Number of inputs	2 (+T, +Z)	
Signal voltage	RS422 level	24 V DC (externally supplied)
Max. output current	RS422 specification	0.5 A
Base frequency	1...500 kHz, 50 kHz default	
Duty factor	50 % (±20 %)	
Resolution	max. 15 bits	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Current consumption K-bus	typ. 50 mA, max. 120 mA (load-dependent)	
Bit width in the process image	24 inputs/outputs: 1 x 16 bit data, 1 x 8 bit control/status	
Configuration	configuration via Bus Coupler or controller	
Weight	approx. 50 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL2521	
Special terminals		
KL2521-0010	with additional outputs (230 V AC/DC, 100 mA) instead of the additional inputs of the default variant	



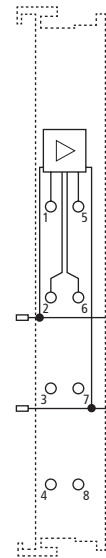
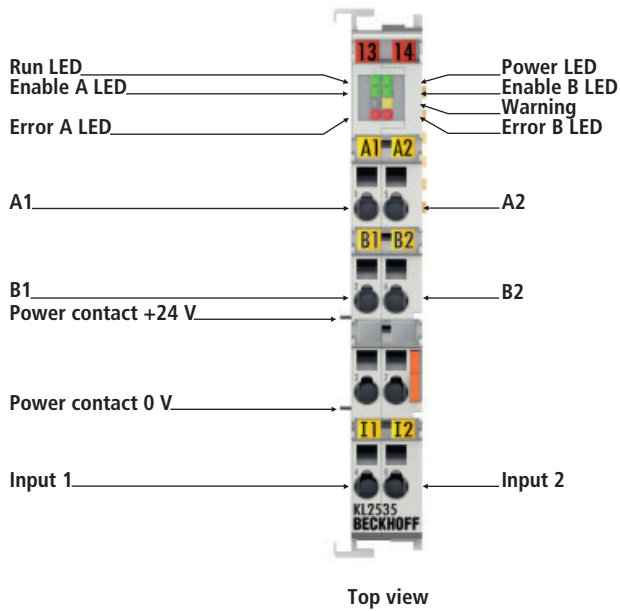
## KL2502, KL2512 | 2-channel pulse width output terminals 24 V DC

The KL2502 output terminal modulates the pulse width of a binary signal, and outputs it electrically isolated from the K-bus. The mark/space ratio is prescribed by a 16 bit value from the automation unit. The output stage is protected against overload and short-circuit. The Bus Terminal contains two channels that indicate their signal state by means of light emitting diodes. The LEDs are driven in time with the outputs and show the mark/space ratio by their brightness.

The KL2512 switches to negative potential and enables direct connection of different ohmic loads. The output signal is a pulse-width modulated voltage. The typical load of an LED group or an incandescent lamp is connected between the positive side of the supply voltage and the output of the KL2512. Via the fieldbus the output can be set independently for two channels with a resolution of more than 30,000 steps. The PWM frequency can be changed. The power transistors switch the ground connection and are galvanically isolated from the internal K-bus.

Technical data	KL2502   KS2502	KL2512   KS2512
Number of outputs	2	
Rated load voltage	24 V DC (-15 %/+20 %)	
Load type	ohmic, inductive	ohmic
Max. output current	0.1 A (short-circuit-proof, 1 A driver component) per channel	1.5 A per channel
Base frequency	1...20 kHz, 250 Hz default	
Duty factor	0...100 % (T <sub>ON</sub> > 750 ns, T <sub>OFF</sub> > 500 ns)	0...100 %
Resolution	max. 10 bits	
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)	
Current consumption power contacts	typ. 10 mA	
Current consumption K-bus	typ. 18 mA	
Bit width in the process image	48 inputs/outputs: 2 x 16 bit data, 2 x 8 bit control/status	
Configuration	no address setting, configuration via Bus Coupler or controller	
Weight	approx. 50 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL2502	

Special terminals	
KL2502-xxxx	for special terminals see page



Contact assembly

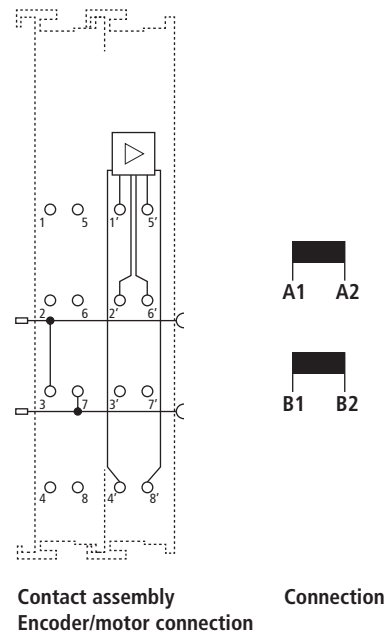
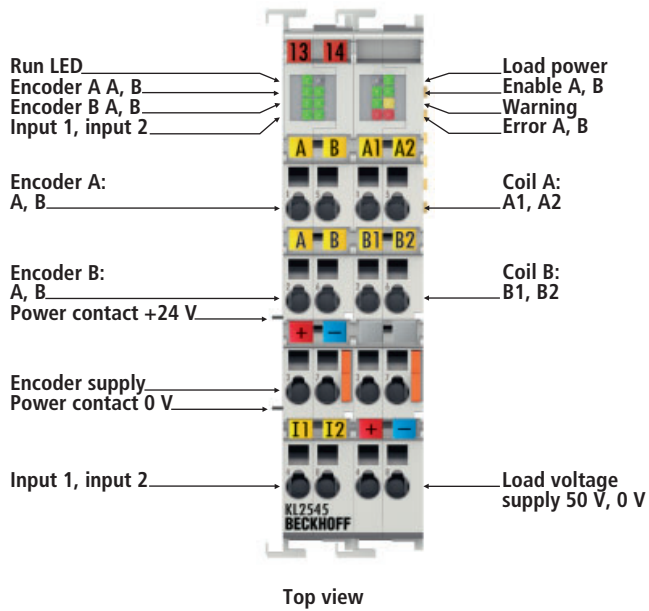


Connection

## KL2535 | 2-channel pulse width current terminal 1 A, 24 V DC

The KL2535 output terminal controls an output current via pulse width control of the supply voltage. It is galvanically isolated from the K-bus. The current value (0 to 1 A) is specified by the automation device via a 16 bit value. The output stage is protected against overload and short-circuit. The Bus Terminal contains two channels that indicate their signal state by means of light emitting diodes. The LEDs simplify local diagnosis by displaying typical load and wiring faults.

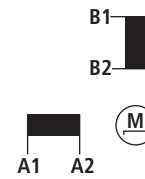
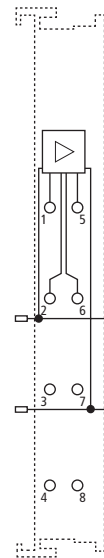
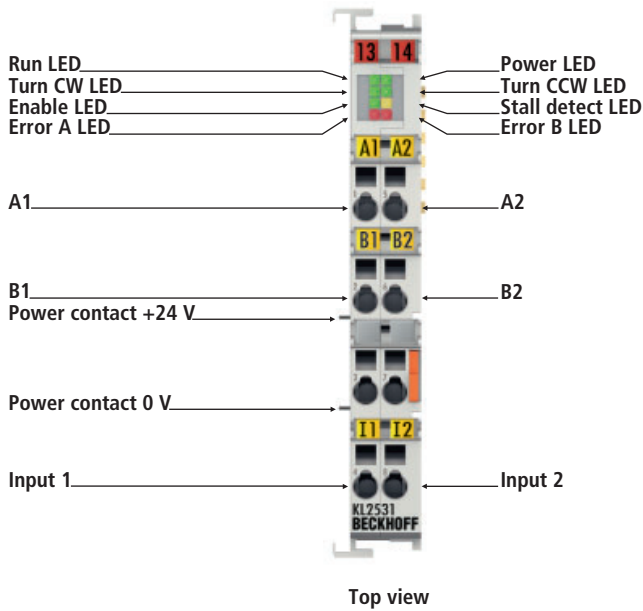
Technical data	KL2535   KS2535
Number of outputs	2
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive > 1 mH
Max. output current	2 x 1 A (short-circuit-proof, thermal overload-proof) for both channels together
PWM clock frequency	36 kHz
Duty factor	0...100 % (current-controlled)
Resolution	max. 12 bits
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption K-bus	typ. 60 mA
Bit width in the process image	48 inputs/outputs: 2 x 16 bit data, 2 x 8 bit control/status
Configuration	no address setting, configuration via Bus Coupler or controller
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2535">www.beckhoff.com/KL2535</a>



## KL2545 | 2-channel pulse width current terminal 3.5 A, 50 V DC

The KL2545 output terminal controls an output current via pulse width control of the supply voltage. It is galvanically isolated from the K-bus. The current value (0 to 3.5 A) is specified by the automation device via a 16 bit value. The output stage is protected against overload and short-circuit. The Bus Terminal contains two channels that indicate their signal state by means of light emitting diodes. The LEDs simplify local diagnosis by displaying typical load and wiring faults.

Technical data	KL2545   KS2545
Number of outputs	2
Rated load voltage	8...50 V DC
Auxiliary voltage	24 V DC via power contacts
Load type	inductive, coil, valve
Max. output current	2 x 3.5 A (short-circuit-proof, thermal overload-proof) for both channels together
PWM clock frequency	36 kHz
Duty factor	0...100 % (current-controlled)
Resolution	max. 12 bits
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption power contacts	typ. 20 mA
Current consumption K-bus	typ. 100 mA
Bit width in the process image	48 inputs/outputs: 2 x 16 bit data, 2 x 8 bit control/status
Configuration	no address setting, configuration via Bus Coupler or controller
Weight	approx. 100 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/see documentation
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	www.beckhoff.com/KL2545



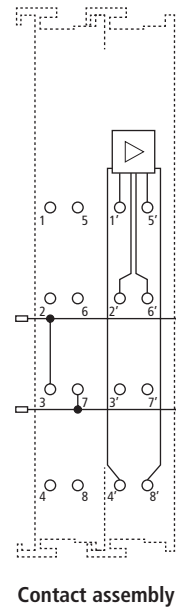
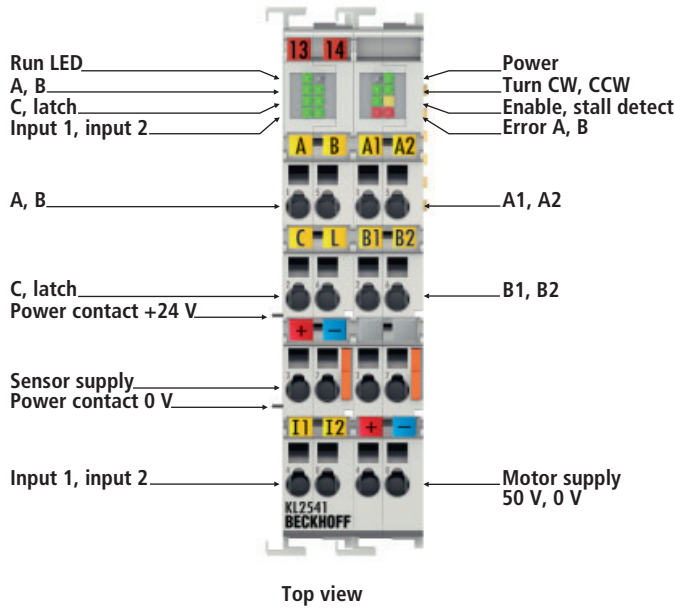
## KL2531 | Stepper motor terminal 24 V DC, 1.5 A

The KL2531 Bus Terminal is intended for the direct connection of different small stepper motors. The slimline PWM output stages for two motor coils are located in the Bus Terminal together with two inputs for limit switches. The KL2531 can be adjusted to the motor and the application by changing just a few parameters. 64-fold micro-stepping ensures particularly quiet and precise motor operation. In many applications, integrated zero-speed monitoring makes an encoder system or limit switch unnecessary.

Technical data	KL2531   KS2531
Number of outputs	1 Stepper Motor, 2 phases
Number of inputs	2
Output current	2 x 1 A, 2 x 1.5 A peak current, overload- and short-circuit-proof
Maximum step frequency	125,000 steps/s
Step pattern	full step, half step, up to 64-fold micro stepping
Current controller frequency	approx. 25 kHz
Diagnostics LED	error phase A and B, loss of step/stagnation, power, enable
Resolution	approx. 5,000 positions in typ. applications (per revolution)
Power supply	8...24 V DC (for output stage over power contacts)
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)
Current consumption K-bus	typ. 60 mA
Bit width in the process image	input: n x 2 x 16 bit data, 2 x 16 bit control/status
Weight	50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2531">www.beckhoff.com/KL2531</a>

Accessories		
AS1xxx	Stepper Motors	1126
ZK4000-6200-2xxx	motor cables for AS1000 Stepper Motors, 4 x 0.5 mm <sup>2</sup>	1131
ZK4000-5100-2xxx	encoder cables for AS1000 Stepper Motors, with shield	1131





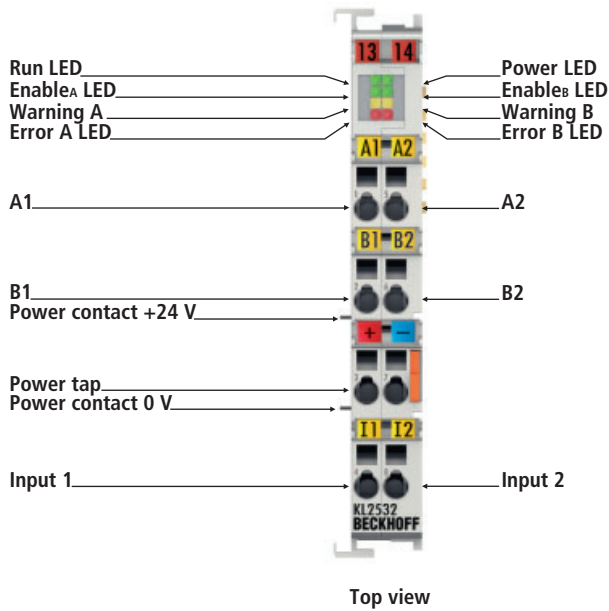
## KL2541 | Stepper motor terminal 50 V DC, 5 A, with incremental encoder

The KL2541 Bus Terminal is intended for stepper motors with medium performance range. The PWM output stages cover a wide range of voltages and currents. Together with two inputs for limit switches, they are located in the Bus Terminal. The stepper motor terminal KL2541 can be adjusted to the motor and the application by changing just a few parameters. 64-fold micro stepping ensures particularly quiet and precise motor operation. Together with a stepper motor, the KL2541 represents an inexpensive small servo axis.

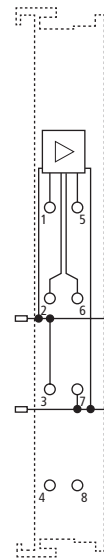
Technical data	KL2541   KS2541
Number of outputs	1 Stepper Motor, 2 phases
Number of inputs	2 limit position, 4 for an encoder system
Supply voltage	8...50 V DC
Output current	2 x 3.5 A, 2 x 5 A peak current
Maximum step frequency	125,000 steps/s
Step pattern	full step, half step, up to 64-fold micro stepping
Current controller frequency	approx. 25 kHz
Diagnostics LED	error phase A and B, loss of step/stagnation, power, enable
Resolution	approx. 5,000 positions in typ. applications (per revolution)
Power supply	via the K-bus
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)
Current consumption K-bus	typ. 100 mA
Bit width in the process image	input/output: 2 x 16 bit data + 1 x 8 bit control/status
Weight	approx. 100 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Protect. class/installation pos.	IP 20/see documentation
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2541">www.beckhoff.com/KL2541</a>

Special terminals	
KL2541-0006	stepper motor terminal 50 V DC, 5 A, 5 V encoder supply

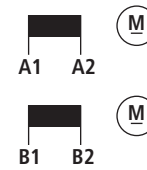
Accessories		
AS1xxx	Stepper Motors	1126
ZK4000-6200-2xxx	motor cables for AS1000 Stepper Motors, 4 x 0.5 mm <sup>2</sup>	1131
ZK4000-5100-2xxx	encoder cables for AS1000 Stepper Motors, with shield	1131



Top view



Contact assembly

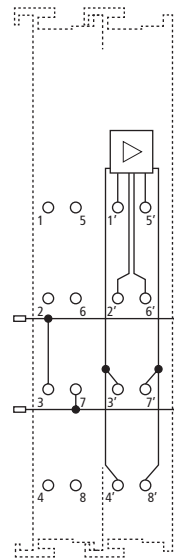
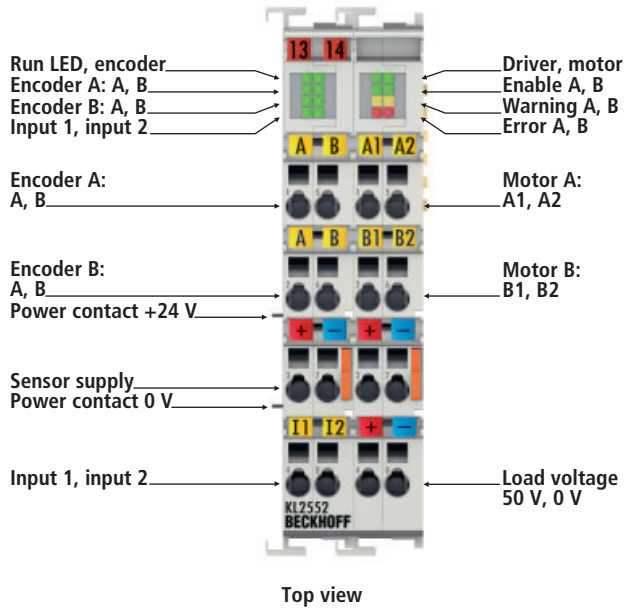


Connection

## KL2532 | 2-channel DC motor output stage 24 V DC, 1 A

The KL2532 Bus Terminal enables direct operation of two DC motors. It is galvanically isolated from the K-bus. The speed is preset by a 16 bit value from the automation unit. The output stage is protected against overload and short-circuit. The Bus Terminal contains two channels that indicate their signal state by means of light emitting diodes. The LEDs enable quick local diagnosis.

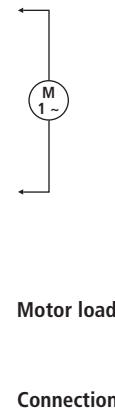
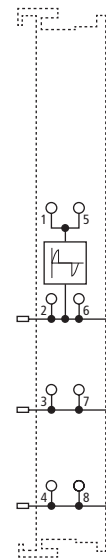
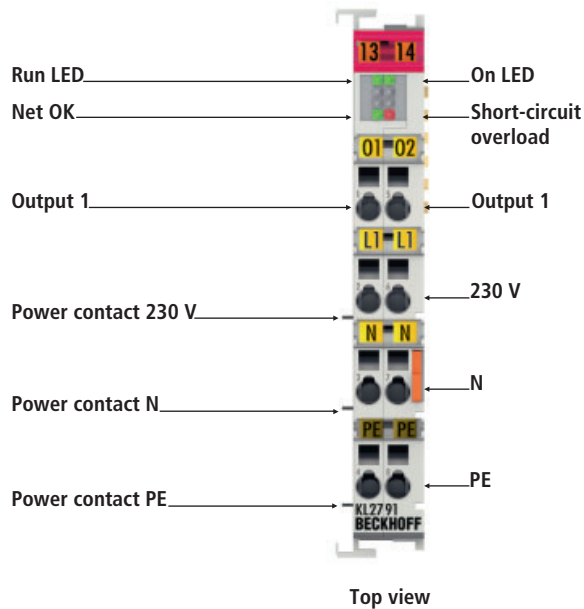
Technical data	KL2532   KS2532
Number of outputs	2
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	DC brush motors, inductive
Max. output current	2 x 1 A (short-circuit-proof, thermal overload-proof) for both channels together
PWM clock frequency	30 kHz with 180° phase shift each
Duty factor	0...100 % (voltage-controlled)
Resolution	max. 10 bits current, 16 bits speed
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption power contacts	typ. 30 mA + motor current
Current consumption K-bus	typ. 50 mA
Bit width in the process image	48 inputs/outputs: 2 x 16 bit data, 2 x 8 bit control/status
Configuration	no address setting, configuration via Bus Coupler or controller
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2532">www.beckhoff.com/KL2532</a>



## KL2552 | 2-channel DC motor output stage 50 V DC, 5 A

The KL2552 Bus Terminal enables direct operation of two DC motors. It is galvanically isolated from the K-bus. The speed is specified by the automation device via a 16 bit value. Connection of an incremental encoder enables a simple servo axis to be realised. Typical motor parameters can be set in order to avoid critical conditions of the DC motor. The load can be protected by limiting the maximum values for speed, torque and acceleration. The output stage is protected against overload and short-circuit. The Bus Terminal contains two channels that indicate their signal state by means of light emitting diodes. The LEDs enable quick local diagnosis.

Technical data	KL2552   KS2552
Number of outputs	2
Rated load voltage	8...50 V DC
Load type	DC brush motors, inductive
Max. output current	2 x 5 A (short-circuit-proof, thermal overload-proof for both channels together)
PWM clock frequency	30 kHz with 180° phase shift each
Duty factor	0...100 % (voltage-controlled)
Resolution	max. 10 bits current, 16 bits speed
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption power contacts	typ. 90 mA
Current consumption K-bus	typ. 120 mA
Encoder signal	5...24 V, 5 mA single-ended
Pulse frequency	max. 400,000 increments/s (with 4-fold evaluation)
Bit width in the process image	48 inputs/outputs: 2 x 16 bit data, 2 x 8 bit control/status
Configuration	adaptation and optimisation of the respective motor via the controller and registers or KS2000 configuration software
Weight	approx. 100 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/see documentation
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2552">www.beckhoff.com/KL2552</a>

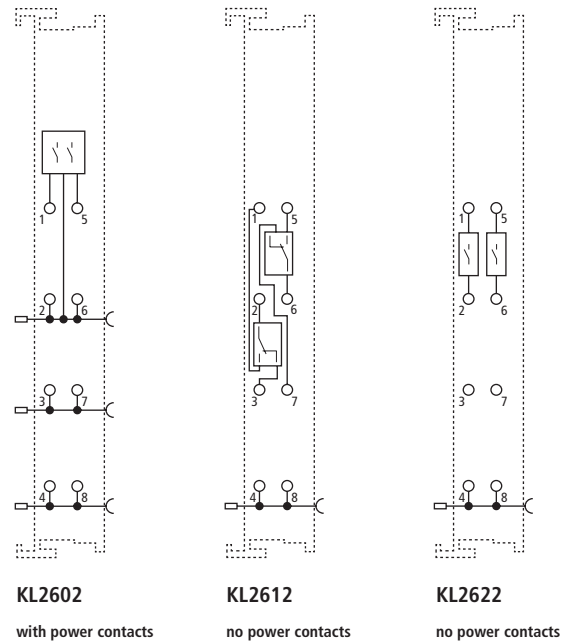
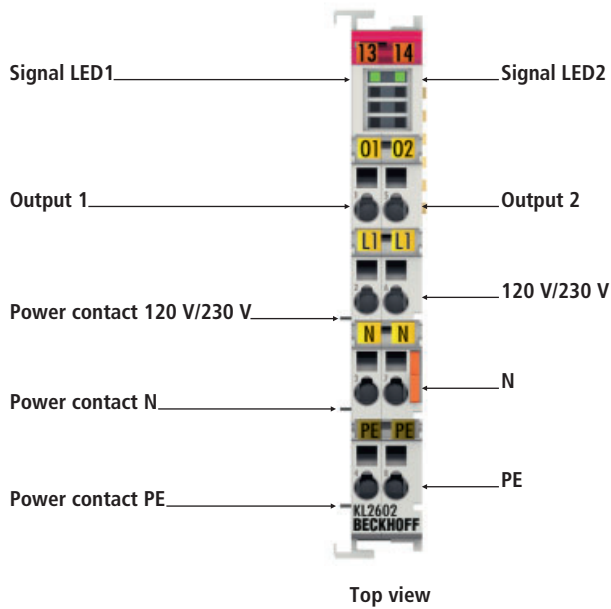


## KL2791 | 1-channel AC motor speed controller 230 V AC, 200 VA

The KL2791 AC motor speed controller is designed for direct connection of different single-phase AC motors with small capacity. The KL2791 enables speed reduction of typical motors such as capacitor motors, universal motors and shaded-pole motors. The required output is specified via the process data. The output setting matches respective output value through targeted on and off switching at optimised times. This technique is particularly suitable for drives with quadratic load characteristic such as fans and pumps.

Technical data	KL2791   KS2791
Mains voltage	230 V AC
Rated output	≤ 200 VA
Load type	1-phase AC motors
Control type	phase/full wave control
Resolution	1 %
Electrical isolation	500 V <sub>rms</sub> (K-bus/field voltage), 3,750 V AC (1 min.)
Leakage current	< 1 mA (OFF state)
Current consumption K-bus	typ. 65 mA
Bit width in the process image	output: 1 x 16 bit data (1 x 8 bit control/status optional)
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2791">www.beckhoff.com/KL2791</a>

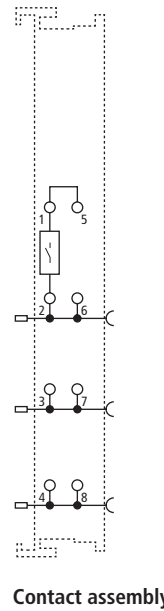
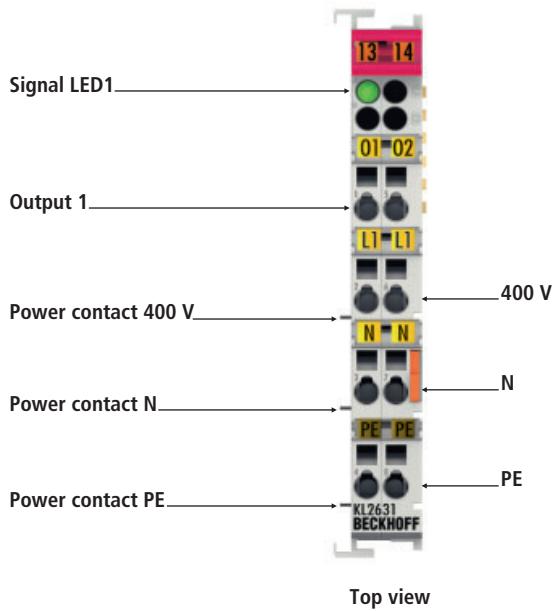
Special terminals	
KL2791-0011	230 V AC, 200 VA, max. 0.45 A, without power contacts
KL2791-1200	120 V AC, 100 VA



## KL2602, KL2612, KL2622 | 2-channel relay output terminals

The KL2602 output terminal has two relays each of which has a single contact. The relay contact is connected to the power contacts, which are suitable for use at up to 230 V AC, and can be generally used for switching devices requiring mains power. The Bus Terminal indicates its signal state by means of a light emitting diode. The KL2612 and KL2622 Bus Terminals have potential-free contacts. The power contacts are not looped through.

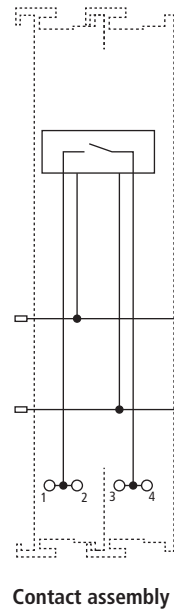
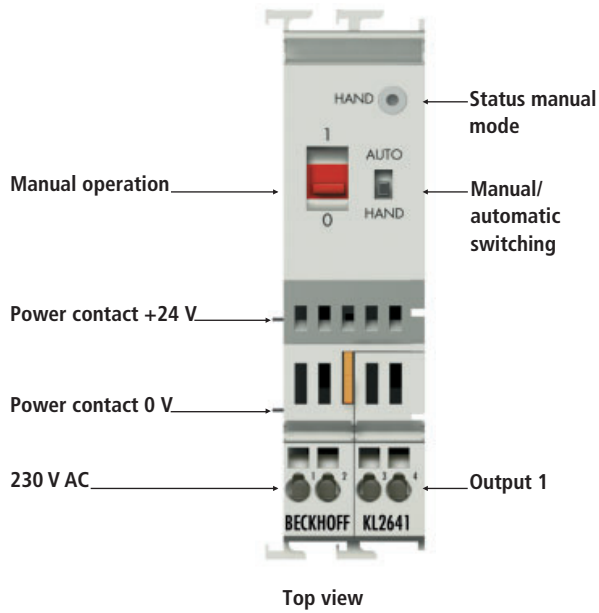
Technical data	KL2602   KS2602	KL2612   KS2612	KL2622   KS2622
Number of outputs	2 x make contacts for power contact	2 x change-over	2 x make contacts
Rated load voltage	230 V AC/30 V DC	125 V AC/30 V DC	230 V AC/30 V DC
Ohmic switching current	5 A AC/DC	0.5 A AC/2 A DC	5 A AC/DC
Inductive switching current	2 A AC/DC	no data	2 A AC/DC
Minimum permitted load	10 mA at 5 V DC	10 µA at 10 mV	10 mA at 5 V DC
Lamp test, electronic ballast	4 x 58 W	–	4 x 58 W
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)		
Current consumption K-bus	80 mA	60 mA	85 mA
Bit width in the process image	2 outputs		
Operating cycles mech. (min.)	2 x 10 <sup>7</sup>	1 x 10 <sup>8</sup>	2 x 10 <sup>7</sup>
Operating cycles electr. (min.)	1 x 10 <sup>5</sup> (5 A/30 V DC)	2 x 10 <sup>5</sup> (1 A/30 V DC)	1 x 10 <sup>5</sup> (5 A/30 V DC)
Configuration	no address or configuration setting		
Weight	approx. 85 g	approx. 80 g	approx. 80 g
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all KSxxxx Bus Terminals		
Further information	www.beckhoff.com/KL2602		



## KL2631 | 1-channel relay output terminal 400 V AC, 300 V DC

The KL2631 output terminal has a relay which has a single contact. The relay contact is connected to the power contacts, which are suitable for use at up to 400 V AC, and can be generally used for switching devices requiring mains power. The Bus Terminal indicates its signal state by means of a light emitting diode. In order to use the high voltage of up to 400 V AC, the KL2631 must be supplied via the KL9190 power feed terminal.

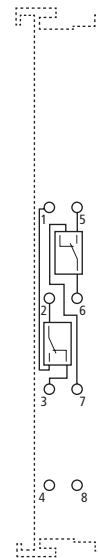
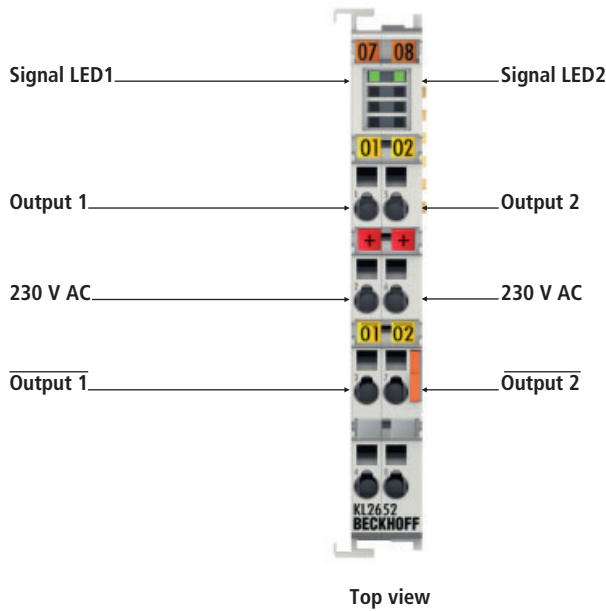
Technical data	KL2631   KS2631
Number of outputs	1 x make contacts for power contact
Rated load voltage	400 V AC/300 V DC
Switching capacity DC	300 V = 0.15 A; 24 V = 5 A; non-linear
Switching capacity AC	1,500 VA
Switching voltage minimum	power contact
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption K-bus	80 mA
Bit width in the process image	2 outputs
Operating cycles mech. (min.)	1 x 10 <sup>7</sup>
Operating cycles electr. (min.)	1.3 x 10 <sup>5</sup> (2 A/250 V AC)
Configuration	no address or configuration setting
Weight	approx. 85 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2631">www.beckhoff.com/KL2631</a>



## KL2641 | 1-channel relay output terminal 230 V AC, 16 A, manual operation, bistable

The KL2641 output terminal has a relay with a single contact which can be used universally for switching devices requiring mains power. The relay can optionally be switched in manual or automatic mode. The switch for the manual operation always indicates the switch status of the relay. The operating mode can be set via a manual/automatic switch, is displayed via an LED and transferred to the process image as a status bit. In manual mode, the coil control is interrupted and the relay is operated via the manual switch. The manual operation can also be used without 24 V supply for switching the actuator. In automatic mode, the relay is operated via the controller.

Technical data	KL2641
Number of outputs	1 make contact
Switching capacity max.	5 kVA
Switching voltage max.	440 V AC (UL: max. 230 V AC)
Switching current max.	16 A AC
Current consumption power contacts	65 mA
Current consumption K-bus	typ. 5 mA
Contact material	AgSnO <sub>2</sub>
Bit width in the process image	2 inputs (status manual, automatic), 2 outputs
Operating cycles	10 <sup>6</sup>
Configuration	no address or configuration setting
Weight	110 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KL2641">www.beckhoff.com/KL2641</a>



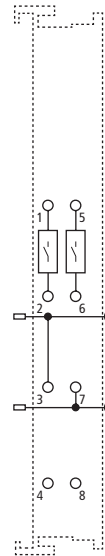
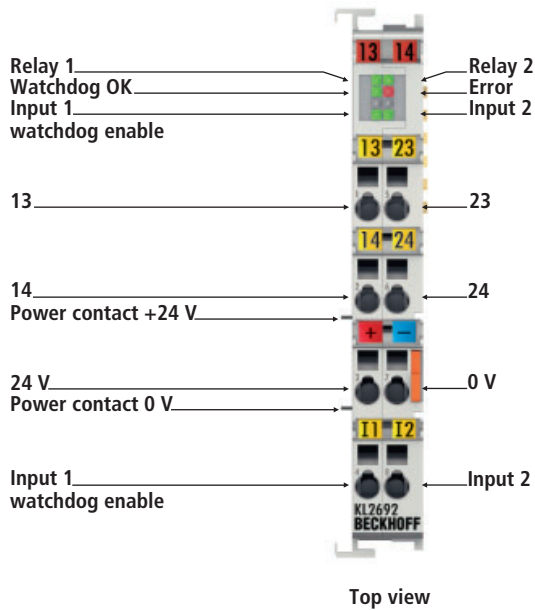
Contact assembly

## KL2652 | 2-channel relay output terminal 230 V AC, 300 V DC, 1 A

The KL2652 output terminal has two relays, each featuring a change-over contact. The relay contact can be used universally for switching devices requiring mains power up to 230 V AC or 300 V DC. The KL2652 Bus Terminal is equipped with potential-free contacts. The signal state of the Bus Terminal is indicated via LEDs.

Technical data	KL2652   KS2652
Number of outputs	2 x change-over
Switching voltage max.	250 V AC, 300 V DC
Switching current max.	1 A AC/1 A DC at 40 V DC; 0.15 A at 300 V DC (UL: max. 230 V AC, 1 A)
Minimum permitted load	100 mA (12 V DC)
Electrical isolation	1.5 kV <sub>rms</sub> (K-bus/field potential); 2.5 kV rated surge voltage, overvoltage category III
Current consumption K-bus	90 mA
Bit width in the process image	2 outputs
Switching frequency max.	6/min. (at rated load)
Operating cycles mech. (min.)	5 x 10 <sup>6</sup>
Operating cycles electr. (min.)	1 x 10 <sup>6</sup> (1 A AC/250 V AC)
Configuration	no address or configuration setting
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2652">www.beckhoff.com/KL2652</a>





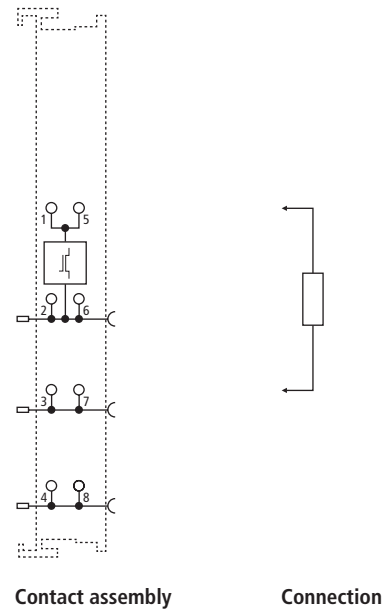
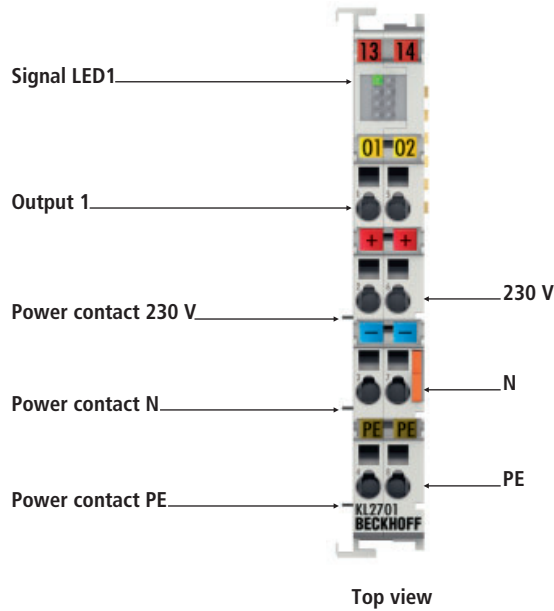
Contact assembly

## KL2692 | Cycle monitoring terminal (watchdog)

The KL2692 Bus Terminal monitors a bit that is toggled by the controller during each cycle. If the toggle signal fails, the controller switches off two potential-free relay circuits in order to prevent damage to the machine. Failure of the toggle signal may be caused by the PLC cycle stopping, by a fault in the bus cable or connector, or by a fault in a bus device. The cycle monitoring time can be parameterised. The Bus Terminal has an enable input that enables the relay to be switched on if a correct toggle signal is detected.

Technical data	KL2692   KS2692
Number of outputs	2 potential-free relay outputs (normally-open contacts)
Number of inputs	2 digital 24 V inputs
Rated load voltage	30 V DC
Ohmic switching current	5 A AC/DC
Inductive switching current	2 A AC/DC
Minimum permitted load	10 mA at 5 V DC
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption K-bus	approx. 165 mA
Bit width in the process image	2 x 8 bit data, 1 x 8 bit control/data
Operating cycles mech. (min.)	2 x 10 <sup>7</sup>
Operating cycles electr. (min.)	1 x 10 <sup>5</sup> (5 A/30 V DC)
Configuration	via the Bus Coupler or the controller
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2692">www.beckhoff.com/KL2692</a>

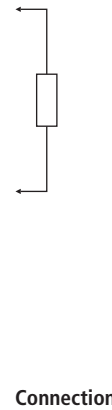
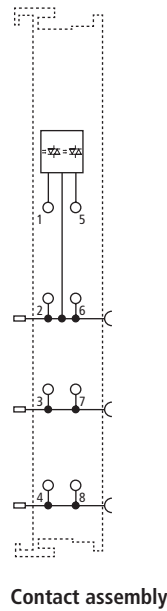
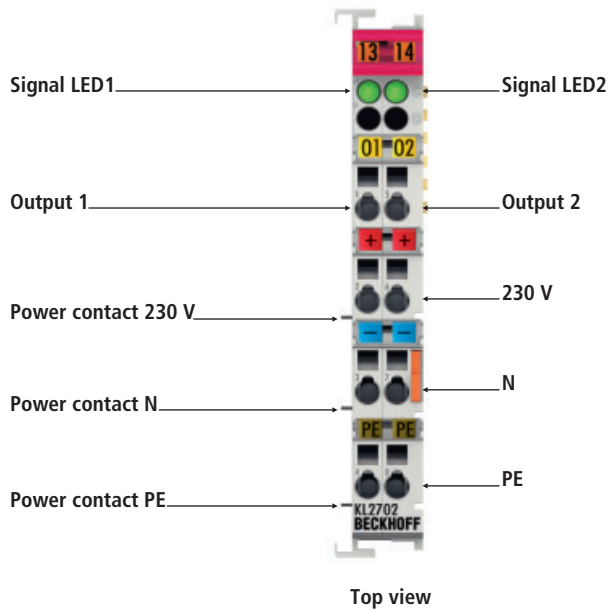
Special terminals	
KL2692-1001	2 digital inputs, 2 potential-free relays



## KL2701 | 1-channel solid state load relay up to 230 V AC/DC, 3 A

The KL2701 output terminal uses an electronic load relay to switch a mains voltage of up to 230 V AC/DC with an output current of 3 A. The switching element is a high-power MOSFET, which is connected to the power contact potential. As a semiconductor switch, it is not subject to wear. The KL2701 terminal has one independent output. Its signal state is indicated by means of a light emitting diode.

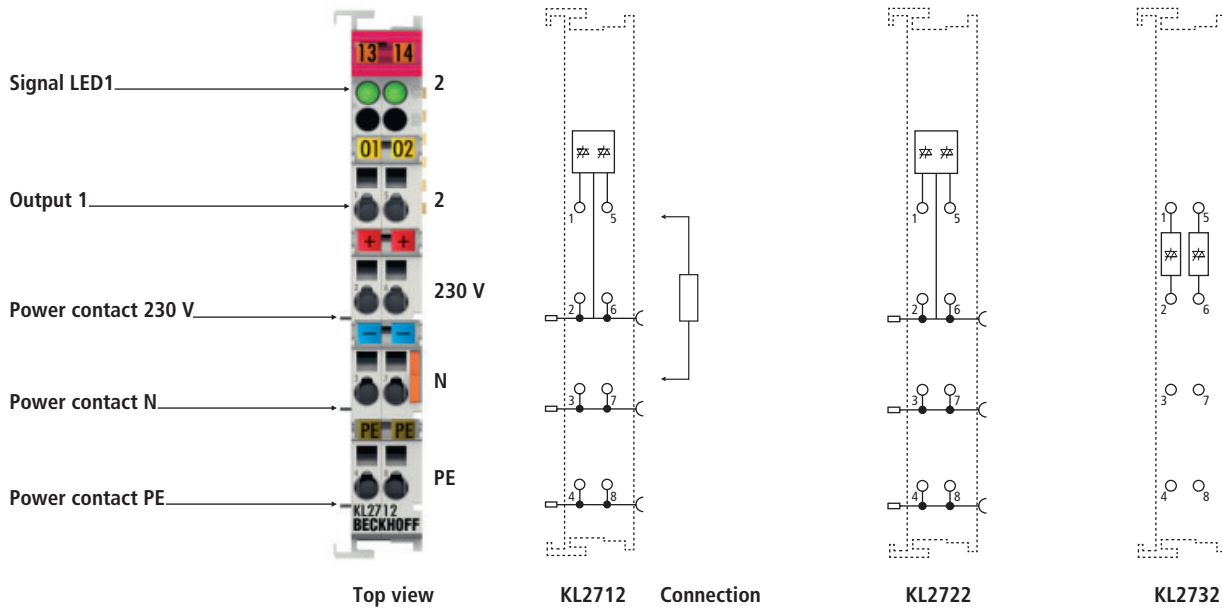
Technical data	KL2701   KS2701
Number of outputs	1 make contact
Rated load voltage	0...230 V AC/DC
Max. output current	3 A steady load
Peak current	5 A (20 s), 50 A (100 ms)
Recommended fuse	≤ 10 A fast fuse
Contact resistance	0.1 Ω typ.
Electrical isolation	500 V <sub>rms</sub> (K-bus/field voltage), 2,500 V AC (1 min.)
Switching speed	typ. 1.65 ms, 5 ms max.
Current consumption K-bus	65 mA
Bit width in the process image	2 outputs
Configuration	no address or configuration setting
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2701">www.beckhoff.com/KL2701</a>



## KL2702 | 2-channel solid state load relay up to 230 V AC/DC, 0.3 A

The KL2702 output terminal uses an electronic load relay to switch a mains voltage of up to 230 V AC/DC. The switching element is a high-power MOSFET, which is connected to the power contact potential. As a semiconductor switch, it is not subject to wear. The KL2702 terminal has two independent outputs. Its signal state is indicated by means of light emitting diodes.

Technical data	KL2702   KS2702
Number of outputs	2 x make contacts
Rated load voltage	0...230 V AC/DC
Max. output current	0.3 A steady load on each channel
Surge voltage protection	> 275 V
Peak current	0.5 A (20 s), 1.5 A (100 ms)
Recommended fuse	≤ 2 A fast fuse, 1 A slow fuse
Contact resistance	2.1 Ω typ., 3.2 Ω max.
Electrical isolation	500 V <sub>rms</sub> (K-bus/field voltage), 2,500 V AC (1 min.)
Switching speed	typ. 1.65 ms, 5 ms max.
Current consumption K-bus	10 mA
Bit width in the process image	2 outputs
Configuration	no address or configuration setting
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2702">www.beckhoff.com/KL2702</a>

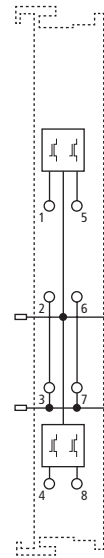
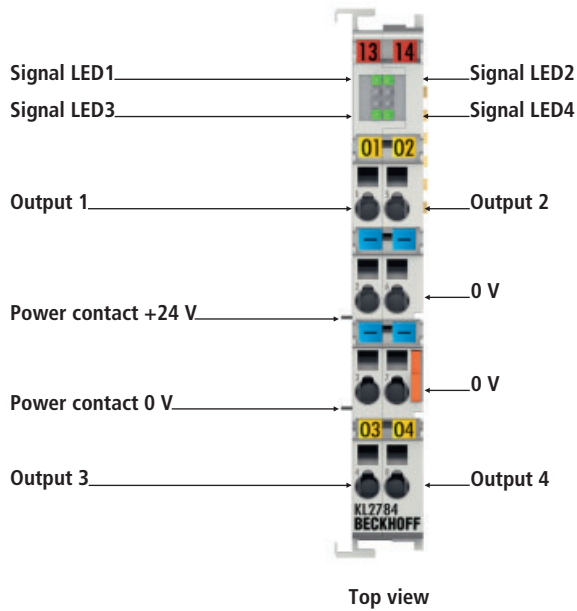


## KL2712, KL2722, KL2732 | 2-channel triac output terminals 12...230 V AC

The KL2712 and KL2722 output terminals use a power switch to control mains voltage from 12 V to 230 V AC. The switching element is a triac, which is connected to the power contact potential. As a semiconductor switch, it is not subject to wear. The steady load capacity of a digital output is 0.5 A (KL2712) or 1 A (KL2722). The KL2712 terminal has two independent outputs. Its signal state is indicated by means of light emitting diodes. The KL2722 and KL2732 have two mutually locked outputs. They differ in terms of their interfacing with the power contacts. The KL2732 operates with two potential-free switches. All outputs indicate their logical state via an LED. The KL2722 is most suitable for reverse motors.

Technical data	KL2712   KS2712	KL2722   KS2722	KL2732   KS2732
Number of outputs	2 x make contacts	2 x make contacts, mutually locked	2 x make contacts (without power contacts), mutually locked
Rated load voltage	12...230 V AC		
Output current	max. 0.01...0.5 A continuous load per channel	1 A (leakage current: typ. 0.8 mA, max. 1.5 mA)	1 A (leakage current: typ. 0.8 mA, max. 1.5 mA)
Frequency range	47...63 Hz		
Surge voltage protection	> 275 V		
Peak current	40 A (16 ms), 1.5 A (30 s)	40 A (16 ms), 3 A (30 s)	40 A (16 ms), 3 A (30 s)
Switch-on time	0.1 ms	0.1...10 ms, zero crossing	0.1...10 ms, zero crossing
Switch-off time	T/2		
Maximum residual voltage	1.5 V	1.5 V (60 mA...1 A), 150 Ω (< 60 mA)	1.5 V (60 mA...1 A), 150 Ω (< 60 mA)
Electrical isolation	500 V <sub>rms</sub> (K-bus/field voltage), 3,750 V AC (1 min.)		
Current consumption K-bus	10 mA		
Bit width in the process image	2 outputs		
Configuration	no address or configuration setting		
Weight	approx. 55 g		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all KSxxxx Bus Terminals		
Further information	www.beckhoff.com/KL2712		

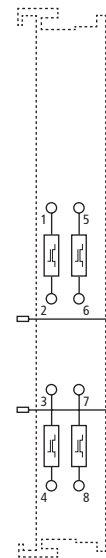
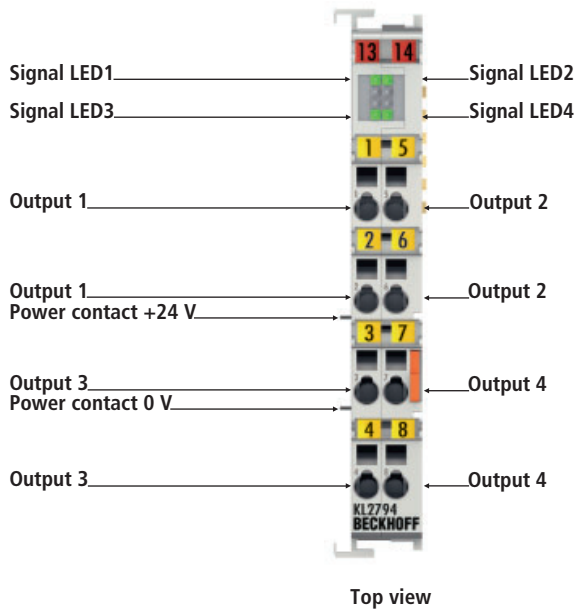
Special terminals	
KL27x2-0010	for special terminals see page 629



## KL2784 | 4-channel digital output terminal 24 V AC/DC, 2 A, short-circuit-proof

The KL2784 digital output terminal is able to switch voltages up to 24 V AC/DC using an advanced MOSFET transistor. The semiconductor switches connected to the power contacts represent a substitute for relay contacts. They are short-circuit-proof and free from wear, thereby increasing the availability of the application. The output is short-circuit-proof to a limited extent. The output transistor can cope with short-term overcurrents until the fuse is triggered. The Bus Terminal contains four channels that indicate their signal state by means of light emitting diodes.

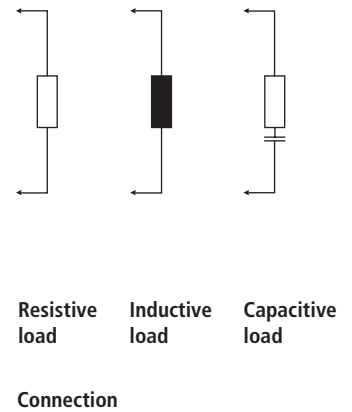
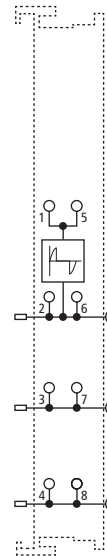
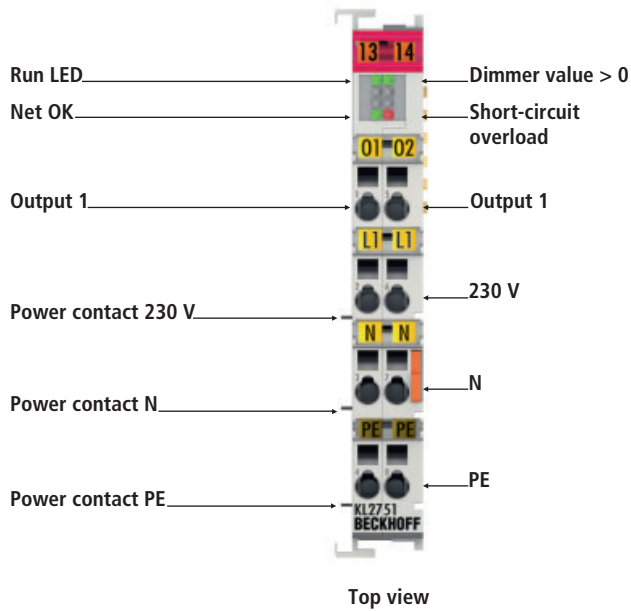
Technical data	KL2784   KS2784
Number of outputs	4 x make contacts
Rated load voltage	0...24 V AC/DC
Output current	2 A on each channel
Surge voltage protection	> 39 V
Peak current	5 A (100 ms), > 50 A (10 ms)
Electrical isolation	500 V (K-bus/field potential)
Switching speed	typ. 1.8 ms, 5 ms max.
Closing resistor	typ. 0.03 Ω
Current consumption K-bus	15 mA
Bit width in the process image	4 outputs
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2784">www.beckhoff.com/KL2784</a>



## KL2794 | 4-channel digital output terminal 24 V AC/DC, 2 A, potential-free, short-circuit-proof

The KL2794 digital output terminal is able to switch voltages up to 24 V AC/DC using advanced MOSFET transistors. The four potential-free semiconductor switches represent a substitute for relay contacts. They are short-circuit-proof and free from wear, thereby increasing the availability of the application. The output is short-circuit-proof to a limited extent. Short overcurrents can be handled by the output transistor until the fuse is triggered. The Bus Terminal contains four channels that indicate their signal state by means of light emitting diodes.

Technical data	KL2794   KS2794
Number of outputs	4 x make contacts
Rated load voltage	0...24 V AC/DC
Output current	2 A on each channel
Surge voltage protection	> 39 V
Peak current	5 A (100 ms), > 50 A (10 ms)
Isolation voltage	< 200 V (channel/channel)
Electrical isolation	500 V (K-bus/field potential)
Switching speed	typ. 1.8 ms, 5 ms max.
Closing resistor	typ. 0.03 Ω
Current consumption K-bus	15 mA
Bit width in the process image	4 outputs
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2794">www.beckhoff.com/KL2794</a>

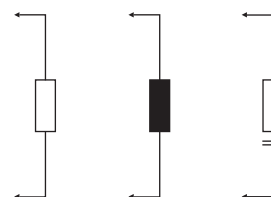
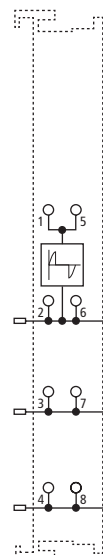
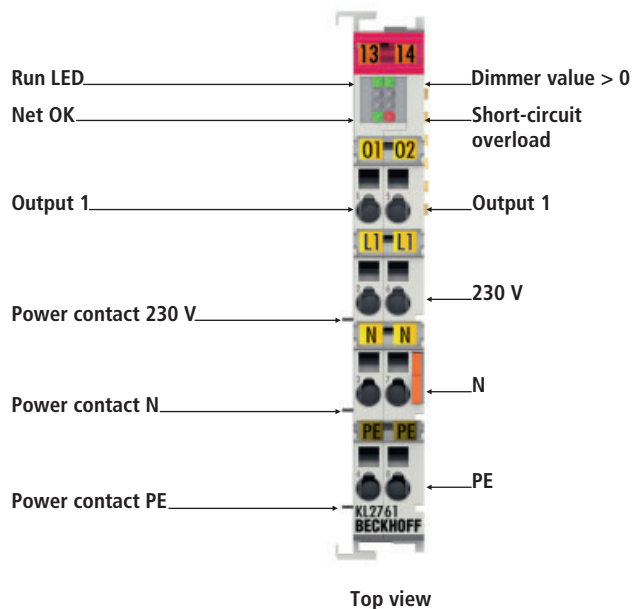


## KL2751 | 1-channel universal dimmer terminal 230 V AC, 300 VA (W)

The KL2751 dimmer Bus Terminal is designed for direct connection of different lighting devices. Typical loads such as incandescent lamps, inductive and electronic ballasts are detected and controlled in the right mode. The required light intensity values are specified via the process data. The KL2751 calculates the correct phase control angle for the required value. The output is short-circuit-proof and overload-proof. The KL2751 can be operated at any fieldbus.

Technical data	KL2751   KS2751
Mains voltage	230 V AC
Rated output	300 VA (W)
Rated current	max. 1.35 A
Load type	ohmic, inductive or capacitive (not mixed), automatic load detection
Control type	phase control
Resolution	1 %
Electrical isolation	500 V <sub>rms</sub> (K-bus/field voltage), 3,750 V AC (1 min.)
Leakage current	< 1 mA (OFF state)
Current consumption K-bus	typ. 65 mA
Bit width in the process image	output: 1 x 16 bit data (1 x 8 bit control/status optional)
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2751">www.beckhoff.com/KL2751</a>

Special terminals	
KL2751-0011	dimmer terminal without power contacts
KL2751-1200	dimmer terminal for 120 V AC



Resistive load    Inductive load    Capacitive load

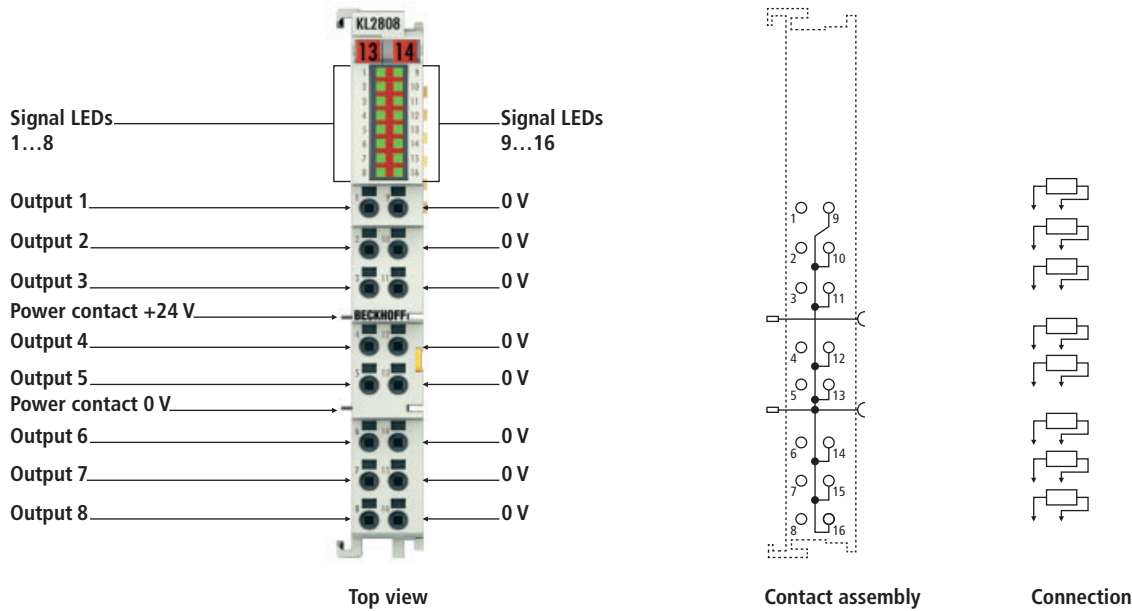
Connection

## KL2761 | 1-channel universal dimmer terminal 230 V AC, 600 VA (W)

The KL2761 dimmer Bus Terminal is intended for direct connection of different lighting devices. Typical lighting devices such as incandescent lamps, inductive and electronic ballasts are detected and controlled in the right mode. The required light intensity values are specified via the process data. The KL2761 calculates the correct phase control angle for the required value. The output is short-circuit-proof and overload-proof. The KL2761 can be operated at any fieldbus. The load status can be read.

Technical data	KL2761   KS2761
Mains voltage	230 V AC
Rated output	600 VA (W)
Rated current	max. 2.7 A
Load type	ohmic, inductive or capacitive (not mixed), automatic load detection
Control type	phase control
Resolution	1 %
Electrical isolation	500 V <sub>rms</sub> (K-bus/field voltage), 3,750 V AC (1 min.)
Leakage current	< 1 mA (OFF state)
Current consumption K-bus	typ. 65 mA
Bit width in the process image	output: 1 x 16 bit data (1 x 8 bit control/status optional)
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL2761">www.beckhoff.com/KL2761</a>
Special terminals	
KL2761-0011	1-channel universal dimmer terminal, 230 V AC, 600 VA (W), 50 Hz (without power contacts)





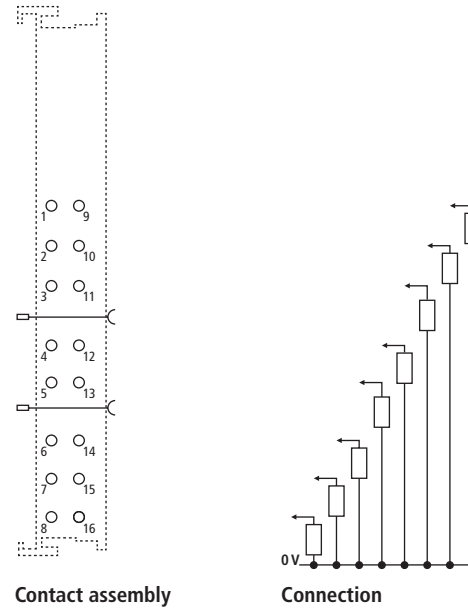
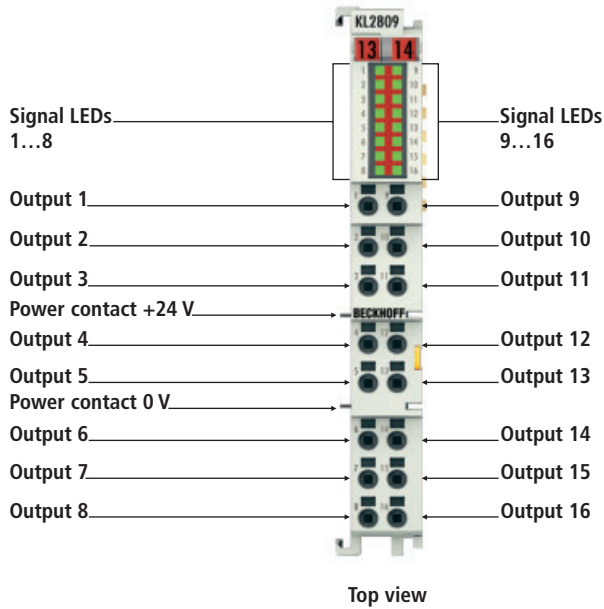
## KL2808 | 8-channel digital output terminal 24 V DC

The KL2808 digital output terminal connects the binary control signals from the automation device on to the actuators at the process level with electrical isolation. The KL2808 is protected against polarity reversal and processes load currents with outputs protected against overload and short-circuit. The Bus Terminal contains eight channels, consisting of a signal output and 0 V DC. The signal states are displayed by LEDs. The power contacts are looped through.

The outputs are fed via the 24 V power contact in the KL2808. The conductors can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	KL2808
Number of outputs	8
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A (per channel)
Reverse voltage protection	yes
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption power contacts	typ. 60 mA
Current consumption K-bus	typ. 20 mA
Bit width in the process image	8 outputs
Configuration	no address or configuration setting
Conductor types	solid wire, stranded wire and ferrule
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5 mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>
Weight	approx. 65 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable (see documentation)
Further information	<a href="http://www.beckhoff.com/KL2808">www.beckhoff.com/KL2808</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/KL2808](http://www.beckhoff.com/KL2808)

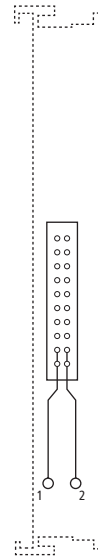
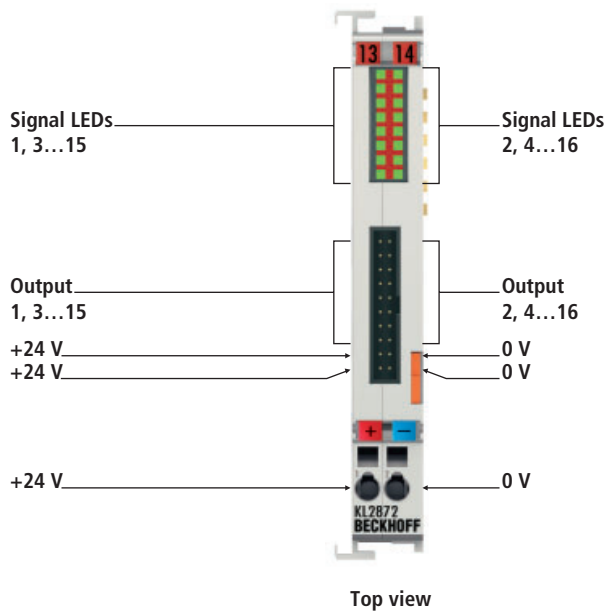


## KL2809 | 16-channel digital output terminal 24 V DC

The KL2809 digital output terminal connects the binary control signals from the automation device on to the actuators at the process level with electrical isolation. The KL2809 is protected against polarity reversal and processes load currents with outputs protected against overload and short-circuit. The Bus Terminal contains 16 channels, whose signal states are displayed by LEDs. The terminal is particularly suitable for space-saving use in control cabinets. The connection technology is particularly suitable for single-ended inputs. All components have to use the same reference point as the KL2809. The power contacts are looped through.

The outputs are fed via the 24 V power contact in the KL2809. The conductors can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	KL2809
Number of outputs	16
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A (per channel)
Reverse voltage protection	yes
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption power contacts	typ. 120 mA
Current consumption K-bus	typ. 35 mA
Bit width in the process image	16 outputs
Configuration	no address or configuration setting
Conductor types	solid wire, stranded wire and ferrule
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5 mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>
Weight	approx. 70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable (see documentation)
Further information	<a href="http://www.beckhoff.com/KL2809">www.beckhoff.com/KL2809</a>



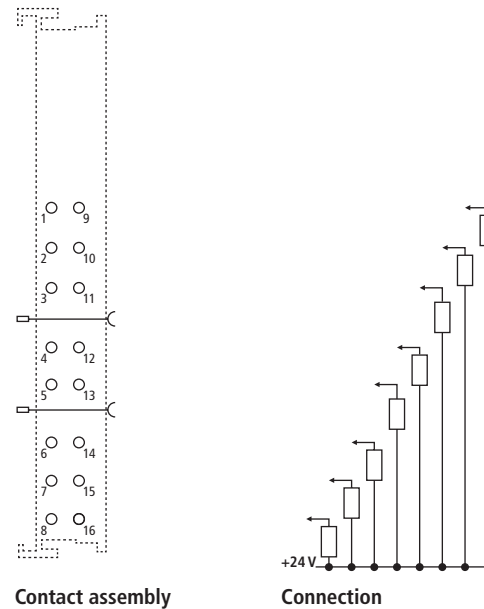
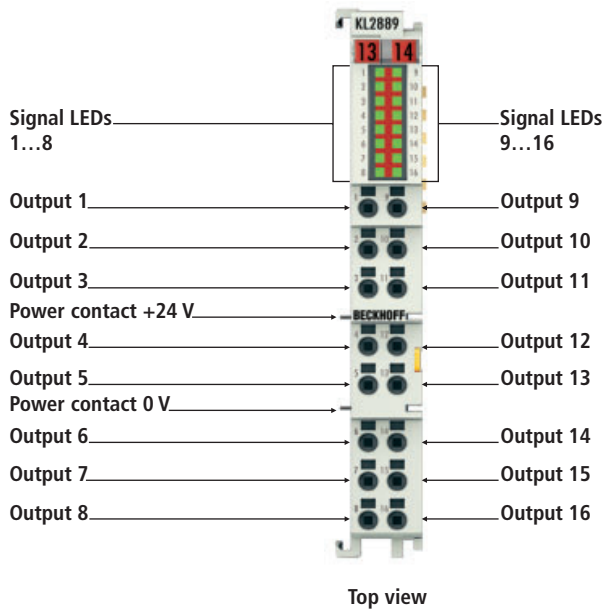
Contact assembly

## KL2872 | 16-channel digital output terminal 24 V DC, flat-ribbon cable connection

The KL2872 digital output terminal offers a very compact design with its 16 channels. A 20-pin connector enables the secure connection of plug connectors using insulation displacement contact, as is usual for ribbon cables and special round cables. This significantly simplifies the wiring of many channels. State-of-the-art output drivers guarantee minimum power dissipation. 16 LEDs display the logical signal states of the outputs.

Technical data	KL2872
Number of outputs	16
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A (short-circuit-proof) per channel
Short circuit current	0.6...1.0 A
Breaking energy	< 150 mJ/channel
Reverse voltage protection	yes
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption K-bus	typ. 5 mA
Bit width in the process image	16 outputs
Configuration	no address or configuration setting
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KL2872">www.beckhoff.com/KL2872</a>

Special terminals	
KL2872-0010	16-channel digital output terminal 24 V DC, flat-ribbon cable connection, switching to ground potential



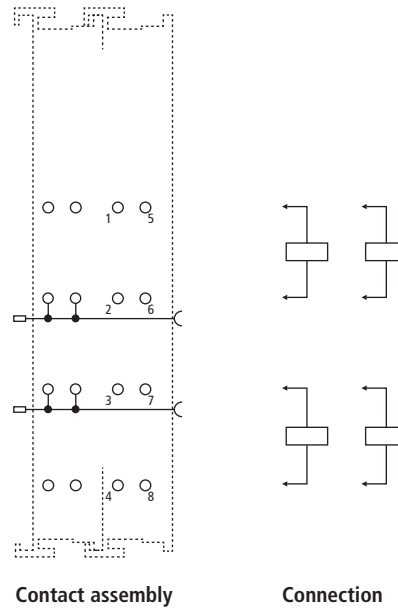
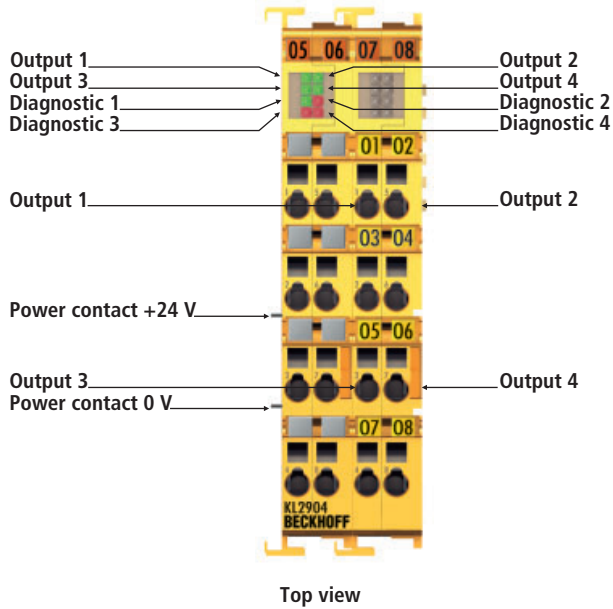
## KL2889 | 16-channel digital output terminal 24 V DC, 0 V (ground) switching

The KL2889 digital output terminal connects the binary control signals from the automation device on to the actuators at the process level with electrical isolation. The KL2889 is protected against polarity reversal and processes load currents with outputs protected against overload and short-circuit. The Bus Terminal contains 16 channels, whose signal states are displayed by LEDs. The terminal is particularly suitable for space-saving use in control cabinets. The connection technology is particularly suitable for single-ended inputs. All components have to use the same reference point as the KL2889. The power contacts are looped through.

The outputs are fed via the 0 V power contact in the KL2889. The conductors can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	KL2889
Number of outputs	16
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A (per channel)
Reverse voltage protection	yes
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption power contacts	typ. 120 mA
Current consumption K-bus	typ. 36 mA
Bit width in the process image	16 outputs
Configuration	no address or configuration setting
Conductor types	solid wire, stranded wire and ferrule
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5 mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>
Weight	approx. 70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable (see documentation)
Further information	<a href="http://www.beckhoff.com/KL2889">www.beckhoff.com/KL2889</a>

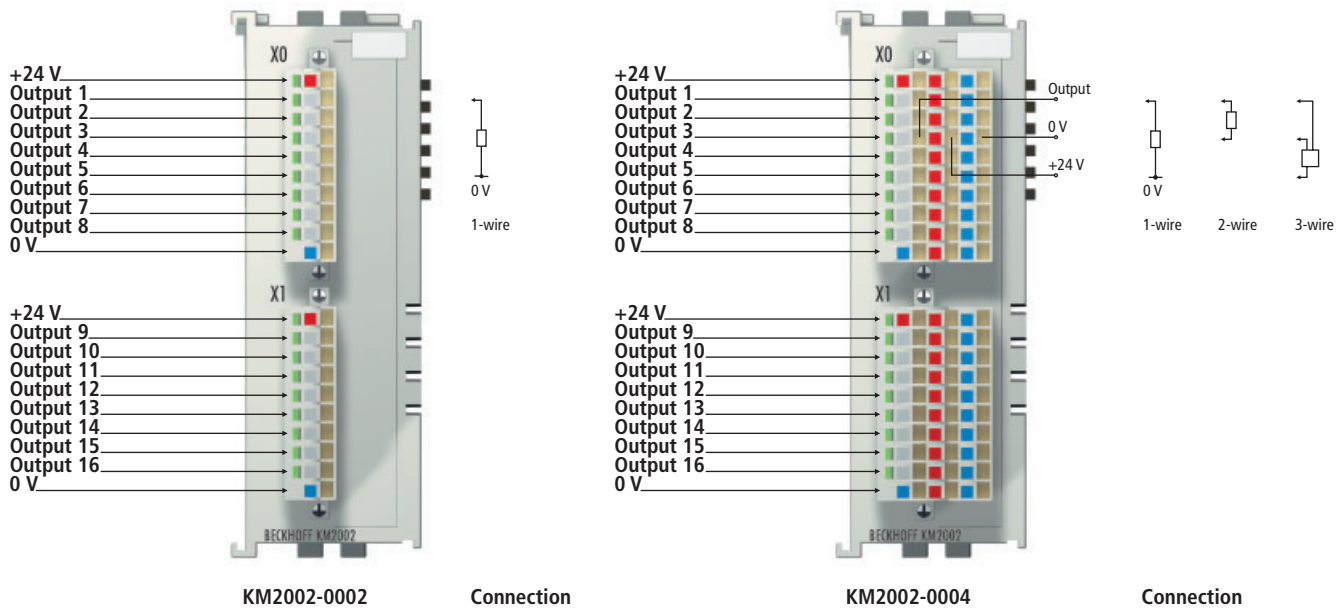
**i** For availability status see Beckhoff website at: [www.beckhoff.com/KL2889](http://www.beckhoff.com/KL2889)



# KL2904 | 4-channel digital output terminal, TwinSAFE, 24 V DC

The KL2904 safety Bus Terminal is a digital output terminal with four channels. It switches 24 V DC actuators with up to 0.5 A current per channel. The KL2904 meets the requirements of IEC 61508 SIL 3, EN 954 Cat. 4 and DIN EN ISO 13849 PL<sub>e</sub>. If the Bus Terminal detects a fault, it switches off automatically (fail stop).

Technical data	KL2904
Number of outputs	4
Protocol	TwinSAFE
Status display	8 LEDs: 1 per output, 4 diagnostic
Current consumption K-bus	250 mA
Fault response time	≤ watchdog time (parameterisable)
Bit width in the process image	6 byte input/6 byte output
Supply voltage	24 V DC (-15 %/+20 %)
Output current	0.5 A max./20 mA min. (per channel)
Weight	approx. 100 g
Operating/storage temperature	0...+55 °C/-25...+70 °C
Permiss. degree of contamin.	2
Climate class EN60721-3-3	3K3
Electrical interference	EN 61000-6-2/EN 61000-6-4
Vibration/shock resistance	EN 60068-2-6/EN 60068-2-27/29
Installation position	horizontal
Protection class	IP 20
Further information	<a href="http://www.beckhoff.com/KL2904">www.beckhoff.com/KL2904</a>

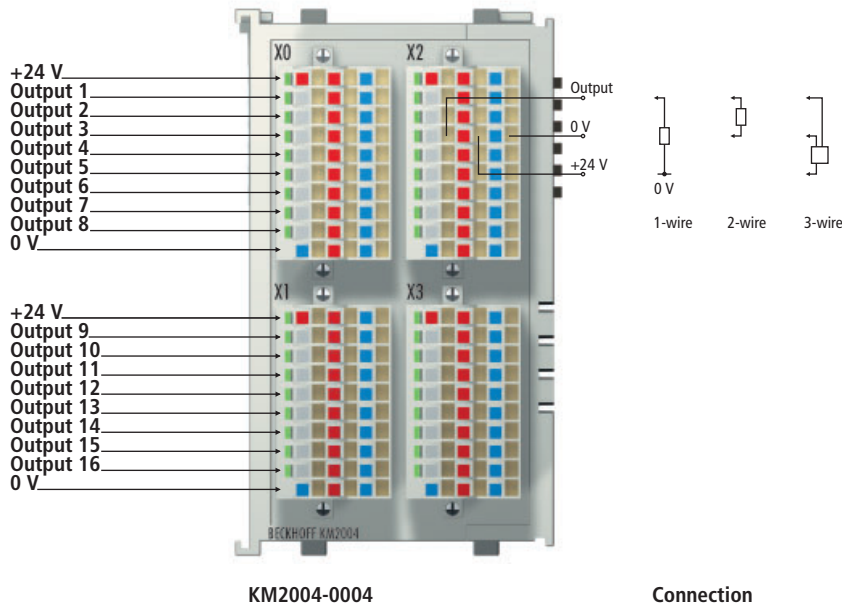


## KM2002 | 16-channel digital output 24 V DC, 0.5 A

The terminal module KM2002 combines 16 digital outputs with eight channels per plug connector in a compact design with high packing density. The binary control signals are transferred (electrically isolated) to the actuators at the process level. Like the standard Bus Terminals, the terminal modules are integrated in the I/O system. Plug connectors with spring connections enable plug-in wiring and are available with 1 or 3 pins. LEDs integrated in the connector indicate the signal state for each channel directly at the wire.

Technical data	KM2002
Number of outputs	16 (2 x 8)
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A
Short circuit current	0.6...1.0 A
Breaking energy	< 150 mJ/channel
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption power contacts	typ. 15 mA
Current consumption K-bus	typ. 5 mA
Bit width in the process image	16 outputs
Dimensions (W x H x D)	26.5 mm x 100 mm x 71 mm
Weight	approx. 90 g with 1-pin connector, approx. 110 g with 3-pin connector
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KM2002">www.beckhoff.com/KM2002</a>

Ordering information	KM2002-000x
KM2002-0000	16-channel DO (0.5 A), without connector
KM2002-0001	16-channel DO (0.5 A), 1-pin connector (no status LED)
KM2002-0002	16-channel DO (0.5 A), 1-pin connector (with status LED)
KM2002-0004	16-channel DO (0.5 A), 3-pin connector (with status LED)



KM2004-0004

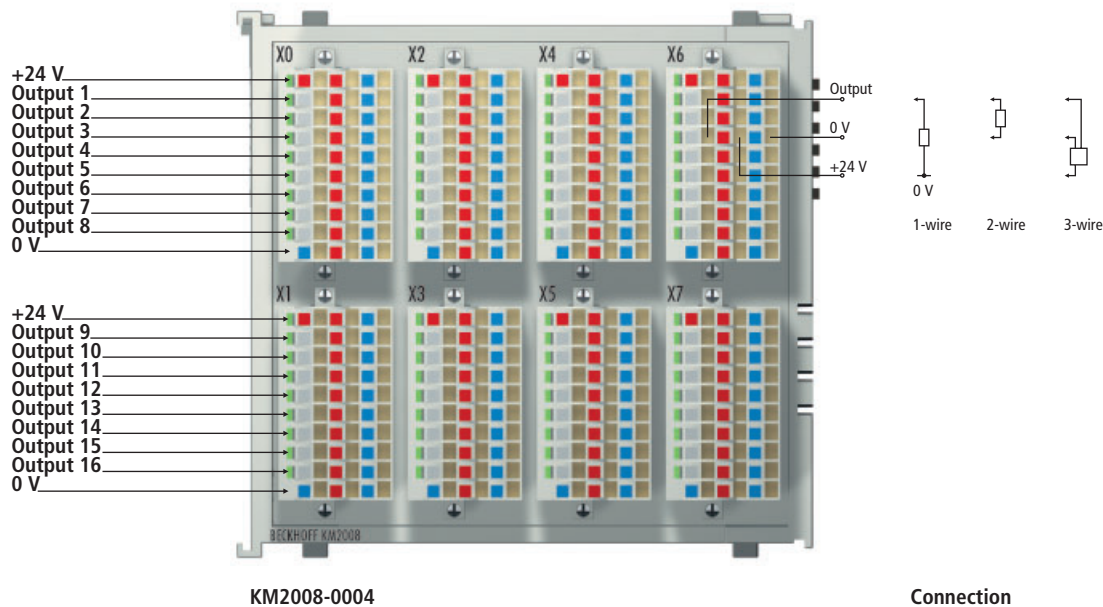
Connection

## KM2004 | 32-channel digital output 24 V DC, 0.5 A

The terminal module KM2004 combines 32 digital outputs with eight channels per plug connector in a compact design with high packing density. The binary control signals are transferred (electrically isolated) to the actuators at the process level. Like the standard Bus Terminals, the terminal modules are integrated in the I/O system. Plug connectors with spring connections enable plug-in wiring and are available with 1 or 3 pins. LEDs integrated in the connector indicate the signal state for each channel directly at the wire.

Technical data	KM2004
Number of outputs	32 (4 x 8)
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A
Short circuit current	0.6...1.0 A
Breaking energy	< 150 mJ/channel
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption power contacts	typ. 15 mA
Current consumption K-bus	typ. 5 mA
Bit width in the process image	32 outputs
Dimensions (W x H x D)	75 mm x 100 mm x 55 mm
Weight	approx. 90 g with 1-pin connector, approx. 110 g with 3-pin connector
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KM2004">www.beckhoff.com/KM2004</a>

Ordering information	KM2004-000x
KM2004-0000	32-channel DO (0.5 A), without connector
KM2004-0001	32-channel DO (0.5 A), 1-pin connector (no status LED)
KM2004-0002	32-channel DO (0.5 A), 1-pin connector (with status LED)
KM2004-0004	32-channel DO (0.5 A), 3-pin connector (with status LED)



KM2008-0004

Connection

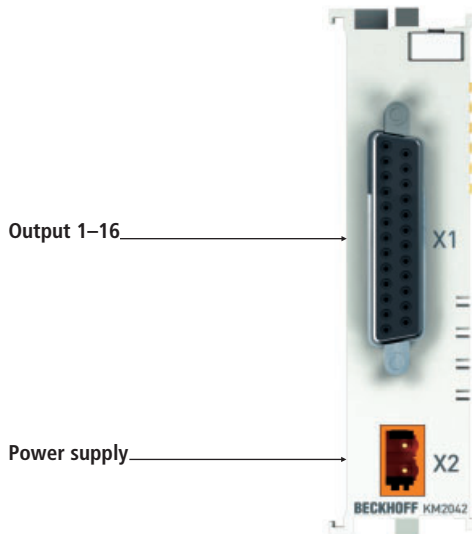
## KM2008 | 64-channel digital output 24 V DC, 0.5 A

The terminal module KM2008 combines 64 digital outputs with eight channels per plug connector in a compact design with high packing density. The binary control signals are transferred (electrically isolated) to the actuators at the process level. Like the standard Bus Terminals, the terminal modules are integrated in the I/O system. Plug connectors with spring connections enable plug-in wiring and are available with 1 or 3 pins. LEDs integrated in the connector indicate the signal state for each channel directly at the wire.

Technical data	KM2008
Number of outputs	64 (8 x 8)
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A
Short circuit current	0.6...1.0 A
Breaking energy	< 150 mJ/channel
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption power contacts	typ. 15 mA
Current consumption K-bus	typ. 5 mA
Bit width in the process image	64 outputs
Dimensions (W x H x D)	123 mm x 100 mm x 55 mm
Weight	approx. 310 g with 1-pin connector, approx. 390 g with 3-pin connector
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KM2008">www.beckhoff.com/KM2008</a>

Ordering information	KM2008-000x
KM2008-0000	64-channel DO (0.5 A), without connector
KM2008-0001	64-channel DO (0.5 A), 1-pin connector (no status LED)
KM2008-0002	64-channel DO (0.5 A), 1-pin connector (with status LED)
KM2008-0004	64-channel DO (0.5 A), 3-pin connector (with status LED)



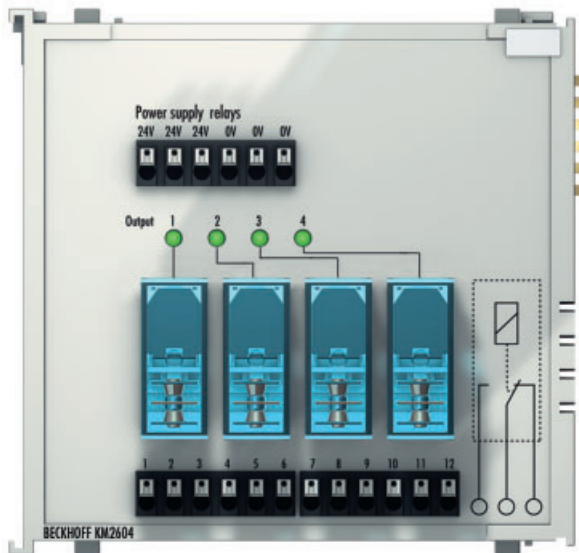


Top view

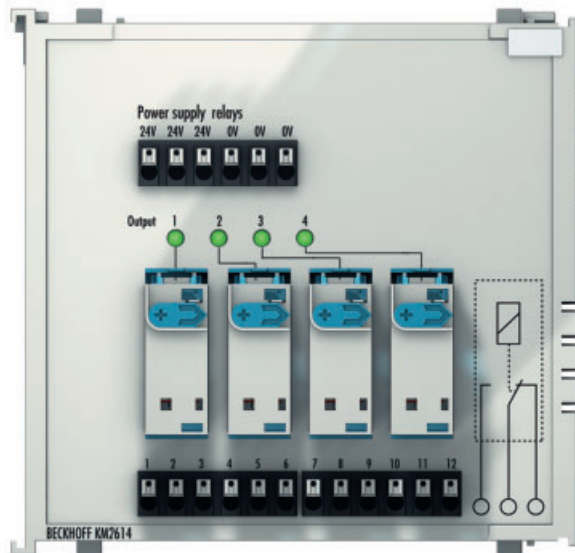
## KM2042 | 16-channel digital output 24 V, 0.5 A, D-sub connection

The terminal module KM2042 combines 16 digital outputs in a D-sub plug connector in a compact design with high packing density. The binary control signals are transferred (electrically isolated) to the actuators at the process level. Like the standard Bus Terminals, the terminal modules are integrated in the I/O system.

Technical data	KM2042
Number of outputs	16
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A
Short circuit current	0.6...1.0 A
Breaking energy	< 150 mJ/channel
Electrical isolation	500 V <sub>rms</sub> (K-bus/field potential)
Current consumption K-bus	typ. 5 mA
Bit width in the process image	16 outputs
Dimensions (W x H x D)	26.5 mm x 100 mm x 71 mm
Weight	approx. 90 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KM2042">www.beckhoff.com/KM2042</a>



KM2604



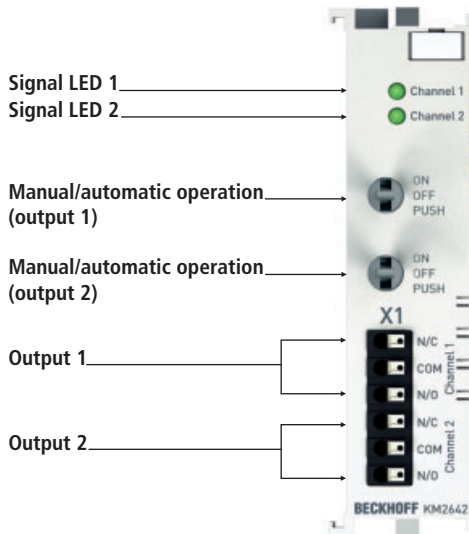
KM2614

## KM2604, KM2614 | 4-channel relay modules 230 V AC, 16 A

The KM2604 and KM2614 terminal modules combine four pluggable power relays in one fieldbus module. The high switching capacity of 16 A at 230 V AC enables direct mains connection of consumers with high current consumption. The relays are positioned at the top and can therefore be exchanged easily. The KM2614 terminal module enables each relay to be manually switched to the ON status. A seal indicates the initial manual operation.

Technical data	KM2604	KM2614
Number of outputs	4 x change-over	
Operation	–	automatic operation/manual operation at the relay
Nominal switching voltage	250 V AC, 30 V DC	
Nominal switching current	16 A	
Minimum switching load	5 mA (10 V DC)	
Electrical isolation	1.5 kV <sub>rms</sub> (K-bus/field potential); 2.5 kV rated surge voltage, overvoltage category III	
Current consumption K-bus	typ. 15 mA	
Current consumption 24 V DC	50 mA for each active relay	
Bit width in the process image	4 outputs	
Operating cycles mech. (min.)	5 x 10 <sup>6</sup>	
Operating cycles electr. (min.)	1 x 10 <sup>6</sup> (1 A AC/250 V AC)	
Dimensions (W x H x D)	99 mm x 100 mm x 62 mm	
Configuration	no address or configuration setting	
Weight	approx. 250 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/KM2604	

Accessories	
ZB2601	relay, 230 V AC, 16 A, coil 24 V, spare part KM2604
ZB2602	relay, manual operation, 230 V AC, 16 A, coil 24 V, spare part KM2614

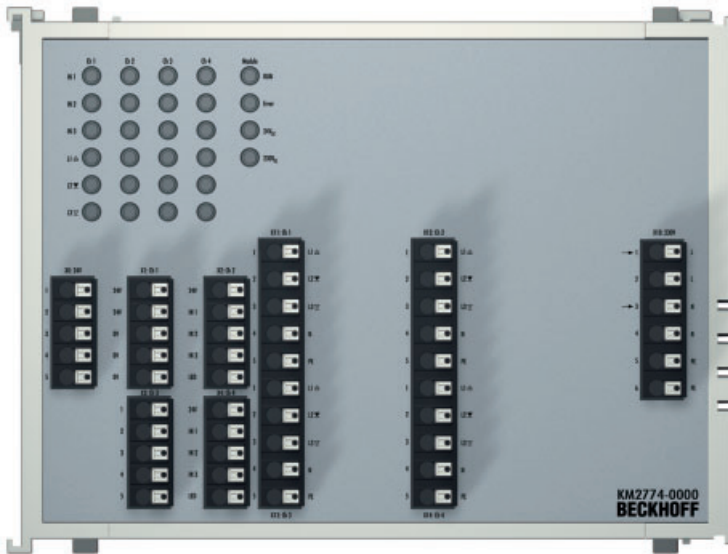


Top view

## KM2642 | 2-channel relay module 230 V AC, 6 A, manual/automatic operation

The digital KM2642 output terminal has two independent relay change-over contacts, which can be used for switching mains current consumers. For each channel a switch enables selection between automatic, manual on, manual off. In automatic mode the logical state of an output bit switches the relay. For manual mode a 24 V supply is required for the Bus Coupler. The output state can be read by the controller.

Technical data	KM2642
Number of outputs	2 x change-over
Switching capacity max.	3 kVA
Switching voltage max.	250 V AC
Switching current max.	6 A AC
Current consumption K-bus	typ. 130 mA
Contact material	AgSnO <sub>2</sub>
Bit width in the process image	2 inputs (status manual, automatic), 2 outputs
Operating cycles	10 <sup>6</sup>
Configuration	no address or configuration setting
Weight	110 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KM2642">www.beckhoff.com/KM2642</a>

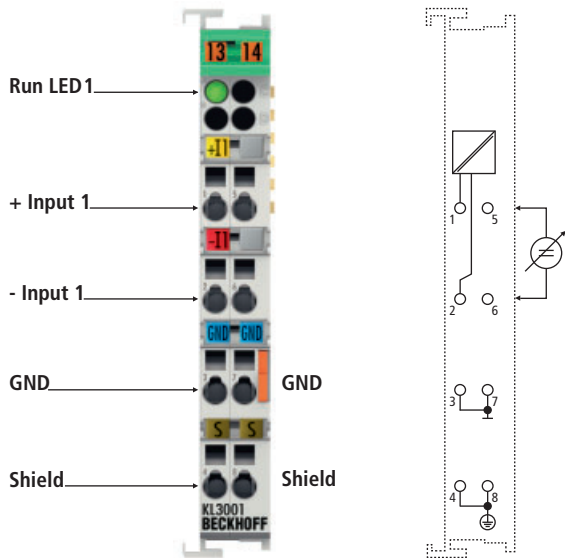


Top view

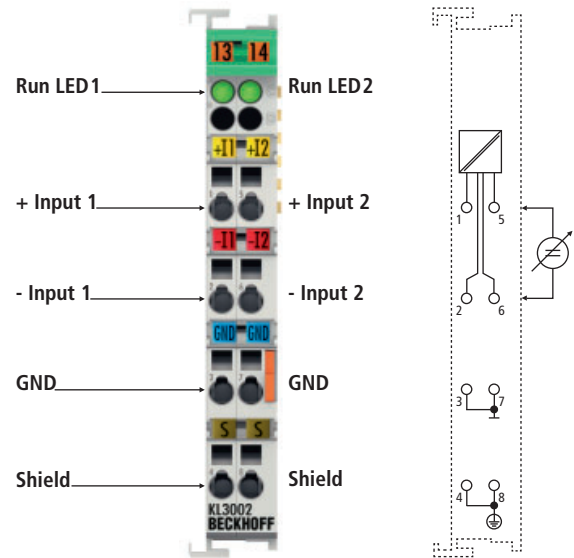
## KM2774 | Triac output for 4 blind motors

The compact KM2774 module enables direct connection of up to four AC motors with reversal of rotation direction and a further travel function. For each motor, three mutually locked Triac outputs with 230 V AC and up to 1.5 A are available. The outputs are protected against overload. An adjustable overcurrent limit protects the motor from damage. The typical control signals can be wired via 24 V inputs. Status and error messages are available via the fieldbus and via LED at the module.

Technical data	KM2774
Number of outputs	4 x 3 make contacts
Nominal voltage	80...230 V AC
Output current	1.5 A
Overcurrent limit	adjustable
Signal input	12 x 24 V DC
Surge voltage protection	> 275 V
Peak current	40 A (16 ms), 3 A (30 s)
Switch-on time	0.1...10 ms, zero crossing
Maximum residual voltage	1.5 V (60 mA...1 A), 150 Ω (< 60 mA)
Electrical isolation	500 V <sub>rms</sub> (K-bus/field voltage), 3,750 V AC (1 min.)
Current consumption K-bus	30 mA
Bit width in the process image	3 byte input/output
Configuration	no address or configuration setting
Dimensions (W x H x D)	132 mm x 100 mm x 38 mm
Weight	approx. 270 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KM2774">www.beckhoff.com/KM2774</a>



Top view, contact assembly, connection



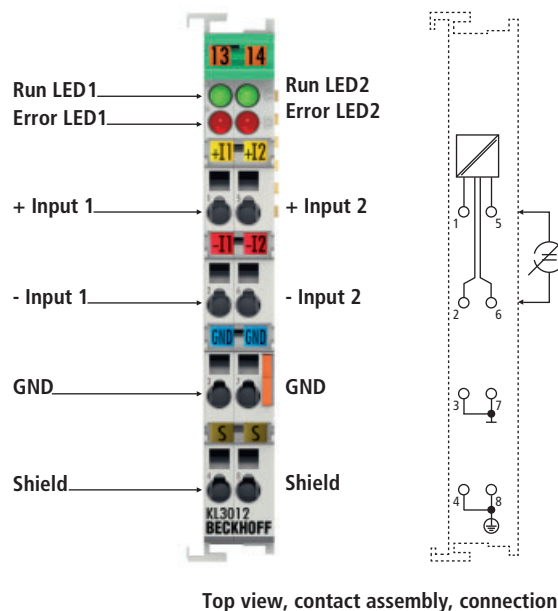
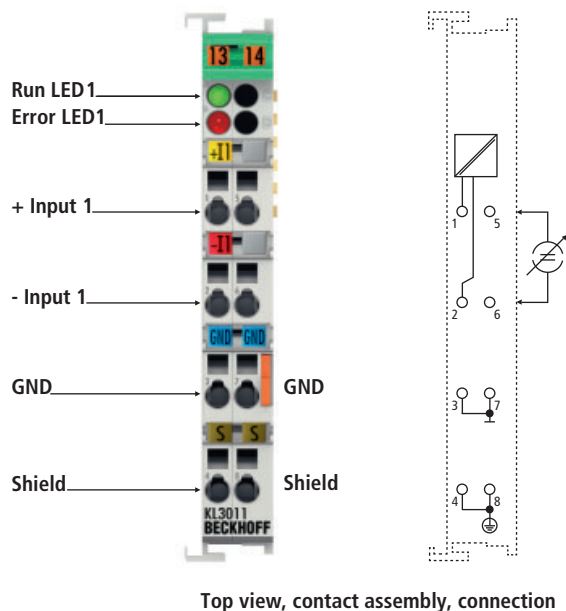
Top view, contact assembly, connection

# KL3001, KL3002 | 1-, 2-channel analog input terminals -10...+10 V

The KL3001 and KL3002 analog input terminals handle signals in the range from -10 to +10 V. The voltage is digitised to a resolution of 12 bits and is transmitted, electrically isolated, to the higher-level automation device. The input channels of the Bus Terminal have differential inputs and possess a common, internal ground potential. The KL3001 is the single-channel variant with differential input and is characterised by its fine granularity and electrical isolation. The KL3002 version combines two channels in one housing. The light emitting diodes give an indication of the data exchange with the Bus Coupler.

Technical data	KL3001   KS3001	KL3002   KS3002
Number of inputs	1	2
Power supply	via the K-bus	
Signal voltage	-10...+10 V	
Internal resistance	> 200 kΩ	
Common-mode voltage U <sub>CM</sub>	35 V max.	
Resolution	12 bits (for 0...10 V range: resolution 11 bits)	
Conversion time	~ 1 ms	~ 2 ms
Measuring error	< ±0.3 % (relative to full scale value)	
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)	
Current consumption K-bus	typ. 65 mA	
Bit width in the process image	input: 1 x 16 bit data (1 x 8 bit control/status optional)	input: 2 x 16 bit data (2 x 8 bit control/status optional)
Configuration	no address or configuration setting	
Weight	approx. 70 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL3001	

Special terminals	
KL3002-0010	Siemens S5 format
KL3002-0011	fast µP, scan time approx. 0.5 ms
KL3002-0050	Siemens S7 format

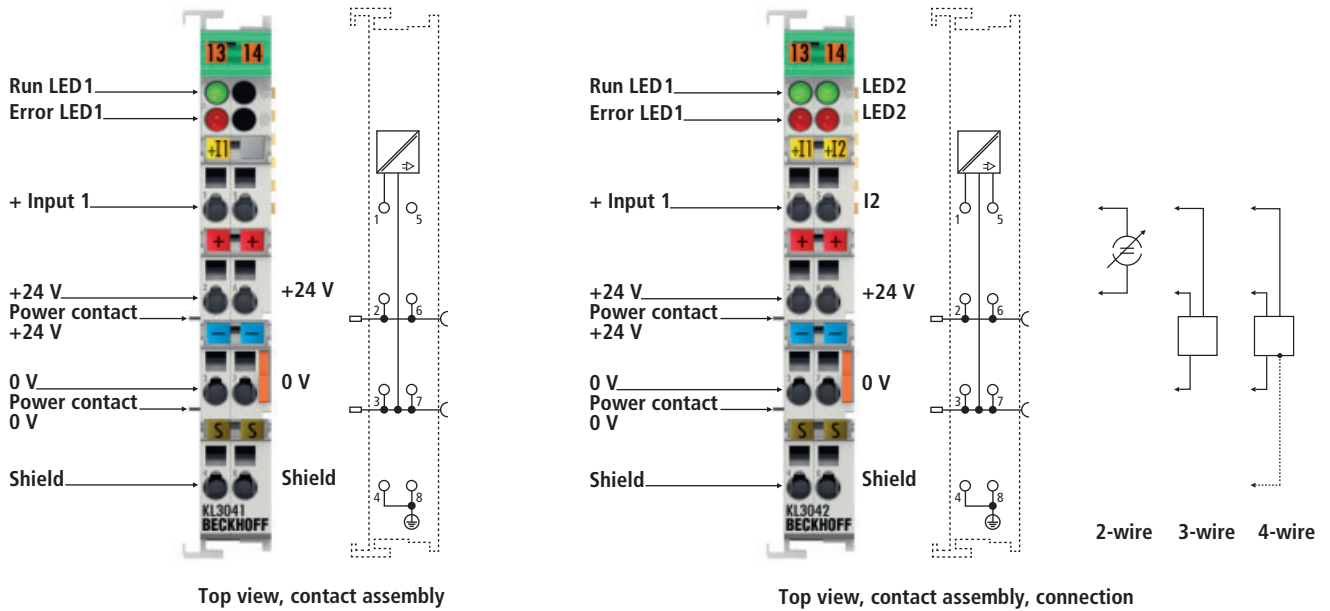


## KL3011/12, KL3021/22 | 1-, 2-channel analog input terminals 0/4...20 mA

The KL3011, KL3012, KL3021 and KL3022 analog input terminals handle signals in the range from 0 to 20 mA or 4 to 20 mA. The current is digitised to a resolution of 12 bits and is transmitted, in an electrically isolated form, to the higher-level automation device. The input channels of the Bus Terminal have differential inputs and possess a common, internal ground potential. The KL3011 and KL3021 are the single-channel variants and are characterised by their fine granularity and electrical isolation. The KL3012 and KL3022 versions combine two channels in one housing. An open lead or overload condition are detected, and the terminal status is relayed to the controller via the K-bus. The run LEDs give an indication of the data exchange with the Bus Coupler. The error LEDs indicate an overload condition and a broken wire.

Technical data	KL3011   KS3011	KL3012   KS3012	KL3021   KS3021	KL3022   KS3022
Number of inputs	1	2	1	2
Power supply	via the K-bus			
Signal current	0...20 mA	0...20 mA	4...20 mA	4...20 mA
Internal resistance	80 Ω + 0.7 V			
Common-mode voltage $U_{CM}$	35 V max.			
Resolution	12 bits			
Conversion time	~ 1 ms	~ 2 ms	~ 1 ms	~ 2 ms
Measuring error	< ±0.3 % (relative to full scale value)			
Surge voltage resistance	35 V DC			
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)			
Current consumption K-bus	typ. 60 mA			
Bit width in the process image	input: 1 x 16 bit data (1 x 8 bit control/status optional)	input: 2 x 16 bit data (2 x 8 bit control/status optional)	input: 1 x 16 bit data (1 x 8 bit control/status optional)	input: 2 x 16 bit data (2 x 8 bit control/status optional)
Weight	70 g			
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 20/variable			
Pluggable wiring	for all KSxxx Bus Terminals			
Further information	www.beckhoff.com/KL3011			

Special terminals	
KL30x2-00xx	for special terminals see page 629



Top view, contact assembly

Top view, contact assembly, connection

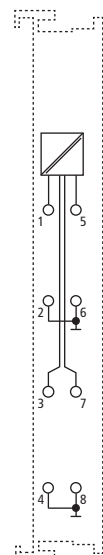
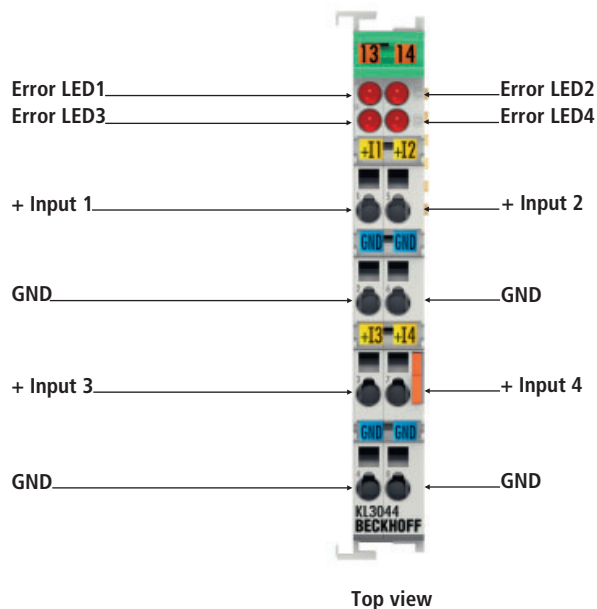
## KL3041/42, KL3051/52 | 1-, 2-channel loop-powered input terminals 0/4...20 mA

The job of the KL3041, KL3042, KL3051 and KL3052 analog input terminals is to supply power to measuring transducers located in the field and to transmit analog measurement signals with electrical isolation to the automation device. The voltage for the sensors is supplied to the terminals via the power contacts. The power contacts can optionally be supplied with operating voltage in the standard way or via a power feed terminal (KL9xxx) with electrical isolation. The input electronics is independent of the supply voltage of the power contacts. The 0 V rail is the reference potential for the inputs. The run LEDs give an indication of the data exchange with the Bus Coupler. The error LEDs indicate an overload condition and a broken wire.

Technical data	KL3041   KS3041	KL3042   KS3042	KL3051   KS3051	KL3052   KS3052
Number of inputs	1	2	1	2
Power supply	24 V DC via the power contacts			
Signal current	0...20 mA	0...20 mA	4...20 mA	4...20 mA
Internal resistance	80 Ω + 0.7 V			
Resolution	12 bits			
Conversion time	~ 1 ms	~ 2 ms	~ 1 ms	~ 2 ms
Measuring error	< ±0.3 % (relative to full scale value)			
Surge voltage resistance	35 V max.			
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)			
Current consumption K-bus	typ. 65 mA			
Bit width in the process image	input: 1 x 16 bit data (1 x 8 bit control/status optional)	input: 2 x 16 bit data (2 x 8 bit control/status optional)	input: 1 x 16 bit data (1 x 8 bit control/status optional)	input: 2 x 16 bit data (2 x 8 bit control/status optional)
Configuration	no address or configuration setting			
Weight	70 g			
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 20/variable			
Pluggable wiring	for all KSxxxx Bus Terminals			
Further information	www.beckhoff.com/KL3041			

Special terminals

KL30x2-00xx for special terminals see page

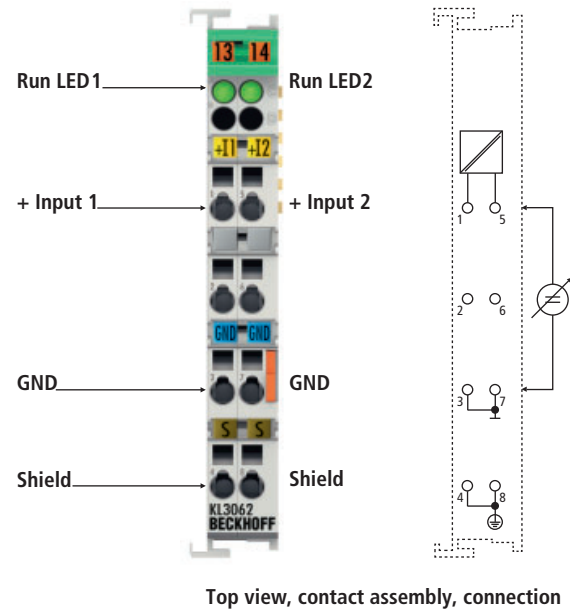
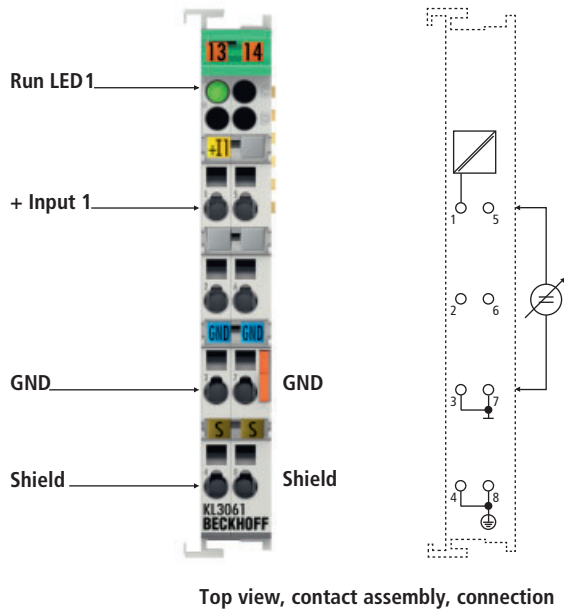


## KL3044, KL3054 | 4-channel analog input terminals 0/4...20 mA

The job of the KL3044 and KL3054 analog input terminals is to transmit analog measurement signals with electrical isolation to the automation device. The input electronics is independent of the supply voltage of the power contacts. The ground connection is the reference potential for the inputs. The error LEDs indicate an overload condition, additionally, the KL3054 indicates a broken wire. The KL3044 and KL3054 versions combine four channels in one housing.

Technical data	KL3044   KS3044	KL3054   KS3054
Number of inputs	4	
Signal current	0...20 mA	4...20 mA
Internal resistance	80 Ω + 0.7 V	
Resolution	12 bits	
Conversion time	~ 4 ms	
Measuring error	< ±0.3 % (relative to full scale value)	
Surge voltage resistance	35 V max.	
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)	
Current consumption K-bus	typ. 65 mA	typ. 75 mA
Bit width in the process image	input: 4 x 16 bit data (4 x 8 bit control/status optional)	
Configuration	no address or configuration setting	
Weight	70 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL3044	
Special terminals		
KL3054-0050	Siemens S7 format	





## KL3061, KL3062 | 1-, 2-channel analog input terminals 0...10 V

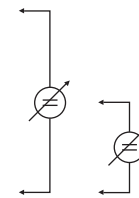
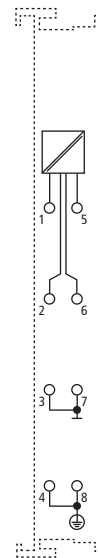
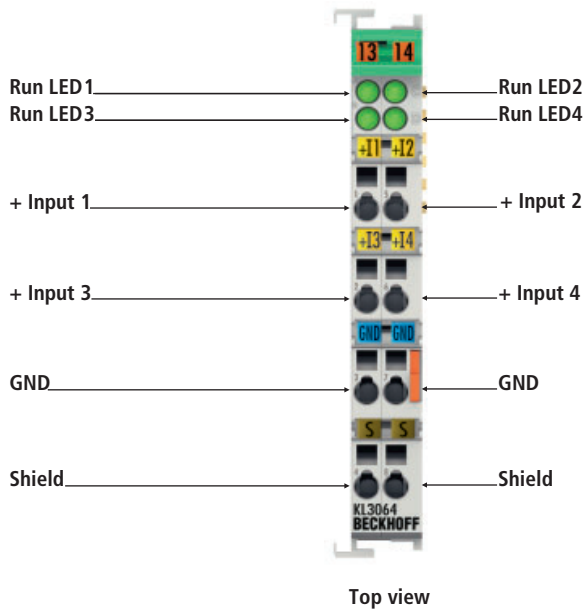
The KL3061 and KL3062 analog input terminals handle signals in the range from 0 to 10 V. The voltage is digitised to a resolution of 12 bits and is transmitted, electrically isolated, to the higher-level automation device. The input channels of a Bus Terminal have a common ground potential, the reference ground. The KL3061 is the single-channel variant and is characterised by its fine granularity and electrical isolation. The KL3062 version combines two channels in one housing. The run LEDs give an indication of the data exchange with the Bus Coupler.

Technical data	KL3061   KS3061	KL3062   KS3062
Number of inputs	1 (single-ended)	2 (single-ended)
Power supply	via the K-bus	
Signal voltage	0...10 V	
Internal resistance	> 130 kΩ	
Resolution	12 bits	
Conversion time	~ 1 ms	~ 2 ms
Measuring error	< ±0.3 % (relative to full scale value)	
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)	
Current consumption K-bus	typ. 60 mA	
Bit width in the process image	input: 1 x 16 bit data (1 x 8 bit control/status optional)	input: 2 x 16 bit data (2 x 8 bit control/status optional)
Configuration	no address or configuration setting	
Weight	approx. 60 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL3061	

### Special terminals

KL3062-00xx for special terminals see page

630

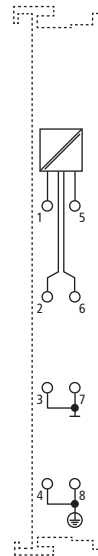
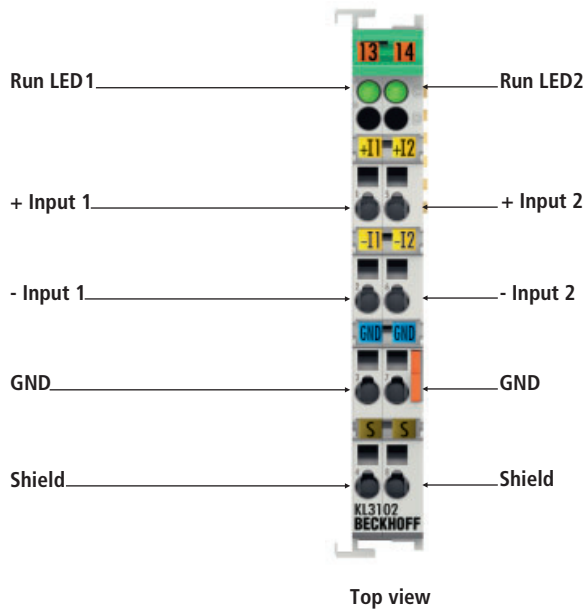


## KL3064 | 4-channel analog input terminal 0...10 V

The KL3064 analog input terminal handles signals in the range from 0 to 10 V. The voltage is digitised to a resolution of 12 bits and is transmitted, electrically isolated, to the higher-level automation device. The input channels of a Bus Terminal have a common ground potential. The KL3064 combines four channels in one housing. The run LEDs give an indication of the data exchange with the Bus Coupler.

Technical data	KL3064   KS3064
Number of inputs	4 (single-ended)
Power supply	via the K-bus
Signal voltage	0...10 V
Internal resistance	> 130 k $\Omega$
Resolution	12 bits
Conversion time	~ 4 ms
Measuring error	< $\pm 0.3$ % (relative to full scale value)
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)
Current consumption K-bus	typ. 85 mA
Bit width in the process image	input: 4 x 16 bit data (4 x 8 bit control/status optional)
Configuration	no address or configuration setting
Weight	approx. 80 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL3064">www.beckhoff.com/KL3064</a>

Special terminals	
KL3064-0010	Siemens S5 format
KL3064-0011	voltage level 0...20 V
KL3064-0050	Siemens S7 format

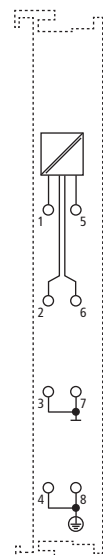
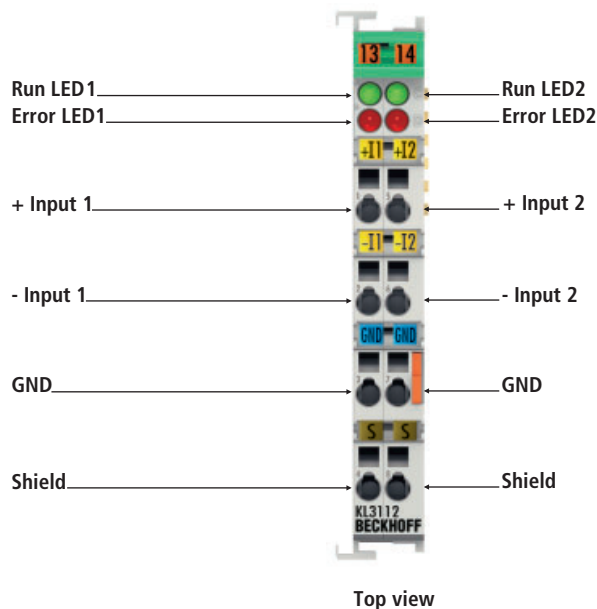


## KL3102 | 2-channel analog input terminal -10...+10 V

The KL3102 analog input terminal handles signals in the range from -10 to +10 V. The voltage is digitised to a resolution of 16 bits and is transmitted, electrically isolated, to the higher-level automation device. The input channels of one Bus Terminal have differential inputs and possess a common, internal ground potential. The KL3102 combines two channels in one housing. The two light emitting diodes give an indication of the data exchange with the Bus Coupler.

Technical data	KL3102   KS3102
Number of inputs	2
Power supply	via the K-bus
Signal voltage	-10...+10 V
Internal resistance	> 200 kΩ
Common-mode voltage $U_{CM}$	35 V max.
Resolution	16 bits (for 0...10 V range: resolution 15 bits)
Conversion time	~ 140 ms, configurable to 2 ms
Filter	50 Hz, configurable
Measuring error	< ±0.3 % (relative to full scale value)
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)
Current consumption K-bus	typ. 65 mA
Bit width in the process image	input: 2 x 16 bit data (2 x 8 bit control/status optional)
Configuration	no address or configuration setting
Weight	70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL3102">www.beckhoff.com/KL3102</a>

Special terminals	
KL3102-0050	Siemens S7 format

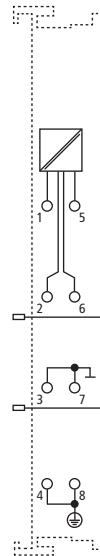
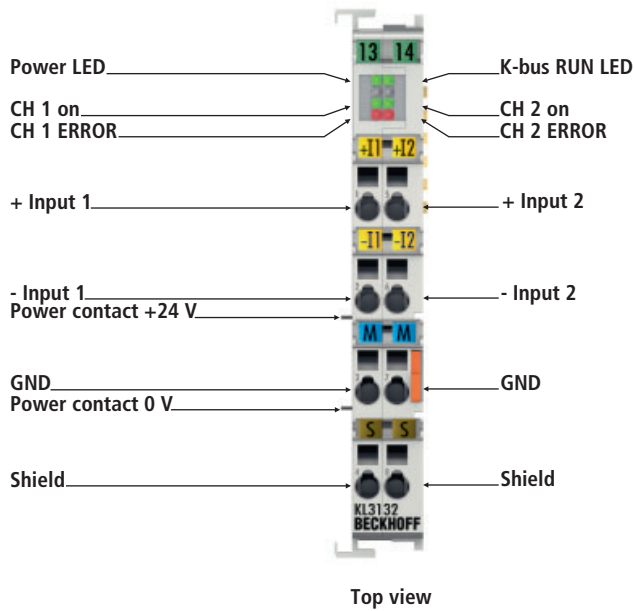


## KL3112, KL3122 | 2-channel analog input terminals 0/4...20 mA

The KL3112 and KL3122 analog input terminals handle signals in the range from 0 to 20 mA and 4 to 20 mA. The current is digitised to a resolution of 16 bits (the default is 15 bits), and is transmitted, in an electrically isolated form, to the higher-level automation device. The input channels of the Bus Terminal have differential inputs and possess a common, internal ground potential. The KL3112/KL3122 version combines two channels in a housing. An open lead or overload condition are detected, and the terminal status is relayed to the controller via the K-bus. The run LEDs give an indication of the data exchange with the Bus Coupler. The error LEDs indicate an overload condition.

Technical data	KL3112   KS3112	KL3122   KS3122
Number of inputs	2	
Power supply	via the K-bus	
Signal current	0...20 mA	4...20 mA
Internal resistance	50 Ω typ. shunt, load: 60 Ω + diode voltage	
Common-mode voltage $U_{CM}$	35 V max.	
Resolution	15 bit, configurable to 16 bit	
Conversion time	~ 140 ms, configurable to 2 ms	
Filter	50 Hz, configurable	
Measuring error	< ±0.3 % (relative to full scale value)	
Surge voltage resistance	35 V DC	
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)	
Current consumption K-bus	typ. 60 mA	
Bit width in the process image	input: 2 x 16 bit data (2 x 8 bit control/status optional)	
Configuration	no address or configuration setting	
Weight	70 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL3112	

Special terminals	
KL31x2-0050	for special terminals see page 630



Contact assembly



Connection

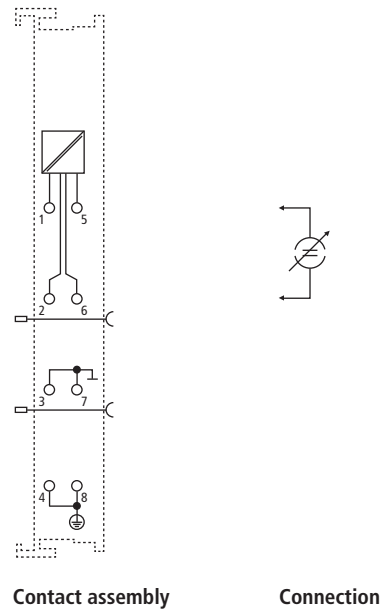
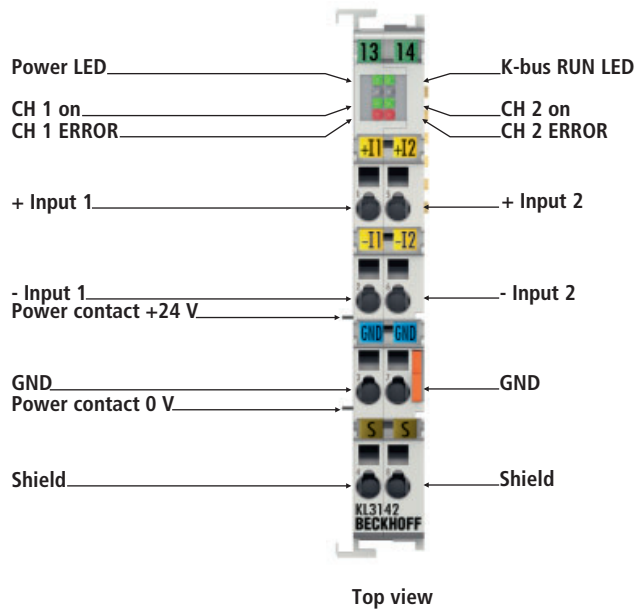
## KL3132/62/72/82 | 2-channel analog input terminals $\pm 2$ V, 0...2 V, $\pm 10$ V, 0...10 V (accuracy 0.05 %)

The analog input terminals KL3132, KL3162, KL3172 and KL3182 process signals in the range of  $\pm 2$  V, 0 to 2 V,  $\pm 10$  V or 0 to 10 V. The voltage is digitised to a resolution of 16 bits and is transmitted, electrically isolated, to the higher-level automation device. The input channels of one Bus Terminal have differential inputs and a common, internal ground potential. With their high measurement accuracy of  $\pm 0.05$  % (relative to full scale value), these terminals are optimised for high-precision control processes, such as dosing, filling, or quality assurance. The Bus Terminals combine two channels within a housing. LEDs indicate data exchange with the Bus Coupler.

Technical data	KL3132   KS3132	KL3162   KS3162	KL3172   KS3172	KL3182   KS3182
Number of inputs	2			
Power supply	via the K-bus			
Signal voltage	-10...+10 V	0...10 V	0...2 V	-2...+2 V
Internal resistance	> 200 k $\Omega$			
Common-mode voltage $U_{CM}$	35 V max.			
Resolution	16 bits			
Conversion time	~ 140 ms, configurable			
Filter	50 Hz, configurable			
Measuring error	< $\pm 0.05$ % (relative to full scale value)			
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)			
Current consumption K-bus	typ. 85 mA			
Bit width in the process image	input: 2 x 16 bit data (2 x 8 bit control/status optional)			
Weight	70 g			
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 20/variable			
Pluggable wiring	for all KSxxxx Bus Terminals			
Further information	www.beckhoff.com/KL3132			

### Special terminals

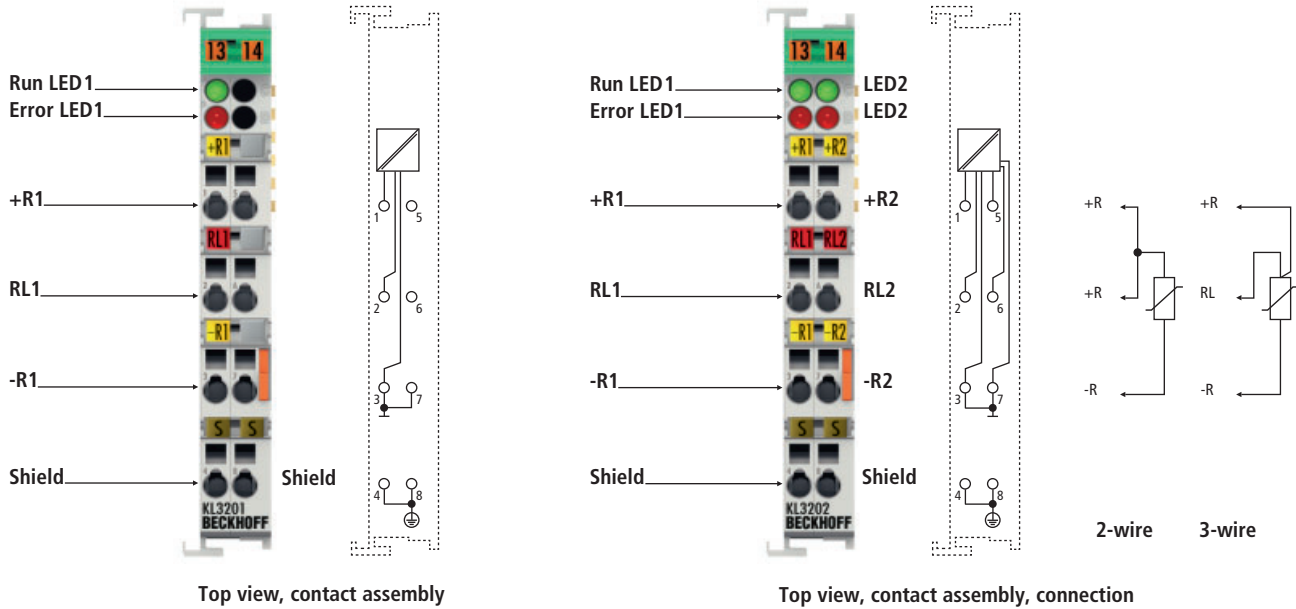
KL3172-0500	0...500 mV
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## KL3142, KL3152 | 2-channel analog input terminals 0/4...20 mA (accuracy 0.05 %)

The KL3142 and KL3152 analog input terminals handle signals in the range between 0 and 20 mA and between 4 and 20 mA respectively. The current is digitised to a resolution of 16 bits (the default is 15 bits), and is transmitted, in an electrically isolated form, to the higher-level automation device. The input channels of the Bus Terminals have differential inputs and a common, internal ground potential. With their high measurement accuracy of  $\pm 0.05\%$  (relative to full scale value), these terminals are optimised for high-precision control processes, such as dosing, filling, or quality assurance. The KL3142 and KL3152 versions combine two channels in a single housing. An open lead or overload condition are detected, and the terminal status is relayed to the controller via the K-bus. The run LEDs indicate data exchange with the Bus Coupler, the error LEDs indicate overload.

Technical data	KL3142   KS3142	KL3152   KS3152
Number of inputs	2	
Power supply	via the K-bus	
Signal current	0...20 mA	4...20 mA
Internal resistance	1 $\Omega$ typ. shunt	
Common-mode voltage $U_{CM}$	$\pm 10$ V max.	
Conversion time	$\sim 140$ ms, configurable	
Filter	50 Hz, configurable	
Resolution	16 bits	
Measuring error	$< \pm 0.05\%$ (relative to full scale value)	
Surge voltage resistance	35 V DC	
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)	
Current consumption K-bus	typ. 85 mA	
Bit width in the process image	input: 2 x 16 bit data (2 x 8 bit control/status optional)	
Weight	70 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL3142	



Top view, contact assembly

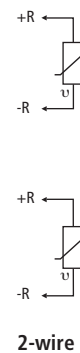
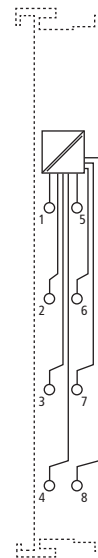
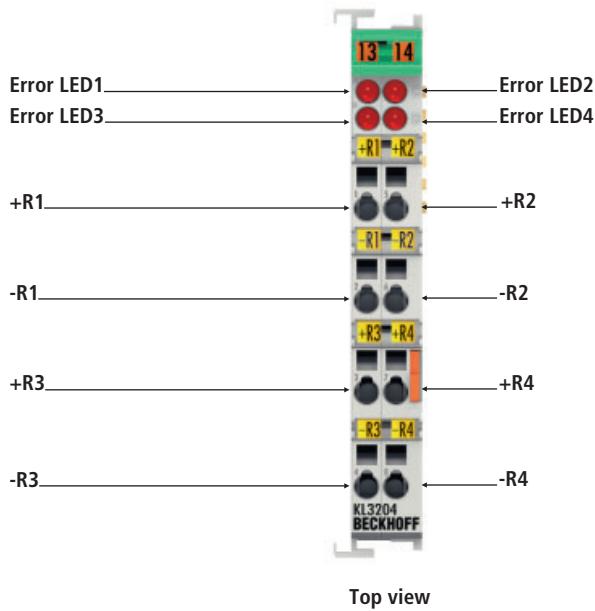
Top view, contact assembly, connection

## KL3201, KL3202 | 1-, 2-channel input terminals PT100 (RTD)

The KL3201 and KL3202 analog input terminals allow resistance sensors to be connected directly. The Bus Terminal's circuitry can operate the sensors using 2-wire or 3-wire connection techniques. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The Bus Terminals standard settings are: resolution 0.1 °C in the temperature range of PT100 sensors in 3-wire connection. The run LEDs give an indication of the data exchange with the Bus Coupler. The error LEDs indicate sensor faults (e.g. a broken wire).

Technical data	KL3201   KS3201	KL3202   KS3202
Number of inputs	1	2
Power supply	via the K-bus	
Sensor types	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 1Ω...1.2/5 kΩ)	
Connection method	2- or 3-wire (default: 3-wire)	
Temperature range	-250...+850 °C (PT sensors); -60...+250 °C (Ni sensors)	
Resolution	0.1 °C per digit	
Conversion time	~ 200 ms	~ 250 ms
Measuring current	typ. 0.5 mA	
Measuring error	< ±1 °C	
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)	
Current consumption K-bus	typ. 60 mA	
Bit width in the process image	input: 1 x 16 bit data (1 x 8 bit control/status optional)	input: 2 x 16 bit data (2 x 8 bit control/status optional)
Configuration	no address setting, configuration via Bus Coupler or controller	
Weight	70 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL3201	

Special terminals	
KL3202-00xx	for special terminals see page



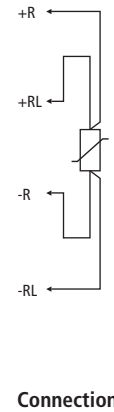
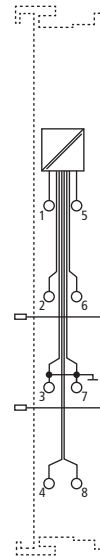
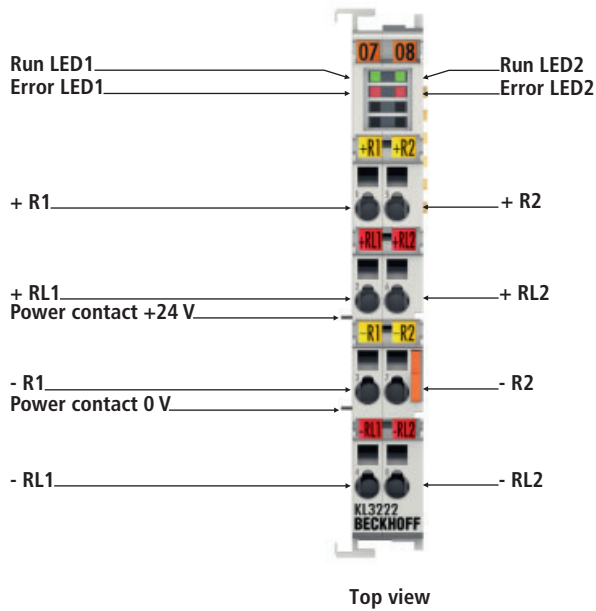
## KL3204 | 4-channel input terminal PT100 (RTD)

The KL3204 analog input terminal allows resistance sensors to be connected directly. The Bus Terminal's circuitry can operate the sensors using 2-wire connection techniques. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The Bus Terminals standard settings are: resolution 0.1 °C in the temperature range of PT100 sensors. The error LEDs indicate sensor faults (e.g. a broken wire). The KL3204 version combines four channels in one housing.

Technical data	KL3204   KS3204
Number of inputs	4
Power supply	via the K-bus
Sensor types	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 1Ω...1.2/5 kΩ)
Connection method	2-wire
Temperature range	-250...+850 °C (PT sensors); -60...+250 °C (Ni sensors)
Resolution	0.1 °C per digit
Conversion time	~ 250 ms
Measuring current	typ. 0.5 mA
Measuring error	< ±1 °C
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)
Current consumption K-bus	typ. 60 mA
Bit width in the process image	input: 4 x 16 bit data (4 x 8 bit control/status optional)
Configuration	no address setting, configuration via Bus Coupler or controller
Weight	70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL3204">www.beckhoff.com/KL3204</a>

Special terminals	
KL3204-0014	PT1000
KL3204-0021	PT1000 in Siemens S5 format
KL3204-0025	Ni1000, 4-channel
KL3204-0029	Ni1000 per Landis&Stefa characteristic curve (Siemens, 100° corresponds to 1,500 Ω)



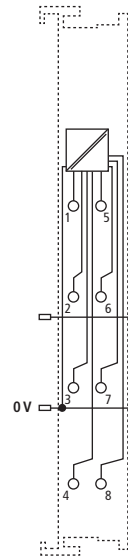
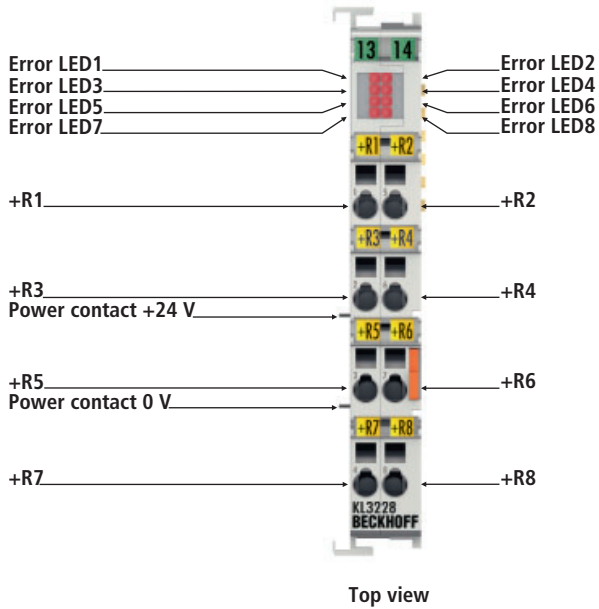


## KL3222 | 2-channel input terminal PT100 (RTD) for 4-wire connection, high-precision

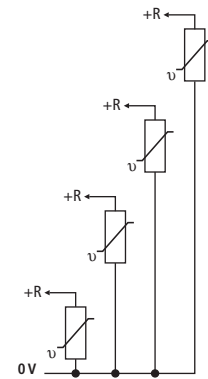
The KL3222 analog input terminal allows resistance sensors to be connected directly. The Bus Terminal's circuitry can operate the sensors using 2-, 3- or 4-wire connection techniques. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The Bus Terminal's standard settings are: resolution 0.01 °C in the temperature range of PT100 sensors in 4-wire connection. The run LEDs give an indication of the data exchange with the Bus Coupler. The error LEDs indicate sensor faults (e.g. a broken wire).

Technical data	KL3222   KS3222
Number of inputs	2
Power supply	via the K-bus
Sensor types	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω...1.2/5 kΩ)
Connection method	2-, 3-, 4-wire (default: 4-wire)
Temperature range	-200...+850 °C (PT sensors); -60...+250 °C (Ni sensors); -200...+320 °C (high-precision)
Conversion time	typ. 50 ms
Measuring current	typ. 0.5 mA
Resolution	0.01 °C per digit
Measuring error	0.1 °C at 40 °C ambient temperature, 4-wire connection, PT100 sensors and 50 Hz filter
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)
Current consumption K-bus	typ. 60 mA
Bit width in the process image	input: 2 x 16 bit data (2 x 8 bit control/status optional)
Configuration	no address setting, configuration via Bus Coupler or controller
Weight	70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL3222">www.beckhoff.com/KL3222</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/KL3222](http://www.beckhoff.com/KL3222)



Contact assembly

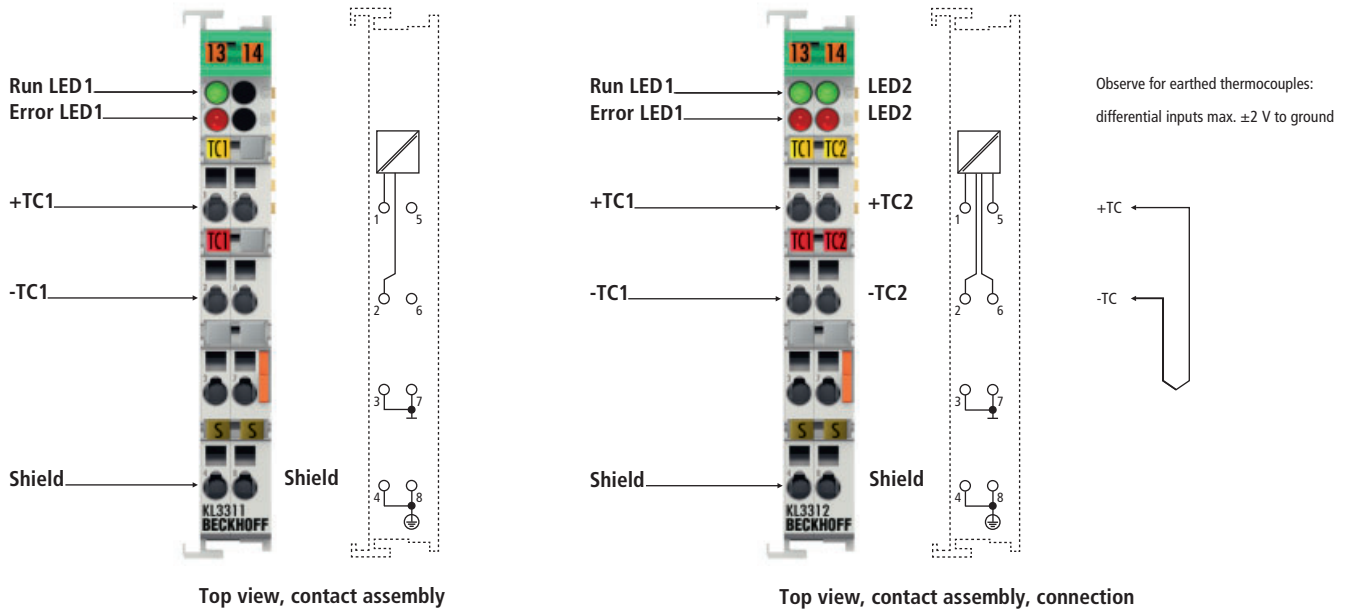


Connection

## KL3228 | 8-channel input terminal PT1000, Ni1000 (RTD)

The KL3228 analog input terminal enables connection of eight resistance sensors. The Bus Terminal's circuitry can handle sensors using the 1-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The Bus Terminal's standard settings are: resolution 0.1 °C within the temperature range of Ni1000 sensors. The error LEDs indicate sensor faults (e.g. a broken wire).

Technical data	KL3228   KS3228
Number of inputs	8
Power supply	via the K-bus
Sensor types	PT1000, Ni1000, PTC
Connection method	1-wire
Temperature range	-50...+150 °C (PT sensors); -50...+150 °C (Ni sensors)
Conversion time	~ 750 ms
Measuring current	~ 0.5 mA typ.
Resolution	0.1 °C per digit
Measuring error	~ ±1 °C, depending on wiring
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)
Current consumption K-bus	typ. 85 mA
Bit width in the process image	input: 8 x 16 bit data (8 x 8 bit control/status optional)
Configuration	no address setting, configuration via Bus Coupler or controller
Weight	75 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL3228">www.beckhoff.com/KL3228</a>



Top view, contact assembly

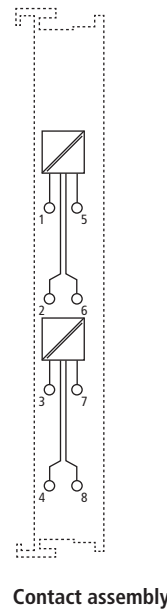
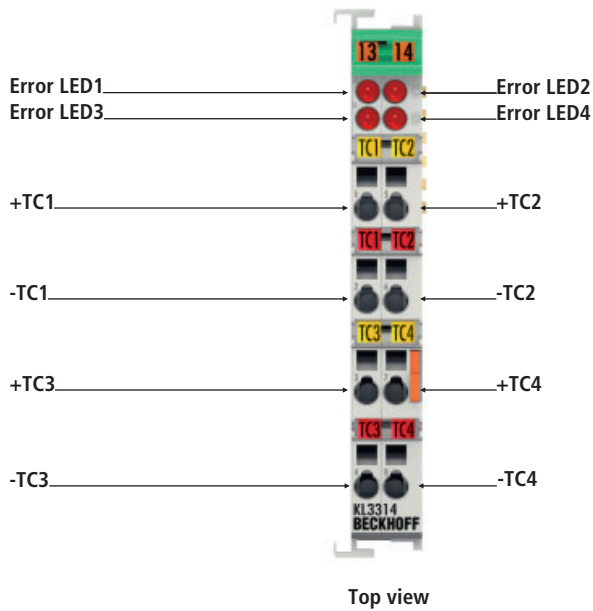
Top view, contact assembly, connection

# KL3311, KL3312 | 1-, 2-channel thermocouple input terminals with open-circuit recognition

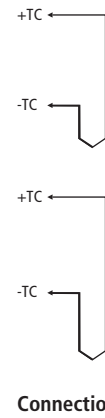
The KL3311 and KL3312 analog input terminals allow thermocouples to be connected directly. The Bus Terminal's circuitry can operate thermocouple sensors using the 2-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The error LEDs indicate a broken wire. Compensation for the cold junction is made through an internal temperature measurement at the terminals. The KL3311/KL3312 can also be used for mV measurement.

Technical data	KL3311	KL3312
Number of inputs	1	2
Power supply	via the K-bus	
Thermocouple sensor types	types J, K, L, B, E, N, R, S, T, U (default setting type K), mV measurement	
Connection method	2-wire	
Temperature range	in the range defined in each case for the sensor (default setting: type K; -100...+1,370 °C)	
Resolution	0.1 °C per digit	
Conversion time	~ 200 ms	~ 250 ms
Wiring fail indication	yes	
Measuring error	< ±0.5 % (relative to full scale value)	
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)	
Current consumption K-bus	typ. 65 mA	
Bit width in the process image	input: 1 x 16 bit data (1 x 8 bit control/status optional)	input: 2 x 16 bit data (2 x 8 bit control/status optional)
Configuration	no address setting, configuration via Bus Coupler or controller	
Weight	70 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/KL3311	

Special terminals	
KL3312-xxxx	for special terminals see page



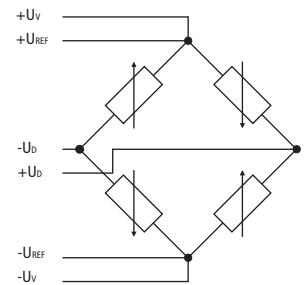
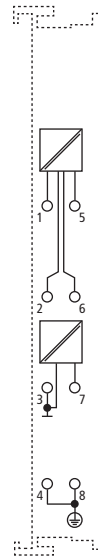
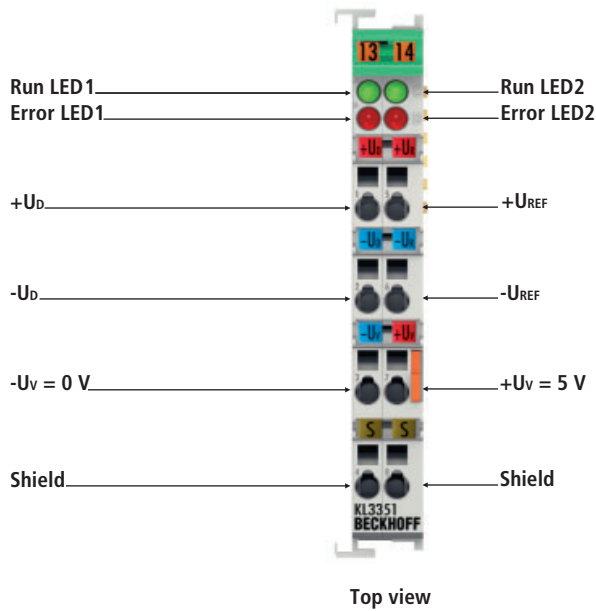
Observe for earthed thermocouples:  
differential inputs max.  $\pm 2$  V to ground



## KL3314 | 4-channel thermocouple input terminal with open-circuit recognition

The KL3314 analog input terminal allows four thermocouples to be connected directly. The Bus Terminal's circuitry can operate thermocouple sensors using the 2-wire technique. Linearisation over the full temperature range, which can be selected freely, is realised with the aid of a microprocessor. The error LEDs indicate a broken wire. Compensation for the cold junction is made through an internal temperature measurement at the terminals. The KL3314 can also be used for mV measurement.

Technical data	KL3314
Number of inputs	4
Power supply	via the K-bus
Thermocouple sensor types	types J, K, L, B, E, N, R, S, T, U (default setting type K), mV measurement
Connection method	2-wire
Temperature range	in the range defined in each case for the sensor (default setting: type K; $-100 \dots +1,370$ °C)
Conversion time	~ 250 ms
Wiring fail indication	yes
Resolution	0.1 °C per digit
Measuring error	$< \pm 0.5$ % (relative to full scale value)
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)
Current consumption K-bus	typ. 75 mA
Bit width in the process image	input: 4 x 16 bit data (4 x 8 bit control/status optional)
Configuration	no address setting, configuration via Bus Coupler or controller
Weight	75 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/kl3314">www.beckhoff.com/kl3314</a>



The supply voltage  $U_v$  can be drawn from the terminal or can be supplied from an external source. The terminal supplies 5 V. The maximum input voltage  $U_{REF}$  is limited to 10 V.

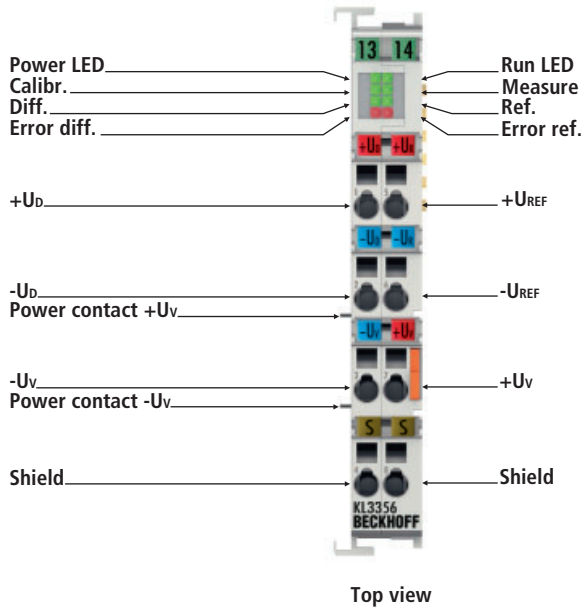
## KL3351 | 1-channel resistor bridge terminal (strain gauge)

The KL3351 analog input terminal permits direct connection of a resistor bridge. The bridge voltage,  $U_D$ , and the supply voltage,  $U_{REF}$ , to the bridge are digitised with a 16 bit resolution, and are transmitted along an electrically isolated channel to the supervising automation system. The input channels are available in the form of two 16 bit values for further processing. The resulting measurement can be calculated from the formula: measurement =  $U_D/U_{REF}$ . Precise acquisition of the supply voltage along with the bridge voltage compensates for long-term and temperature drift.

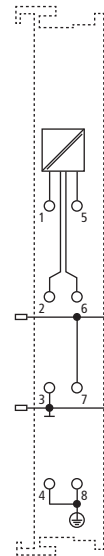
Technical data	KL3351   KS3351
Number of inputs	2, for one resistor bridge
Power supply	via the K-bus
Signal voltage $U_D$	-16...+16 mV, configurable
Signal voltage $U_{REF}$	-10...+10 V, configurable
Internal resistance	> 200 k $\Omega$ ( $U_{REF}$ ), > 1 M $\Omega$ ( $U_D$ )
Power supply $U_v$	5 V, max. 20 mA
Resolution	16 bits
Conversion time	< 250 ms, configurable
Filter	50 Hz, configurable
Measuring error	< $\pm 0.1$ % (relative to full scale value)
Current consumption K-bus	typ. 65 mA
Bit width in the process image	input: 2 x 16 bit data (2 x 8 bit control/status optional)
Weight	70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL3351">www.beckhoff.com/KL3351</a>

### Special terminals

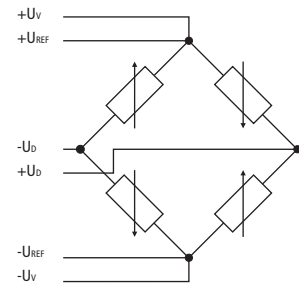
KL3351-0001	with faster measurement time approx. 10 ms
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Top view



Contact assembly



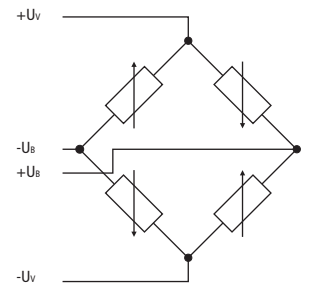
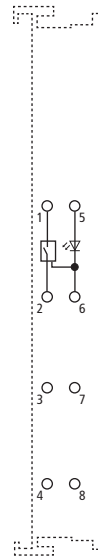
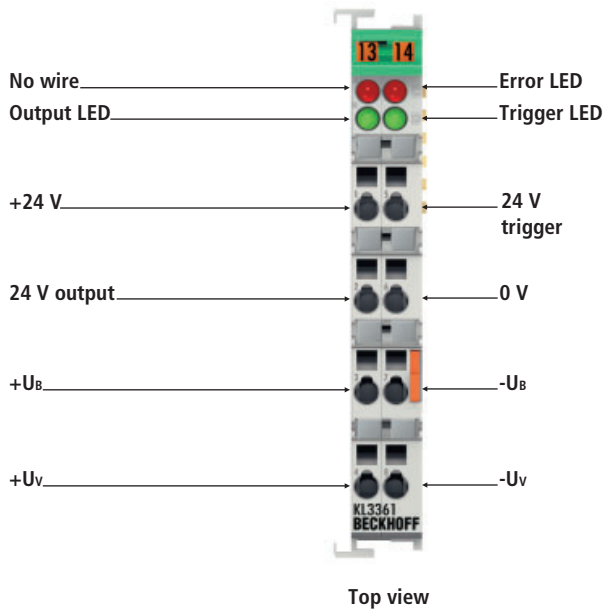
The supply voltage  $U_v$  is supplied from an external source (e.g. KL9512). The maximum input voltage  $U_{REF}$  is limited to 12 V.

Connection

## KL3356 | 1-channel accurate resistor bridge evaluation

The KL3356 analog input terminal permits direct connection of a resistor bridge. An improved input circuit makes the KL3356 significantly more accurate than the KL3351. The ratio between the bridge voltage  $U_D$  and the supply voltage  $U_{REF}$  is determined in the input circuit. In order to achieve good long-term stability, the complete circuit is re-calibrated at least every three minutes. This procedure can be synchronised by the control in order to prevent the calibration leading to a delay in the production process.

Technical data	KL3356   KS3356
Number of inputs	2, for one resistor bridge
Power supply	via the K-bus
Signal voltage $U_D$ , $U_{REF}$	-20...+20 mV, -12...+12 V
Internal resistance	> 200 k $\Omega$ ( $U_{REF}$ ), > 1 M $\Omega$ ( $U_D$ )
Conversion time	< 250 ms, configurable
Resolution	16 bits
Measuring error	< $\pm 0.01$ % (relative to full scale value), self-calibration
Current consumption K-bus	typ. 85 mA
Bit width in the process image	input: 2 x 16 bit data (2 x 8 bit control/status optional)
Weight	75 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL3356">www.beckhoff.com/KL3356</a>

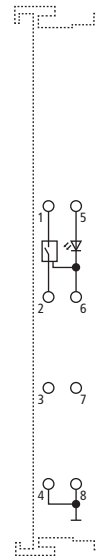
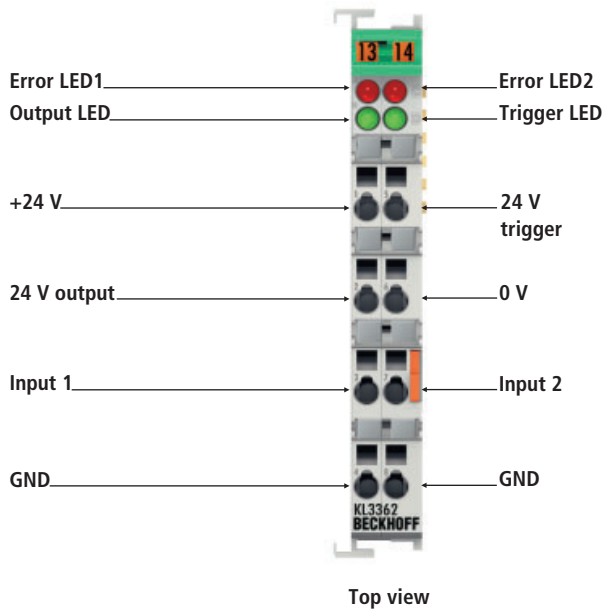


The supply voltage  $U_V$  can be drawn from the terminal or can be supplied from an external source. The terminal supplies 5 V. The maximum input voltage  $U$  is limited to 10 V.

## KL3361 | 1-channel oscilloscope terminal -20...+20 mV

The KL3361 analog input terminal makes it possible to perform non-central preliminary processing of analog values. The input values are digitised with a 14 bit resolution and written into an internal memory. An efficient processor can pre-process the values. Limit values and maximum and minimum values can be determined or monitored. The KL3361 can also carry out envelope curve monitoring. A trigger starts the cyclical processes. The result or all the measured values are transported to the higher-level automation unit.

Technical data	KL3361   KS3361
Number of inputs	1 analog, 1 trigger
Power supply	via the K-bus
Signal voltage $U_{IN}$	-20...+20 mV
Internal resistance	> 1 M $\Omega$ ( $U_B$ )
Supply voltage	5 V DC, max. 20 mA
Sampling rate	< 100 $\mu$ s, configurable (10 $\mu$ s with fast sampling mode)
Resolution	max. 15 bits
Measuring error	< $\pm 1$ % (relative to full scale value)
Internal memory	32 kbytes
Current consumption K-bus	120 mA with external DMS power supply, 140 mA with internal DMS power supply from terminal (4 x 350 $\Omega$ )
Bit width in the process image	input/output: 1 x 16 bit data (1 x 8 bit status, 1 x 8 bit control)
Weight	75 g
Operating/storage temperature	0...+55 $^{\circ}$ C/-25...+85 $^{\circ}$ C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL3361">www.beckhoff.com/KL3361</a>

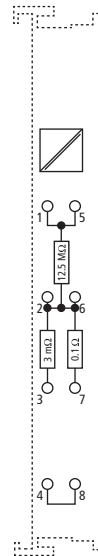
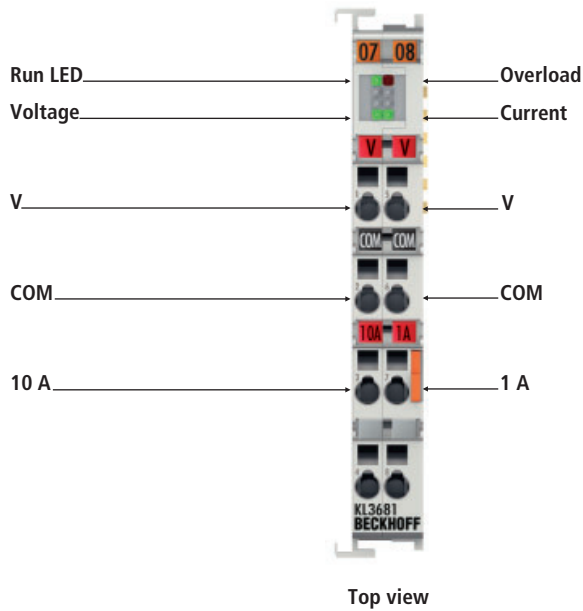


## KL3362 | 2-channel oscilloscope terminal -10...+10 V

The KL3362 analog input terminal makes it possible to perform non-central preliminary processing of analog values. The input values are digitised with a 14 bit resolution and written into an internal memory. An efficient processor can pre-process the values. Limit values and maximum and minimum values can be determined or monitored. The KL3362 can also carry out envelope curve monitoring. A trigger starts the cyclical processes. The result or all the measured values are transported to the higher-level automation unit.

Technical data	KL3362   KS3362
Number of inputs	2 analog, 1 trigger
Power supply	via the K-bus
Signal voltage	-10...+10 V
Internal resistance <small>E1-GND, E2-GND</small>	> 500 kΩ
Conversion time	< 100 μs, configurable (10 μs with fast sampling mode)
Resolution	14 bits + sign
Measuring error	< ±0.5 % (relative to full scale value)
Internal memory	32 kbytes
Trigger	configurable
Current consumption K-bus	typ. 120 mA
Bit width in the process image	input/output: 2 x 16 bit data (2 x 8 bit control/status per channel)
Weight	75 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL3362">www.beckhoff.com/KL3362</a>





Top view

Contact assembly

## KL3681 | Digital multimeter terminal

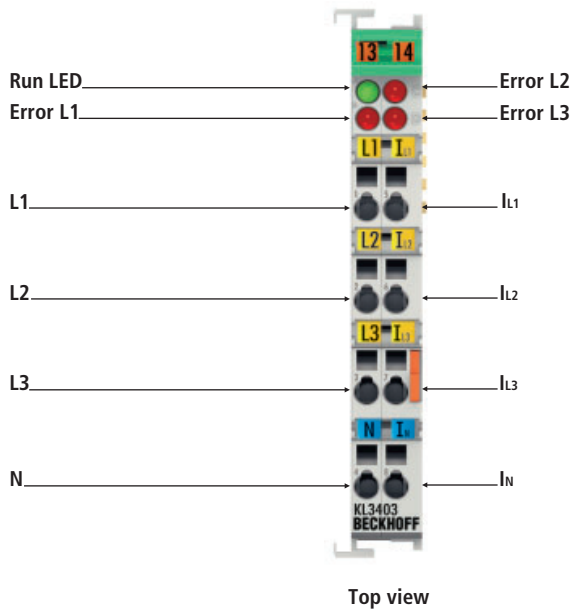
The KL3681 Bus Terminal enables measurement of currents and voltages in a wide input range. The measuring ranges are switched automatically, as usual in advanced digital multimeters. For current measurements, two current paths are available, one of which is a high-current path for up to 10 A. The current and the voltage measurement facility can be used for DC and AC. The alternating parameters are output as true RMS values. The measurement readings can be read and processed with commercially available fieldbuses. At the same time, the KL3681 enables the measuring type and range to be set via the bus.

Excellent interference immunity is achieved through the fully electrically isolated design of the electronic measuring system and the dual-slope conversion system. High precision and simple, high-impedance measurement from 300 mV to 300 V allow the Bus Terminal to be used like a modern digital multimeter.

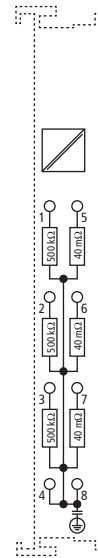
In measuring applications in particular, the voltage to be expected is often not yet known during the planning phase. Automatic adjustment of the measurement range simplifies use and reduces stock levels. The selected measuring type and overload are indicated by LEDs.

Technical data	KL3681   KS3681
Measured values	current, voltage
Measuring voltage	300 mV, 3 V, 30 V, 300 V
Measuring current	100 mA, 1 A and 10 A via high-current path
Resolution	18 bit + sign in each measurement range
Measuring error	0.01 % DC voltage measurement at 25 °C
Measuring procedure	DC with arithmetic averaging, AC with true RMS value calculation
Update time	0.5 s, 1 s for measuring range selection
Electrical isolation	1,500 V <sub>rms</sub> (terminal/K-bus)
Current consumption K-bus	100 mA
Bit width in the process image	32 bit data, 8 bit control/status
Weight	approx. 70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL3681">www.beckhoff.com/KL3681</a>

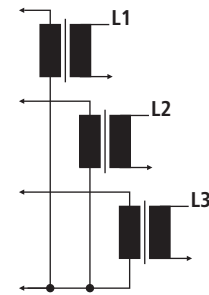
**i** For availability status see Beckhoff website at: [www.beckhoff.com/KL3681](http://www.beckhoff.com/KL3681)



Top view



Contact assembly



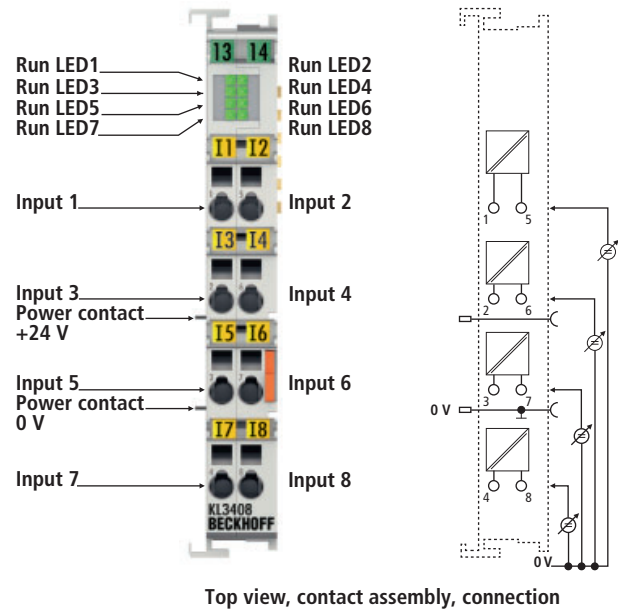
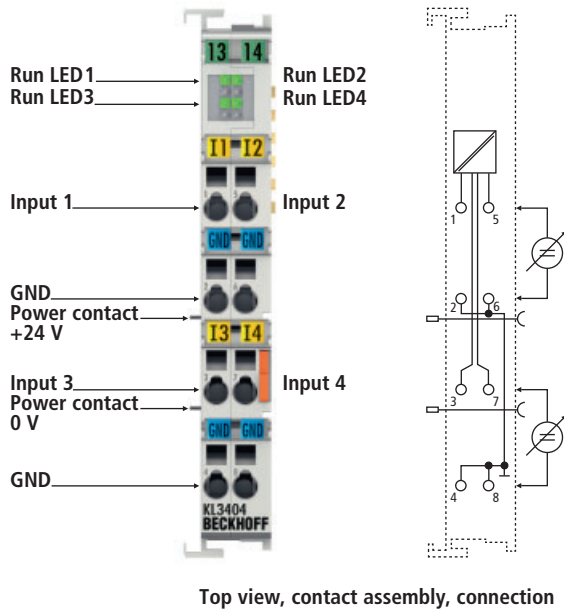
Connection

## KL3403 | 3-phase power measurement terminal

The KL3403 Bus Terminal enables the measurement of all relevant electrical data of the supply network. The voltage is measured via the direct connection of L1, L2, L3 and N. The current of the three phases L1, L2 and L3 is fed via simple current transformers. All measured currents and voltages are available as root-mean-square values. In the KL3403 version, the effective power and the energy consumption for each phase are calculated. Through the relationship of the root-mean-square values of voltage  $U$  \* current  $I$  and the effective power  $P$ , all other information such as the apparent power  $S$  or the phase shift angle  $\cos \varphi$  can be derived. For each fieldbus, KL3403 provides a comprehensive network analysis and an energy management option.

Technical data	KL3403   KS3403
Measured values	current, voltage, effective power, energy, $\cos \varphi$ , peak values $U$ , $I$ and $P$ , frequency
Measuring voltage	max. 500 V AC 3~ (ULx-N: max. 288 V AC)
Resolution	16 bits (21 bits, internal)
Measuring current	max. 1 A, via measuring transformers x A/1 A
Measuring error	0.5 % relative to full scale value ( $U/I$ ), 1 % calculated value
Measuring procedure	true RMS with 64,000 samples/s
Update time	50 ms per measured value preset, free configurable
Electrical isolation	1,500 V <sub>rms</sub> (terminal/K-bus)
Current consumption K-bus	typ. 115 mA
Bit width in the process image	input/output: 3 x 16 bit data, 3 x 8 bit control/status
Weight	approx. 75 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL3403">www.beckhoff.com/KL3403</a>

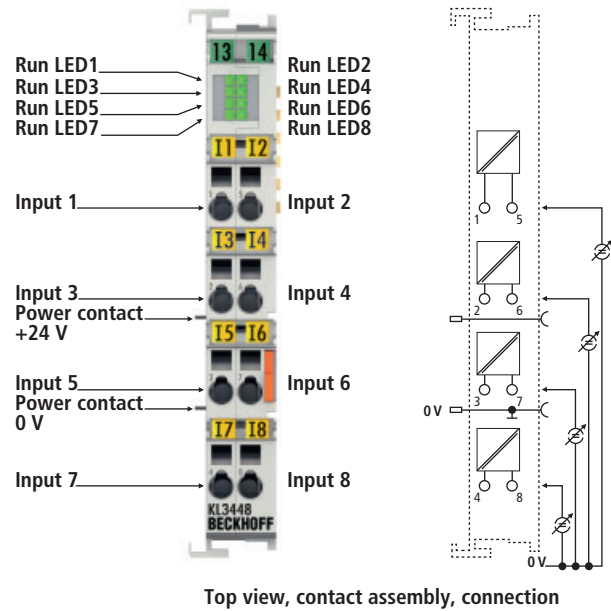
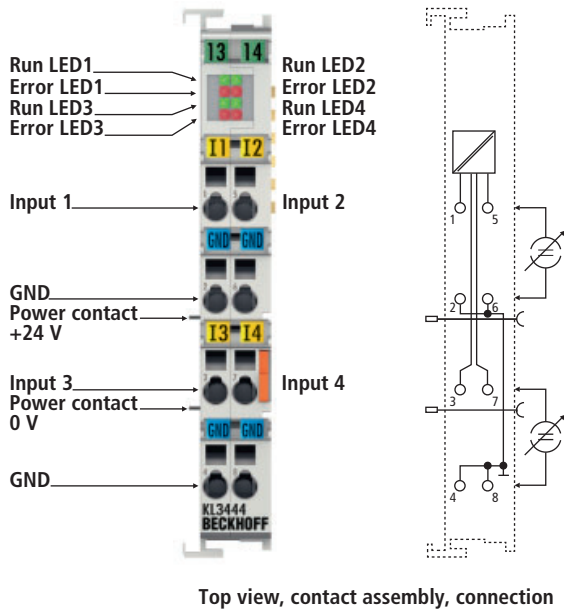
Special terminals	
KL3403-0010	current path designed for 5 A transducer (1 % measuring accuracy I)
KL3403-0020	current path designed for 20 mA, optimised for electronic current transformer
KL3403-0022	current path and voltage input designed for 20 mA



# KL3404/08, KL3464/68 | 4-, 8-channel analog input terminals -10/0...+10 V

The analog input terminals KL3404, KL3408, KL3464 and KL3468 process signals in the range between -10 and +10 V or 0 and 10 V. The voltage is digitised to a resolution of 12 bits and is transmitted, electrically isolated, to the higher-level automation device. In the KL3404 and KL3464 Bus Terminals, the four inputs are 2-wire versions and have a common ground potential. The reference ground of the inputs is the internal ground. The KL3408 and KL3468 variants combine eight channels in one housing and are particularly suitable for space saving installation in control cabinets. The use of single conductor connection technology enables the connection of multi-channel sensor technology with minimum space requirements. The power contacts are connected through. The reference ground for all inputs is the 0 V power contact. The LEDs indicate the data exchange with the Bus Coupler.

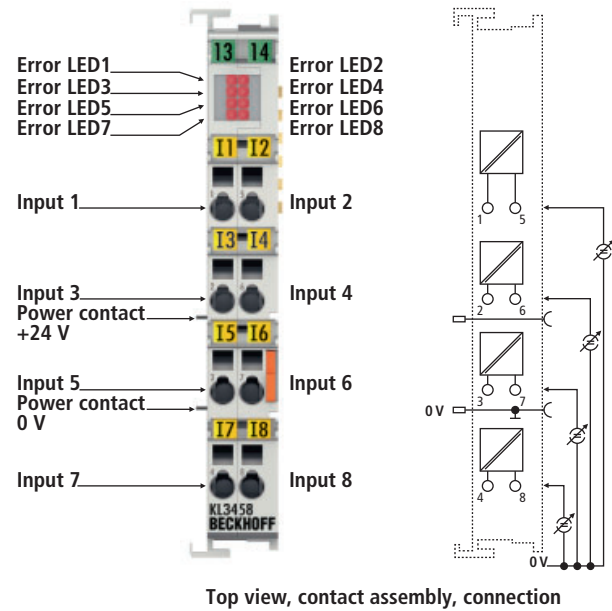
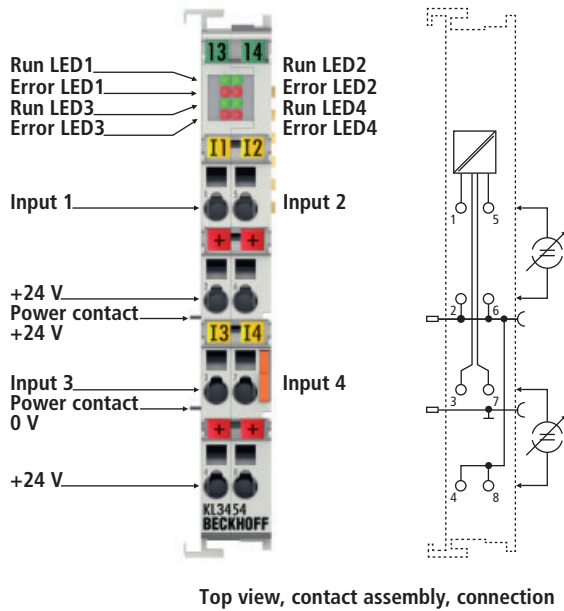
Technical data	KL3404   KS3404	KL3408   KS3408	KL3464   KS3464	KL3468   KS3468
Number of inputs	4	8	4	8
Power supply	via the K-bus			
Signal voltage	-10...+10 V	-10...+10 V	0...10 V	0...10 V
Internal resistance	> 130 kΩ			
Conversion time	~ 2 ms	~ 4 ms	~ 2 ms	~ 4 ms
Resolution	12 bits (for 0...10 V range: resolution 11 bits)			
Measuring error	< ±0.3 % (relative to full scale value)			
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)			
Current consumption K-bus	typ. 100 mA	typ. 140 mA	typ. 100 mA	typ. 140 mA
Bit width in the process image	input: 4 x 16 bit data (4 x 8 bit control/status optional)	input: 8 x 16 bit data (8 x 8 bit control/status optional)	input: 4 x 16 bit data (4 x 8 bit control/status optional)	input: 8 x 16 bit data (8 x 8 bit control/status optional)
Configuration	no address or configuration setting			
Weight	75 g			
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 20/variable			
Pluggable wiring	for all KSxxxx Bus Terminals			
Further information	www.beckhoff.com/KL3404			



## KL3444, KL3448 | 4-, 8-channel analog input terminals 0...20 mA

The KL3444 and KL3448 analog input terminals process signals in the range between 0 and 20 mA. The current is digitised to a resolution of 12 bits and is transmitted, in an electrically isolated form, to the higher-level automation device. In the KL3444 Bus Terminal, the four inputs are 2-wire versions and have a common ground potential. The reference ground of the inputs is the internal ground. The KL3448 variant combines eight channels in one housing and is particularly suitable for space-saving installation in control cabinets. The use of single conductor connection technology enables the connection of multi-channel sensor technology with minimum space requirements. The reference ground for all inputs is the 0 V power contact. In both Bus Terminals the power contacts are connected through. Overload is detected in both variants. The terminal status is relayed to the controller via the K-bus. The LEDs indicate the data exchange with the Bus Coupler as well as overload or wire breakage.

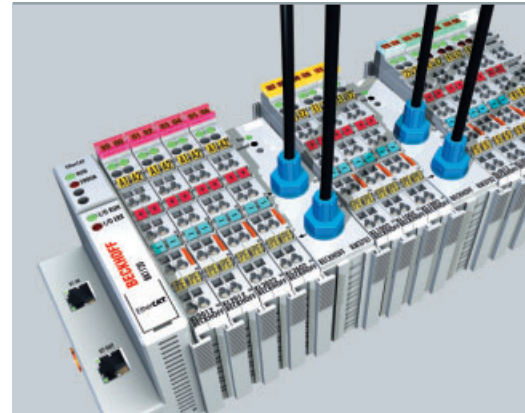
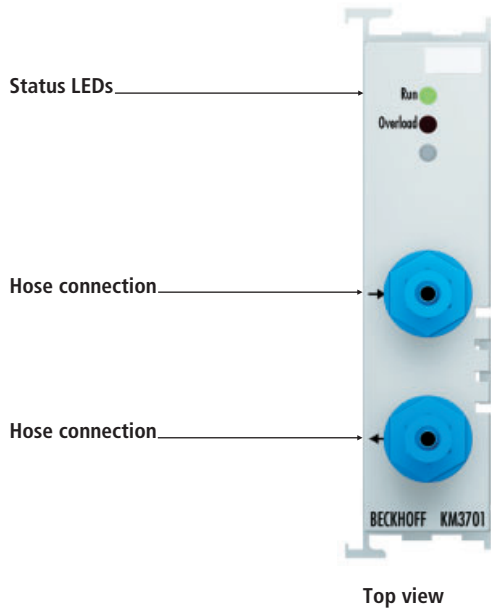
Technical data	KL3444   KS3444	KL3448   KS3448
Number of inputs	4	8
Power supply	via the K-bus	
Signal current	0...20 mA	
Internal resistance	< 85 Ω	
Common-mode voltage $U_{CM}$	30 V max.	
Conversion time	~ 2 ms	~ 4 ms
Resolution	12 bits	
Measuring error	< ±0.3 % (relative to full scale value)	
Surge voltage resistance	30 V DC	
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)	
Current consumption K-bus	typ. 85 mA	typ. 105 mA
Bit width in the process image	input: 4 x 16 bit data (4 x 8 bit control/status optional)	input: 8 x 16 bit data (8 x 8 bit control/status optional)
Configuration	no address or configuration setting	
Weight	75 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL3444	



## KL3454, KL3458 | 4-, 8-channel analog input terminals 4...20 mA

The KL3454 and KL3458 analog input terminals process signals in the range between 4 and 20 mA. The current is digitised to a resolution of 12 bits and is transmitted, in an electrically isolated form, to the higher-level automation device. In the KL3454 Bus Terminal, the four inputs are 2-wire versions and have a common ground potential. The 24 V power contact is connected to the terminal, in order to enable the connection of 2-wire sensors without external supply. The KL3458 variant combines eight channels in one housing and is particularly suitable for space-saving installation in control cabinets. The use of single conductor connection technology enables the connection of multi-channel sensor technology with minimum space requirements. In the KL3454 and KL3458, the power contacts are connected through. The reference ground for all inputs is the 0 V power contact. Overload is detected in both variants. The terminal status is relayed to the controller via the K-bus. The run LEDs indicate the data exchange with the Bus Coupler, the error LEDs overload or wire breakage.

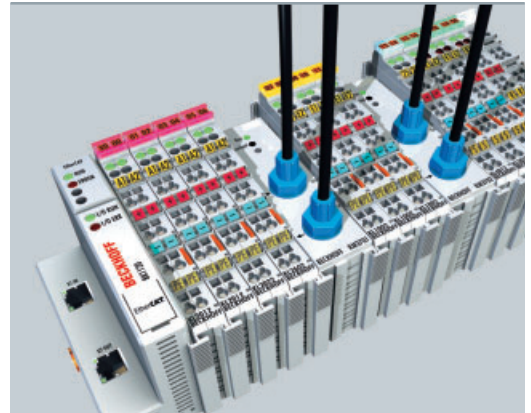
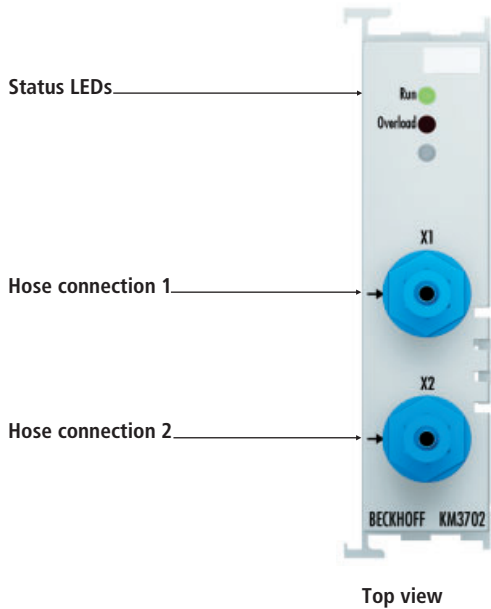
Technical data	KL3454   KS3454	KL3458   KS3458
Number of inputs	4	8
Power supply	via the K-bus	
Signal current	4...20 mA	
Internal resistance	< 85 Ω	
Conversion time	~ 2 ms	~ 4 ms
Resolution	12 bits	
Measuring error	< ±0.3 % (relative to full scale value)	
Surge voltage resistance	30 V DC	
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)	
Current consumption K-bus	typ. 85 mA	typ. 105 mA
Bit width in the process image	input: 4 x 16 bit data (4 x 8 bit control/status optional)	input: 8 x 16 bit data (8 x 8 bit control/status optional)
Configuration	no address or configuration setting	
Weight	75 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL3454	



## KM3701 | 1-channel differential pressure measuring terminal -100...+100 hPa (-100...+100 mbar)

The KM3701 pressure measuring terminal enables direct measurement of pressure differences between two hose connections. The pressure difference is available in the fieldbus as a 16 bit value and can be measured between any points up to an ambient pressure of 10 bar. The status LEDs indicate proper function or errors such as over-range.

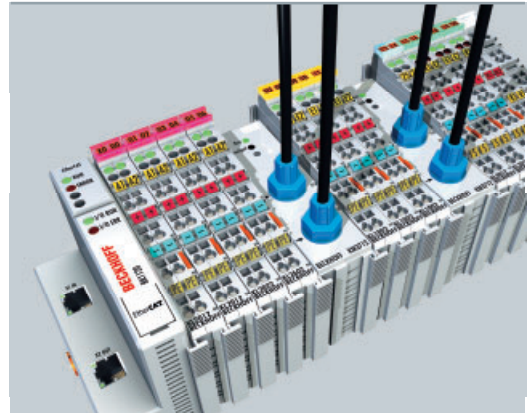
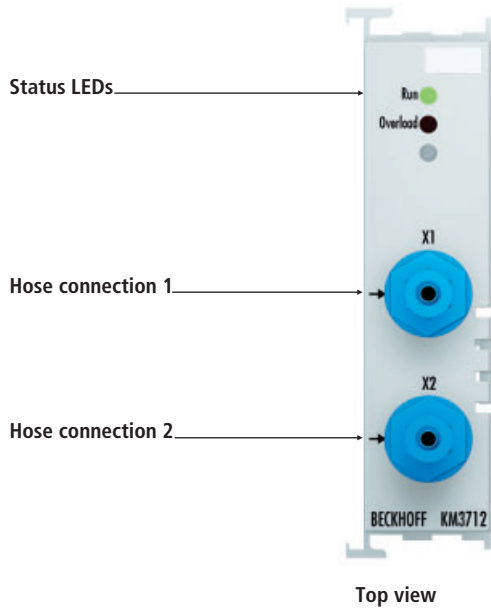
Technical data	KM3701
Number of inputs	1 (differential pressure)
Measuring range	-100...+100 hPa (-100...+100 mbar)
Max. overload	500 hPa (500 mbar) differential, 5,000 hPa (5 bar) to ambient
Resolution	0.1 hPa (0.1 mbar) per digit
Measuring speed	5 ms typ.
Current consumption K-bus	15 mA
Bit width in the process image	3 byte input/output
Medium	non-aggressive gases
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KM3701">www.beckhoff.com/KM3701</a>
Special terminals	
KM3701-0340	differential pressure up to 340 hPa



## KM3702 | 2-channel absolute pressure measuring terminal 7,500 hPa (7.5 bar)

The KM3702 pressure measuring terminal enables direct measurement of two pressure values at the hose connections. The pressure is determined as a pressure difference to the ambience of the KM3702 and is available in the fieldbus as a 16 bit value. The status LEDs indicate proper function or errors such as over-range.

Technical data	KM3702
Number of inputs	2
Measuring range	0...7,500 hPa (7.5 bar)
Max. overload	10,000 hPa (10 bar)
Resolution	1 hPa (1 mbar) per digit
Measuring speed	5 ms typ.
Current consumption K-bus	15 mA
Bit width in the process image	2 x 3 byte input/output
Medium	non-aggressive gases
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KM3702">www.beckhoff.com/KM3702</a>

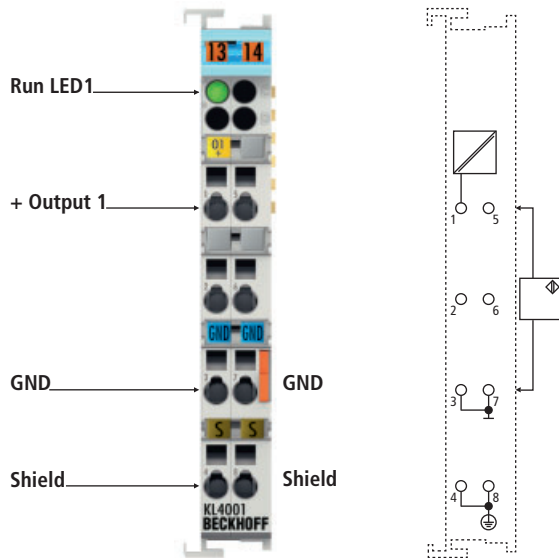


## KM3712 | 2-channel absolute pressure measuring terminal -1,000...+1,000 hPa (-1...+1 bar)

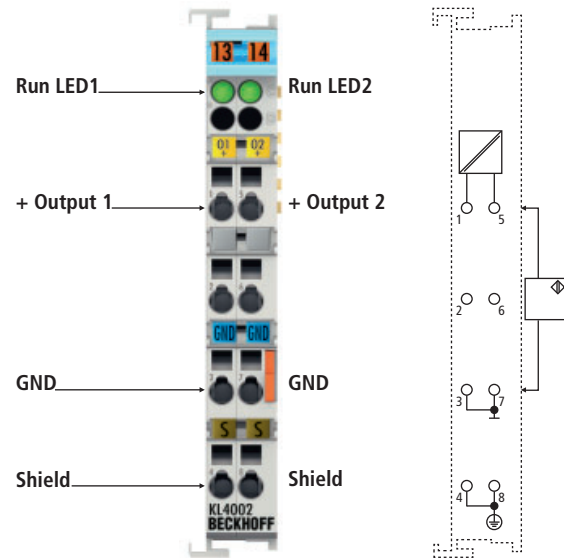
The KM3712 pressure measuring terminal enables direct measurement of two negative pressure values at the hose connections. The pressure is determined as a pressure difference to the ambience of the KM3712 and is available in the fieldbus as a 16 bit value. The status LEDs indicate proper function or errors such as over-range.

Technical data	KM3712
Number of inputs	2
Measuring range	-1,000...+1,000 hPa (-1...+1 bar)
Max. overload	5,000 hPa (5 bar)
Resolution	1 hPa (1 mbar) per digit
Measuring speed	5 ms typ.
Current consumption K-bus	15 mA
Bit width in the process image	2 x 3 byte input/output
Medium	non-aggressive gases
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KM3712">www.beckhoff.com/KM3712</a>





Top view, contact assembly, connection



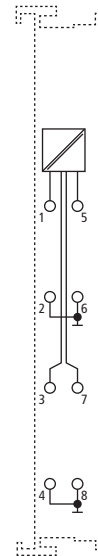
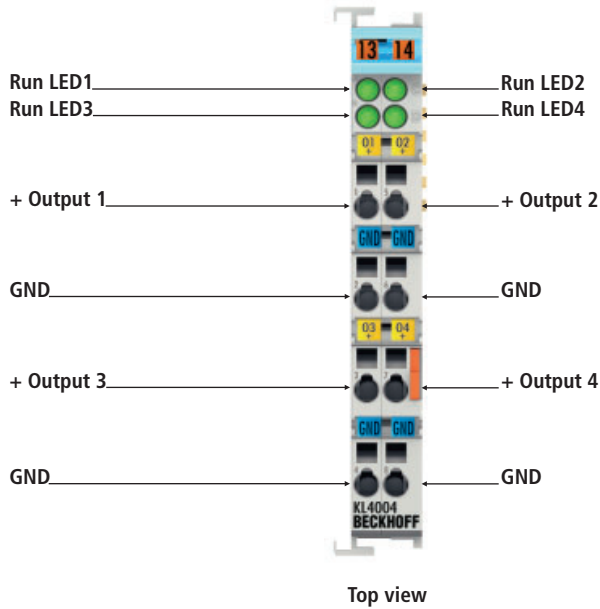
Top view, contact assembly, connection

## KL4001, KL4002 | 1-, 2-channel analog output terminals 0...10 V

The KL4001 and KL4002 analog output terminals generate signals in the range from 0 to 10 V. The voltage is supplied to the process level with a resolution of 12 bits and is electrically isolated. The output channels of a Bus Terminal have a common ground potential. The KL4001 is the single-channel variant and is particularly suitable for signals with electrically isolated ground potentials. The KL4002 version combines two channels in one housing. The run LEDs give an indication of the data exchange with the Bus Coupler.

Technical data	KL4001   KS4001	KL4002   KS4002
Number of outputs	1	2
Power supply	via the K-bus	
Signal voltage	0...10 V	
Load	> 5 k $\Omega$ (short-circuit-proof)	
Measuring error	$\pm 0.5$ LSB linearity error, $\pm 0.5$ LSB offset error, $\pm 0.1$ % (relative to full scale value)	
Resolution	12 bits	
Conversion time	~ 1.5 ms	
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)	
Current consumption K-bus	75 mA	
Bit width in the process image	output: 1 x 16 bit data (1 x 8 bit control/status optional)	output: 2 x 16 bit data (2 x 8 bit control/status optional)
Configuration	no address or configuration setting	
Weight	approx. 85 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL4001	

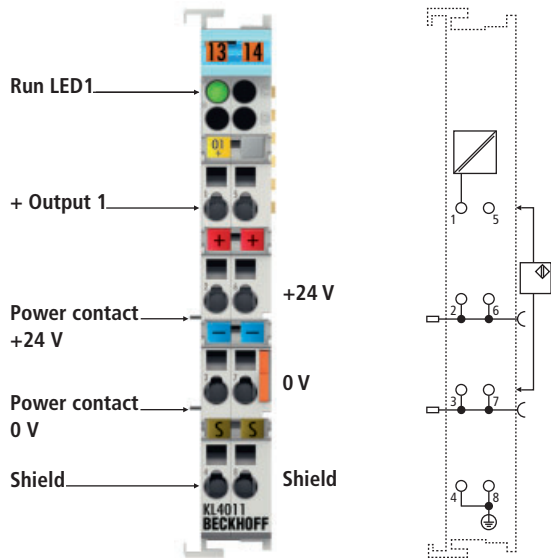
Special terminals	
KL4002-0010	Siemens S5 format
KL4002-0011	fast $\mu$ P, scan time approx. 0.15 ms
KL4002-0050	Siemens S7 format



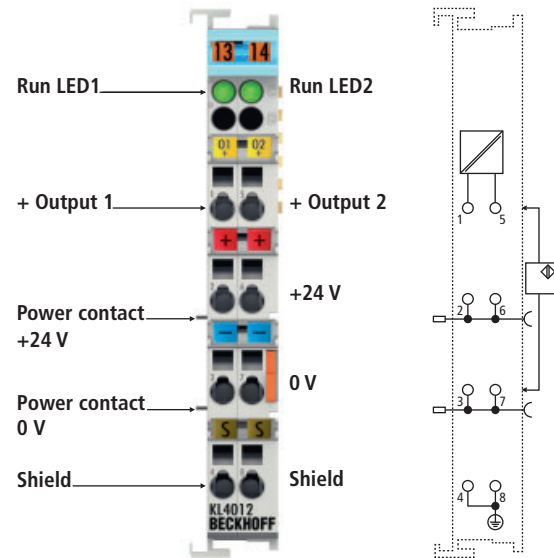
## KL4004 | 4-channel analog output terminal 0...10 V

The KL4004 analog output terminal generates signals in the range from 0 to 10 V. The voltage is supplied to the process level with a resolution of 12 bits and is electrically isolated. The output channels of a Bus Terminal have a common ground potential. The run LEDs give an indication of the data exchange with the Bus Coupler.

Technical data	KL4004   KS4004
Number of outputs	4
Power supply	via the K-bus
Signal voltage	0...10 V
Load	> 5 k $\Omega$ (short-circuit-proof)
Measuring error	$\pm 0.5$ LSB linearity error, $\pm 0.5$ LSB offset error, $\pm 0.1$ % (relative to full scale value)
Resolution	12 bits
Conversion time	~ 2 ms
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)
Current consumption K-bus	85 mA
Bit width in the process image	output: 4 x 16 bit data (4 x 8 bit control/status optional)
Configuration	no address or configuration setting
Weight	approx. 85 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL4004">www.beckhoff.com/KL4004</a>
Special terminals	
KL4004-0050	Siemens S7 format



Top view, contact assembly, connection



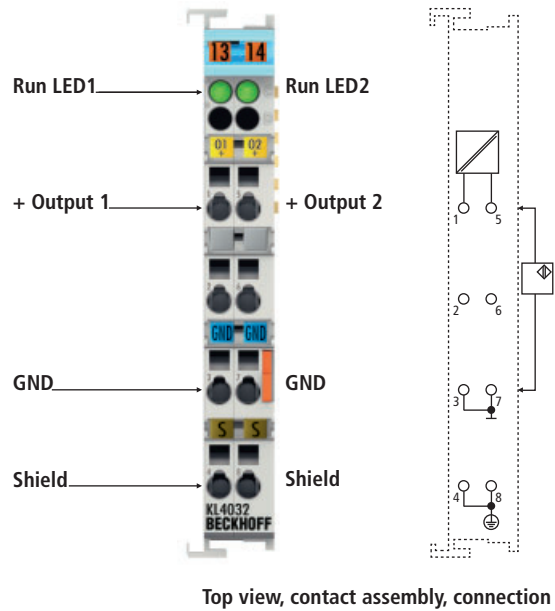
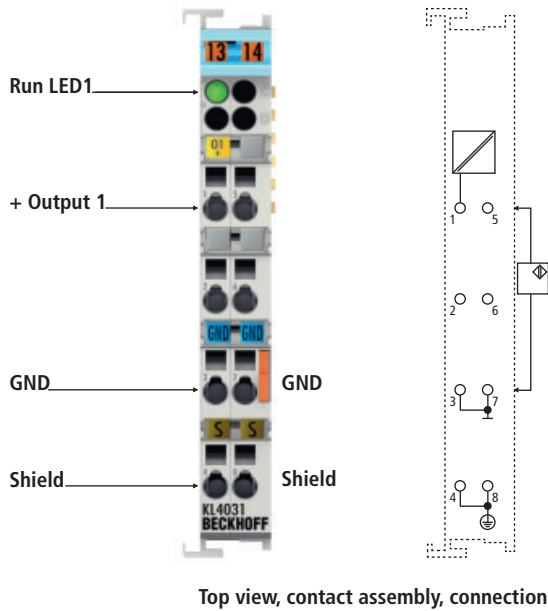
Top view, contact assembly, connection

## KL4011/12, KL4021/22 | 1-, 2-channel analog output terminals 0/4...20 mA

The KL4011, KL4012, KL4021 and KL4022 analog output terminals generate analog output signals in the range from 0/4 to 20 mA. The power is supplied to the process level with a resolution of 12 bits and is electrically isolated. Ground potential for the output channels of a Bus Terminal is common with the 24 V DC supply. The output stages are powered by the 24 V supply. The KL4011 and KL4021 are the single-channel variants. The KL4012 and KL4022 versions combine two channels in one housing. The run LEDs give an indication of the data exchange with the Bus Coupler.

Technical data	KL4011   KS4011	KL4012   KS4012	KL4021   KS4021	KL4022   KS4022
Number of outputs	1	2	1	2
Power supply	24 V DC via the power contacts (alternative 15 V DC with Bus Terminal KL9515)			
Signal current	0...20 mA	0...20 mA	4...20 mA	4...20 mA
Load	< 500 Ω			
Measuring error	±0.5 LSB linearity error, ±0.5 LSB offset error, ±0.1 % (relative to full scale value)			
Resolution	12 bits			
Conversion time	~ 1.5 ms			
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)			
Current consumption K-bus	typ. 60 mA			
Bit width in the process image	output: 1 x 16 bit data (1 x 8 bit control/status optional)	output: 2 x 16 bit data (2 x 8 bit control/status optional)	output: 1 x 16 bit data (1 x 8 bit control/status optional)	output: 2 x 16 bit data (2 x 8 bit control/status optional)
Configuration	no address or configuration setting			
Weight	approx. 80 g			
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 20/variable			
Pluggable wiring	for all KSxxxx Bus Terminals			
Further information	www.beckhoff.com/KL4011			

Special terminals		
KL4012-00xx	for special terminals see page	631
KL4022-00xx	for special terminals see page	631

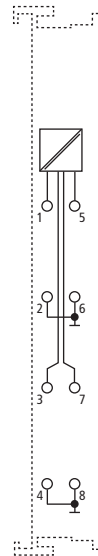
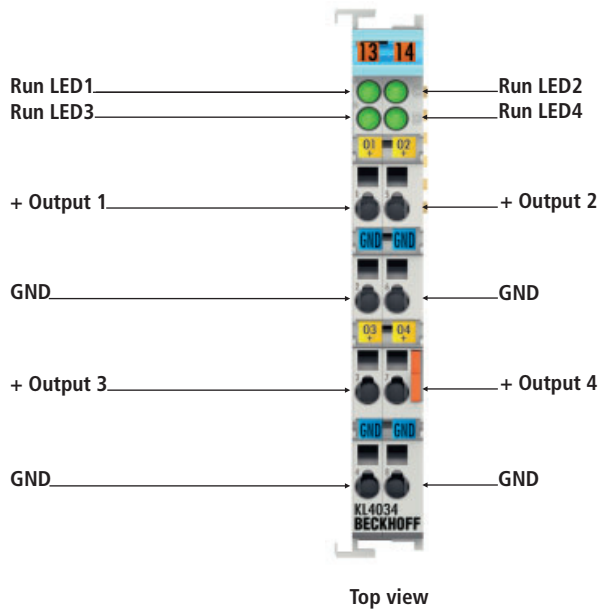


## KL4031, KL4032 | 1-, 2-channel analog output terminals -10...+10 V

The KL4031 and KL4032 analog output terminals generate signals in the range from -10 to 10 V. The voltage is supplied to the process level with a resolution of 12 bits and is electrically isolated. The output channels of a Bus Terminal have a common ground potential. The KL4031 is the single-channel variant and is particularly suitable for signals with electrically isolated ground potentials. The KL4032 version combines two channels in one housing. The run LEDs give an indication of the data exchange with the Bus Coupler.

Technical data	KL4031   KS4031	KL4032   KS4032
Number of outputs	1	2
Power supply	via the K-bus	
Signal voltage	-10...+10 V	
Load	> 5 k $\Omega$	
Measuring error	< $\pm 0.1$ % (relative to full scale value)	
Resolution	12 bits	
Conversion time	~ 1.5 ms	
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)	
Current consumption K-bus	75 mA	
Bit width in the process image	output: 1 x 16 bit data (1 x 8 bit control/status optional)	output: 2 x 16 bit data (2 x 8 bit control/status optional)
Configuration	no address or configuration setting	
Weight	approx. 85 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	<a href="http://www.beckhoff.com/KL4031">www.beckhoff.com/KL4031</a>	

Special terminals	
KL4032-0010	Siemens S5 format
KL4032-0011	fast $\mu$ P, scan time approx. 0.15 ms
KL4032-0050	Siemens S7 format

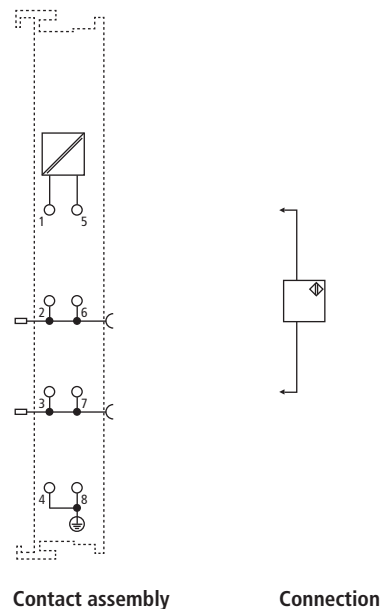
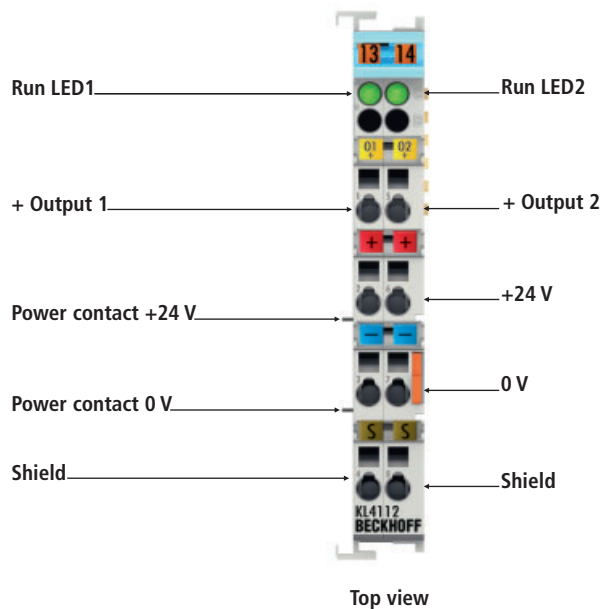


## KL4034 | 4-channel analog output terminal -10...+10 V

The KL4034 analog output terminal generate signals in the range from +10 to -10 V. The power is supplied to the process level with a resolution of 12 bits and is electrically isolated. The output channels of a Bus Terminal have a common ground potential. The run LEDs give an indication of the data exchange with the Bus Coupler.

Technical data	KL4034   KS4034
Number of outputs	4
Power supply	via the K-bus
Signal voltage	-10...+10 V
Load	> 5 k $\Omega$ (short-circuit-proof)
Measuring error	$\pm 0.5$ LSB linearity error, $\pm 0.5$ LSB offset error, $\pm 0.1$ % (relative to full scale value)
Resolution	12 bits
Conversion time	~ 2 ms
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)
Current consumption K-bus	85 mA
Bit width in the process image	output: 4 x 16 bit data (4 x 8 bit control/status optional)
Configuration	no address or configuration setting
Weight	approx. 85 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL4034">www.beckhoff.com/KL4034</a>

Special terminals	
KL4034-0010	Siemens S5 format

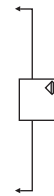
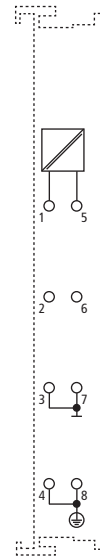
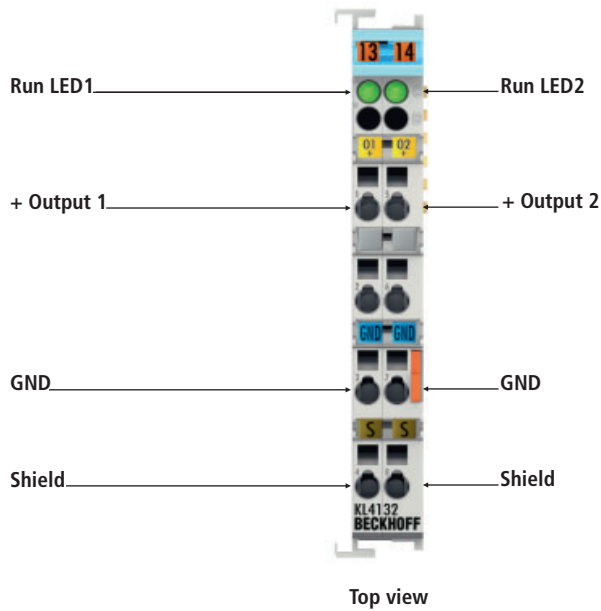


## KL4112 | 2-channel analog output terminal 0...20 mA

The KL4112 analog output terminal generates analog output signals in the range from 0 to 20 mA. The power is supplied to the process level with a resolution of 16 bits (default: 15 bits), and is electrically isolated. Ground potential for the output channels of a Bus Terminal is common with the 24 V DC supply. The output stages are powered by the 24 V supply. The two run LEDs give an indication of the data exchange with the Bus Coupler.

Technical data	KL4112   KS4112
Number of outputs	2
Power supply	24 V DC via the power contacts (alternative 15 V DC with Bus Terminal KL9515)
Signal current	0...20 mA
Load	< 500 Ω
Measuring error	< ±0.1 % (relative to full scale value)
Resolution	15 bit, configurable to 16 bit
Conversion time	~ 3.5 ms
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)
Current consumption K-bus	typ. 60 mA
Bit width in the process image	output: 2 x 16 bit data (2 x 8 bit control/status optional)
Configuration	no address or configuration setting
Weight	approx. 80 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL4112">www.beckhoff.com/KL4112</a>

Special terminals	
KL4112-0010	Siemens S5 format
KL4112-0050	Siemens S7 format

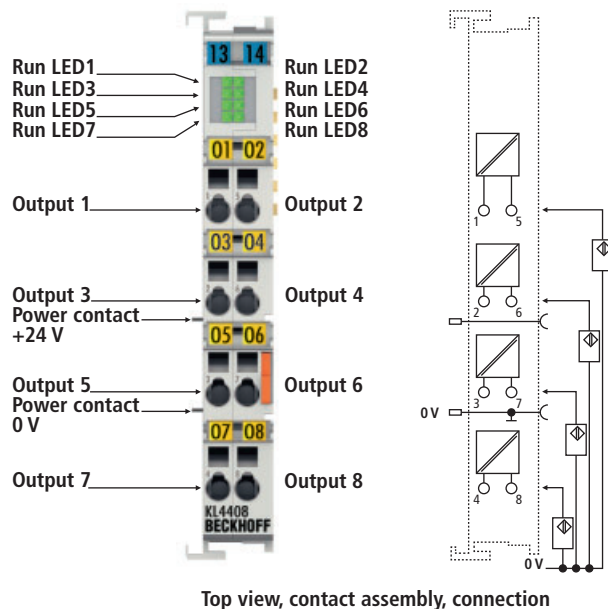
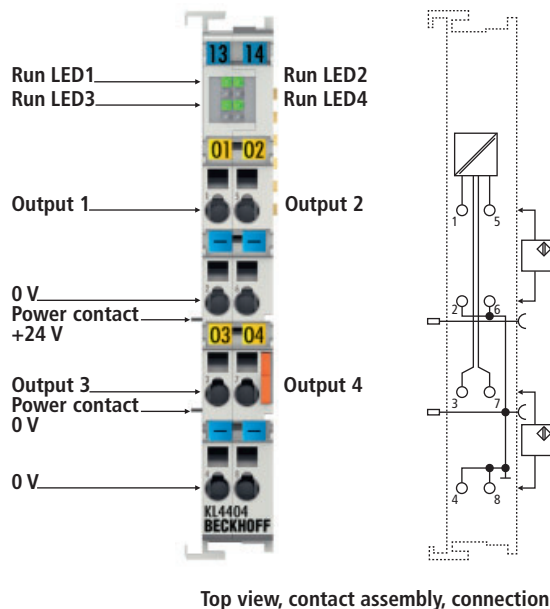


## KL4132 | 2-channel analog output terminal -10...+10 V

The KL4132 analog output terminal generates signals in the range from -10 to +10 V. The voltage is supplied to the process level with a resolution of 16 bits and is electrically isolated. The output channels of a Bus Terminal have a common ground potential. The two run LEDs give an indication of the data exchange with the Bus Coupler.

Technical data	KL4132   KS4132
Number of outputs	2
Power supply	via the K-bus
Signal voltage	-10...+10 V
Load	> 5 kΩ
Measuring error	< ±0.1 % (relative to full scale value)
Resolution	16 bits
Conversion time	~ 1.5 ms
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)
Current consumption K-bus	75 mA
Bit width in the process image	output: 2 x 16 bit data (2 x 8 bit control/status optional)
Configuration	no address or configuration setting
Weight	approx. 85 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL4132">www.beckhoff.com/KL4132</a>

Special terminals	
KL4132-0010	Siemens S5 format
KL4132-0050	Siemens S7 format



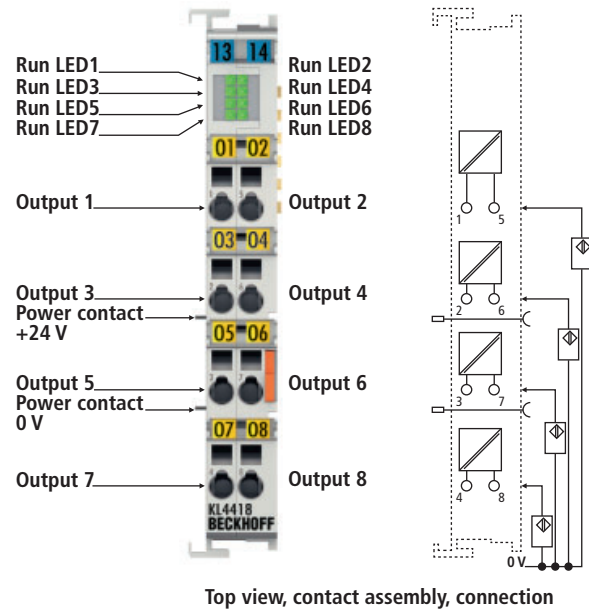
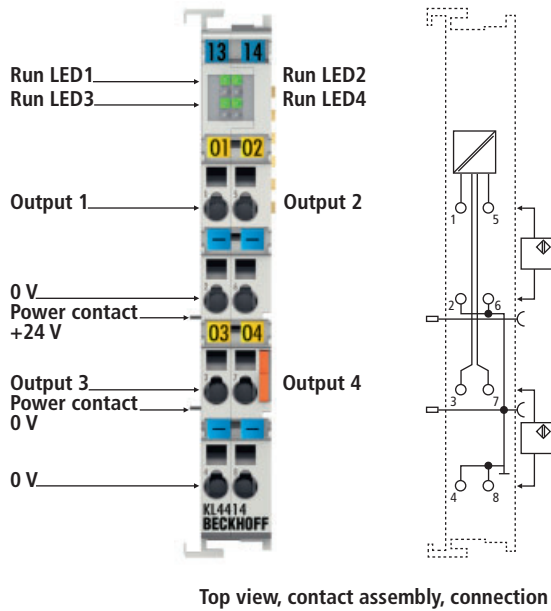
# KL4404/08, KL4434/38 | 4-, 8-channel analog output terminals -10/0...+10 V

The KL4404, KL4408, KL4434 and KL4438 analog output terminals generate signals in the range between 0 to 10 V or -10 to +10 V. The voltage is supplied to the process level with a resolution of 12 bits and is electrically isolated. In the KL4404 and KL4434 Bus Terminals, the four outputs are 2-wire versions. The KL4408 and KL4438 variants combine eight channels in one housing and are particularly suitable for space-saving installation in control cabinets. The use of single conductor connection technology enables the connection of multi-channel actuator technology with minimum space requirements.

The Bus Terminals have a common ground potential. The power contacts are connected through. The reference ground of the outputs is the 0 V power contact. The LEDs indicate the data exchange with the Bus Coupler.

Technical data	KL4404   KS4404	KL4408   KS4408	KL4434   KS4434	KL4438   KS4438
Number of outputs	4	8	4	8
Signal voltage	0...10 V	0...10 V	-10...+10 V	-10...+10 V
Load	> 5 kΩ (short-circuit-proof)			
Measuring error	< ±0.1 % (relative to full scale value)	< ±0.2 % (relative to full scale value)	< ±0.1 % (relative to full scale value)	< ±0.2 % (relative to full scale value)
Resolution	12 bits			
Conversion time	~ 4 ms	~ 8 ms	~ 4 ms	~ 8 ms
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)			
Current consumption K-bus	20 mA			
Bit width in the process image	output: 4 x 16 bit data (4 x 8 bit control/status optional)	output: 8 x 16 bit data (8 x 8 bit control/status optional)	output: 4 x 16 bit data (4 x 8 bit control/status optional)	output: 8 x 16 bit data (8 x 8 bit control/status optional)
Configuration	no address or configuration setting			
Weight	75 g			
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 20/variable			
Pluggable wiring	for all KSxxxx Bus Terminals			
Further information	www.beckhoff.com/KL4404			



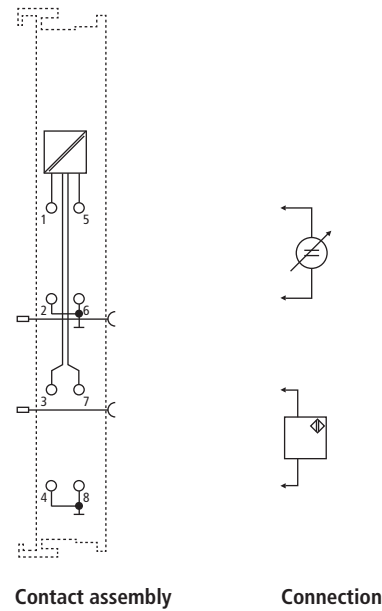
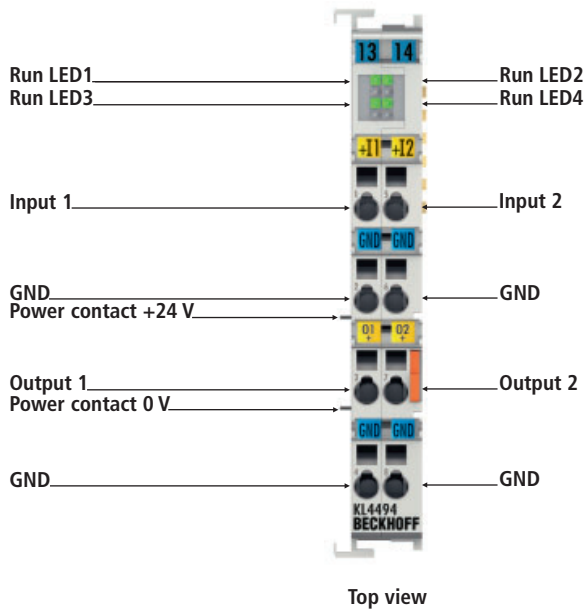


## KL4414/18, KL4424/28 | 4-, 8-channel analog output terminals 0/4...20 mA

The KL4414, KL4418, KL4424 and KL4428 analog output terminals generate signals in the range between 0/4 to 20 mA. The power is supplied to the process level with a resolution of 12 bits and is electrically isolated. The output stage is powered by the 24 V supply. In the KL4414 and KL4424 Bus Terminals, the four outputs are 2-wire versions. The KL4418 and KL4428 variants combine eight channels in one housing and are particularly suitable for space-saving installation in control cabinets. The use of single conductor connection technology enables the connection of multi-channel actuator technology with minimum space requirements.

The Bus Terminals have a common ground potential. The power contacts are connected through. The reference ground of the outputs is the 0 V power contact. The LEDs indicate the data exchange with the Bus Coupler.

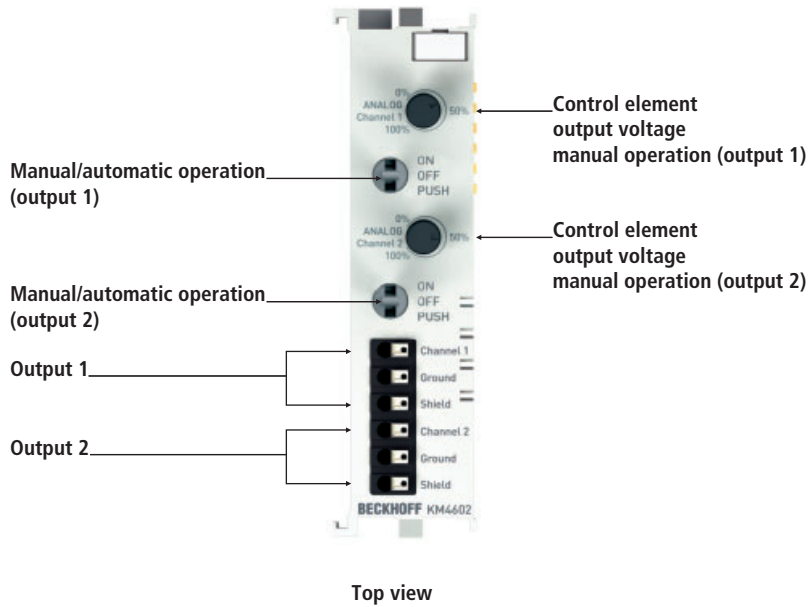
Technical data	KL4414   KS4414	KL4418   KS4418	KL4424   KS4424	KL4428   KS4428
Number of outputs	4	8	4	8
Power supply	24 V DC via the power contacts (alternative 15 V DC with Bus Terminal KL9515)			
Signal voltage	0...20 mA	0...20 mA	4...20 mA	4...20 mA
Load	< 350 Ω (short-circuit-proof)	< 150 Ω (short-circuit-proof)	< 350 Ω (short-circuit-proof)	< 150 Ω (short-circuit-proof)
Measuring error	< ±0.1 % (relative to full scale value)	< ±0.2 % (relative to full scale value)	< ±0.1 % (relative to full scale value)	< ±0.2 % (relative to full scale value)
Resolution	12 bits			
Conversion time	~ 4 ms	~ 8 ms	~ 4 ms	~ 8 ms
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)			
Current consumption K-bus	typ. 20 mA			
Bit width in the process image	output: 4 x 16 bit data (4 x 8 bit control/status optional)	output: 8 x 16 bit data (8 x 8 bit control/status optional)	output: 4 x 16 bit data (4 x 8 bit control/status optional)	output: 8 x 16 bit data (8 x 8 bit control/status optional)
Weight	75 g			
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 20/variable			
Pluggable wiring	for all KSxxxx Bus Terminals			
Further information	www.beckhoff.com/KL4414			



## KL4494 | 2-channel analog input, 2-channel analog output terminal -10...+10 V

The KL4494 Bus Terminal combines two analog inputs and two analog outputs in one housing and can process signals in the range between -10 to +10 V. The voltage is digitised to a resolution of 12 bits and is transmitted, electrically isolated, to the higher-level automation device or to the process level. The input and output channels of the Bus Terminal have a common ground potential. The run LEDs give an indication of the data exchange with the Bus Coupler.

Technical data	KL4494   KS4494
Number of outputs	2 (single-ended)
Number of inputs	2
Power supply	via the K-bus
Signal voltage	-10...+10 V
Internal resistance input	> 130 k $\Omega$
Load output	> 5 k $\Omega$
Measuring error	0.3 %
Resolution	12 bits
Conversion time	< 2ms
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)
Current consumption K-bus	70 mA
Bit width in the process image	input/output: 2 x 16 bit data
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL4494">www.beckhoff.com/KL4494</a>

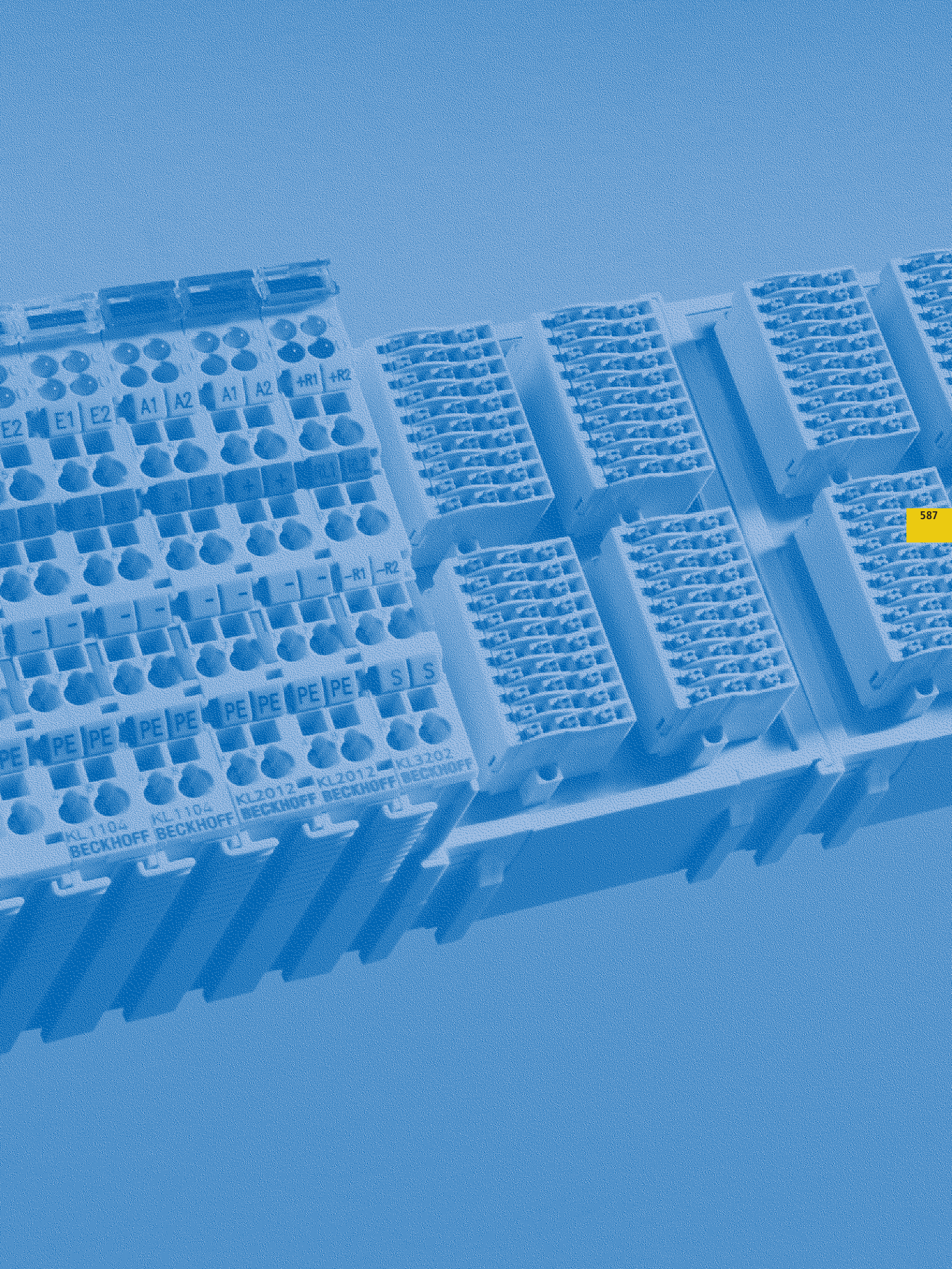


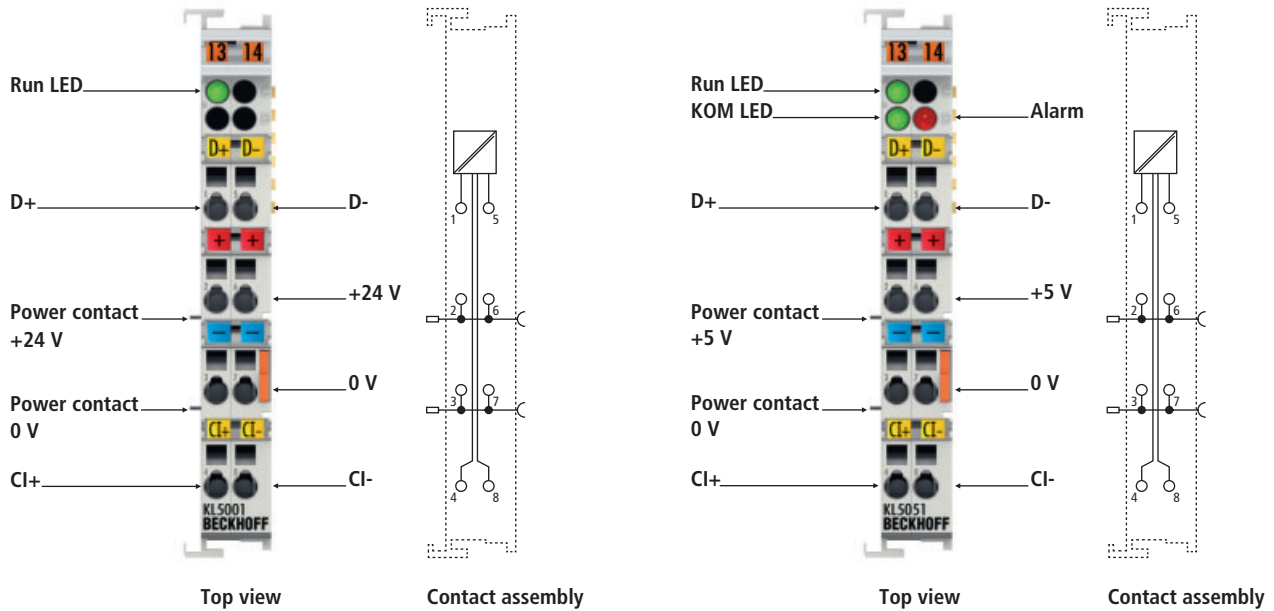
## KM4602 | 2-channel analog output terminal 0...10 V, manual/automatic operation

The analog KM4602 output terminal has two potential-free analog 0 to 10 V outputs. Both are connected internally to common ground. For each channel a switch enables selection between automatic or manual mode. In automatic mode an analog value is issued depending on the process data. With the manual switch settings the value set via the potentiometer is applied to the output. For manual mode a 24 V supply is required for the Bus Coupler. The switch state can be read by the controller.

Technical data	KM4602
Power supply	via the K-bus
Signal voltage	0...10 V
Load	> 5 k $\Omega$ (short-circuit-proof)
Measuring error	$\pm 0.5$ LSB linearity error, $\pm 0.5$ LSB offset error, $\pm 0.1$ % (relative to full scale value)
Resolution	12 bits
Conversion time	~ 1.5 ms
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)
Current consumption K-bus	75 mA
Configuration	no address or configuration setting
Weight	approx. 85 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KM4602">www.beckhoff.com/KM4602</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/KM4602](http://www.beckhoff.com/KM4602)



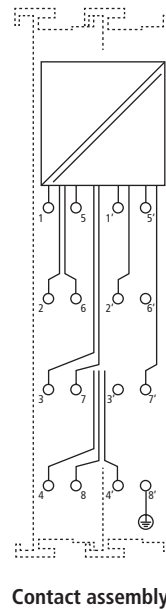
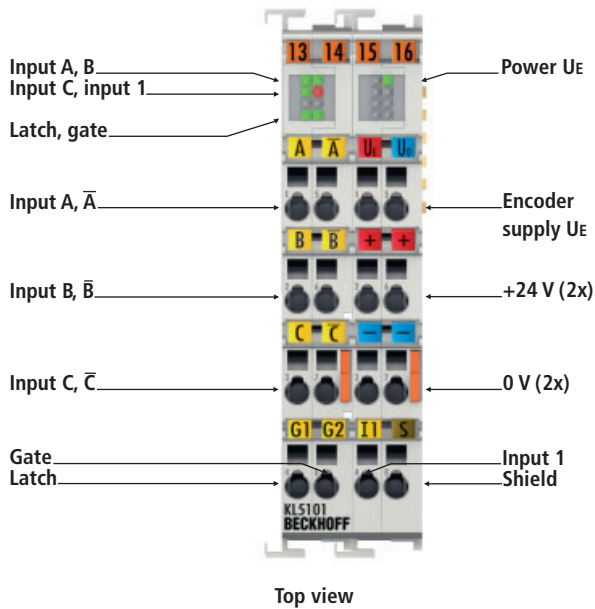


## KL5001, KL5051 | SSI encoder interface

The KL5001 SSI interface terminal allows an SSI encoder to be connected directly. The encoder is powered via the SSI interface. The interface circuit generates a pulse for reading the encoder, and makes the incoming data stream available to the controller as a data word in the process image. Various operating modes, transmission frequencies and bit widths can be permanently stored in a control register. A screen can be connected via the KL9195 screen terminal.

The bidirectional KL5051 SSI interface terminal is used to connect to digital servo-amplifiers. The encoder is powered via the SSI interface, which consists of two logical channels. The first channel is used for the positioning of the drive, while the second channel is used to set releases, to transmit parameter data and to read status information and parameter values. The 5 V DC supply voltage can be generated with the KL9505 power supply unit terminal and fed into the power contacts.

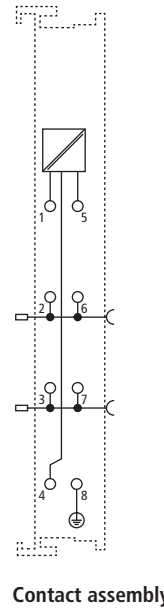
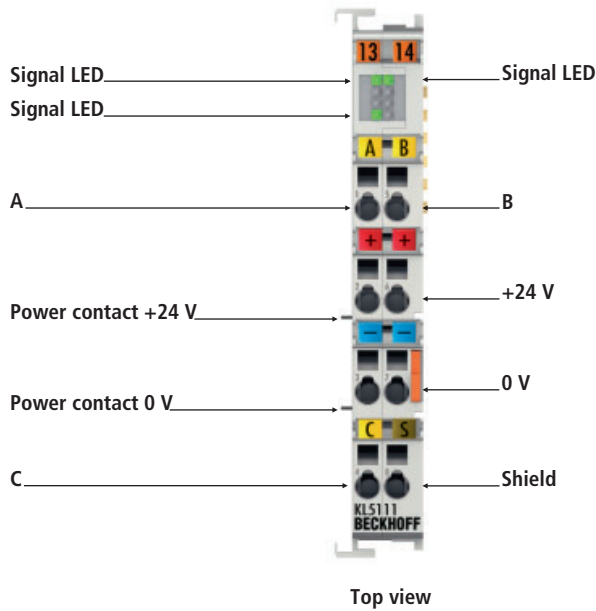
Technical data	KL5001   KS5001	KL5051   KS5051
Encoder connection	binary input: D+, D-; binary output: CI+, CI-	
Power supply	24 V DC via the power contacts	5 V DC via power contacts (KL9505)
Current consumption	typ. 20 mA without encoder	typ. 85 mA without encoder
Encoder supply	24 V DC (-15 %/+20 %) via power contacts	5 V DC
Data transfer rates	variable up to 1 MHz, 250 kHz default	1 MHz
Serial input	24 bit width (variable)	
Data direction	read	bidirectional
Signal output	difference signal (RS422)	
Signal input	difference signal (RS422)	
Electrical isolation	500 V (K-bus/field potential)	
Current consumption K-bus	25 mA	75 mA
Bit width in the process image	input: 1 x 32 bit data (1 x 8 bit control/status optional)	input/output: 2 x 16 bit data, 2 x 8 bit control/status
Weight	60 g	approx. 80 g
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL5001	



## KL5101 | Incremental encoder interface

The KL5101 terminal is an interface for the direct connection of incremental encoders with difference signal (RS485) or with single inputs. A 16 bit counter with a quadrature decoder and a 16 bit latch for the zero pulse can be read, set or enabled. Incremental encoders with alarm outputs can be connected at the interface's status input. Interval measurement with a resolution of 200 ns is possible. The G2 input allows the counter to be halted (high = stop). The value is read with a rising edge at G1.

Technical data	KL5101   KS5101
Encoder connection	A, A (inv), B, B (inv), zero, zero (inv), difference signal (RS485); status input
Encoder operating voltage	5 V DC
Encoder output current	0.5 A
Counter	16 bits, binary
Limit frequency	4 million increments/s (with 4-fold evaluation)
Quadrature decoder	1-, 2-, or 4-fold evaluation
Zero-pulse latch	16 bits
Commands	read, set, enable
Supply voltage	24 V DC (-15 %/+20 %)
Current consumption power contacts	0.1 A (without encoder lead current)
Current consumption K-bus	25 mA
Bit width in the process image	input: 1 x 16 bit data, 1 x 8 bit control/status
Weight	approx. 85 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL5101">www.beckhoff.com/KL5101</a>

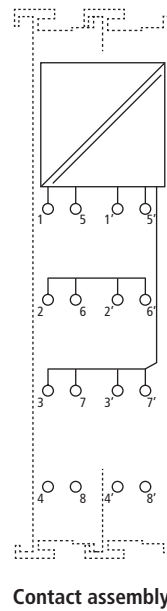
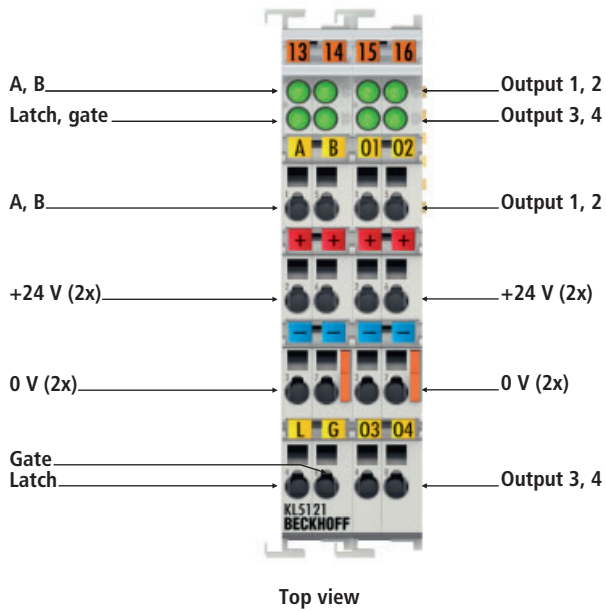


## KL5111 | Incremental encoder interface

The KL5111 Bus Terminal is an interface for the direct connection of 24 V incremental encoders. A 16 bit counter with a quadrature decoder and a 16 bit latch for the zero pulse can be read, set or enabled. The state of the counter is transmitted quickly and securely to the PC, PLC or CNC over the fieldbus. Interval measurement with a resolution of 200 ns is possible. Up to 64 incremental encoders can be connected to a Bus Coupler.

Technical data	KL5111   KS5111
Encoder connection	A, B, C; 24 V (low: < 3 V, high: > 18 V)
Encoder operating voltage	24 V DC
Counter	16 bits, binary
Limit frequency	1 million increments/s (with 4-fold evaluation)
Quadrature decoder	4-fold evaluation
Zero-pulse latch	16 bits
Commands	read, set, enable
Supply voltage	24 V DC (-15 %/+20 %)
Current consumption power contacts	0.1 A (without encoder lead current)
Current consumption K-bus	50 mA
Bit width in the process image	input/output: 2 x 16 bit data, 2 x 8 bit control/status
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL5111">www.beckhoff.com/KL5111</a>

Special terminals	
KL5111-0010	A, B, C signals: 5 V inputs
KL5111-0011	special function: latch input sets counter to zero
KL5111-0012	latches on both edges, A, B, C inputs 24 V
KL5111-0013	latches on both edges, A, B, C inputs 5 V
KL5111-0015	frequency measurement over a selectable time window; 24 V inputs
KL5111-0016	frequency measurement over a selectable time window; 5 V inputs
KL5111-0020	12 V input circuit

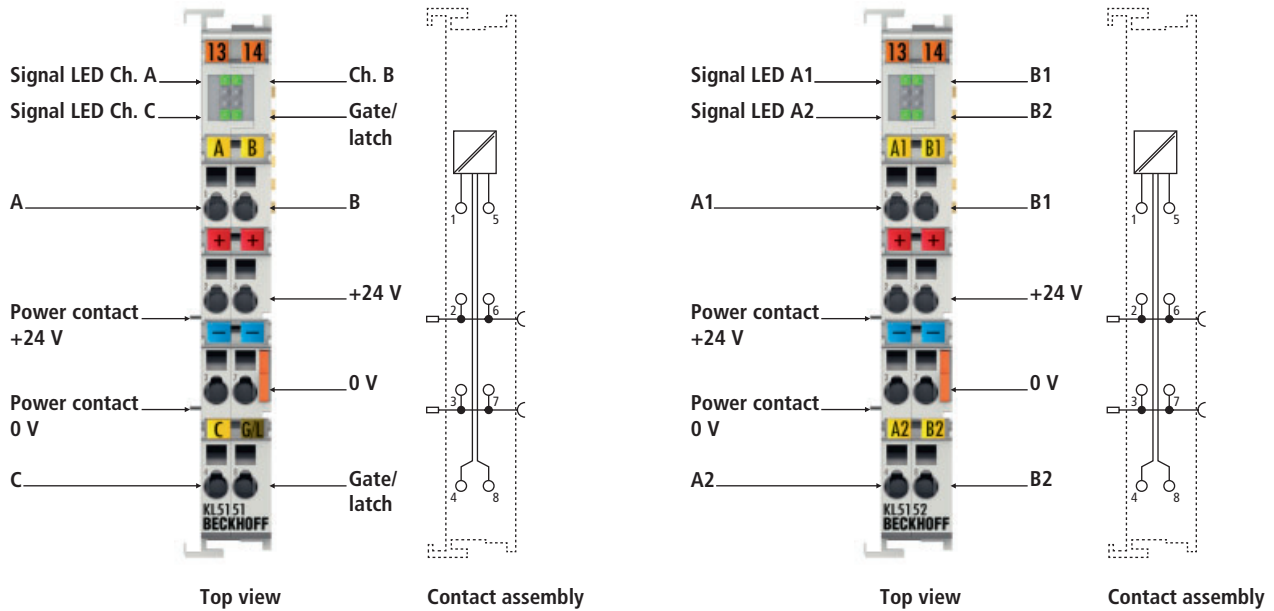


## KL5121 | Incremental encoder interface with programmable outputs

The KL5121 can be used to implement a linear path control. The terminal reads an incremental signal, which can be supplied by an incremental encoder or a pulse generator, and switches the outputs when the counter reaches a previously defined state. The counter states can be transmitted to the terminal by the higher-level automation device in the form of a table. The position is acquired with the aid of the latch input, which is activated/deactivated by the gate input. Up to four 24 V outputs can be switched. The LEDs indicate the states of the signals at the various inputs and outputs.

Technical data	KL5121   KS5121
Encoder connection	A, B, latch, gate
Encoder operating voltage	24 V DC
Counter	16 bits, binary
Limit frequency	1 million increments/s (with 4-fold evaluation)
Output voltage	24 V
Output current	0.5 A
Switching times	< 100 µs
Supply voltage	24 V DC (-15 %/+20 %)
Current consumption power contacts	0.1 A (without encoder lead current)
Current consumption K-bus	30 mA
Bit width in the process image	input/output: 2 x 16 bit data, 2 x 8 bit control/status
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL5121">www.beckhoff.com/KL5121</a>



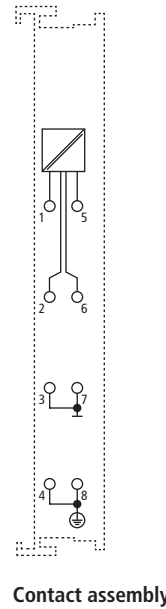
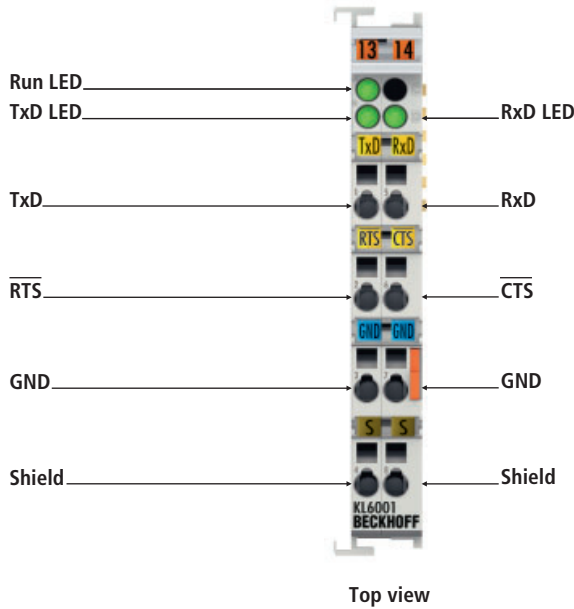


## KL5151, KL5152 | 1-, 2-channel incremental encoder interface

The KL5151/KL5152 Bus Terminal is an interface with 24 V inputs for the direct connection of incremental encoders. A 32 bit (KL5151) or 16 bit (KL5152) counter with a quadrature decoder and a 32 bit (KL5151) or 16 bit (KL5152) latch for the zero pulse can be read, set or enabled. The KL5151 inputs can optionally be used as single or two-counter inputs. The KL5152 indicates the logical state of the signals via LEDs. The signal inputs use 0 V as the reference potential and are electrically isolated from the K-bus.

Technical data	KL5151   KS5151	KL5152   KS5152
Encoder connection	A, B, C, gate/latch, 24 V	A1, B1, A2, B2, 24 V
Sensor inputs	1	2
Encoder operating voltage	24 V DC	
Counter	1 x 32 bits, binary	
Limit frequency	400,000 increments/s (with 4-fold evaluation)	
Quadrature decoder	4-fold evaluation	
Commands	read, set, latching	
Supply voltage	24 V DC (-15 %/+20 %)	
Current consumption power contacts	0.1 A (without encoder lead current)	
Current consumption K-bus	50 mA	
Bit width in the process image	input/output: 2 x 32 bit data, 2 x 8 bit control/status	
Weight	approx. 50 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	<a href="http://www.beckhoff.com/KL5151">www.beckhoff.com/KL5151</a>	

Special terminals	
KL5151-0021	incremental encoder 1 x 32 bits A, B, capture input and 1 driver output 24 V, 0.5 A
KL5151-0050	incremental encoder 2 x 32 bits A, B-track



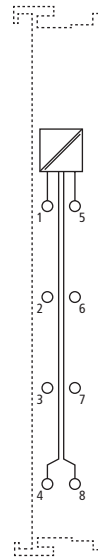
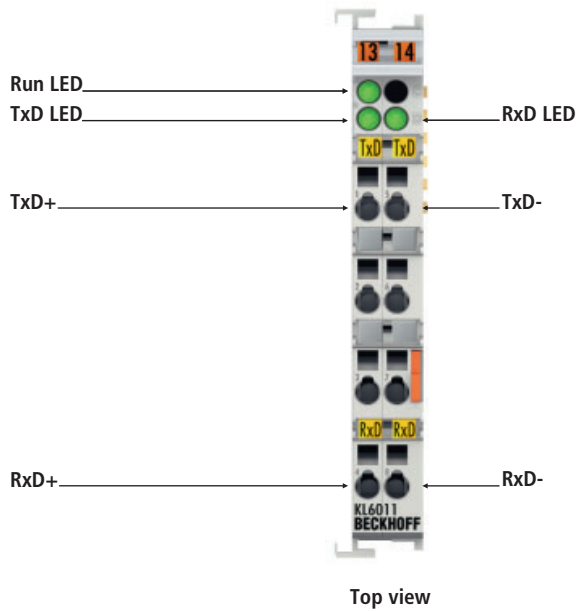
## KL6001, KL6031 | Serial interface RS232

The KL6001 and KL6031 serial interfaces allow devices with an RS232 interface to be connected. The interface operates in conformity with the CCITT V.28/DIN 66 259-1 standards. The device connected to the terminal communicates with the automation device via the Bus Coupler. The active communication channel operates independently of the higher-level bus system in full duplex mode at up to 19,200 baud (KL6001) or 115.2 kbaud (KL6031). The RS232 interface guarantees high immunity to interference through electrically isolated signals.

Technical data	KL6001   KS6001	KL6031   KS6031
Data transfer channels	2 (1/1), TxD and RxD, full duplex	
Data transfer rates	9,600 baud, 8 data bits, no parity and one stop bit are preset (max. 19,200 baud)	9,600 baud, 8 data bits, no parity and one stop bit are preset (max. 115,200 baud)
Bit distortion	< 3 %	
Cable length	max. 15 m	
"0" signal voltage	-18...-3 V	
"1" signal voltage	3...18 V	
Power supply	via the K-bus	
Current consumption K-bus	55 mA	
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)	
Data buffer	128 bytes receive buffer, 16 bytes transmit buffer	1024 bytes receive buffer, 128 bytes transmit buffer
Bit width in the process image	input/output: 3 x 8 bit user data, 1 x 8 bit control/status (up to 5 x 8 bit user data are possible)	input/output: 22 x 8 bit user data, 2 x 8 bit control/status (up to 22 byte user data are possible)
Configuration	no address setting, configuration via Bus Coupler or controller	
Weight	approx. 80 g	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL6001	

Special terminals	
KL6001-0020	standard format 5 bytes of user data

Accessories		
TwinCAT PLC Serial Communication	IEC 61131-3 software library for TwinCAT PLC for communication via serial Bus Terminals or PC COM ports	1170
TwinCAT PLC Serial Communication 3964R/RK512	licence for using the IEC 61131-3 software library for TwinCAT PLC for communication via serial Bus Terminals or the PC COM ports using the protocol 3964R/RK512	1170
TwinCAT PLC Modbus RTU	IEC 61131-3 software library for TwinCAT PLC with Modbus RTU function blocks for serial communication with Modbus devices	1171



Top view

Contact assembly

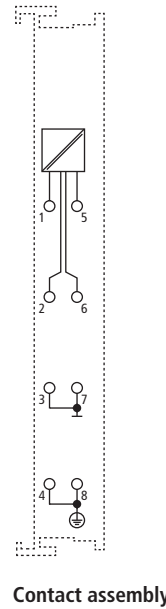
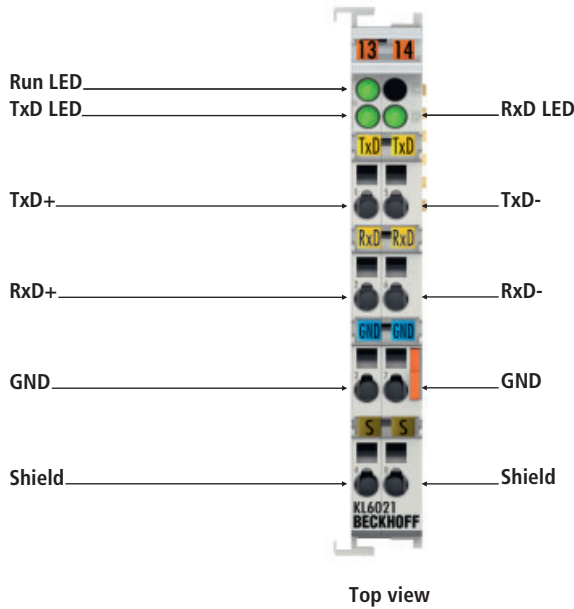
## KL6011 | Serial interface TTY, 20 mA current loop

The KL6011 serial interface allows devices with a 20 mA current interface to be connected. The interface operates passively. The device connected to the KL6011 terminal communicates with the automation device via the Bus Coupler. The active communication channel operates independently of the higher-level bus system in full duplex mode at up to 19,200 baud. The current interface (TTY) guarantees high immunity to interference through electrically isolated signals with injected current.

Technical data	KL6011   KS6011
Data transfer channels	2 (1/1), TxD and RxD, full duplex
Data transfer rates	9,600 baud, 8 data bits, no parity and one stop bit are preset (max. 19,200 baud)
Bit transfer	2 x 20 mA
Load	< 500 $\Omega$
Cable length	max. 1,000 m twisted pair
Power supply	via the K-bus
Current consumption K-bus	typ. 55 mA
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)
Data buffer	128 bytes receive buffer, 16 bytes transmit buffer
Bit width in the process image	input/output: 3 x 8 bit user data, 1 x 8 bit control/status (up to 5 x 8 bit user data are possible)
Configuration	no address setting, configuration via Bus Coupler or controller
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL6011">www.beckhoff.com/KL6011</a>

### Special terminals

KL6011-0020	standard format 5 bytes of user data
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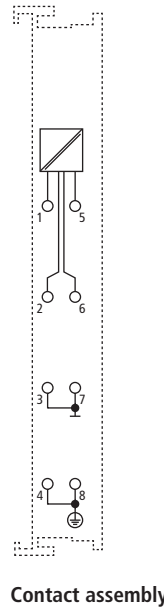
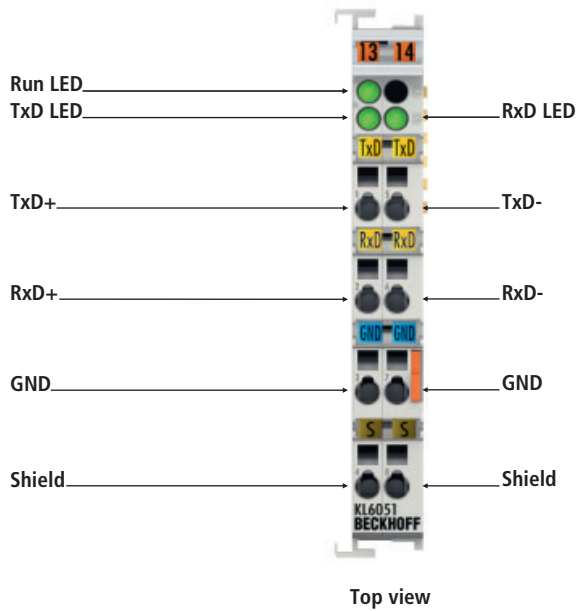
# KL6021, KL6041 | Serial interface RS422/RS485

The KL6021 and KL6041 serial interfaces allow devices with an RS422 or RS485 interface to be connected. The device connected to the terminal communicates with the automation device via the Bus Coupler. The active communication channel operates independently of the higher-level bus system in full or half duplex mode at up to 19,200 baud or 115.2 kbaud (KL6041). The transmission of differential signals conforms to RS422 and guarantees high immunity to interference through electrically isolated signals.

Technical data	KL6021   KS6021	KL6041   KS6041
Data transfer channels	TxD and RxD, full/half duplex	
Data transfer rates	9,600 baud, 8 data bits, no parity and one stop bit are preset (max. 19,200 baud)	9,600 baud, 8 data bits, no parity and one stop bit are preset (max. 115,200 baud)
Bit transfer	with differential signal	
Line impedance	120 Ω	
Cable length	approx. 1,000 m twisted pair	
Power supply	via the K-bus	
Current consumption K-bus	typ. 65 mA	
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)	
Data buffer	128 bytes receive buffer, 16 bytes transmit buffer	1,024 bytes receive buffer, 128 bytes transmit buffer
Bit width in the process image	input/output: 3 x 8 bit user data, 1 x 8 bit control/status (up to 5 x 8 bit user data are possible)	input/output: 22 x 8 bit user data, 2 x 8 bit control/status (up to 22 byte user data are possible)
Configuration	no address setting, configuration via Bus Coupler or controller	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL6021	

Special terminals	
KL6021-0020	standard format 5 bytes of user data (rest default)
KL6021-0021	standard format 5 bytes of user data (7 bits, even, 1 stop bit, 9,600 baud)
KL6021-0023	serial Bus Terminal for processing the RS485 signals from the KL6023 wireless adapter with EnOcean radio technology

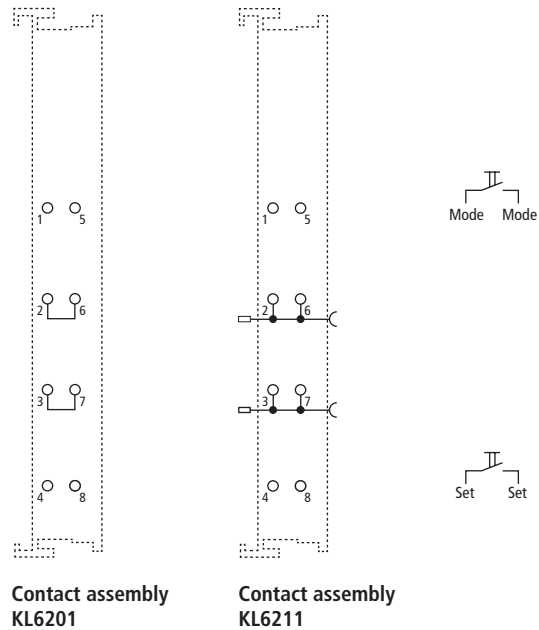
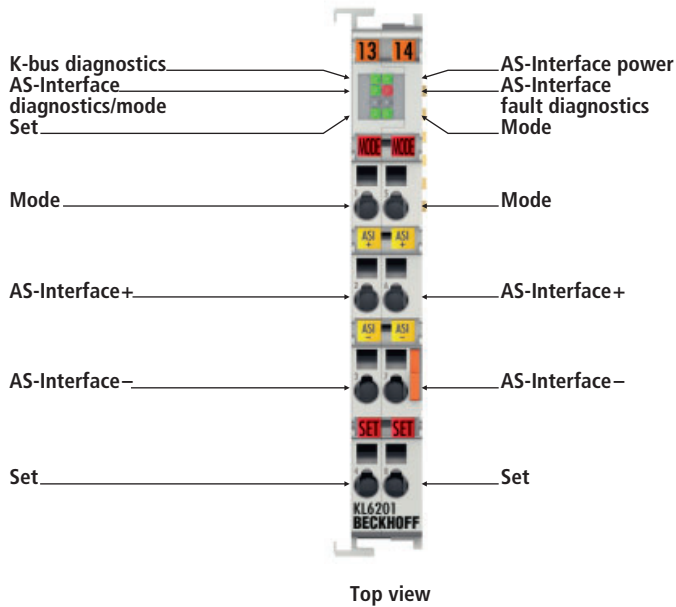
Accessories	
TwinCAT PLC Serial Communication	IEC 61131-3 software library for TwinCAT PLC for communication via serial Bus Terminals or PC COM ports <span style="float: right;">1170</span>
TwinCAT PLC Serial Communication 3964R/RK512	licence for using the IEC 61131-3 software library for TwinCAT PLC for communication via serial Bus Terminals or the PC COM ports using the protocol 3964R/RK512 <span style="float: right;">1170</span>
TwinCAT PLC Modbus RTU	IEC 61131-3 software library for TwinCAT PLC with Modbus RTU function blocks for serial communication with Modbus devices <span style="float: right;">1171</span>



## KL6051 | Data exchange terminal with serial interface

The KL6051 serial interface terminal makes it possible to exchange data between different fieldbus systems. Full duplex data exchange is possible, independently of the higher-level fieldbus. Under the terminal's default setting, 32 inputs and 32 outputs are transferred between the fieldbus systems. The time to exchange the data is about 5 ms for 32 bits of I/O. The exchange of data with the Bus Coupler is indicated by the run LED. The TxD and RxD LEDs indicate the state of the signal transmission.

Technical data	KL6051   KS6051
Data transfer channels	TxD and RxD, full duplex
Data transfer rates	62,500 baud, 8 data bits, no parity, one stop bit
Bit transfer	via 2 pairs of twisted wires with differential signals
Line impedance	120 Ω
Cable length	approx. 1,000 m twisted pair
Power supply	via the K-bus
Current consumption K-bus	typ. 65 mA
Electrical isolation	500 V <sub>rms</sub> (K-bus/signal voltage)
Bit width in the process image	input/output: 4 x 8 bit user data, 1 x 8 bit control/status (up to 5 x 8 bit user data are possible)
Configuration	no address or configuration setting
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL6051">www.beckhoff.com/KL6051</a>



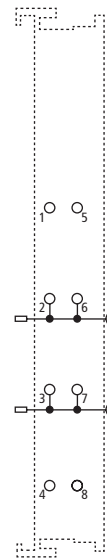
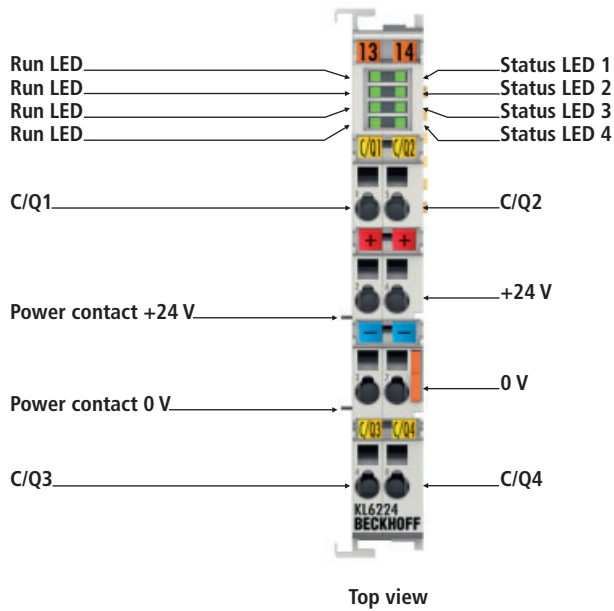
# KL6201, KL6211 | AS-Interface master terminals



The AS-Interface master terminal is an extended master according to profile M3 and enables the direct connection of AS-Interface slaves. The AS-Interface-compliant interface supports digital and analog slaves, versions 2.0 and 2.1, safety slaves and slaves with Combined Transaction Type 1 (profile S-7.3 and 7.4). Process data exchange, parameterisation and the diagnosis are fieldbus-independent. Together with the different Bus Couplers, the KL6201 or the KL6211 represent a universal AS-Interface/fieldbus gateway. Together with the BK3120, the PROFIBUS DP V1 services can be used for communication with the KL6201 or KL6211. Unlike the KL6201 AS-Interface master terminal, the KL6211 features power contacts. This enables direct connection to the AS-Interface supply via the KL9520 AS-Interface potential feed terminal or the KL9528 power supply terminal.

Technical data	KL6201   KS6201	KL6211   KS6211
AS-Interface channels	1	
Number of slaves	31 for V 2.0, 62 for V 2.1	
AS-Interface versions	V 2.0 and V 2.1, automatic support	
Slave types	digital and analog	
Diagnostics	power failure, slave failure, parameterisation fault	
AS-Interface address assignment	via configuration or automatic	
Cycle time	max. 5 ms (31 devices)	
Connection	2 lines via spring force technology	
Current consumption K-bus	55 mA (K-bus), approx. 60 mA (AS-Interface)	
Electrical isolation	500 V (AS-Interface/K-bus)	
Power contacts	no	yes
Bit width in the process image	selectable: 12 bytes, 22 bytes or 38 bytes, of which 6 bytes parameter interface	
Configuration	via fieldbus parameter interface, DP-V1 or Bus Coupler through KS2000	
Weight	approx. 55 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL6201	

Special terminals	
KL6201-0010	preset to 22 bytes K-bus interface (2 K-bus cycles 31 AS-Interface slaves)
KL6201-0011	preset to 38 bytes K-bus interface (4 K-bus cycles 62 AS-Interface slaves)



Contact assembly



IO-Link devices

Connection

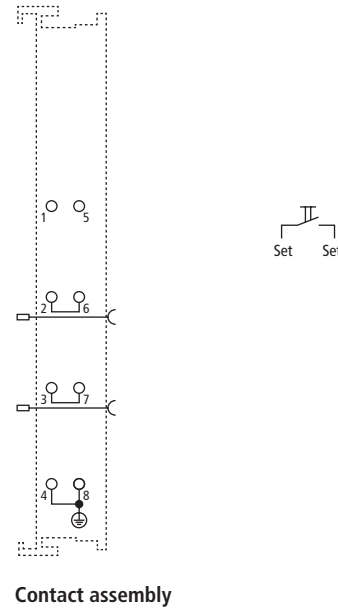
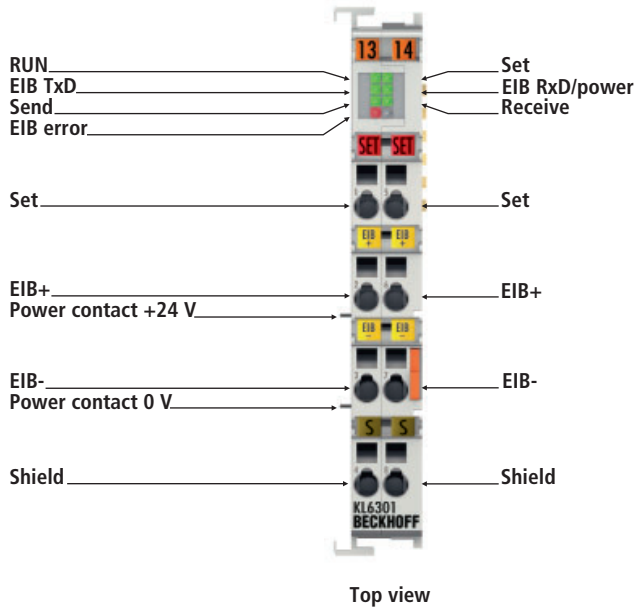
## KL6224 | IO-Link terminal



The IO-Link terminal enables connection of up to four IO-Link devices. A point-to-point connection is used between the terminal and the device. The terminal is parameterised via the master. 2-wire and 3-wire connections are supported. Additional 24 V and 0 V connection points can be realised via the KL918x potential distributor terminal.

Technical data	KL6224   KS6224
IO-Link interfaces	4
Field voltage	24 V DC via power contacts
Connection	physics 1 (2-wire) or physics 2 (3-wire)
Data transfer rates	4.8 kbaud, 38.4 kbaud and 230.4 kbaud
Cable length	max. 20 m
Power supply	via K-bus and power contacts
Supply current for devices	< 200 mA per device (method 1)
Current consumption K-bus	typ. 85 mA
Electrical isolation	500 V (K-bus/signal voltage)
Power contacts	yes
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL6224">www.beckhoff.com/KL6224</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/KL6224](http://www.beckhoff.com/KL6224)

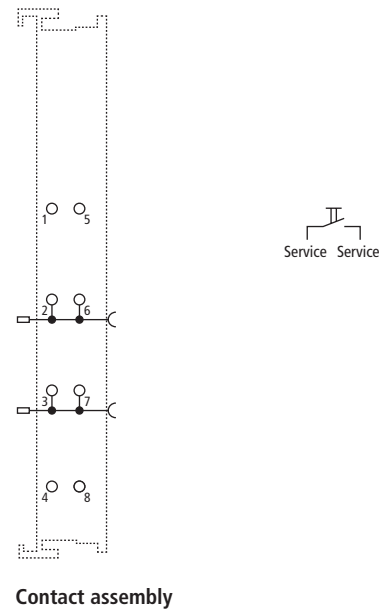
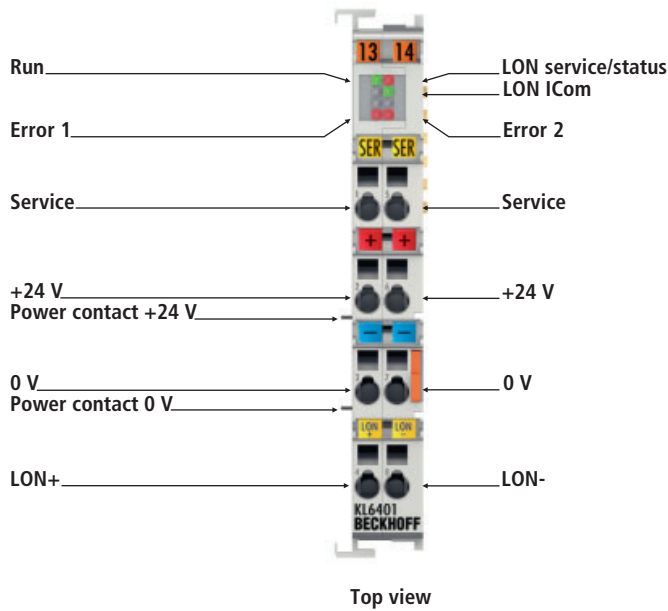


# KL6301 | EIB Bus Terminal

The KL6301 EIB Bus Terminal is integrated in an EIB network and can receive/transmit data from/to other EIB devices. Due to the integration in the Bus Terminal system, EIB components can also be integrated in higher-level bus systems such as Ethernet. The Bus Terminal is commissioned or configured via TwinCAT function blocks. Status LEDs directly indicate the bus status. The EIB terminal operates independent of the bus system used. Several KL6301 can be used with a single Bus Coupler or a Bus Terminal Controller. Up to 256 group addresses can be received; sending is only limited by the application.

Technical data	KL6301   KS6301
Data transfer channels	1
Data transfer standard	twisted pair (TP)
Data transfer rates	9,600 baud
Bus access	CSMA/CA
Current consumption K-bus	approx. 55 mA
Short-circuit-proof	yes
Electrical isolation	500 V <sub>rms</sub> (K-bus/EIB)
Bit width in the process image	input/output: 24 bytes
Configuration	TwinCAT (function blocks)
Input voltage	24 V DC (-15 %/+20 %)
Weight	approx. 80 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL6301">www.beckhoff.com/KL6301</a>

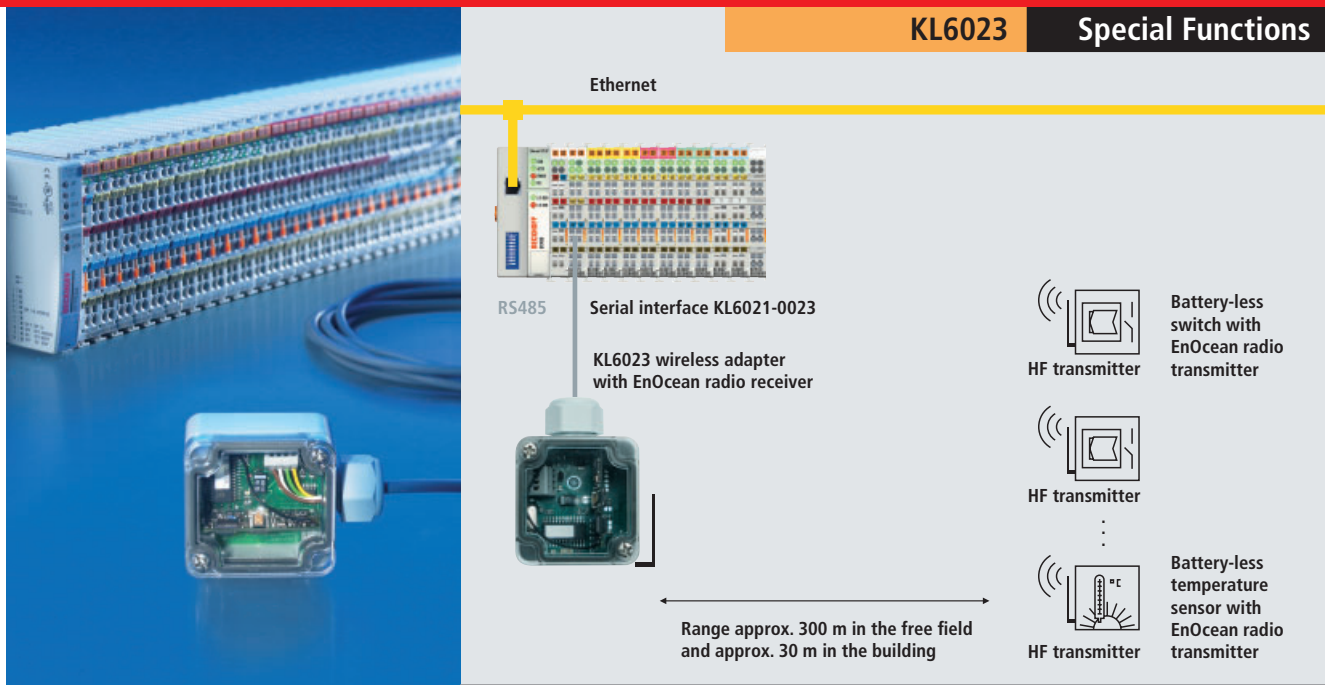




## KL6401 | LON Bus Terminal

The KL6401 LON Bus Terminal enables direct connection of LON devices. The network variables of the connected devices are available for the Bus Coupler or the higher-level bus system. This simplifies the data exchange between a variety of systems and a LON network. Status LEDs directly indicate the bus status. The LON terminal operates independent of the bus system used. Several KL6401 can be used with a single Bus Coupler or a Bus Terminal Controller. The KL6401 supports 62 SNVTs. All SNVT types can be configured as input or output variable via the KS2000 software. The KS2000 software generates an XIF file that is integrated in an LON tool.

Technical data	KL6401   KS6401
Data transfer channels	1
Network variables	62 (standard network variables SNVTs), max. 15 LON devices
Data transfer standard	FTT-10, LPT
Data transfer rates	78 kbit/s
Bus segment length	500 m
Current consumption K-bus	approx. 55 mA
Electrical isolation	500 V <sub>rms</sub> (K-bus/LON-bus)
Bit width in the process image	input/output: 36 bytes
Configuration	KS2000, LonMaker or another LON Tool, TwinCAT (function blocks)
Weight	approx. 85 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL6401">www.beckhoff.com/KL6401</a>



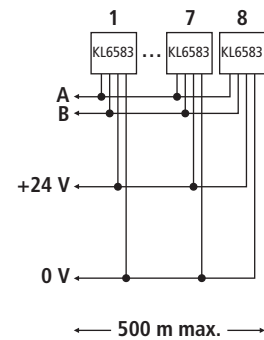
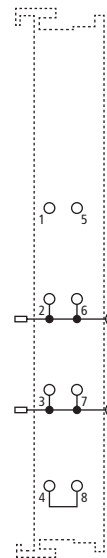
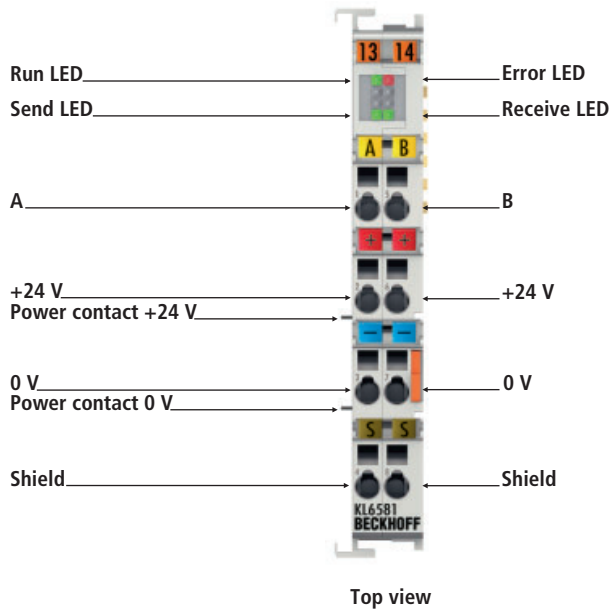
## KL6023 | Wireless adapter for EnOcean radio technology

The KL6023 wireless adapter receives signals from battery-less sensors with EnOcean technology. These signals are converted by the wireless adapter to a RS485 signal and directly processed further by the KL6021-0023 serial Bus Terminal. With a radio signal range of at least 30 m, the wiring of buildings can be simplified significantly.

The status LEDs of the wireless adapter are helpful during commissioning. The LEDs indicate all telegrams, received as faulty or faultless. With a distance of more than 300 m between the receiver and the Bus Terminal station, the receiver can be placed at any position within a building that is advantageous for radio transmission purposes. The system does not limit the number of transmitters per receiver unit. In practice, between 25 and 100 transmitters per receiver are used.

Technical data	KL6023
Connection	2 x 2-wires directly at the KL6021-0023 Bus Terminal
Power supply	via KL6021-0023 Bus Terminal with electrical isolation
Connecting cable	up to 300 m
Configuration	not required
Frequency band	868.35 MHz
Data transfer range	300 m in the free field, 30 m within buildings
Radio telegram	depending on the sensor type (32 bits sensor ID number, the number of useful bytes is not limited.)
Receiving antenna	integrated in the housing
Housing	box: polystyrene (grey) with M16 high-strength cable gland for cable connection; cover: polycarbonate (transparent)
Dimensions (W x H x D)	52 mm x 50 mm x 35.5 mm
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Protect. class/installation pos.	IP 66/variable
Further information	<a href="http://www.beckhoff.com/KL6023">www.beckhoff.com/KL6023</a>

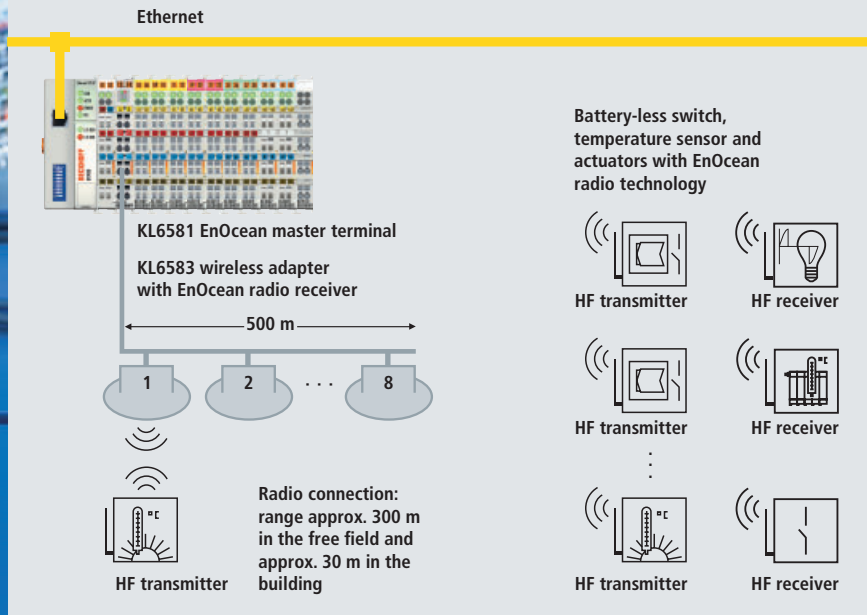
Accessories	
KL6021-0023	serial Bus Terminal for processing the RS485 signals from the KL6023 wireless adapter with EnOcean radio technology <span style="float: right;">595</span>
TwinCAT PLC Serial Communication EnOcean	free licence for using the PLC library for processing of data from the KL6023 wireless adapter or the KL6021-0023 serial Bus Terminal <span style="float: right;">1171</span>



## KL6581 | EnOcean master terminal

The bidirectional EnOcean technology receives signals from battery-less sensors or transmits data to actuators. With a radio signal range of 30 m, the wiring of buildings can be simplified significantly. The KL6581 EnOcean master terminal is the link between the KL6583 EnOcean transmitter and receiver modules and the application. Up to eight KL6583 EnOcean transmitters and receivers can be connected to a KL6581 EnOcean master terminal. The KL6583 modules are connected to the KL6581 via two wires for the power supply and two wires for the data bus that transmits the EnOcean telegrams. The maximum total length of the data bus is 500 m.

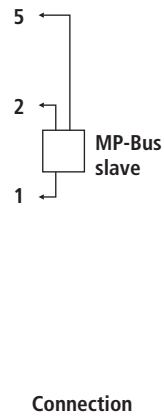
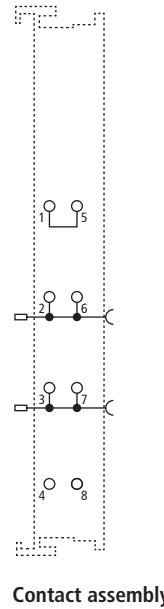
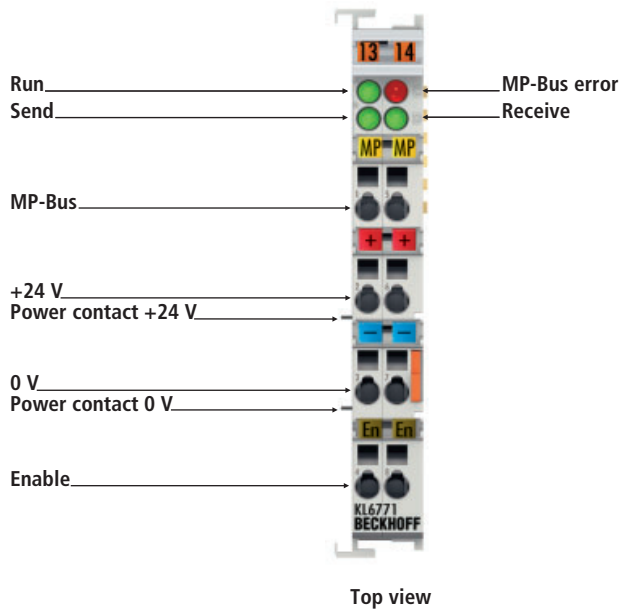
Technical data	KL6581
Connection	2 x 2-wires directly at the KL6583 EnOcean module (connection of max. 8 KL6583)
Power supply	via the K-bus
Connecting cable	up to 500 m
Configuration	not required
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/kl6581">www.beckhoff.com/kl6581</a>



## KL6583 | EnOcean transmitter and receiver

The KL6583 EnOcean module enables EnOcean data to be transmitted and received. An antenna is integrated in the device. The KL6583 module is supplied with 24 V and offers a bus connection to the KL6581 EnOcean master terminal. Data is transmitted from the EnOcean module to the EnOcean master terminal via a 2-wire bus. The data is transmitted to the KL6581 and is thus available to the application. The length of the data bus may be max. 500 m. The KL6583 is addressed via an address selection switch. Up to eight KL6583 modules can be connected to a KL6581.

Technical data	KL6583
Connection	2 x 2-wires directly at the KL6581 Bus Terminal
Power supply	via KL6581 (24 V DC)
Connecting cable	up to 500 m
Configuration	not required
Frequency band	868.35 MHz
Data transfer range	300 m in the free field, 30 m within buildings
Radio telegram	depending on the sensor type (32 bits sensor ID number, unlimited number of useful bytes), send and receive
Receiving antenna	integrated in the housing
Housing	round upper part for mounting (ceiling/wall) with flange connection for main housing, upper part with cable feed-through
Dimensions	height: 57 mm, diameter: 72 mm
Weight	approx. 90 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Protect. class/installation pos.	IP 40/variable
Further information	<a href="http://www.beckhoff.com/KL6583">www.beckhoff.com/KL6583</a>

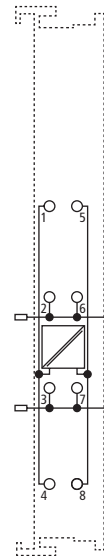
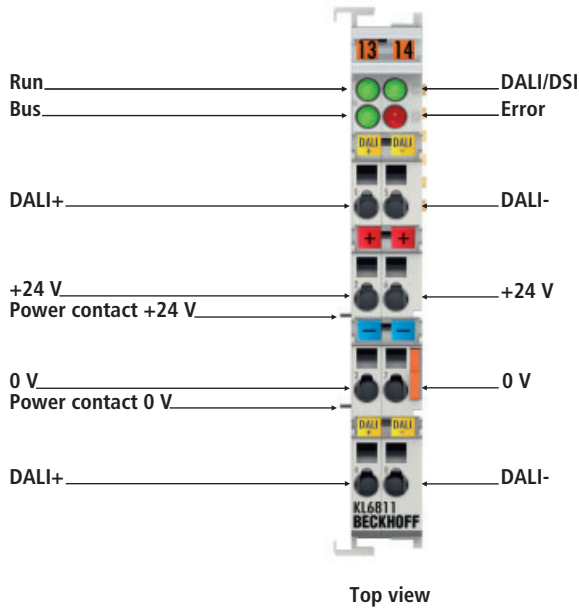


## KL6771 | MP-Bus master terminal



The MP-Bus master terminal enables direct connection of MP-Bus slave devices. The MP-Bus was developed by Belimo for connecting valves, throttle valves, air valves and fire dampers for window ventilation systems. Up to sixteen field devices, eight drives and eight sensors can be connected to the KL6771. Process data exchange is fieldbus-independent. The Bus Terminal is configured and commissioned via TwinCAT function blocks. Status LEDs directly indicate the bus status. Several KL6771 terminals can be connected to the same Bus Coupler or Bus Terminal Controller.

Technical data	KL6771   KS6771
Data transfer channels	1
MP-Bus devices	max. 16 (8 drives/8 sensors)
Data transfer rates	1,200 baud
Current consumption K-bus	approx. 55 mA
Short-circuit-proof	yes
Electrical isolation	500 V <sub>rms</sub> (K-bus/MP-Bus)
Bit width in the process image	input/output: 12 bytes
Configuration	TwinCAT (function blocks)
Input voltage	24 V DC (-15 %/+20 %)
Weight	approx. 80 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL6771">www.beckhoff.com/KL6771</a>

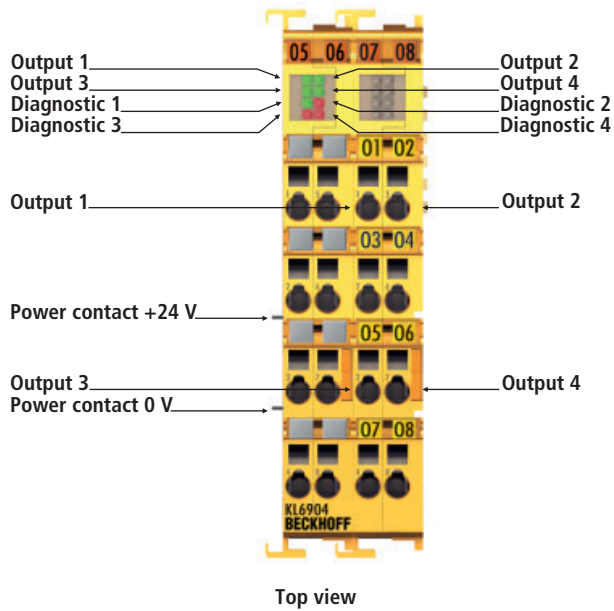


## KL6811 | DALI/DSI master and power supply terminal

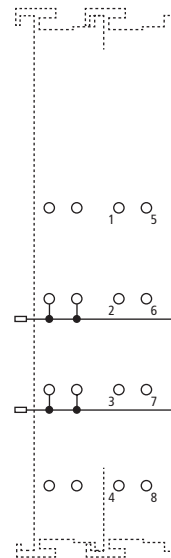
The KL6811 enables the connection of up to 64 DALI slaves. The KS2000 software enables simple configuration via a PC that is directly coupled with the Bus Coupler via an RS232 interface or via the fieldbus. The integrated power supply unit generates an electrically isolated 24 V DC output voltage. No further components are required for the operation of the DALI slaves. The KL6811 operates fieldbus-independent.

Technical data	KL6811   KS6811
Slaves/groups	max. 64/max. 16
Data transfer channels	1
Current consumption K-bus	approx. 55 mA
Short-circuit-proof	yes, automatic restart
Electrical isolation	500 V <sub>rms</sub> (K-bus/DALI-bus)
Bit width in the process image	input/output: 4 x 8 bit user data, 1 x 8 bit control/status (up to 5 x 8 bit user data are possible)
Configuration	via the Bus Coupler or the controller
Input voltage	24 V DC (-15 %/+20 %)
Insulation voltage	DALI-bus/K-bus: 1,500 V AC <sub>rms</sub> , constant load; DALI-bus/power contacts: 1,500 V AC <sub>rms</sub> , constant load; K-bus/power contacts: 500 V AC <sub>rms</sub> , constant load
DALI/DSI	standard conformable, open circuit voltage 11.5...15 V DC
Max. high/low state current	130 mA/250 mA
Surge voltage resistance	constant load 275 V AC <sub>rms</sub>
Weight	70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL6811">www.beckhoff.com/KL6811</a>

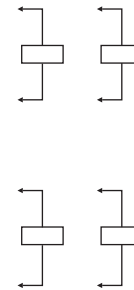
Accessories	
TwinCAT PLC Building Automation DALI	free licence for using an IEC 61131-3 software library for TwinCAT PLC for communication with the KL6811 DALI master Bus Terminal



Top view



Contact assembly

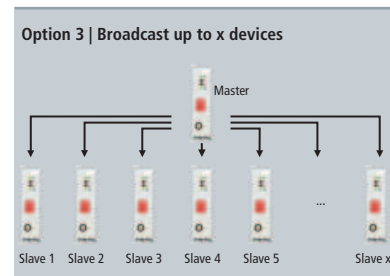
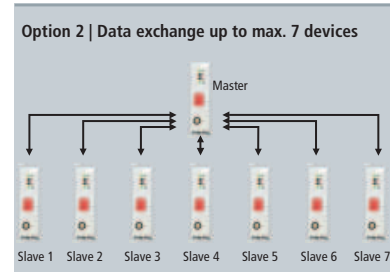
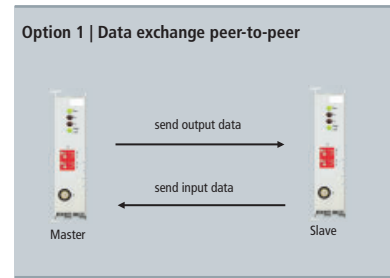
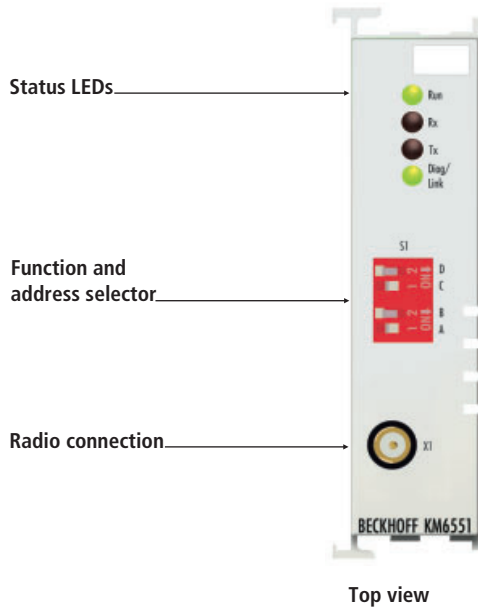


Connection

## KL6904 | TwinSAFE Logic Bus Terminal

TwinSAFE enables networks with up to 1,024 TwinSAFE devices. The KL6904 TwinSAFE Logic Bus Terminal can establish 15 connections (TwinSAFE connections). Multiple Logic Terminals are cascable within a network. The Bus Terminal features certified safety function blocks, which are configured according to the application to be realised. Functions such as emergency stop, safety door monitoring, etc. can thus easily be selected and linked. All blocks can be freely connected among each other and are complemented by operators such as AND, OR, etc. The required functions are configured via the TwinCAT System Manager and loaded into the KL6904 Logic Terminal via the fieldbus. The TwinSAFE logic terminal has four safe, local outputs, so that safety applications can be realised with only two components (KL1904 and KL6904). The KL6904 is suitable for applications up to SIL 3 according to IEC 61508, EN 954 Cat. 4 and DIN EN ISO 13849 PL<sub>e</sub>.

Technical data	KL6904
Number of outputs	4
Protocol	TwinSAFE
Status display	8 LEDs: 1 per output, 4 diagnostic
Cycle time	4...100 ms
Current consumption K-bus	250 mA
Fault response time	≤ watchdog time (parameterisable)
Bit width in the process image	6...192 bytes
Supply voltage	24 V DC (-15 %/+20 %)
Output current	0.5 A max./20 mA min. (per channel)
Operating/storage temperature	0...+55 °C/-25...+70 °C
Permiss. degree of contamin.	2
Climate class EN60721-3-3	3K3
Electrical interference	EN 61000-6-2/EN 61000-6-4
Vibration/shock resistance	EN 60068-2-6/EN 60068-2-27/29
Installation position	horizontal
Protection class	IP 20
Further information	<a href="http://www.beckhoff.com/KL6904">www.beckhoff.com/KL6904</a>



# KM6551 | Wireless data exchange terminal

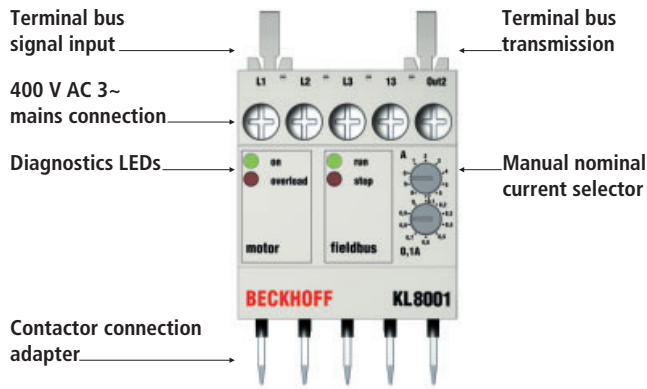
The KM6551 terminal module is a data exchange unit for radio technology. The KM module is based on the IEEE802.15.4 standard. Data are exchanged or transferred via radio between two stand-alone control units, independent of the higher-level fieldbus. The outdoor range between two KM6551 units can be up to 300 m.

The data exchange module has a reverse SMA plug (Straight Medium Adapter) for connection of various radio antennas. The free choice of antenna enables adaptation to the respective environment. Status and data exchange are displayed via LEDs, thereby offering fast and simple diagnostics. A library is available for using the KM6551 module with TwinCAT.

Technical data	KM6551
Frequency band	2.4 GHz band
Data transfer rates	250 kbit
Protocol	IEEE 802.15.4
Antenna connection	reverse SMA plug (RP-SMA)
Power supply	via the K-bus
Current consumption K-bus	typ. 135 mA
Bit width in the process image	12 byte input/output (10 byte user data, 2 byte control/status)
Configuration	no configuration required
Weight	approx. 85 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4/EN 300 440-02
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/KM6551

Accessories		
ZS6200-0400	omni-directional antenna 4 dBi, matching cables: ZK6000-0102-0020/-0040 (not included in the scope of supply)	640
ZS6100-0900	directional antenna 9 dBi, matching cables: ZK6000-0102-0020/-0040 (not included in the scope of supply)	640
ZS6201-0410	rod antenna 4 dBi, 1 m cable with reverse SMA socket (included in the scope of supply)	641
ZS6201-0500	rod antenna 5 dBi, direct connection, reverse SMA socket	641
ZS6100-1800	directional antenna 18 dBi, matching cables: ZK6000-0102-0020/-0040 (not included in the scope of supply)	641
ZK6000-0102-0020	coaxial cable, 50 Ω impedance, with attached connectors (SMA plug and reverse SMA socket), black, 200 cm	
ZK6000-0102-0040	coaxial cable, 50 Ω impedance, with attached connectors (SMA plug and reverse SMA socket), black, 400 cm	





## KL8001 | Power terminal for Siemens contactor, series Sirius 3R

Like a standard motor protection relay the KL8001 power terminal is fitted to a power contactor up to a switching capacity of 5.5 kW. The connection mechanism of the KL8001 power terminal of the KL8xxx series is particularly suitable for Siemens contactors of the Sirius 3R series. Other power terminals are adapted for other contactor manufacturers. The power terminal switches the installed contactor and takes over all the functions of the motor protection relay. Apart from its purely protective function of switching off the motor when overloaded, the power terminal can carry out numerous diagnostic functions on the motor and make the information available to the controller via the fieldbus.

Technical data	KL8001
Number of power terminals	up to 10 (at 140 mA typ. current consumption per contactor)
Contactor	connection mechanism for Siemens contactor series Sirius 3R (switch size S00, Typ 3RT 10 1)
Type of connection power path	screw terminals up to 2 x 2.5 mm <sup>2</sup>
Current load	max. 25 A (fuse)
Short-circuit-proof	up to 5 kA
Internal resistance	< 1 mΩ
Setting range of nominal current	0.9...9.9 A
Tripping classes	class 5, 10, 15, 20, 25, 30 selectable
Measured values	current, voltage, power
Measuring error	0.1 A active
Measuring voltage	500 V AC
Type of K-bus connection	2 x flat plug socket, 10-pin
Current consumption K-bus	approx. 150 mA
Current consumption power contacts	7 mA
Power contacts	24 V DC (-15 %/+20 %)/1.4 A max., short-circuit-proof
Electrical isolation	500 V <sub>rms</sub> (24 V DC/K-bus), 2,500 V <sub>rms</sub> (mains supply/K-bus)
Configuration possibility	automatically, via the fieldbus, KS2000, rated current also manually
Bit width in the process image	input/output: 64 bits, 8 bit control/status, 32 bit data
Adapter terminal	KL9060
Short circuit behaviour	conforms to EN 60947-4-1 (assignment type 2)/VDE 102
Triggering tolerance	conforms to IEC 947, as well as UL and CSA
Weight	approx. 90 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable, contactor dependent
Further information	www.beckhoff.com/KL8001

The KL8601 communication module connects the TeSys modules with the Bus Terminal system, thereby making them fieldbus-capable for all common bus systems.

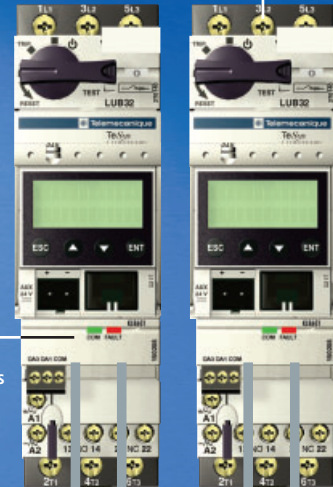
Adapter terminal KL8610 for the connection of up to 8 TeSys modules

Motor starter TeSys model U from Schneider Electric



The signals are transferred via standard 5(F)TP cables with RJ 45 plugs (up to 5 m distance).

The KL8601 communication module connects the TeSys module with the KL8610 adapter terminal and further motor starters.

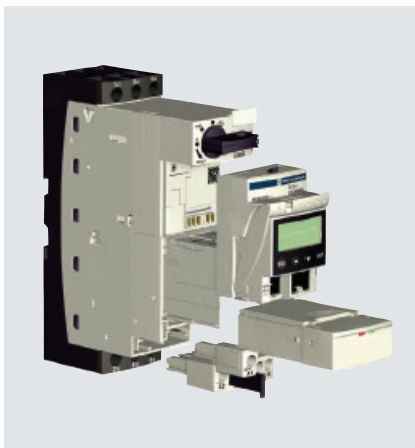


## Motor starter TeSys model U on the Bus Terminal system

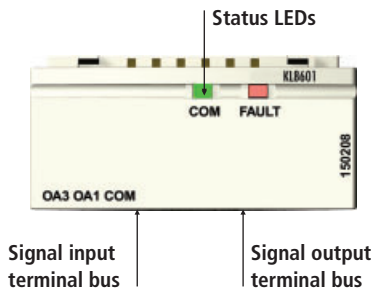
The TeSys series from Schneider Electric/ Télémécanique is a product family for the protection and switching of motors. Model U is a very compact motor starter that can be connected directly to the Bus Terminal system via the KL8601 communication module from Beckhoff. Users of TeSys modules therefore have the complete fieldbus range of the Bus Terminal system available. Similar to the KL8001 power terminal from Beckhoff, the motor starter integrates seamlessly into the terminal bus.

The motor starter is integrated into the fieldbus system via the KL8610 adapter terminal and a common, screened RJ 45 cable. The 24 V DC supply of the contactor systems is also transferred via this patch cable. The maximum distance between the KL8610 and the first motor starter module is 5 m; the maximum distance between two starters is 0.5 m. Up to eight starters can be connected in series. Spatial separation of I/O and power plane can thus be realised within the control cabinet.

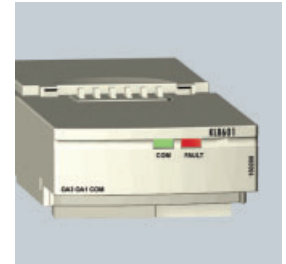
**Note:** The KL8601 communication module, the KL8610 adapter terminal and the accessory cable can be ordered via Schneider Electric/Télémécanique and Beckhoff. The TeSys motor starters are only available from Schneider Electric, the Bus Terminal system only from Beckhoff.



Motor starter TeSys model U  
Further information can be found on the internet at: [www.schneider-electric.com](http://www.schneider-electric.com)



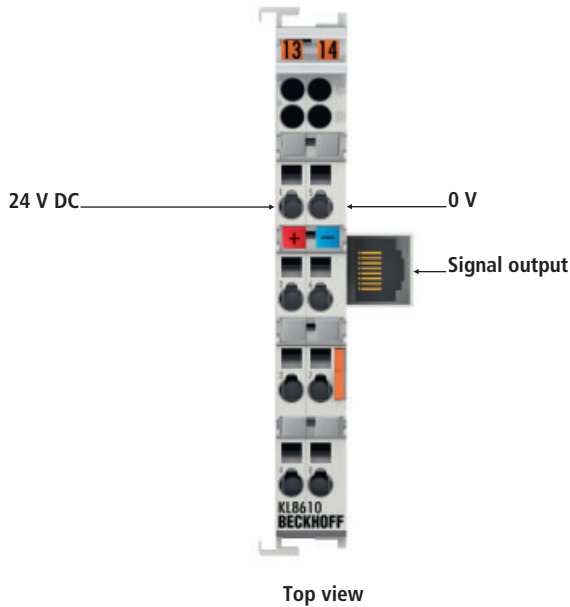
Top view



## KL8601 | Communication module for TeSys model U

The KL8601 communication module is plugged into the TeSys Model U motor starter. It connects the starter with the KL8610 adapter terminal and further motor starters with communication module. The KL8610 adapter terminal provides the connection with the Bus Terminal system. The control and status information of the motor starter evaluation unit are transferred to the Bus Terminal system via the KL8601 communication module. The KL8601 communicates with the higher-level automation device via the Bus Coupler. All TeSys system control devices are supported (standard, expanded and multi-functional).

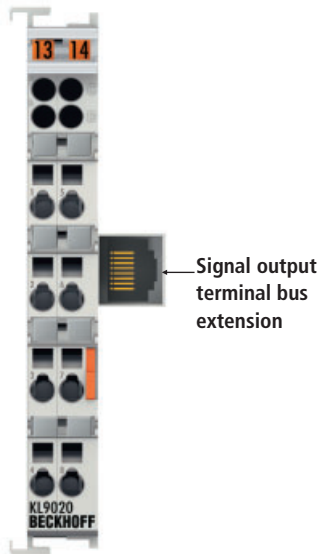
Technical data	KL8601
Number of modules	up to 8 TeSys model U
Communication unit	TeSys model U, all control devices (standard, expanded and multi-functional)
Current consumption system bus	20 mA + load current 2 x 0.5 A max.
Bit width in the process image	3 byte input/3 byte output (is represented in the KL8610)
Number of outputs	2 (digital 24 V DC)
Output current	0.5 A short-circuit-proof
Configuration	automatic
Weight	110 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KL8601">www.beckhoff.com/KL8601</a>



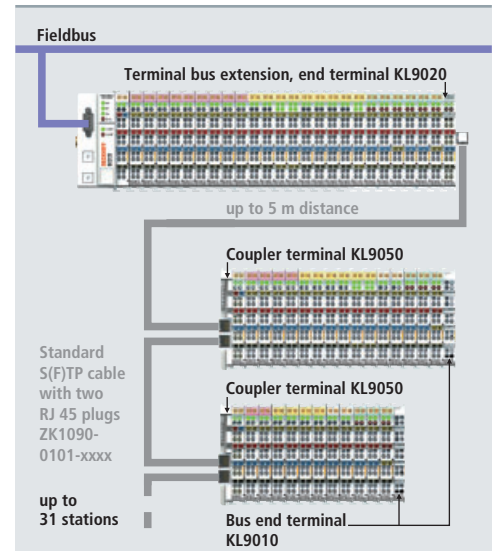
## KL8610 | Adapter terminal for TeSys model U

The KL8610 adapter terminal enables the connection of the TeSys Model U motor starter to the Beckhoff Bus Terminal system. Together with the KL8601 communication module, the KL8610 forms an operational unit in the TeSys motor starter. The KL8610 adapter terminal is attached to the end of the bus terminal block in the same way as the standard terminal KL9010. The block is terminated with the KL8610 and offers the option to connect up to eight TeSys Model U motor starters. In the KL8610, the K-bus signals are converted to a system bus and fed into the RJ 45 plug connector with 24 V DC. This supply is short-circuit-proof and capable of carrying up to 2 A. No further parameterising or configuration work on the KL8610 is necessary apart from plugging-in the connecting cable.

Technical data	KL8610
Connection	up to 8 TeSys model U KL8601
Type of connection	RJ 45 socket
Voltage	24 V DC (-15 %/+20 %)
Current load	2 A max. short-circuit-proof
Current consumption K-bus	32 mA
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/K-bus)
Bit width in the process image	3 bytes input and 3 bytes output per each TeSys modul (KL8601)
Weight	approx. 65 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KL8610">www.beckhoff.com/KL8610</a>



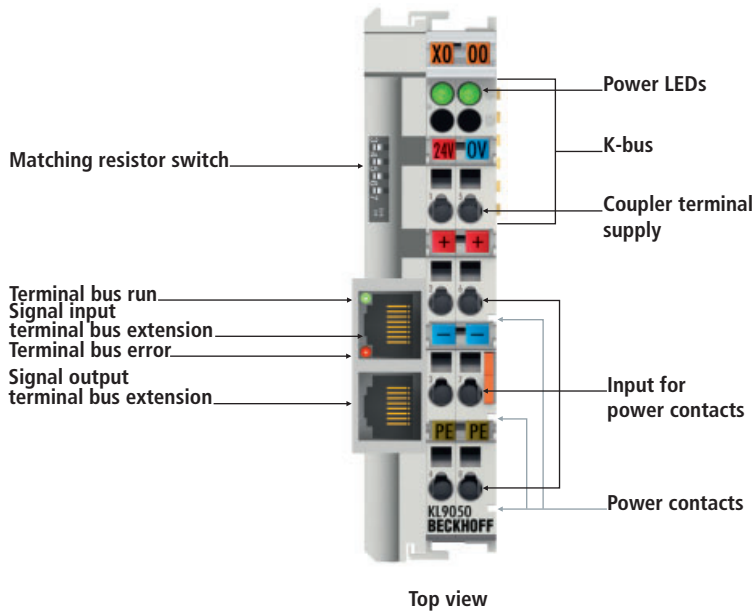
Top view



## KL9020 | Terminal bus extension, end terminal

The KL9020 is attached to the end of the Bus Terminal block in the same way as the standard terminal KL9010 and terminates the terminal block. The KL9020 enables the connection of an Ethernet cable with a RJ 45 plug. The K-bus signals are converted to RS485. Power to the KL9020 electronics is supplied via the K-bus. The KL9020 forms a properly working unit together with at least one KL9050. Apart from a supply voltage of 24 V and the insertion of the Ethernet cable, there is no further parameterisation or configuration work necessary. The Bus Coupler carries out all diagnosis and commissioning tasks.

Technical data	KL9020
Number of coupler terminals	up to 31 KL9050
Type/number of peripheral signals	Bus Coupler dependency
Max. number of bytes fieldbus	Bus Coupler dependency
Distance between stations	max. 5 m between KL9020 and KL9050
Bus interface	1 x RJ 45 socket
Current consumption K-bus	70 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/K-bus)
Configuration possibility	none, automatic
Weight	85 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KL9020">www.beckhoff.com/KL9020</a>

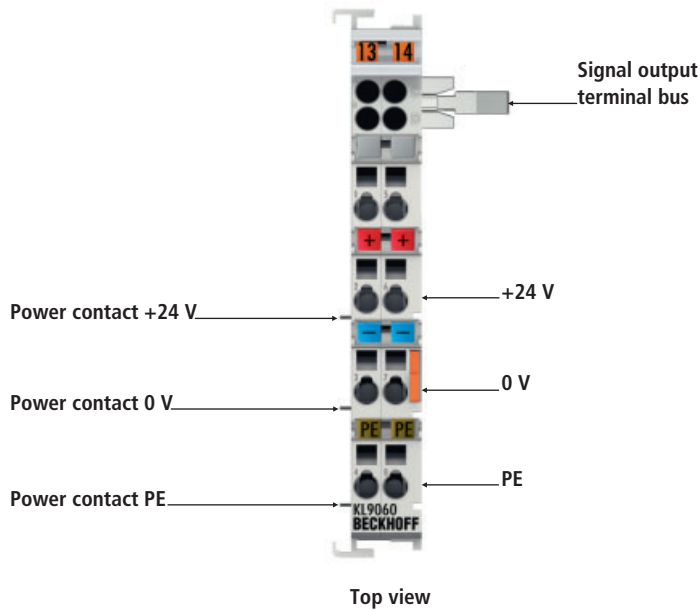


Top view

## KL9050 | Terminal bus extension, coupler terminal

The KL9050 coupler terminal replaces the Bus Coupler on a Bus Terminal block. The KL9050 is the counterpart to the KL9020. The S(F)TP cable (shielded twisted pair) is plugged into the upper socket, providing the logical connection to the Bus Coupler. The extension is fully transparent for the Bus Coupler. All Bus Terminal system functions remain unchanged. The second RJ 45 socket allows the system to be extended further. A new KL9050 can be connected to the first coupler terminal. The whole system can thereby be extended by 31 stations. The supply voltage for the field level and the internal electronics can be input separately. Both levels are thereby electrically isolated from one another. In the KL9050 a 400 mA K-bus power supply unit supplies the added Bus Terminals. The internal electronics and the field level can be supplied together from a single voltage source. Three diagnostic LEDs give information about the supply voltage for each Bus Terminal block, internal and field level. The KL9050 can be used as the last coupler terminal in the system or as a bridge between two Bus Terminal blocks. You can switch between these two functions with a selector switch. The switch must be correctly positioned for the system to operate.

Technical data	KL9050
Number of Bus Terminals	64
Type/number of peripheral signals	Bus Coupler dependency
Distance between stations	max. 5 m between KL9050 and KL9050
Bus interface	2 x RJ 45 socket (input + output)
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 200 mA max.
Starting current	2.5 x continuous current
Current supply K-bus	up to 400 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/fieldbus)
Weight	115 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KL9050">www.beckhoff.com/KL9050</a>



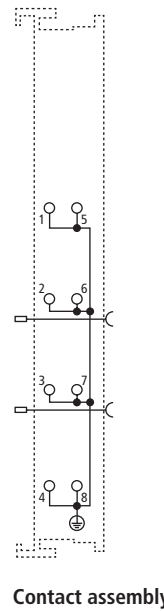
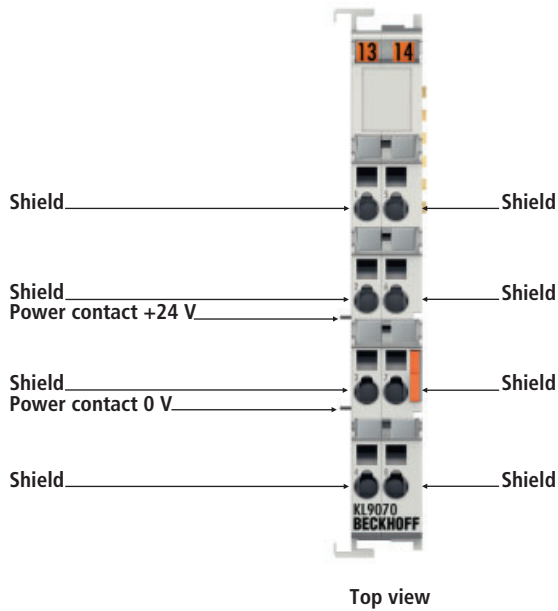
Top view

## KL9060 | Adapter terminal for KL8001 power terminals

The KL9060 adapter terminal is attached to the end of the Bus Terminal block in the same way as the standard terminal KL9010. The block is terminated with the KL9060 and provides the opportunity to connect one or more power terminals of the KL8001 series. In the KL9060 the K-bus signals are fed into a ribbon cable together with the 24 V DC for the power contacts.

Power for the electronics of the KL9060 and also for the internal electronics of the subsequent KL8001 power terminals is provided via the K-bus. The power contacts and the associated connection points are electrically isolated and fed to the output stages of the power terminal. This connection is short-circuit-proof and capable of bearing up to 1 A. Supply voltage feeding from one power module to the next can be achieved without any additional wiring. The KL9060 forms a properly working unit together with at least one KL8001. No further parameterising or configuration work on the KL9060 is necessary apart from plugging-in the connecting cable. All diagnostic and commissioning tasks relate directly to the power terminal.

Technical data	KL9060
Number of power terminals	up to 10 KL8001
Type of connection	1 x 10-pin ribbon cable connector
Current consumption K-bus	–
Power contacts	24 V DC (-15 %/+20 %)/1.4 A max., short-circuit-proof
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/K-bus)
Configuration possibility	none, automatic
Bit width in the process image	–
Weight	approx. 65 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/KL9060">www.beckhoff.com/KL9060</a>

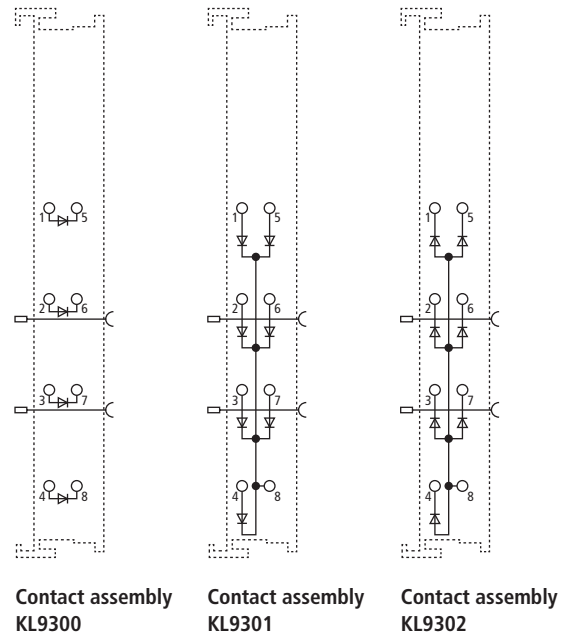
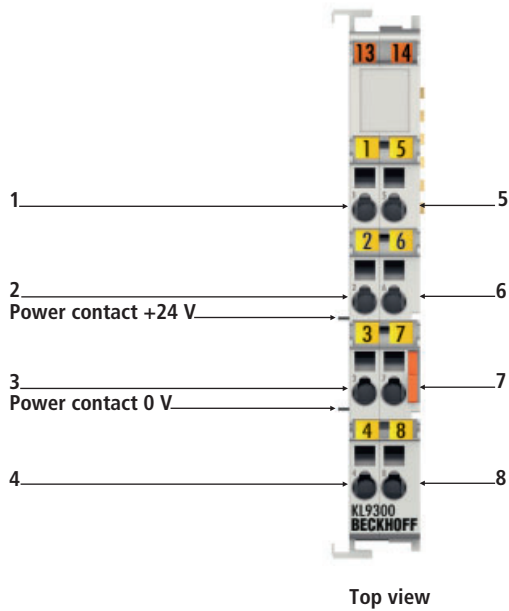


## KL9070 | Shield terminal

The KL9070 shield terminal provides eight terminal points with the potential of the mounting rail and enables the screening to be picked up without further modular terminal blocks or wiring. With its internal seamless copper surface, the KL9070 offers good screening between two Bus Terminals.

Technical data	KL9070   KS9070
Nominal voltage	≤ 60 V
Current load	≤ 10 A
Diagnostics	–
Reported to K-bus	–
PE contact	no
Shield connection	–
Renewed infeed	yes
Connection facility to additional power contact	8 x shield
K-bus, looped through	yes
Bit width in the process image	0
Connection to DIN rail	–
Electrical isolation	yes
Housing width in mm	12
Side by side mounting on Bus Terminals with power contact	yes, left without PE
Side by side mounting on Bus Terminals without power contact	yes
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL9070">www.beckhoff.com/KL9070</a>

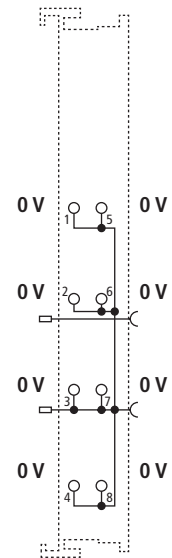
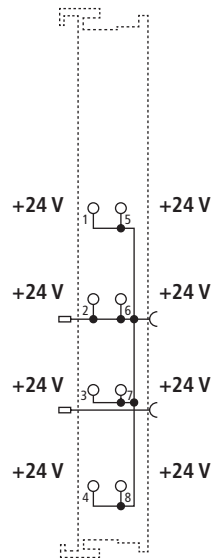
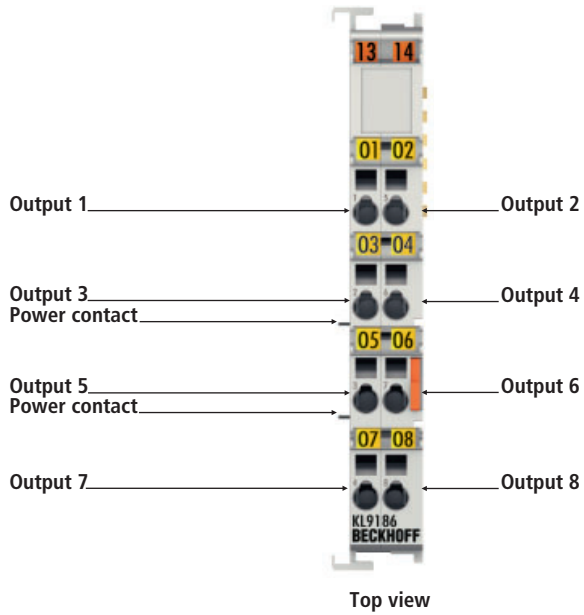




## KL9300, KL9301, KL9302 | Diode array terminals

The KL9300, KL9301 and KL9302 Bus Terminals contain diode arrays with different connection configurations that can be used as free-wheeling or decoupling diodes. The KL9300 contains four potential-free diodes. The KL9301 and the KL9302 both have a total of seven diodes, the former with a common cathode, the latter with a common anode. Through direct integration into the Bus Terminal assembly, the compact design of the Bus Terminal is retained for the whole application. Wiring is simplified significantly.

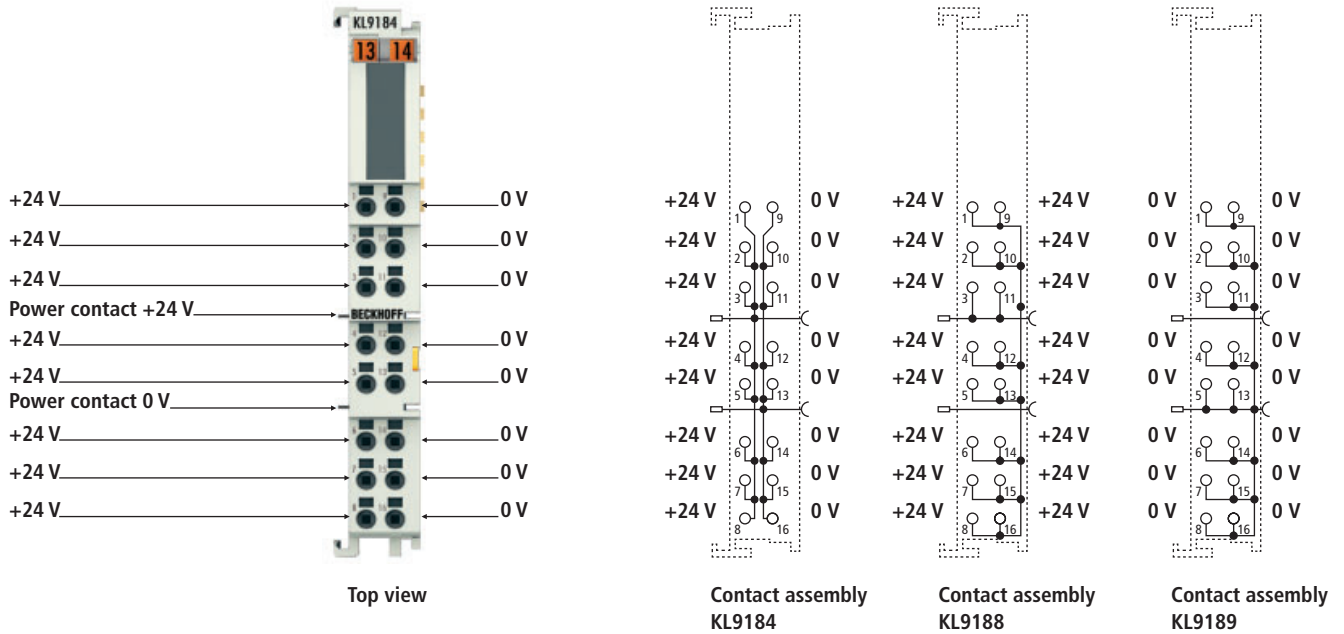
Technical data	KL9300   KS9300	KL9301   KS9301	KL9302   KS9302
Number of diodes	4	7	7
Interconnection	potential-free	common cathode	common anode
Nominal cut-off voltage	1,000 V (diodes)		
Output current	1 A on each diode		
Peak current	2.5 A (100 ms)		
Voltage drop	0.7 V typ.		
Current consumption K-bus	–		
Isolation voltage	< 200 V (channel/channel)		
Electrical isolation	1,500 V (K-bus/field)		
Bit width in the process image	–		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all KSxxxx Bus Terminals		
Further information	www.beckhoff.com/KL9300		



## KL9186, KL9187 | Potential distribution terminals

The potential distribution terminals KL9186 and KL9187 provide eight terminal points with a potential and enable the voltage to be picked up without further bus terminal blocks or wiring.

Technical data	KL9186   KS9186	KL9187   KS9187
Nominal voltage	≤ 60 V	
Current load	≤ 10 A	
Diagnostics	–	
Reported to K-bus	–	
PE contact	no	
Shield connection	–	
Renewed infeed	yes	
Number of outputs	e.g.: 8 x 24 V contact	e.g.: 8 x 0 V contact
K-bus, looped through	yes	
Bit width in the process image	0	
Connection to DIN rail	–	
Electrical isolation	yes	
Housing width in mm	12	
Side by side mounting on Bus Terminals with power contact	yes, left without PE	
Side by side mounting on Bus Terminals without power contact	yes	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL9186	

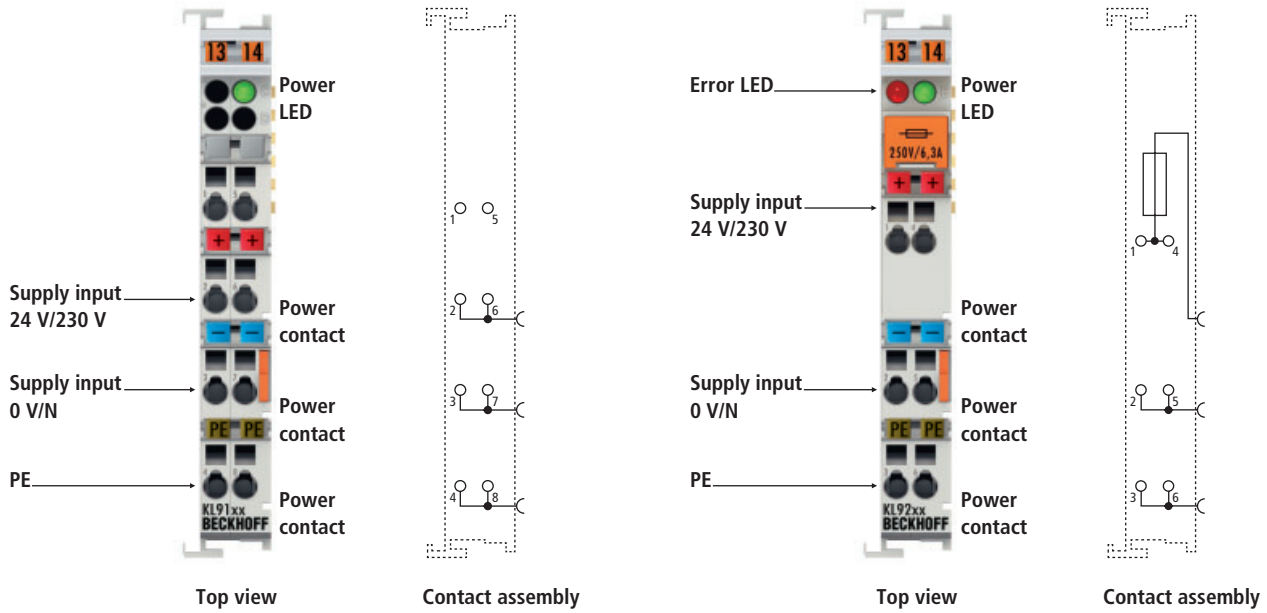


## KL9184, KL9188, KL9189 | 16-channel potential distribution terminals

The potential distribution terminals KL9188 and KL9189 provide 16 terminal points with a potential and enable the voltage to be picked up without further bus terminal blocks or wiring.

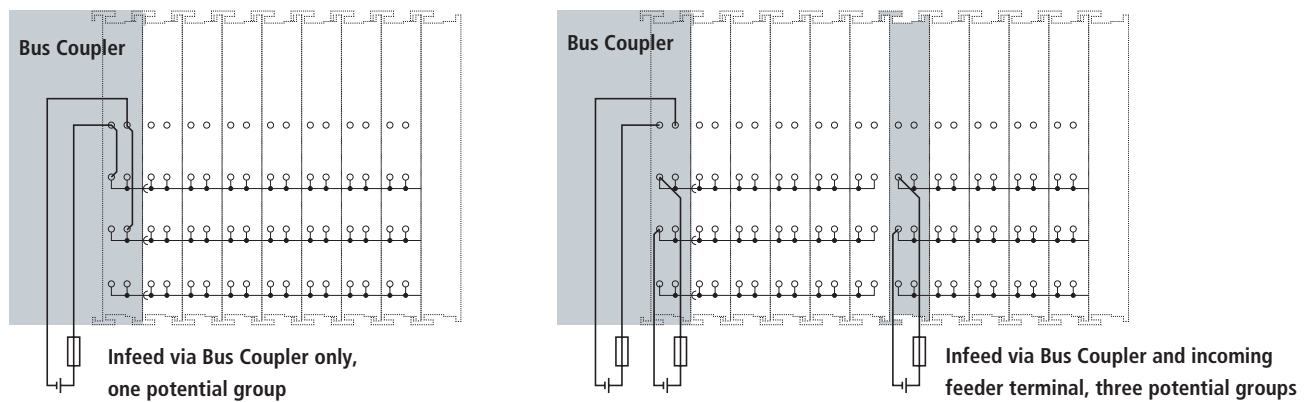
The KL9184 provides the potential of the 24 V DC contact at 8 terminal points and the potential of the 0 V contact at 8 terminal points. The conductors can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	KL9184	KL9188	KL9189
Nominal voltage	≤ 60 V		
Current load	≤ 10 A		
Diagnostics	–		
Reported to K-bus	–		
PE contact	no		
Shield connection	–		
Renewed infeed	yes		
Number of outputs	e.g.: 8 x 24 V contact, 8 x 0 V contact	e.g.: 16 x 24 V contact	e.g.: 16 x 0 V contact
K-bus, looped through	yes		
Bit width in the process image	0		
Connection to DIN rail	–		
Electrical isolation	yes		
Housing width in mm	12		
Conductor types	solid wire, stranded wire and ferrule		
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver		
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5 mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>		
Weight	approx. 60 g		
Side by side mounting on Bus Terminals with power contact	yes, left without PE		
Side by side mounting on Bus Terminals without power contact	no		
Further information	<a href="http://www.beckhoff.com/KL9184">www.beckhoff.com/KL9184</a>		



## KL91xx, KL92xx | Bus function terminals

The feed terminals can be inserted anywhere between the input and output terminals in order to construct a further potential group, or in order to supply the terminals that follow to the right with additional current. The feed terminals can be used for voltages up to 230 V AC. The terminals with diagnostics report any voltage failure or short-circuit to the controller. The function and electronic data from the diagnostic terminals appear like a 2-channel input terminal with correlating voltage. In other words, they occupy 2 bits in the automation device's process image.



Technical data	KL91xx   KS91xx, KL92xx
Power contacts	max. 10 A
Short-circuit-proof	125 A
Voltage	24 V DC or 230 V AC, depending on type
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL91xx">www.beckhoff.com/KL91xx</a>
Special terminals	
KL9210-0020	with 2 A fuse (slow-blow) and modified label

# KL91xx, KL92xx | Bus function terminals

The power feed terminals make it possible to set up various potential groups with any desired voltages (KL9190) or with the standard voltages of 24 V DC or 230 V AC (120 V AC). The power feed terminals are available with or without fine-wire fuse. In order to monitor the supply voltage, the terminals with

diagnostics report the status of the power feed terminal to the Bus Coupler through two input bits. It is thus possible for the controller to check the distributed peripheral voltage over the fieldbus. The operating point performance conforms to the input terminals KL1002 (24 V) and KL1702 (230 V).

The KL9180, KL9185 and KL9195 Bus Terminals allow the supply voltage to be accessed a number of times via spring force terminals. These Bus Terminals make it unnecessary to use additional terminal blocks on the terminal strip. The KL9195 Bus Terminal can be used for the connection of

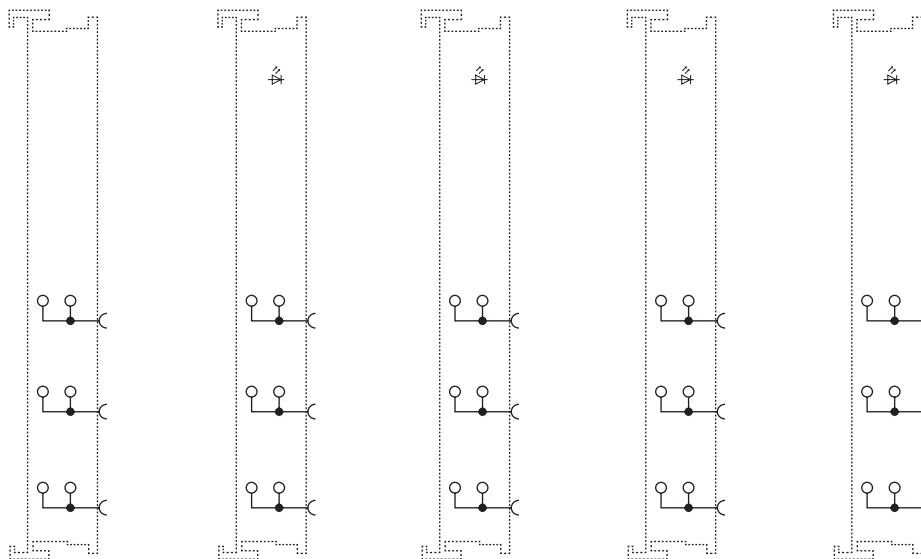
## Meaning of the diagnostic bits:

Bit 0 = 0

no power supply present;

Bit 0 = 1

power supply present; if the bus function terminal does not have a fuse, then bit 1 = 0.



Description	KL9190   KS9190	KL9100   KS9100	KL9110   KS9110	KL9150   KS9150	KL9160   KS9160
Nominal voltage	arbitrary	24 V DC	24 V DC	230 V AC (120 V AC)	230 V AC (120 V AC)
Integrated fine-wire fuse	–	–	–	–	–
Diagnostics	–	–	yes	–	yes
Power LED	–	green	green	green	green
Defect LED	–	–	–	–	–
Reported to K-bus	–	–	yes	–	yes
PE contact	yes	–	–	–	–
Shield connection	–	–	–	–	–
Renewed infeed	yes	–	–	–	–
Connection facility to additional power contact	1	–	–	–	–
K-bus, looped through	yes	–	–	–	–
Bit width in the process image	0	0	2	0	2
Connection to DIN rail	–	–	–	–	–
Electrical isolation	yes	–	–	–	–
Housing width in mm	12	–	–	–	–
Side by side mounting on Bus Terminals with power contact	yes	–	–	–	–
Side by side mounting on Bus Terminals without power contact	yes	–	–	–	–
Pluggable wiring	for all KSxxxx Bus Terminals				
Further information	<a href="http://www.beckhoff.com/KL9190">www.beckhoff.com/KL9190</a>				

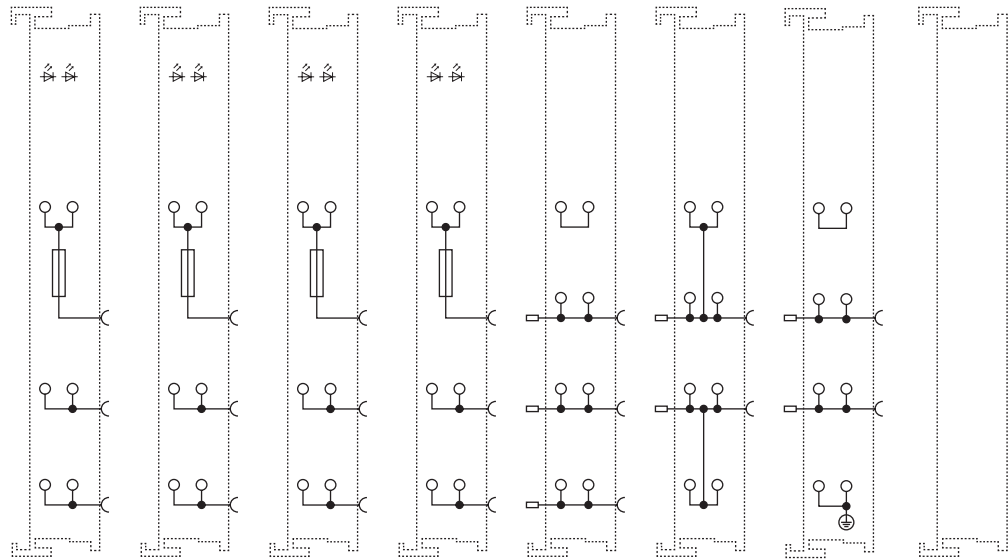
screens. The KL9195 connects the spring force contacts directly to the DIN rail, and can optimally ground incoming electromagnetic radiation. The two power contacts are looped through by the KL9195, allowing two wires to be connected to each power contact. The KL9010 bus end terminal is necessary for

data exchange between the Bus Coupler and the Bus Terminals. Each assembly must be terminated at the right hand end with a KL9010 bus end terminal. The bus end terminal does not have any other function or connection facility. The KL9080 is used to identify potential groups (e.g. 230 V AC/24 V DC).

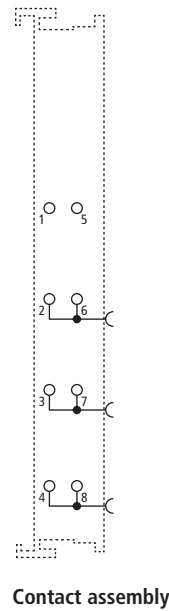
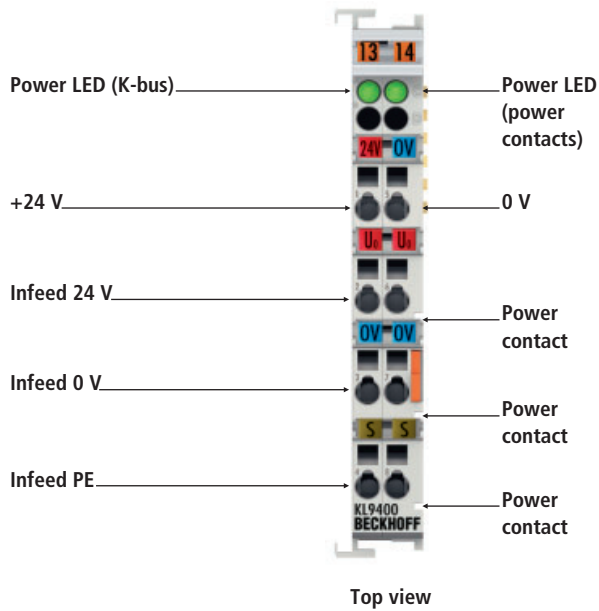
It is inserted between two potential groups, and indicates the separation through an orange coloured cover.

**Meaning of the diagnostic bits:**

- Bit 0 = 0  
no power supply present;
- Bit 0 = 1  
power supply present;
- Bit 1 = 0  
fuse OK;
- Bit 1 = 1  
fuse faulty.



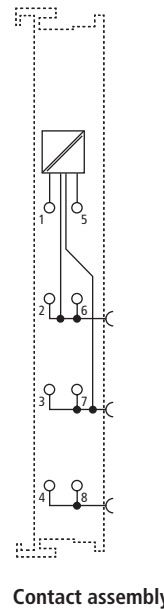
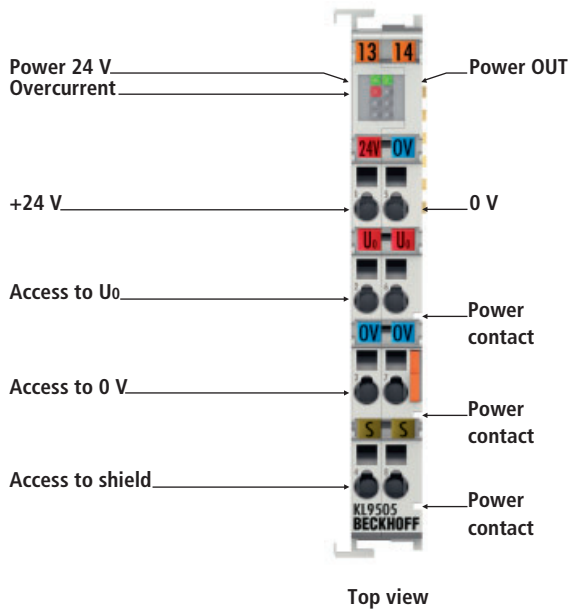
Description	KL9200 (KL9290)	KL9210	KL9250	KL9260	KL9180 (KS9180)	KL9185 (KS9185)	KL9195 (KS9195)	KL9010 KL9080
Nominal voltage	24 V DC (arbitrary)	24 V DC	230 V AC	230 V AC	arbitrary up to 230 V AC	arbitrary up to 230 V AC	arbitrary up to 230 V AC	end/separa. terminal
Integrated fine-wire fuse	...6.3 A	...6.3 A	...6.3 A	...6.3 A	–	–	–	–
Diagnostics	–	y s	e	y s	e	–	–	–
Power LED	green (without)	green	green	green	–	–	–	–
Defect LED	red (without)	red	red	red	–	–	–	–
Reported to K-bus	–	y s	e	y s	e	–	–	–
PE contact	yes	yes	yes	yes	yes	–	–	–
Shield connection	–	–	–	–	–	–	2	–
Renewed infeed	yes	yes	yes	yes	–	–	–	–
Connection facility to additional power contact	1	1	1	1	2	4	1	–
K-bus, looped through	yes	yes	yes	yes	yes	yes	yes	–/yes
Bit width in the process image	0	2	0	2	0	0	0	0
Connection to DIN rail	–	–	–	–	–	–	shield terminal	–
Electrical isolation	yes	yes	yes	yes	–	–	–	–
Housing width in mm	12							
Side by side mounting on Bus Terminals with power contact	yes	yes	yes	yes	yes	only 2 power contacts	only 2 power contacts	yes
Side by side mounting on Bus Terminals without power contact	yes	yes	yes	yes	–	–	–	yes
Pluggable wiring	for all KSxxxx Bus Terminals							
Further information	www.beckhoff.com/KL9200							



## KL9400 | Power supply unit terminal for the K-bus

The KL9400 power supply unit terminal is used to refresh the K-bus. Data is exchanged between the Bus Coupler and Bus Terminal over the K-bus. Each Bus Terminal draws a certain amount of current from the K-bus (see "Current consumption K-bus" in the technical data). This current is fed into the K-bus by the relevant Bus Coupler's power supply unit. The standard couplers (BKxx00, BCxx00) make 1.75 A available to the K-bus, while the "Economy" Couplers (BKxx10) and the "Low Cost" Couplers (LCxx00) provide 0.5 A. In configurations with a large number of Bus Terminals it is possible to use the KL9400 in order to supply an extra 2 A to the K-bus.

Technical data	KL9400   KS9400
Input voltage	24 V DC
Output current	2 A for K-bus supply
Power contacts	24 V DC max./10 A max.
Weight	approx. 65 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL9400">www.beckhoff.com/KL9400</a>

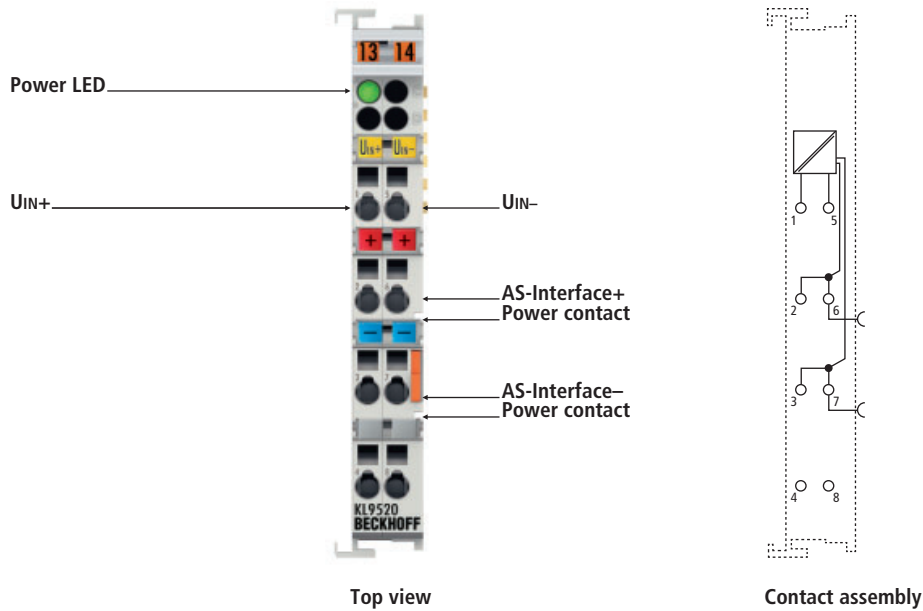


## KL95xx | Power supply unit terminals 5 V, 8 V, 10 V, 12 V, 15 V DC

The KL9505, KL9508, KL9510, KL9512 and KL9515 power supply unit terminals generate a variety of output voltages from the (24 V DC) input voltage, which can be accessed at the terminals. The following Bus Terminals are also supplied with this voltage via the power contacts. The power LEDs indicate the terminal's operating state. The input voltage and the output voltage  $U_0$  are not electrically isolated.

Technical data	KL9505   KS9505	KL9508   KS9508	KL9510   KS9510	KL9512   KS9512	KL9515   KS9515
Input voltage	24 V DC				
Output voltage	5 V DC $\pm 1\%$	8 V DC $\pm 1\%$	10 V DC $\pm 1\%$	12 V DC $\pm 1\%$	15 V DC $\pm 1\%$
Output current	0.5 A				
Short-circuit-proof	yes				
Residual ripple	< 5 mV				
Weight	approx. 65 g				
Operating/storage temperature	0...+55 °C/-25...+85 °C				
Relative humidity	95 %, no condensation				
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				
Protect. class/installation pos.	IP 20/variable				
Pluggable wiring	for all KSxxxx Bus Terminals				
Further information	<a href="http://www.beckhoff.com/KL9505">www.beckhoff.com/KL9505</a>				

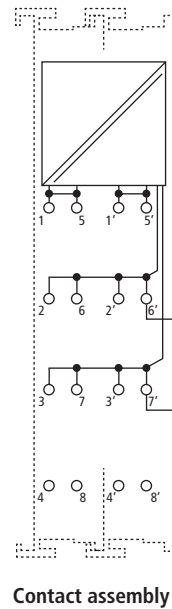
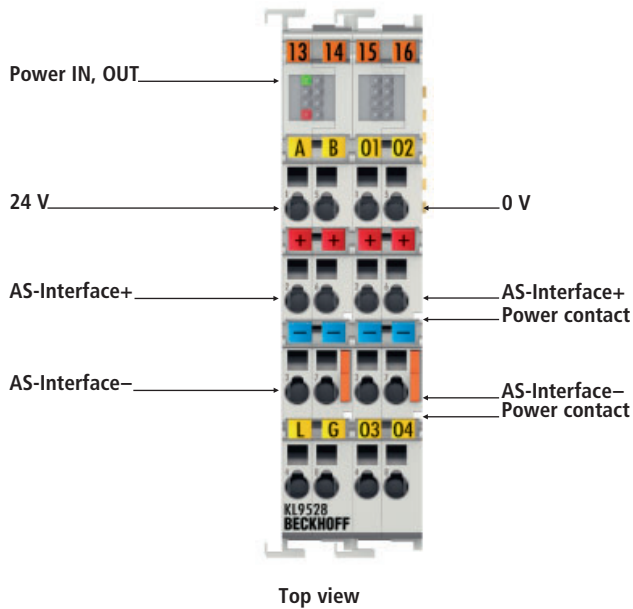




## KL9520 | AS-Interface potential feed terminal with filter

The KL9520 potential feed terminal uncouples the input and output signal through an integrated filter and enables the supply of AS-Interface networks from standard power supply units or another AS-Interface network. The KL9520 can be used directly next to the KL6201 AS-Interface master terminal. Multiple parallel operation of this combination in a Bus Terminal block is possible and saves several AS-Interface power supply units.

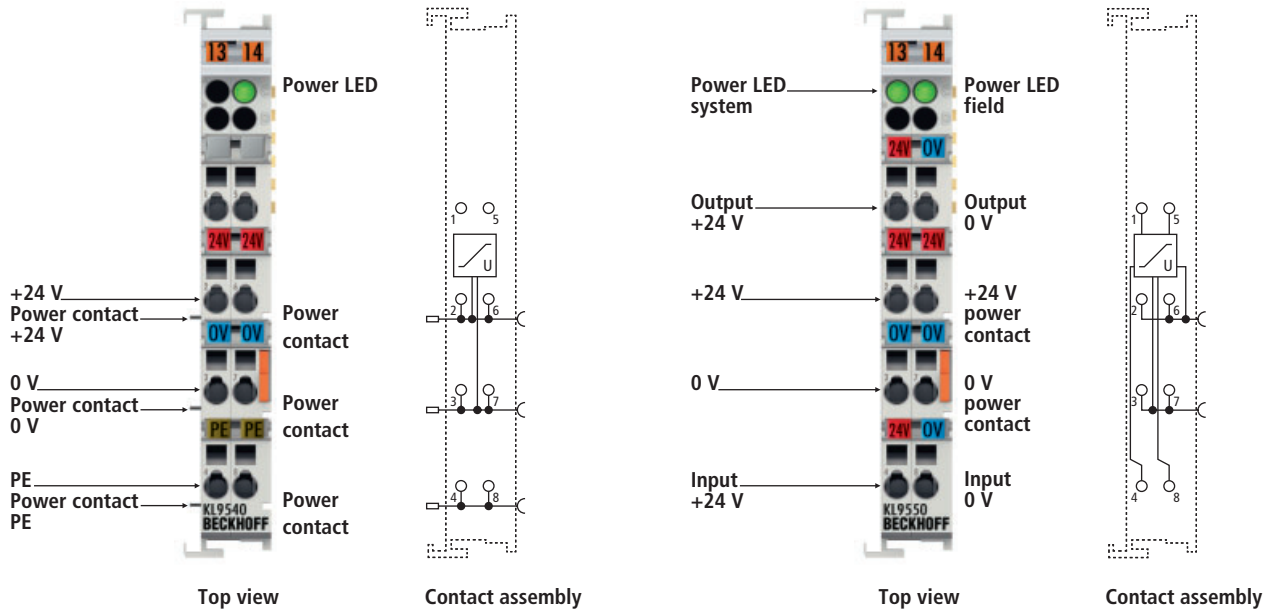
Technical data	KL9520   KS9520
Input voltage	up to 35 V
Output voltage	up to 35 V
Current load	max. 2 A
Configuration	no address or configuration setting
Weight	approx. 90 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL9520">www.beckhoff.com/KL9520</a>



## KL9528 | AS-Interface power supply terminal 24 V DC/30 V DC, 1.25 A

The KL9528 power supply terminal generates a 30 V DC output voltage from the 24 V DC control voltage with high-frequency decoupling for the operation of an AS-Interface network. The output voltage is short-circuit-proof and is limited to a current of 1.25 A. The LEDs display the input and output voltage. There is no electrical isolation between the input voltage and the output voltage. The connection to the KL6201 AS-Interface master is established via plugs.

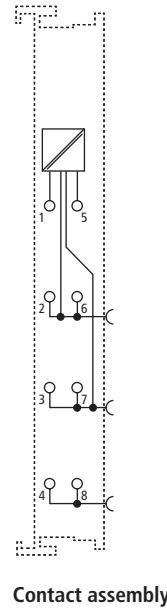
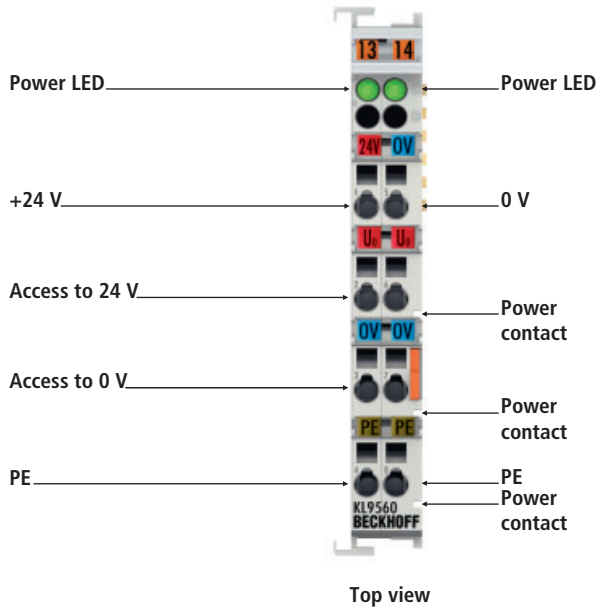
Technical data	KL9528   KS9528
Input voltage	21...28.8 V DC
Output voltage	30 V DC (+5 %/- 5 %)
Output current	max. 1.25 A
Short circuit current	max. 1.3 A
Efficiency	approx. 95 %
K-bus length	2 inputs, 2 outputs
Current consumption K-bus	10 mA
Short-circuit-proof	yes, automatic restart
Insulation voltage input/output	none
Insulation voltage	1,500 V AC constant load field/K-bus
Weight	approx. 150 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL9528">www.beckhoff.com/KL9528</a>



## KL9540, KL9550 | System terminals, surge filter system and field supply

The KL9540 system terminal contains an overvoltage filter for the 24 V field supply, the KL9550 for the 24 V field and system supply. The filter protects the Bus Terminals from line-bound surge voltages that can occur due to high-energy disturbances such as switching overvoltages at inductive consumers or lightning strikes at the supply lines. The Bus Terminals KL9540 or KL9550 protect the Bus Terminal station from damage in particularly harsh environments. The ship classification organisations require the use in shipbuilding applications and in the onshore/offshore sector.

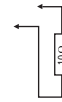
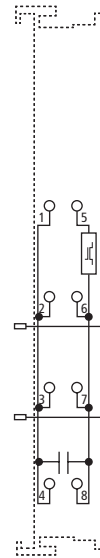
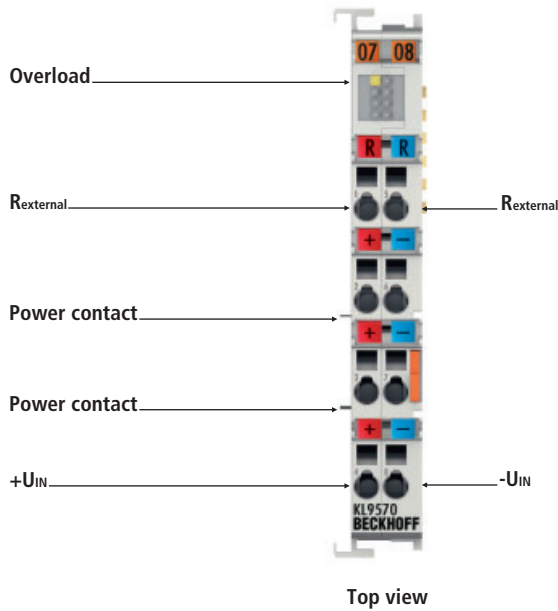
Technical data	KL9540   KS9540	KL9550   KS9550
Nominal voltage	24 V (-15 %/+20 %)	
Surge filter field supply	yes	
Surge filter system supply	no	yes
PE connection	yes	no
Weight	approx. 40 g	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all KSxxxx Bus Terminals	
Further information	www.beckhoff.com/KL9540	



## KL9560 | Power supply unit terminal 24 V DC/24 V DC, 0.1 A

The KL9560 power supply unit terminal generates an electrically isolated output voltage from the 24 V DC input voltage, which can be accessed at the terminal. The following Bus Terminals are also supplied with this voltage via the power contacts. The power LEDs indicate the operating state of the terminal. The input voltage and the output voltage of 500 V are electrically isolated.

Technical data	KL9560   KS9560
Input voltage	24 V DC (-15 %/+20 %)
Output voltage	24 V DC (-15 %/+5 %)
Output current	≤ 0.1 A
Short circuit current	approx. 0.15 A
Efficiency	approx. 85 %
K-bus length	–
Current consumption K-bus	–
Short-circuit-proof	yes, automatic restart
Insulation voltage input/output	500 V AC permanent load
Insulation voltage	1,500 V AC constant load field/K-bus
Weight	approx. 65 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL9560">www.beckhoff.com/KL9560</a>



## KL9570 | Buffer capacitor terminal

The KL9570 Bus Terminal contains high-performance capacitors for stabilizing supply voltages. The KL9570 can be used in conjunction with KL2531/KL2541 stepper motor terminals and KL2532/KL2552 DC motor terminals. Low internal resistance and high-pulsed current capability enable good buffering in parallel with a power supply unit. Return currents are stored, particularly in the context of drive applications, thereby preventing overvoltages. If the regenerative energy exceeds the capacity of the capacitors, energy can be dissipated via an external ballast resistor.

Technical data	KL9570   KS9570
Nominal voltage	50 V
Capacity	500 $\mu$ F
Ripple current	10 A in continuous operation
Internal resistance	< 10 m $\Omega$
Surge voltage protection	> 56 V
Recommended ballast resistor	10 $\Omega$ , typ. 10 W
Overvoltage control range	$\pm 2$ V
Ballast resistor clock rate	load-dependent, 2-point control
Electrical isolation	1,500 V <sub>rms</sub> (terminal/K-bus)
Weight	approx. 90 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all KSxxxx Bus Terminals
Further information	<a href="http://www.beckhoff.com/KL9570">www.beckhoff.com/KL9570</a>

## Ordering instructions for special terminals and couplers

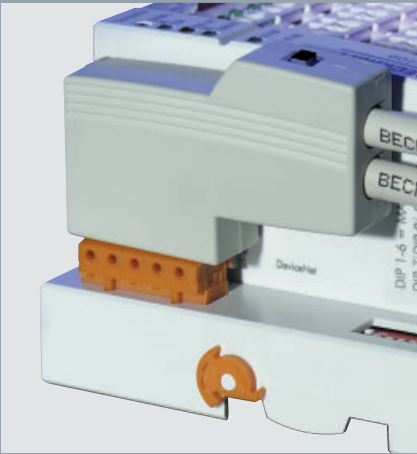
All Bus Couplers and Bus Terminals are supplied with a standard configuration. The settings can be found on the relevant catalog pages. In addition to this standard configuration, specific coupler and terminal types with modified software or hardware are available. These variants have an order number with additional four figures. Therefore, if you do require a configuration other than standard, quote this extended number when you place your order. The following table provides a summary of the Bus Couplers and Bus Terminals that are available with modified default settings.

Ordering information	
<b>Bus Coupler</b>	
BK8100-0060	watchdog special setting 60 s
BK8100-1001	watchdog special setting 10 s
<b>Digital input</b>	
KL1052-0010	96 V DC positive and negative switching, not in accordance with the EN 61131-2 specifications: I high = 3 mA, I low = 0.5 mA
KL1232-0001	plus-switching, positive edge-triggered input, 10 ms pulse extension, input filter 0.2 ms
KL1232-0002	plus-switching, positive edge-triggered input, 20 ms pulse extension, input filter 0.2 ms
KL1232-0010	plus-switching, positive edge-triggered input, 100 ms pulse extension, input filter 3.0 ms
KL1232-0100	plus-switching, negative edge-triggered input, 100 ms pulse extension, input filter 0.2 ms
KL1232-0110	plus-switching, negative edge-triggered input, 100 ms pulse extension, input filter 3.0 ms
KL1232-1000	0 V (ground) switching, positive edge-triggered input, 100 ms pulse extension, input filter 0.2 ms
KL1232-1001	5 V, 0 V (ground) switching, negative edge-triggered input, 20 ms pulse extension, input filter 0.2 ms
KL1232-1010	0 V (ground) switching, positive edge-triggered input, 100 ms pulse extension, input filter 3.0 ms
KL1232-1100	0 V (ground) switching, negative edge-triggered input, 100 ms pulse extension, input filter 0.2 ms
KL1232-1110	0 V (ground) switching, negative edge-triggered input, 100 ms pulse extension, input filter 3.0 ms
KL1232-2000	plus switching, positive edge-triggered input, 200 ms pulse extension, input filter 0.2 ms
KL1501-0010	gate-counter with auto-reset and setting A0
KL1501-0011	up/down counter with 5 V inputs, 24 V DC outputs
KL1702-0010	230 V AC input circuit with type 2 characteristics
KL1712-0010	24 V AC/DC input circuit
<b>Digital output</b>	
KL2502-0012	time-delayed setting of the outputs
KL2502-3020	5 V output, 30 kHz limit frequency
KL2521-0010	with additional outputs (230 V AC/DC, 100 mA) instead of the additional inputs of the default variant
KL2521-0024	for 24 V signal level
KL2541-0006	stepper motor terminal 50 V DC, 5 A, 5 V encoder supply
KL2692-1001	2 digital inputs, 2 potential-free relays
KL2722-0010	without reciprocal locking of the channels, total current 1 A
KL2732-0010	without reciprocal locking of the channels, total current 1 A
KL2751-0011	dimmer terminal without power contacts
KL2751-1200	dimmer terminal for 120 V AC
KL2761-0011	1-channel universal dimmer terminal, 230 V AC, 600 VA (W), 50 Hz (without power contacts)
KL2791-0011	230 V AC, 200 VA, max. 0.45 A, without power contacts
KL2791-1200	120 V AC, 100 VA
<b>Analog input</b>	
KL3002-0010	Siemens S5 format
KL3002-0011	fast $\mu$ P, scan time approx. 0.5 ms
KL3002-0050	Siemens S7 format
KL3012-0011	altered range: 0...21.5 mA, maximum value corresponds to 21.5 mA instead of 20 mA
KL3012-0012	fast $\mu$ P, scan time approx. 0.5 ms
KL3012-0050	Siemens S7 format
KL3022-0010	Siemens S5 format
KL3022-0011	fast $\mu$ P, scan time approx. 0.5 ms
KL3022-0050	Siemens S7 format
KL3042-0010	Siemens S5 format
KL3042-0011	fast $\mu$ P, scan time approx. 0.5 ms

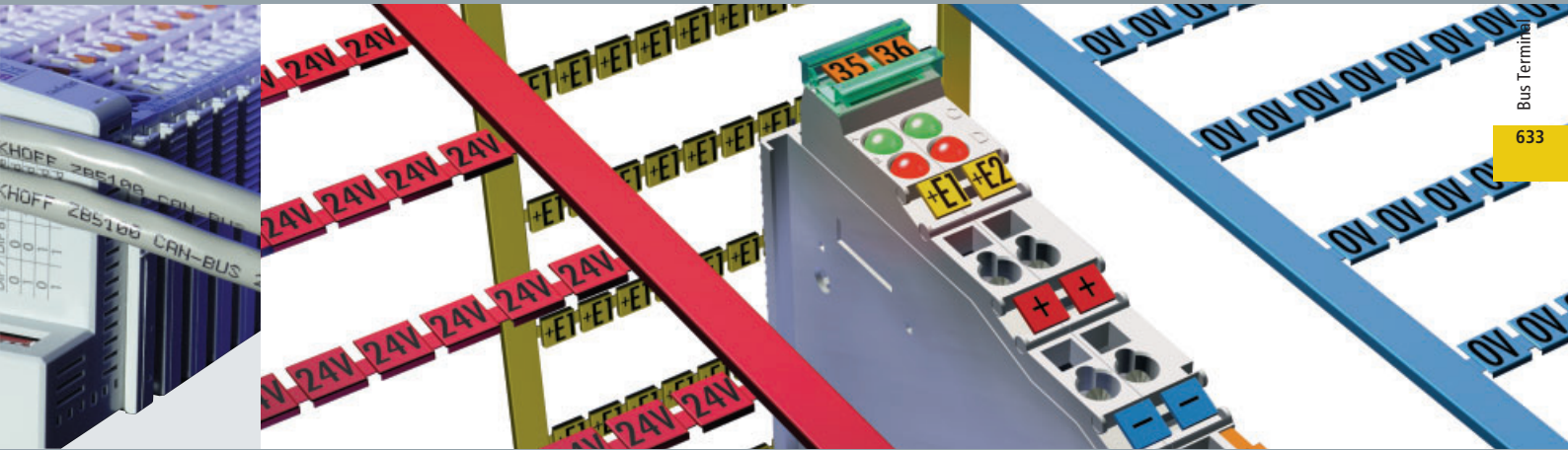
KL3042-0012	altered range: 0...21.5 mA, maximum value corresponds to 21.5 mA instead of 20 mA
KL3042-0050	Siemens S7 format
KL3052-0010	Siemens S5 format
KL3052-0011	fast $\mu$ P, scan time approx. 0.5 ms
KL3052-0012	changed diagnostic level (<3.5 mA or >21.5 mA)
KL3052-0050	Siemens S7 format
KL3054-0050	Siemens S7 format
KL3062-0010	Siemens S5 format
KL3062-0011	voltage level 0...20 V
KL3062-0012	fast $\mu$ P, scan time approx. 0.5 ms
KL3062-0013	voltage level 0...30 V
KL3062-0014	voltage level 0...50 V
KL3062-0050	Siemens S7 format
KL3064-0010	Siemens S5 format
KL3064-0011	voltage level 0...20 V
KL3064-0050	Siemens S7 format
KL3102-0050	Siemens S7 format
KL3112-0050	Siemens S7 format
KL3122-0050	Siemens S7 format
KL3172-0500	0...500 mV
KL3202-0010	PT200
KL3202-0011	PT200 in Siemens S5 format
KL3202-0012	PT500
KL3202-0013	PT500 in Siemens S5 format
KL3202-0014	PT1000
KL3202-0015	PT1000 in Siemens S5 format
KL3202-0016	Ni100
KL3202-0017	Ni100 in Siemens S5 format
KL3202-0020	resistance measurement 0...1.2 k $\Omega$
KL3202-0021	PT100 in Siemens S5 format
KL3202-0023	Ni120
KL3202-0024	Ni120 in Siemens S5 format
KL3202-0025	Ni1000
KL3202-0026	Ni1000 in Siemens S5 format
KL3202-0027	resistance measurement 10...10 k $\Omega$
KL3202-0028	Resolution increased to 0.01 °C; the measurement range is reduced to -40 °C to +128 °C. The absolute accuracy is 0.3 °C, differential error is 0.1 °C.
KL3202-0029	Ni1000 per Landis&Stefa characteristic curve (Siemens, 100° corresponds to 1,500 $\Omega$ )
KL3204-0014	PT1000
KL3204-0021	PT1000 in Siemens S5 format
KL3204-0025	Ni1000, 4-channel
KL3204-0029	Ni1000 per Landis&Stefa characteristic curve (Siemens, 100° corresponds to 1,500 $\Omega$ )
KL3312-0010	type J
KL3312-0011	type J in Siemens S5 format
KL3312-0012	type L
KL3312-0013	type L in Siemens S5 format
KL3312-0014	type B
KL3312-0015	type B in Siemens S5 format
KL3312-0016	type E
KL3312-0017	type E in Siemens S5 format
KL3312-0018	type N
KL3312-0019	type N in Siemens S5 format
KL3312-0020	type R
KL3312-0021	type R in Siemens S5 format

KL3312-0022	type S
KL3312-0023	type S in Siemens S5 format
KL3312-0024	type T
KL3312-0025	type T in Siemens S5 format
KL3312-0026	type U
KL3312-0027	type U in Siemens S5 format
KL3312-0028	0...120 mV measurement
KL3312-0029	type K in Siemens S5 format
KL3312-0040	expanded temperature range for type S and L type S: -50...+1,700 °C (as supplied type L: -100...+900 °C)
KL3312-0110	type J, Fahrenheit scaling
KL3312-2000	setting of reference junction temperature via process image, unit 1/256° C in a 16 bit word
KL3312-2100	external reference point temperature specification via process image is possible, the unit is 1/256 °C in 16-bit format, fast conversion time 65 ms
KL3351-0001	with faster measurement time approx. 10 ms
KL3403-0010	current path designed for 5 A transducer (1 % measuring accuracy I)
KL3403-0020	current path designed for 20 mA, optimised for electronic current transformer
KL3403-0022	current path and voltage input designed for 20 mA
KM3701-0340	differential pressure up to 340 hPa
<b>Analog output</b>	
KL4002-0010	Siemens S5 format
KL4002-0011	fast $\mu$ P, scan time approx. 0.15 ms
KL4002-0050	Siemens S7 format
KL4004-0050	Siemens S7 format
KL4012-0010	Siemens S5 format
KL4012-0011	altered range: 0...21.5 mA, maximum value corresponds to 21.5 mA instead of 20 mA
KL4012-0050	Siemens S7 format
KL4022-0010	Siemens S5 format
KL4022-0050	Siemens S7 format
KL4032-0010	Siemens S5 format
KL4032-0011	fast $\mu$ P, scan time approx. 0.15 ms
KL4032-0050	Siemens S7 format
KL4034-0010	Siemens S5 format
KL4112-0010	Siemens S5 format
KL4112-0050	Siemens S7 format
KL4132-0010	Siemens S5 format
KL4132-0050	Siemens S7 format
<b>Special functions</b>	
KL5111-0010	A, B, C signals: 5 V inputs
KL5111-0011	special function: latch input sets counter to zero
KL5111-0012	latches on both edges, A, B, C inputs 24 V
KL5111-0013	latches on both edges, A, B, C inputs 5 V
KL5111-0015	frequency measurement over a selectable time window; 24 V inputs
KL5111-0016	frequency measurement over a selectable time window; 5 V inputs
KL5111-0020	12 V input circuit
KL5151-0021	incremental encoder 1 x 32 bits A, B, capture input and 1 driver output 24 V, 0.5 A
KL5151-0050	incremental encoder 2 x 32 bits A, B-track
KL6001-0020	standard format 5 bytes of user data
KL6011-0020	standard format 5 bytes of user data
KL6021-0020	standard format 5 bytes of user data (rest default)
KL6021-0021	standard format 5 bytes of user data (7 bits, even, 1 stop bit, 9,600 baud)
KL6201-0010	preset to 22 bytes K-bus interface (2 K-bus cycles 31 AS-Interface slaves)
KL6201-0011	preset to 38 bytes K-bus interface (4 K-bus cycles 62 AS-Interface slaves)
<b>System terminals</b>	
KL9210-0020	with 2 A fuse (slow-blow) and modified label





# Accessories Bus Terminals



# Connectors and cables

## Connectors

Lightbus	Description
Z1000	standard connector for 1,000 µm plastic fibre
Z1010	standard connector for 200 µm PCS fibre
Z1020	coupling for Z1000

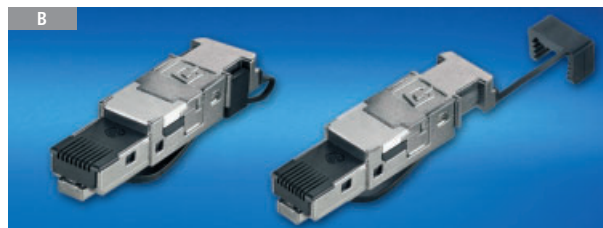
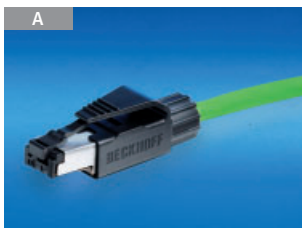
PROFIBUS	Description
ZB3100	9-pin D-sub connector for PROFIBUS (12 Mbaud) with switchable termination resistor
ZB3101	9-pin D-sub connector for PROFIBUS (12 Mbaud) with programming interface
ZB3102	9-pin D-sub connector for PROFIBUS (12 Mbaud) with programming interface (housing inverts)
ZS1031-3000	9-pin D-sub connector for PROFIBUS (12 Mbaud) with integrated termination resistor
ZS1031-3500	fibre optic connector for Bus Coupler BK3500 and BK3520

Interbus	Description
Z1003	FSMA plug with knurled nut for 1,000 µm plastic fibre
ZB4100	9-pin D-sub socket for incoming remote bus
ZB4101	9-pin D-sub plug for outgoing remote bus

CANopen/DeviceNet	Description
ZS1051-3000	9-pin D-sub connector for CANopen with integrated termination resistor
ZS1052-3000	5-pin open style connector for CANopen/DeviceNet with integrated termination resistor
ZS1052-5150	CAN diagnostic interface

SERCOS interface	Description
Z1003	FSMA plug with knurled nut for 1,000 µm plastic fibre
Z1100	plastic fibre optic, single core, 1,000 µm, 2.2 mm
Z1101	plastic fibre optic, single core, 1,000 µm with protective PU cladding and Kevlar strain relief, drag chain suitable

Ethernet/EtherCAT	Description	Pict.
ZS1090-0003	EtherCAT/Ethernet RJ 45 connector, IP 20, 4-pin, for field assembly	A
ZS1090-0005	EtherCAT/Ethernet RJ 45 plug, IP 20, 8-pin, field assembly	B



### Bus interface connectors for PROFIBUS, CANopen/DeviceNet

The Beckhoff bus interface connector for PROFIBUS and CAN Bus Couplers simplifies bus wiring considerably. There are separate terminals for incoming and outgoing leads. A large area of the screen is connected via the cable grip. The integrated termination resistor can be switched externally. When it is switched on, it makes a break in the outgoing bus lead – this allows rapid fault location and guarantees that no more than two resistors are active in the network.

Technical data	ZS1031-3000	ZS1052-3000
Fieldbus	PROFIBUS	CANopen/DeviceNet
Bus plug	D-sub, 9-pin	open style connector, 5-pin
Data transfer rates	up to 12 Mbaud	up to 1 Mbaud (CANopen) or 500 kbaud (DeviceNet)
Cable outgoing	downwards (where Bus Terminals are assembled horizontally)	
Cable diameter	4.5...8 mm	
Wire cross section	0.34 mm wire	0.2...0.5 mm litz wire or wire
Connection method	screw type terminal	
Wire	PROFIBUS, type A, ZB3200	e.g. CANopen cable ZB5100 or DeviceNet cable ZB5200
Termination resistor	network with 2 x 390 Ω, 1 x 220 Ω	120 Ω
Protection class	IP 40	
Temperature range	-20...+75 °C	
Dimensions (L x W x H)	approx. (65 x 50 x 16) mm	
Packaging	folding box with instructions	

## Cables for K-bus extension

Ordering information	Description
ZK1010-8080-3003	ribbon cable (3 cm) for connecting two KL8001 (included in the scope of supply)
ZK1010-8080-3005	ribbon cable (5 cm) for connecting two KL8001, if a reversing contactor connection is used
ZK1010-8080-3010	ribbon cable (10 cm) for connecting the KL9060 with the KL8001 (included in the scope of supply for KL9060)
ZS1010-1610	end plug for KL8001 (included in the scope of supply for KL9060)
ZK1090-0101-1002	extension cable with two plugs, double screened, red, 20 cm, cable for TeSys module KL8601/KL8610
ZK1090-0101-1005	extension cable with two plugs attached, double screened, red, 50 cm, cable for TeSys module KL8601/KL8610
ZK1090-0101-1010	extension cable with two plugs attached, double screened, red, 100 cm
ZK1090-0101-1020	extension cable with two plugs attached, double screened, red, 200 cm
ZK1090-0101-1030	extension cable with two plugs attached, double screened, red, 300 cm
ZK1090-0101-1050	extension cable with two plugs attached, double screened, red, 500 cm

## USB cable for KS2000

The KS2000 cable establishes a connection between the Bus Couplers or Bus Terminal Controllers and the PC. The KS2000 can be used for parametering Bus Terminals or Bus Couplers, local diagnostics, forcing Bus Terminal data, monitoring Bus Terminal values, updating firmware and programming Beckhoff mini PLCs via TwinCAT. The USB cable features electrical isolation. Status LEDs indicate whether data are sent or received. On the connected PC the USB cable behaves like a COM port and can therefore be used for all Beckhoff tools using serial communication.

Ordering information	Description
KS2000-Z2-USB	connection cable for KS2000 or TwinCAT for serial conversion from USB for Bus Couplers or Bus Terminal Controllers of the BK, BC or LC series, length 3 m



## Cables

Lightbus	Description
Z1100	plastic fibre optic, single core, 1,000 µm, 2.2 mm
Z1101	plastic fibre optic, single core, 1,000 µm with protective PU cladding and Kevlar strain relief, drag chain suitable
Z1111	HCS fibre optic, single core, 200 µm with protective PU cladding and Kevlar strain relief

PROFIBUS	Description
ZB3200	PROFIBUS cable 12 Mbaud 1 x 2 x 0.64 mm <sup>2</sup>
Z1100	plastic fibre optic, single core, 1,000 µm, 2.2 mm
Z1101	plastic fibre optic, single core, 1,000 µm with protective PU cladding and Kevlar strain relief, drag chain suitable

Interbus	Description
ZB4200	Interbus remote bus cable, certified 3 x 2 x 0.22 mm <sup>2</sup>
Z1120	Interbus plastic fibre optic, 2-core, 1,000 µm
Z1121	Interbus plastic fibre optic, 2-core, 1,000 µm with protective PU cladding

CANopen	Description
ZB5100	CAN cable, 4-core, fixed laying 2 x 2 x 0.25 mm <sup>2</sup>

DeviceNet	Description
ZB5200	DeviceNet cable, 4-core with screen, fixed laying 2 x 2/22 AWG

Ethernet/EtherCAT	Description
ZB9010	Industrial Ethernet/EtherCAT cable, fixed installation, CAT 5e, 4 wires
ZB9020	Industrial Ethernet/EtherCAT cable, drag chain suitable, CAT 5e, 4 wires

## Patch cables

Ethernet/EtherCAT	Description
ZK1090-9191-0001	Industrial Ethernet/EtherCAT patch cable, 0.17 m
ZK1090-9191-0002	Industrial Ethernet/EtherCAT patch cable, 0.26 m
ZK1090-9191-0005	Industrial Ethernet/EtherCAT patch cable, 0.5 m
ZK1090-9191-0010	Industrial Ethernet/EtherCAT patch cable, 1.0 m
ZK1090-9191-0020	Industrial Ethernet/EtherCAT patch cable, 2.0 m
ZK1090-9191-0030	Industrial Ethernet/EtherCAT patch cable, 3.0 m
ZK1090-9191-0050	Industrial Ethernet/EtherCAT patch cable, 5.0 m
ZK1090-9191-0100	Industrial Ethernet/EtherCAT patch cable, 10.0 m
ZK1090-9191-0150	Industrial Ethernet/EtherCAT patch cable, 15.0 m
ZK1090-9191-0200	Industrial Ethernet/EtherCAT patch cable, 20.0 m
ZK1090-9191-0250	Industrial Ethernet/EtherCAT patch cable, 25.0 m
ZK1090-9191-0300	Industrial Ethernet/EtherCAT patch cable, 30.0 m
ZK1090-9191-0350	Industrial Ethernet/EtherCAT patch cable, 35.0 m
ZK1090-9191-0400	Industrial Ethernet/EtherCAT patch cable, 40.0 m
ZK1090-9191-0450	Industrial Ethernet/EtherCAT patch cable, 45.0 m
ZK1090-9191-0500	Industrial Ethernet/EtherCAT patch cable, 50.0 m



## Connectors for KS Bus Terminals, ES EtherCAT Terminals

Ordering information	Description
ZS2010	10 connectors for KS and ES series, spare part (KS/ES terminals are supplied with connector.)

## Connectors for KM and EM modules

Ordering information	Description
ZS2001-0001	connector for KM/EM module, 1-pin, without LED; spare part (KM/EM terminals are supplied with connector.)
ZS2001-0002	connector for KM/EM module, 1-pin, with LED; spare part (KM/EM terminals are supplied with connector.)
ZS2001-0004	connector for KM/EM module, 3-pin, with LED; spare part (KM/EM terminals are supplied with connector.)

## Relay


Ordering information	Description
ZB2601	relay, 230 V AC, 16 A, coil 24 V, spare part KM2604
ZB2602	relay, manual operation, 230 V AC, 16 A, coil 24 V, spare part KM2614

## Assembly aids

Ordering information	Description
ZB8700	slot screwdriver assembly tool for pressing the spring force clamps on the coupler and the terminals

## Bus system housing

The BG1558 and BG1559 housings are especially suitable for the construction of compact I/O stations with a higher protection class (IP 65). The housings are supplied with mounting rails.

Ordering information	Description	Pict.
BG1558	bus system housing 400 mm x 200 mm x 120 mm (W x H x D) with mounting rails and holes	
BG1559	bus system housing 600 mm x 200 mm x 120 mm (W x H x D) with mounting rails and holes	

If desired, the housings can be supplied fully fitted with Bus Couplers, Bus Terminals, flanges and PG threaded fittings. Further sizes are available on request.



# Marking material

The KLxxxx Bus Terminals can be individually labelled with standard contact signs. Signs with markings for the supply voltages are supplied together with the BKxxxx Bus Couplers, but can be changed if required. The marking material is not included in the Bus Terminal delivery.

Ordering information	Unprinted
BZ1000	100 unprinted contact labels
BZ1002	100 unprinted contact labels, yellow
BZ1005	100 unprinted contact labels, red
BZ1006	100 unprinted contact labels, blue
BZ1007	100 unprinted contact labels, orange
BZ1008	100 unprinted contact labels, light green
BZ3000	180 equipment identification labels 12 x 7 mm for Bus Terminals with removable identification section, blank

Ordering information	Printed
BZ1100	100 contact labels, printed with: 0 V, blue
BZ1102	100 contact labels, printed with: -, blue
BZ1104	100 contact labels, printed with: 24 V, red
BZ1106	100 contact labels, printed with: +, red
BZ1107	100 contact labels, printed with: +, white
BZ1108	100 contact labels, printed with: PE, light green
BZ1300	100 contact labels, ten of each printed with: 0...7, 20 unprinted, white
BZ1400	100 contact labels, two of each printed with: 00 01...48 49, white
BZ3010	180 equipment identification labels 12 x 7 mm for Bus Terminals with removable identification section, printed (printed according to customer specification [in Excel file])

Ordering information	Description
BZ5100	push-in strips for removable labels, 10 pages DIN A4, pre-punched



## Coding pins and sockets for KS and ES terminals

The coding pins and sockets for ZS2010 and KS/ES terminals with pluggable wiring level enable coding between terminal and plug in order to prevent incorrect plug insertion.

Ordering information	Description
ZS2010-0010	The set contains 100 sockets and 100 pins.



# Demokits

The Demokits offer a convenient and fast introduction to fieldbus communication with TwinCAT. Currently more than 10 fieldbuses are covered, including Lightbus, RS232, PROFIBUS, Ethernet, and EtherCAT. The aim of the Demokits is to familiarise the user with the basic TwinCAT automation procedures. Program creation and interfacing of the program with the hardware is explained in detail, based on examples. For many fieldbuses the Demokits are available both with Bus Couplers (BKxxxx) and Bus

Terminal Controllers (BCxxxx). A Bus Coupler serves as a physical interface between the selected fieldbus and the I/O terminals. It is therefore not programmable. In these Demokits the connected terminals receive their data from a higher-level PC. In contrast, the Bus Terminal Controllers are programmed from a PC via the selected fieldbus or a programming cable based on IEC 61131. After programming, the Bus Terminal Controllers autonomously manage the connected I/O terminals without involvement from the PC.

Each Demokit consists of:

- BKxxxx Bus Coupler or BCxxxx Bus Terminal Controller
- 2 digital input terminals 24 V DC
- 2 digital output terminals 24 V DC
- Beckhoff product folder
- Beckhoff TwinCAT CD
- “TwinCAT Quickstart” documentation
- documentation describing the Bus Coupler or Bus Terminal Controller used
- a 25 cm section of 35 mm mounting rail for fitting the terminal system

If required for the respective Demokit, the following additional components are included:

- programming cable (if a BCxxxx Bus Terminal Controller is used)
- TwinCAT PLC licence
- end terminal
- fieldbus cable (e.g. PROFIBUS or SERCOS cable)
- fieldbus interface card for the PC (e.g. PROFIBUS PCI master card or SERCOS PCI master card)

Ordering information	Demokits with Bus Coupler and TwinCAT PLC licence
TC9910-B110	EtherCAT demokit, with TwinCAT PLC licence
TC9910-B111	EtherCAT, EK1100, EtherCAT Terminals (without PLC licence)
TC9910-B200	Lightbus, BK2020
TC9910-B310	PROFIBUS, BK3150
TC9910-B400	Interbus, BK4020
TC9910-B510	CANopen, BK5120
TC9910-B520	DeviceNet, BK5220
TC9910-B750	SERCOS, BK7520
TC9910-B800	RS485, BK8000
TC9910-B810	RS232, BK8100
TC9910-B900	Ethernet TCP/IP, BK9100
TC9910-B903	PROFINET, BK9103

Ordering information	Demokits with Bus Terminal Controller and TwinCAT PLC licence
TC9910-C200	Lightbus, BC2000
TC9910-C310	PROFIBUS, BC3150
TC9910-C400	Interbus, BC4000
TC9910-C730	Modbus, BC7300
TC9910-C800	RS485, BC8000
TC9910-C810	RS232, BC8100
TC9910-C815	RS232, BC8150
TC9910-C900	Ethernet TCP/IP, BC9100

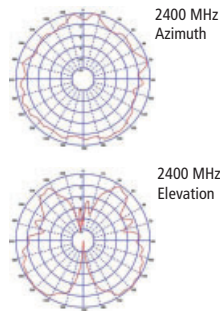




# Accessories radio technology

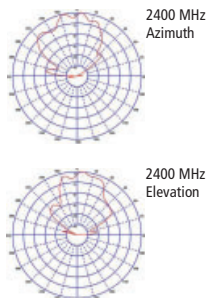
Possible connections	KM6551	607	CU8890	187
ZS6200-0400	x		x	
ZS6100-0900	x		x	
ZS6201-0410	x		x	
ZS6201-0500	x		x	
ZS6100-1800	x		-	

## Omni-directional antenna 4 dBi



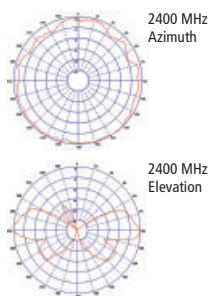
Technical data	ZS6200-0400
Frequency range	2,400...2,485 MHz
Gain	4 dBi
3 dB beamwidth, horizontal	360°
3 dB beamwidth, vertical	70°
Termination	SMA socket
Dimensions	height: 45 mm, diameter: 110 mm
Operating temperature	-40...+80 °C
Mounting	ceiling clip
Matching cables	ZK6000-0102-0020/-0040 (not included in the scope of supply)

## Directional antenna 9 dBi



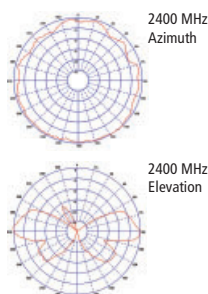
Technical data	ZS6100-0900
Frequency range	2,400...2,485 MHz
Gain	9 dBi
3 dB beamwidth, horizontal	65°
3 dB beamwidth, vertical	65°
Termination	SMA socket
Dimensions	93 mm x 93 mm x 25 mm (H x W x D)
Operating temperature	-40...+80 °C
Mounting	bracket mounting
Matching cables	ZK6000-0102-0020/-0040 (not included in the scope of supply)

## Rod antenna 4 dBi



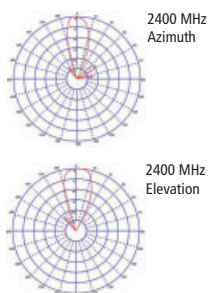
Technical data	ZS6201-0410
Frequency range	2,400...2,485 MHz
Gain	4 dBi
3 dB beamwidth, horizontal	360°
3 dB beamwidth, vertical	70°
Termination	reverse SMA socket
Dimensions	height: 202 mm, base diameter: 35 mm
Operating temperature	-40...+80 °C
Mounting	M14 connecting nut
Matching cables	1 m cable (included in the scope of supply)

## Rod antenna 5 dBi



Technical data	ZS6201-0500
Frequency range	2,400...2,485 MHz
Gain	5 dBi
3 dB beamwidth, horizontal	360°
3 dB beamwidth, vertical	70°
Termination	reverse SMA socket
Dimensions	height: 195 mm, base diameter: 12 mm
Operating temperature	-40...+80 °C
Mounting	direct connection, with angle joint
Matching cables	not applicable, direct connection

## Directional antenna 18 dBi



Technical data	ZS6100-1800
Frequency range	2,400...2,485 MHz
Gain	18 dBi
3 dB beamwidth, horizontal	20°
3 dB beamwidth, vertical	20°
Termination	SMA socket
Dimensions	360 mm x 360 mm x 30 mm (H x W x D)
Operating temperature	-40...+80 °C
Mounting	bracket mounting
Matching cables	ZK6000-0102-0020/-0040 (not included in the scope of supply)

## Antenna cables

Ordering information	Description
ZK6000-0102-0020	coaxial cable, 50 Ω impedance, with attached connectors (SMA plug and reverse SMA socket), black, 200 cm
ZK6000-0102-0040	coaxial cable, 50 Ω impedance, with attached connectors (SMA plug and reverse SMA socket), black, 400 cm



EtherCAT®

# EtherCAT

Ultra high-speed communication



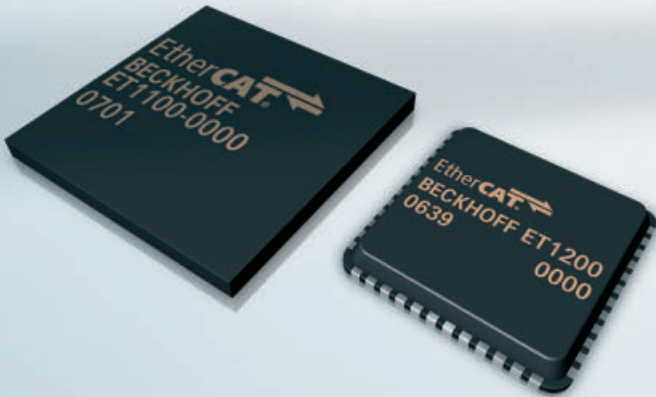
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# EtherCAT

Ethernet for Control Automation Technology

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# Product overview EtherCAT Terminals

EtherCAT Coupler		Embedded PC		
<b>EtherCAT Coupler E-bus</b>	<b>EK1100</b> 686 E-bus interface (EtherCAT Terminals ELxxxx)	<b>EK1000</b> 687 E-bus interface for operation at the switch (EtherCAT Terminals ELxxxx), UDP, MAC-ID	<b>Embedded PC with E-bus interface</b>	<b>CX80xx</b> 258 Embedded PC, with directly integrated E-bus interface
	<b>EK1501</b> 689 EtherCAT Coupler with ID switch, multimode fibre optic			<b>CX9000, CX9010</b> 268 Embedded PC, with directly integrated E-bus interface
	<b>EK1101</b> 688 EtherCAT Coupler with ID switch			<b>CX1010</b> 277 Embedded PC, EtherCAT Terminal integration via power supply CX1100-0004
<b>EtherCAT Coupler K-bus</b>	<b>BK1120</b> 694 K-bus interface (Bus Terminals KLxxxx)	<b>BK1250</b> 695 "Compact" Coupler between E-bus and K-bus terminals	<b>CX5010, CX5020</b> 283 Embedded PC, with directly integrated E-bus interface	
<b>Bus Coupler</b>	<b>EK3100</b> 696 PROFIBUS Coupler for EtherCAT Terminals	<b>EK9300</b> 700 PROFINET IO Coupler for EtherCAT Terminals	<b>CX1020, CX1030</b> 286 Embedded PC, EtherCAT Terminal integration via power supply CX1100-00x4	
	<b>EK5100</b> 697 CANopen Coupler for EtherCAT Terminals			
	<b>EK5200</b> 698 DeviceNet Coupler for EtherCAT Terminals			
	<b>EK9000</b> 699 Ethernet Coupler for EtherCAT Terminals			
<b>Extension system</b>	<b>EK1110</b> 693 EtherCAT extension end terminal	<b>EK1122</b> 691 2-port EtherCAT junction		
	<b>EK1521</b> 690 1-port EtherCAT multimode fibre optic junction	<b>EK1132</b> 692 2-port Power over EtherCAT junction		

**Digital input: EL1xxx | ES1xxx**

Signal	2-channel	4-channel	8-channel	16-channel	
<b>5 V DC</b>		<b>EL1124</b>   ES1124 <b>704</b> filter 10 µs			
<b>12 V DC</b>		<b>EL1144</b>   ES1144 <b>704</b> filter 10 µs			
<b>24 V DC</b>	<b>EL1002</b>   ES1002 <b>705</b> filter 3.0 ms, type 3, p-switching  <b>EL1012</b>   ES1012 <b>712</b> filter 10 µs, type 3, p-switching	<b>EL1004</b>   ES1004 <b>705</b> filter 3.0 ms, type 3, p-switching  <b>EL1014</b>   ES1014 <b>712</b> filter 10 µs, type 3, p-switching  <b>EL1024</b>   ES1024 <b>713</b> filter 3.0 ms, type 2, p-switching  <b>EL1804</b> <b>708</b> 8 x 24 V, 4 x 0 V, 3.0 ms, type 3  <b>EL1104</b>   ES1104 <b>715</b> filter 3.0 ms, ±sensor supply  <b>EL1084</b>   ES1084 <b>716</b> filter 3.0 ms, n-switching  <b>EL1904</b> <b>720</b> TwinSAFE, 4 safe inputs	<b>EL1034</b>   ES1034 <b>714</b> filter 10 µs, potential-free inputs  <b>EL1814</b> <b>708</b> 8 x 24 V, 4 x 0 V, 10 µs, type 3  <b>EL1114</b>   ES1114 <b>715</b> filter 10 µs, ±sensor supply  <b>EL1094</b>   ES1094 <b>716</b> filter 10 µs, n-switching  <b>EL1934</b> <b>721</b> PROFIsafe, 4 safe inputs	<b>EL1008</b>   ES1008 <b>705</b> filter 3.0 ms, type 3, p-switching  <b>EL1018</b>   ES1018 <b>712</b> filter 10 µs, type 3, p-switching  <b>EL1808</b> <b>707</b> 8 x 24 V DC, 3.0 ms, type 3  <b>EL1088</b>   ES1088 <b>716</b> filter 3.0 ms, n-switching  <b>EL1098</b>   ES1098 <b>716</b> filter 10 µs, n-switching	<b>EL1862</b> <b>711</b> filter 3.0 ms, flat-ribbon cable connection, type 3  <b>EL1862-0010</b> <b>711</b> filter 3.0 ms, flat-ribbon cable connection, 0 V (ground) switching  <b>EL1872</b> <b>711</b> filter 10 µs, flat-ribbon cable connection, type 3  <b>EL1809</b> <b>706</b> filter 3.0 ms, type 3  <b>EL1819</b> <b>706</b> filter 10 µs, type 3  <b>EL1859</b> <b>710</b> 8 inputs, 8 outputs, filter 3.0 ms, type 3, I <sub>max</sub> = 0.5 A  <b>EL1889</b> <b>709</b> filter 3.0 ms, 0 V (ground) switching
<b>48 V DC</b>		<b>EL1134</b>   ES1134 <b>704</b> filter 10 µs			
<b>120 V AC/DC</b>	<b>EL1712</b>   ES1712 <b>722</b> power contacts				
<b>230 V AC</b>	<b>EL1702</b>   ES1702 <b>722</b> power contacts  <b>EL1722</b>   ES1722 <b>722</b> no power contacts				
<b>Counter</b>	<b>EL1502</b>   ES1502 <b>723</b> up/down, 24 V DC, 100 kHz, 32 bit  <b>EL1512</b>   ES1512 <b>724</b> up/down, 24 V DC, 1 kHz, 16 bit				

ELxxx: Standard EtherCAT Terminals, ESxxx: EtherCAT Terminals with pluggable wiring level  
 EN 61131-2 specification: [www.beckhoff.com/EN61131-2](http://www.beckhoff.com/EN61131-2)



# Product overview EtherCAT Terminals

## Digital output: EL2xxx | ES2xxx

Signal	1-channel	2-channel
5 V DC		
12 V DC		
24 V DC		<p><b>EL2002</b>   ES2002 <span style="float: right;">726</span> I<sub>MAX</sub> = 0.5 A</p> <p><b>EL2022</b>   ES2022 <span style="float: right;">731</span> I<sub>MAX</sub> = 2.0 A</p> <p><b>EL2032</b>   ES2032 <span style="float: right;">731</span> I<sub>MAX</sub> = 2.0 A, with diagnostic</p> <p><b>EL2042</b>   ES2042 <span style="float: right;">733</span> 2 x 4 A/1 x 8 A</p> <p><b>EL2202</b>   ES2202 <span style="float: right;">735</span>    <b>EL2212</b>   ES2212 <span style="float: right;">736</span> T<sub>ON</sub>/T<sub>OFF</sub> 1 μs, push-pull outputs    T<sub>ON</sub>/T<sub>OFF</sub> 1 μs, 0.5 A, overexcitation</p> <p><b>EL2252</b>   ES2252 <span style="float: right;">737</span>    <b>EL2262</b>   ES2262 <span style="float: right;">738</span> T<sub>ON</sub>/T<sub>OFF</sub> 1 μs, I<sub>MAX</sub> = 0.5 A, time stamp    I<sub>MAX</sub> = 0.5 A, oversampling</p> <p><b>EL2902</b> <span style="float: right;">739</span> TwinSAFE, 2 safe outputs</p>
Relay (up to 230 V AC)		<p><b>EL2602</b>   ES2602 <span style="float: right;">742</span>    <b>EL2622</b>   ES2622 <span style="float: right;">742</span> I<sub>MAX</sub> = 2.0 A, make contact, power contacts    I<sub>MAX</sub> = 2.0 A, make contact, no power contacts</p> <p><b>EL2612</b>   ES2612 <span style="float: right;">742</span> I<sub>MAX</sub> = 1.0 A, change-over, no power contacts</p>
Triac (up to 230 V AC)		<p><b>EL2712</b>   ES2712 <span style="float: right;">744</span>    <b>EL2722</b>   ES2722 <span style="float: right;">744</span> 12...230 V, 0.5 A, power contacts    12...230 V, 1.0 A, mutually locked outputs</p> <p><b>EL2732</b>   ES2732 <span style="float: right;">744</span> 12...230 V, 0.5 A, no power contacts</p>
PWM		<p><b>EL2502</b>   ES2502 <span style="float: right;">745</span> PWM output, 24 V DC, 1.0 A</p> <p><b>EL2535</b>   ES2535 <span style="float: right;">746</span>    <b>EL2545</b>   ES2545 <span style="float: right;">747</span> 24 V DC, 1.0 A, current-controlled    50 V DC, 3.5 A, current-controlled</p>
Pulse train	<b>EL2521</b>   ES2521 <span style="float: right;">748</span> 1...500 kHz	

ELxxxx: Standard EtherCAT Terminals, ESxxxx: EtherCAT Terminals with pluggable wiring level

				EM2xxx	
4-channel	8-channel	16-channel	16-channel		
<b>EL2124</b>   ES2124 <b>725</b>					
<b>EL2024-0010</b> <b>732</b> I <sub>MAX</sub> = 2.0 A					
<b>EL2004</b>   ES2004 <b>726</b> I <sub>MAX</sub> = 0.5 A	<b>EL2008</b>   ES2008 <b>726</b> I <sub>MAX</sub> = 0.5 A		<b>EM2042</b> <b>749</b> I <sub>MAX</sub> = 0.5 A, D-sub connection		
<b>EL2024</b>   ES2024 <b>732</b> I <sub>MAX</sub> = 2.0 A		<b>EL2872</b> <b>730</b> I <sub>MAX</sub> = 0.5 A, flat-ribbon cable connection			
<b>EL2034</b>   ES2034 <b>732</b> I <sub>MAX</sub> = 2.0 A, with diagnostic		<b>EL2872-0010</b> <b>730</b> I <sub>MAX</sub> = 0.5 A, flat-ribbon cable connection, n-switching			
<b>EL2084</b>   ES2084 <b>734</b> I <sub>MAX</sub> = 0.5 A, n-switching	<b>EL2088</b>   ES2088 <b>734</b> I <sub>MAX</sub> = 0.5 A, n-switching	<b>EL1859</b> <b>710</b> 8 inputs, 8 outputs, filter 3.0 ms, type 3, I <sub>MAX</sub> = 0.5 A			
<b>EL2904</b> <b>740</b> TwinSAFE, 4 safe outputs		<b>EL2808</b> <b>728</b> I <sub>MAX</sub> = 0.5 A, 8 x 0 V	<b>EL2809</b> <b>727</b> I <sub>MAX</sub> = 0.5 A		
<b>EL2934</b> <b>741</b> PROFIsafe, 4 safe outputs			<b>EL2889</b> <b>729</b> I <sub>MAX</sub> = 0.5 A, 0 V (ground) switching		
<b>EL2624</b>   ES2624 <b>743</b> make contact, no power contacts					

# Product overview EtherCAT Terminals

Analog input: EL3xxx   ES3xxx						
Signal	1-channel		2-channel		4-channel	
<b>±75 mV</b>			EL3602-0010 <b>756</b> differential input, 24 bit			
<b>0...10 V</b>	EL3061   ES3061 <b>750</b> single-ended, 12 bit	EL3161   ES3161 <b>751</b> single-ended, 16 bit	EL3062   ES3062 <b>750</b> single-ended, 12 bit	EL3162   ES3162 <b>751</b> single-ended, 16 bit	EL3064   ES3064 <b>752</b> single-ended, 12 bit	
<b>0...30 V</b>			EL3062-0030 <b>750</b> single-ended, 12 bit			
<b>±10 V</b>	EL3001   ES3001 <b>753</b> single-ended, 12 bit		EL3002   ES3002 <b>753</b> single-ended, 12 bit	EL3602   ES3602 <b>756</b> differential input, 24 bit	EL3004   ES3004 <b>754</b> single-ended, 12 bit	
	EL3101   ES3101 <b>755</b> differential input, 16 bit		EL3102   ES3102 <b>755</b> differential input, 16 bit	EL3702   ES3702, 16 bit, <b>758</b> differential input, oversampling	EL3104   ES3104 <b>757</b> differential input, 16 bit	
<b>0...20 mA</b>	EL3041   ES3041 <b>760</b> single-ended, 12 bit, terminal supply	EL3141   ES3141 <b>760</b> single-ended, 16 bit, terminal supply	EL3042   ES3042 <b>760</b> single-ended, 12 bit, terminal supply	EL3142   ES3142 <b>760</b> single-ended, 16 bit, terminal supply	EL3044   ES3044 <b>762</b> single-ended, 12 bit	
	EL3011   ES3011 <b>759</b> differential input, 12 bit		EL3012   ES3012 <b>759</b> differential input, 12 bit	EL3612   ES3612 <b>774</b> differential input, 24 bit	EL3014   ES3014 <b>761</b> differential input, 12 bit	
	EL3111   ES3111 <b>759</b> differential input, 16 bit		EL3112   ES3112 <b>759</b> differential input, 16 bit	EL3742   ES3742 <b>763</b> differential input, 16 bit, oversampling	EL3114   ES3114 <b>761</b> differential input, 16 bit	
<b>4...20 mA</b>	EL3051   ES3051 <b>765</b> single-ended, 12 bit, terminal supply	EL3151   ES3151 <b>765</b> single-ended, 16 bit, terminal supply	EL3052   ES3052 <b>765</b> single-ended, 12 bit, terminal supply	EL3152   ES3152 <b>765</b> single-ended, 16 bit, terminal supply	EL3054   ES3054 <b>767</b> single-ended, 12 bit	
	EL3021   ES3021 <b>764</b> differential input, 12 bit	EL3121   ES3121 <b>764</b> differential input, 16 bit	EL3022   ES3022 <b>764</b> differential input, 12 bit	EL3122   ES3122 <b>764</b> differential input, 16 bit	EL3024   ES3024 <b>766</b> differential input, 12 bit	
<b>±10 mA</b>			EL3142-0010 <b>760</b> single-ended, 16 bit, terminal supply			
<b>Thermocouples</b>	EL3311 <b>768</b> type J, K, L, ... U, 16 bit		EL3312 <b>768</b> type J, K, L, ... U, 16 bit		EL3314 <b>769</b> type J, K, L, ... U, 16 bit	
<b>Resistance thermometer (RTD)</b>	EL3201   ES3201 <b>770</b> PT100...1000, Ni100, 16 bit		EL3202   ES3202 <b>770</b> PT100...1000, Ni100, 16 bit		EL3204   ES3204 <b>771</b> PT100...1000, Ni100, 16 bit	
<b>Resistor bridge</b>	EL3351   ES3351 <b>772</b> strain gauge, 16 bit	EL3356   ES3356 <b>773</b> strain gauge, 16 bit, self-calibration				
<b>Measurement</b>	EL3681   ES3681 <b>776</b> digital multimeter terminal, 18 bit		EL3403   ES3403 <b>778</b> 3-phase power measurement terminal	EL3692 <b>777</b> resistance measurement, 10 mΩ...10 MΩ		
<b>Condition monitoring</b>			EL3632 <b>775</b> IEPE terminal, acceleration sensors			

ELxxxx: Standard EtherCAT Terminals, ESxxxx: EtherCAT Terminals with pluggable wiring level

8-channel	
<b>EL3164</b>   ES3164   752	<b>EL3068</b>   ES3068   752
single-ended, 16 bit	single-ended, 12 bit
	<b>EL3008</b>   ES3008   754
	single-ended, 12 bit
<b>EL3144</b>   ES3144   762	<b>EL3048</b>   ES3048   762
single-ended, 16 bit	single-ended, 12 bit
<b>EL3154</b>   ES3154   767	<b>EL3058</b>   ES3058   767
single-ended, 16 bit	single-ended, 12 bit
<b>EL3124</b>   ES3124   766	
differential input, 16 bit	

### Analog output: EL4xxx | ES4xxx

Signal	1-channel	2-channel	4-channel	8-channel
<b>0...10 V</b>	<b>EL4001</b>   ES4001   780 12 bit	<b>EL4002</b>   ES4002   780 12 bit  <b>EL4102</b>   ES4102   780 16 bit	<b>EL4004</b>   ES4004   781 12 bit  <b>EL4104</b>   ES4104   781 16 bit	<b>EL4008</b>   ES4008   781 12 bit
<b>±10 V</b>	<b>EL4031</b>   ES4031   782 12 bit	<b>EL4032</b>   ES4032   782 12 bit  <b>EL4132</b>   ES4132   782 16 bit  <b>EL4732</b>   ES4732   784 16 bit, oversampling	<b>EL4034</b>   ES4034   783 12 bit  <b>EL4134</b>   ES4134   783 16 bit	<b>EL4038</b>   ES4038   783 12 bit
<b>0...20 mA</b>	<b>EL4011</b>   ES4011   785 12 bit	<b>EL4012</b>   ES4012   785 12 bit  <b>EL4112</b>   ES4112   785 16 bit  <b>EL4712</b>   ES4712   787 16 bit, oversampling	<b>EL4014</b>   ES4014   786 12 bit  <b>EL4114</b>   ES4114   786 16 bit	<b>EL4018</b>   ES4018   786 12 bit
<b>4...20 mA</b>	<b>EL4021</b>   ES4021   788 12 bit	<b>EL4022</b>   ES4022   788 12 bit  <b>EL4122</b>   ES4122   788 16 bit	<b>EL4024</b>   ES4024   789 12 bit  <b>EL4124</b>   ES4124   789 16 bit	<b>EL4028</b>   ES4028   789 12 bit
<b>±10 mA</b>		<b>EL4112-0010</b>   ES4112-0010   785 16 bit		

ELxxxx: Standard EtherCAT Terminals, ESxxxx: EtherCAT Terminals with pluggable wiring level

# Product overview EtherCAT Terminals

## Special functions: EL5xxx | ES5xxx, EL6xxx | ES6xxx, EL7xxx | ES7xxx

Signal	1-channel		2-channel		4-channel	
Position measurement	<b>EL5001</b>   ES5001 <b>790</b>	<b>EL5021</b>   ES5021 <b>791</b>	<b>EL5002</b>   ES5002 <b>790</b>			
	SSI encoder interface	SinCos encoder interface, 1 V <sub>s</sub>	SSI encoder interface			
	<b>EL5001-0011</b> <b>790</b>					
	SSI monitor terminal					
	<b>EL5101</b>   ES5101 <b>792</b>	<b>EL5151</b>   ES5151 <b>793</b>	<b>EL5152</b>   ES5152 <b>793</b>			
	incremental encoder interface, differential inputs	incremental encoder interface, 32 bit	incremental encoder interface, 32 bit			
Communication	<b>EL6001</b>   ES6001 <b>794</b>	<b>EL6021</b>   ES6021 <b>795</b>	<b>EL6002</b> <b>796</b>			
	RS232, 115.2 kbaud	RS422/RS485, 115.2 kbaud	RS232, 115.2 kbaud, D-sub			
	<b>EL6080</b> <b>797</b>	<b>EL6201</b>   ES6201 <b>798</b>	<b>EL6022</b> <b>796</b>		<b>EL6224</b>   ES6224 <b>799</b>	
	memory terminal 128 kbyte	AS-Interface master terminal	RS422/RS485, 115.2 kbaud, D-sub		IO-Link master	
	<b>EL6601</b> <b>800</b>		<b>EL6692</b> <b>803</b>		<b>EL6614</b> <b>800</b>	
	switch port		EtherCAT bridge terminal		switch port	
	<b>EL6631</b> <b>801</b>	<b>EL6688</b> <b>802</b>				
	PROFINET IO controller/device terminal	IEEE 1588 master/slave				
	<b>EL6720</b> <b>804</b>					
	Lightbus master terminal					
	<b>EL6731</b> <b>805</b>	<b>EL6731-0010</b> <b>805</b>				
	PROFIBUS master terminal	PROFIBUS slave terminal				
		<b>EL6740-0010</b> <b>806</b>				
		Interbus slave terminal				
<b>EL6751</b> <b>807</b>	<b>EL6751-0010</b> <b>807</b>					
CANopen master terminal	CANopen slave terminal					
<b>EL6752</b> <b>808</b>	<b>EL6752-0010</b> <b>808</b>					
DeviceNet master terminal	DeviceNet slave terminal					
<b>EL6851</b> <b>809</b>						
DMX master						
Motion	<b>EL7031</b>   ES7031 <b>811</b>		<b>EL7332</b>   ES7332 <b>813</b>			
	stepper motor terminal, I <sub>max</sub> = 1.5 A, 24 V		DC motor output stage, 24 V DC, 1.0 A			
	<b>EL7041</b>   ES7041 <b>812</b>		<b>EL7342</b>   ES7342 <b>814</b>	<b>EM7004</b> <b>815</b>		
	stepper motor terminal, I <sub>max</sub> = 5.0 A, 50 V, incremental encoder interface		DC motor output stage, 50 V DC, 3.5 A, incremental encoder interface	3 incremental encoders, 16 digital inputs 24 V DC, 16 digital outputs 24 V DC, 4 analog inputs ±10 V		

ELxxxx: Standard EtherCAT Terminals, ESxxxx: EtherCAT Terminals with pluggable wiring level

## Safety EtherCAT Terminals

## System terminals: EL9xxx | ES9xxx

Signal		Signal	System	Signal	Potential supply	Power supply and accessories
<b>24 V DC</b>	<b>EL1904</b> 720 TwinSAFE, 4 safe inputs	<b>System</b>	<b>EL9011</b> 817 bus end cap	<b>24 V DC</b>	<b>EL9100</b>   ES9100 818	<b>EL9400</b>   ES9400 820 input 24 V DC, E-bus power supply, 2 A
	<b>EL1934</b> 721 PROFIsafe, 4 safe inputs		<b>EL9080</b> 817 isolation terminal			<b>EL9410</b>   ES9410 820 input 24 V DC, output 5 V/2 A
	<b>EL2902</b> 739 TwinSAFE, 2 safe outputs		<b>EL9180</b>   ES9180 817 potential distribution terminal, 2 clamping units per power contact		<b>EL9110</b>   ES9110 816 diagnostic	<b>EL9505</b>   ES9505 822 input 24 V DC, output 5 V DC, 0.5 A
	<b>EL2904</b> 740 TwinSAFE, 4 safe outputs		<b>EL9184</b> 819 potential distribution, 8 x 24 V DC, 8 x 0 V DC		<b>EL9200</b> 817 with fuse	<b>EL9508</b>   ES9508 822 input 24 V DC, output 8 V DC, 0.5 A
	<b>EL2934</b> 741 PROFIsafe, 4 safe outputs		<b>EL9185</b>   ES9185 817 potential distribution terminal, 4 clamping units at 2 power contacts		<b>EL9210</b> 817 diagnostic, with fuse	<b>EL9510</b>   ES9510 822 input 24 V DC, output 10 V DC, 0.5 A
	<b>EL6900</b> 810 TwinSAFE PLC		<b>EL9186</b>   ES9186 818 potential distribution, 8 x 24 V		<b>EL9520</b>   ES9520 821 AS-Interface potential supply with filter	<b>EL9512</b>   ES9512 822 input 24 V DC, output 12 V DC, 0.5 A
			<b>EL9187</b>   ES9187 818 potential distribution, 8 x 0 V	<b>50 V DC</b>		<b>EL9515</b>   ES9515 822 input 24 V DC, output 15 V DC, 0.5 A
			<b>EL9188</b> 819 potential distribution, 16 x 24 V DC			<b>EL9560</b>   ES9560 823 input 24 V DC, output 24 V DC, 0.5 A with electrical isolation
			<b>EL9189</b> 819 potential distribution, 16 x 0 V DC	<b>120... 230 V AC</b>	<b>EL9150</b>   ES9150 816 diagnostic	<b>EL9570</b>   ES9570 824 buffer capacitor terminal, 500 µF, 50 V DC
			<b>EL9195</b>   ES9195 817 shield terminal		<b>EL9160</b>   ES9160 816 diagnostic	
					<b>EL9190</b>   ES9190 816 any voltage up to 230 V without LED	
					<b>EL9250</b> 817 with fuse	
					<b>EL9260</b> 817 diagnostic, with fuse	

ELxxxx: Standard EtherCAT Terminals, ESxxxx: EtherCAT Terminals with pluggable wiring level

# Product overview EtherCAT components

EtherCAT components	
<b>PC-based Control</b>	
<b>Industrial PC</b>	<p><b>CPxxxx</b> 62 Panel PCs (EtherCAT masters)</p> <p><b>Cxxxx</b> 114 control cabinet PCs (EtherCAT masters)</p>
<b>Embedded PC</b>	<p><b>CXxxxx</b> 258 Embedded PCs (EtherCAT masters)</p>
<b>EtherCAT Box</b>	
<b>Extension system</b>	<p><b>EP1122</b> 972 2-port EtherCAT junction</p>
<b>Digital I/O</b>	<p><b>EP1xxx</b> 973 digital input</p> <p><b>EP2xxx</b> 976 digital output</p> <p><b>EP23xx</b> 979 digital combi</p>
<b>Analog I/O</b>	<p><b>EP3xxx</b> 982 analog input</p> <p><b>EP4xxx</b> 985 analog output</p>
<b>Special functions</b>	<p><b>EP7xxx</b> 986 motion</p>
<b>Fieldbus Box</b>	
<b>Fieldbus Box</b>	<p><b>IL230x-B110</b> 866 IP 67 Coupler Box with EtherCAT interface</p> <p><b>IExxxx</b> 942 Extension Box modules for IP-Link</p>

## PC Fieldbus Cards, Switches

<b>PCI Ethernet</b>	<b>FC9001, FC9011</b> 1048
	1-channel PCI Ethernet card
	<b>FC9002</b> 1049
	2-channel PCI Ethernet card
	<b>FC9004</b> 1049
	4-channel PCI Ethernet card
	<b>FC9051, FC9151</b> 1055
	1-channel Mini PCI Ethernet card

<b>PCI EtherCAT</b>	<b>FC1100</b> 1050
	PCI EtherCAT slave card

<b>Switches</b>	<b>CU2008, CU2016</b> 1058
	Ethernet Switch with 8/16 ports
	<b>CU2508</b> 1061
	real-time Ethernet port multiplier

## Drive Technology

<b>Servo Drives</b>	<b>AX51xx</b> 1082
	EtherCAT Servo Drives up to 170 A, 1-channel
	<b>AX52xx</b> 1084
	EtherCAT Servo Drives up to 2 x 6 A, 2-channel
	<b>AX20xx-B110</b> 1098
	Servo Drives with EtherCAT interface

<b>Servomotors</b>	<b>AM2xxx</b> 1114
	Synchronous Servomotors
	<b>AM3xxx</b> 1108
	Synchronous Servomotors
	<b>ALxxxx</b> 1118
	Linear Servomotors



# EtherCAT – Ultra high-speed for automation

## Highlights

- Ethernet up to the terminal – complete continuity
- Ethernet process interface scalable from 1 bit to 64 kbyte
- first true Ethernet solution for the field level
- exact timing and adapted to synchronisation

## Performance

- 256 digital I/Os in 12  $\mu$ s
- 1,000 digital I/Os in 30  $\mu$ s
- 200 analog I/Os (16 bit) in 50  $\mu$ s, corresponding to 20 kHz sampling rate
- 100 servo axes every 100  $\mu$ s
- 12,000 digital I/Os in 350  $\mu$ s

## Topology

- line, tree or star topology
- up to 65,535 devices
- network size: almost unlimited (> 500 km)
- operation with or without switches
- cost-effective cabling: Industrial Ethernet patch cable (CAT5)
- twisted pair physical layer:
  - Ethernet 100BASE-TX, up to 100 m between 2 devices
  - alternative: fibre-optic cable variants 50 to 2,000 m
- hot connect/disconnect of bus segments

## Address space

- network-wide process image: 4 Gbyte
- device process image: 1 bit to 64 kbyte
- address allocation: freely configurable
- device address selection: automatically via software

## Cost benefits

- no more network tuning: lower engineering costs
- hard real-time with software master: no plug-in cards required
- no active infrastructure components (switches, etc.) required
- Ethernet cable and connector costs lower than for traditional fieldbuses
- EtherCAT right down to the I/O terminal:
  - no complex Bus Couplers required
- low interface costs due to highly integrated EtherCAT Slave Controller

## Protocol

- optimised protocol directly within the Ethernet frame
- fully hardware-implemented
- for routing and socket interface: UDP datagram
- processing while passing
- distributed clock for accurate synchronisation
- time stamp data types for resolution in the nanosecond range
- oversampling data types for high-resolution measurements

## Diagnostics

- breaking point detection
- continuous “quality of line” measurement enables accurate localisation of transmission faults
- Topology View

## Interfaces

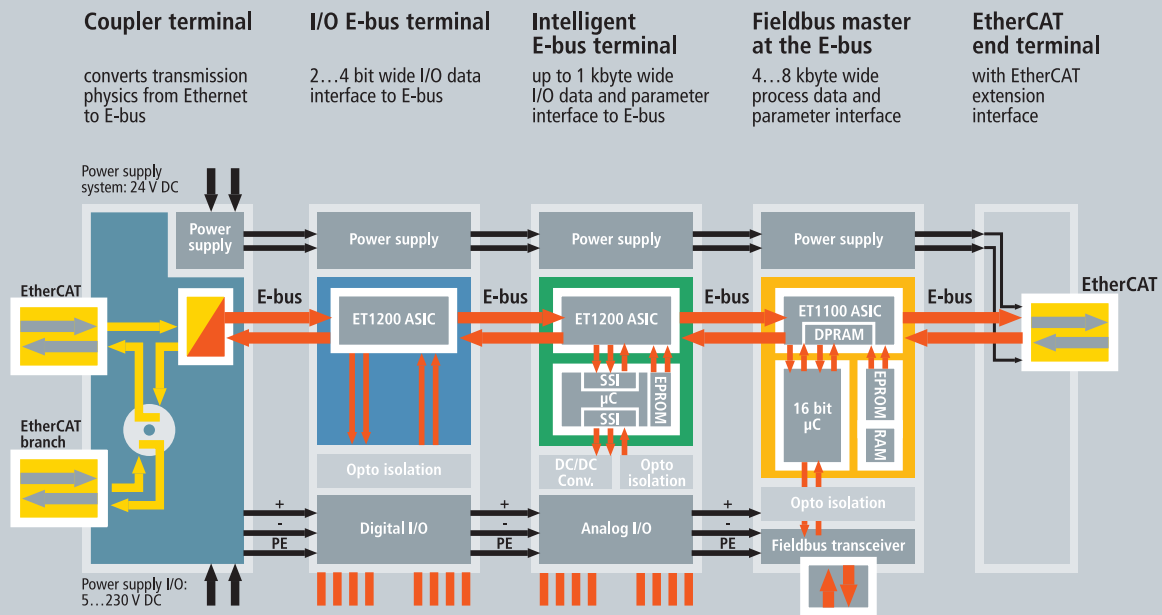
- switch port terminal for standard Ethernet devices
- fieldbus terminals for fieldbus devices
- decentralised serial interfaces
- communication gateways
- gateway to other EtherCAT systems

## Openness

- fully Ethernet-compatible
- operation with switches and routers possible, but not required
- mixed operation with other protocols also possible
- internet technologies (Web server, FTP, etc.)
- compatible with the existing Bus Terminal range
- protocol is published completely
- EtherCAT is IEC, ISO and SEMI standard.

## EtherCAT Technology Group

- international pool of companies
- includes users and manufactures
- supports technology development
- guarantees interoperability
- integration and development of device profiles



**Protocol processing completely in hardware** | Protocol ASICs flexibly configurable. Process interface from 1 bit to 64 kbyte.

## Ethernet for Control and Automation Technology

### Real-time Ethernet: Ultra high-speed right up to the terminal

Outstanding performance, flexible topology and simple configuration characterise EtherCAT (Ethernet for Control Automation Technology), the real-time Ethernet technology from Beckhoff. EtherCAT sets new standards where conventional fieldbus systems reach their limits: 1,000 distributed I/Os in 30  $\mu$ s, almost unlimited network size, and optimum vertical integration thanks to Ethernet and Internet technologies. With EtherCAT, the costly Ethernet star topology can be replaced with a simple line or tree structure – no expensive infrastructure components are required. All types of Ethernet devices can be integrated via a switch or switch port.

Where other real-time Ethernet approaches require special master or scanner cards, EtherCAT manages with very cost-effective standard Ethernet interface cards.

### Principle of operation

There are many different approaches that try to provide real-time capability for Ethernet: for example, the CSMA/CD access procedure is disabled via higher level protocol layers and replaced by time slicing or polling. Other propositions use special switches that distribute Ethernet telegrams in a precisely controlled timely manner. While these solutions are able to transport data packets more or less quickly and accurately to the con-

nected Ethernet node, bandwidth utilisation is very poor, particularly for typical automation devices, since even for very small data quantities a complete Ethernet frame has to be sent. Moreover, the times required for the redirection to the outputs or drive controllers and for reading the input data strongly depend on the implementation. A sub-bus is usually also required, particularly in modular I/O systems, which, like the Beckhoff K-bus, may be synchronised and fast, but nevertheless always adds small delays to the communication that cannot be avoided.

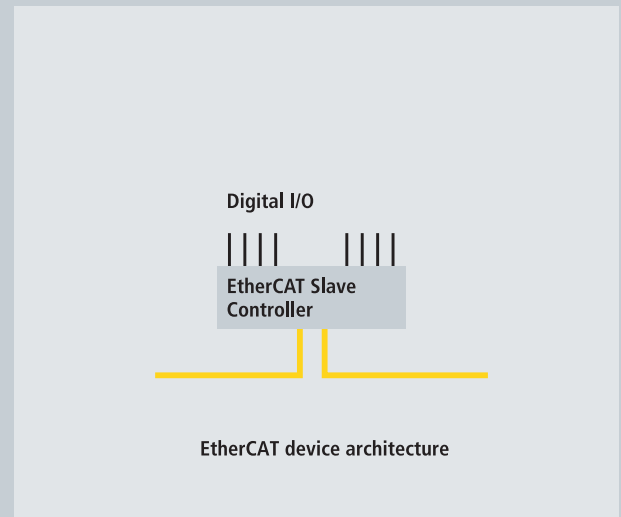
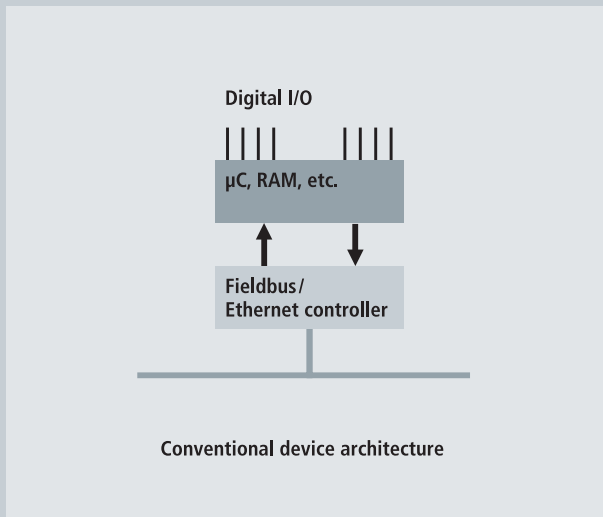
With EtherCAT technology, Beckhoff overcomes these system limitations of other Ethernet solutions: the process no longer involves consecutive steps for receiving and interpreting telegrams and copying the process data. In each device (down to the I/O terminals) the EtherCAT Slave Controller reads the data relevant for the device while the frame passes through it. Similarly, input data is inserted into the data stream on the fly. While the frames (delayed by only a few bit times) are already passed on, the slave recognises relevant commands and executes them accordingly. The process is hardware-implemented in the slave controller and is, therefore, independent of the protocol stack software run-times or the processor power. The last EtherCAT slave in the segment returns the fully processed frame, so that the first slave device forwards it to the master as a kind of response telegram.

From an Ethernet point of view, an EtherCAT bus segment is simply a single large Ethernet device that receives and sends Ethernet frames. However, the “device” does not contain a single Ethernet controller with downstream microprocessor, but a large number of EtherCAT slaves. Like for any other Ethernet device, direct communication may be established without a switch, thereby creating a pure EtherCAT system.

### Ethernet down to the terminal

The Ethernet protocol remains intact right down to the individual devices, i.e. down to the individual I/O terminals; no sub-bus is required. Only the physical layer is converted in the coupler from 100BASE-TX or -FX to E-bus, in order to meet the requirements of the electronic terminal block. The E-bus signal type (LVDS) within the terminal block is nothing proprietary, it is also used for 10 Gbit Ethernet. At the end of the terminal block, the physical bus characteristics are converted back to the 100BASE-TX standard.

The on-board Ethernet MAC is sufficient as hardware in the master device. DMA (direct memory access) is used for data transfer to the main memory. That means that the network data access burden is lifted from the CPU. The same principle is also used in the Beckhoff multiport cards, which bundle up to four Ethernet channels on one PCI slot.



**EtherCAT Slave Controller (ESC)** | EtherCAT is not only faster outside the I/O device, but also inside. Digital I/Os are directly operated by the EtherCAT Slave Controller, without delays through local firmware and independent of the installed  $\mu\text{C}$  performance.

### Protocol

The EtherCAT protocol is optimised for process data and is either transported directly in the Ethernet frame or packed into UDP/IP datagrams. The UDP version is used in situations where EtherCAT segments in other subnets are addressed via routers. Ethernet frames may contain several EtherCAT telegrams, with each telegram serving a particular memory area of the logical process image with an addressable size of up to 4 GB. The data sequence is independent of the physical order of the EtherCAT Terminals in the network; addressing can be in any order. Broadcast, Multicast and communication between slaves are possible.

The protocol can also handle parameter communication, which typically is acyclical. The structure and meaning of the parameters is specified via CANopen device profiles, which are available for a wide range of device classes and applications. EtherCAT also supports the servo profile according to IEC 61800-7-204. Under the name of SERCOS this profile is recognised and popular for Motion Control applications worldwide.

In addition to data exchange according to the master/slave principle, EtherCAT is also very suitable for communication between controllers (master/master). Freely addressable network variables for process data and a variety of services for parameterisation, diagnosis, programming and remote control cover a wide range of requirements. The data

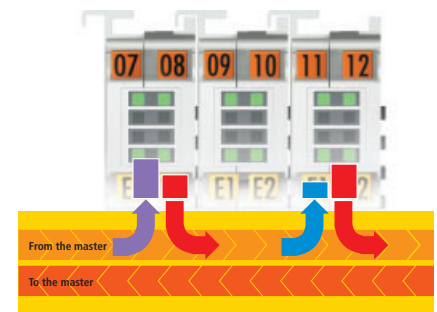
interfaces for master/slave and master/master communication are identical.

### Performance

EtherCAT reaches new dimensions in network performance. The update time for the data from 1,000 distributed inputs/outputs is only  $30\ \mu\text{s}$  – including terminal cycle time. Up to 1,486 byte of process data can be exchanged with a single Ethernet frame – this is equivalent to almost 12,000 digital inputs and outputs. The transfer of this data quantity only takes  $300\ \mu\text{s}$ .

The communication with 100 servo axes takes place every  $100\ \mu\text{s}$ . With this cycle time, all axes are provided with set values and control data and report their actual position and status. The distributed clock technique enables the axes to be synchronised with a jitter of significantly less than 1 microsecond.

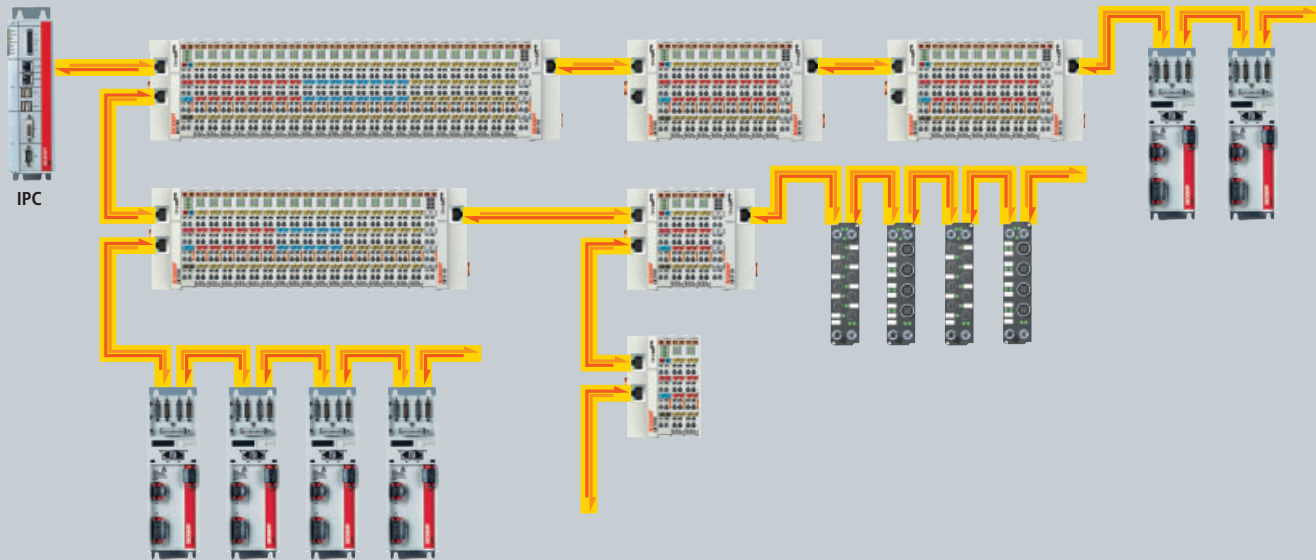
The extremely high performance of the EtherCAT technology enables control concepts that could not be realised with classic fieldbus systems. Very fast control loops can thus also be closed via the bus. Functions that previously required dedicated local hardware support can now be mapped in software. The tremendous bandwidth enables status information to be transferred with each data item. With EtherCAT, a communication technology is available that matches the superior computing capacity of modern Industrial PCs. The bus system is no longer the “bottleneck” of the control



FMMU: telegram processing completely in hardware

concept. Distributed I/Os are recorded faster than is possible with most local I/O interfaces.

The benefits of this network performance also become apparent in smaller controllers with comparatively moderate computing capacity. The EtherCAT cycle is so fast that it can be executed between two control cycles. The controller thus always has the latest input data available; the outputs are addressed with minimum delay. The response behaviour of the controller is improved significantly without increasing the computing capacity itself.



**Freedom in the choice of topology** | Maximum flexibility for wiring: with or without switch, line or tree topologies can be freely selected and combined. Address assignment is automatic; no IP address setting is required.

The EtherCAT technology principle is scalable and not bound to the baud rate of 100 Mbaud – extension to Gbit Ethernet is possible.

### EtherCAT instead of PCI

With increasing miniaturisation of the PC components, the physical size of Industrial PCs is increasingly determined by the number of required slots. The bandwidth of Fast Ethernet, together with the data width of the EtherCAT communication hardware (EtherCAT Slave Controller) opens up new opportunities: interfaces that are conventionally located in the IPC are transferred to intelligent interface terminals at the EtherCAT system. Apart from the decentralised I/Os, axes and control units, complex systems such as fieldbus masters, fast serial interfaces, gateways and other communication interfaces can be addressed via a single Ethernet port in the PC. Even further Ethernet devices without restriction on protocol variants can be connected via decentralised switch port terminals. The central IPC becomes smaller and therefore more cost-effective, one Ethernet interface is sufficient for the complete communication with the periphery.

### Topology

Line, tree or star: EtherCAT supports almost any topology. The bus or line structure known from the fieldbuses thus also becomes

available for Ethernet. Particularly useful for system wiring is the combination of lines and branches or stubs. The required interfaces exist on the couplers; no additional switches are required. Naturally, the classic switch-based Ethernet star topology can also be used.

Wiring flexibility is further maximised through the choice of different cables. Flexible and inexpensive Industrial Ethernet fieldbus cables transfer the signals in Ethernet mode (100BASE-TX) up to a cable length of 100 m between two devices. The complete bandwidth of the Ethernet network – such as different optical fibres and copper cables – can be used in combination with switches or media converters. For each cable distance, the signal variant can be selected individually. Since up to 65,535 devices can be connected, the size of the network is almost unlimited.

### Distributed clocks

Accurate synchronisation is particularly important in cases where spatially distributed processes require simultaneous actions. This may be the case, for example, in applications where several servo axes carry out coordinated movements simultaneously.

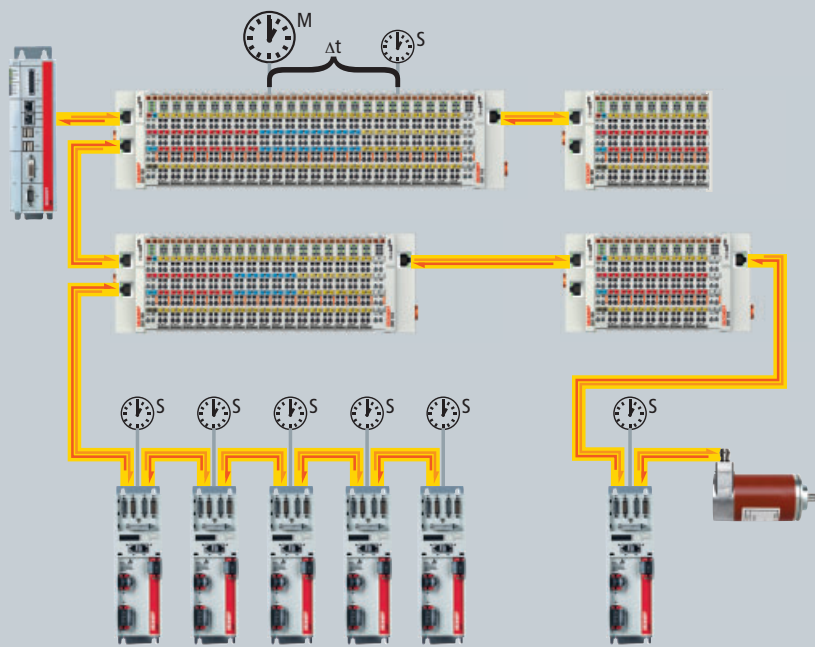
The most powerful approach for synchronisation is the accurate alignment of distributed clocks. In contrast to fully synchronous communication, where synchronisation quality suffers immediately in the event of a communication fault, distributed aligned clocks

have a high degree of tolerance vis-à-vis possible fault-related delays within the communication system. With EtherCAT, the data exchange is fully based on a pure hardware machine. Since the communication utilises a logical (and thanks to full-duplex Fast Ethernet, also physical) ring structure, the “master clock” can determine the run-time offset to the individual “slave clocks” simply and accurately – and vice versa. The distributed clocks are adjusted based on this value, which means that a very precise network-wide timebase with a jitter of significantly less than 1 microsecond is available.

However, high-resolution distributed clocks are not only used for synchronisation, but can also provide accurate information about the local timing of the data acquisition. Thanks to new, extended data types, very precise time stamps can be assigned to measured values.

### Hot Connect

Many applications require a change in I/O configuration during operation. Examples are machining centres with changing, sensor-equipped tool systems or transfer systems with intelligent, flexible workpiece carriers, or printing machines in which individual printing units are switched off. The protocol structure of the EtherCAT system takes account of these requirements: the Hot Connect function enables parts of the network to be linked and decoupled or



### Distributed clocks | Local absolute system synchronisation for CPU, I/O and drive units

reconfigured “on the fly”, offering flexible response capability for changing configurations.

#### High availability

Increasing demands in terms of system availability are catered for with optional cable redundancy that enables devices to be changed without having to shut down the network. EtherCAT also supports redundant masters with hot standby functionality. Since the EtherCAT Slave Controllers immediately return the frame automatically if an interruption is encountered, failure of a device does not lead to the complete network being shut down. Dragchain applications, for example, can thus be specifically configured as stubs in order to be prepared for cable break.

#### Safety over EtherCAT

In the interest of achieving safe data communication with EtherCAT, the Safety over EtherCAT protocol has been created. The protocol meets the requirements of IEC 61508 up to Safety Integrity Level (SIL) 3, as approved by the German Technical Inspection Agency (TÜV).

EtherCAT is used as a single-channel communication system. The transport medium is regarded as a “black channel” and is not included in the safety considerations. Thus, the protocol can also be transmitted by other communication systems, backplanes, WLAN, etc. The transfer cycle can be as short

as required without affecting residual error probability. The cyclic exchange of safe data between a Safety over EtherCAT master and a Safety over EtherCAT slave is referred to as a connection that is monitored via a watchdog timer. A master can establish and monitor several connections to different slaves.

#### Diagnostics

The diagnostic capability of a network is a crucial factor for availability and commissioning times – and therefore overall costs. Only faults that are detected quickly and accurately and located unambiguously can be rectified quickly. Therefore, special attention was paid to exemplary diagnostic features during the development of EtherCAT.

During commissioning, the actual configuration of the I/O terminals should be checked for consistency with the specified configuration. The topology should also match the configuration. Due to the built-in topology recognition down to the individual terminals, the verification can not only take place during system start-up, automatic reading in of the network is also possible (configuration upload).

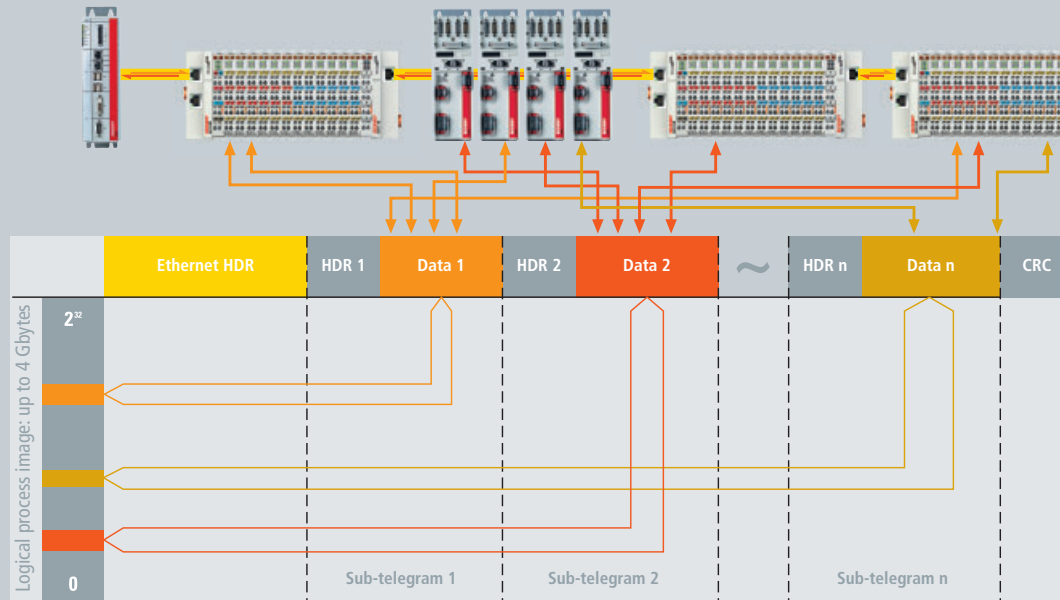
Bit faults during the transfer are reliably detected through evaluation of the CRC checksum in each device. Apart from breaking point detection and localisation, the protocol, transfer physics and topology of the EtherCAT system enable individual quality

monitoring of each individual transmission segment. The automatic evaluation of the associated error counters enables precise localisation of critical network sections. Gradual or changing sources of error such as EMC influences, defective connectors or cable damage are detected and located, even if they do not yet overstrain the self-healing capacity of the network.

#### EtherCAT components

On the hardware side, EtherCAT technology is located in EtherCAT Terminals, for example. The I/O system in protection class IP 20 is based on the housing of the tried and tested Beckhoff Bus Terminal system. In contrast to Bus Terminals, where the fieldbus protocol data is converted within the Bus Coupler to the internal, fieldbus-independent terminal bus, the EtherCAT protocol remains fully intact down to the individual terminal. In addition to EtherCAT Terminals with E-bus connection, the proven standard Bus Terminals with K-bus connection can also be connected via the BK1120 EtherCAT Bus Coupler. This ensures compatibility and continuity with the prevalent system. Existing and future investments are protected.

EtherCAT is integrated in further Beckhoff components, such as the Fieldbus Box in protection class IP 67. The extension modules can be connected directly via an IL230x-B110 EtherCAT Coupler Box. The EtherCAT Box modules, also in protection



**Protocol structure** | The process image allocation is freely configurable. Data are copied directly in the I/O terminal to the desired location within the process image: no additional mapping is required. There is a very large address space of 4 Gbytes.

class IP 67, feature an integrated EtherCAT interface and can be connected directly to an EtherCAT network without an additional Coupler Box. The Beckhoff Industrial PCs, the Embedded PCs of the CX series, the Control Panels with control functionality, and the Ethernet PCI cards already offer inherent EtherCAT capability. The Beckhoff Servo Drives are also available with EtherCAT interface.

### Openness

The EtherCAT technology is not only fully Ethernet-compatible, but also characterised by particular openness “by design”: the protocol tolerates other Ethernet-based services and protocols on the same physical network – usually only with minimum loss of performance. Any Ethernet device can be connected within the EtherCAT segment via a switch port terminal without influencing the cycle time. Devices with fieldbus interface are integrated via EtherCAT fieldbus master terminals. The UDP protocol variant can be implemented on each socket interface. EtherCAT is a fully open protocol. It is recognised and available as an official IEC specification (IEC 61158, type 12).

### EtherCAT Technology Group

The EtherCAT Technology Group (ETG) is an association of automation users and manufacturers with a mission to support the development of EtherCAT technology. The group

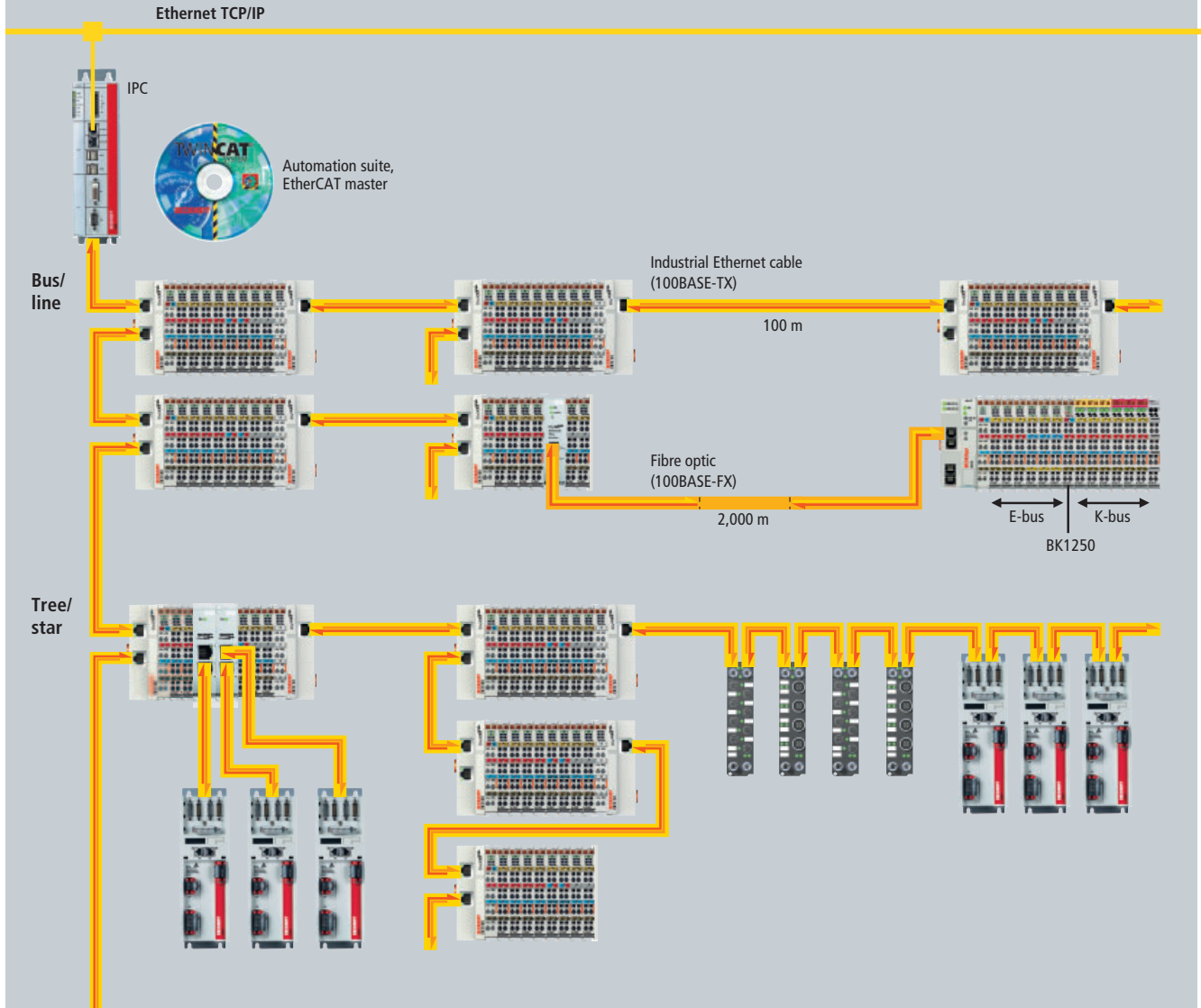
represents a variety of industry sectors and application areas. This ensures that the EtherCAT technology functions and interfaces are ideally prepared for the widest range of applications. The organisation ensures that EtherCAT can be easily and cost-effectively integrated in all kinds of automation devices, while ensuring interoperability of these implementations. The EtherCAT Technology Group is the official IEC partner organisation for fieldbus standardisation. Membership is open to all companies.

For further information see [www.ethercat.org](http://www.ethercat.org)

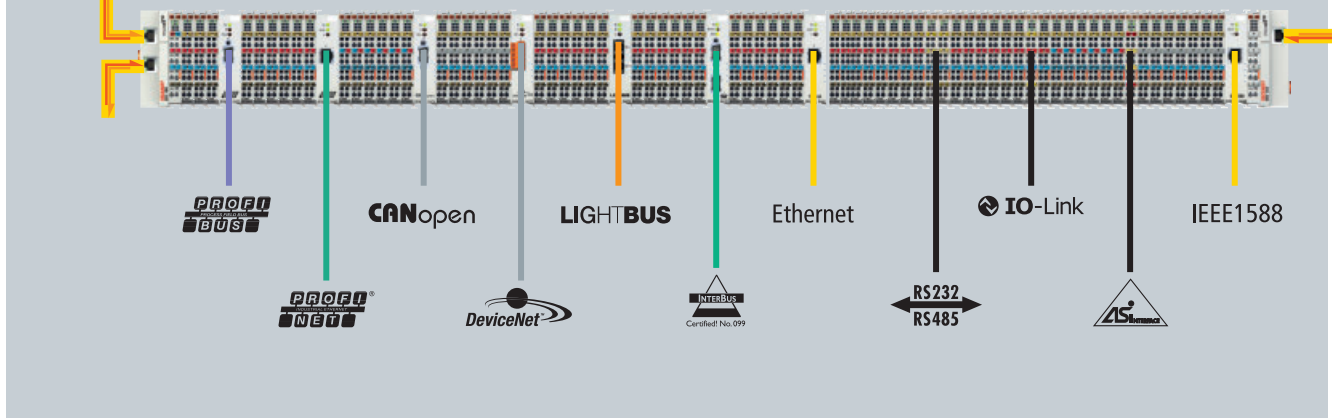


# EtherCAT system overview

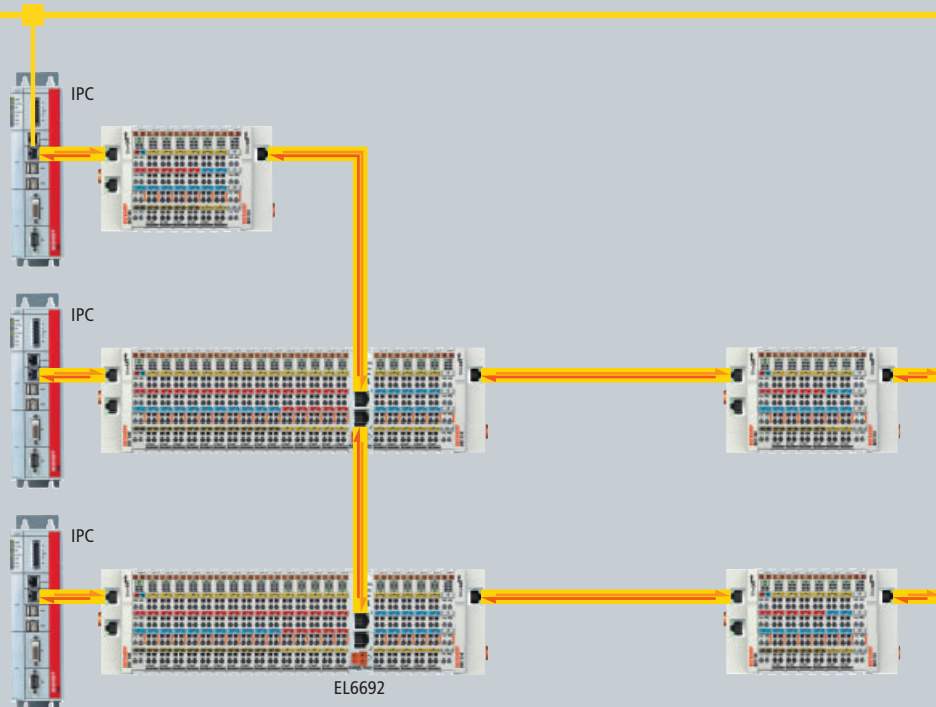
## Flexible topology



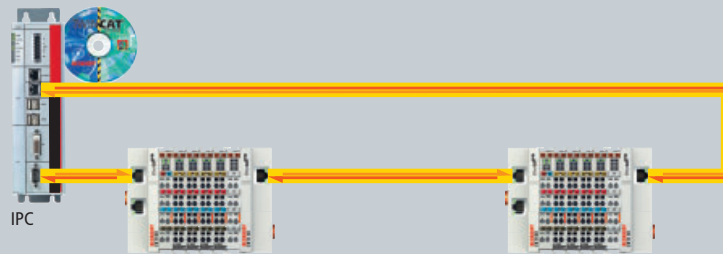
## Fieldbus integration



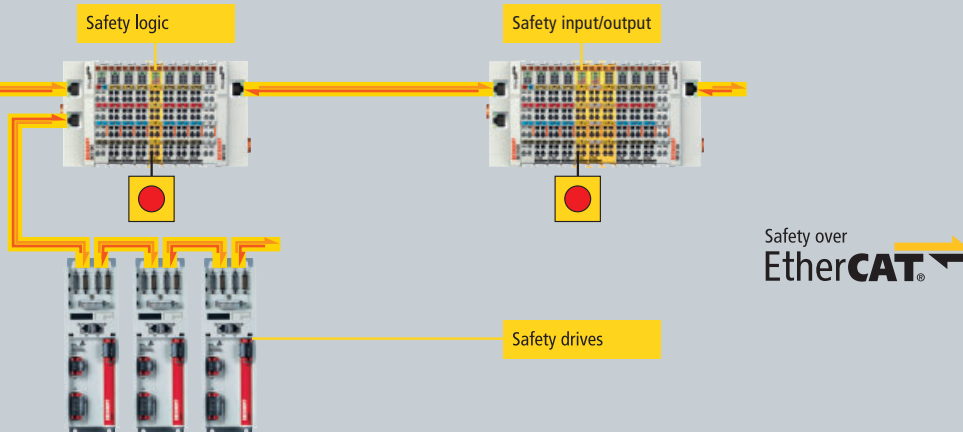
## EtherCAT bridge



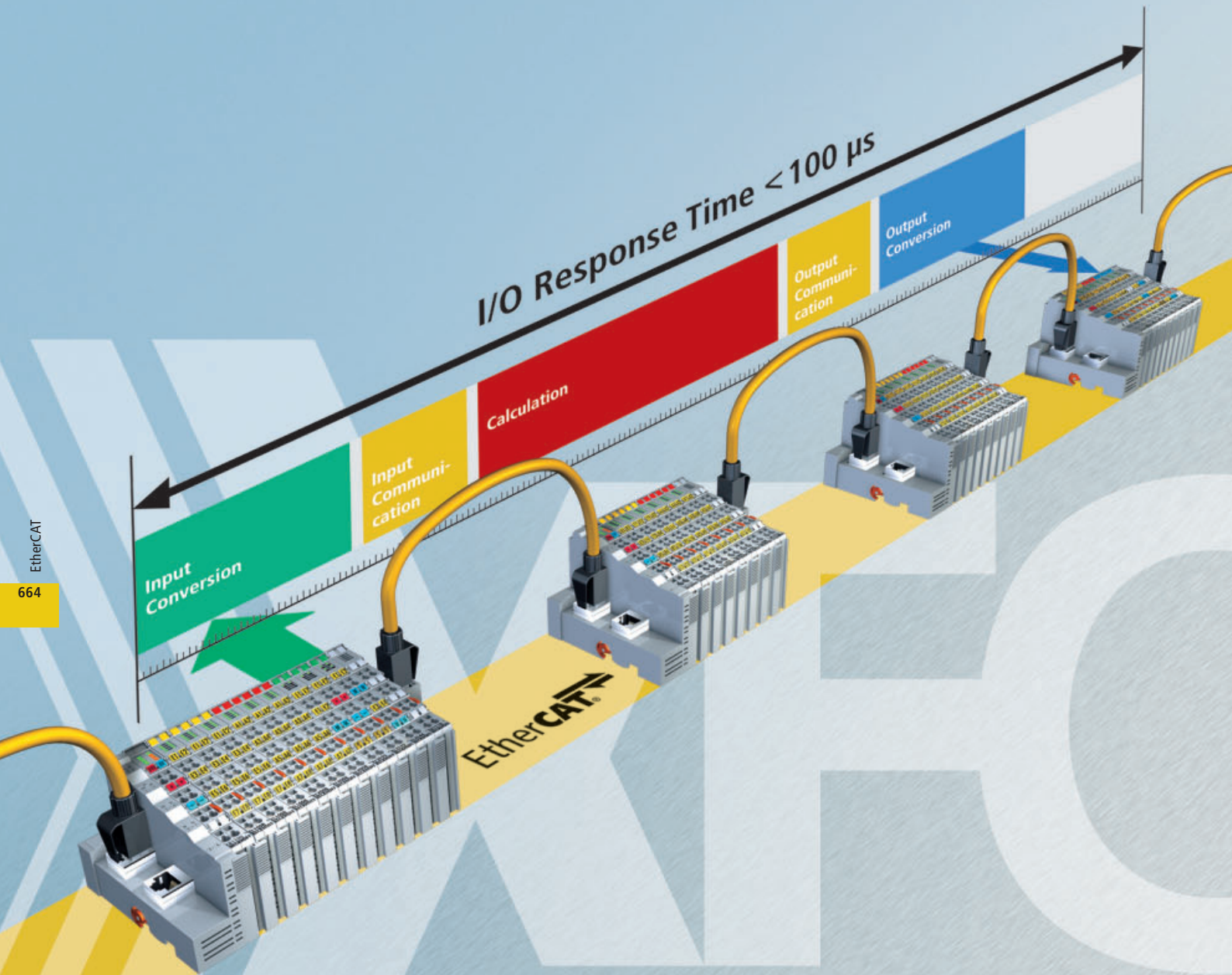
## Redundancy



## Safety







The I/O response time includes all hardware processing times (IPC, EtherCAT and I/O system), ranging from physical input event to output response. With an I/O response time of <math>< 100 \mu\text{s}</math>, PLC programmers have access to performance that in the past was only available in servo controllers with digital signal processors.

# EtherCAT – Even faster with XFC

## XFC – The new class of Control Performance

**With XFC technology (eXtreme Fast Control Technology) Beckhoff presents an ultra fast control solution: XFC is based on optimised control and communication architectures comprising an advanced Industrial PC, ultra-fast I/O terminals with extended real-time characteristics, the EtherCAT high-speed Ethernet system, and the TwinCAT automation software. With XFC it is possible to achieve I/O response times < 100 µs. This technology opens up new process optimisation opportunities for the user that were not possible in the past due to technical limitations.**

XFC represents a control technology that enables very fast and highly deterministic responses. It includes all hardware and software components involved in control applications: optimised input and output components that can detect signals with high accuracy or initiate tasks; EtherCAT as very fast communication network; high-performance Industrial PCs; and TwinCAT, the automation software that links all system components.

Not long ago, control cycle times around 10 to 20 ms were normal. The communications interface was free-running, with corresponding inaccuracy of the determinism associated with responses to process signals. The increased availability of high-performance Industrial PC controllers enabled a reduction in cycle times down to 1–2 ms, i.e. by about a factor of 10. Many special control loops could thus be moved to the

central machine controller, resulting in cost savings and greater flexibility in the application of intelligent algorithms.

XFC offers a further reduction of response times by a factor of 10, and enables cycle times of 100 µs, without having to give up central intelligence and associated high-performance algorithms. XFC also includes additional technologies that not only improve cycle times, but also temporal accuracy and resolution.

Users benefit from entirely new options for enhancing the quality of their machines and reducing response times. Measuring tasks such as preventive maintenance measures, monitoring of idle times or documentation of parts quality can simply be integrated in the machine control without additional, costly special devices.

In a practical automation solution, not everything has to be extremely fast and accurate – many tasks can still be handled with “normal” solutions. XFC technology is therefore fully compatible with existing solutions and can be used simultaneously with the same hardware and software.

### **XFC: Optimised control and communication architecture for highest performance**

#### **TwinCAT – The extreme fast real-time control software**

- real-time under Microsoft Windows down to 50 µs cycle time
- standard IEC 61131-3 programming in XFC real-time tasks
- Standard features of Windows and TwinCAT are XFC-compliant.

#### **EtherCAT – The extreme fast control communication technology**

- 1,000 distributed digital I/Os in 30 µs
- EtherCAT down to the individual I/O terminals, no sub bus required
- optimised use of standard Ethernet Controllers, e.g. Intel® PC chipset architecture
- advanced real-time feature based on distributed clocks
  - synchronisation
  - time stamping
  - oversampling

#### **EtherCAT Terminals – The extreme fast I/O technology**

- full range I/O line for all signal types
- high-speed digital and analog I/Os
- Time stamping and oversampling features allow extreme high timing resolution (down to 10 ns).

#### **IPC – The extreme fast control CPU**

- Industrial PC based on high-performance real-time motherboards
- compact form factors optimised for control applications



# XFC technologies

## Distributed clocks

In a normal, discrete control loop, actual value acquisition occurs at a certain time (input component), the result is transferred to the control system (communication component), the response is calculated (control component), the result is communicated to the set value output module (output component) and issued to the process (controlled system).

The crucial factors for the control process are: minimum response time, deterministic actual value acquisition (i.e. exact temporal calculation must be possible), and corresponding deterministic set value output. At what point in time the communication and calculation occurs in the meantime is irrelevant, as long as the results are available in the output unit in time for the next output, i.e. temporal precision is required in the I/O components, but not in the communication or the calculation unit.

The distributed EtherCAT clocks therefore represent a basic XFC technology and are a general component of EtherCAT communication. All EtherCAT devices have their own local clocks, which are automatically and continuously synchronised with all other clocks via the EtherCAT communication. Different communication run-times are compensated, so that the maximum deviation between all clocks is generally less than 100 nanoseconds. The current time of the distributed clocks is therefore also referred to as system time, because it is always available across the whole system.

### Distributed clocks

- distributed absolute system synchronisation for CPU, I/O and drive devices
- resolution: 10 ns
- accuracy: < 100 ns

## Time stamp

Process data is usually transferred in its respective data format (e.g. one bit for a digital value or one word for an analog value). The temporal relevance of the process record is therefore inherent in the communication cycle during which the record is transferred. However, this also means that the temporal resolution and accuracy is limited to the communication cycle.

Time stamped data types contain a time stamp in addition to their user data. This time stamp – naturally expressed in the ubiquitous system time – enables provision of temporal information with significantly higher precision for the process record. Time stamps can be used for inputs (e.g. to identify the time of an event occurred) and outputs (e.g. timing of a response).

### Signal time stamping (10 ns resolution)

- extreme time measurement for digital single shot events: resolution 10 ns, accuracy < 100 ns
- exact time measurement of rising or falling edges of distributed digital inputs
  - exact timing of distributed output signals, independent of control cycle
  - time stamping data: resolution 10 ns, accuracy < 100 ns



# Oversampling

Process data is usually transferred exactly once per communication cycle. Conversely, the temporal resolution of a process record directly depends on the communication cycle time. Higher temporal resolution is only possible through a reduction in cycle time – with associated practical limits.

Oversampling data types enable multiple sampling of a process record within a communication cycle and subsequent (inputs) or prior (outputs) transfer of all data contained in an array. The oversampling factor describes the number of samples within a communication cycle and is therefore a multiple of one. Sampling rates of 200 kHz can easily be achieved, even with moderate communication cycle times.

Triggering of the sampling within the I/O components is controlled by the local clock (or the global system time), which enables associated temporal relationships between distributed signals across the whole network.

## Signal oversampling

- multiple signal conversion within one control cycle
- hard time synchronisation through distributed clocks
- for digital input/output signals
- for analog input/output signals
- support of analog I/O EtherCAT Terminals
  - up to 100 kHz signal conversion
  - down to 10 µs resolution
- support of digital I/O EtherCAT Terminals
  - up to 1 MHz
  - up to 1 µs
- application
  - fast signal monitoring
  - fast function generator output
  - signal sampling independent of cycle time
  - fast loop control

# Fast I/O

Very fast physical responses require suitably short control cycle times in the associated control system. A response can only take place once the control system has detected and processed an event.

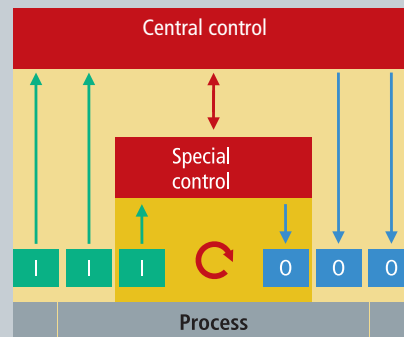
The traditional approach for achieving cycle times in the 100 µs range relies on special separate controllers with their own, directly controlled I/Os. This approach has clear disadvantages, because the separate controller has only very limited information about the overall system and therefore cannot make higher-level decisions. Reparameterisation options (e.g. for new workpieces) are also limited. Another significant disadvantage is the fixed I/O configuration, which generally cannot be expanded.

## Extreme fast I/O response time

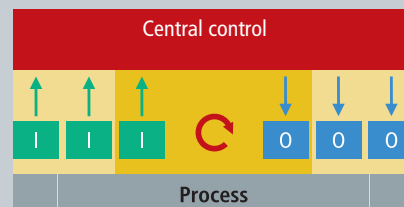
- from 85 µs
- Deterministic synchronised input and output signal conversion leads to low process timing jitter.
- Process timing jitter is independent of communication and CPU jitter.

## Extreme short control cycle time

- 100 µs (min. 50 µs)
- new performance class for PLC application: control loops with 100 µs



Subordinate special control (limited process image)



Fast central control (complete process image)

# XFC components

Implementation of the XFC technologies described above requires full support for all hardware and software components involved in the control system, including fast, deterministic communication and I/O and control hardware. A significant part of XFC are the software components responsible for fast processing of the control algorithms and optimised configuration of the overall system.

Beckhoff offers a special XFC product range based primarily on four categories: EtherCAT as fieldbus, EtherCAT Terminals as I/O system, IPCs as hardware platform, and TwinCAT as higher-level software. All components are based on open standards, which means that any engineer or programmer can develop very fast control solutions with high performance based on standard components (i.e. without special hardware).

## I/O components with XFC technology

Standard EtherCAT Terminals already offer full support for XFC technology. Synchronisation of the I/O conversion with the communication or – more precisely – with the distributed clocks is already standard in EtherCAT and is therefore supported by the corresponding terminals.

XFC terminals offer additional special features that make them particularly suitable for fast or high-precision applications:

- digital EtherCAT Terminals with very short  $T_{ON}/T_{OFF}$  times, or analog terminals with particularly short conversion times
- EtherCAT Terminals and EtherCAT Box modules with time stamp latching at the exact system time at which digital or analog events occur. Output of digital or analog values can occur at exactly predefined times.
- Terminals with oversampling enable actual value acquisition or set value output with significantly higher resolution than the communication cycle time.

## Communication component – EtherCAT fully utilised

With high communication speed and usable data rates EtherCAT offers the basic prerequisites for XFC. However, speed is not everything. The option of using the bus to exchange several independent process images arranged according to the control application enables parallel application of XFC and standard control technology.

The central control system is relieved of time-consuming copying and mapping tasks and can fully utilise the available computing power for the control algorithms.

The distributed EtherCAT clocks that form the temporal backbone of the XFC technologies are available in all communication devices without significant additional effort.

The crucial point of XFC is the option of integrating all I/O components directly in the EtherCAT communication, so that no subordinate communication systems (sub bus) are required. In many XFC terminals the AD or DA converter is connected directly to the EtherCAT chip, so that delays are avoided.

## Control component – High-performance Industrial PCs

Central control technology can be particularly advantageous if it can run faster and more powerful control algorithms than would be the case with many distributed small controllers. Modern Industrial PCs offer significantly more processing power and memory at lower cost than the sum of a large number of small controllers.

The latest general PC technology innovations can also be used to good effect for control technology. Fast dual core processors are ideal for running the operator interface of the machine in parallel with the control tasks. Large caches available with modern CPUs are ideal for XFC technology, because fast algorithms run in the cache and can therefore be processed even faster.

An important factor for short XFC cycle times is the fact that the CPU is not burdened with complex process data copying tasks needed by traditional fieldbuses with their DPRAM-based central boards. EtherCAT process data communication can be handled entirely by the integrated Ethernet controller (NIC with bus master DMA).

## Software component – TwinCAT automation suite

TwinCAT as high-performance automation suite fully supports the XFC technologies while retaining all the familiar features. The real-time implementation of TwinCAT supports different tasks with different cycle times. Modern Industrial PCs can achieve cycle times of 100  $\mu$ s or less without problem. Several (different) fieldbuses can be mixed. The associated allocations and com-

munication cycles are optimised according to the fieldbus capabilities. The EtherCAT implementation in TwinCAT makes full use of the communication system and enables application of several independent time levels. It uses distributed clocks. Different time levels enable coexistence of XFC and normal control tasks in the same system, without the XFC requirements becoming a “bottleneck”.

An option specially designed for XFC enables inputs to be read during independent communication calls and outputs to be sent directly after the calculation. Due to the speed offered by EtherCAT the inputs are read “just” before the start of the control tasks, followed by immediate distribution of the outputs. The resulting response times are faster than the fieldbus cycle time in some cases.

Special TwinCAT extensions facilitate handling of the new XFC data types (time stamp and oversampling). PLC blocks enable simple analysis and calculation of the time stamps. The TwinCAT scope can display the data picked up via oversampling according to the allocated oversampling factor and enables precise data analyses.

Industrial PC



TwinCAT



### TwinCAT

The TwinCAT automation suite supports XFC technology with real-time implementation and extensions for the XFC functions oversampling, time stamp and distributed clocks.



### Industrial PC

High-performance Industrial PCs offer plenty of computing power for short XFC cycle times.

EtherCAT



### Time stamp

Time stamp input/output modules can be used to realise responses with equidistant time intervals.

EtherCAT Terminals



### Oversampling

Oversampling offers refined temporal resolution of a signal through multiple signal sampling.

EtherCAT Box



### Fast I/O

Fast I/O make delays in the hardware negligible.



### EtherCAT

EtherCAT offers the basis for XFC with an extremely fast communication technology.

EtherCAT Servo Drives



### Drive Technology

The flexible drive interface with short cycle times enables highly dynamic, strictly synchronous control processes covering multiple axes.

# XFC EtherCAT Terminals

The EtherCAT I/O system provides a wide range with different signal terminals. Standard EtherCAT Terminals already offer full support for XFC technology. Synchronisation of the I/O conversion with the communication or – more precisely – with the distributed clocks is already standard in EtherCAT and is therefore supported by all terminals. Further developed XFC terminals offer additional special features that make them particularly suitable for fast or high-precision applications:

## Oversampling

### EL1262:

- 2-channel digital input  
24 V DC
- time synchronisation across the system through distributed clocks
- jitter  $\ll 1 \mu\text{s}$
- conversion time up to  $1 \mu\text{s}$  or 1 Msample/s

### EL2262:

- 2-channel digital output  
24 V DC
- time synchronisation across the system through distributed clocks
- jitter  $\ll 1 \mu\text{s}$
- conversion time up to  $1 \mu\text{s}$  or 1 Msample/s

### EL3742:

- 2-channel analog input  
0...20 mA
- time synchronisation across the system through distributed clocks
- jitter  $\ll 1 \mu\text{s}$
- conversion time up to  $10 \mu\text{s}$  or 100 ksamples/s

### EL3702:

- 2-channel analog input  
-10 V...+10 V
- time synchronisation across the system through distributed clocks
- jitter  $\ll 1 \mu\text{s}$
- conversion time up to  $10 \mu\text{s}$  or 100 ksamples/s

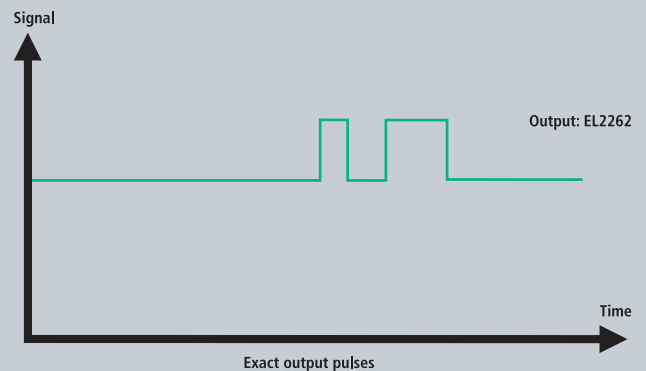
### EL4732:

- 2-channel analog output  
-10 V...+10 V
- time synchronisation across the system through distributed clocks
- jitter  $\ll 1 \mu\text{s}$
- conversion time up to  $10 \mu\text{s}$  or 100 ksamples/s

### EL4712:

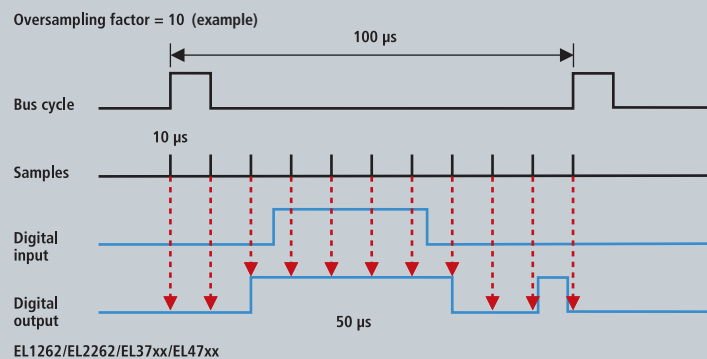
- 2-channel analog output  
0...20 mA
- time synchronisation across the system through distributed clocks
- jitter  $\ll 1 \mu\text{s}$
- conversion time up to  $10 \mu\text{s}$  or 100 ksamples/s

### Oversampling terminals



With the digital EL2262 oversampling output terminal, outputs can be switched on and off within a  $1 \mu\text{s}$  time frame, which is ideal for high-precision dosing applications, for example.

### Oversampling terminals



The digital EL1262 oversampling input terminal offers an input signal sampling rate that is better than the bus cycle time by a factor of 10 (configurable), enabling even short signals to be recorded, measured or counted exactly.



## Time stamp

### EL1252:

- 2-channel digital input 24 V DC
- exact signal acquisition for edge changes
- system accuracy < 1  $\mu$ s
- absolutely synchronised responses with EL2252

### EL2252:

- 2-channel digital output 24 V DC
- exact signal output after time allocation
- system accuracy < 1  $\mu$ s
- absolutely synchronised responses with EL1252

### EtherCAT Box EP1258:

- 8-channel digital input 24 V DC with 2-channel time stamp
- protection class IP 67

- exact signal acquisition for edge changes
- system accuracy < 1  $\mu$ s

## Fast I/O

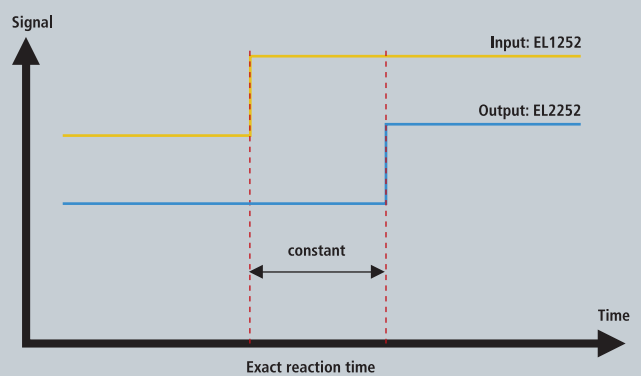
### EL1202:

- 2-channel digital input 24 V DC
- input delay  $T_{ON}/T_{OFF}$  1  $\mu$ s
- minimum response times without appreciable delay

### EL2202:

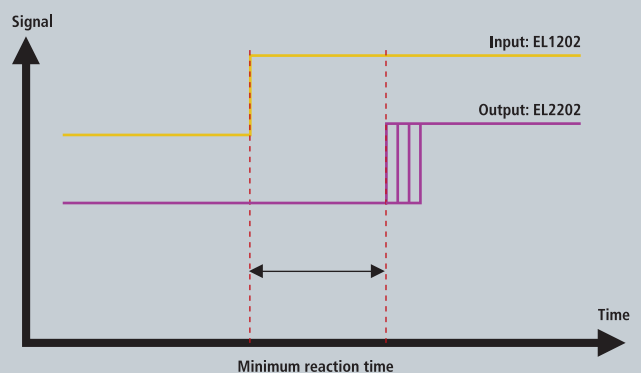
- 2-channel digital output 24 V DC
- output delay  $T_{ON}/T_{OFF}$  1  $\mu$ s

### Time stamp terminals



Synchronised responses can be realised with time stamp input and output terminals; in the past, precision of < 1  $\mu$ s was impossible with bus systems. The new XFC technology replaces hardware wiring.

### Fast I/O terminals 1 $\mu$ s $T_{ON}/T_{OFF}$



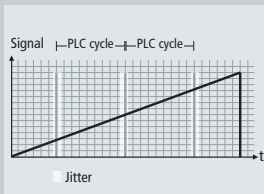
With the EL1202 and EL2202 XFC terminals, delays in the terminal hardware are reduced down to < 1  $\mu$ s and therefore become negligible. Input and output data are forwarded with maximum speed.



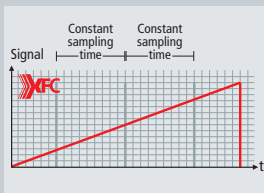
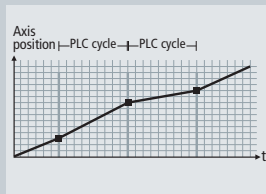
# Optimisation of standard machines with XFC

## Distributed clocks

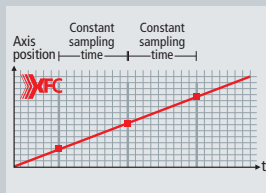
The high-precision, synchronised clocks ensure polling of the position encoder at equidistant time intervals. Jitters and signal propagation delays that lead to inconstant polling intervals are eliminated. Exact evaluation of the encoder by the control system is made possible.



Standard machine



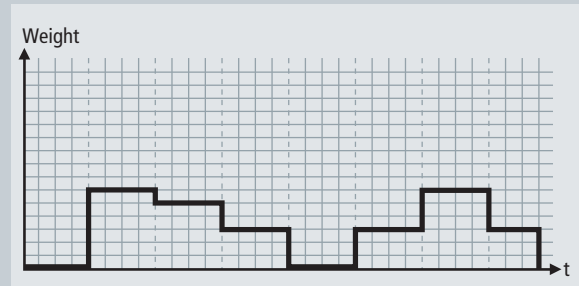
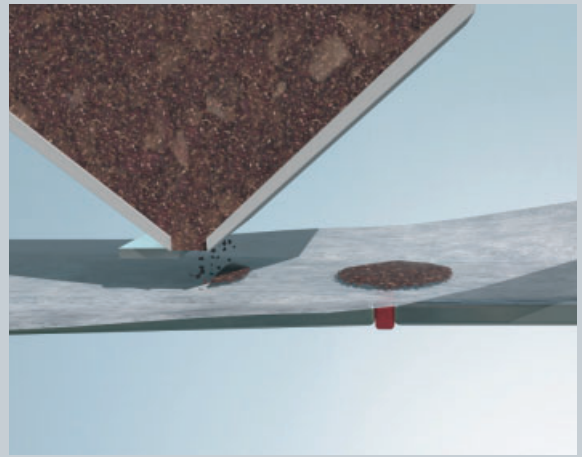
Machine with XFC technology



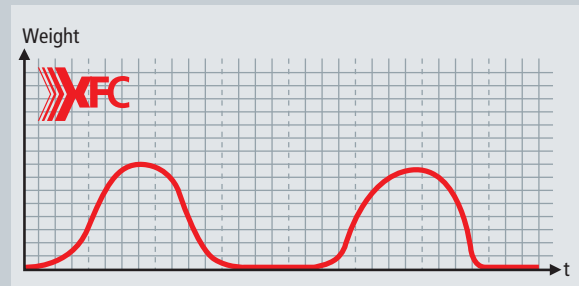
- quieter motor operation
- better synchronisation
- higher clock rate

## Oversampling

Multiple sampling of the weighing unit signal results in high temporal resolution representation and therefore more detailed information from the field, even for fast processes. Dynamic weighing can therefore be realised without subordinate intelligence in the central control system. The high computing power of the central PC enables any evaluation routines to be used.



Standard machine

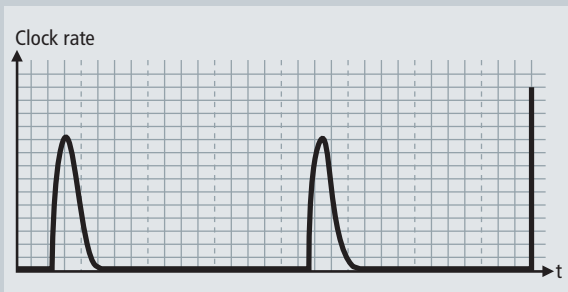
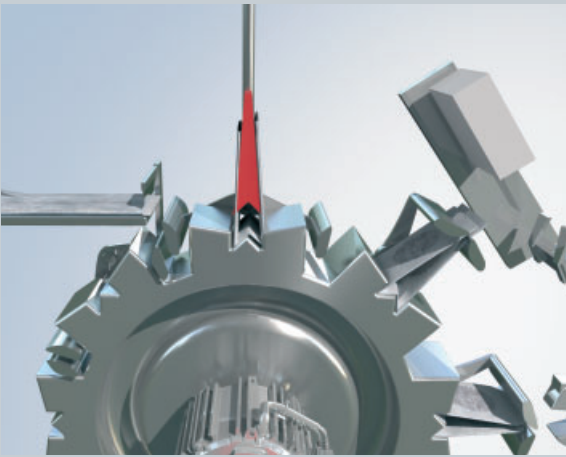


Machine with XFC technology

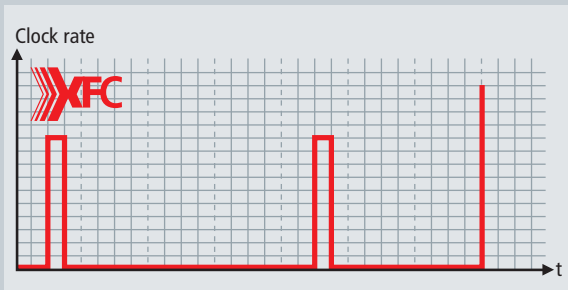
- optimised dosing
- reduced material consumption

## Fast I/O

Modern machines often operate with very high clock rates. Delays in the I/O module may limit the maximum speed of the machine. The fast I/O EtherCAT Terminals have a maximum delay of 1  $\mu$ s, that means it is practically negligible. Higher clock rates become possible, and the field can be operated "directly" at the bus.



Standard machine

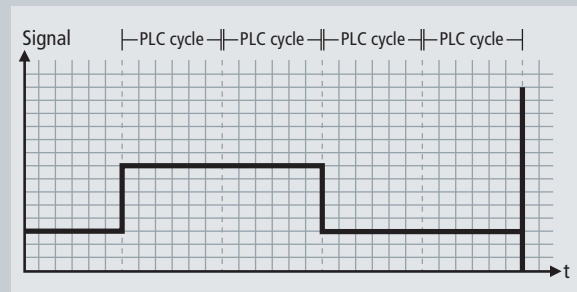
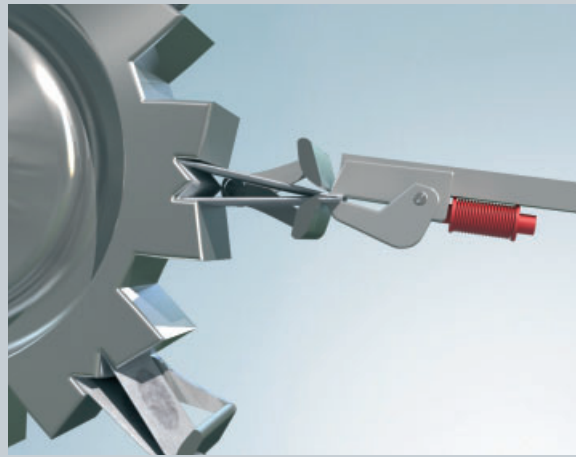


Machine with XFC technology

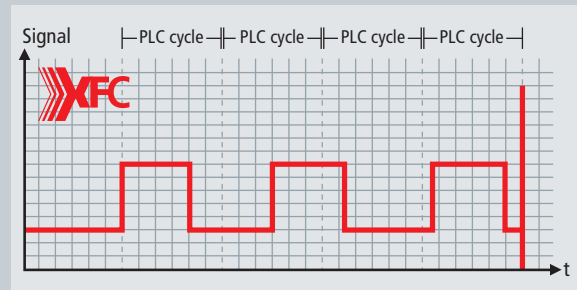
- higher productivity

## Time stamp

Many machine procedures require a response exactly at a certain position. A cyclically operating standard controller can only switch an output once, usually at the end of the cycle. The maximum speed therefore depends directly on the cycle time. Time stamp outputs enable switching at an exact position/time within a cycle. The response is precise and constant, resulting in higher clock rate, qualitative improvement and precise actions.



Standard machine



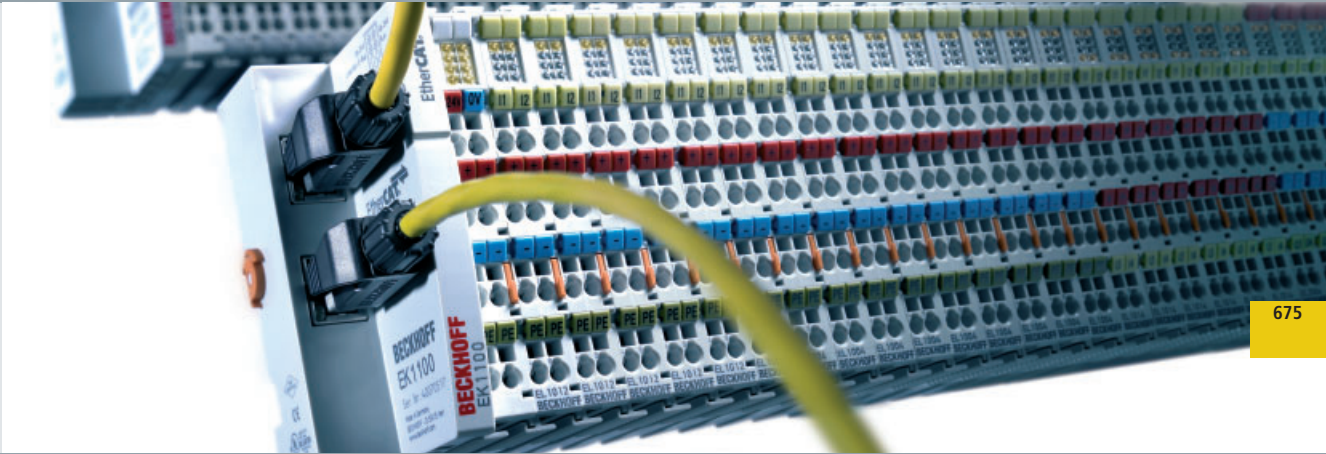
Machine with XFC technology

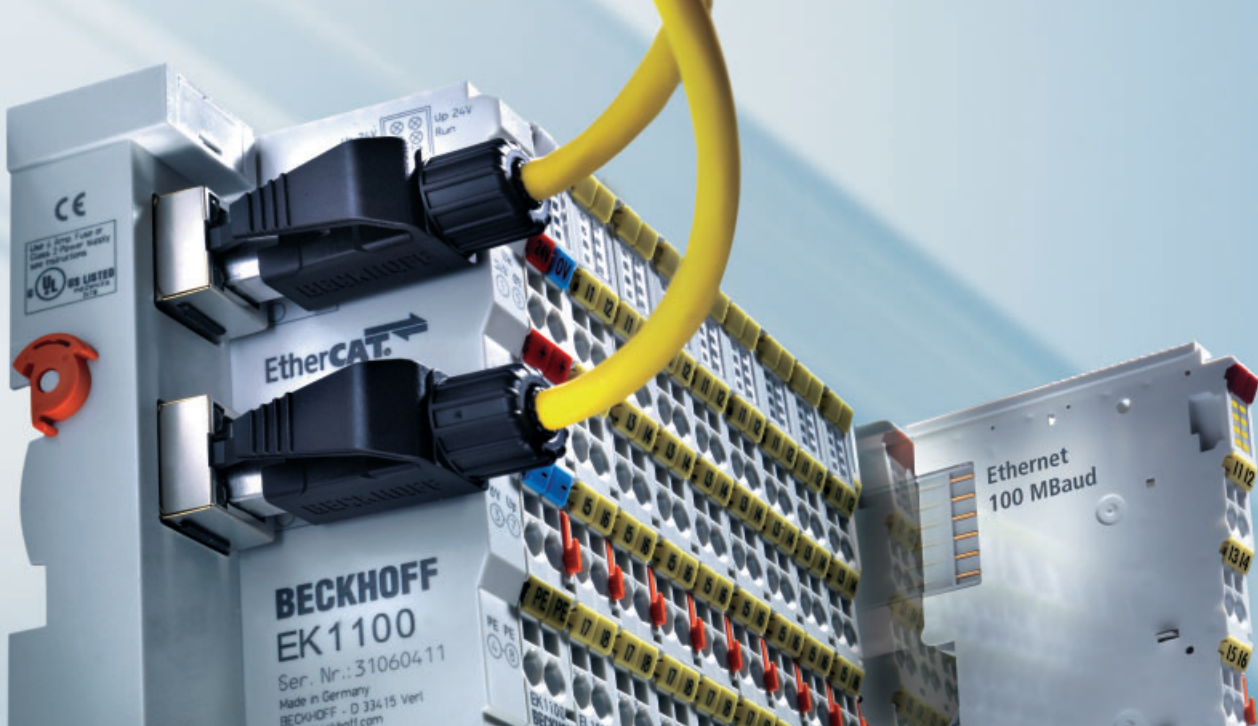
- control independent of PLC cycle
- control with nanosecond precision even for slow PLC cycles



# EtherCAT Terminals

Ultra high-speed I/O





## Beckhoff EtherCAT Terminals

In analogy to the Beckhoff Bus Terminals, the EtherCAT Terminal system is a modular I/O system consisting of electronic terminal blocks. In contrast to Bus Terminals, where the fieldbus signal is implemented within the Bus Coupler on the internal, fieldbus-independent terminal bus, the EtherCAT protocol remains fully intact down to the individual terminal. In addition to EtherCAT Terminals with E-bus connection, the proven standard Bus Terminals with K-bus connection can also be connected via the BK1120 EtherCAT Bus Coupler. This ensures compatibility and continuity with the existing system. Existing and future investments are protected.

### Structure

The robust housing, secure contacts and the solidly built electronics are prominent features of Beckhoff components. An I/O station consists of an EtherCAT Coupler and almost any number of terminals. Since up to 65,535 devices can be connected, the size of the network is almost unlimited.

The electronic terminal blocks are attached to the EtherCAT Coupler. The contacts are made as the terminal clicks into place, without any other manipulation. This means that each electronic terminal block can be individually exchanged. It can be placed on a standard DIN rail. In addition to horizontal fitting, all other fitting methods are permitted.

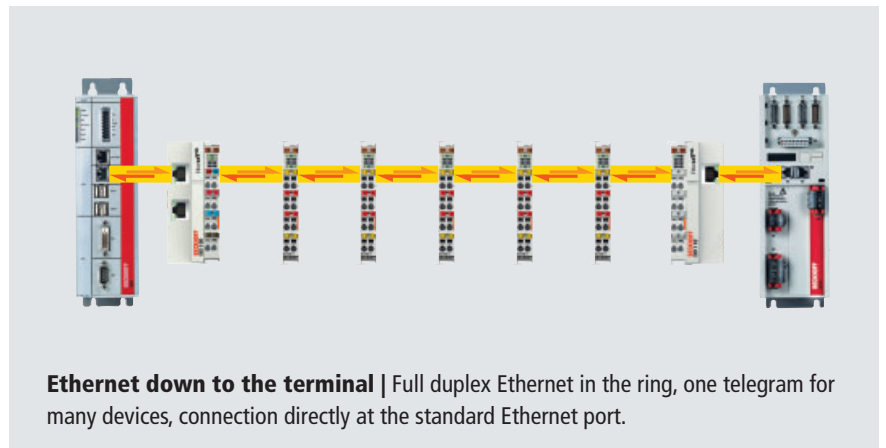
Like the Beckhoff Bus Terminals, the outer contour of the EtherCAT Terminals perfectly adapts to the dimensions of terminal boxes. A clearly arranged connection panel with LEDs for status display and push-in contact labels ensures clarity in the field. 3-wire conductors with an additional connection for a protective conductor, enable direct connection of sensors and actuators.

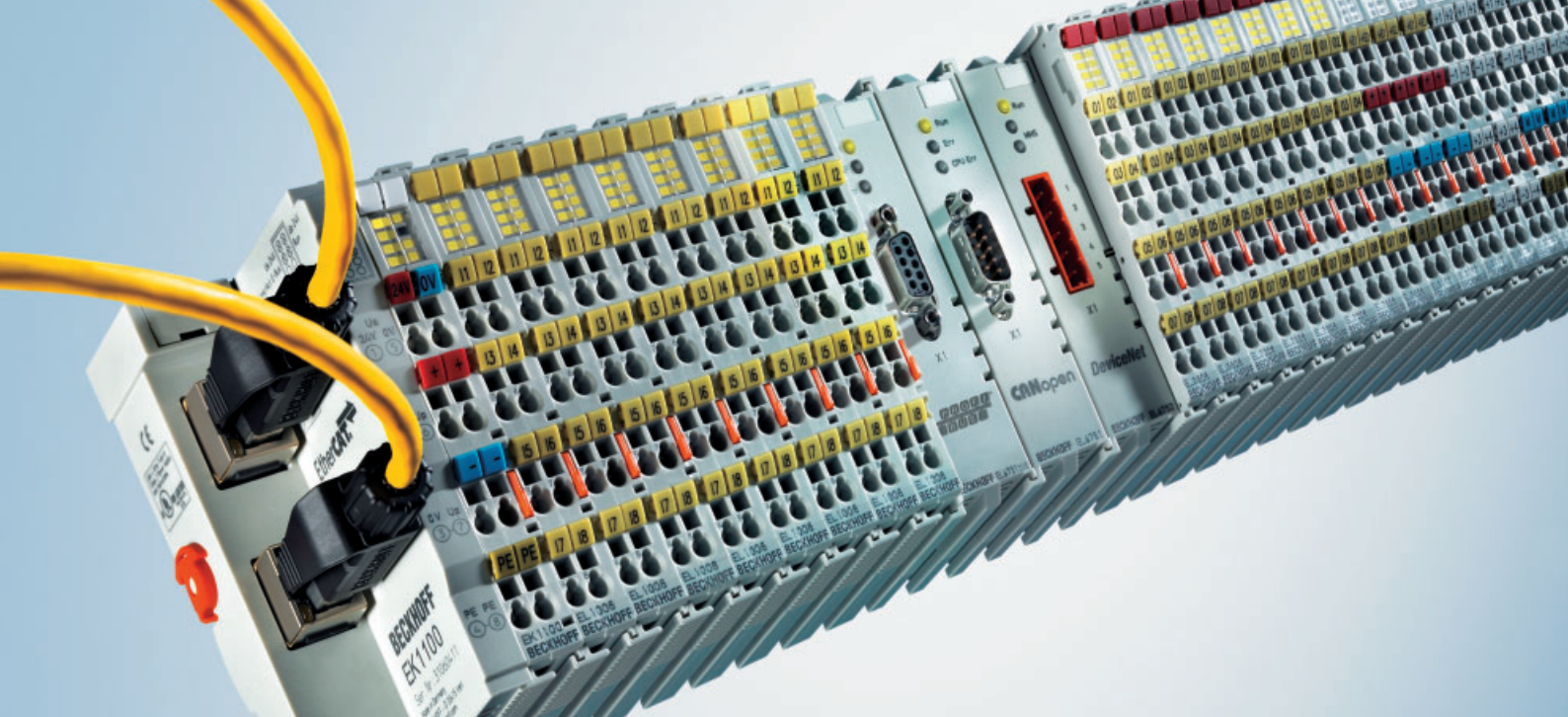
### Free mix of signals

Suitable EtherCAT Terminals are available for all common digital and analog signal types encountered in the world of automation. Fieldbus devices, e.g. for PROFIBUS, PROFINET, CANopen, DeviceNet, Interbus, IO-Link or Lightbus, are integrated via local

fieldbus master/slave terminals. Removal of the fieldbus master saves PCI slots in the PC. Any Ethernet devices can be integrated locally via switch port terminals.

The fine granularity of the EtherCAT Terminals enables bit-precise composition of the required I/O channels. The digital EtherCAT Terminals are designed as 2-, 4-, 8- or 16-channel terminals. In the 16-channel variant, digital input and output signals are arranged in an ultra-compact way within a standard terminal housing across a width of only 12 mm. The standard analog signals of  $\pm 10\text{ V}$ ,  $0 \dots 10\text{ V}$ ,  $0 \dots 20\text{ mA}$  and  $4 \dots 20\text{ mA}$  are all available as 1-, 2-, 4- and 8-channel variants within a standard housing.





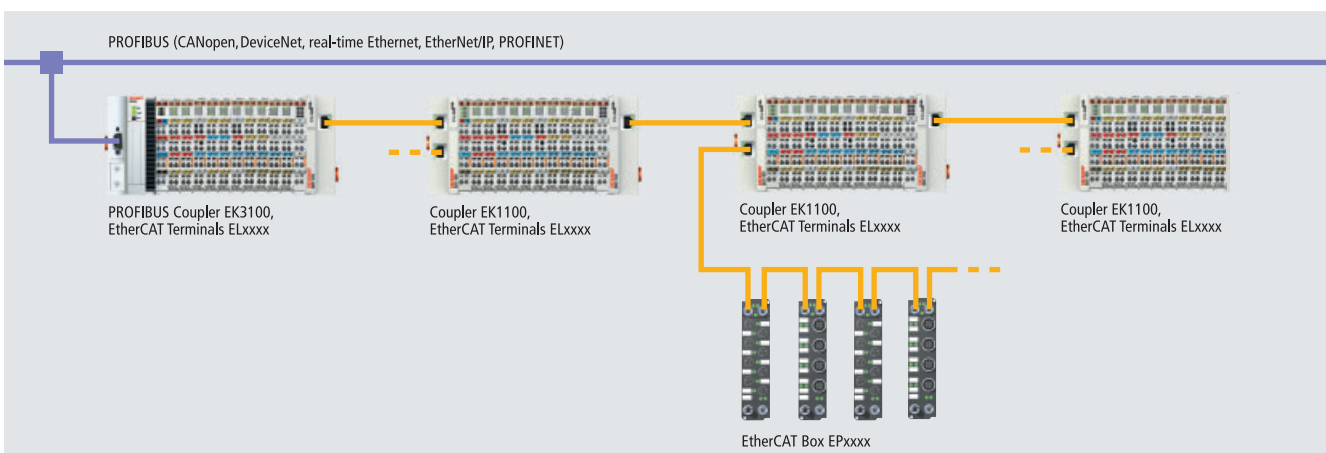
### Flexible connection system

The EtherCAT Terminal system offers different connection options for optimum adaptation to the respective application. The ELxxxx EtherCAT Terminals include electronics and connection level in a single enclosure. The ESxxxx type EtherCAT Terminals feature a pluggable connection level. The ES series Bus Terminals enable the complete wiring to be removed as a plug connector from the top of the housing for servicing.

### Bus Coupler for the EtherCAT Terminal system

The Bus Couplers from the EKxxxx series connect conventional fieldbus systems to EtherCAT. The ultra-fast, powerful I/O system with its large choice of terminals is now available for other fieldbus and Industrial Ethernet systems. EtherCAT makes a very flexible topology configuration possible. Thanks to the Ethernet physics, long distances can also be bridged without the bus speed being affected. When changing to the

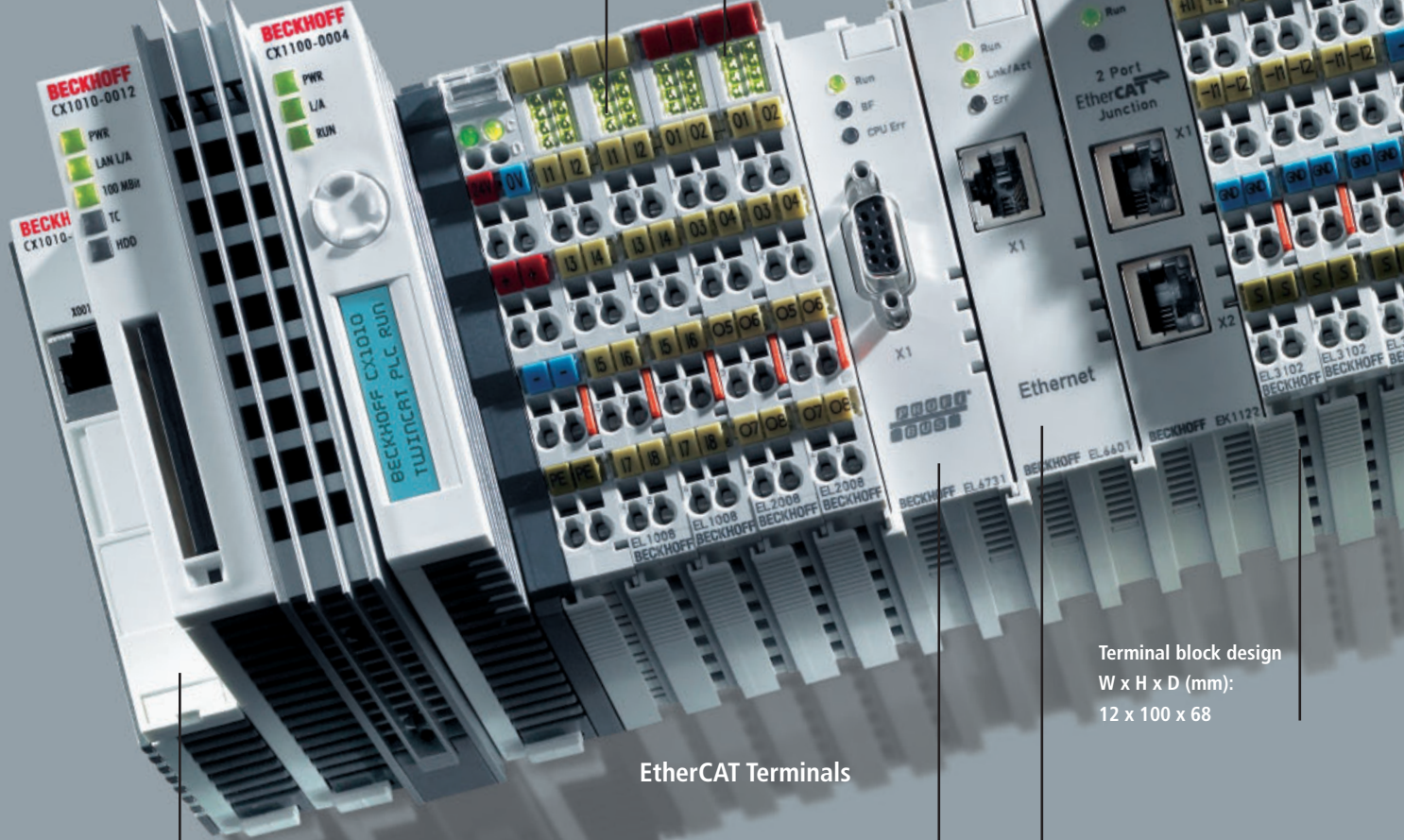
field level – without a control cabinet – the IP 67 EtherCAT Box modules (EPxxxx) can also be connected to the EKxxxx. The EKxxxx Bus Couplers are fieldbus slaves and contain an EtherCAT master for the EtherCAT Terminals. The EKxxxx is integrated in exactly the same way as the Bus Couplers from the BKxxxx series via the corresponding fieldbus system configuration tools and the associated configuration files, such as GSD, ESD or GSDML. The TwinCAT-programmable variant is the CX8000 Embedded PC series.



# EtherCAT Terminal features

EtherCAT down to the terminal: the EtherCAT protocol is maintained down to each device; no sub bus is required.

Status LEDs for secure commissioning



Embedded PC with direct E-bus interface

## EtherCAT Terminals

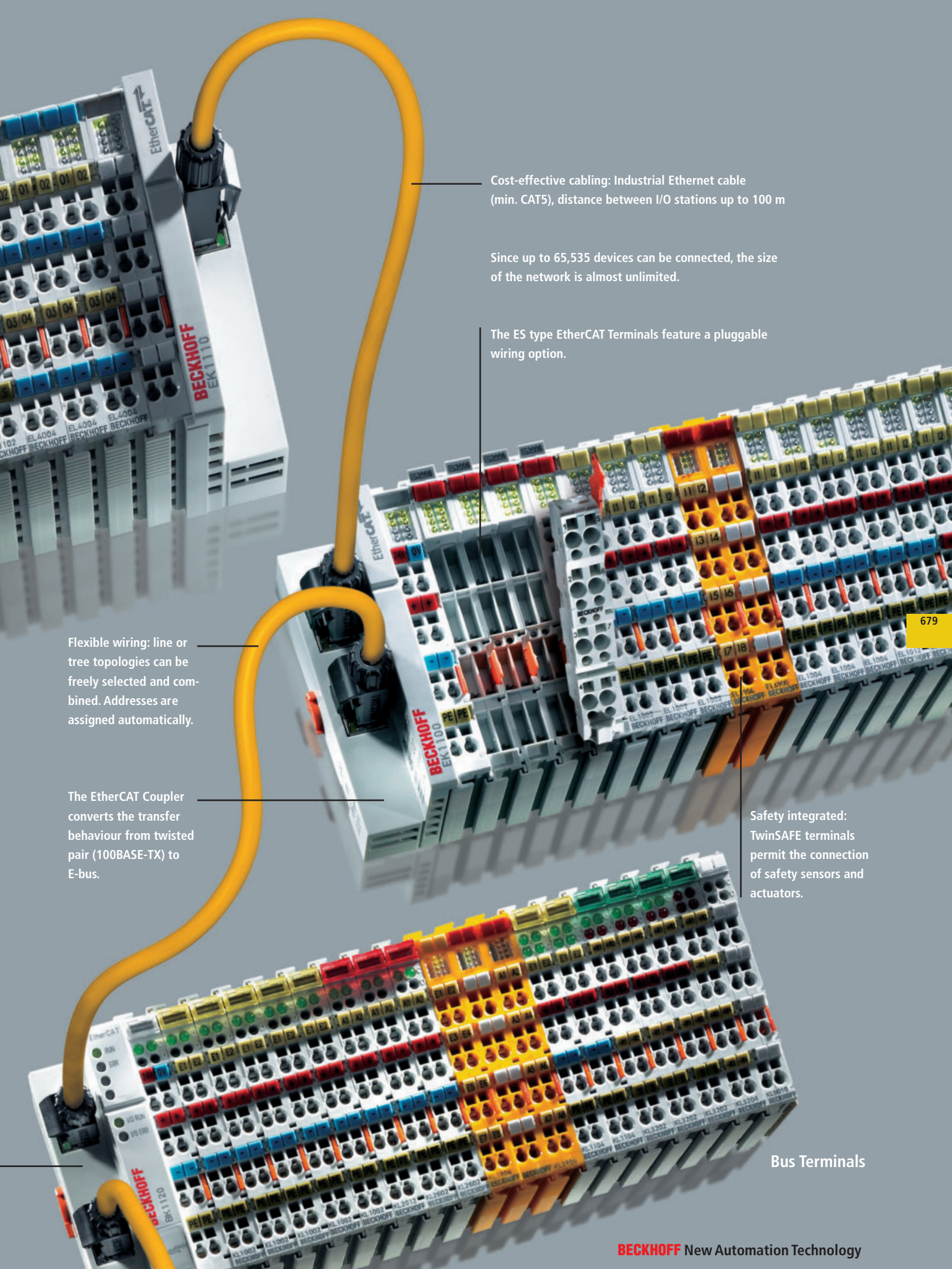
Protection of investment: fieldbus devices are integrated via decentralised fieldbus master/slave terminals.

Terminal block design  
W x H x D (mm):  
12 x 100 x 68

Any Ethernet device can be integrated locally via switch port terminals.

Compatibility and integration: in addition to EtherCAT Terminals, the tried and tested Bus Terminals can also be connected via the BK1120 EtherCAT Bus Coupler.





Cost-effective cabling: Industrial Ethernet cable (min. CAT5), distance between I/O stations up to 100 m

Since up to 65,535 devices can be connected, the size of the network is almost unlimited.

The ES type EtherCAT Terminals feature a pluggable wiring option.

Flexible wiring: line or tree topologies can be freely selected and combined. Addresses are assigned automatically.

The EtherCAT Coupler converts the transfer behaviour from twisted pair (100BASE-TX) to E-bus.

Safety integrated: TwinSAFE terminals permit the connection of safety sensors and actuators.

Bus Terminals



# Beckhoff EtherCAT Terminals



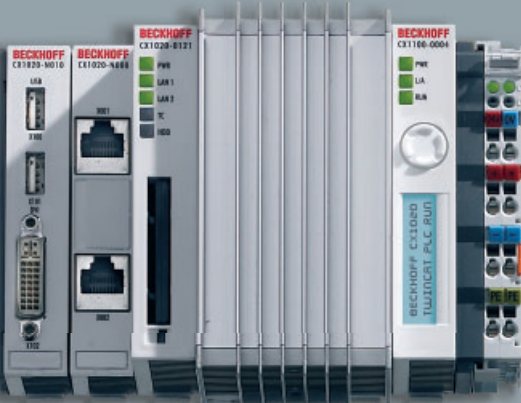
EK EtherCAT Coupler series



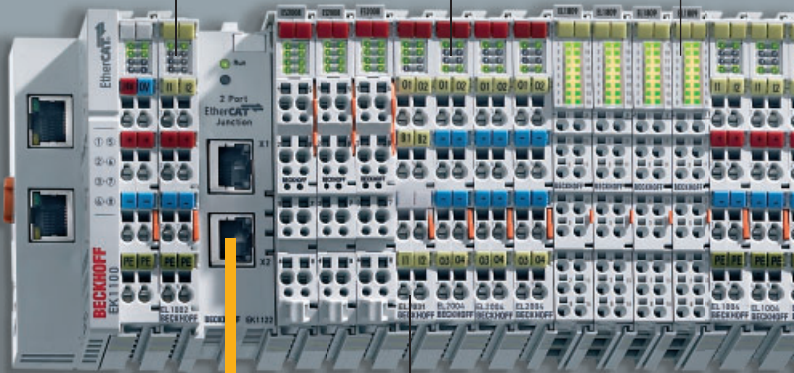
Bus Coupler, e.g. PROFIBUS, PROFINET, for E-bus terminals



CX8000 Embedded PC series with integrated fieldbus slave



Embedded PC series CX for PLC and Motion Control applications



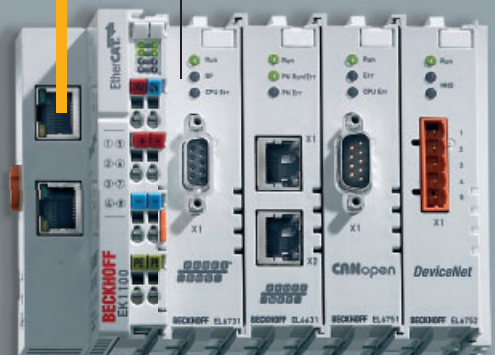
EtherCAT Terminals in 1-, 2-, 4-, 8- and 16-channel modularity with combinations of any desired signal type

Free mix of signals: more than 200 different EtherCAT Terminals enable connection of all common sensors and actuators.

The EtherCAT Terminals with 16 connection points offer high packing density on 12 mm.

EtherCAT motion terminals for stepper motors, DC motors or hydraulic valves

Optional fieldbus integration via decentralised fieldbus master/slave terminals

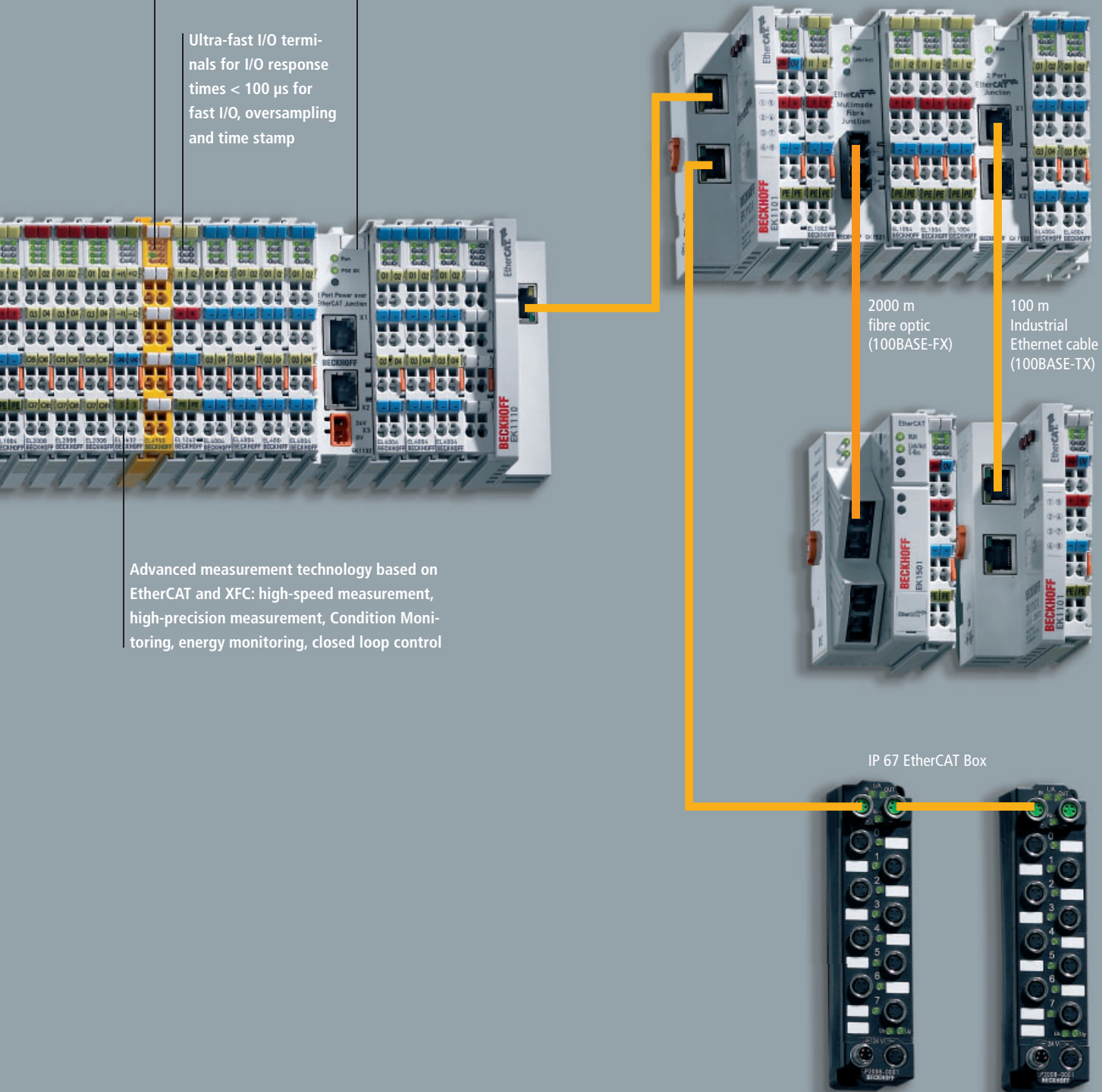


Compact Safety PLC for TwinSAFE for up to 128 safety-relevant bus devices

Ultra-fast I/O terminals for I/O response times < 100 µs for fast I/O, oversampling and time stamp

Power over EtherCAT junction

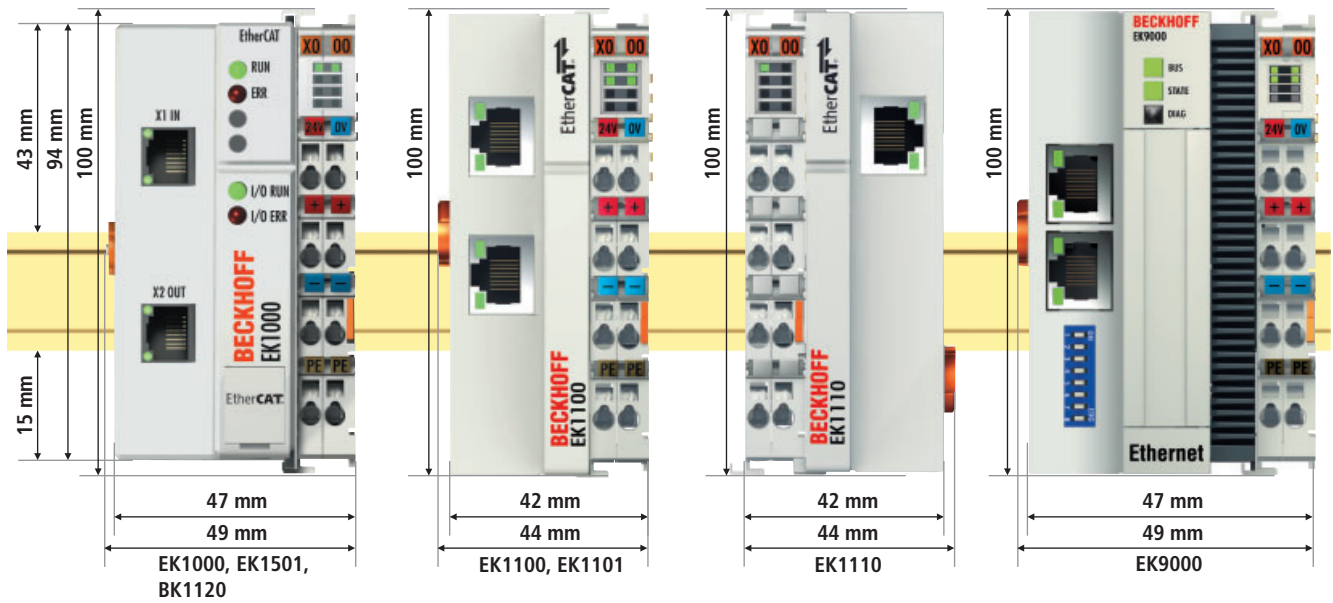
Advanced measurement technology based on EtherCAT and XFC: high-speed measurement, high-precision measurement, Condition Monitoring, energy monitoring, closed loop control



2000 m fibre optic (100BASE-FX)

100 m Industrial Ethernet cable (100BASE-TX)

IP 67 EtherCAT Box



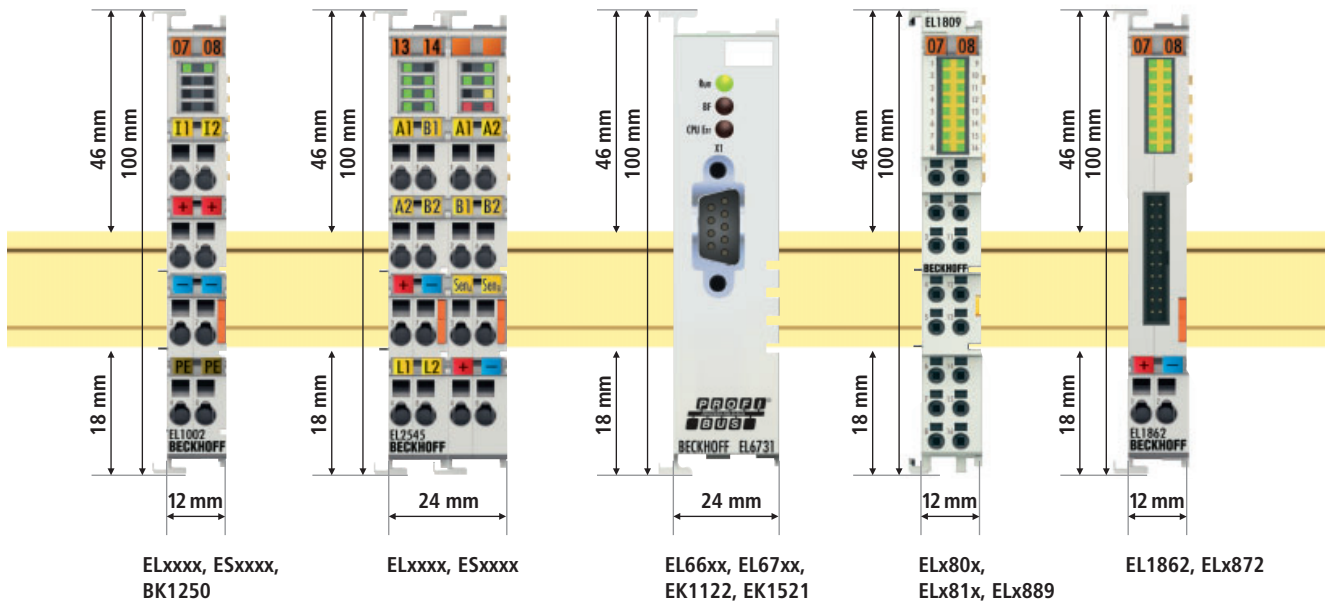
## Technical data – EtherCAT Coupler housing

The EtherCAT Coupler electronics can be mounted in a variety of housings. A housing has three power contacts, which, if the application requires, automatically implement a continued connection, carrying the potential of the power circuit to the next EtherCAT Terminal. The supply voltage that is connected to the coupler spring-loaded terminals is 24 V DC. If a different voltage is required for the power contacts, the appropriate power feed terminal must be inserted after the coupler.

Mechanical data	EK1000, EK1501, BK1120	EK1100, EK1101, EK1110	EK3100, EK5x00, EK9xxx
Design form	compact terminal housing with signal LED		
Material	polycarbonate		
Dimensions (W x H x D)	49 mm x 100 mm x 68 mm	44 mm x 100 mm x 68 mm	65 mm x 100 mm x 80 mm
Installation	on 35 mm C-rail, conforming to EN 50022 with lock		
Side by side mounting by means of	double slot and key connection		
Marking	standard terminal block marking and plain language slides (8 mm x 47 mm)		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		

Connection	EK1000, EK1501, BK1120, EK1100, EK1101, EK1110, EK3100, EK5x00, EK9xxx
Wiring	Cage Clamp® spring-loaded technique
Connection cross-section	0.08...2.5 mm <sup>2</sup> , AWG 28-14, stranded wire, solid wire
Stripping length	8...9 mm
Fieldbus connection	depending on fieldbus
Power contacts	3 spring contacts
Current load	I <sub>max</sub> : 10 A (125 A short-circuit)
Nominal voltage	24 V DC



## Technical data – EtherCAT Terminal housing

The EtherCAT Terminals have different housings. They are available with up to three power contacts and can have a variety of voltages. Care should be taken to ensure that a change in voltage always starts with a power feed terminal.

Mechanical data	ELxxxx, BK1250	EL66xx, EL67xx, EK1122, EK1521	ESxxxx	ELx80x, ELx81x, ELx889	EL1862, ELx872
Design form	compact terminal housing with signal LED	compact terminal housing with signal LED	terminal housing with pluggable wiring level	compact terminal housing with signal LED	compact terminal housing with signal LED
Material	polycarbonate				
Dimensions (W x H x D)	12/24 mm x 100 mm x 68 mm	24 mm x 100 mm x 68 mm	12/24 mm x 100 mm x 71 mm	12 mm x 100 mm x 68 mm	12 mm x 100 mm x 68 mm
Installation	on 35 mm C-rail, conforming to EN 50022 with lock				
Side by side mounting by means of	double slot and key connection				
Marking	standard terminal block marking	standard terminal block marking	standard terminal block marking	–	standard terminal block marking
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				

Connection	ELxxxx, BK1250	EL66xx, EL67xx, EK1122, EK1521	ESxxxx	ELx80x, ELx81x, ELx889	EL1862, ELx872
Wiring	Cage Clamp® spring-loaded technique	specific push-in connection	Cage Clamp® spring-loaded technique	direct plug-in technique	flat-ribbon cable connection
Connection cross-section	s, st*: 0.08...2.5 mm <sup>2</sup> , AWG 28-14	–	s, st*: 0.08...1.5 mm <sup>2</sup>	s*: 0.08...1.5 mm <sup>2</sup> ; st: 0.25...1.5 mm <sup>2</sup> ; f: 0.14...0.75 mm <sup>2</sup>	common flat-ribbon cables
Stripping length	8...9 mm	–	9...10 mm	8...9 mm	–
Fieldbus connection	depending on fieldbus				
Power contacts	3 spring contacts				
Current load	I <sub>MAX</sub> : 10 A (125 A short-circuit)				
Nominal voltage	24 V DC				

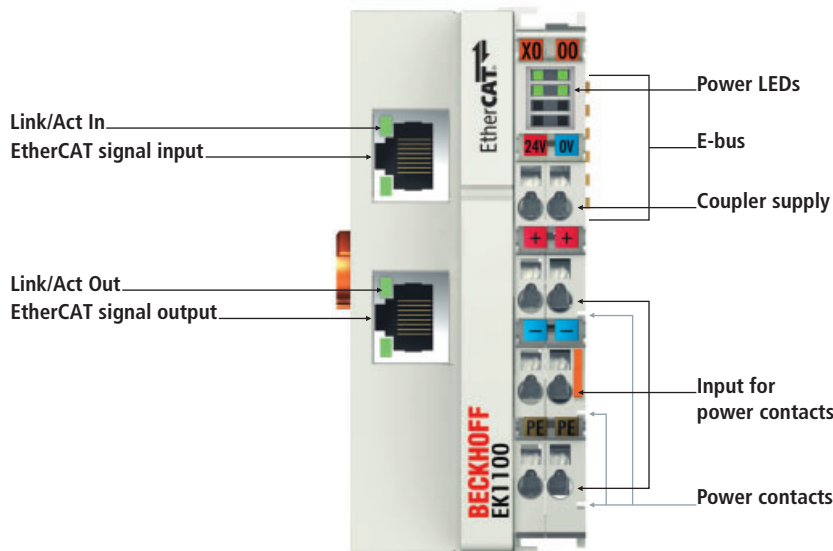
\*s: solid wire; st: stranded wire; f: ferrule



# EtherCAT Couplers

Ultra high-speed I/O





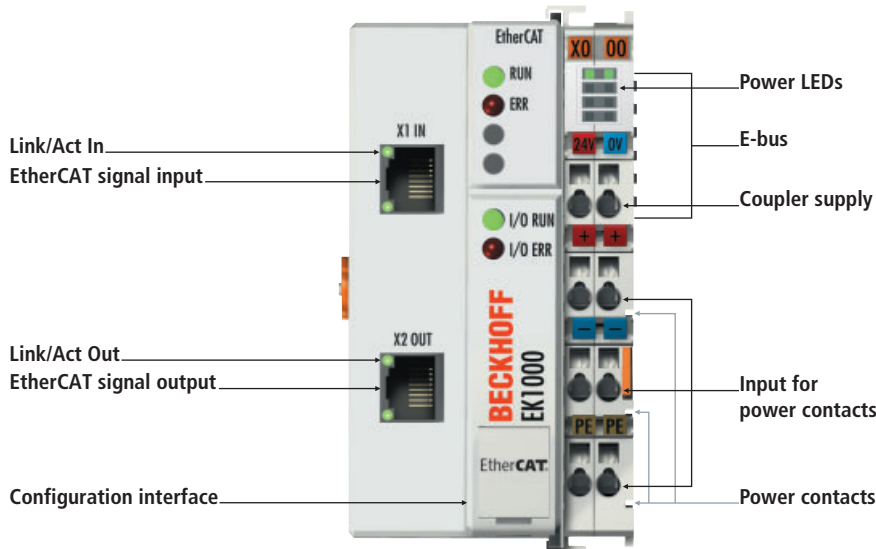
## EK1100 | EtherCAT Coupler

The EK1100 coupler connects EtherCAT with the EtherCAT Terminals (ELxxxx). One station consists of an EK1100 coupler, any number of EtherCAT Terminals and a bus end terminal. The coupler converts the passing telegrams from Ethernet 100BASE-TX to E-bus signal representation.

The coupler is connected to the network via the upper Ethernet interface. The lower RJ 45 socket may be used to connect further EtherCAT devices in the same strand. In the EtherCAT network, the EK1100 coupler can be installed anywhere in the Ethernet signal transfer section (100BASE-TX) – except directly at the switch. The couplers EK1000 (for E-bus components) or BK9000 (for K-bus components) are suitable for installation at the switch.

Technical data	EK1100
Task within EtherCAT system	coupling of EtherCAT Terminals (ELxxxx) to 100BASE-TX EtherCAT networks
Number of EtherCAT Terminals	up to 65,535
Type/number of peripheral signals	unlimited
Data transfer medium	Ethernet/EtherCAT CAT5 cable
Distance between stations	100 m (100BASE-TX)
Protocol	EtherCAT
Delay	approx. 1 $\mu$ s
Data transfer rates	100 Mbaud
Configuration	not required
Bus interface	2 x RJ 45
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total E-bus current)/4
Current consumption E-bus	up to 2 A
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/Ethernet)
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EK1100">www.beckhoff.com/EK1100</a>

Accessories	
Cordsets	cordsets and connectors



## EK1000 | EtherCAT Coupler for operation at the switch

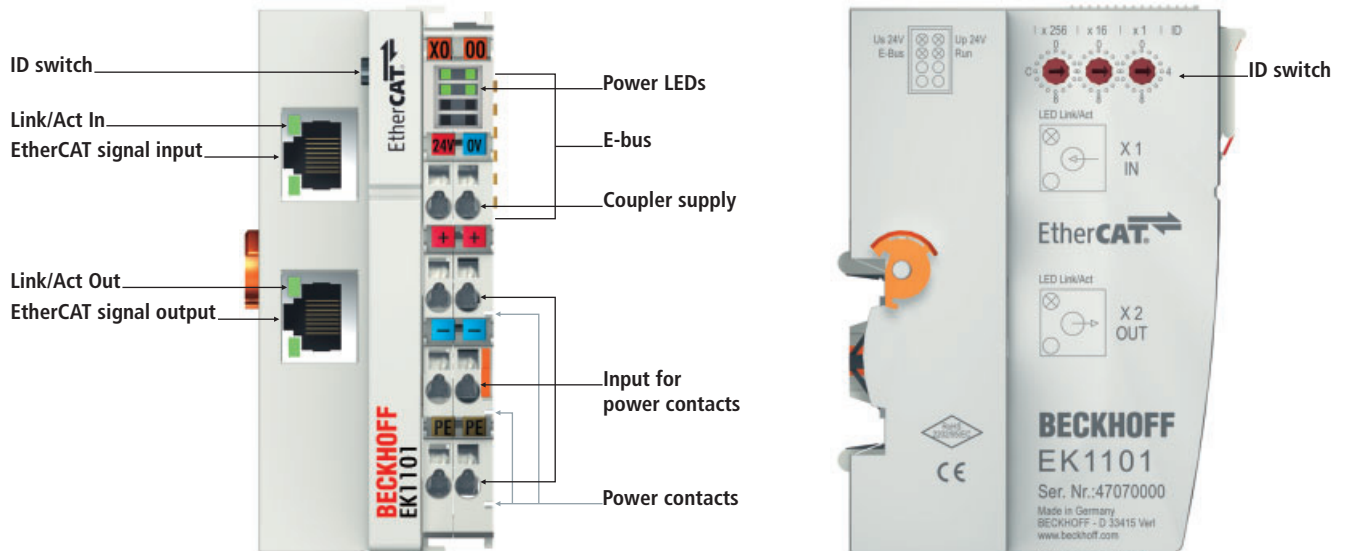
The EK1000 coupler connects EtherCAT with the EtherCAT Terminals (ELxxxx). One station consists of an EK1000 Coupler, any number of EtherCAT Terminals and a bus end terminal. The Coupler converts the passing telegrams from Ethernet 100BASE-TX to E-bus signal representation. Additionally, it is able to process the EtherCAT UDP protocol in passing. The Coupler is connected to the network via the upper Ethernet interface. The lower RJ 45 socket may be used to connect further EtherCAT devices in the same strand. In the EtherCAT network, the EK1000 Coupler is installed directly at the switch. The couplers EK1100 (for E-bus components) or BK1120 (for K-bus components) are suitable for installation at other locations within the Ethernet signal transfer (100BASE-TX).

Technical data	EK1000
Task within EtherCAT system	coupling of EtherCAT Terminals (ELxxxx, except fieldbus terminals) to 100BASE-TX Ethernet networks; operation at the switch
Number of EtherCAT Terminals	up to 65,535
Type/number of peripheral signals	unlimited
Data transfer medium	Ethernet/EtherCAT CAT5 cable
Distance between stations	100 m (100BASE-TX)
Protocol	EtherCAT, EtherCAT UDP
Delay	approx. 1 $\mu$ s
Data transfer rates	100 Mbaud
Configuration possibility	KS2000 software or via EtherCAT (ADS)
Bus interface	2 x RJ 45
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total E-bus current)/4
Current consumption E-bus	up to 2 A
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/Ethernet)
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EK1000">www.beckhoff.com/EK1000</a>

Accessories	
Cordsets	cordsets and connectors

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EK1000](http://www.beckhoff.com/EK1000)





## EK1101 | EtherCAT Coupler with ID switch

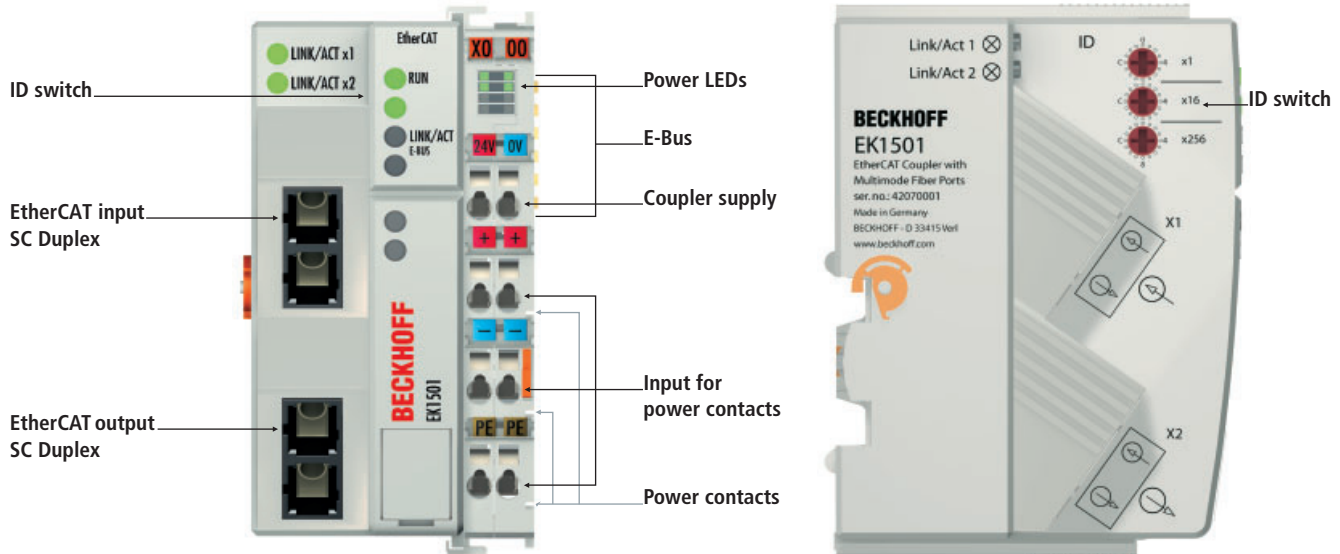
The EK1101 coupler connects EtherCAT with the EtherCAT Terminals (ELxxxx). A station consists of an EK1101 coupler, any number of EtherCAT Terminals, an EL9011 bus end cap or an EK1110 EtherCAT extension. The coupler converts the passing telegrams from Ethernet 100BASE-TX to E-bus signal representation.

The EK1101 has three hexadecimal ID switches for assigning an ID to a group of EtherCAT components. This group can then be located at any position within the EtherCAT network. Variable topologies are therefore easily implementable.

Technical data	EK1101
Task within EtherCAT system	coupling of EtherCAT Terminals (ELxxxx) to 100BASE-TX EtherCAT networks
Number of EtherCAT Terminals	up to 65,535
Type/number of peripheral signals	unlimited
Number of configurable IDs	4,000
Data transfer medium	Ethernet/EtherCAT cable (min. CAT5)
Distance between stations	100 m (100BASE-TX)
Protocol	EtherCAT
Delay	approx. 1 $\mu$ s
Data transfer rates	100 Mbaud
Configuration	not required
Bus interface	2 x RJ 45
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total E-bus current)/4
Current consumption E-bus	up to 2 A
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/Ethernet)
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EK1101">www.beckhoff.com/EK1101</a>

### Accessories

Cordsets	cordsets and connectors
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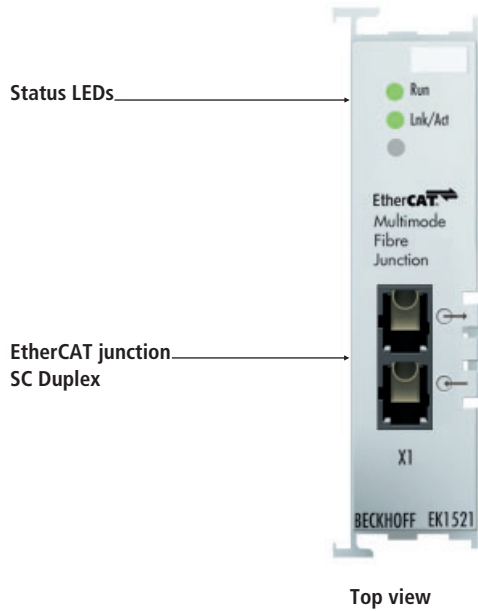
## EK1501 | EtherCAT Coupler with ID switch, multimode fibre optic

The EK1501 coupler connects EtherCAT with the EtherCAT Terminals (ELxxxx). A station consists of an EK1501 coupler, any number of EtherCAT Terminals, an EL9011 bus end cap or an EK1110 EtherCAT extension. The coupler converts the passing telegrams from Ethernet 100BASE-FX to E-bus signal representation. The multimode glass fibre connection enables distances of up to 2 km between two couplers.

The EK1501 has three hexadecimal ID switches for assigning an ID to a group of EtherCAT components. This group can then be located at any position within the EtherCAT network. Variable topologies are therefore easily implementable.

Technical data	EK1501
Task within EtherCAT system	coupling of EtherCAT Terminals (ELxxxx) to 100BASE-FX EtherCAT networks
Number of EtherCAT Terminals	up to 65,535
Type/number of peripheral signals	unlimited
Number of configurable IDs	4,000
Data transfer medium	multimode glass fibre (MM)
Distance between stations	2,000 m
Protocol	EtherCAT
Delay	approx. 1 µs
Data transfer rates	100 Mbaud
Configuration	not required
Bus interface	2 x SC Duplex
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total E-bus current)/4
Current consumption E-bus	up to 2 A
Power contacts	24 V DC max./10 A max.
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EK1501">www.beckhoff.com/EK1501</a>

Accessories	
Cordsets	cordsets and connectors

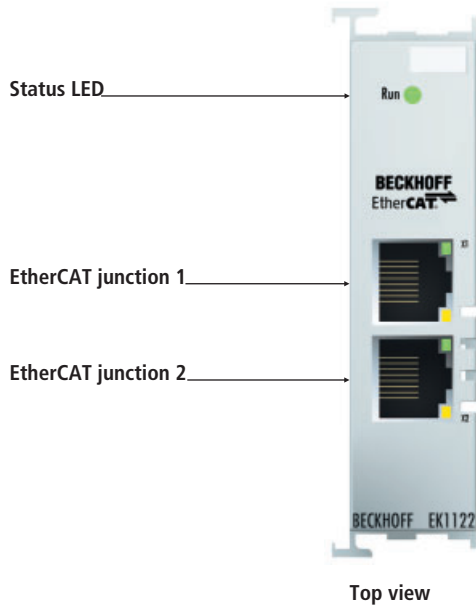


## EK1521 | 1-port EtherCAT multimode fibre optic junction

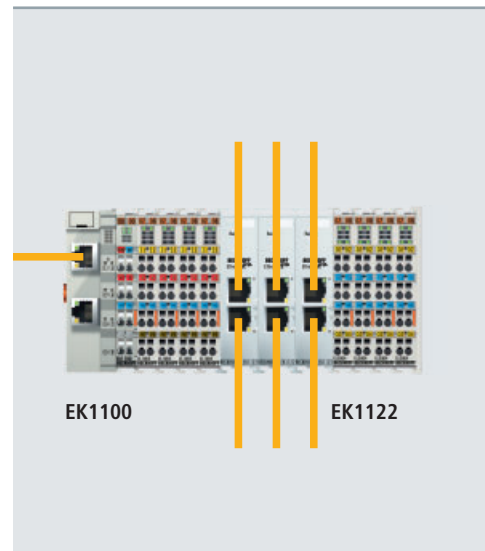
In conjunction with an EK1100 EtherCAT Coupler, the 1-port EtherCAT multimode fibre optic junction enables conversion from 100BASE-TX to 100BASE-FX physics (glass fibre). In this way, distances of up to 2 km can be bridged in conjunction with the EK1501 EtherCAT Coupler for multimode fibre optics. Even cable redundant systems with fibre optic can be realised using the 1-port EtherCAT multimode fibre optic junction. The run LED shows the status of the EK1521.

Technical data	EK1521
Task within EtherCAT system	coupling of EtherCAT junctions
Data transfer medium	multimode glass fibre (MM)
Distance between stations	2,000 m (100BASE-FX) multimode glass fibre
Protocol	EtherCAT
Data transfer rates	100 Mbaud
Configuration	not required
Bus interface	1 x SC Duplex plug
Power supply	from E-bus
Current consumption	typ. 400 mA
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EK1521">www.beckhoff.com/EK1521</a>

Accessories	
Cordsets	cordsets and connectors



Top view

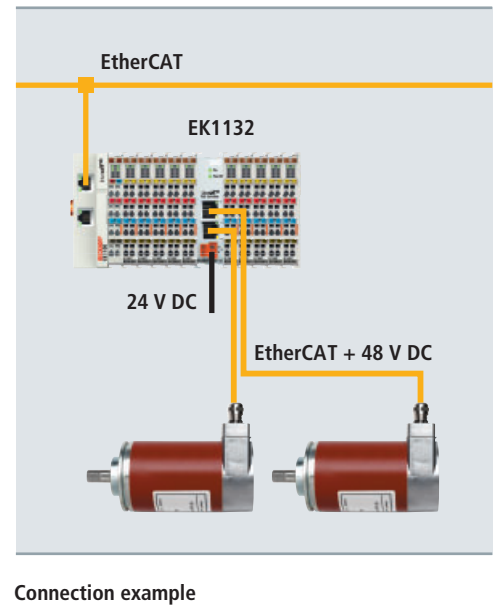
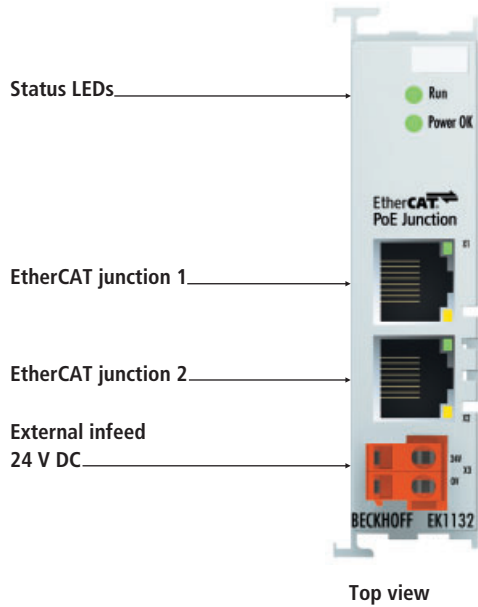


Connection example

## EK1122 | 2-port EtherCAT junction

The 2-port EtherCAT junction enables configuration of EtherCAT star topologies. A modular EtherCAT star can be realised by using several EK1122 units in a station. Individual devices or complete EtherCAT strands can be connected at the junction ports. The EtherCAT junctions are connected via RJ 45 sockets with direct display of link and activity status. The Run LED indicates the status of the EK1122. Through TwinCAT and other suitable EtherCAT masters the EK1122 also supports coupling and uncoupling of EtherCAT strands during operation (Hot Connect).

Technical data	EK1122
Task within EtherCAT system	coupling of EtherCAT junctions
Data transfer medium	Ethernet/EtherCAT cable (min. CAT5)
Distance between stations	100 m (100BASE-TX)
Protocol	EtherCAT
Data transfer rates	100 Mbaud
Configuration	not required
Bus interface	2 x RJ 45
Power supply	from E-bus
Current consumption	typ. 220 mA
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EK1122">www.beckhoff.com/EK1122</a>
Accessories	
Cordsets	cordsets and connectors



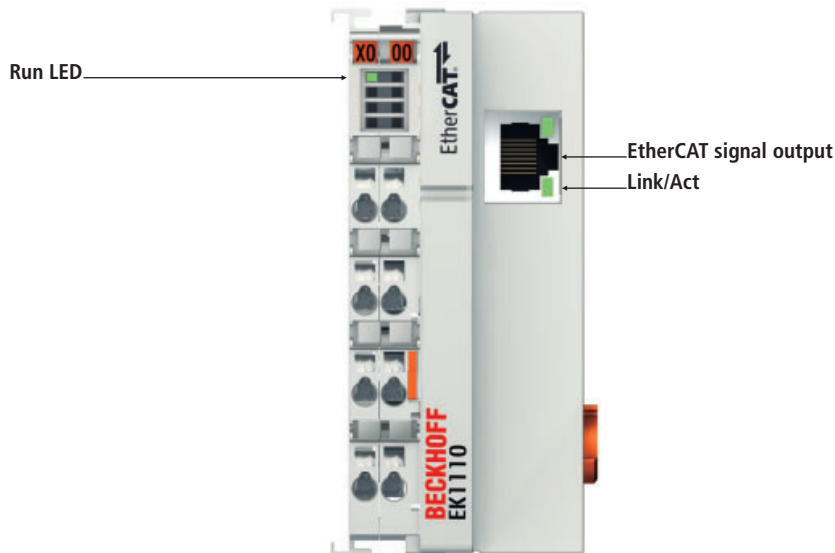
## EK1132 | 2-port Power over EtherCAT junction

The EK1132 EtherCAT junction is based on IEEE standard 802.3af and supports power sourcing equipment (PSE), in order to ensure the supply of connected consumers (power devices, PD) via the four-wire standard EtherCAT/Ethernet cable. The PSE-PD supply voltage of 48 V is generated in the junction from the 24 V voltage used as industry standard. The maximum current input of the terminal devices is 350 mA. The signal and energy transfer takes place on the same wires, so that four-wire cables can be used. The Power over EtherCAT sensors are connected via a 4-pin connector, e.g. M12. The EK1132 uses the resistive power discovery procedure to determine whether the connected EtherCAT device supports Power over EtherCAT and to which performance class (as defined in the standard) it belongs. If Power over EtherCAT is supported, the supply is enabled. An intelligent power distribution system detects which consumer belongs to which performance class and distributes the total available power (15.4 W) to the connected devices accordingly. Like the 2-port EK1122 EtherCAT junction, the EK1132 also enables configuration of EtherCAT star topologies. Through TwinCAT and other suitable EtherCAT masters the EK1132 also supports coupling and uncoupling of EtherCAT devices during operation (Hot Connect).

Technical data	EK1132
Task within EtherCAT system	coupling of EtherCAT junctions incl. power supply
Combined power	15.4 W
Data transfer medium	Ethernet/EtherCAT cable (min. CAT5)
Distance between stations	100 m (100BASE-TX)
Protocol	EtherCAT
Data transfer rates	100 Mbaud
Configuration	not required
Bus interface	2 x RJ 45
Power supply	from E-bus and via external power supply
Current consumption E-bus	220 mA
Current consumption 24 V DC	700 mA at max. load
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EK1132">www.beckhoff.com/EK1132</a>

Accessories	
Cordsets	cordsets and connectors

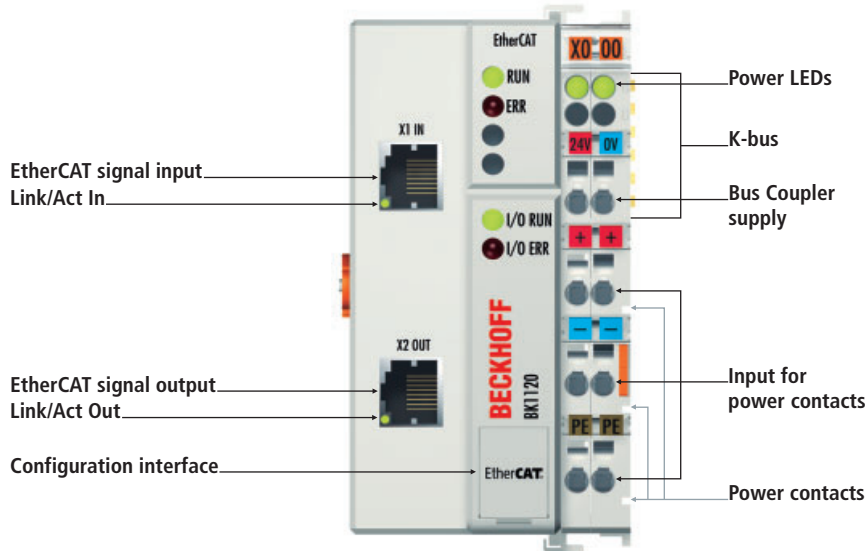
**i** For availability status see Beckhoff website at: [www.beckhoff.com/EK1132](http://www.beckhoff.com/EK1132)



## EK1110 | EtherCAT extension

Like the E-bus end terminal, the EK1110 EtherCAT extension is connected to the end of the EtherCAT Terminal block. The terminal offers the option of connecting an Ethernet cable with RJ 45 connector, thereby extending the EtherCAT strand electrically isolated by up to 100 m. In the EK1110 terminal, the E-bus signals are converted on the fly to 100BASE-TX Ethernet signal representation. Power supply to the EK1110 electronics is via the E-bus. No parameterisation or configuration tasks are required.

Technical data	EK1110
Task within EtherCAT system	conversion of the E-bus signals to 100BASE-TX Ethernet for extension of the EtherCAT network
Data transfer medium	Ethernet/EtherCAT CAT5 cable
Distance between stations	100 m (100BASE-TX)
Protocol	any EtherCAT protocol
Delay	approx. 1 $\mu$ s
Data transfer rates	100 Mbaud
Configuration	not required
Bus interface	1 x RJ 45
Power supply	from E-bus
Current consumption E-bus	approx. 125 mA
Electrical isolation	500 V <sub>rms</sub> (supply voltage/Ethernet)
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EK1110">www.beckhoff.com/EK1110</a>
Accessories	
Cordsets	cordsets and connectors



## BK1120 | EtherCAT Coupler for standard Bus Terminals

The BK1120 Bus Coupler connects EtherCAT with the K-bus components (KLxxxx) from the proven Beckhoff Bus Terminals range. One station consists of a BK1120 Bus Coupler, any number of terminals (up to 64; up to 255 with K-bus extension) and a bus end terminal. The Bus Coupler recognises the connected terminals and automatically allocates them into the EtherCAT process image. The Bus Coupler is connected to the network via the upper Ethernet interface. The lower RJ 45 socket may be used to connect further EtherCAT devices in the same strand. In the EtherCAT network, the BK1120 Bus Coupler can be installed anywhere in the Ethernet signal transfer section (100BASE-TX) – except directly at the switch. The couplers BK9000 (for K-bus components) or EK1000 (for E-bus components) are suitable for installation at the switch.

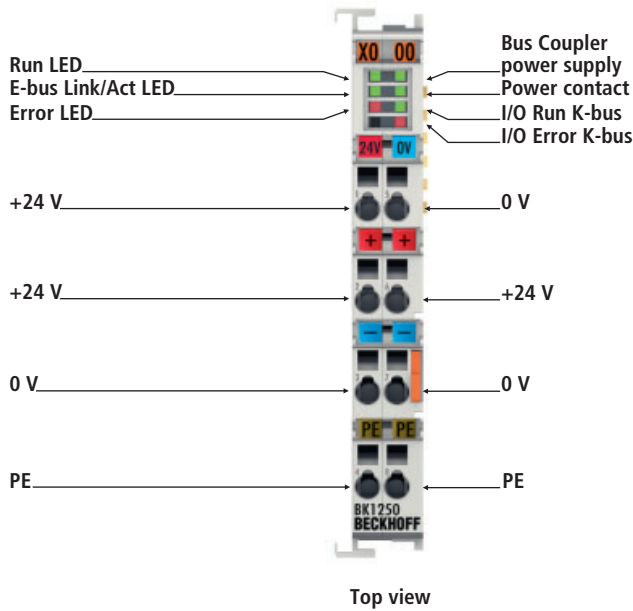
Technical data	BK1120
Task within EtherCAT system	coupling of standard Bus Terminals (KLxxxx) to 100BASE-TX EtherCAT networks
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	1,024 byte input and 1,024 byte output
Data transfer medium	Ethernet/EtherCAT CAT5 cable
Distance between stations	100 m (100BASE-TX)
Protocol	EtherCAT
Data transfer rates	100 Mbaud
Configuration possibility	via KS2000 or EtherCAT (ADS)
Bus interface	2 x RJ 45
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 500 mA max.
Starting current	approx. 2.5 x continuous current
Recommended fuse	≤ 10 A
Supply current K-bus	1,750 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/Ethernet)
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/BK1120">www.beckhoff.com/BK1120</a>

### Accessories

Cordsets cordsets and connectors

835

Bus Terminals see page 474



## BK1250 | “Compact” Coupler between EtherCAT Terminals and Bus Terminals

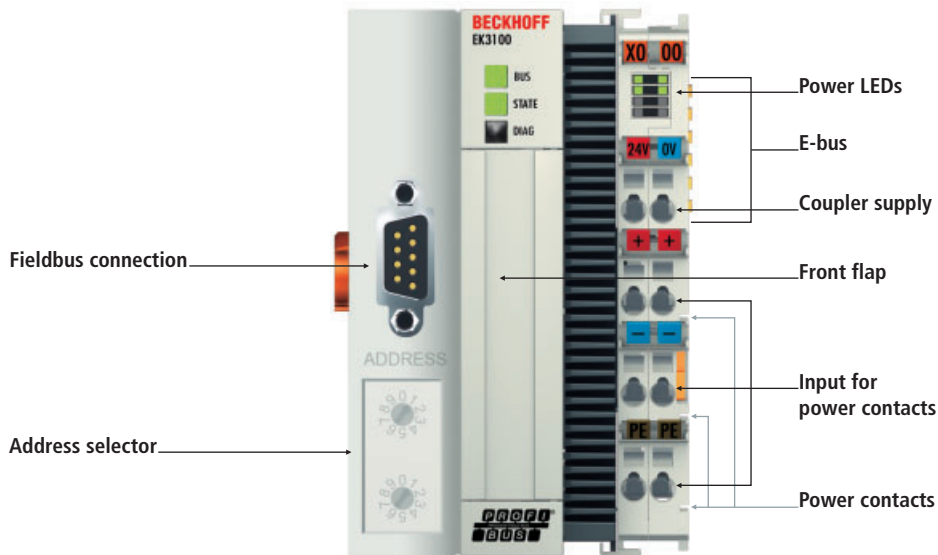
The BK1250 is a “Bus Coupler in terminal housing” for mixed application of EtherCAT Terminals (ELxxxx) and standard Bus Terminals (KLxxxx) in a bus station. It enables implementation of compact and cost-effective control solutions. The wide range of Bus Terminals can thus be optimally combined with the communication speed and large bandwidth of EtherCAT Terminals. Up to 64 Bus Terminals (with K-bus extension up to 255) can be connected to a BK1250. The Bus Coupler recognises the connected Bus Terminals and automatically allocates them into the EtherCAT process image.

Technical data	BK1250
Task within EtherCAT system	coupling of standard Bus Terminals (KLxxxx) to 100BASE-TX EtherCAT networks
Number of Bus Terminals	64 (255 with K-bus extension)
Max. number of bytes fieldbus	1,024 byte input and 1,024 byte output
Protocol	EtherCAT
Data transfer rates	100 Mbaud
Configuration possibility	via KS2000 or EtherCAT (ADS)
Bus interface	via E-bus contacts
Power supply	24 V DC (-15 %/+20 %)
Input current	70 mA + (total K-bus current)/4, 200 mA max.
Starting current	approx. 2.5 x continuous current
Recommended fuse	≤ 10 A
Supply current K-bus	max. 500 mA
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/Ethernet)
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/BK1250">www.beckhoff.com/BK1250</a>

Accessories	
Cordsets	cordsets and connectors <span style="float: right;">835</span>

Bus Terminals see page 474





## EK3100 | PROFIBUS Bus Coupler

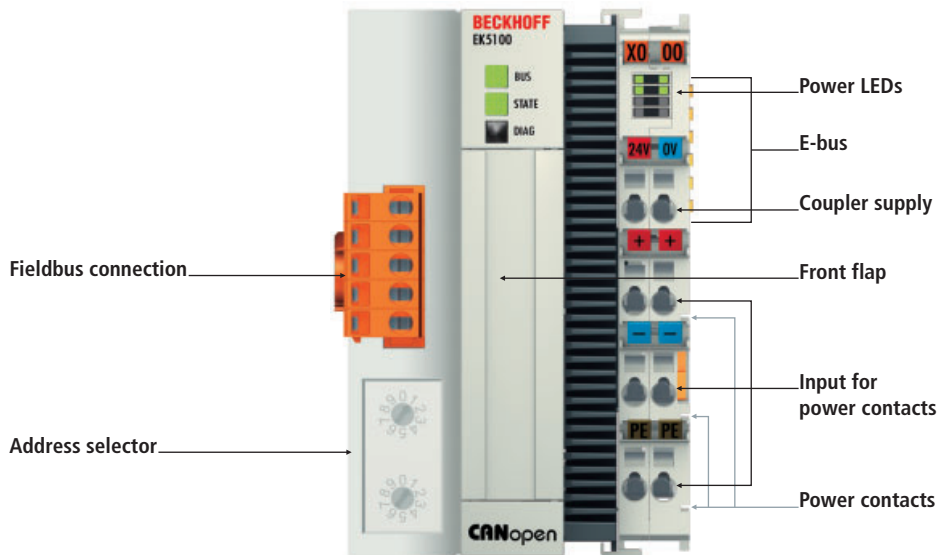


The EK3100 Bus Coupler connects PROFIBUS networks to the EtherCAT Terminals (ELxxxx) as well as the EtherCAT Box modules (EPxxxx) and converts the telegrams from PROFIBUS to the E-bus signal representation. One station consists of an EK3100 and any number of EtherCAT Terminals. The coupler is connected to PROFIBUS via a 9-pin D-sub plug. In EtherCAT, the PROFIBUS coupler has at its disposal a lower-level, powerful and ultra-fast I/O system with a large selection of terminals. The coupler supports the PROFIBUS profile and fits seamlessly into PROFIBUS networks.

Technical data	EK3100
Task within EtherCAT system	coupling of EtherCAT Terminals (ELxxxx, except fieldbus terminals, and EPxxxx) to PROFIBUS networks
Number of EtherCAT Terminals	depending on the process data size
Type/number of peripheral signals	depending on the process data size
Protocol	PROFIBUS DP
Data transfer rates	up to 12 Mbaud (automatic detection)
Configuration	not required
Bus interface	1 x D-sub 9-pin socket with shielding
Power supply	24 V DC (-15 %/+20 %)
Input current	typ. 120 mA + (total E-bus current)/4
Current consumption E-bus	up to 2 A
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/Ethernet)
Dimensions (W x H x D)	65 mm x 100 mm x 80 mm
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/EK3100

Accessories		
Cordsets	cordsets and connectors	835
FC310x	PC Fieldbus Cards with PCI interface	1044

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EK3100](http://www.beckhoff.com/EK3100)



## EK5100 | CANopen Bus Coupler

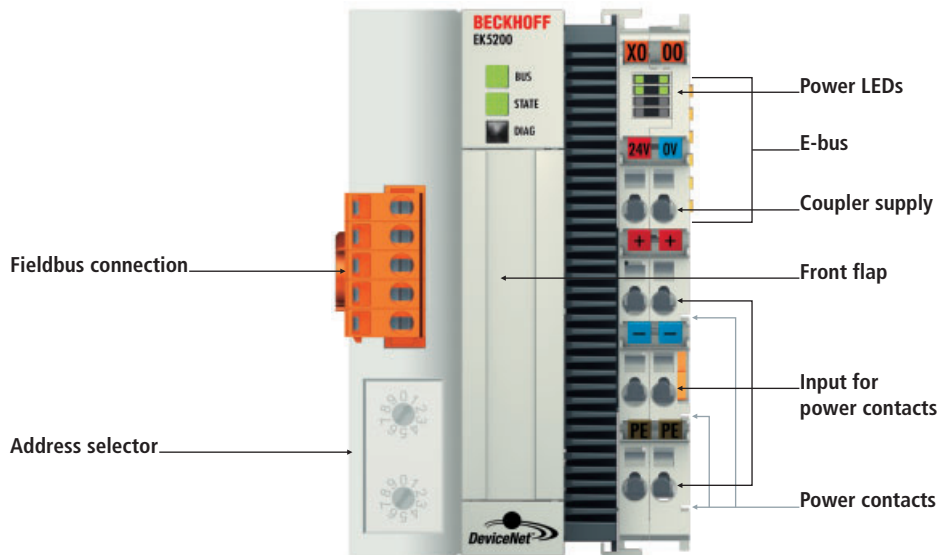
### CANopen

The EK5100 Bus Coupler connects CANopen networks to the EtherCAT Terminals (ELxxxx) as well as the EtherCAT Box modules (EPxxxx) and converts the telegrams from CANopen to the E-bus signal representation. One station consists of an EK5100 and any number of EtherCAT Terminals. The coupler is connected to CANopen via a 5-pin open style connector. In EtherCAT, the CANopen coupler has at its disposal a lower-level, powerful and ultra-fast I/O system with a large selection of terminals. The coupler supports the CANopen profile and fits seamlessly into CANopen networks.

Technical data	EK5100
Task within EtherCAT system	coupling of EtherCAT Terminals (ELxxxx, except fieldbus terminals, and EPxxxx) to CANopen networks
Number of EtherCAT Terminals	depending on the process data size
Type/number of peripheral signals	depending on the process data size
Protocol	CANopen
Data transfer rates	up to 1 Mbaud (automatic detection)
Configuration	not required
Bus interface	1 x open style connector, 5-pin, included
Power supply	24 V DC (-15 %/+20 %)
Input current	typ. 120 mA + (total E-bus current)/4
Current consumption E-bus	up to 2 A
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/Ethernet)
Dimensions (W x H x D)	65 mm x 100 mm x 80 mm
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EK5100">www.beckhoff.com/EK5100</a>

Accessories		
Cordsets	cordsets and connectors	835
FC510x	PC Fieldbus Cards with PCI interface	1045

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EK5100](http://www.beckhoff.com/EK5100)



## EK5200 | DeviceNet Bus Coupler

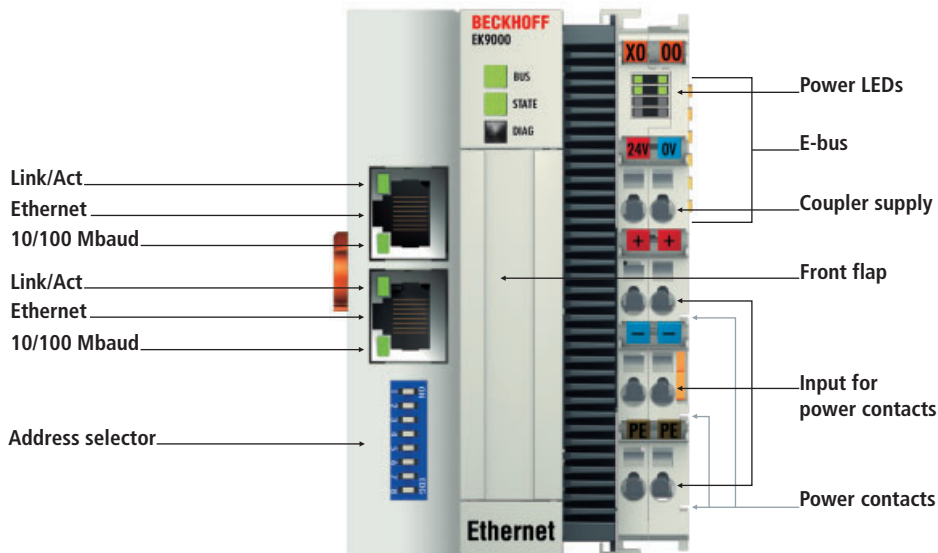


The EK5200 Bus Coupler connects DeviceNet networks to the EtherCAT Terminals (ELxxxx) as well as the EtherCAT Box modules (EPxxxx) and converts the telegrams from DeviceNet to the E-bus signal representation. One station consists of an EK5200 and any number of EtherCAT Terminals. The coupler is connected to DeviceNet via a 5-pin open style connector. In EtherCAT, the DeviceNet coupler has at its disposal a lower-level, powerful and ultra-fast I/O system with a large selection of terminals. The coupler supports the DeviceNet profile and fits seamlessly into DeviceNet networks.

Technical data	EK5200
Task within EtherCAT system	coupling of EtherCAT Terminals (ELxxxx, except fieldbus terminals, and EPxxxx) to DeviceNet networks
Number of EtherCAT Terminals	depending on the process data size
Type/number of peripheral signals	depending on the process data size
Protocol	DeviceNet
Data transfer rates	up to 500 kbaud (automatic detection)
Configuration	not required
Bus interface	1 x open style connector, 5-pin, included
Power supply	24 V DC (-15 %/+20 %)
Input current	typ. 120 mA + (total E-bus current)/4
Current consumption E-bus	up to 2 A
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/Ethernet)
Dimensions (W x H x D)	65 mm x 100 mm x 80 mm
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EK5200">www.beckhoff.com/EK5200</a>

Accessories		
Cordsets	cordsets and connectors	835
FC520x	PC Fieldbus Cards with PCI interface	1046

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EK5200](http://www.beckhoff.com/EK5200)



## EK9000 | Ethernet Bus Coupler

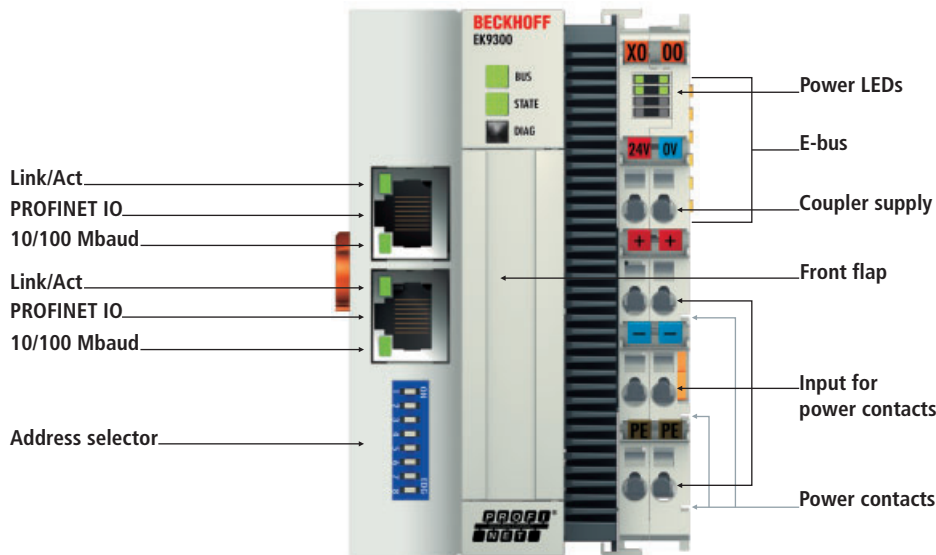
### Ethernet

The EK9000 Bus Coupler connects Ethernet networks to the EtherCAT Terminals (ELxxxx) as well as the EtherCAT Box modules (EPxxxx) and converts the telegrams from Ethernet to the E-bus signal representation. One station consists of an EK9000 and any number of EtherCAT Terminals. The coupler is connected to Ethernet via RJ 45. In EtherCAT, the Ethernet coupler has at its disposal a lower-level, powerful and ultra-fast I/O system with a large selection of terminals. The coupler supports the Ethernet and Modbus TCP protocol and fits seamlessly into Ethernet networks.

Technical data	EK9000
Task within EtherCAT system	coupling of EtherCAT Terminals (ELxxxx, except fieldbus terminals, and EPxxxx) to Ethernet networks
Number of EtherCAT Terminals	depending on the process data size
Type/number of peripheral signals	depending on the process data size
Protocol	real-time Ethernet, Modbus TCP, ADS/TCP, ADS/UDP
Data transfer rates	10/100 Mbaud
Configuration	not required
Bus interface	2 x RJ 45
Power supply	24 V DC (-15 %/+20 %)
Input current	typ. 120 mA + (total E-bus current)/4
Current consumption E-bus	up to 2 A
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/Ethernet)
Dimensions (W x H x D)	65 mm x 100 mm x 80 mm
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EK9000">www.beckhoff.com/EK9000</a>

Accessories		
Cordsets	cordsets and connectors	835
FC90xx	PC Fieldbus Cards with PCI interface	1048

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EK9000](http://www.beckhoff.com/EK9000)



## EK9300 | PROFINET IO Bus Coupler

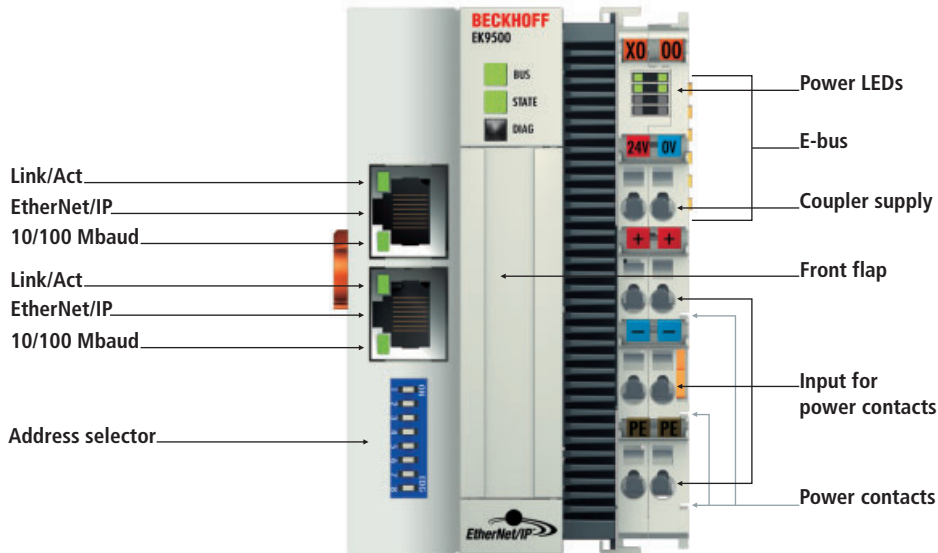


The EK9300 Bus Coupler connects PROFINET IO networks to the EtherCAT Terminals (ELxxxx) as well as the EtherCAT Box modules (EPxxxx) and converts the telegrams from PROFINET IO to the E-bus signal representation. One station consists of an EK9300 and any number of EtherCAT Terminals. The coupler is connected to PROFINET IO via RJ 45. In EtherCAT, the PROFINET IO coupler has at its disposal a lower-level, powerful and ultra-fast I/O system with a large selection of terminals. The coupler supports the PROFINET IO profile and fits seamlessly into PROFINET IO networks.

Technical data	EK9300
Task within EtherCAT system	coupling of EtherCAT Terminals (ELxxxx, except fieldbus terminals, and EPxxxx) to PROFINET IO networks
Number of EtherCAT Terminals	depending on the process data size
Type/number of peripheral signals	depending on the process data size
Protocol	PROFINET IO
Data transfer rates	10/100 Mbaud
Configuration	not required
Bus interface	2 x RJ 45
Power supply	24 V DC (-15 %/+20 %)
Input current	typ. 120 mA + (total E-bus current)/4
Current consumption E-bus	up to 2 A
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/Ethernet)
Dimensions (W x H x D)	65 mm x 100 mm x 80 mm
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	www.beckhoff.com/EK9300

Accessories		
Cordsets	cordsets and connectors	835
FC90xx	PC Fieldbus Cards with PCI interface	1048

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EK9300](http://www.beckhoff.com/EK9300)



## EK9500 | EtherNet/IP Bus Coupler

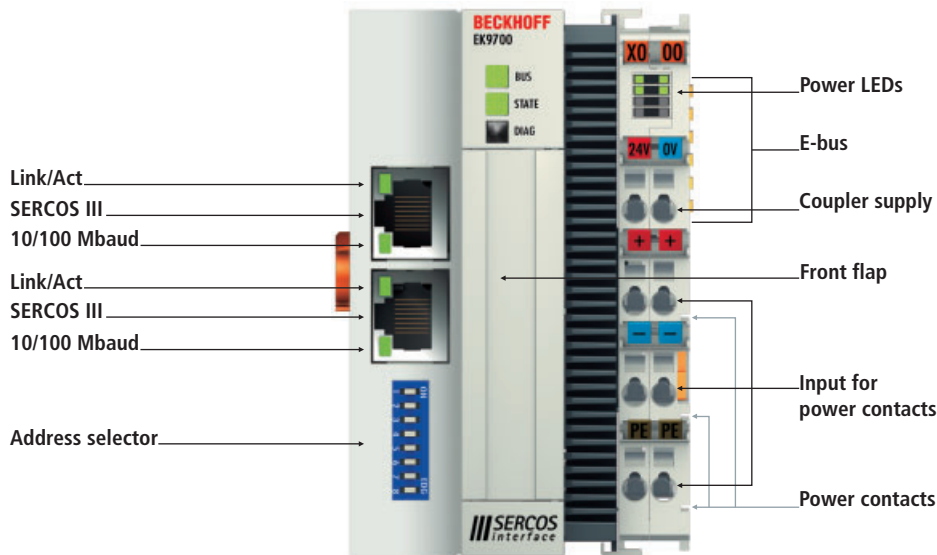


The EK9500 Bus Coupler connects EtherNet/IP networks to the EtherCAT Terminals (ELxxxx) as well as EtherCAT Box modules (EPxxxx) and converts the telegrams from EtherNet/IP to the E-bus signal representation. One station consists of an EK9500 and any number of EtherCAT Terminals. The coupler is connected to EtherNet/IP via RJ 45. In EtherCAT, the EtherNet/IP coupler has at its disposal a lower-level, powerful and ultra-fast I/O system with a large selection of terminals. The coupler supports the EtherNet/IP profile and fits seamlessly into EtherNet/IP networks.

Technical data	EK9500
Task within EtherCAT system	coupling of EtherCAT Terminals (ELxxxx, except fieldbus terminals, and EPxxxx) to EtherNet/IP networks
Number of EtherCAT Terminals	depending on the process data size
Type/number of peripheral signals	depending on the process data size
Protocol	EtherNet/IP
Data transfer rates	10/100 Mbaud
Configuration	not required
Bus interface	2 x RJ 45
Power supply	24 V DC (-15 %/+20 %)
Input current	typ. 120 mA + (total E-bus current)/4
Current consumption E-bus	up to 2 A
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/Ethernet)
Dimensions (W x H x D)	65 mm x 100 mm x 80 mm
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EK9500">www.beckhoff.com/EK9500</a>

Accessories		
Cordsets	cordsets and connectors	835
FC90xx	PC Fieldbus Cards with PCI interface	1048

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EK9500](http://www.beckhoff.com/EK9500)



## EK9700 | SERCOS III Bus Coupler



The EK9700 Bus Coupler connects SERCOS III networks to the EtherCAT Terminals (ELxxxx) as well as the EtherCAT Box modules (EPxxxx) and converts the telegrams from SERCOS III to the E-bus signal representation. One station consists of an EK9700 and any number of EtherCAT Terminals. The coupler is connected to the network via RJ 45. In EtherCAT, the SERCOS III coupler has at its disposal a lower-level, powerful and ultra-fast I/O system with a large selection of terminals. The coupler supports the SERCOS III profile and fits seamlessly into SERCOS III networks.

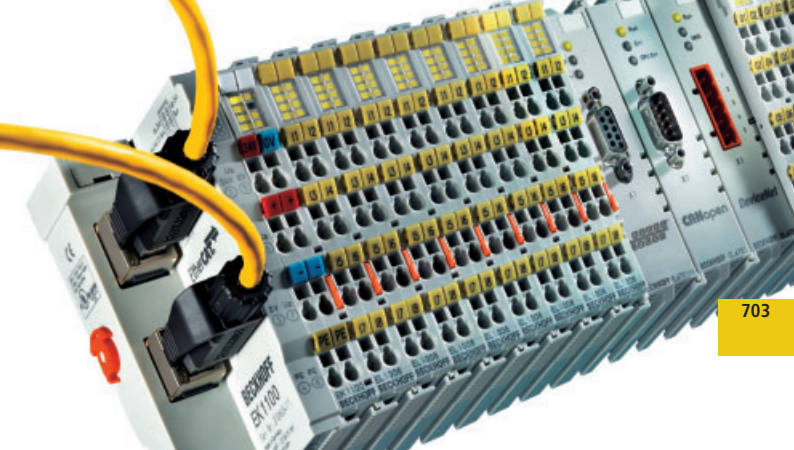
Technical data	EK9700
Task within EtherCAT system	coupling of EtherCAT Terminals (ELxxxx, except fieldbus terminals, and EPxxxx) to SERCOS III networks
Number of EtherCAT Terminals	depending on the process data size
Type/number of peripheral signals	depending on the process data size
Protocol	SERCOS III I/O profile
Delay	approx. 1 $\mu$ s
Data transfer rates	10/100 Mbaud
Configuration	not required
Bus interface	2 x RJ 45
Power supply	24 V DC (-15 %/+20 %)
Input current	typ. 120 mA + (total E-bus current)/4
Current consumption E-bus	up to 2 A
Power contacts	24 V DC max./10 A max.
Electrical isolation	500 V <sub>rms</sub> (power contact/supply voltage/Ethernet)
Dimensions (W x H x D)	65 mm x 100 mm x 80 mm
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EK9700">www.beckhoff.com/EK9700</a>

Accessories		
Cordsets	cordsets and connectors	835
FC750x	PC Fieldbus Cards with PCI interface	1047

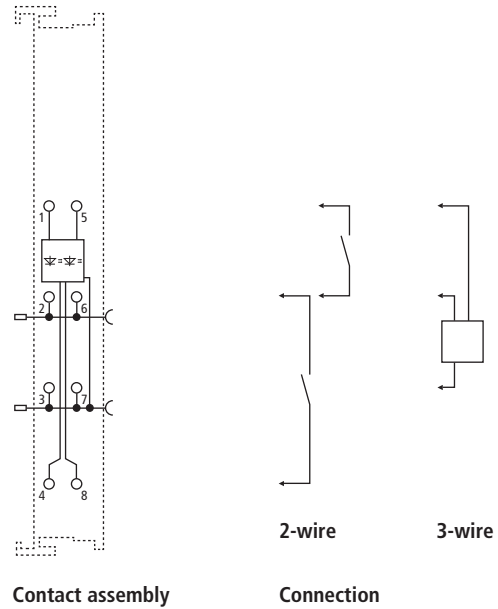
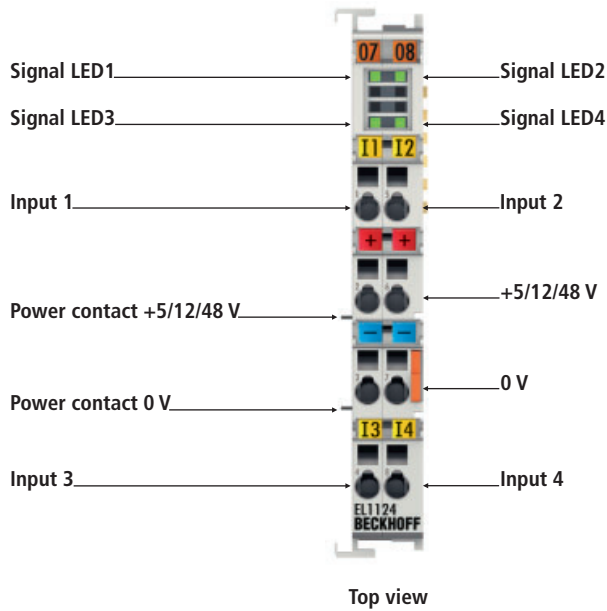
**i** For availability status see Beckhoff website at: [www.beckhoff.com/EK9700](http://www.beckhoff.com/EK9700)

# EtherCAT Terminals

Ultra high-speed I/O



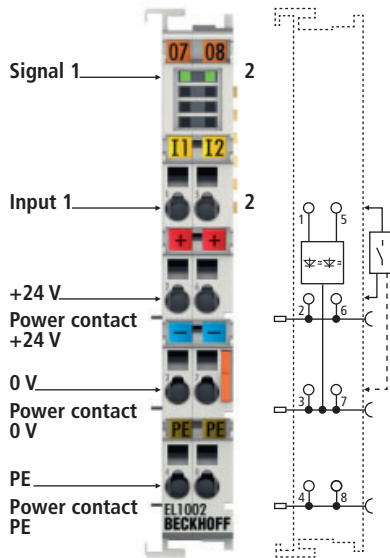




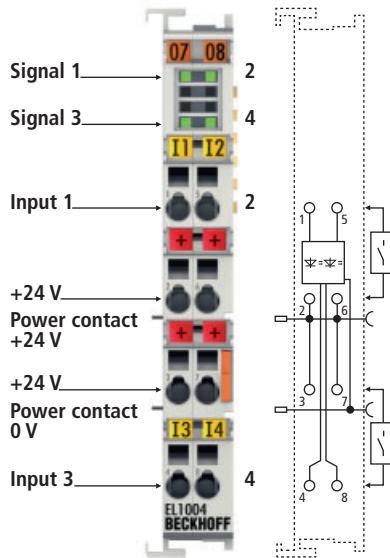
## EL1124, EL1144, EL1134 | 4-channel digital input terminals 5 V DC, 12 V DC, 48 V DC

The EL1124 (5 V DC), EL1144 (12 V DC) and EL1134 (48 V DC) digital input terminals acquire the binary control signals and transmit them, in an electrically isolated form, to the higher-level automation unit. The EtherCAT Terminals contain four channels that indicate their signal state by means of light emitting diodes. These versions have different input voltages.

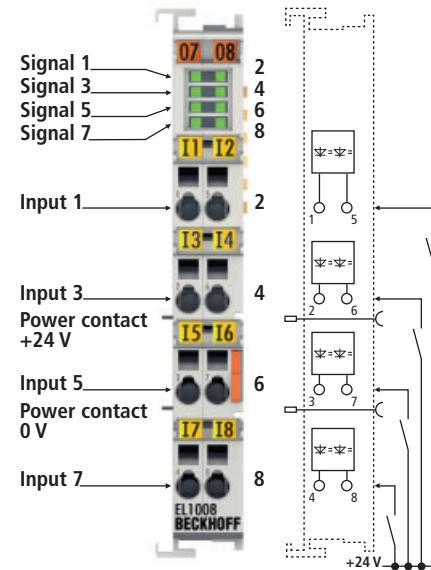
Technical data	EL1124   ES1124	EL1144   ES1144	EL1134   ES1134
Number of inputs	4		
Nominal voltage	5 V DC	12 V DC	48 V DC
"0" signal voltage	< 0.8 V	< 2.4 V	< 10 V (EN 61131-2, type 1)
"1" signal voltage	> 2.4 V	> 8.5 V	> 34 V (EN 61131-2, Typ 1)
Input current	typ. 50 $\mu$ A	typ. 3 mA	typ. 3 mA (EN 61131-2, type 1)
Input filter	<< 1 $\mu$ s (typ. 50 ns)	10 $\mu$ s	10 $\mu$ s
Current consumption E-bus	typ. 90 mA		
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)		
Bit width in the process image	4 inputs		
Configuration	no address or configuration setting		
Weight	approx. 55 g		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all ESxxxx terminals		
Further information	www.beckhoff.com/EL1124		



Contact assembly, connection



Contact assembly, connection

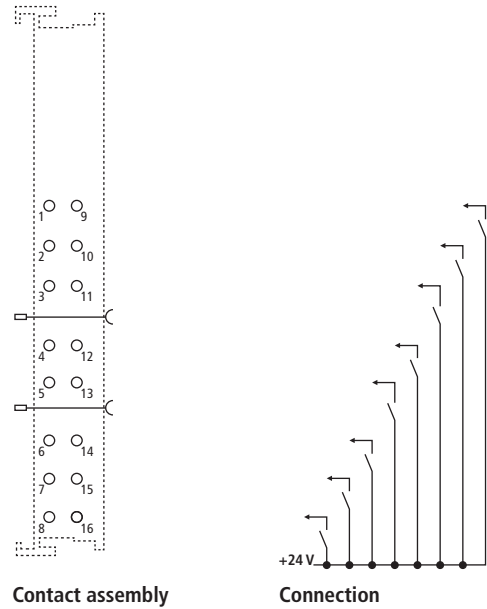
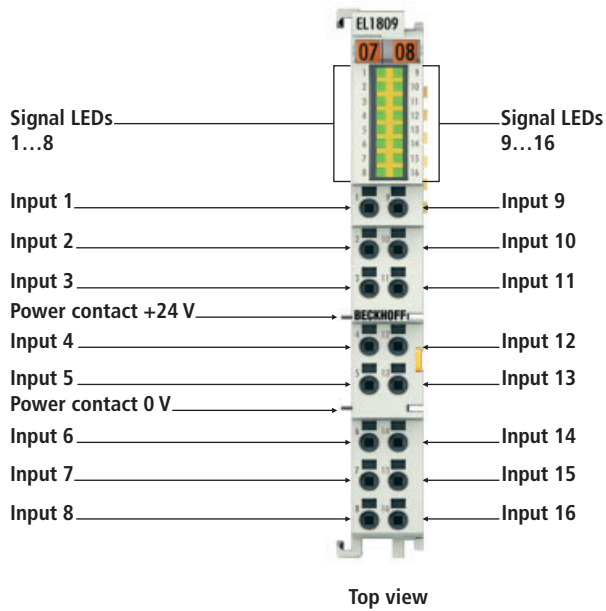


Contact assembly, connection

## EL1002, EL1004, EL1008 | 2-, 4-, 8-channel digital input terminals 24 V DC, 3 ms

The EL1002, EL1004 and EL1008 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation unit. The variants differ in terms of the number of channels and their connection type. Digital input terminals from the EL100x series have a 3 ms input filter. The EtherCAT Terminals indicate their state via an LED.

Technical data	EL1002   ES1002	EL1004   ES1004	EL1008   ES1008
Number of inputs	2	4	8
Nominal voltage	24 V DC (-15 %/+20 %)		
"0" signal voltage	-3...+5 V (EN 61131-2, type 3)		
"1" signal voltage	15...30 V (EN 61131-2, type 3)		
Input current	typ. 3 mA (EN 61131-2, type 3)		
Input filter	3.0 ms		
Current consumption E-bus	typ. 90 mA		
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)		
Bit width in the process image	2 inputs	4 inputs	8 inputs
Configuration	no address or configuration setting		
Weight	approx. 50 g	approx. 50 g	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable	IP 20/variable	IP 20/see documentation
Pluggable wiring	for all ESxxxx terminals		
Further information	www.beckhoff.com/EL1002		



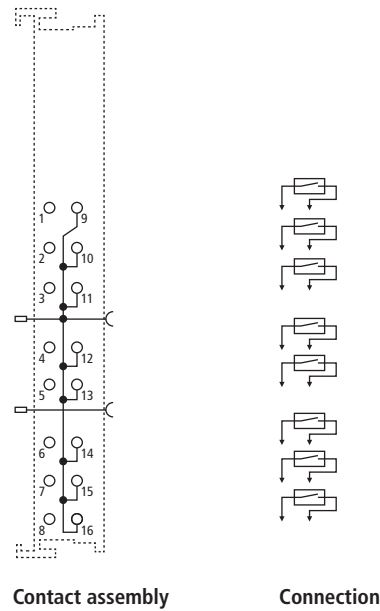
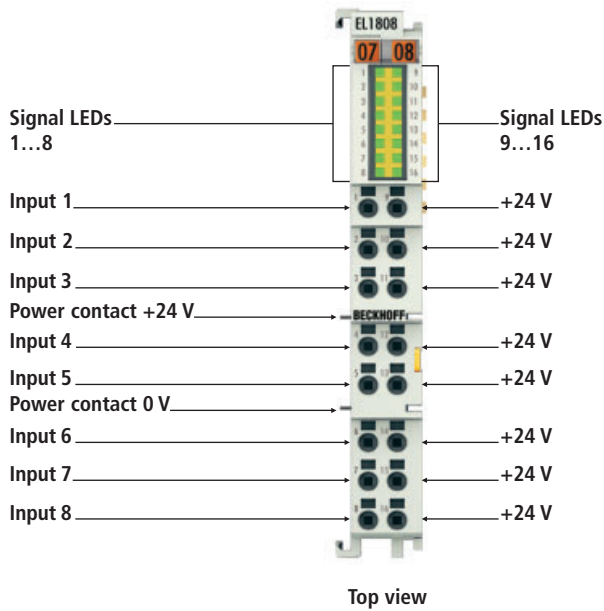
## EL1809, EL1819 | 16-channel digital input terminals 24 V DC

The EL1809 and EL1819 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation device. The EtherCAT Terminals each contain 16 channels, whose signal states are displayed by LEDs. The terminals are particularly suitable for space-saving use in control cabinets. By using the single-conductor connection technique, a multi-channel sensor can be connected in the smallest space with a minimum amount of wiring. The power contacts are looped through.

For the EL1809 and EL1819 EtherCAT Terminals, the reference ground for all inputs is the 0 V power contact. The versions have input filters with different speeds. The conductors can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	EL1809	EL1819
Number of inputs	16	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	-3...+5 V (EN 61131-2, type 1/3)	
"1" signal voltage	15...30 V (EN 61131-2, type 3)	
Input current	typ. 3 mA (EN 61131-2, type 3)	
Input filter	typ. 3.0 ms	typ. 10 $\mu$ s
Current consumption E-bus	typ. 100 mA	
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)	
Bit width in the process image	16 inputs	
Configuration	no address or configuration setting	
Conductor types	solid wire, stranded wire and ferrule	
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver	
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5 mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>	
Weight	approx. 65 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable (see documentation)	
Further information	www.beckhoff.com/EL1809	

**i** For availability status of the EL1819 see Beckhoff website at: [www.beckhoff.com/EL1819](http://www.beckhoff.com/EL1819)

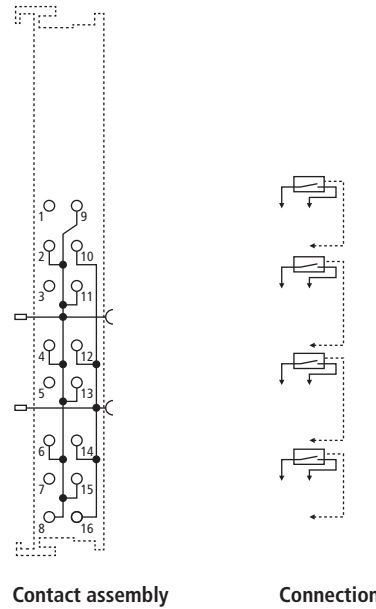
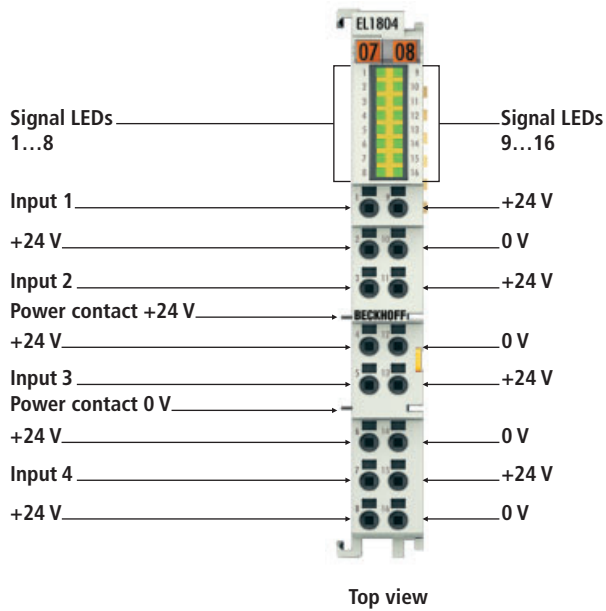


## EL1808 | 8-channel digital input terminal 24 V DC, 2-wire connection

The EL1808 digital input terminal acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation device. The EtherCAT Terminal contains eight channels, consisting of a signal input and 24 V DC. The signal states are displayed by LEDs. The power contacts are looped through.

For the EL1808 EtherCAT Terminal, the reference ground for all inputs is the 0 V power contact. The wires can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	EL1808
Number of inputs	8
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V (EN 61131-2, type 1/3)
"1" signal voltage	15...30 V (EN 61131-2, type 3)
Input current	typ. 3 mA (EN 61131-2, type 3)
Input filter	typ. 3.0 ms
Current consumption E-bus	typ. 100 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	8 inputs
Configuration	no address or configuration setting
Conductor types	solid wire, stranded wire and ferrule
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5 mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable (see documentation)
Further information	<a href="http://www.beckhoff.com/EL1808">www.beckhoff.com/EL1808</a>



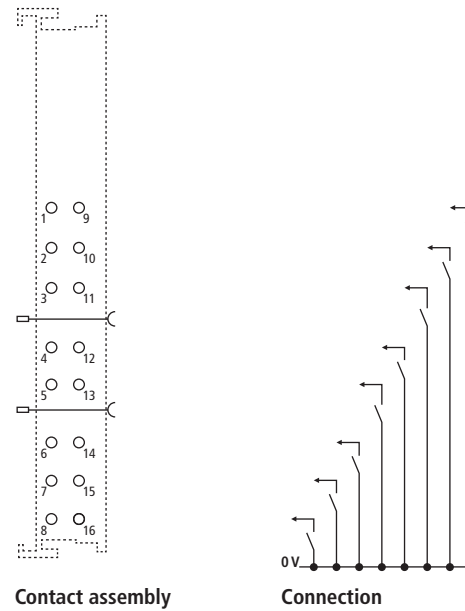
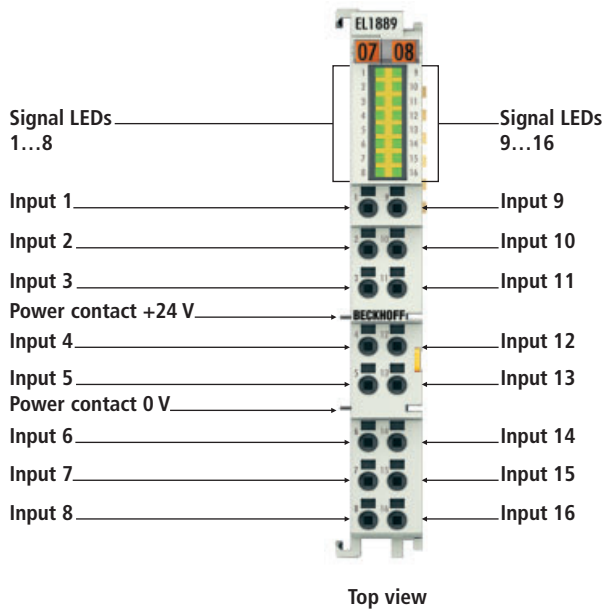
## EL1804, EL1814 | 4-channel digital input terminals 24 V DC, 3-wire connection

The EL1804 and EL1814 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation device. The EtherCAT Terminals each contain four channels, consisting of a signal input, 24 V DC and 0 V. The signal states are displayed by LEDs. The power contacts are looped through.

For the EL1804 and EL1814 EtherCAT Terminals, the reference ground for all inputs is the 0 V power contact. The versions have input filters with different speeds. The wires can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	EL1804	EL1814
Number of inputs	4	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	-3...+5 V (EN 61131-2, type 1/3)	
"1" signal voltage	15...30 V (EN 61131-2, type 3)	
Input current	typ. 3 mA (EN 61131-2, type 3)	
Input filter	typ. 3.0 ms	typ. 10 $\mu$ s
Current consumption E-bus	typ. 90 mA	typ. 100 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)	
Bit width in the process image	4 inputs	
Configuration	no address or configuration setting	
Conductor types	solid wire, stranded wire and ferrule	
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver	
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5 mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>	
Weight	approx. 60 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable (see documentation)	
Further information	www.beckhoff.com/EL1804	

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL1804](http://www.beckhoff.com/EL1804)



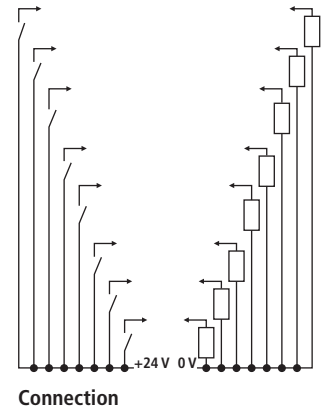
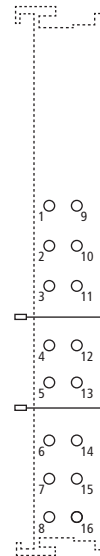
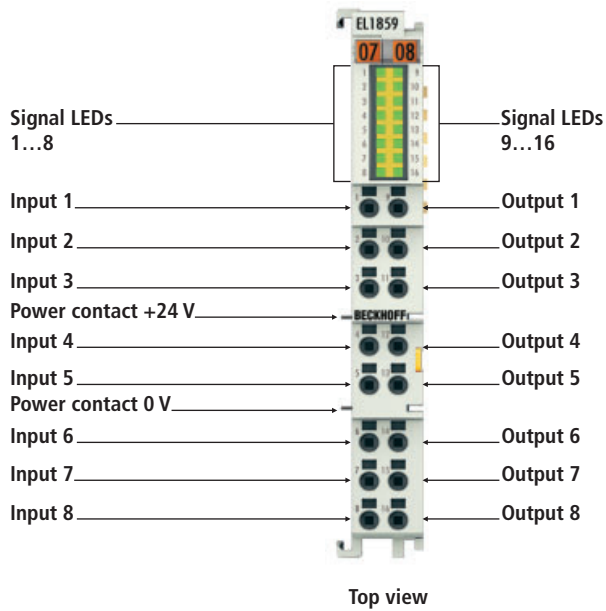
## EL1889 | 16-channel digital input terminal 24 V DC, 0 V (ground) switching

The EL1889 digital input terminal acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation device. The EtherCAT Terminal contains 16 channels, whose signal states are displayed by LEDs. The terminal is particularly suitable for space-saving use in control cabinets. By using the single-conductor connection technique, a multi-channel sensor can be connected in the smallest space with a minimum amount of wiring. The power contacts are looped through.

The EL1889 EtherCAT Terminal takes the 24 V power contact as its reference for all inputs. The conductors can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	EL1889
Number of inputs	16
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	18...30 V
"1" signal voltage	0...7 V
Input current	typ. 3 mA
Input filter	typ. 3.0 ms
Current consumption E-bus	typ. 140 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	16 inputs
Configuration	no address or configuration setting
Conductor types	solid wire, stranded wire and ferrule
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5 mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable (see documentation)
Further information	<a href="http://www.beckhoff.com/EL1889">www.beckhoff.com/EL1889</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL1889](http://www.beckhoff.com/EL1889)



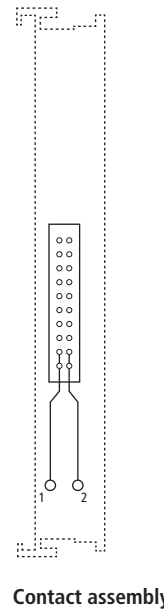
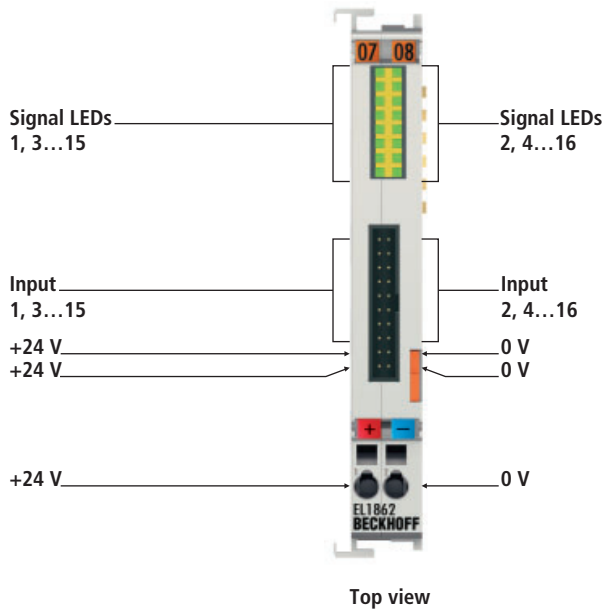
## EL1859 | 8-channel digital input + 8-channel digital output 24 V DC

The digital EL1859 EtherCAT Terminal combines eight digital inputs and eight digital outputs in one device. The inputs have a filter of 3.0 ms. The outputs process load currents up to 0.5 A, are short-circuit-proof and protected against polarity reversal. The signal states are displayed by LEDs.

The reference ground for all inputs is the 0 V power contact, the outputs are fed via the 24 V power contact. The conductors can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	EL1859
Number of channels	8 inputs + 8 outputs
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V (EN 61131-2, type 1/3)
"1" signal voltage	15...30 V (EN 61131-2, type 3)
Input current	typ. 3 mA (EN 61131-2, type 3)
Input filter	typ. 3.0 ms
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A (per channel)
Reverse voltage protection	yes
Breaking energy	< 150 mJ/channel
Switching times	typ. $T_{ON}$ : 60 $\mu$ s, $T_{OFF}$ : 300 $\mu$ s
Current consumption E-bus	typ. 130 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	8 inputs + 8 outputs
Configuration	no address or configuration setting
Conductor types	solid wire, stranded wire and ferrule
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5 mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>
Weight	approx. 65 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Protect. class/installation pos.	IP 20/variable (see documentation)
Further information	<a href="http://www.beckhoff.com/EL1859">www.beckhoff.com/EL1859</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL1859](http://www.beckhoff.com/EL1859)

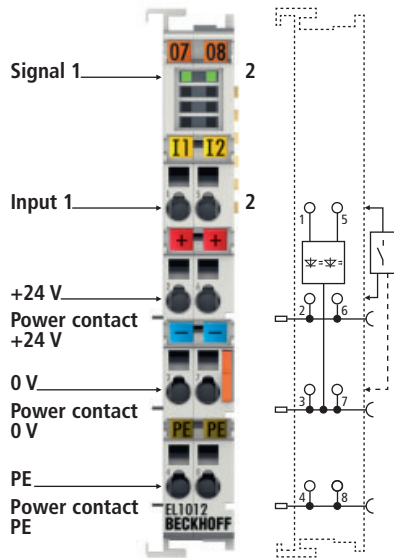


## EL1862, EL1872 | 16-channel digital input terminals 24 V DC, type 3, flat-ribbon cable connection

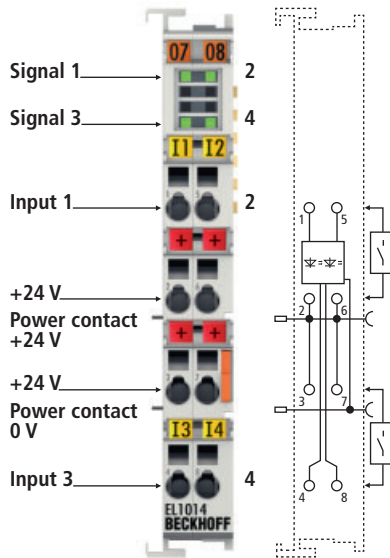
The EL1862 and EL1872 digital input terminals offer a very compact design with their 16 channels. A 20-pin connector enables the secure connection of plug connectors using insulation displacement contact, as is usual for ribbon cables and special round cables. This significantly simplifies the wiring of many channels. The input characteristic conforms to the type 3 specification and guarantees minimum power dissipation. 16 LEDs display the logical signal states of the inputs.

Technical data	EL1862	EL1872
Number of inputs	16	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	-3...+5 V (EN 61131-2, type 1/3)	
"1" signal voltage	11...30 V (EN 61131-2, type 3)	
"0" signal current	0...1.5 mA	
"1" signal current	2.0...2.5 mA	
Input filter	typ. 3.0 ms	typ. 10 $\mu$ s
Current consumption E-bus	typ. 130 mA (see documentation)	
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)	
Bit width in the process image	16 inputs	
Configuration	no address or configuration setting	
Weight	approx. 50 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/EL1862	
Special terminals		
EL1862-0010	16-channel digital input 24 V DC, 3.0 ms, flat-ribbon cable connection, switching to ground potential	

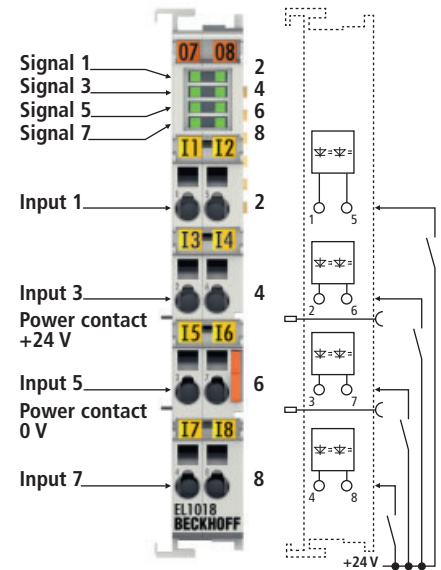




Contact assembly, connection



Contact assembly, connection

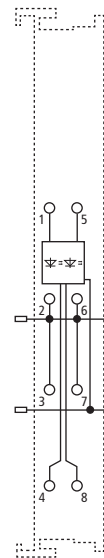
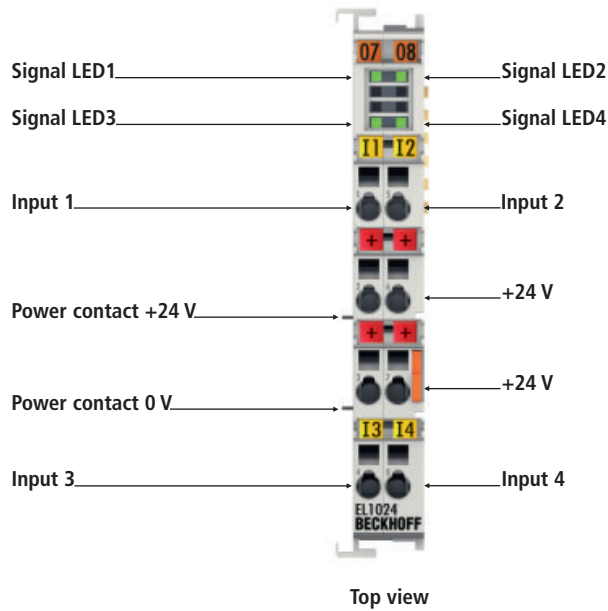


Contact assembly, connection

## EL1012, EL1014, EL1018 | 2-, 4-, 8-channel digital input terminals 24 V DC, 10 $\mu$ s

The EL1012, EL1014 and EL1018 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation unit. The variants differ in terms of the number of channels and their connection type. Digital input terminals from the EL101x series have a 10  $\mu$ s input filter. The EtherCAT Terminals indicate their state via an LED.

Technical data	EL1012   ES1012	EL1014   ES1014	EL1018   ES1018
Number of inputs	2	4	8
Nominal voltage	24 V DC (-15 %/+20 %)		
"0" signal voltage	-3...+5 V (EN 61131-2, type 3)		
"1" signal voltage	15...30 V (EN 61131-2, type 3)		
Input current	typ. 3 mA (EN 61131-2, type 3)		
Input filter	typ. 10 $\mu$ s (see documentation)		
Current consumption E-bus	typ. 90 mA		
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)		
Bit width in the process image	2 inputs	4 inputs	8 inputs
Configuration	no address or configuration setting		
Weight	approx. 50 g	approx. 50 g	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable	IP 20/variable	IP 20/see documentation
Pluggable wiring	for all ESxxxx terminals		
Further information	www.beckhoff.com/EL1012		

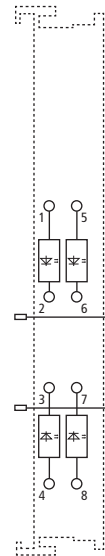
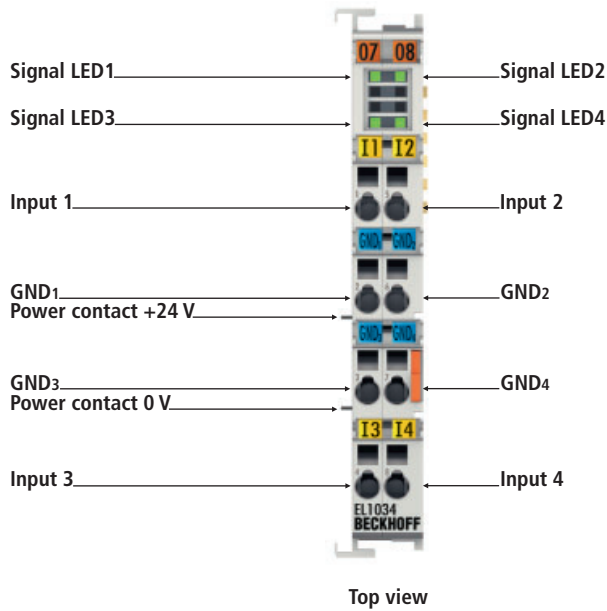


2-wire  
Connection

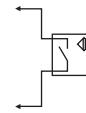
## EL1024 | 4-channel digital input terminal 24 V DC for type 2 sensors

The EL1024 digital input terminal acquires the binary 24 V control signals and transmits them, in an electrically isolated form, to the higher-level automation system. The EtherCAT Terminal contains four channels that indicate their signal state by means of light emitting diodes. The input signal of the EL1024 corresponds to EN 61131-2, type 2. Additionally, the 4-channel EtherCAT Terminal enables the direct connection of four 2-wire sensors. Four +24 V connection points are provided.

Technical data	EL1024   ES1024
Number of inputs	4
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V (EN 61131-2, type 2)
"1" signal voltage	15...30 V (EN 61131-2, type 2)
Input current	typ. 6 mA (EN 61131-2, type 2)
Input filter	3.0 ms
Current consumption E-bus	typ. 90 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	4 inputs
Configuration	no address or configuration setting
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL1024">www.beckhoff.com/EL1024</a>



Contact assembly



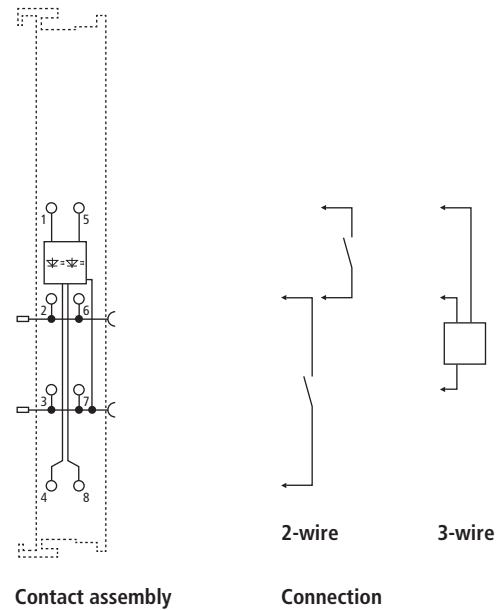
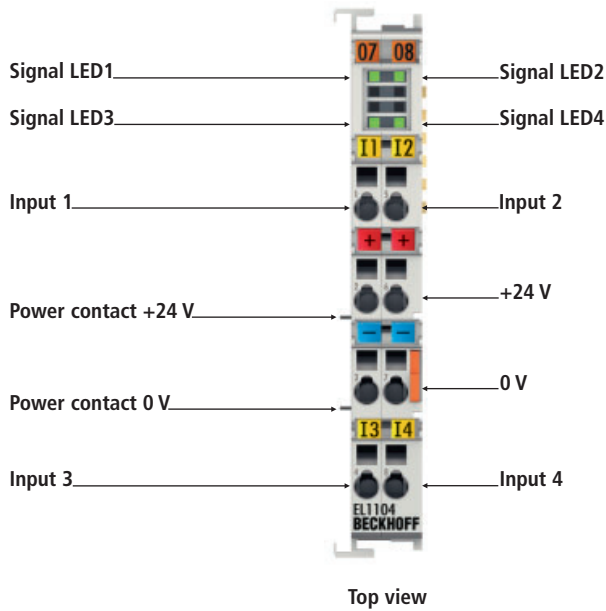
2-wire

Connection

## EL1034 | 4-channel digital input terminal 24 V DC, potential-free inputs

The EL1034 digital input terminal acquires the binary 24 V control signals and transmits them, in an electrically isolated form, to the higher-level automation system. The EtherCAT Terminal contains four channels that indicate their signal state by means of light emitting diodes. The EL1034 features electrical isolation of individual channels. The input signal meets the requirements of EN 61131-2, type 1.

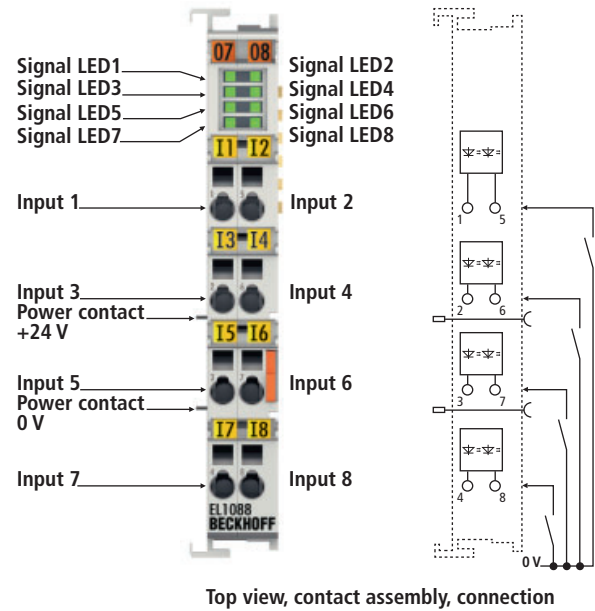
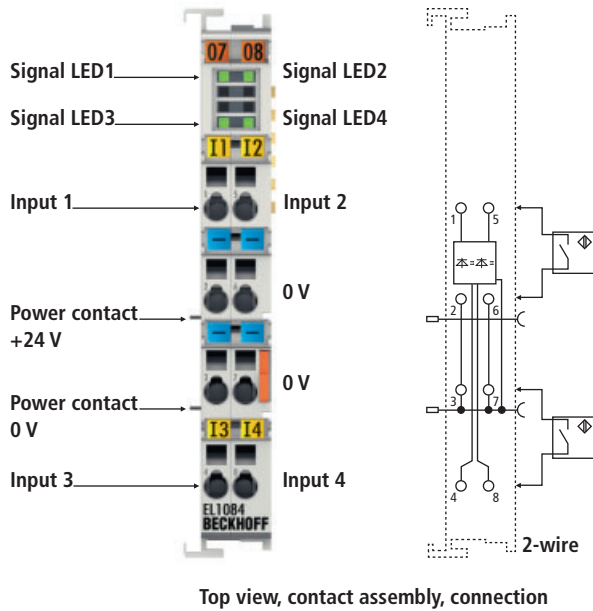
Technical data	EL1034   ES1034
Number of inputs	4
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V (EN 61131-2, type 1)
"1" signal voltage	15...30 V (EN 61131-2, type 1)
Input current	typ. 3 mA (EN 61131-2, type 1)
Input filter	10 $\mu$ s
Current consumption E-bus	typ. 90 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	4 inputs
Configuration	no address or configuration setting
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL1034">www.beckhoff.com/EL1034</a>



## EL1104, EL1114 | 4-channel digital input terminals 24 V DC, 24 V and 0 V sensor supply

The EL1104 and EL1114 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation unit. The EL1104 and EL1114 versions have input filters of different speeds. The EtherCAT Terminals contain four channels that indicate their signal state by means of light emitting diodes.

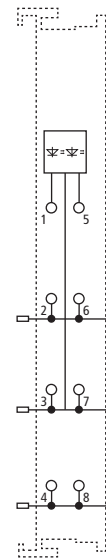
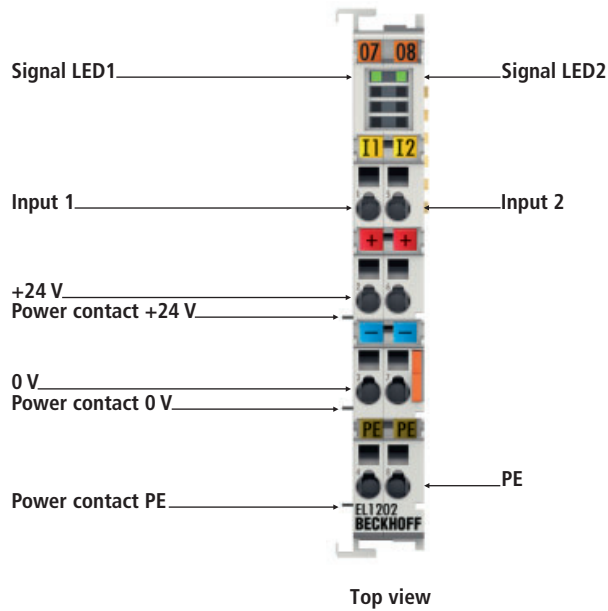
Technical data	EL1104   ES1104	EL1114   ES1114
Number of inputs	4	
Nominal voltage	24 V DC (-15 %/+20 %)	
"0" signal voltage	-3...+5 V (EN 61131-2, type 3)	
"1" signal voltage	15...30 V (EN 61131-2, type 3)	
Input current	typ. 3 mA (EN 61131-2, type 3)	
Input filter	3.0 ms	typ. 10 $\mu$ s (see documentation)
Current consumption E-bus	typ. 90 mA	
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)	
Bit width in the process image	4 inputs	
Configuration	no address or configuration setting	
Weight	approx. 55 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all ESxxxx terminals	
Further information	www.beckhoff.com/EL1104	



## EL1084/88/94/98 | 4-, 8-channel digital input terminals 24 V DC, switching to negative potential

The EL1084/EL1088 and EL1094/EL1098 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation unit. The EL108x and EL109x versions have input filters of different speeds. Four 2-wire sensors can be connected to the EL1084 and EL1094 EtherCAT Terminals. The 8-channel versions EL1088 and EL1098 are suitable for multi-channel sensors with single-wire connections. The EtherCAT Terminals indicate their signal state by means of light emitting diodes.

Technical data	EL1084   ES1084	EL1088   ES1088	EL1094   ES1094	EL1098   ES1098
Number of inputs	4	8	4	8
Nominal voltage	24 V DC (-15 %/+20 %)			
"0" signal voltage	18...30 V			
"1" signal voltage	0...7 V			
Input current	typ. 3 mA			
Input filter	3.0 ms	3.0 ms	10 μs	10 μs
Current consumption E-bus	typ. 90 mA			
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)			
Bit width in the process image	4 inputs	8 inputs	4 inputs	8 inputs
Configuration	no address or configuration setting			
Weight	approx. 50 g			
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 20/variable	IP 20/see documentation	IP 20/variable	IP 20/see documentation
Pluggable wiring	for all ESxxxx terminals			
Further information	www.beckhoff.com/EL1084			



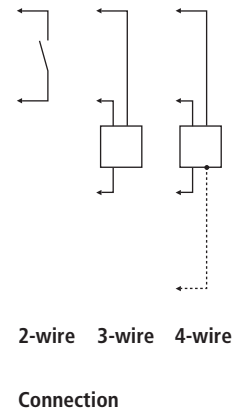
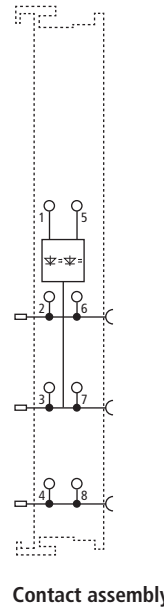
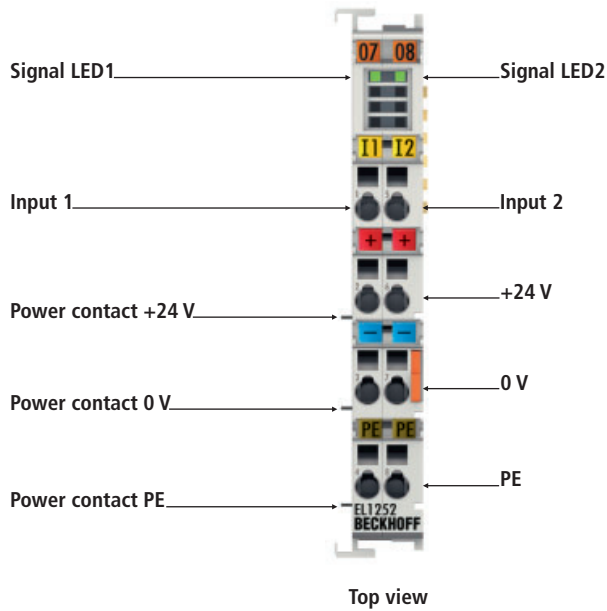
## EL1202 | 2-channel digital input terminal 24 V DC, T<sub>ON</sub>/T<sub>OFF</sub> 1 μs



The EL1202 digital input terminal acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation unit. It is suitable for particularly fast signals due to its very low input delay. The EtherCAT Terminal can support distributed clocks, i.e. the input data can be monitored synchronously with other data that are also linked to distributed clock terminals. To this end, the user has to switch to terminal version EL1202-0100 (see documentation). The DC accuracy across the system is  $\ll 1 \mu\text{s}$ . For this, the user has to switch the terminal to the EL1202-0100 version (see documentation). The EL1202 contains two channels whose signal state is indicated via LEDs.

Technical data	EL1202   ES1202
Number of inputs	2
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V (similar to EN 61131-2, type 3)
"1" signal voltage	11...30 V (similar to EN 61131-2, type 3)
Input current	typ. 3 mA (similar to EN 61131-2, type 3)
Input delay T <sub>ON</sub> /T <sub>OFF</sub>	< 1 μs
Distributed clocks	yes
Current consumption E-bus	typ. 110 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	2 inputs
Configuration	no address or configuration setting
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	www.beckhoff.com/EL1202

XFC technology description see **664**



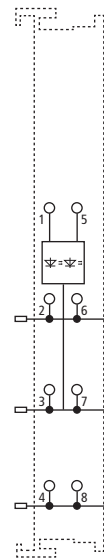
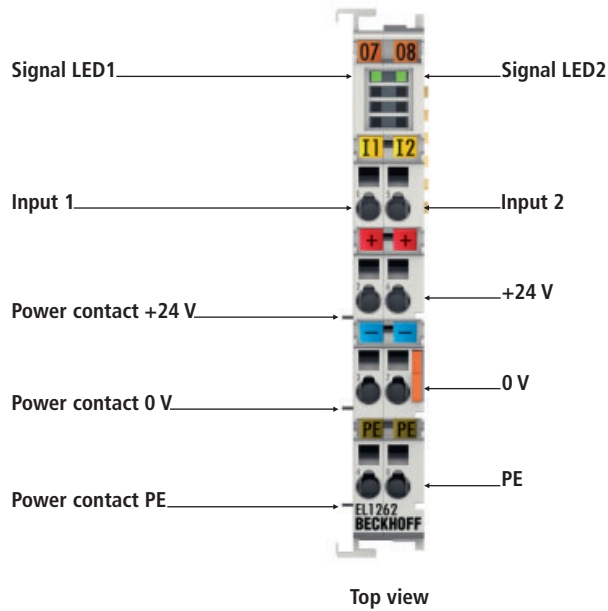
## EL1252 | 2-channel digital input terminal with time stamp



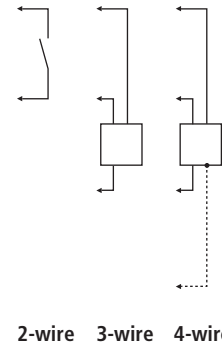
The EL1252 digital input terminal acquires the fast binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The signals are furnished with a time stamp that identifies the time of the last edge change with a resolution of 1 ns. This technology enables signals to be traced exactly over time and synchronised with the distributed clocks across the system. With this technology, machine-wide parallel hardware wiring of digital inputs or encoder signals for synchronisation purposes is often no longer required. In conjunction with the EL2252 EtherCAT Terminal (digital output terminal with time stamp), the EL1252 enables responses with equidistant time intervals, largely independent of the bus cycle time.

Technical data	EL1252   ES1252
Number of inputs	2
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V (similar to EN 61131-2, type 3)
"1" signal voltage	11...30 V (similar to EN 61131-2, type 3)
Input current	typ. 3 mA (similar to EN 61131-2, type 3)
Resolution time stamp	1 ns
Precision of time stamp in the terminal	10 ns (+ input delay)
Distributed clock precision	< 100 ns
Input delay $T_{ON}/T_{OFF}$	< 1 $\mu$ s
Current consumption E-bus	typ. 110 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	2 inputs + 36 byte time stamp
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL1252">www.beckhoff.com/EL1252</a>

XFC technology description see 664



Contact assembly



Connection

## EL1262 | 2-channel digital input terminal with oversampling

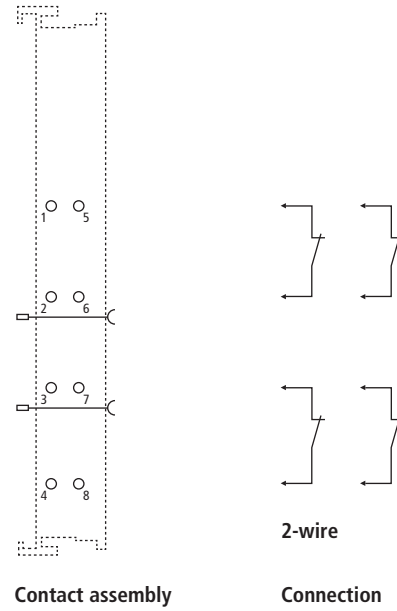
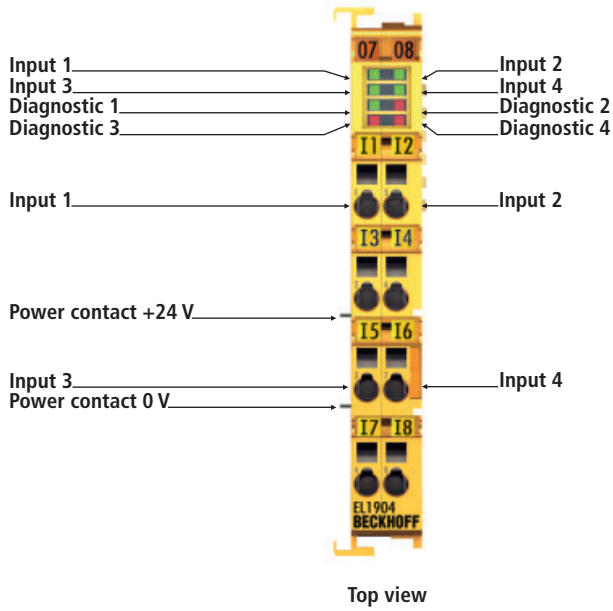


The EL1262 digital input terminal acquires the fast binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The signals are oversampled with an adjustable, integer multiple (oversampling factor:  $n$ ) of the bus cycle time ( $n$  micro-cycles per bus cycle). For each microcycle, the EtherCAT Terminal generates a process data block that is transferred collectively during the next bus cycle. The time base of the terminal can be synchronised precisely with other EtherCAT devices via distributed clocks. This procedure enables the temporal resolution of the digital input signals to be increased to  $n$  times the bus cycle time.

Technical data	EL1262   ES1262
Number of inputs	2
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V (EN 61131-2, type 1)
"1" signal voltage	11...30 V (EN 61131-2, type 1)
Input current	typ. 3 mA
Input filter	typ. < 1 $\mu$ s
Oversampling factor	$n$ = integer multiple of the cycle time, 1...1,000, see documentation
Distributed clock precision	<< 1 $\mu$ s
Sampling rate	max. 1 Msample/s
Current consumption E-bus	typ. 70 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	$n \times 2$ inputs + 64 bit CycleCounter/latch
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL1262">www.beckhoff.com/EL1262</a>

XFC technology description see **664**

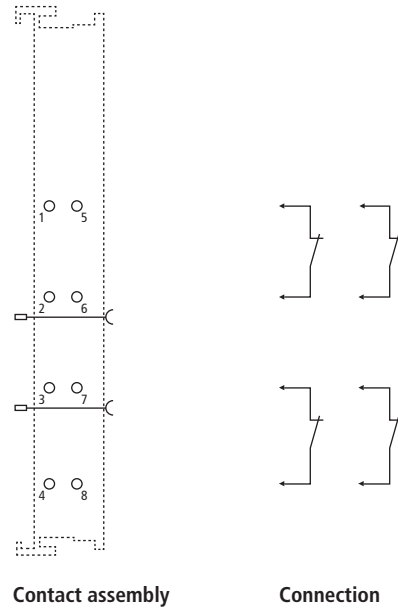
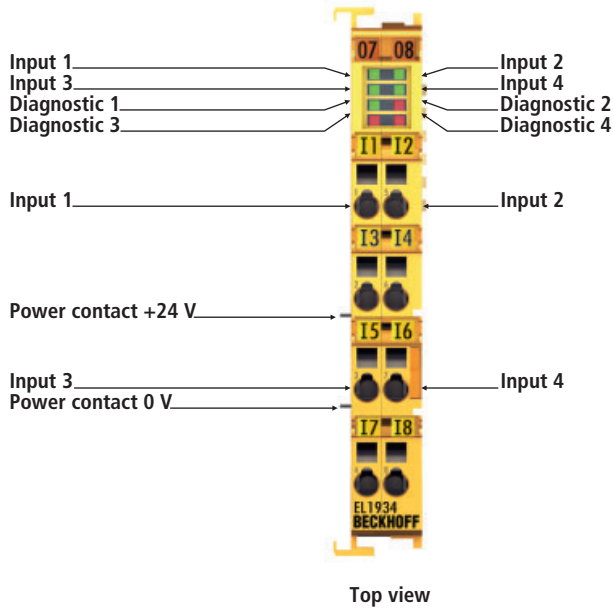




# EL1904 | 4-channel digital input terminal, TwinSAFE, 24 V DC

The EL1904 EtherCAT Terminal is a digital input terminal for sensors with potential-free contacts for 24 V DC. The EtherCAT Terminal has four fail-safe inputs. The EL1904 meets the requirements of IEC 61508 SIL 3, EN 954 Cat. 4 and DIN EN ISO 13849 PL<sub>e</sub>.

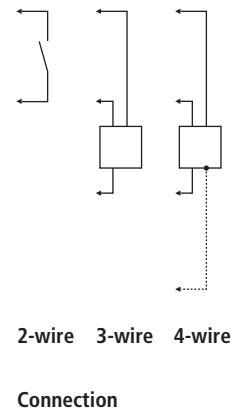
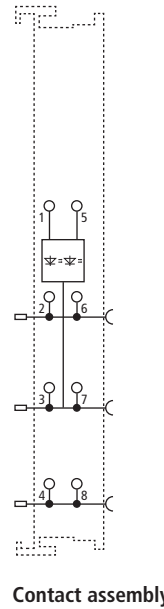
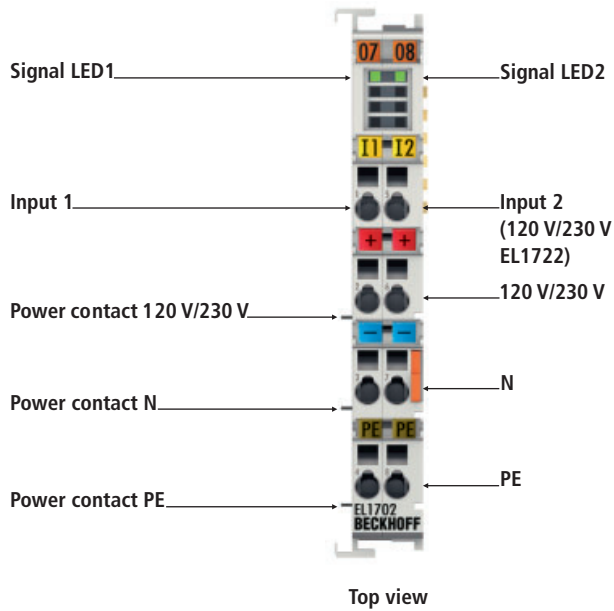
Technical data	EL1904
Number of inputs	4
Protocol	TwinSAFE/Safety over EtherCAT
Status display	8 LEDs: 1 per input, 4 diagnostic
Response time	typ. 4 ms (read input/write to E-bus)
Current consumption E-bus	approx. 200 mA
Fault response time	≤ watchdog time (parameterisable)
Bit width in the process image	input: 6 byte; output: 6 byte
Supply voltage	24 V DC (-15 %/+20 %)
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+70 °C
Permiss. degree of contamin.	2
Climate class EN60721-3-3	3K3
Electrical interference	EN 61000-6-2/EN 61000-6-4
Vibration/shock resistance	EN 60068-2-6/EN 60068-2-27/29
Installation position	horizontal
Protection class	IP 20
Further information	<a href="http://www.beckhoff.com/EL1904">www.beckhoff.com/EL1904</a>



## EL1934 | 4-channel digital input terminal, PROFI-safe, 24 V DC

The EL1934 PROFI-safe EtherCAT Terminal is a digital input terminal for sensors with potential-free contacts for 24 V DC and has four fail-safe inputs. The EL1934 meets the requirements of IEC 61508 SIL 3, EN 954 Cat. 4 and DIN EN ISO 13849 PL<sub>e</sub>.

Technical data	EL1934
Number of inputs	4
Protocol	PROFI-safe
Status display	8 LEDs: 1 per input, 4 diagnostic
Response time	typ. 4 ms (read input/write to E-bus)
Current consumption E-bus	approx. 200 mA
Fault response time	≤ watchdog time (parameterisable)
Bit width in the process image	input: 6 byte; output: 6 byte
Supply voltage	24 V DC (-15 %/+20 %)
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+70 °C
Permiss. degree of contamin.	2
Climate class EN60721-3-3	3K3
Electrical interference	EN 61000-6-2/EN 61000-6-4
Vibration/shock resistance	EN 60068-2-6/EN 60068-2-27/29
Installation position	horizontal
Protection class	IP 20
Further information	<a href="http://www.beckhoff.com/EL1934">www.beckhoff.com/EL1934</a>

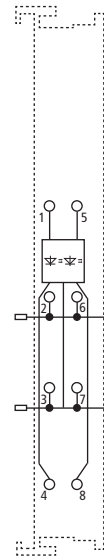
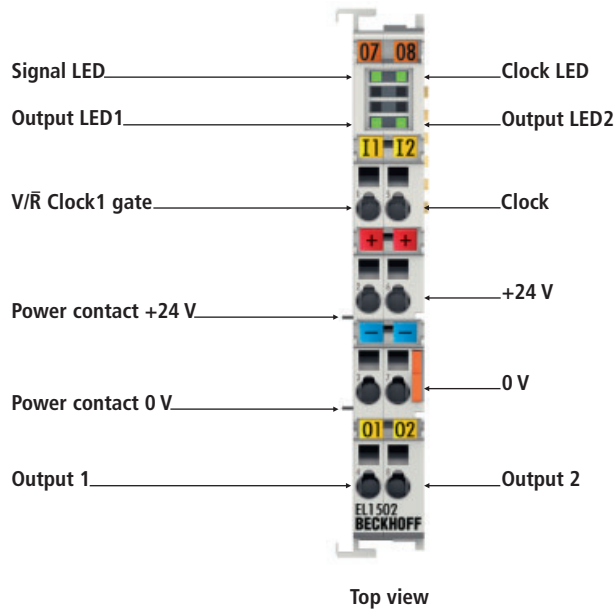


## EL1702, EL1712, EL1722 | 2-channel digital input terminals 120...230 V AC

The EL1702, EL1712 and EL1722 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation unit. It is possible to connect 120 V/230 V AC actuators directly. The EtherCAT Terminals contain two channels that indicate their signal state by means of light emitting diodes. The EL1722 version does not have any power contacts. This makes it possible to create individual potential groups. The voltage between input 1 and input 2 must not exceed 230 V AC. The EL1712 is also suitable for 120 V DC.

Technical data	EL1702   ES1702	EL1712   ES1712	EL1722   ES1722
Number of inputs	2	2	2 (no power contacts)
Nominal voltage	120 V AC/230 V AC	120 V AC/DC	120 V AC/230 V AC
"0" signal voltage	0...40 V		
"1" signal voltage	79...260 V	80...140 V	79...260 V
Input current	> 3 mA, typ. 6 mA		
Switching times	10 ms		
Current consumption E-bus	110 mA (see documentation)		
Electrical isolation	500 V <sub>rms</sub> (E-bus/mains voltage); 3,750 V AC, 1 min.		
Bit width in the process image	2 inputs		
Configuration	no address or configuration setting		
Weight	approx. 60 g		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all ESxxxx terminals		
Further information	<a href="http://www.beckhoff.com/EL1702">www.beckhoff.com/EL1702</a>		

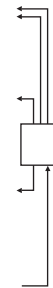
**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL1702](http://www.beckhoff.com/EL1702)



Contact assembly



no output connection



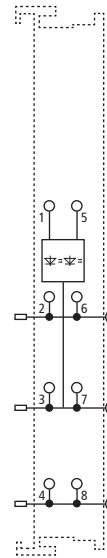
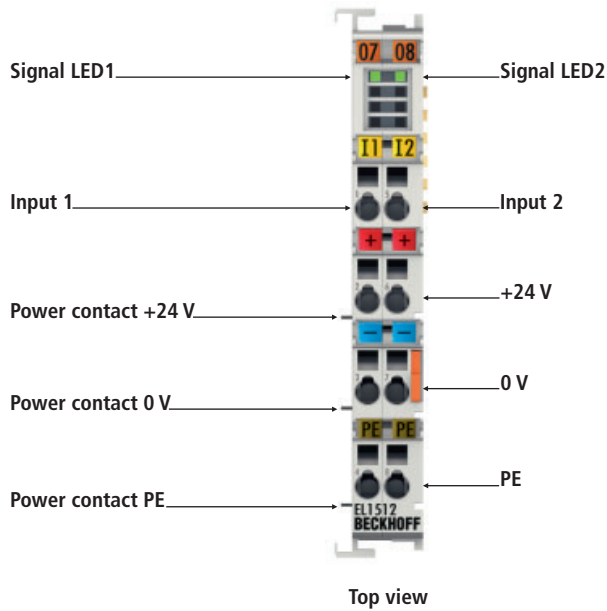
with output connection

## EL1502 | Up/down counter 24 V DC, 100 kHz

The up/down counter counts binary pulses, and transmits the counter state, in an electrically isolated form, to the higher-level automation device. In the EL1502 EtherCAT Terminal it is possible to choose the (32 bits) counting direction using the up/down input, the gate connection can be used to control the triggering. Using the Clock1 input it is possible to implement two (32 bits) counters. The EtherCAT Terminal contains two inputs that indicate their signal state via LEDs. Both outputs are switched according to the counter state, so that they can be used as fast control signals for field devices.

The EL1502 device supports the distributed clocks function. This means that the counter can be read at constant intervals (DC precision  $\ll 1 \mu\text{s}$ ).

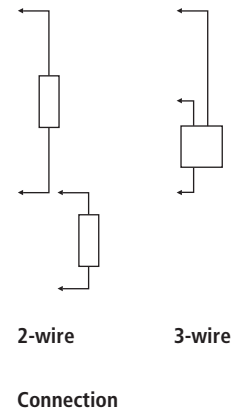
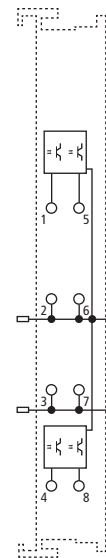
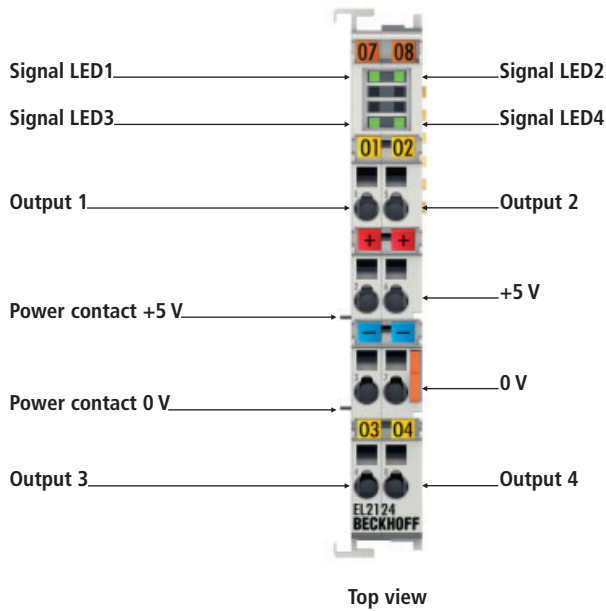
Technical data	EL1502   ES1502
Number of counters	1 or 2
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V
"1" signal voltage	15...30 V
Input current	typ. 5 mA
Counting frequency	100 kHz
Distributed clocks	yes
Max. output current	0.5 A (short-circuit-proof) per channel
Current consumption E-bus	typ. 130 mA
Counter depth	32 bits
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	48 bit counter input, 48 bit counter output
Configuration	no address setting, configuration via the EtherCAT master
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL1502">www.beckhoff.com/EL1502</a>



## EL1512 | 2-channel, up/down counter, 24 V DC, 1 kHz, 16 bit

The up/down counter counts binary pulses, and transmits the counter state, in an electrically isolated form, to the higher-level automation device. Optionally, the EL1512 EtherCAT Terminal can be set up as an up or down counter (16 bits). The EtherCAT Terminal contains two inputs that indicate their signal state by means of light emitting diodes. The EL1512 is particularly suitable for simple counting tasks, e.g. in connection with flow meters.

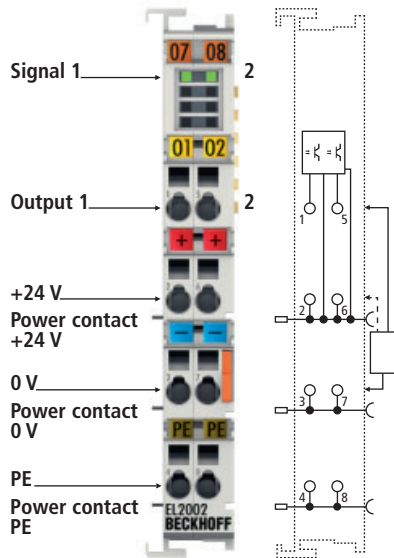
Technical data	EL1512   ES1512
Number of inputs	2
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V (EN 61131-2, type 1)
"1" signal voltage	15...30 V (EN 61131-2, type 1)
Input current	typ. 3 mA (EN 61131-2, type 1)
Input filter	10 $\mu$ s
Counting frequency	max. 1 kHz
Current consumption E-bus	typ. 130 mA
Counter depth	16 bits
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	input/output: 16 bit data, 16 bit control/status
Configuration	no address setting, configuration via the EtherCAT master
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL1512">www.beckhoff.com/EL1512</a>



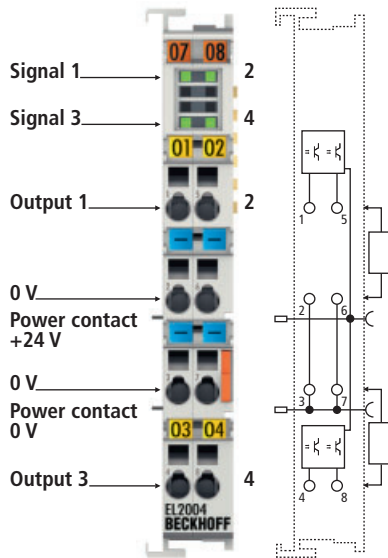
## EL2124 | 4-channel digital output terminal 5 V DC

The EL2124 digital output terminal connects the binary control signals from the automation unit on to the actuators at the process level with electrical isolation. The load current outputs of the EL2124 are protected against overload and short circuit. The EtherCAT Terminal has four channels that indicate their signal state via light emitting diodes.

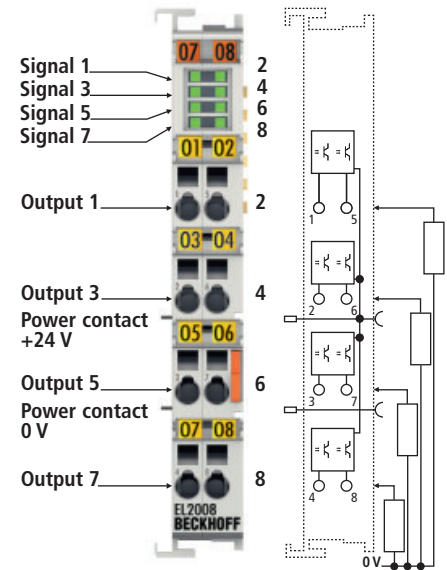
Technical data	EL2124   ES2124
Number of outputs	4
Rated load voltage	5 V DC
Load type	ohmic, inductive, lamp load
Max. output current	±20 mA (short-circuit-proof) per channel, 8 mA signal current, type CMOS output
Switching times	typ. $T_{ON}$ : < 1 $\mu$ s, $T_{OFF}$ : < 1 $\mu$ s
Current consumption E-bus	typ. 130 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	4 outputs
Configuration	no address or configuration setting
Weight	approx. 70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL2124">www.beckhoff.com/EL2124</a>



Contact assembly, connection



Contact assembly, connection

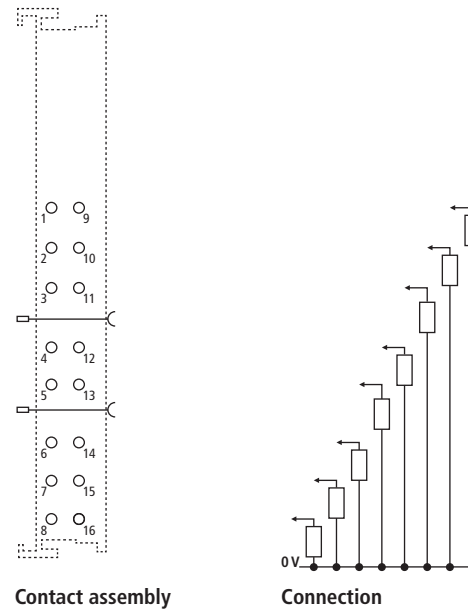
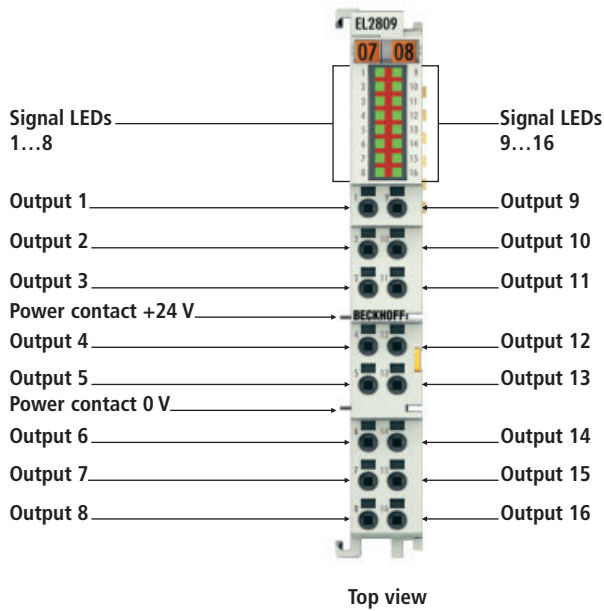


Contact assembly, connection

## EL2002, EL2004, EL2008 | 2-, 4-, 8-channel digital output terminals 24 V DC, 0.5 A

The EL2002, EL2004 and EL2008 digital output terminals connect the binary control signals from the automation unit on to the actuators at the process level with electrical isolation. The variants differ in terms of the number of channels and their connection type. The EtherCAT Terminals indicate their signal state via an LED.

Technical data	EL2002   ES2002	EL2004   ES2004	EL2008   ES2008
Number of outputs	2	4	8
Rated load voltage	24 V DC (-15 %/+20 %)		
Load type	ohmic, inductive, lamp load		
Max. output current	0.5 A (short-circuit-proof) per channel		
Reverse voltage protection	yes		
Breaking energy	< 150 mJ/channel		
Switching times	typ. T <sub>ON</sub> : 60 µs, typ. T <sub>OFF</sub> : 300 µs		
Current consumption E-bus	typ. 100 mA	typ. 100 mA	typ. 110 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)		
Current consumption power contacts	typ. 15 mA + load		
Bit width in the process image	2 outputs	4 outputs	8 outputs
Configuration	no address or configuration setting		
Weight	approx. 55 g		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable	IP 20/variable	IP 20/see documentation
Pluggable wiring	for all ESxxxx terminals		
Further information	www.beckhoff.com/EL2002		



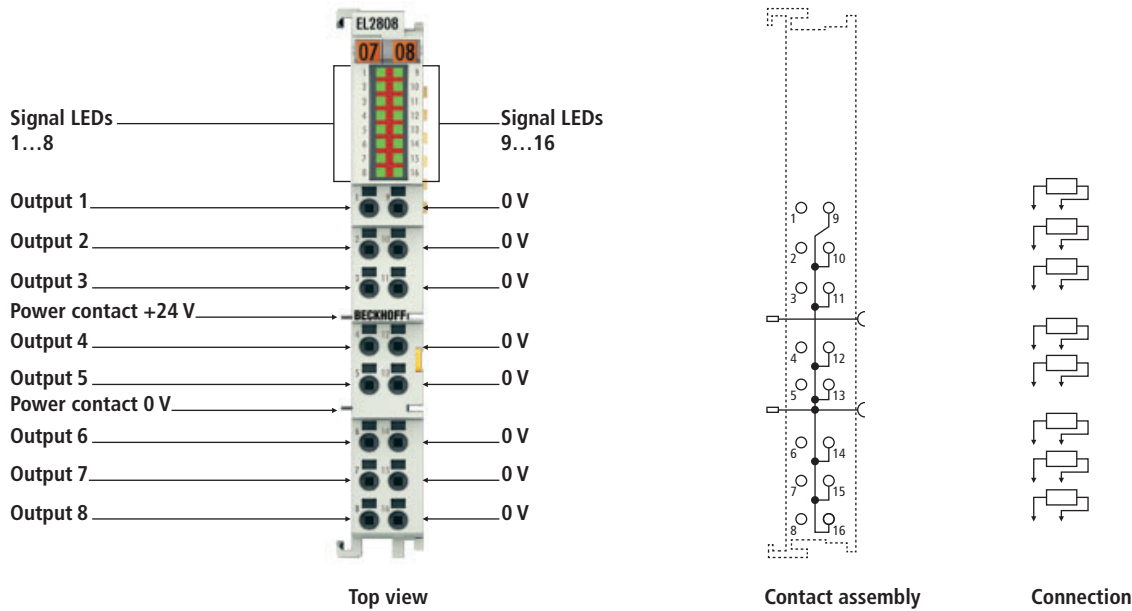
## EL2809 | 16-channel digital output terminal 24 V DC, 0.5 A

The EL2809 digital output terminal connects the binary control signals from the automation device on to the actuators at the process level with electrical isolation. The EL2809 is protected against polarity reversal and processes load currents with outputs protected against overload and short-circuit. The EtherCAT Terminal contains 16 channels, whose signal states are displayed by LEDs. The terminal is particularly suitable for space-saving use in control cabinets. The connection technology is particularly suitable for single-ended inputs. All components have to use the same reference point as the EL2809. The power contacts are looped through.

The outputs are fed via the 24 V power contact in the EL2809. The conductors can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	EL2809
Number of outputs	16
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A (short-circuit-proof) per channel
Reverse voltage protection	yes
Breaking energy	< 150 mJ/channel
Switching times	typ. T <sub>ON</sub> : 60 µs, typ. T <sub>OFF</sub> : 300 µs
Current consumption E-bus	typ. 140 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Current consumption power contacts	typ. 15 mA + load
Bit width in the process image	16 outputs
Configuration	no address or configuration setting
Conductor types	solid wire, stranded wire and ferrule
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5 mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>
Weight	approx. 70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable (see documentation)
Further information	<a href="http://www.beckhoff.com/EL2809">www.beckhoff.com/EL2809</a>





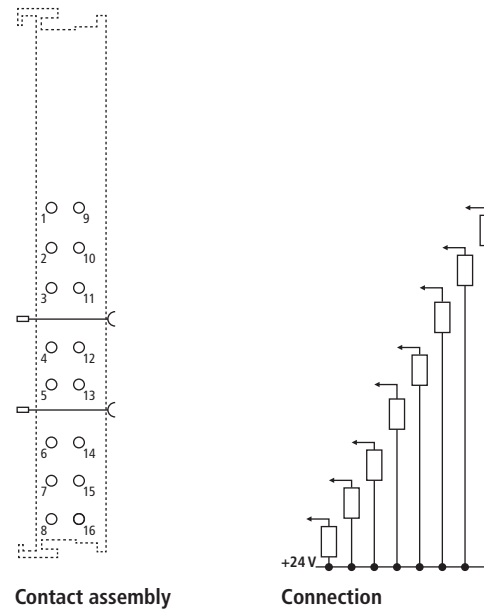
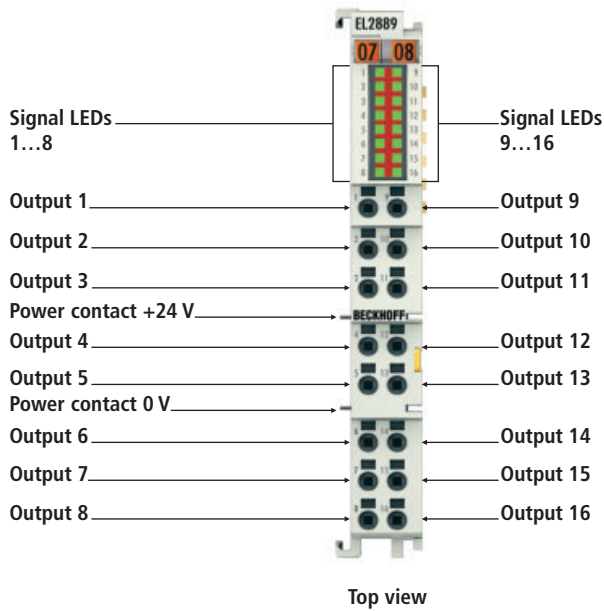
## EL2808 | 8-channel digital output terminal 24 V DC, 0.5 A

The EL2808 digital output terminal connects the binary control signals from the automation device on to the actuators at the process level with electrical isolation. The EL2808 is protected against polarity reversal and processes load currents with outputs protected against overload and short-circuit. The EtherCAT Terminal contains eight channels, consisting of a signal output and 0 V DC. The signal states are displayed by LEDs. The power contacts are looped through.

The outputs are fed via the 24 V power contact in the EL2808. The conductors can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	EL2808
Number of outputs	8
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A (short-circuit-proof) per channel
Reverse voltage protection	yes
Breaking energy	< 150 mJ/channel
Switching times	typ. $T_{ON}$ : 60 $\mu$ s, typ. $T_{OFF}$ : 300 $\mu$ s
Current consumption E-bus	typ. 110 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Current consumption power contacts	typ. 15 mA + load
Bit width in the process image	8 outputs
Configuration	no address or configuration setting
Conductor types	solid wire, stranded wire and ferrule
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5 mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>
Weight	approx. 65 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable (see documentation)
Further information	<a href="http://www.beckhoff.com/EL2808">www.beckhoff.com/EL2808</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL2808](http://www.beckhoff.com/EL2808)



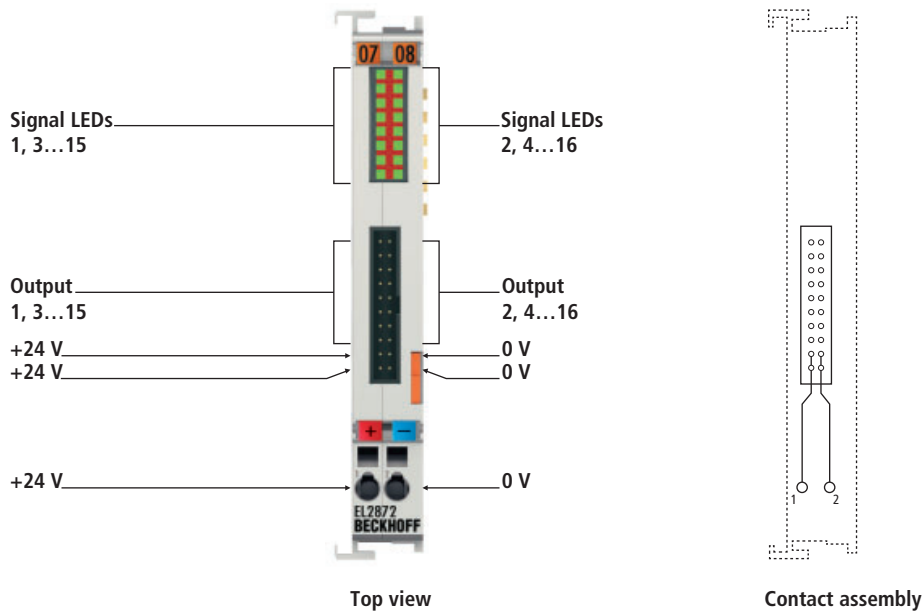
## EL2889 | 16-channel digital output terminal 24 V DC, 0.5 A, 0 V (ground) switching

The EL2889 digital output terminal connects the binary control signals from the automation device on to the actuators at the process level with electrical isolation. The EL2889 is protected against polarity reversal and processes load currents with outputs protected against overload and short-circuit. The EtherCAT Terminal contains 16 channels, whose signal states are displayed by LEDs. The terminal is particularly suitable for space-saving use in control cabinets. The connection technology is particularly suitable for single-ended inputs. All components have to use the same reference point as the EL2889. The power contacts are looped through.

The outputs are fed via the 0 V power contact in the EL2889. The conductors can be connected without tools in the case of solid wires using a direct plug-in technique.

Technical data	EL2889
Number of outputs	16
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A (short-circuit-proof) per channel
Current consumption E-bus	typ. 140 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Current consumption power contacts	typ. 30 mA + load
Bit width in the process image	16 outputs
Configuration	no address or configuration setting
Conductor types	solid wire, stranded wire and ferrule
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5 mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>
Weight	approx. 70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable (see documentation)
Further information	<a href="http://www.beckhoff.com/EL2889">www.beckhoff.com/EL2889</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL2889](http://www.beckhoff.com/EL2889)

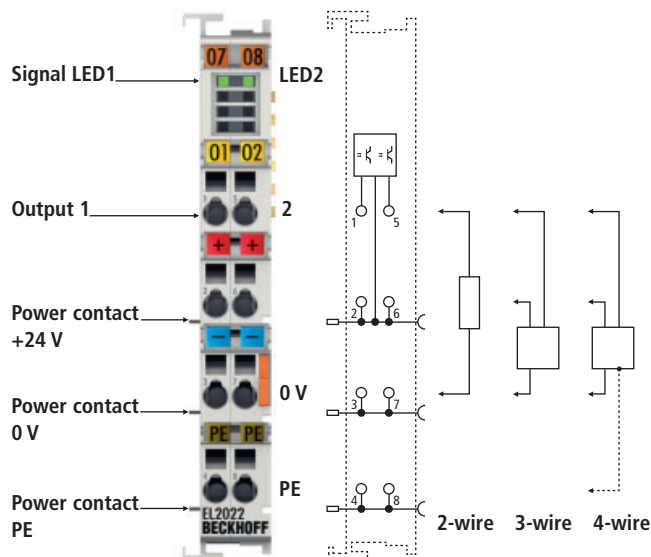


## EL2872 | 16-channel digital output terminal 24 V DC, flat-ribbon cable connection

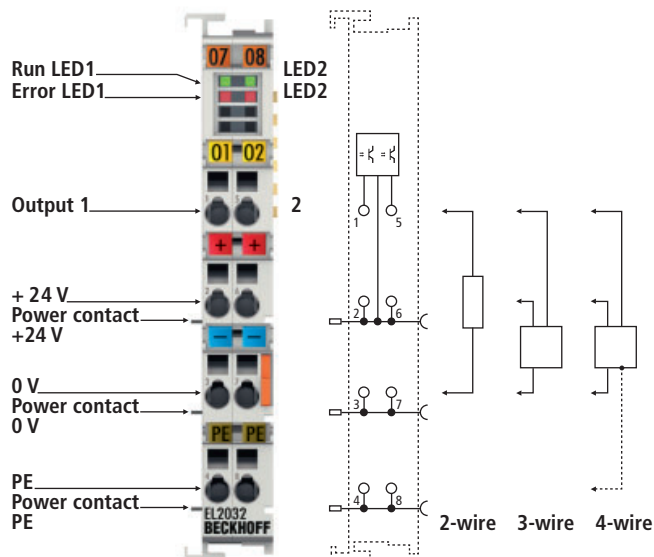
The EL2872 digital output terminal offers a very compact design with its 16 channels. A 20-pin connector enables the secure connection of plug connectors using insulation displacement contact, as is usual for ribbon cables and special round cables. This significantly simplifies the wiring of many channels. State-of-the-art output drivers guarantee minimum power dissipation. 16 LEDs display the logical signal states of the outputs.

Technical data	EL2872
Number of outputs	16
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A (short-circuit-proof) per channel
Short circuit current	0.6...1.0 A
Reverse voltage protection	no
Breaking energy	< 150 mJ/channel
Current consumption E-bus	typ. 130 mA (see documentation)
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	16 outputs
Configuration	no address or configuration setting
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EL2872">www.beckhoff.com/EL2872</a>

Special terminals	
EL2872-0010	16-channel digital output terminal 24 V DC, flat-ribbon cable connection, switching to ground potential



Top view, contact assembly, connection



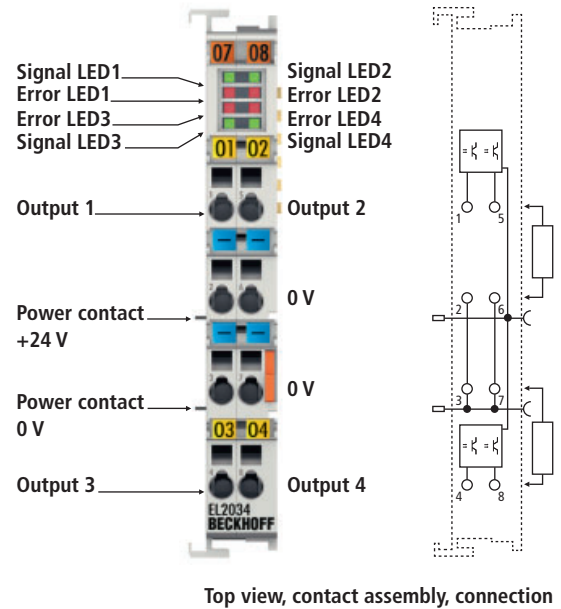
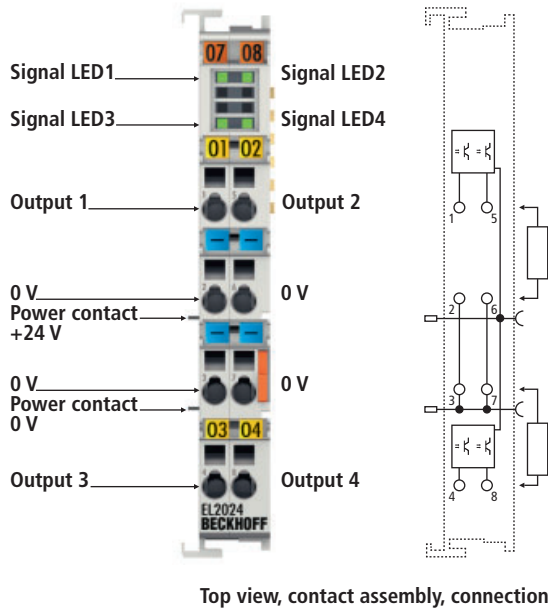
Top view, contact assembly, connection

## EL2022, EL2032 | 2-channel digital output terminals 24 V DC, 2 A

The EL2022 and EL2032 digital output terminals connect the binary control signals from the automation unit on to the actuators at the process level with electrical isolation. The EtherCAT Terminals offer short-circuit protection of the outputs and contain two channels that indicate their signal state by means of light emitting diodes.

The EL2032 enables direct connection of two 3-wire actuators; diagnostic LEDs and input bits indicate short circuits and wire breakage.

Technical data	EL2022   ES2022	EL2032   ES2032
Number of outputs	2	
Rated load voltage	24 V DC (-15 %/+20 %)	
Load type	ohmic, inductive, lamp load	
Max. output current	2.0 A (short-circuit-proof) per channel	
Reverse voltage protection	yes	
Breaking energy	< 1.7 J/channel	
Switching times	T <sub>ON</sub> : 40 µs, T <sub>OFF</sub> : typ. 200 µs	
Current consumption E-bus	typ. 100 mA	
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)	
Current consumption power contacts	typ. 9 mA + load	typ. 13 mA + load
Bit width in the process image	2 outputs	2 outputs, 2 inputs (diagnostics)
Configuration	no address or configuration setting	
Weight	approx. 55 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all ESxxxx terminals	
Further information	www.beckhoff.com/EL2022	



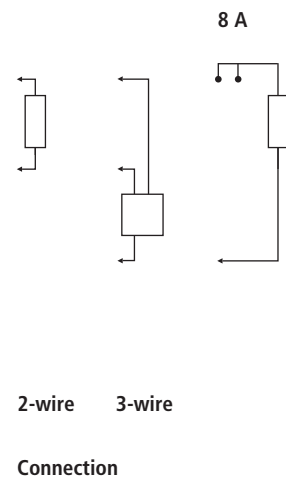
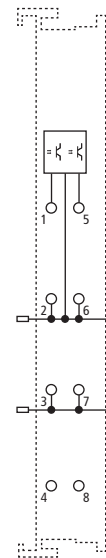
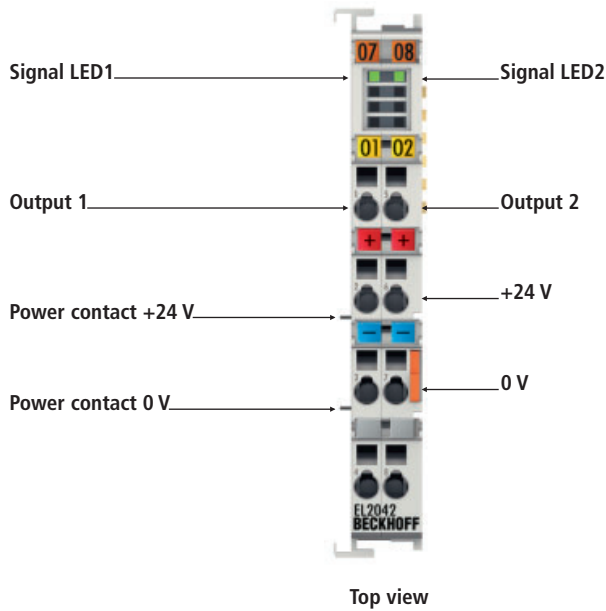
## EL2024, EL2034 | 4-channel digital output terminals 24 V DC, 2 A

The EL2024 and EL2034 digital output terminals connect the binary 24 V control signals, electrically isolated, with the actuators. Four channels are available and indicate their signal state via LEDs. The terminals enable direct connection of four 2-wire actuators. They feature four earth connecting points. The EL2034 offers output diagnostics in the form of short circuit and open circuit detection per channel.

Technical data	EL2024   ES2024	EL2034   ES2034
Number of outputs	4	
Rated load voltage	24 V DC (-15 %/+20 %)	
Load type	ohmic, inductive, lamp load	
Max. output current	2.0 A (short-circuit-proof) per channel	
Reverse voltage protection	yes	
Breaking energy	< 1.7 J/channel	
Switching times	T <sub>ON</sub> : typ. 40 μs, T <sub>OFF</sub> : typ. 200 μs	
Current consumption E-bus	typ. 120 mA	
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)	
Current consumption power contacts	typ. 13 mA + load	typ. 14 mA + load
Bit width in the process image	4 outputs	4 outputs + 4 diagnostic inputs
Configuration	no address or configuration setting	
Weight	approx. 55 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all ESxxx terminals	
Further information	www.beckhoff.com/EL2024	

### Special terminals

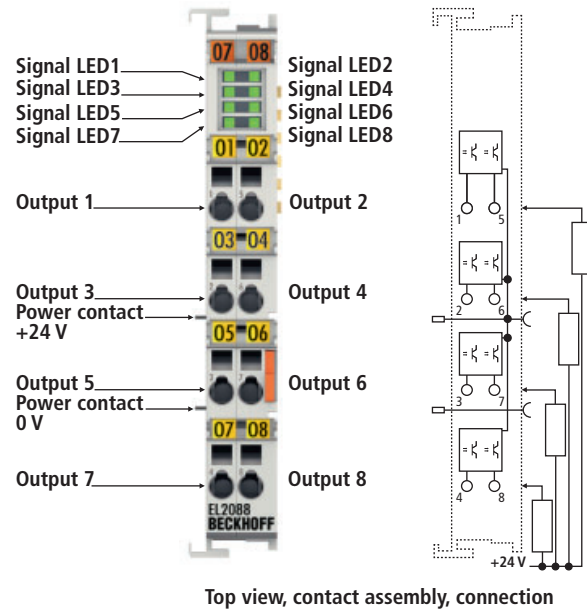
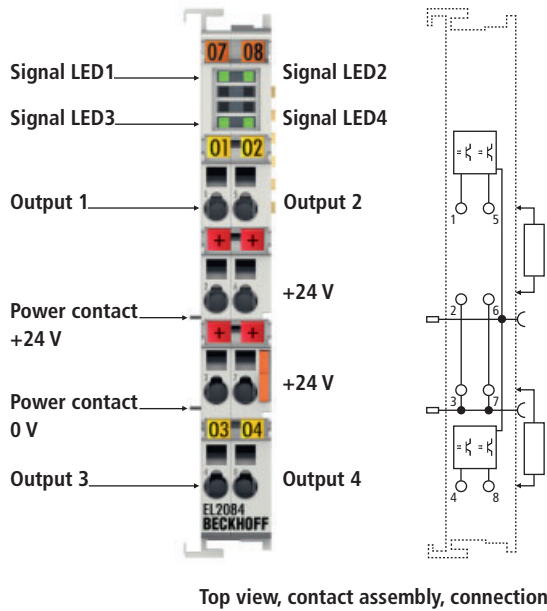
EL2024-0010	rated load voltage 12 V DC (-15 %/+20 %)
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## EL2042 | 2-channel digital output terminal 24 V DC, 2 x 4 A/1 x 8 A

The EL2042 digital output terminal connects the binary 24 V control signals, electrically isolated, with the actuators. Two channels are available and indicate their signal state via LEDs. The EL2042 enables connection of loads with current consumption up to 8 A if the outputs are connected in parallel.

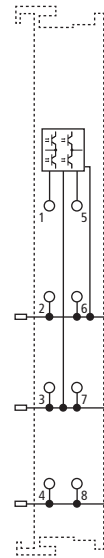
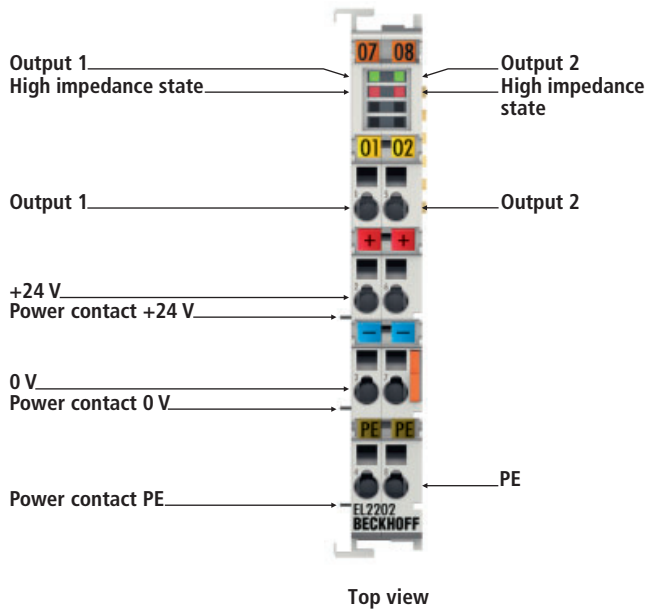
Technical data	EL2042   ES2042
Number of outputs	2
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	4.0 A (short-circuit-proof) per channel, 8 A for parallel connection
Reverse voltage protection	yes
Switching times	$T_{ON}$ : typ. 40 $\mu$ s, $T_{OFF}$ : typ. 200 $\mu$ s
Current consumption E-bus	typ. 120 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	2 outputs
Configuration	no address or configuration setting
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL2042">www.beckhoff.com/EL2042</a>



## EL2084, EL2088 | 4-, 8-channel digital output terminals 24 V DC, switching to negative potential

The EL2084 and EL2088 digital output terminals connect the binary control signals from the automation unit on to the actuators at the process level with electrical isolation. The EtherCAT Terminals have four 0 V (ground) switching outputs and generate load currents with outputs that are resistant to overload and short-circuit. They contain four or eight channels that indicate their signal state by means of light emitting diodes.

Technical data	EL2084   ES2084	EL2088   ES2088
Number of outputs	4	8
Rated load voltage	24 V DC (-15 %/+20 %)	
Load type	ohmic, inductive, lamp load	
Max. output current	0.5 A (short-circuit-proof) per channel	0.5 A (total current 3 A)
Current consumption E-bus	typ. 100 mA	typ. 110 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)	
Current consumption power contacts	30 mA + load	
Bit width in the process image	4 outputs	8 outputs
Configuration	no address or configuration setting	
Weight	approx. 70 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all ESxxxx terminals	
Further information	www.beckhoff.com/EL2084	



Contact assembly



Connection

## EL2202 | 2-channel digital output terminal 24 V DC, $T_{ON}/T_{OFF}$ 1 $\mu$ s, push-pull outputs, tri-state



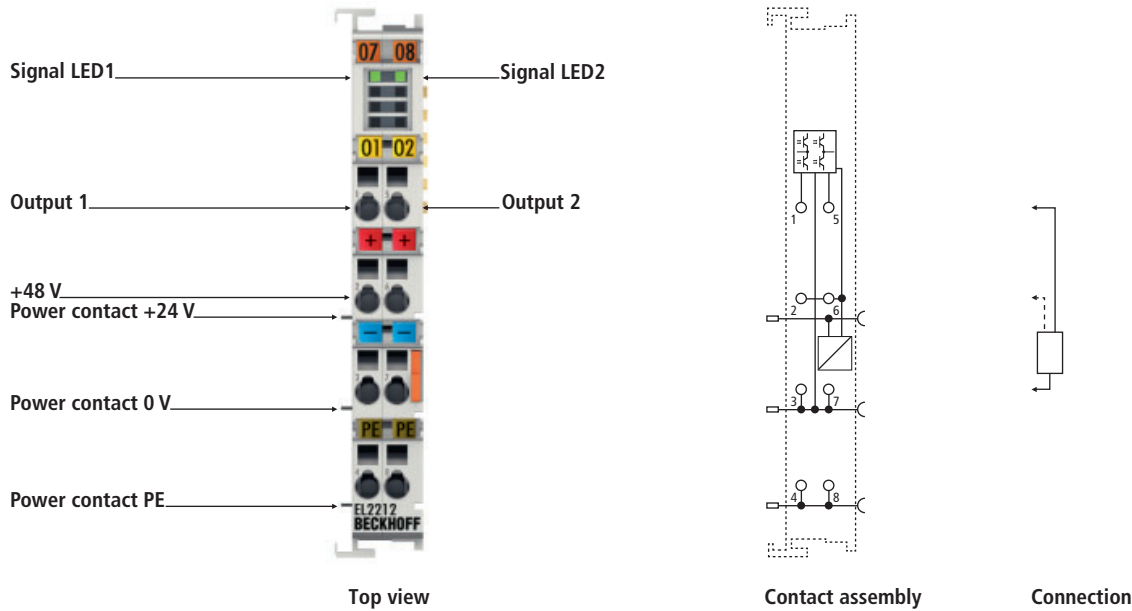
The EL2202 digital output terminal connects the binary control signals from the automation unit on to the actuators at the process level with electrical isolation. This terminal benefits from very small output delay and is therefore suitable for signals requiring particularly fast output. The EtherCAT Terminal supports distributed clocks, i.e. output data can be monitored synchronously with other data from terminals with distributed clock support, if the user switches to terminal version EL2202-0100 (see documentation). The DC accuracy across the system is  $\ll 1 \mu$ s. The EtherCAT Terminal has a push-pull output that enables the output to be connected actively to 24 V, 0 V or high-resistance. The EL2202 contains two channels, whose signal state per channel is indicated via LEDs. Each output can be switched to high resistance.

Technical data	EL2202   ES2202
Number of outputs	2
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Distributed clocks	yes
Max. output current	0.5 A (per channel)
Switching times	typ. $T_{ON}$ : < 1 $\mu$ s, typ. $T_{OFF}$ : < 1 $\mu$ s
Output stage	push-pull
Current consumption E-bus	typ. 130 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	2 outputs, 2 bit enable tri-state
Configuration	no address or configuration setting
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL2202">www.beckhoff.com/EL2202</a>

XFC technology description see

664



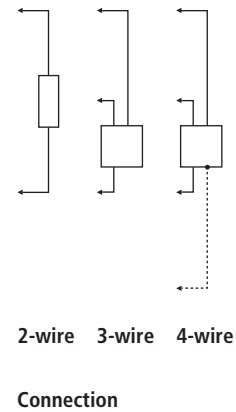
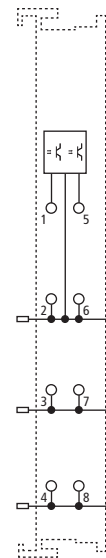
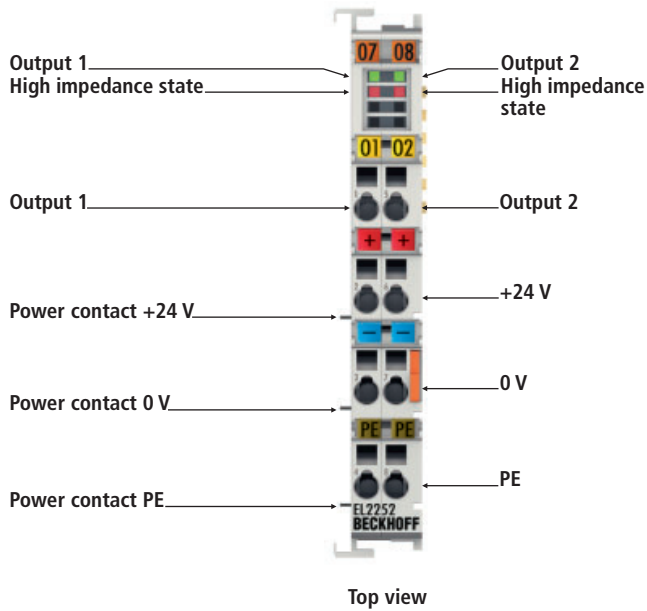


## EL2212 | 2-channel digital output terminal 24 V DC with overexcitation

The EL2212 digital output terminal connects the binary control signals from the automation unit on to the actuators at the process level with electrical isolation. It is suitable for actuators, e.g. valves, with particularly fast switching requirements. It operates with overexcitation and initially applies a higher voltage of 48 V to the actuator with the aid of the booster stage. In conjunction with a higher current, which the terminal can supply for a short time, valves can switch significantly more quickly. In hold mode the terminal reduces the current accordingly. The EtherCAT Terminal supports distributed clocks, i.e. the output data can be monitored synchronously with other data from terminals with distributed clock support. The accuracy across the system is  $\ll 1 \mu\text{s}$ . The EL2212 contains two channels, the signal state of which is indicated via LEDs.

Technical data	EL2212   ES2212
Number of outputs	2
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive
Distributed clocks	yes
Max. output current	0.5 A (per channel), max. 5 A peak current (see documentation)
Switching times	typ. $T_{\text{on}}$ : $< 1 \mu\text{s}$ , typ. $T_{\text{off}}$ : $< 1 \mu\text{s}$
Output stage	push-pull
Current consumption E-bus	130 mA (see documentation)
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	2 outputs, 2 bit enable overexcitation
Configuration	no address or configuration setting
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL2212">www.beckhoff.com/EL2212</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL2212](http://www.beckhoff.com/EL2212)



## EL2252 | 2-channel digital output terminal with time stamp, tri-state

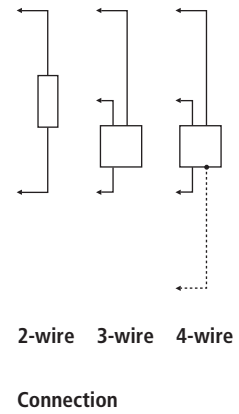
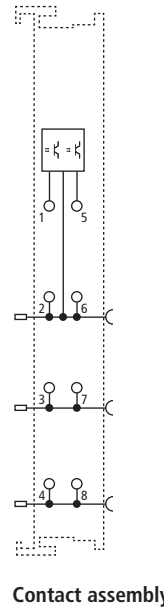
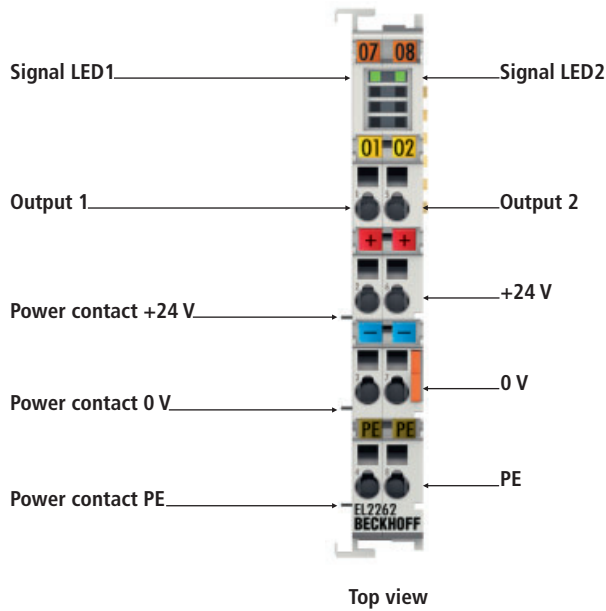


The EL2252 digital output terminal connects the binary control output signals at the process level with electrical isolation. The outputs are switched precisely synchronised with the transferred time stamp, which has a resolution of 10 ns. This technology enables output switching times to be specified precisely across the system. The distributed clocks are used for reference. In conjunction with the EL1252 (digital input terminal with time stamp), the EL2252 enables responses with equidistant time intervals, largely independent of the bus cycle time. Each output can be switched to high resistance individually.

Technical data	EL2252   ES2252
Number of outputs	2
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Resolution time stamp	1 ns (channel 0/1)
Precision of time stamp in the terminal	10 ns (+ output circuit drift)
Distributed clock precision	<< 1 $\mu$ s
Output delay through 24 V power section	typ. < 1 $\mu$ s
Max. output current	0.5 A (short-circuit-proof) per channel
Current limitation	typ. 1.5 A
Breaking energy	< 150 mJ/channel
Switching times	see documentation
Current consumption E-bus	typ. 130 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Current consumption power contacts	typ. 15 mA + load
Bit width in the process image	8 bit output (ch. 1 + ch. 2), 9 byte time stamp
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL2252">www.beckhoff.com/EL2252</a>

XFC technology description see

664



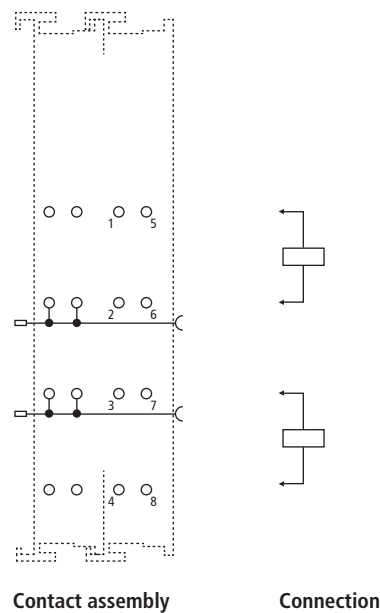
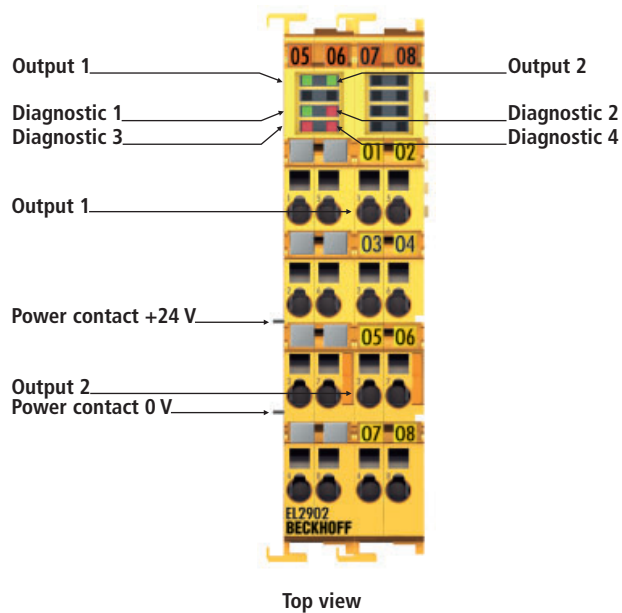
## EL2262 | 2-channel digital output terminal with oversampling



The EL2262 digital output terminal connects the binary control output signals at the process level with electrical isolation. The outputs are controlled with an adjustable, integer multiple (oversampling factor:  $n$ ) of the bus cycle time ( $n$  microcycles per bus cycle). For each micro-cycle, the EtherCAT Terminal receives a process data block that is output consecutively. The time base of the terminal can be synchronised precisely with other EtherCAT devices via distributed clocks. This enables an output pattern with a significantly higher pulse sequence than the bus cycle time, exactly synchronised with the system time base. This procedure enables the temporal resolution of the digital output signals to be increased to  $n$  times the bus cycle time. The maximum output rate is 1 Msample/s.

Technical data	EL2262   ES2262
Number of outputs	2
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Oversampling factor	$n$ = integer multiple of the cycle time, 1...1,000
Distributed clocks	yes
Distributed clock precision	$\ll 1 \mu\text{s}$
Max. output current	0.5 A (short-circuit-proof in push operation) per channel
Current limitation	typ. 4 A/150 $\mu\text{s}$
Breaking energy	< 150 mJ/channel
Switching times	typ. $T_{\text{ON}}$ : < 1 $\mu\text{s}$ , typ. $T_{\text{OFF}}$ : < 1 $\mu\text{s}$
Output rate	max. 1 Msample/s, min. cycle 1 $\mu\text{s}$
Current consumption E-bus	typ. 70 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Current consumption power contacts	typ. 35 mA + load
Bit width in the process image	$n \times 2$ outputs + 32 bit CycleCounter + 32 bit StartTimeNextOutput
Configuration	via TwinCAT System Manager
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL2262">www.beckhoff.com/EL2262</a>

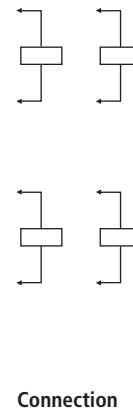
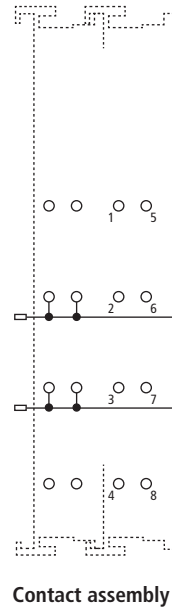
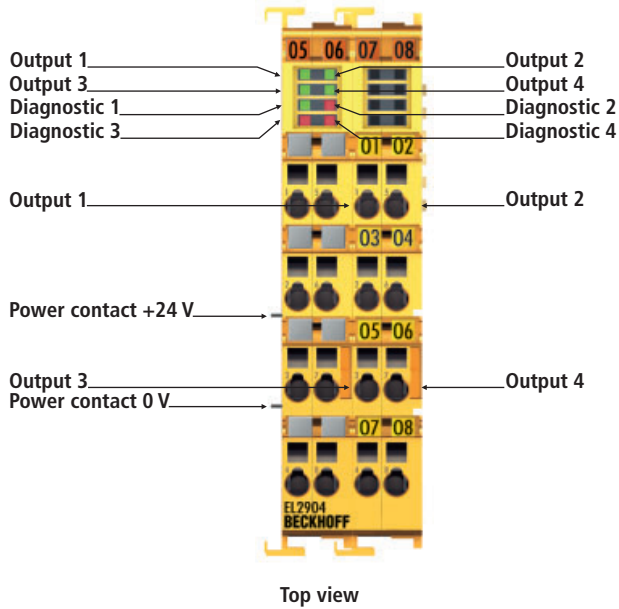
XFC technology description see 664



## EL2902 | 2-channel digital output terminal, TwinSAFE, 24 V DC, 2.3 A

The EL2902 safety EtherCAT Terminal is a digital output terminal with two channels. It switches 24 V DC actuators with up to 2.3 A current per channel. If the EtherCAT Terminal detects a fault, it switches off automatically (fail stop). The EL2902 meets the requirements of IEC 61508 SIL 3, EN 954 Cat. 4 and DIN EN ISO 13849 PL<sub>e</sub>.

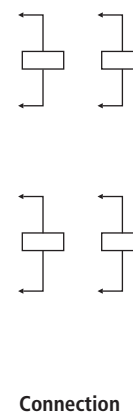
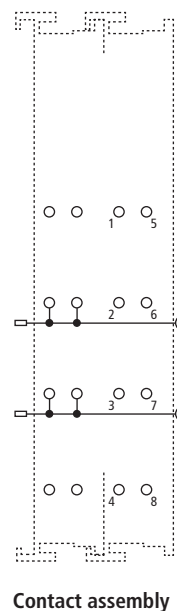
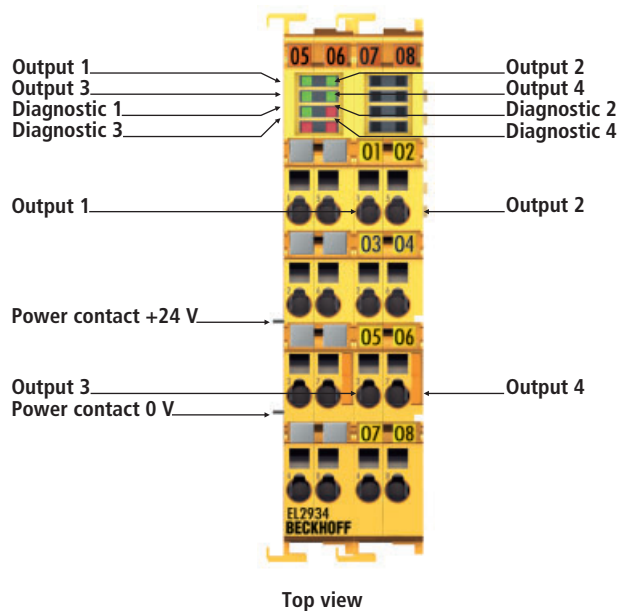
Technical data	EL2902
Number of outputs	2
Protocol	TwinSAFE/Safety over EtherCAT
Status display	6 LEDs: 1 per output, 4 diagnostic
Fault response time	≤ watchdog time (parameterisable)
Bit width in the process image	input: 6 byte; output: 6 byte
Supply voltage	24 V DC (-15 %/+20 %)
Max. output current	2.3 A (per channel)
Weight	approx. 90 g
Operating/storage temperature	0...+55 °C/-25...+70 °C
Permiss. degree of contamin.	2
Climate class EN60721-3-3	3K3
Electrical interference	EN 61000-6-2/EN 61000-6-4
Vibration/shock resistance	EN 60068-2-6/EN 60068-2-27/29
Installation position	horizontal
Protection class	IP 20
Further information	<a href="http://www.beckhoff.com/EL2902">www.beckhoff.com/EL2902</a>



# EL2904 | 4-channel digital output terminal, TwinSAFE, 24 V DC

The EL2904 safety EtherCAT Terminal is a digital output terminal with four channels. It switches 24 V DC actuators with up to 0.5 A current per channel. If the EtherCAT Terminal detects a fault, it switches off automatically (fail stop). The EL2904 meets the requirements of IEC 61508 SIL 3, EN 954 Cat. 4 and DIN EN ISO 13849 PL<sub>e</sub>.

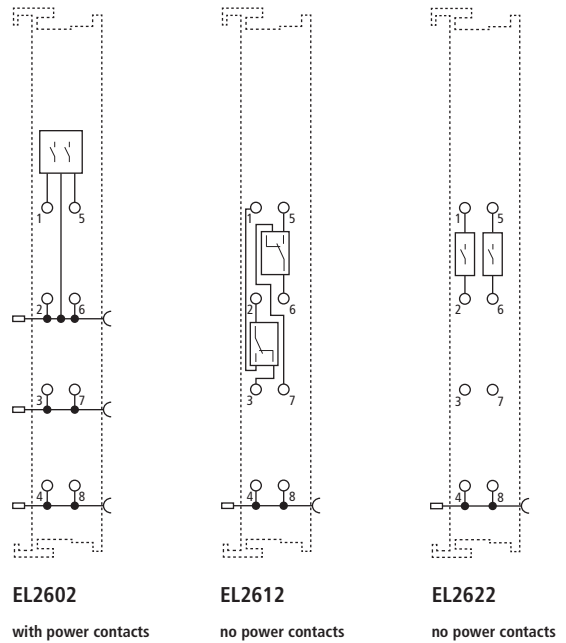
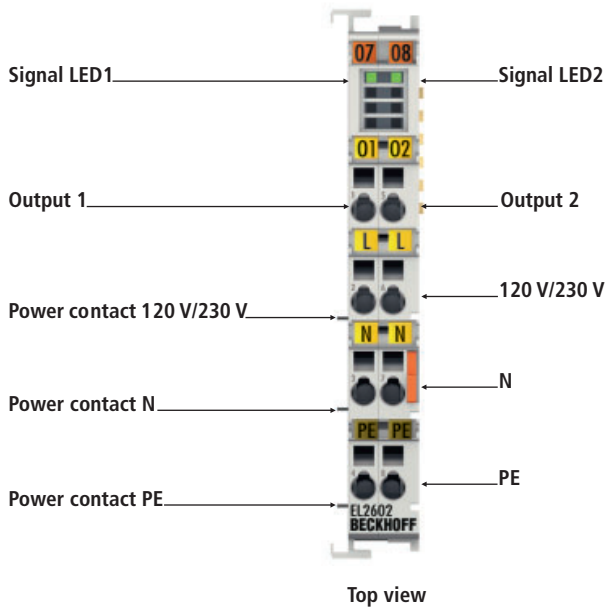
Technical data	EL2904
Number of outputs	4
Protocol	TwinSAFE/Safety over EtherCAT
Status display	8 LEDs: 1 per output, 4 diagnostic
Current consumption E-bus	approx. 221 mA
Fault response time	≤ watchdog time (parameterisable)
Bit width in the process image	input: 6 byte; output: 6 byte
Supply voltage	24 V DC (-15 %/+20 %)
Max. output current	0.5 A (per channel), min. 20 mA (with active current measurement)
Weight	approx. 90 g
Operating/storage temperature	0...+55 °C/-25...+70 °C
Permiss. degree of contamin.	2
Climate class EN60721-3-3	3K3
Electrical interference	EN 61000-6-2/EN 61000-6-4
Vibration/shock resistance	EN 60068-2-6/EN 60068-2-27/29
Installation position	horizontal
Protection class	IP 20
Further information	www.beckhoff.com/EL2904



## EL2934 | 4-channel digital output terminal, PROFIsafe, 24 V DC

The EL2934 PROFIsafe EtherCAT Terminal is a digital output terminal with four channels. It switches 24 V DC actuators with up to 0.5 A current per channel. If the EtherCAT Terminal detects a fault, it switches off automatically (fail stop). The EL2934 meets the requirements of IEC 61508 SIL 3, EN 954 Cat. 4 and DIN EN ISO 13849 PL e.

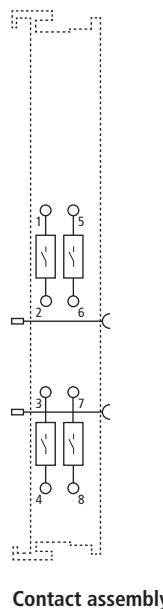
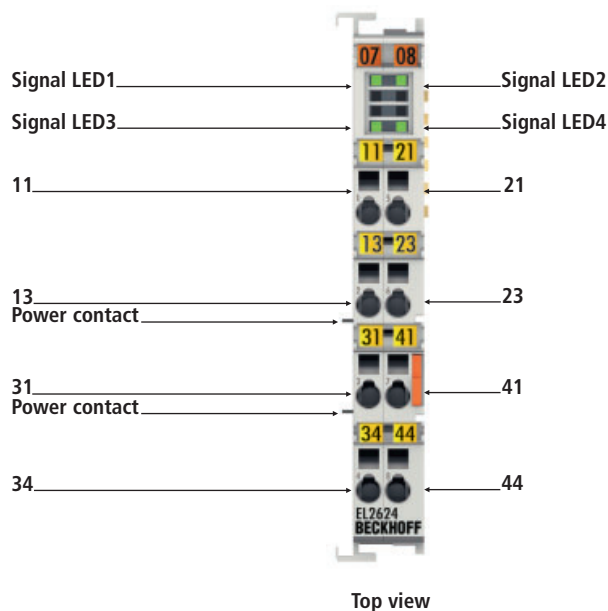
Technical data	EL2934
Number of inputs	4
Protocol	PROFIsafe
Status display	8 LEDs: 1 per output, 4 diagnostic
Current consumption E-bus	approx. 221 mA
Fault response time	≤ watchdog time (parameterisable)
Bit width in the process image	input: 6 byte; output: 6 byte
Supply voltage	24 V DC (-15 %/+20 %)
Max. output current	0.5 A (per channel), min. 20 mA (with active current measurement)
Weight	approx. 100 g
Operating/storage temperature	0...+55 °C/-25...+70 °C
Permiss. degree of contamin.	2
Climate class EN60721-3-3	3K3
Electrical interference	EN 61000-6-2/EN 61000-6-4
Vibration/shock resistance	EN 60068-2-6/EN 60068-2-27/29
Installation position	horizontal
Protection class	IP 20
Further information	<a href="http://www.beckhoff.com/EL2934">www.beckhoff.com/EL2934</a>



## EL2602, EL2612, EL2622 | 2-channel relay output terminals

The EL2602, EL2612 and EL2622 output terminals have two relays each of which has a single contact. The relay contact is connected to the power contacts, which are suitable for use at up to 230 V AC, and can be generally used for switching devices requiring mains power. The EtherCAT Terminals indicate their signal state by means of light emitting diodes. The EL2612 and EL2622 have potential-free contacts. The power contacts are not looped through.

Technical data	EL2602   ES2602	EL2612   ES2612	EL2622   ES2622
Number of outputs	2 x make contacts for power contact	2 x change-over	2 x make contacts
Rated load voltage	230 V AC/30 V DC	125 V AC/30 V DC	230 V AC/30 V DC
Ohmic switching current	5 A AC/DC	0.5 A AC/2 A DC	5 A AC/DC
Inductive switching current	2 A AC/DC	no data	2 A AC/DC
Minimum permitted load	10 mA at 5 V DC	10 µA at 10 mV DC	10 mA at 5 V DC
Lamp test, electronic ballast	4 x 58 W	–	4 x 58 W
Current consumption E-bus	typ. 170 mA	typ. 150 mA	typ. 170 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)		
Bit width in the process image	2 outputs		
Operating cycles mech. (min.)	2 x 10 <sup>7</sup>	1 x 10 <sup>8</sup>	2 x 10 <sup>7</sup>
Operating cycles electr. (min.)	1 x 10 <sup>5</sup> (5 A/30 V DC)	2 x 10 <sup>5</sup> (1 A/30 V DC)	1 x 10 <sup>5</sup> (5 A/30 V DC)
Configuration	no address or configuration setting		
Weight	approx. 50 g		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all ESxxxx terminals		
Further information	www.beckhoff.com/EL2602		

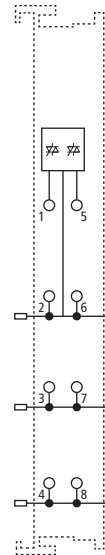
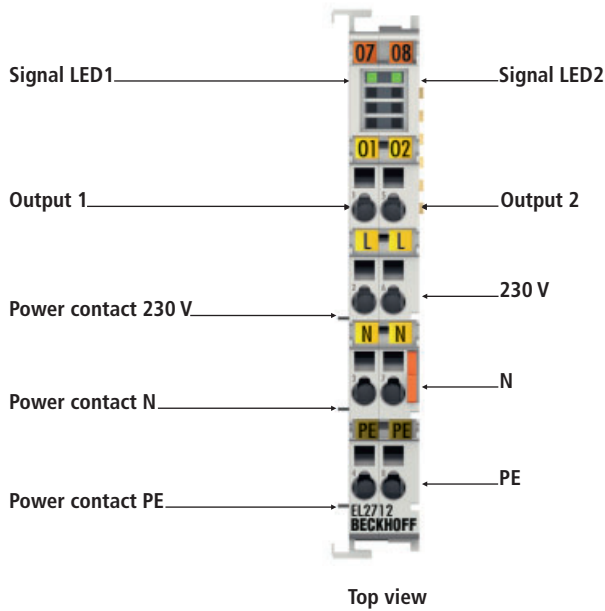


## EL2624 | 4-channel relay output terminal 125 V AC/30 V DC

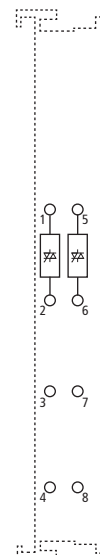
The EL2624 output terminal has four relays each of which has a single contact. The relay contact is suitable for use at up to 125 V AC or 30 V DC. The EtherCAT Terminal indicates its signal state by means of light emitting diodes. The EL2624 has potential-free contacts. The power contacts are looped through.

Technical data	EL2624   ES2624
Number of outputs	4 x make contacts
Rated load voltage	125 V AC/30 V DC
Ohmic switching current	0.5 A AC/2 A DC
Inductive switching current	no data
Minimum permitted load	10 $\mu$ A at 10 mV DC
Current consumption E-bus	typ. 200 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	4 outputs
Operating cycles mech. (min.)	1 x 10 <sup>8</sup>
Operating cycles electr. (min.)	2 x 10 <sup>5</sup> (1 A/30 V DC)
Configuration	no address or configuration setting
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL2624">www.beckhoff.com/EL2624</a>





Contact assembly EL2712/22



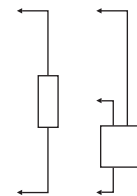
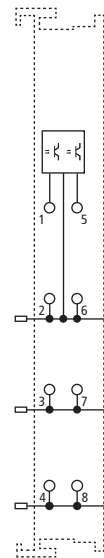
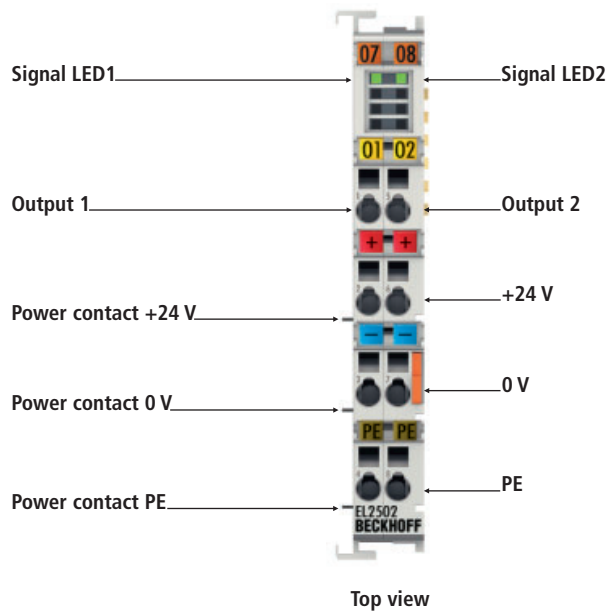
Contact assembly EL2732

## EL2712, EL2722, EL2732 | 2-channel triac output terminals

The EL2712, EL2722 and EL2732 output terminals use a power switch to control mains voltage from 12 V to 230 V AC. The switching element is a triac, which is connected to the power contact potential. As a semiconductor switch, it is not subject to wear. The steady load capacity of a digital output is 1 A. The EtherCAT Terminals have two independent outputs and indicate their signal state by means of light emitting diodes. The EL2722 has two mutually locked outputs and is very suitable for turning motors (blinds).

Technical data	EL2712   ES2712	EL2722   ES2722	EL2732   ES2732
Number of outputs	2 x make contacts	2 x make contacts, mutually locked	2 x make contacts (without power contacts), mutually locked
Rated load voltage	12...230 V AC		
Max. output current	0.5 A continuous load per channel	1 A	0.5 A
Frequency range	47...63 Hz		
Surge voltage protection	> 275 V		
Peak current	40 A (16 ms), 1.5 A (30 s)		
Standby current	0.6 mA		
Switch-on time	0.1...10 ms, zero crossing		
Switch-off time	T/2		
Maximum residual voltage	1.5 V (60 mA...1 A), 150 Ω (< 60 mA)		
Current consumption E-bus	120 mA (see documentation)		
Electrical isolation	500 V <sub>rms</sub> (E-bus/field voltage), 3,750 V AC (1 min.)		
Bit width in the process image	2 outputs		
Configuration	no address or configuration setting		
Weight	approx. 55 g		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all ESxxxx terminals		
Further information	www.beckhoff.com/EL2712		

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL2712](http://www.beckhoff.com/EL2712)



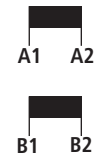
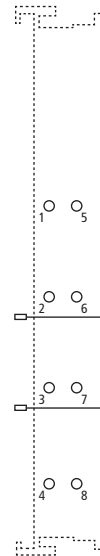
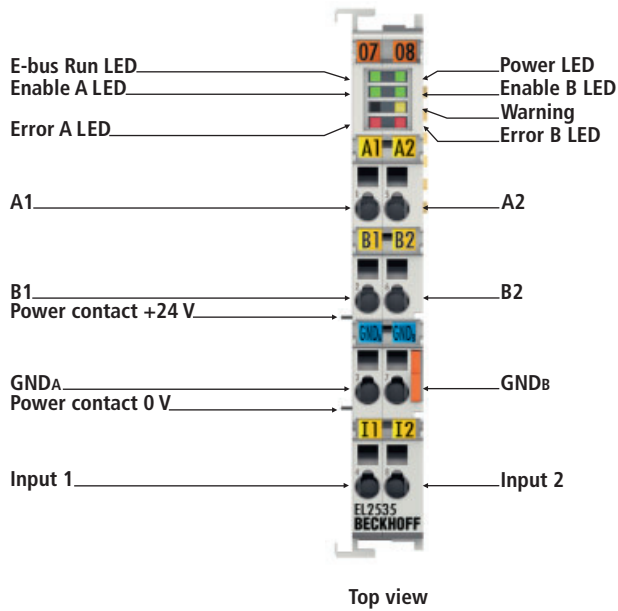
2-wire 3-wire

Connection

## EL2502 | 2-channel pulse width output terminal 24 V DC

The EL2502 output terminal modulates the pulse width of a binary signal and outputs it electrically isolated from the E-bus. The mark/space ratio is prescribed by a 16 bit value from the automation unit. The output stage is protected against overload and short-circuit. The EtherCAT Terminal has two channels that indicate their signal state via LEDs. The LEDs are driven in time with the outputs, and show the mark/space ratio by their brightness.

Technical data	EL2502   ES2502
Number of outputs	2
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive
Max. output current	0.5 A (per channel)
Base frequency	1...20 kHz, 250 Hz default
Duty factor	0...100 % ( $T_{ON} > 750 \text{ ns}$ , $T_{OFF} > 500 \text{ ns}$ )
Resolution	max. 10 bits
Current consumption E-bus	typ. 150 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Current consumption power contacts	typ. 10 mA + load
Bit width in the process image	2 x 16 bit PWM output
Configuration	via TwinCAT System Manager
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL2502">www.beckhoff.com/EL2502</a>

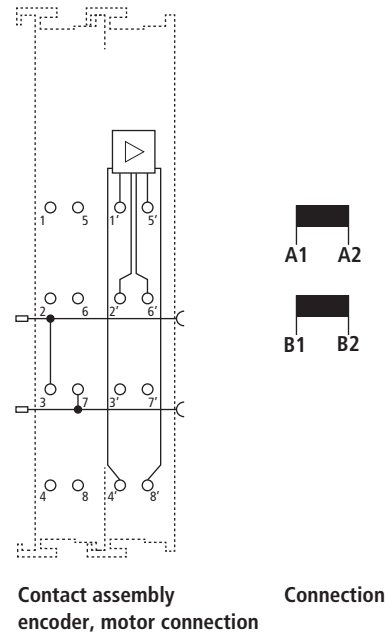
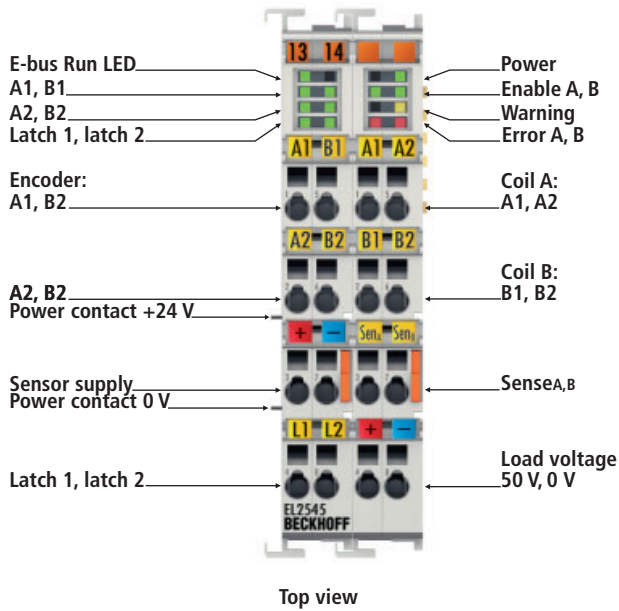


## EL2535 | 2-channel pulse width current terminal 1 A, 24 V DC

The EL2535 output terminal controls the output current via pulse width control of the supply voltage. It is galvanically isolated from the E-bus. The current value (0 to 1 A) is specified by the automation device via a 16 bit value. The output stage is protected against overload and short-circuit. The EtherCAT Terminal has two channels that indicate their signal state via light emitting diodes. The LEDs simplify local diagnosis by displaying typical load and wiring faults.

Technical data	EL2535   ES2535
Number of outputs	2
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive > 1 mH
Max. output current	2 x 1 A (short-circuit-proof, thermal overload-proof) for both channels together
PWM clock frequency	25 kHz
Duty factor	0...100 % (current-controlled)
Resolution	max. 12 bits
Current consumption E-bus	180 mA (see documentation)
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	48 inputs/outputs: 2 x 16 bit data, 2 x 8 bit control/status
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL2535">www.beckhoff.com/EL2535</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL2535](http://www.beckhoff.com/EL2535)

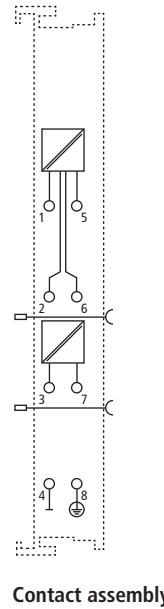
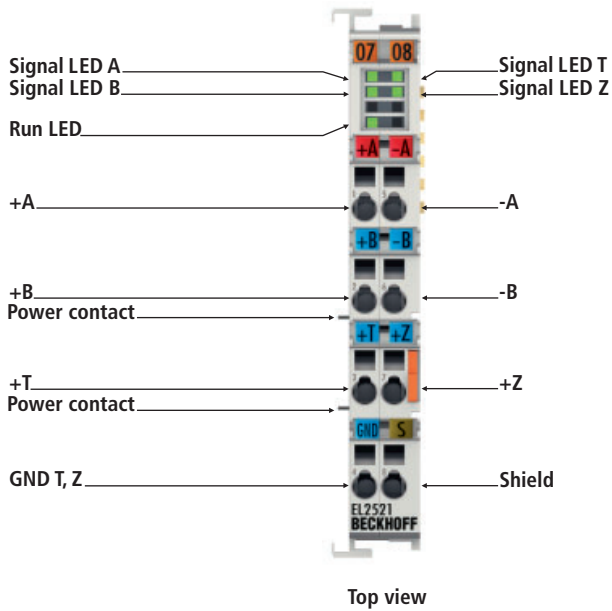


## EL2545 | 2-channel pulse width current terminal 3.5 A, 50 V DC

The EL2545 output terminal controls the output current via pulse width control of the supply voltage. It is galvanically isolated from the E-bus. The current value (0 to 3.5 A) is specified by the automation device via a 16 bit value. The output stage is protected against overload and short-circuit. The EtherCAT Terminal has two channels that indicate their signal state via light emitting diodes. The LEDs simplify local diagnosis by displaying typical load and wiring faults.

Technical data	EL2545   ES2545
Number of outputs	2
Rated load voltage	8...50 V DC
Load type	inductive, coil, valve
Auxiliary voltage	24 V DC via power contacts
Max. output current	2 x 3.5 A (short-circuit-proof, thermal overload-proof) for both channels together
PWM clock frequency	25 kHz
Duty factor	0...100 % (current-controlled)
Resolution	max. 12 bits
Current consumption E-bus	180 mA (see documentation)
Current consumption auxiliary voltage	typ. 10 mA
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	48 inputs/outputs: 2 x 16 bit data, 2 x 8 bit control/status
Configuration	no address setting, configuration via the controller
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL2545">www.beckhoff.com/EL2545</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL2545](http://www.beckhoff.com/EL2545)

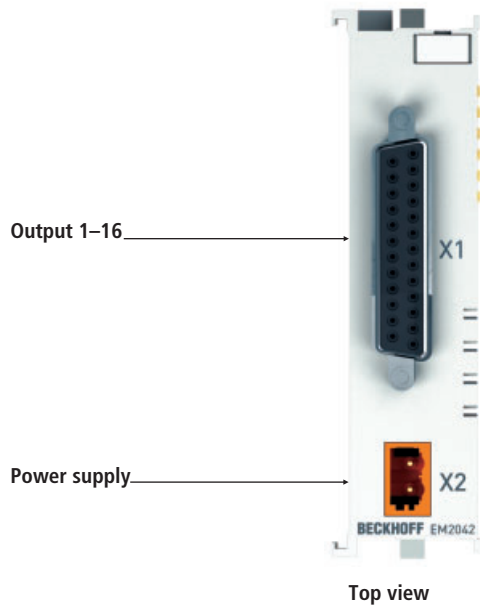


## EL2521 | 1-channel pulse train output terminal RS422/24 V DC

The EL2521 output terminal alters the frequency of a binary signal and (electrically isolated from the E-bus) outputs it. The frequency is preset by a 16 bit value from the automation unit. The output stage is RS422-compatible. In the version EL2521-0024 it can be driven with 24 V DC signals. The terminal indicates its signal state by means of light emitting diodes. The LEDs are driven in time with the outputs and each displays an active output.

Technical data	EL2521   ES2521
Number of outputs	1 channel (2 differential outputs A, B)
Number of inputs	2 (+T, +Z)
Distributed clocks	yes
Signal voltage	RS422 level
Max. output current	RS422 specification
Base frequency	0...500 kHz, 50 kHz default
Duty factor	0...50 % ( $\pm 10$ %)
Resolution	max. 24 bits
Step size	10 mHz
Current consumption E-bus	typ. 280 mA (load-dependent)
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	14 byte output, 8 byte input
Configuration	configuration via controller
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL2521">www.beckhoff.com/EL2521</a>

Special terminals	
EL2521-0024	24 V version
EL2521-0124	24 V version, with Capture & Compare input/output

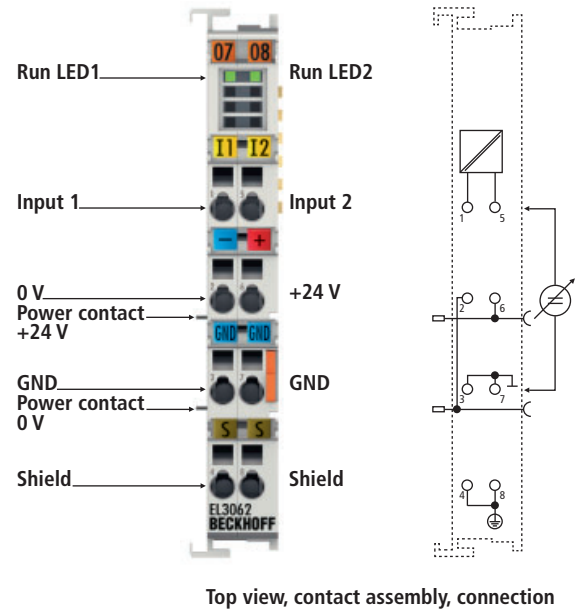
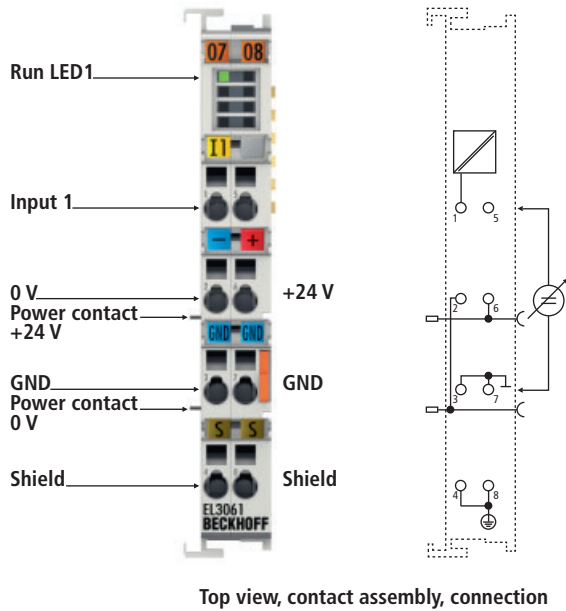


## EM2042 | 16-channel digital output 24 V, 0.5 A, D-sub connection

The terminal module EM2042 combines 16 digital outputs in a D-sub plug connector in a compact design with high packing density. The binary control signals are transferred (electrically isolated) to the actuators at the process level. Like the standard Bus Terminals, the terminal modules are integrated in the I/O system.

Technical data	EM2042
Number of outputs	16
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A
Short circuit current	0.6...1.0 A
Breaking energy	< 150 mJ/channel
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Current consumption E-bus	typ. 120 mA
Bit width in the process image	16 outputs
Dimensions (W x H x D)	26.5 mm x 100 mm x 71 mm
Weight	approx. 90 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EM2042">www.beckhoff.com/EM2042</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EM2042](http://www.beckhoff.com/EM2042)

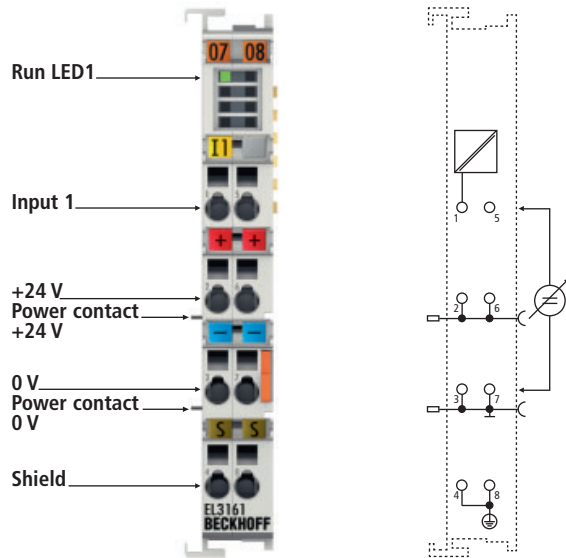


## EL3061, EL3062 | 1-, 2-channel analog input terminals 0...10 V, single-ended, 12 bits

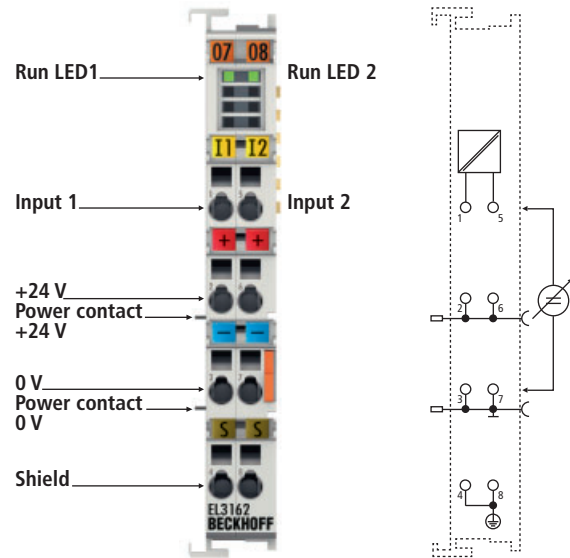
The EL3061 and EL3062 analog input terminals process signals in the range between 0 and 10 V. The voltage is digitised to a resolution of 12 bits and is transmitted, electrically isolated, to the higher-level automation device. The input channels of an EtherCAT Terminal have the reference ground as common ground potential. The EL3061 is the single-channel version. The EL3062 combines two channels in one housing. The signal state of the EtherCAT Terminals is indicated by light emitting diodes.

Technical data	EL3061   ES3061	EL3062   ES3062
Number of inputs	1 (single-ended)	2 (single-ended)
Power supply	via the E-bus	
Signal voltage	0...10 V	
Internal resistance	> 130 kΩ	
Input filter limit frequency	1 kHz	
Resolution	12 bits (16 bits presentation)	
Conversion time	typ. 0.625 ms (default setting: 50 Hz filter)	
Measuring error	< ±0.3 % (relative to full scale value)	
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)	
Current consumption E-bus	typ. 130 mA	
Bit width in the process image	inputs: 4 byte	inputs: 8 byte
Weight	approx. 60 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all ESxxxx terminals	
Further information	www.beckhoff.com/EL3061	

Special terminals	
EL3062-0030	signal voltage 0...30 V



Top view, contact assembly, connection



Top view, contact assembly, connection

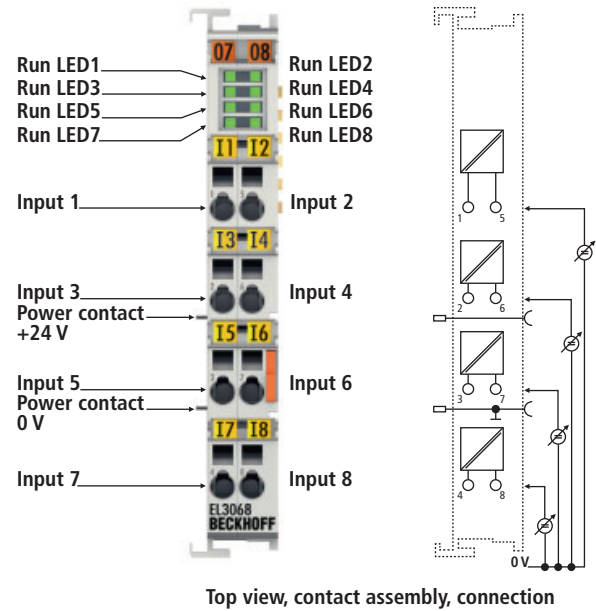
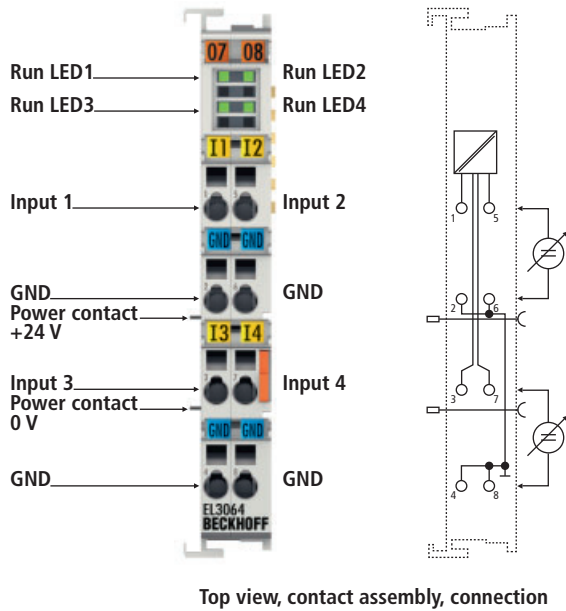
## EL3161, EL3162 | 1-, 2-channel analog input terminals 0...10 V, single-ended, 16 bits

The EL3161 and EL3162 analog input terminals process signals in the range between 0 and 10 V. The voltage is digitised to a resolution of 16 bits, and is transmitted, electrically isolated, to the higher-level automation device. The input channels of an EtherCAT Terminal have the reference ground as common ground potential. The EL3161 is the single-channel version. The EL3162 combines two channels in one housing. The signal state of the EtherCAT Terminals is indicated by light emitting diodes.

Technical data	EL3161   ES3161	EL3162   ES3162
Number of inputs	1 (single-ended)	2 (single-ended)
Power supply	via the E-bus	
Signal voltage	0...10 V	
Distributed clocks	yes	
Internal resistance	> 130 k $\Omega$	> 200 k $\Omega$
Input filter limit frequency	10 kHz	
Conversion time	~ 35 $\mu$ s	~ 50 $\mu$ s
Resolution	16 bits (incl. sign)	
Measuring error	< $\pm$ 0.3 % (relative to full scale value)	
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)	
Current consumption E-bus	180 mA (see documentation)	
Bit width in the process image	1 x 16 bit input, 1 x 8 bit status	2 x 16 bit input, 2 x 8 bit status
Weight	approx. 60 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all ESxxxx terminals	
Further information	www.beckhoff.com/EL3161	

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL3161](http://www.beckhoff.com/EL3161)

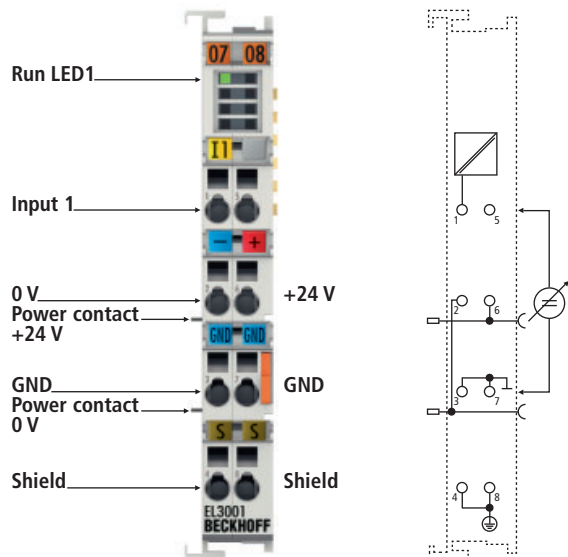




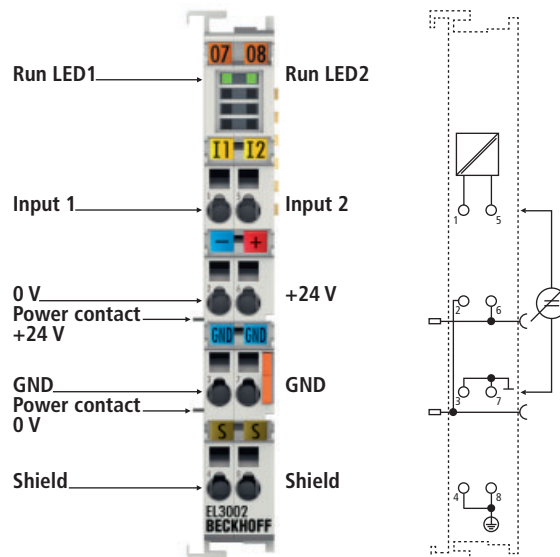
## EL3064, EL3068, EL3164 | 4-, 8-channel analog input terminals 0...10 V, single-ended, 12/16 bits

The EL3064, EL3068 and EL3164 analog input terminals process signals in the range between 0 and 10 V. The voltage is digitised with a resolution of 12 bits (EL3064, EL3068) or 16 bits (EL3164) and is transmitted (electrically isolated) to the higher-level automation device. The EL3064/EL3164 EtherCAT Terminals feature 2-wire conductors for the four single-ended inputs with a common internal ground potential. The EL3068 version combines eight channels in one housing. The power contacts are connected through. The 0 V power contact is used as reference ground connection for the inputs. The signal state of the EtherCAT Terminals is indicated by light emitting diodes.

Technical data	EL3064   ES3064	EL3068   ES3068	EL3164   ES3164
Number of inputs	4 (single-ended)	8 (single-ended)	4 (single-ended)
Power supply	via the E-bus		
Signal voltage	0...10 V		
Distributed clocks	no	no	yes
Internal resistance	> 130 k $\Omega$	> 130 k $\Omega$	> 200 k $\Omega$
Input filter limit frequency	1 kHz	1 kHz	5 kHz
Conversion time	typ. 0.625 ms (default setting: 50 Hz filter)	typ. 1.25 ms (default setting: 50 Hz filter)	~ 100 $\mu$ s
Resolution	12 bits (16 bits presentation)	12 bits (16 bits presentation)	16 bits (incl. sign)
Measuring error	< $\pm 0.3$ % (relative to full scale value)		
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)		
Current consumption E-bus	typ. 130 mA	typ. 130 mA	180 mA (see documentation)
Bit width in the process image	inputs: 16 byte	inputs: 32 byte	inputs: 16 byte
Weight	approx. 60 g	approx. 60 g	approx. 65 g
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all ESxxx terminals		
Further information	www.beckhoff.com/EL3064		



Top view, contact assembly, connection

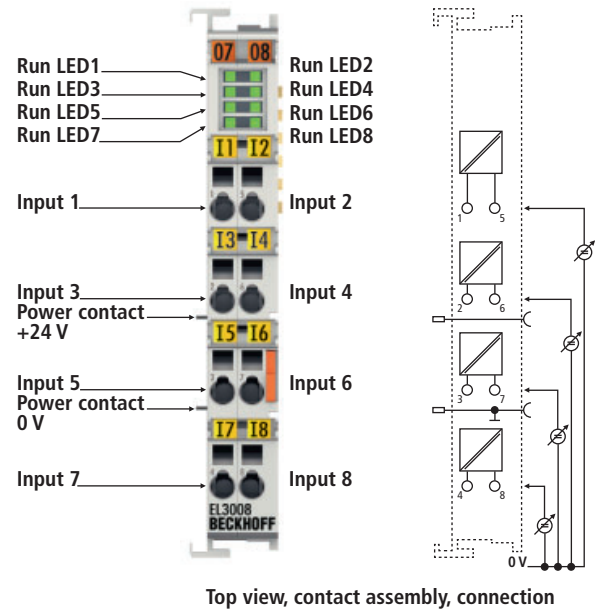
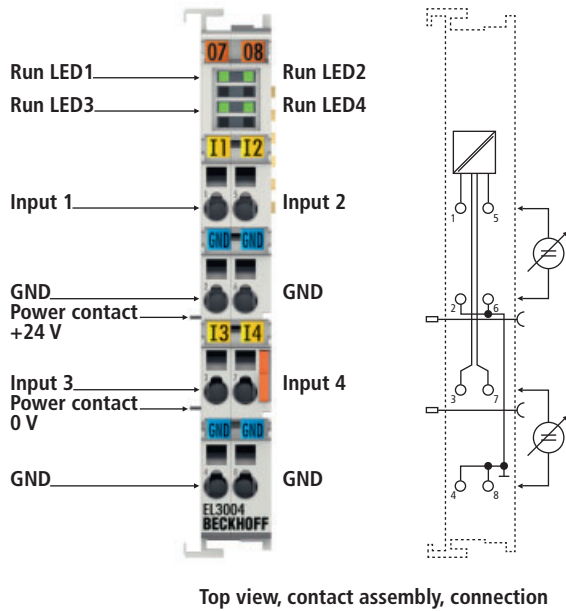


Top view, contact assembly, connection

## EL3001, EL3002 | 1-, 2-channel analog input terminals -10...+10 V, single-ended, 12 bits

The EL3001 and EL3002 analog input terminals process signals in the range between -10 and +10 V. The voltage is digitised to a resolution of 12 bits, and is transmitted, electrically isolated, to the higher-level automation device. The input channels of the EtherCAT Terminals are single-ended inputs with a common, internal ground potential. The EL3001 is the single-channel version and is characterised by its fine granularity and electrical isolation. The EL3002 version combines two channels in one housing. The signal state of the EtherCAT Terminals is indicated by light emitting diodes.

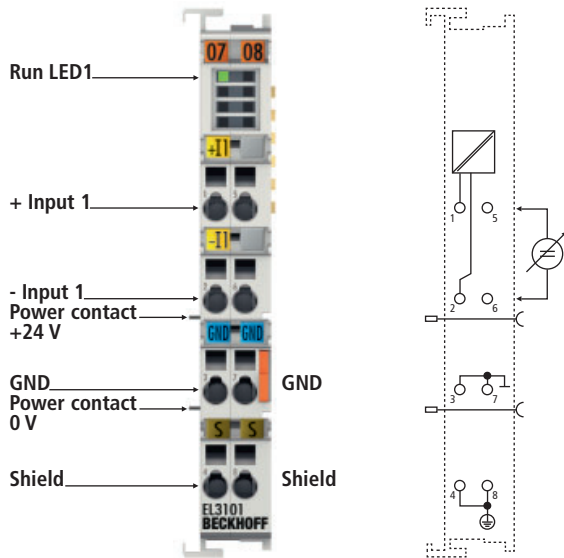
Technical data	EL3001   ES3001	EL3002   ES3002
Number of inputs	1 (single-ended)	2 (single-ended)
Power supply	via the E-bus	
Signal voltage	-10...+10 V	
Internal resistance	> 130 k $\Omega$	
Input filter limit frequency	1 kHz	
Conversion time	typ. 0.625 ms (default setting: 50 Hz filter)	
Resolution	12 bits (16 bits presentation)	
Measuring error	< $\pm 0.3\%$ (relative to full scale value)	
Surge voltage resistance	30 V max.	
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)	
Current consumption E-bus	typ. 130 mA	
Bit width in the process image	inputs: 4 byte	inputs: 8 byte
Configuration	no address or configuration setting required	
Weight	approx. 70 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all ESxxxx terminals	
Further information	www.beckhoff.com/EL3001	



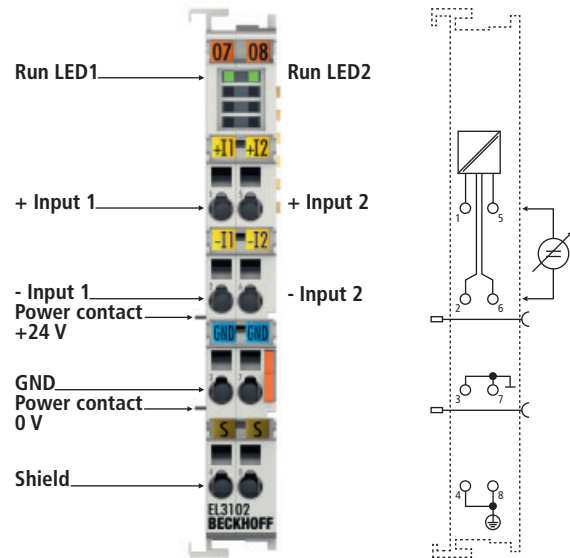
## EL3004, EL3008 | 4-, 8-channel analog input terminals -10...+10 V, single-ended, 12 bits

The EL3004 and EL3008 analog input terminals process signals in the range between -10 and +10 V. The voltage is digitised to a resolution of 12 bits, and is transmitted, electrically isolated, to the higher-level automation device. In the EL3004 EtherCAT Terminal, the four single ended inputs are 2-wire versions and have a common, internal ground potential. The EL3008 version combines eight channels in one housing. The power contacts are connected through. The reference ground for all inputs is the 0 V power contact. The signal state of the EtherCAT Terminals is indicated by light emitting diodes.

Technical data	EL3004   ES3004	EL3008   ES3008
Number of inputs	4 (single-ended)	8 (single-ended)
Power supply	via the E-bus	
Signal voltage	-10...+10 V	
Internal resistance	> 130 kΩ	
Input filter limit frequency	1 kHz	
Conversion time	typ. 0.625 ms (default setting: 50 Hz filter)	typ. 1.25 ms (default setting: 50 Hz filter)
Resolution	12 bits (16 bits presentation)	
Measuring error	< ±0.3 % (relative to full scale value)	
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)	
Current consumption E-bus	typ. 130 mA	
Bit width in the process image	inputs: 16 byte	inputs: 32 byte
Configuration	no address or configuration setting required	
Weight	approx. 70 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all ESxxx terminals	
Further information	www.beckhoff.com/EL3004	



Top view, contact assembly, connection

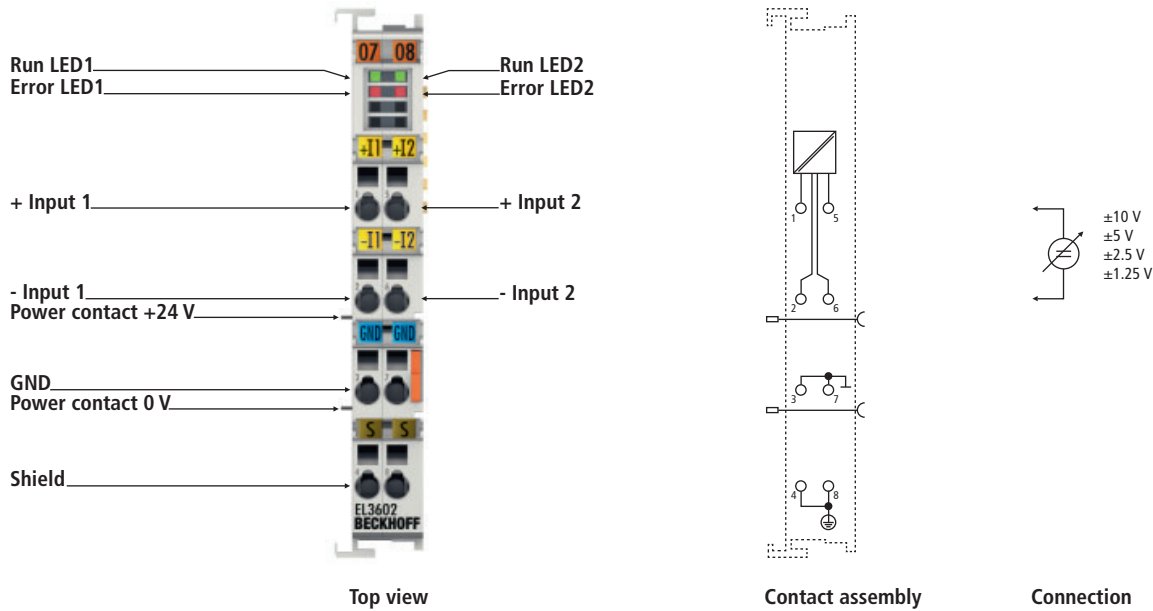


Top view, contact assembly, connection

## EL3101, EL3102 | 1-, 2-channel analog input terminals -10...+10 V, differential input, 16 bits

The EL3101 and EL3102 analog input terminals handle signals in the range between -10 and +10 V. The voltage is digitised to a resolution of 16 bits, and is transmitted, electrically isolated, to the higher-level automation device. The input channels of the EtherCAT Terminals have differential inputs and possess a common, internal ground potential. The signal state of the EtherCAT Terminals is indicated by light emitting diodes.

Technical data	EL3101   ES3101	EL3102   ES3102
Number of inputs	1	2
Power supply	via the E-bus	
Signal voltage	-10...+10 V	
Distributed clocks	yes	
Internal resistance	> 200 k $\Omega$	
Input filter limit frequency	10 kHz	
Common-mode voltage $U_{CM}$	35 V max.	
Conversion time	~ 40 $\mu$ s	~ 60 $\mu$ s (fast mode ~ 40 $\mu$ s)
Resolution	16 bits	
Measuring error	< $\pm 0.3$ % (relative to full scale value)	
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)	
Current consumption E-bus	typ. 180 mA	
Bit width in the process image	1 x 16 bit input, 1 x 8 bit status	2 x 16 bit input, 2 x 8 bit status
Weight	approx. 60 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all ESxxxx terminals	
Further information	www.beckhoff.com/EL3101	

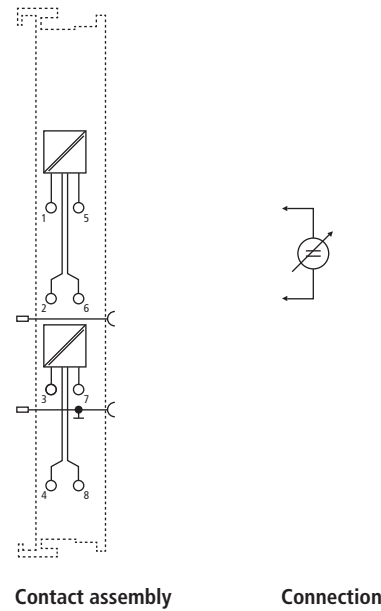
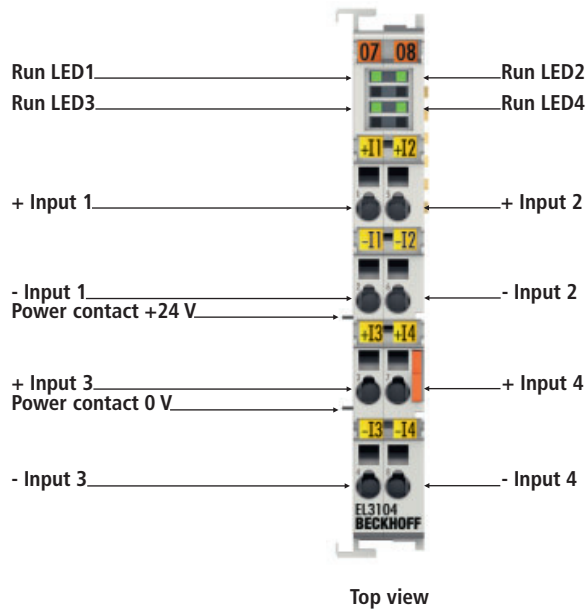


## EL3602 | 2-channel analog input terminal -10...+10 V, differential input, 24 bits

The EL3602 analog input terminal handles signals in the range between -10 and +10 V. The voltage is digitised to a resolution of 24 bits, and is transmitted, electrically isolated, to the higher-level automation device. The input channels of the EtherCAT Terminal have differential inputs and possess a common, internal ground potential. The signal state of the EtherCAT Terminal is indicated by light emitting diodes.

Technical data	EL3602   ES3602
Number of inputs	2
Power supply	via the E-bus
Signal voltage	-10...+10 V, -5...+5 V, -2.5...+2.5 V, -1.25...+1.25 V (parameterisable)
Internal resistance	> 200 k $\Omega$
Common-mode voltage $U_{CM}$	35 V max.
Resolution	24 bits
Conversion time	1...400 ms configurable (see documentation)
Measuring error	< $\pm 0.01\%$ at 25 °C (relative to full scale value)
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)
Current consumption E-bus	typ. 190 mA
Crosstalk attenuation	> 60 dB
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL3602">www.beckhoff.com/EL3602</a>

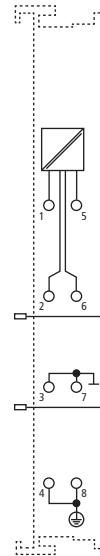
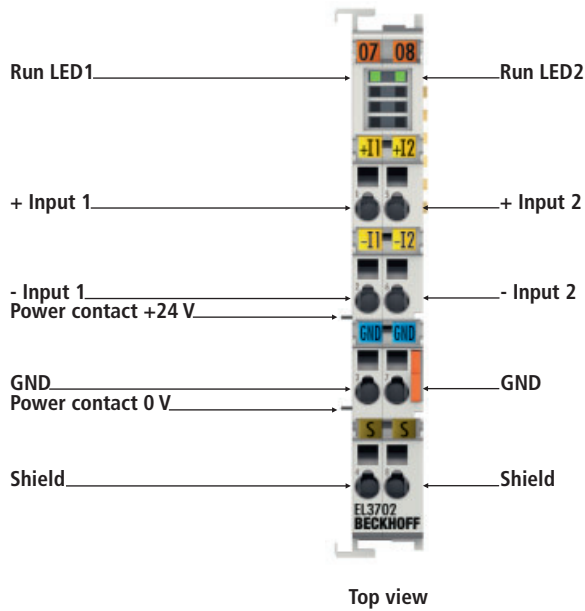
Special terminals	
EL3602-0010	signal voltage -75...+75 mV, measuring error < $\pm 0.05\%$ at 25 °C (relative to full scale value, 50 Hz filter)



## EL3104 | 4-channel analog input terminal -10...+10 V

The EL3104 analog input terminal processes signals in the range between -10 and +10 V. The voltage is digitised to a resolution of 16 bits, and is transmitted, electrically isolated, to the higher-level automation device. The input channels of the EL3104 EtherCAT Terminal are differential inputs. The signal state of the EtherCAT Terminal is indicated by light emitting diodes.

Technical data	EL3104   ES3104
Number of inputs	4
Power supply	via the E-bus
Signal voltage	-10...+10 V
Distributed clocks	yes
Internal resistance	> 200 kΩ
Input filter limit frequency	5 kHz
Common-mode voltage $U_{CM}$	35 V max.
Conversion time	~ 100 μs
Resolution	16 bits
Measuring error	< ±0.3 % (relative to full scale value)
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)
Current consumption E-bus	180 mA (see documentation)
Bit width in the process image	4 x 16 bit input, 4 x 8 bit status
Configuration	no address or configuration setting
Weight	approx. 65 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL3104">www.beckhoff.com/EL3104</a>



## EL3702 | 2-channel analog input terminal -10...+10 V with oversampling

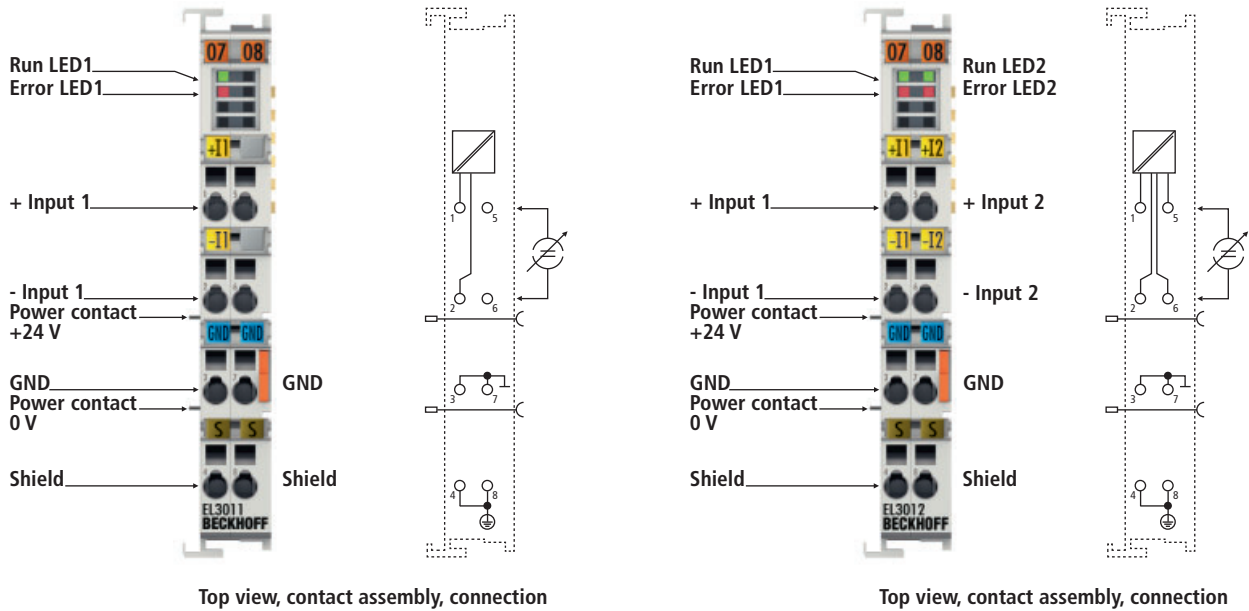


The EL3702 analog input terminal handles signals in the range between -10 and +10 V. The voltage is digitised to a resolution of 16 bits, and is transmitted, electrically isolated, to the controller. The signals are oversampled with an adjustable, integer multiple (oversampling factor:  $n$ ) of the bus cycle time ( $n$  microcycles per bus cycle). For each microcycle, the EtherCAT Terminal generates a process data block that is transferred collectively during the next bus cycle. The time base of the terminal can be synchronised precisely with other EtherCAT devices via distributed clocks. This procedure enables the temporal resolution of the analog input signals to be increased to  $n$  times the bus cycle time. In conjunction with the EL47xx (analog output terminal with oversampling), responses with equidistant time intervals, e.g. in the event of a threshold value being exceeded, become possible.

The distributed clocks function enables several EL3702 devices to be synchronised in almost any configuration. The maximum sampling rate per channel is 100 ksamples/s (100,000 samples/s).

Technical data	EL3702   ES3702
Number of inputs	2
Power supply	via the E-bus
Signal voltage	-10...+10 V
Oversampling factor	$n$ = integer multiple of the cycle time, 1...100 selectable
Distributed clock precision	$\ll 1 \mu\text{s}$
Internal resistance	$> 200 \text{ k}\Omega$
Common-mode voltage $U_{\text{CM}}$	35 V max.
Conversion time	$\sim 10 \mu\text{s}$
Input signal bandwidth	0...30 kHz recommended
Resolution	16 bits
Measuring error	typ. $\pm 1 \%$ , -10 kHz (relative to full scale value), see documentation
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)
Current consumption E-bus	typ. 200 mA
Bit width in the process image	input: $n \times 2 \times 16$ bit data; optionally $2 \times 16$ bit cycle counter, 4 byte StartNextLatch time
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL3702">www.beckhoff.com/EL3702</a>

XFC technology description see 664



Top view, contact assembly, connection

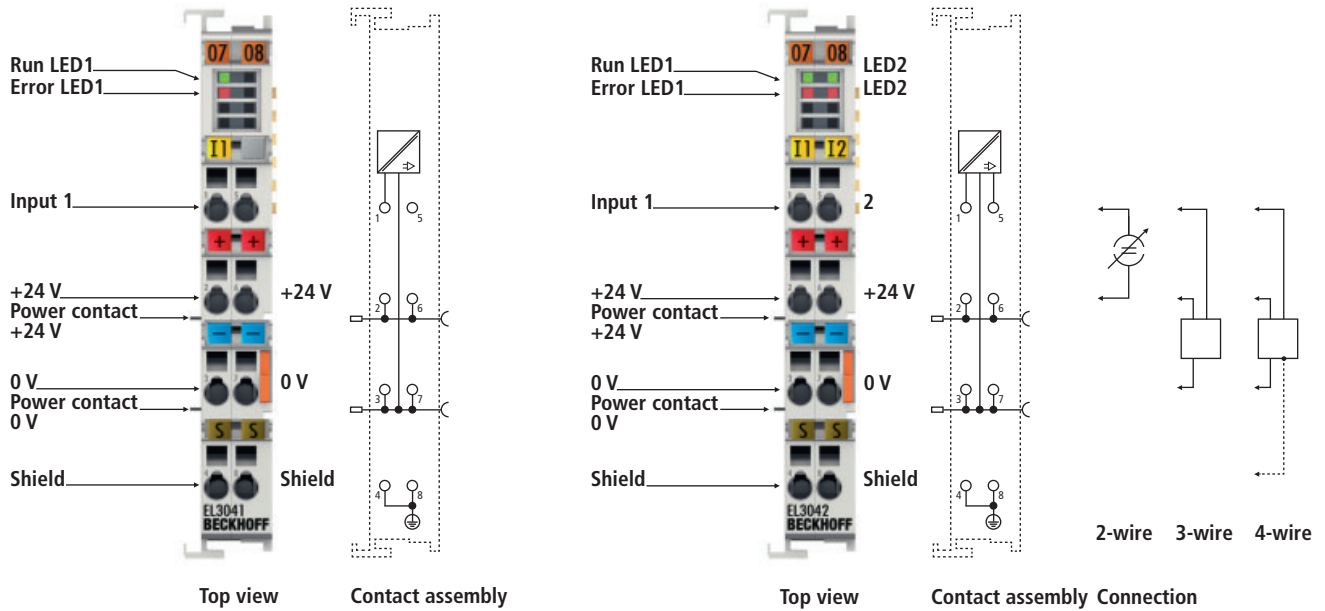
Top view, contact assembly, connection

## EL3011/12, EL3111/12 | 1-, 2-channel analog input terminals 0...20 mA, differential input, 12/16 bits

The EL3011, EL3012, EL3111 and EL3112 analog input terminals process signals in the range between 0 and 20 mA. The current is digitised to a resolution of 12 bits (EL3011, EL3012) or 16 bits (EL311x), and is transmitted, electrically isolated, to the higher-level automation device. The input channels of the EtherCAT Terminals have differential inputs and possess a common, internal ground potential. The EL3011 and EL3111 are the single-channel versions and are characterised by its fine granularity and electrical isolation. The EL3012 and EL3112 versions combine two channels in one housing. Overload condition is detected, and the terminal status is relayed to the controller via the E-bus. The EtherCAT Terminals indicate their signal state by means of light emitting diodes. The error LEDs indicate an overload condition and a broken wire.

Technical data	EL3011   ES3011	EL3012   ES3012	EL3111   ES3111	EL3112   ES3112
Number of inputs	1	2	1	2
Power supply	via the E-bus			
Signal current	0...20 mA			
Distributed clocks	yes			
Internal resistance	< 85 Ω	< 85 Ω	33 Ω typ. + diode voltage	33 Ω typ. + diode voltage
Input filter limit frequency	1 kHz	1 kHz	10 kHz	10 kHz
Common-mode voltage $U_{CM}$	35 V max.	35 V max.	35 V max.	10 V max.
Conversion time	~ 500 μs	~ 500 μs	~ 40 μs	~ 50 μs (fast mode ~ 35 μs)
Resolution	12 bits	12 bits	16 bits (incl. sign)	16 bits (incl. sign)
Measuring error	< ±0.3 % (relative to full scale value)			
Surge voltage resistance	35 V DC			
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)			
Current consumption E-bus	typ. 180 mA			
Bit width in the process image	1 x 16 bit input, 1 x 8 bit status	2 x 16 bit input, 2 x 8 bit status	1 x 16 bit input, 1 x 8 bit status	2 x 16 bit input, 2 x 8 bit status
Weight	approx. 55 g			
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 20/variable			
Pluggable wiring	for all ESxxxx terminals			
Further information	www.beckhoff.com/EL3011			



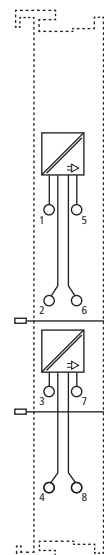
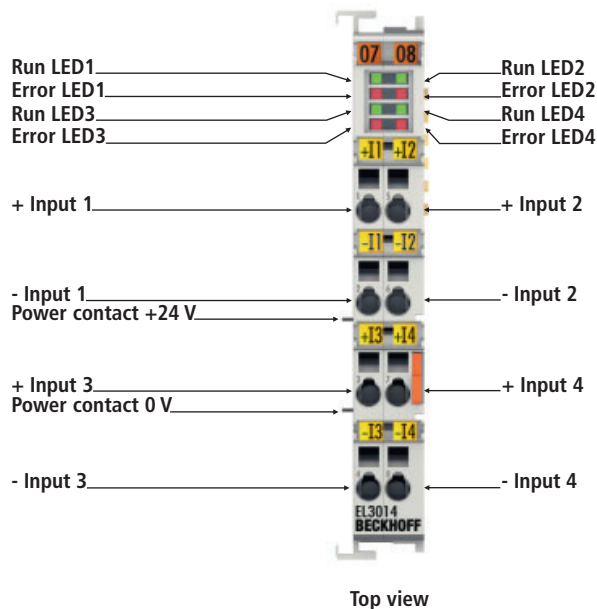


## EL3041/42, EL3141/42 | 1-, 2-channel analog supply terminals 0...20 mA, single-ended, 12/16 bits

The job of the EL3041, EL3042, EL3141 and EL3142 analog input terminals is to supply power to measuring transducers located in the field, and to transmit analog measurement signals with electrical isolation to the automation device. The voltage for the sensors is supplied to the terminals via the power contacts. The power contacts can optionally be supplied with operating voltage in the standard way or via a supply terminal (EL9xxx) with electrical isolation. The input electronics is independent of the supply voltage of the power contacts. The 0 V power contact is the reference potential for the inputs. The EtherCAT Terminals indicate their signal state by means of light emitting diodes.

Technical data	EL3041   ES3041	EL3042   ES3042	EL3141   ES3141	EL3142   ES3142
Number of inputs	1 (single-ended)	2 (single-ended)	1 (single-ended)	2 (single-ended)
Power supply	via the E-bus			
Signal current	0...20 mA			
Distributed clocks	no	no	yes	yes
Internal resistance	typ. < 85 Ω	typ. < 85 Ω	33 Ω typ. + diode voltage	33 Ω typ. + diode voltage
Input filter limit frequency	1 kHz	1 kHz	10 kHz	10 kHz
Resolution	12 bits (16 bits presentation)	12 bits (16 bits presentation)	16 bits (incl. sign)	16 bits (incl. sign)
Conversion time	typ. 0.625 ms (default setting: 50 Hz filter)	typ. 0.625 ms (default setting: 50 Hz filter)	~ 40 μs	~ 60 μs (fast mode ~ 40 μs)
Measuring error	< ±0.3 % (relative to full scale value)			
Surge voltage resistance	30 V max.	30 V max.	35 V max.	35 V max.
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)			
Current consumption E-bus	typ. 130 mA	typ. 130 mA	180 mA (see documentation)	180 mA (see documentation)
Bit width in the process image	inputs: 4 byte	inputs: 8 byte	inputs: 4 byte	inputs: 8 byte
Configuration	no address or configuration setting required			
Weight	approx. 60 g			
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Relative humidity	95 %, no condensation			
Protect. class/installation pos.	IP 20/variable			
Pluggable wiring	for all ESxxxx terminals			
Further information	www.beckhoff.com/EL3041			

Special terminals	
EL3142-0010	signal current ±10 mA



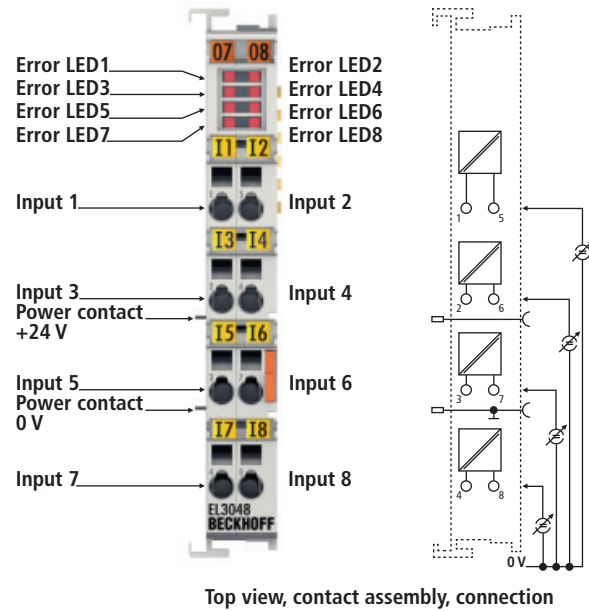
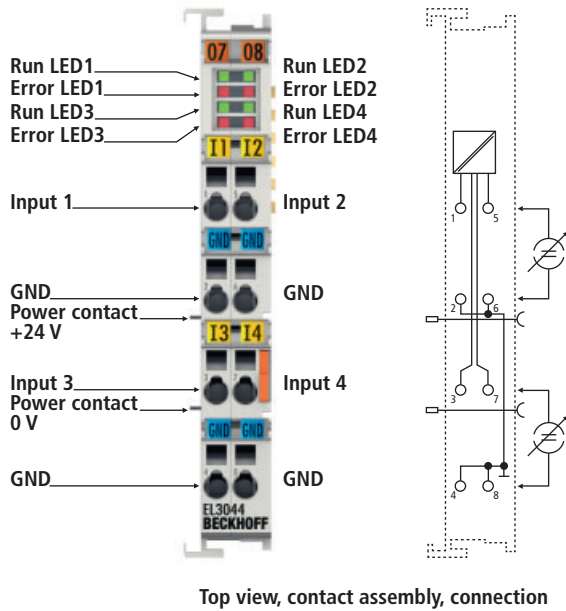
2-wire

Connection

## EL3014, EL3114 | 4-channel analog input terminals 0...20 mA, differential input, 12/16 bits

The EL3014 and EL3114 analog input terminals process signals in the range between 0 and 20 mA. The current is digitised to a resolution of 12 bits (EL3014) or 16 bits (EL3114) and is transmitted, electrically isolated, to the higher-level automation device. The input channels of the EtherCAT Terminals have differential inputs and possess a common, internal ground potential. Overload condition is detected, and the terminal status is relayed to the controller via the E-bus. The EtherCAT Terminals indicate their signal state by means of light emitting diodes.

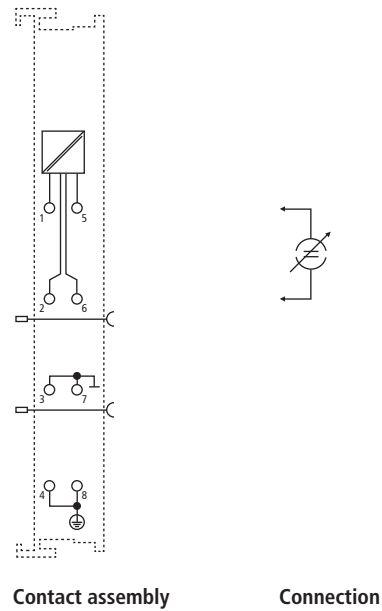
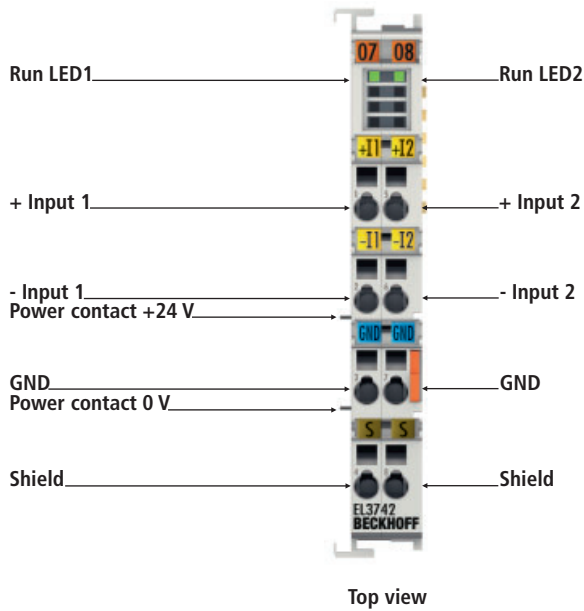
Technical data	EL3014   ES3014	EL3114   ES3114
Number of inputs	4	
Power supply	via the E-bus	
Signal current	0...20 mA	
Distributed clocks	yes	
Internal resistance	33 Ω typ. + diode voltage	
Input filter limit frequency	1 kHz	5 kHz
Common-mode voltage $U_{CM}$	10 V max.	
Conversion time	~ 500 μs	~ 100 μs
Resolution	12 bits	16 bits (incl. sign)
Measuring error	< ±0.3 % (relative to full scale value)	
Surge voltage resistance	35 V DC	
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)	
Current consumption E-bus	180 mA (see documentation)	
Bit width in the process image	4 x 16 bit input, 4 x 8 bit status	
Configuration	no address or configuration setting	
Weight	approx. 55 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all ESxxxx terminals	
Further information	www.beckhoff.com/EL3014	



## EL3044, EL3048, EL3144 | 4-, 8-channel analog input terminals 0...20 mA, single-ended, 12/16 bits

The EL3044, EL3048 and EL3144 analog input terminals process signals in the range between 0 and 20 mA. The current is digitised to a resolution of 12 bits (EL3044, EL3048) or 16 bits (EL3144) and is transmitted (electrically isolated) to the higher-level automation device. The EL3044/EL3144 EtherCAT Terminals feature 2-wire conductors for the four single-ended inputs with a common internal ground potential. The EL3048 version combines eight channels in one housing. The power contacts are connected through. The 0 V power contact is used as reference ground connection for the inputs. The signal state of the EtherCAT Terminals is indicated by light emitting diodes.

Technical data	EL3044   ES3044	EL3048   ES3048	EL3144   ES3144
Number of inputs	4 (single-ended)	8 (single-ended)	4 (single-ended)
Power supply	via the E-bus		
Signal current	0...20 mA		
Distributed clocks	no	no	yes
Internal resistance	typ. < 85 Ω	typ. < 85 Ω	< 85 Ω
Input filter limit frequency	1 kHz	1 kHz	5 kHz
Conversion time	typ. 0.625 ms (default setting: 50 Hz filter)	typ. 1.25 ms (default setting: 50 Hz filter)	~ 40 μs
Resolution	12 bits (16 bits presentation)	12 bits (16 bits presentation)	16 bits (incl. sign)
Measuring error	< ±0.3 % (relative to full scale value)		
Surge voltage resistance	30 V max.	30 V max.	30 V DC
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)		
Current consumption E-bus	typ. 130 mA	typ. 130 mA	180 mA (see documentation)
Bit width in the process image	inputs: 16 byte	inputs: 32 byte	inputs: 16 byte
Configuration	no address or configuration setting required		
Weight	approx. 60 g		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all ESxxx terminals		
Further information	www.beckhoff.com/EL3044		



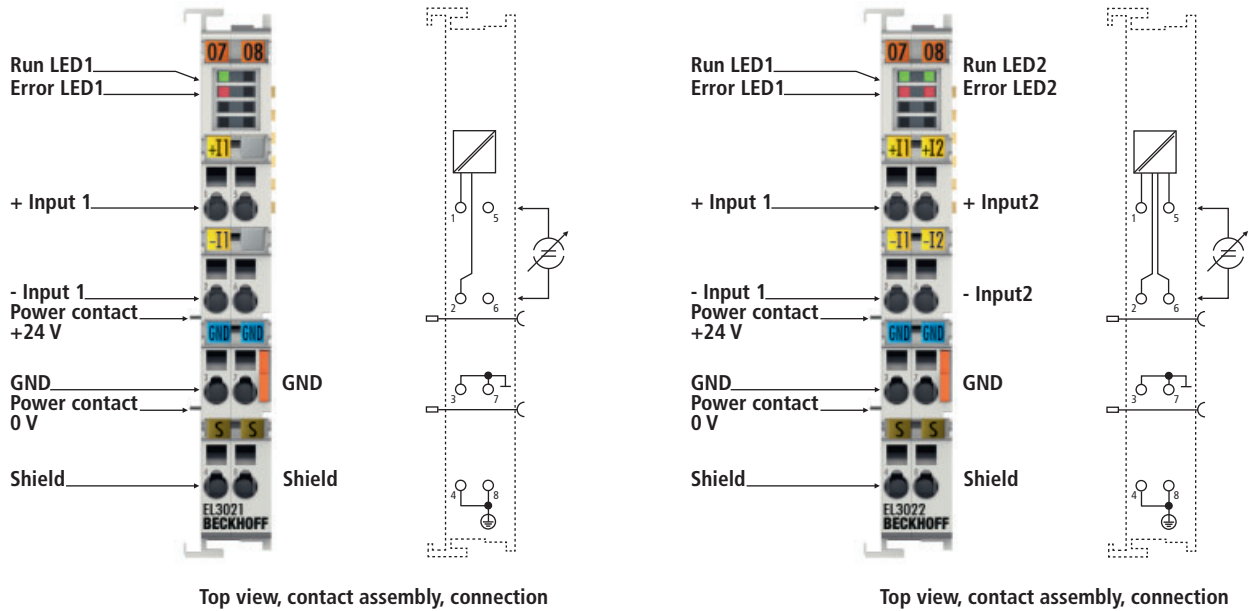
## EL3742 | 2-channel analog input terminal 0...20 mA, differential input, with oversampling



The EL3742 analog input terminal handles signals in the range between 0 and 20 mA. The voltage is digitised to a resolution of 16 bits, and is transmitted, electrically isolated, to the controller. The input channels of the EtherCAT Terminal have differential inputs and possess a common, internal ground potential. The signals are oversampled with an adjustable, integer multiple (oversampling factor:  $n$ ) of the bus cycle time ( $n$  microcycles per bus cycle). For each microcycle, the EtherCAT Terminal generates a process data block that is collected and transferred during the next bus cycle. The time base of the terminal can be synchronised precisely with other EtherCAT devices via distributed clocks. This procedure enables the temporal resolution of the analog input signals to be increased to  $n$  times the bus cycle time. In conjunction with the EL47xx (analog output terminal with oversampling), responses with equidistant time intervals, e.g. in the event of a threshold value being exceeded, become possible. The distributed clocks function enables several EL3742 devices to be synchronised in almost any configuration. The maximum sampling rate per channel is 100 ksamples/s (100,000 samples/s).

Technical data	EL3742   ES3742
Number of inputs	2
Power supply	via the E-bus
Signal current	0...20 mA
Oversampling factor	$n$ = integer multiple of the cycle time, 1...100 selectable
Distributed clock precision	$\ll 1 \mu\text{s}$
Internal resistance	$33 \Omega$ typ. + diode voltage
Conversion time	min. 10 $\mu\text{s}$
Input signal bandwidth	0...20 kHz recommended
Resolution	16 bits
Measuring error	$< \pm 0.3 \%$ (relative to full scale value) up to 100 Hz input signal
Surge voltage resistance	35 V max.
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)
Current consumption E-bus	typ. 200 mA
Bit width in the process image	input: $n \times 2 \times 16$ bit data; optionally $2 \times 16$ bit cycle counter, 4 byte StartNextLatch time
Operating/storage temperature	0...+55 °C/-25...+85 °C
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL3742">www.beckhoff.com/EL3742</a>

XFC technology description see **664**



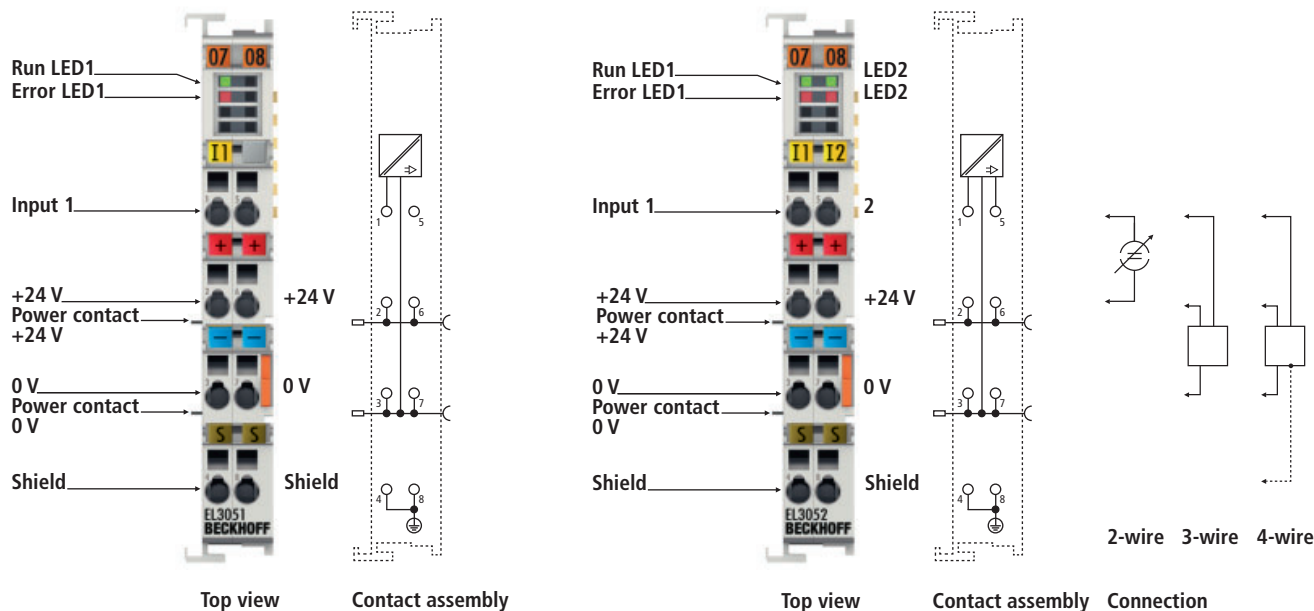
Top view, contact assembly, connection

Top view, contact assembly, connection

## EL3021/22, EL3121/22 | 1-, 2-channel analog input terminals 4...20 mA, differential input, 12/16 bits

The EL3021, EL3022, EL3121 and EL3122 analog input terminals process signals in the range between 4 and 20 mA. The current is digitised to a resolution of 12 bits (EL3021/EL3022) or 16 bits (EL3121/EL3122), and is transmitted, electrically isolated, to the higher-level automation device. The input channels of the EtherCAT Terminals have differential inputs and possess a common, internal ground potential. The EL3021 and EL3121 are the single-channel versions and are characterised by their fine granularity and electrical isolation. The EL3022 and EL3122 versions combine two channels in one housing. An open lead or overload condition are detected. The terminal status is relayed to the controller via the E-bus. The EtherCAT Terminals indicate their signal state by means of light emitting diodes. The error LEDs indicate an overload condition and a broken wire.

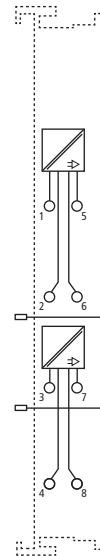
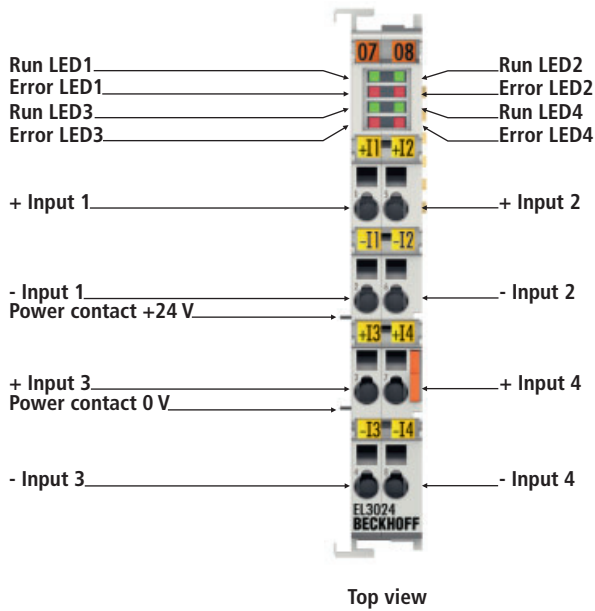
Technical data	EL3021   ES3021	EL3022   ES3022	EL3121   ES3121	EL3122   ES3122
Number of inputs	1	2	1	2
Power supply	via the E-bus			
Signal current	4...20 mA			
Distributed clocks	yes			
Internal resistance	< 85 $\Omega$	< 85 $\Omega$	33 $\Omega$ typ. + diode voltage	33 $\Omega$ typ. + diode voltage
Input filter limit frequency	1 kHz	1 kHz	10 kHz	10 kHz
Common-mode voltage $U_{CM}$	10 V max.			
Conversion time	~ 500 $\mu$ s	~ 500 $\mu$ s	~ 40 $\mu$ s	~ 50 $\mu$ s (fast mode ~ 35 $\mu$ s)
Resolution	12 bits	12 bits	16 bits	16 bits
Measuring error	< $\pm 0.3$ % (relative to full scale value)			
Surge voltage resistance	35 V max.			
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)			
Current consumption E-bus	180 mA (see documentation)			
Bit width in the process image	1 x 16 bit input, 1 x 8 bit status	2 x 16 bit input, 2 x 8 bit status	1 x 16 bit input, 1 x 8 bit status	2 x 16 bit input, 2 x 8 bit status
Weight	approx. 55 g			
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 20/variable			
Pluggable wiring	for all ESxxxx terminals			
Further information	www.beckhoff.com/EL3021			



## EL3051/52, EL3151/52 | 1-, 2-channel analog supply terminals 4...20 mA, single-ended, 12/16 bits

The job of the EL3051, EL3052, EL3151 and EL3152 analog input terminals is to supply power to measuring transducers located in the field and to transmit analog measurement signals with electrical isolation to the automation device. The voltage for the sensors is supplied to the terminals via the power contacts. The power contacts can optionally be supplied with operating voltage in the standard way or via a supply terminal (EL9xxx) with electrical isolation. The input electronics are independent of the supply voltage of the power contacts. The reference potential for the inputs is the 0 V power contact. The EtherCAT Terminals indicate their signal state by means of light emitting diodes. The error LEDs indicate an overload condition and a broken wire.

Technical data	EL3051   ES3051	EL3052   ES3052	EL3151   ES3151	EL3152   ES3152
Number of inputs	1 (single-ended)	2 (single-ended)	1 (single-ended)	2 (single-ended)
Power supply	via the E-bus			
Signal current	4...20 mA			
Distributed clocks	no	no	yes	yes
Internal resistance	typ. < 85 Ω	typ. < 85 Ω	33 Ω typ. + diode voltage	33 Ω typ. + diode voltage
Input filter limit frequency	1 kHz	1 kHz	10 kHz	10 kHz
Resolution	12 bits (16 bits presentation)	12 bits (16 bits presentation)	16 bits (incl. sign)	16 bits (incl. sign)
Conversion time	typ. 0.625 ms (default setting: 50 Hz filter)	typ. 0.625 ms (default setting: 50 Hz filter)	~ 40 μs	~ 60 μs (fast mode ~ 40 μs)
Measuring error	< ±0.3 % (relative to full scale value)			
Surge voltage resistance	30 V max.	30 V max.	35 V max.	35 V max.
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)			
Current consumption E-bus	typ. 130 mA	typ. 130 mA	typ. 180 mA	typ. 180 mA
Bit width in the process image	inputs: 4 byte	inputs: 8 byte	inputs: 4 byte	inputs: 8 byte
Weight	approx. 60 g			
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 20/variable			
Pluggable wiring	for all ESxxxx terminals			
Further information	www.beckhoff.com/EL3051			
Special terminals				
EL3152-1002	enhanced sensor supply			



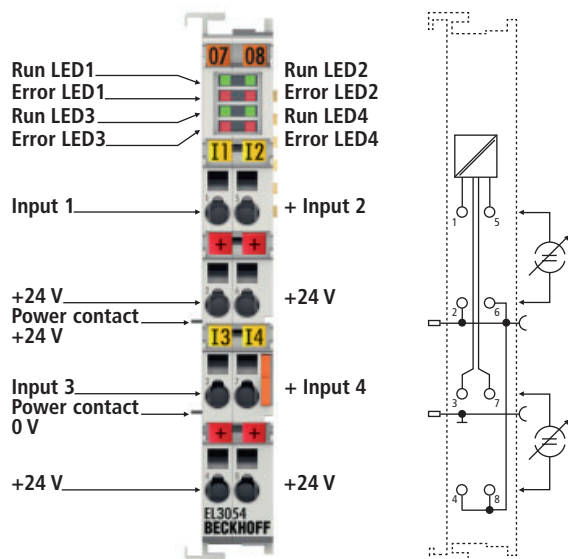
2-wire

Connection

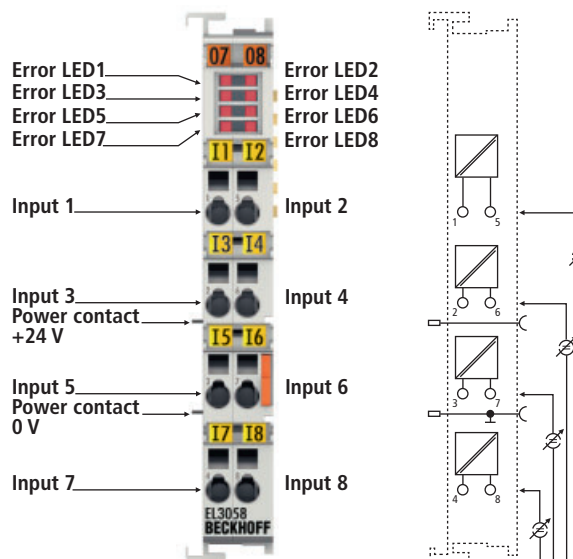
## EL3024, EL3124 | 4-channel analog input terminals 4...20 mA, differential input, 12/16 bits

The EL3024 and EL3124 analog input terminals handle signals in the range from 4 to 20 mA. The current is digitised to a resolution of 12 bits (EL3024) or 16 bits (EL3124) and is transmitted, in an electrically isolated form, to the higher-level automation device. The input channels of the EtherCAT Terminals have differential inputs and possess a common, internal ground potential. The EL3024 and the EL3124 combine four channels in one housing. An open lead or overload condition are detected and the terminal status is relayed to the controller via the E-bus. The EtherCAT Terminal indicates its signal state by means of light emitting diodes. The error LEDs indicate an overload condition and a broken wire.

Technical data	EL3024   ES3024	EL3124   ES3124
Number of inputs	4	
Power supply	via the E-bus	
Signal current	4...20 mA	
Distributed clocks	yes	
Internal resistance	33 $\Omega$ typ. + diode voltage	
Input filter limit frequency	1 kHz	5 kHz
Common-mode voltage $U_{CM}$	10 V max.	
Conversion time	~ 500 $\mu$ s	~ 100 $\mu$ s
Resolution	12 bits	16 bits (incl. sign)
Measuring error	< $\pm 0.3$ % (relative to full scale value)	
Surge voltage resistance	35 V DC	
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)	
Current consumption E-bus	180 mA (see documentation)	
Bit width in the process image	4 x 16 bit input, 4 x 8 bit status	
Configuration	no address or configuration setting	
Weight	approx. 60 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all ESxxx terminals	
Further information	www.beckhoff.com/EL3024	



Top view, contact assembly, connection



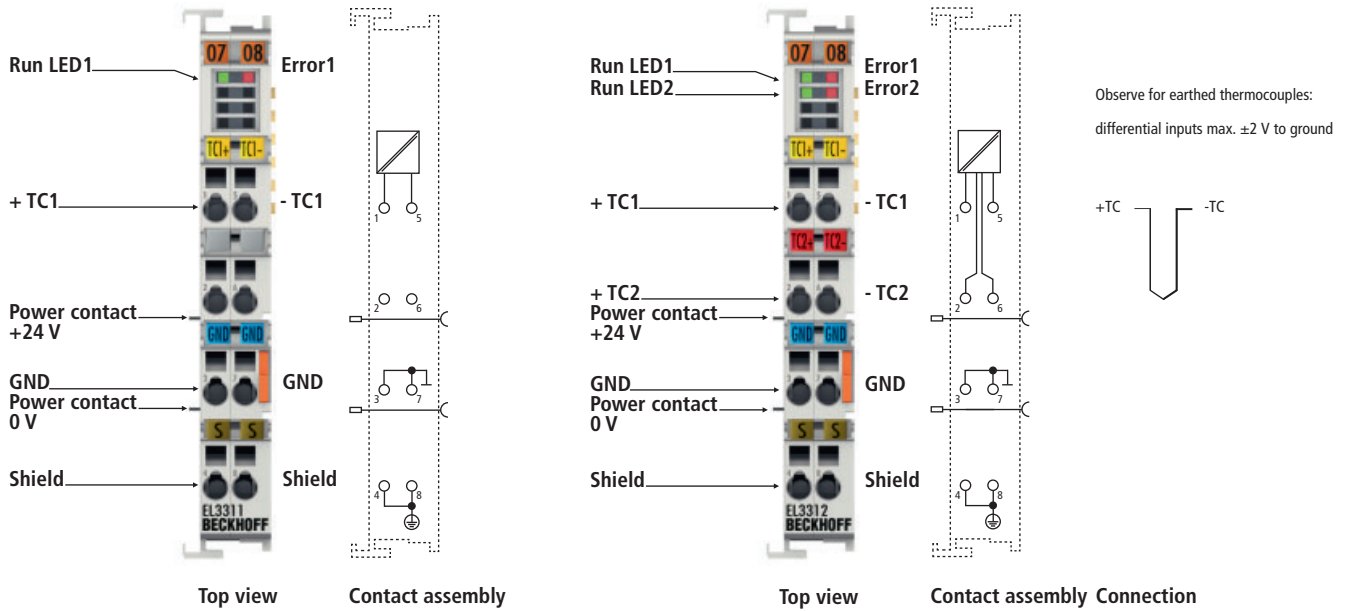
Top view, contact assembly, connection

## EL3054, EL3058, EL3154 | 4-, 8-channel analog input terminals 4...20 mA, single-ended, 12/16 bits

The EL3054, EL3058 and EL3154 analog input terminals process signals in the range between 4 and 20 mA. The current is digitised to a resolution of 12 bits (EL3054, EL3058) or 16 bits (EL3154) and is transmitted (electrically isolated) to the higher-level automation device. The input electronics are independent of the supply voltage of the power contacts. In the EL3054/EL3154 with four inputs, the 24 V power contact is connected to the terminal in order to enable connection of 2-wire sensors without external supply. The EL3058 version combines eight channels in one housing. The power contacts are connected through. The 0 V power contact is used as reference ground connection for the inputs. The signal state of the EtherCAT Terminals is indicated by light emitting diodes. The error LEDs indicate an overload condition and a broken wire.

Technical data	EL3054   ES3054	EL3058   ES3058	EL3154   ES3154
Number of inputs	4 (single-ended)	8 (single-ended)	4 (single-ended)
Signal current	4...20 mA		
Distributed clocks	no	no	yes
Internal resistance	typ. < 85 Ω	typ. < 85 Ω	33 Ω typ. + diode voltage
Input filter limit frequency	1 kHz	1 kHz	5 kHz
Conversion time	typ. 0.625 ms (default setting: 50 Hz filter)	typ. 1.25 ms (default setting: 50 Hz filter)	~ 100 μs
Resolution	12 bits (16 bits presentation)	12 bits (16 bits presentation)	16 bits (incl. sign)
Measuring error	< ±0.3 % (relative to full scale value)		
Surge voltage resistance	30 V max.	30 V max.	35 V max.
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)		
Current consumption E-bus	typ. 130 mA	typ. 130 mA	180 mA (see documentation)
Bit width in the process image	inputs: 16 byte	inputs: 32 byte	inputs: 16 byte
Configuration	no address or configuration setting required		
Weight	approx. 60 g		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all ESxxxx terminals		
Further information	www.beckhoff.com/EL3054		

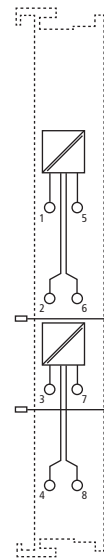
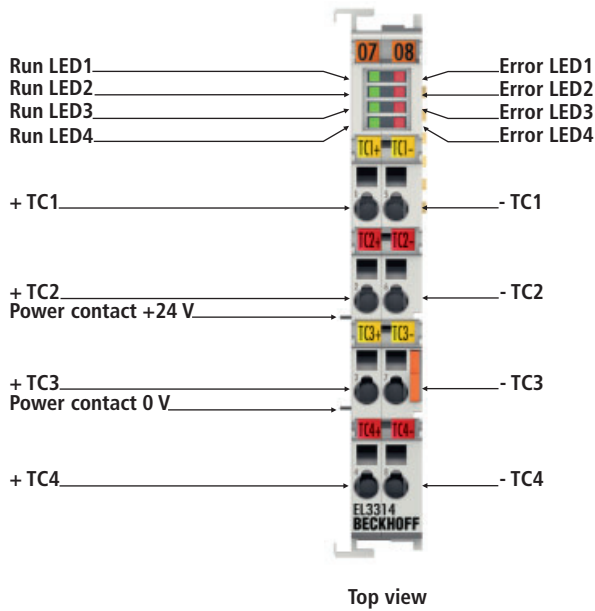




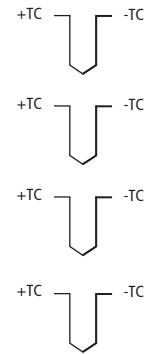
## EL3311, EL3312 | 1-, 2-channel thermocouple input terminals with open-circuit recognition

The EL3311 and EL3312 analog input terminals allow thermocouples to be connected directly. The EtherCAT Terminals circuit can operate thermocouple sensors using the 2-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The error LEDs indicate a broken wire. Compensation for the cold junction is made through an internal temperature measurement at the terminals. The EL3311/EL3312 can also be used for mV measurement.

Technical data	EL3311	EL3312
Number of inputs	1	2
Power supply	via the E-bus	
Thermocouple sensor types	types J, K, L, B, E, N, R, S, T, U (default setting type K), mV measurement	
Connection method	2-wire	
Temperature range	in the range defined in each case for the sensor (default setting: type K; -100...+1,370 °C)	
Resolution	0.1 °C per digit	
Wiring fail indication	yes	
Conversion time	approx. 750 ms up to 20 ms, depending on configuration and filter setting, see documentation, default: approx. 75 ms	approx. 1.2 s up to 20 ms, depending on configuration and filter setting, see documentation, default: approx. 125 ms
Measuring error	< ±0.3 % (relative to full scale value)	
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)	
Current consumption E-bus	200 mA	
Bit width in the process image	1 x 32 bit TC input, 1 x 16 bit TC output	2 x 32 bit TC input, 2 x 16 bit TC output
Weight	approx. 60 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/EL3311	



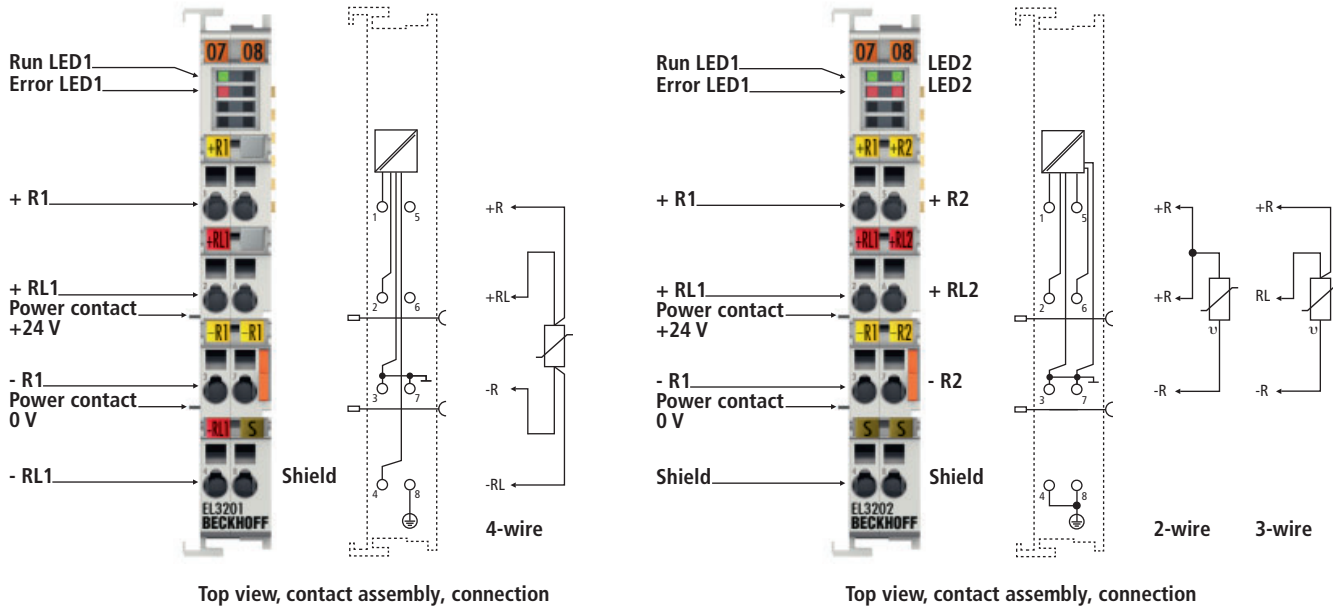
Observe for earthed thermocouples:  
differential inputs max.  $\pm 2$  V to ground



## EL3314 | 4-channel thermocouple input terminal with open-circuit recognition

The EL3314 analog input terminal allows four thermocouples to be connected directly. The EtherCAT Terminal circuit can operate thermocouple sensors using the 2-wire technique. A microprocessor handles linearisation across the whole temperature range, which is freely selectable. The error LEDs indicate a broken wire. Compensation for the cold junction is made through an internal temperature measurement at the terminal. The EL3314 can also be used for mV measurement.

Technical data	EL3314
Number of inputs	4
Power supply	via the E-bus
Thermocouple sensor types	types J, K, L, B, E, N, R, S, T, U (default setting type K), mV measurement
Connection method	2-wire
Temperature range	in the range defined in each case for the sensor (default setting: type K; $-100 \dots +1,370$ °C)
Resolution	0.1 °C per digit
Wiring fail indication	yes
Conversion time	approx. 2.5 s up to 20 ms, depending on configuration and filter setting, see documentation, default: approx. 250 ms
Measuring error	$< \pm 0.3$ % for type K (relative to full scale value), further types see documentation
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)
Current consumption E-bus	200 mA
Bit width in the process image	4 x 32 bit TC input, 4 x 16 bit TC output
Configuration	no address setting, configuration via the controller
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EL3314">www.beckhoff.com/EL3314</a>

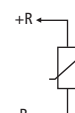
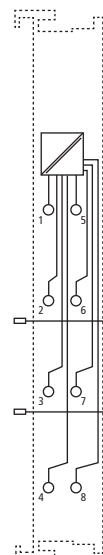
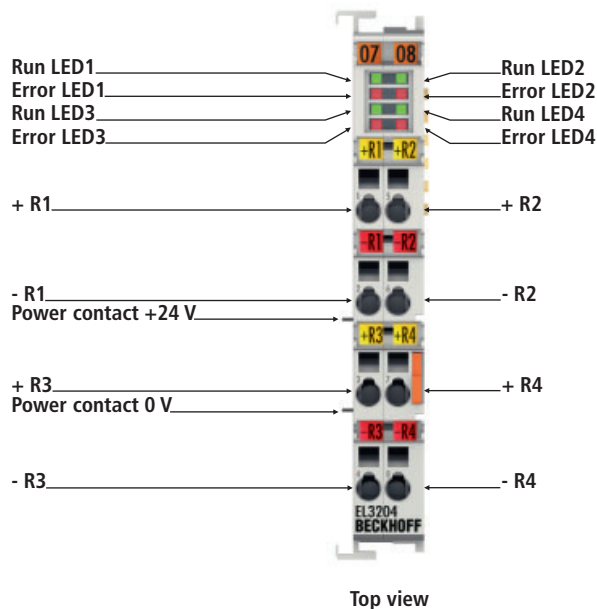


## EL3201, EL3202 | 1-, 2-channel input terminals PT100 (RTD) for 2-, 3- or 4-wire connection

The EL3201 and EL3202 analog input terminals allow resistance sensors to be connected directly. The EtherCAT Terminal circuitry can operate 2- and 3-wire sensors. The EL3201 can operate 4-wire versions in addition. A microprocessor handles linearisation across the whole temperature range, which is freely selectable. The EtherCAT Terminal's standard settings are: resolution 0.1 °C in the temperature range of PT100 sensors in 3-wire connection. The EtherCAT Terminals indicate their signal state by means of light emitting diodes. Sensor malfunctions such as broken wires are indicated by error LEDs.

Technical data	EL3201   ES3201	EL3202   ES3202
Number of inputs	1	2
Power supply	via the E-bus	
Sensor types	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω...1.2/4 kΩ), KTY sensors (types see documentation)	
Connection method	2-, 3-, 4-wire	2- or 3-wire (default: 3-wire)
Temperature range	-200...+850 °C (PT sensors); -60...+250 °C (Ni sensors)	
Resolution	0.1 °C per digit	
Conversion time	~ 200 ms default setting, configurable (65...500 ms, see documentation)	approx. 800 ms up to 2 ms, depending on configuration and filter setting, see documentation, default: approx. 85 ms
Measuring current	typ. 0.5 mA	
Measuring error	< ±0.5 °C for PT sensors (further types see documentation)	
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)	
Current consumption E-bus	190 mA (see documentation)	
Bit width in the process image	1 x 32 bit RTD input	2 x 32 bit RTD input
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all ESxxxx terminals	
Further information	www.beckhoff.com/EL3201	

Special terminals	
EL3201-0010	high-precision: measuring error < ±0.1 °C at 40 °C ambient temperature, 4-wire connection, PT100 sensors and 50 Hz filter, resolution 0.01 °C
EL3201-0020	high-precision: measuring error < ±0.1 °C at 40 °C ambient temperature, 4-wire connection, PT100 sensors and 50 Hz filter, resolution 0.01 °C, with calibration certificate
EL3202-0010	high-precision: measuring error < ±0.1 °C at 40 °C ambient temperature, 4-wire connection, PT100 sensors and 50 Hz filter, resolution 0.01 °C



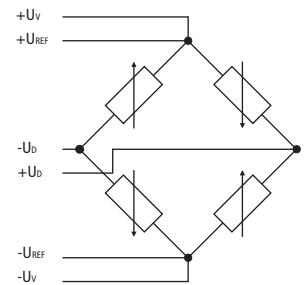
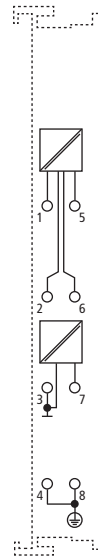
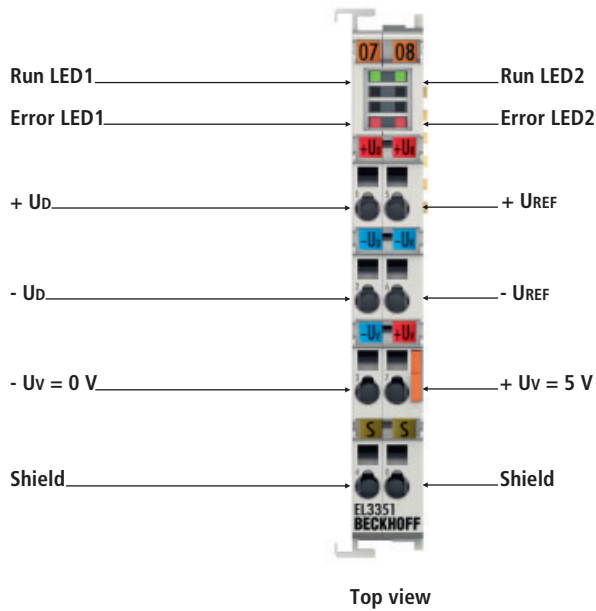
2-wire

Connection

## EL3204 | 4-channel input terminal PT100 (RTD)

The EL3204 analog input terminal allows resistance sensors to be connected directly. The EtherCAT Terminal circuit can operate sensors using the 2-wire technique. A microprocessor handles linearisation across the whole temperature range, which is freely selectable. The EtherCAT Terminal's standard settings are: resolution 0.1 °C in the temperature range of PT100 sensors. Sensor malfunctions such as broken wires are indicated by error LEDs.

Technical data	EL3204   ES3204
Number of inputs	4
Power supply	via the E-bus
Sensor types	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω...1.2/4 kΩ)
Connection method	2-wire
Temperature range	-200...+850 °C (PT sensors); -60...+250 °C (Ni sensors)
Resolution	0.1 °C per digit
Conversion time	approx. 800 ms up to 2 ms, depending on configuration and filter setting, see documentation, default: approx. 85 ms
Measuring current	typ. 0.5 mA
Measuring error	< ±0.5 °C for PT sensors (further types see documentation)
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)
Current consumption E-bus	190 mA (see documentation)
Bit width in the process image	4 x 32 bit RTD input
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL3204">www.beckhoff.com/EL3204</a>

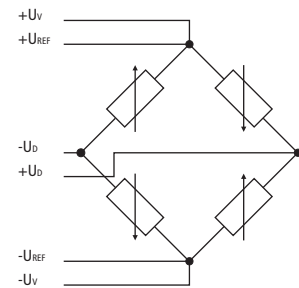
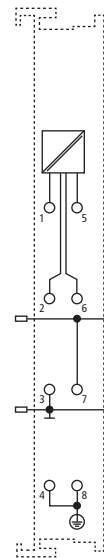
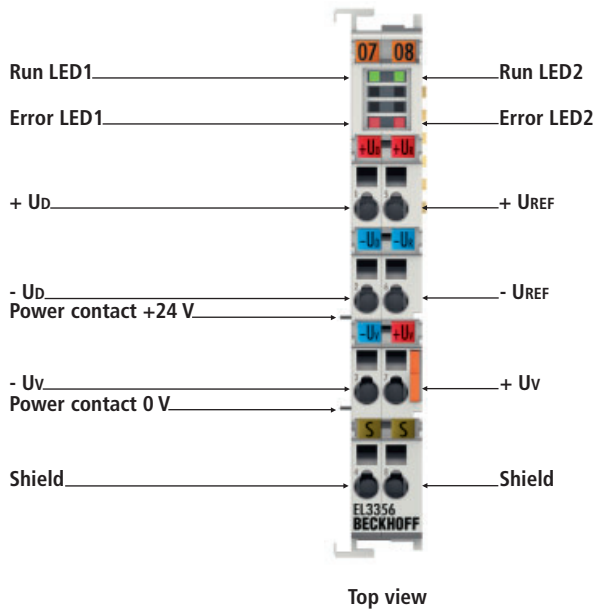


The supply voltage  $U_v$  can be drawn from the terminal or can be supplied from an external source. The terminal supplies 5 V. The maximum input voltage  $U_{REF}$  is limited to 12 V.

## EL3351 | 1-channel resistor bridge terminal (strain gauge)

The EL3351 analog input terminal permits direct connection of a resistor bridge. The bridge voltage,  $U_D$ , and the supply voltage,  $U_{REF}$ , to the bridge are digitised with a 16 bit resolution, and are transmitted along an electrically isolated channel to the supervising automation system. The input channels are available in the form of two 16 bit values for further processing. The resulting measurement can be calculated from the formula: measurement =  $U_D/U_{REF}$ . Precise acquisition of the supply voltage along with the bridge voltage compensates for long-term and temperature drift.

Technical data	EL3351   ES3351
Number of inputs	2, for one resistor bridge
Power supply	via the E-bus
Measuring range $U_D$	max. -20...+20 mV
Measuring range $U_{REF}$	max. -12...+12 V
Internal resistance	> 200 k $\Omega$ ( $U_{REF}$ ), > 1 M $\Omega$ ( $U_D$ )
Conversion time	2.5...800 ms, configurable, default 82 ms
Power supply $U_v$	5 V, max. 20 mA
Resolution	16 bits, 32 bits presentation
Filter	50 Hz, configurable
Measuring error	< $\pm 0.1$ % (relative to full scale value, 50 Hz filter)
Current consumption E-bus	typ. 170 mA
Weight	70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	www.beckhoff.com/EL3351



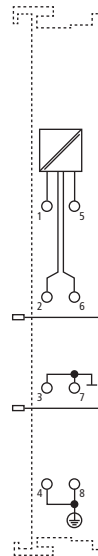
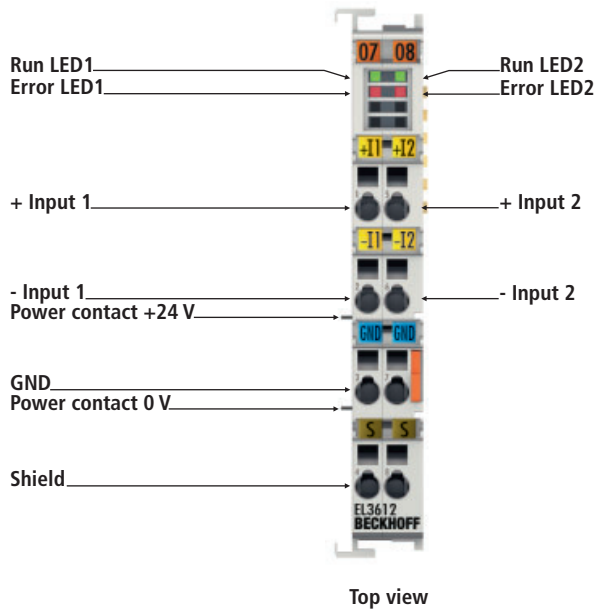
The supply voltage  $U_V$  is supplied from an external source (e.g. EL9512). The maximum input voltage  $U_{REF}$  is limited to 12 V.

## EL3356 | 1-channel accurate resistance bridge evaluation

The EL3356 analog input terminal permits direct connection of a resistance bridge. The ratio between the bridge voltage  $U_D$  and the supply voltage  $U_{REF}$  is determined in the input circuit. In order to achieve good long-term stability, the complete circuit is re-calibrated at least every 3 minutes. This procedure can be synchronised by the control in order to prevent the calibration leading to a delay in the production process.

Technical data	EL3356   ES3356
Number of inputs	2, for one resistor bridge
Power supply	via the E-bus
Signal voltage $U_D$ , $U_{REF}$	-20...+20 mV, -12...+12 V
Internal resistance	> 200 k $\Omega$ ( $U_{REF}$ ), > 1 M $\Omega$ ( $U_D$ )
Resolution	16 bits
Conversion time	< 250 ms, configurable
Measuring error	< $\pm 0.01$ % (relative to full scale value), self-calibration
Current consumption E-bus	180 mA (see documentation)
Bit width in the process image	input: 2 x 16 bit data, 2 x 16 bit control/status
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL3356">www.beckhoff.com/EL3356</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL3356](http://www.beckhoff.com/EL3356)



Contact assembly

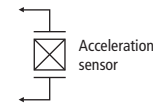
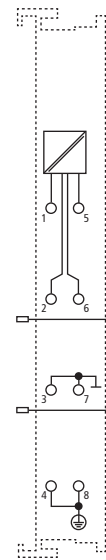
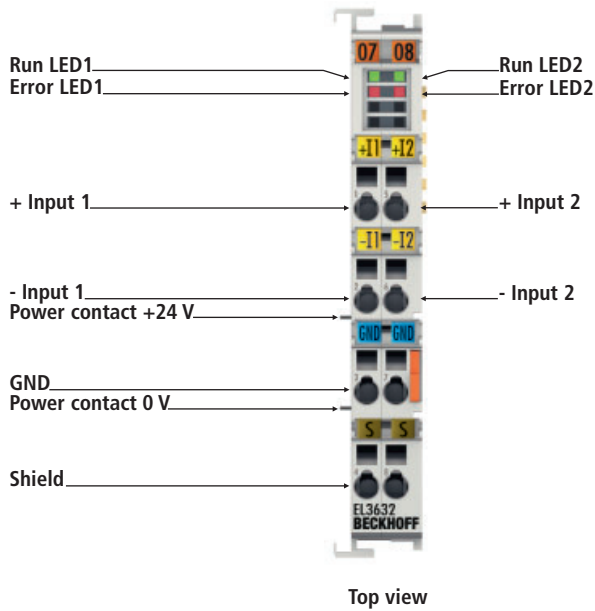


Connection

## EL3612 | 2-channel analog input terminal 0...20 mA, differential input, 24 bits

The EL3612 analog input terminal handles signals in the range between 0 and 20 mA. The voltage is digitised to a resolution of 24 bits, and is transmitted, electrically isolated, to the higher-level automation device. The input channels of the EtherCAT Terminal have differential inputs and possess a common, internal ground potential. The signal state of the EtherCAT Terminal is indicated by light emitting diodes.

Technical data	EL3612   ES3612
Number of inputs	2
Power supply	via the E-bus
Signal current	0...20 mA
Internal resistance	33 Ω typ. + diode voltage
Common-mode voltage $U_{CM}$	10 V max.
Conversion time	1...400 ms configurable (see documentation)
Resolution	24 bits
Measuring error	< ±0.01 % at 25 °C (relative to full scale value, 50 Hz filter)
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)
Current consumption E-bus	typ. 190 mA
Crosstalk attenuation	> 60 dB
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL3612">www.beckhoff.com/EL3612</a>



Connection

## EL3632 | 2-channel analog input terminal for Condition Monitoring (IEPE)

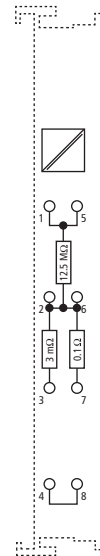
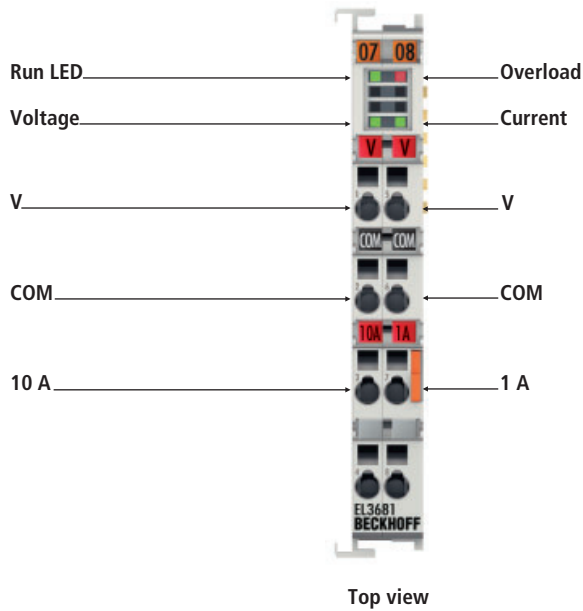
Accelerometers with IEPE interface can be directly connected to the EL3632 EtherCAT Terminal. The measuring signals are analysed on the PC via the TwinCAT library. This enables all benefits of the PC platform, such as performance and flexibility, to be fully utilised. Alternatively, custom software can be used for the analysis. The terminal can be adapted to individual requirements through configurable filters and supply currents.

A galvanically isolated measurement configuration can be achieved using the EL9560. Through interfacing via EtherCAT and support of the distributed clocks function, the measurement results – and any detected defects – can be precisely allocated to an axis position.

Technical data	EL3632
Number of inputs	2
Measuring range	$\pm 5$ V
Power supply $U_v$	24 V DC via power contacts
$U_{\text{EXCITE}}$	typ. $U_v - 1$ V
Sensor state monitoring	yes, through monitoring of the bias voltage
Supply current $I_{\text{EXCITE}}$	typ. 4 mA/8 mA/12 mA (separately configurable for both channels)
Limit frequency	25 kHz
Max. sampling rate	40 ksamples/s
HW filter	5 kHz (selectable)
Input	single-ended
Amplification	1 (default) or 10 (with 10 Hz low-pass filter)
AC coupling	typ. 0.05 Hz
TEDS interface	Transducer Electronic Data Sheet is supported.
Resolution	16 bits
Measuring error	0.5 %
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EL3632">www.beckhoff.com/EL3632</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL3632](http://www.beckhoff.com/EL3632)





Contact assembly

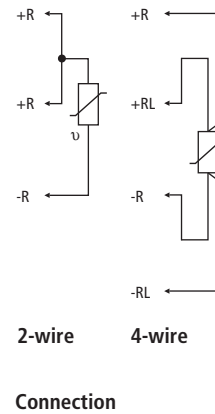
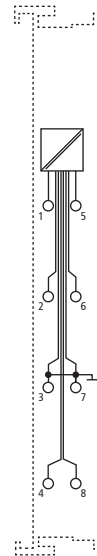
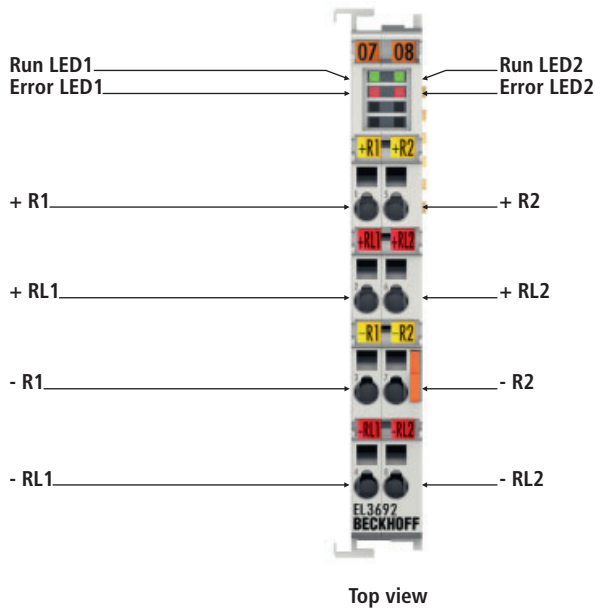
## EL3681 | Digital multimeter terminal

The EL3681 EtherCAT Terminal enables measurement of currents and voltages in a wide input range. The measuring ranges are switched automatically, as usual in advanced digital multimeters. For current measurements, two current paths are available, one of which is a high-current path for up to 10 A. The current and the voltage measurement facility can be used for DC and AC. The alternating parameters are output as true RMS values. The measurement readings can be read and processed with EtherCAT. At the same time, the EL3681 enables the measuring type and range to be set via the bus.

Excellent interference immunity is achieved through the fully electrically isolated design of the electronic measuring system and the dual-slope conversion system. High precision and simple, high-impedance measurement from 300 mV to 300 V allow the EtherCAT Terminal to be used like a modern digital multimeter.

In measuring applications in particular, the voltage to be expected is often not yet known during the planning phase. Automatic adjustment of the measurement range simplifies use and reduces stock levels. The selected measuring type and overload are indicated by LEDs.

Technical data	EL3681   ES3681
Measured values	current, voltage
Measuring voltage	300 mV, 3 V, 30 V, 300 V
Measuring current	100 mA, 1 A and 10 A via high-current path
Resolution	18 bits + sign in each measurement range
Measuring error	0.01 % DC voltage measurement at 25 °C
Measuring procedure	DC with arithmetic averaging, AC with true RMS value calculation
Update time	0.5 s, 1 s for measuring range selection
Electrical isolation	1,500 V <sub>rms</sub> (terminal/E-bus)
Current consumption E-bus	150 mA
Bit width in the process image	32 bit data, 16 bit control/status
Weight	approx. 70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL3681">www.beckhoff.com/EL3681</a>

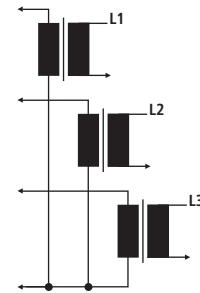
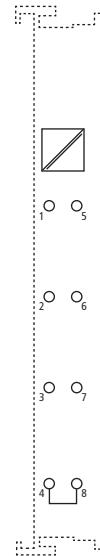
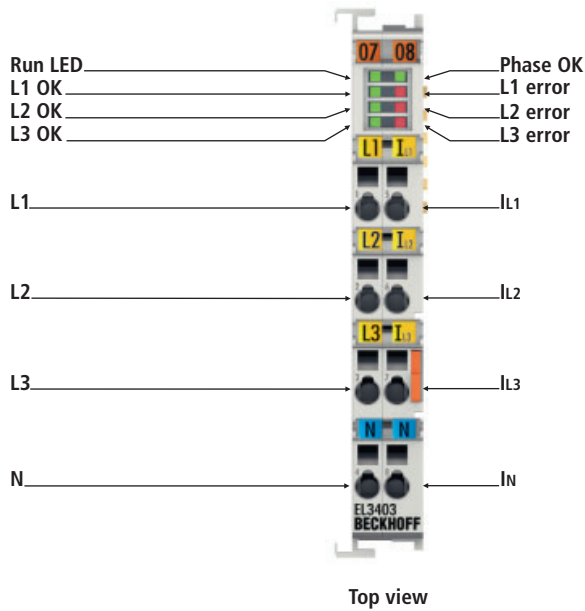


## EL3692 | 2-channel resistance measurement terminal 10 mΩ...10 MΩ, high-precision

The analog EL3692 input terminal enables direct resistance measurement in a wide range between 10 mΩ and 10 MΩ. The circuitry of the EtherCAT Terminal enables measurement in 2- and 4-wire versions. The EL3692 offers measuring range selection, either automatic or through the controller. Due to the galvanic isolation of 1500 V between the field side and the E-bus, in single-channel mode measurements can be carried out at live points (within the permissible range). The EtherCAT Terminal indicates its state through LEDs. Malfunctions such as broken wires are indicated by error LEDs.

Technical data	EL3692
Number of inputs	2
Power supply	via the E-bus
Connection method	4- or 2-wire
Wiring fail indication	yes
Conversion time	typ. 250 ms
Measuring range	1 Ω, 100 Ω, 10 kΩ, 10 MΩ
Range switching	automatic or through control
Resolution	depending on the range, typ. 14 bits
Measuring error	< ±0.5 % (relative to full scale value with 4-wire connection)
Electrical isolation	1500 V <sub>rms</sub> (E-bus/signal voltage)
Current consumption E-bus	150 mA
Configuration	via the controller
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EL3692">www.beckhoff.com/EL3692</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL3692](http://www.beckhoff.com/EL3692)



## EL3403 | 3-phase power measurement terminal

The EL3403 EtherCAT Terminal enables the measurement of all relevant electrical data of the supply network. The voltage is measured via the direct connection of L1, L2, L3 and N. The current of the three phases L1, L2 and L3 is fed via simple current transformers. All measured currents and voltages are available as root-mean-square values. In the EL3403 version, the effective power and the energy consumption for each phase are calculated. The root-mean-square value of voltage  $U$ , current  $I$  and the effective power  $P$ , apparent power  $S$ , reactive power  $Q$ , frequency  $F$  and phase shift angle  $\cos \varphi$  can be derived. For each fieldbus, EL3403 provides a comprehensive network analysis and an energy management option.

Technical data	EL3403   ES3403
Resolution	1 $\mu$ A, 0.1 mV, 10 mW
Measured values	current, voltage, effective power, energy, $\cos \varphi$ , peak values $U$ , $I$ and $P$ , frequency
Measuring voltage	max. 500 V AC 3~ (ULx-N: max. 288 V AC)
Measuring current	max. 1 A (AC), via measuring transformers x A/1 A
Measuring error	0.5 % relative to full scale value ( $U/I$ ), 1 % calculated value ( $P$ )
Measuring procedure	true RMS
Update time	net-synchronous
Electrical isolation	1,500 V <sub>rms</sub> (terminal/E-bus)
Current consumption E-bus	typ. 120 mA
Bit width in the process image	62 byte PM input, 3 byte PM output
Weight	approx. 75 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL3403">www.beckhoff.com/EL3403</a>

Special terminals	
EL3403-0010	3-phase power measurement terminal, 500 V AC, 5 A
EL3403-0026	3-phase power measurement terminal, 500 V AC, 1 A, without EMC bypass capacitor between N and DIN rail
EL3403-0100	3-phase power measurement terminal, 500 V AC, 100 mA
EL3403-0111	10, 100, 1000 mA current inputs

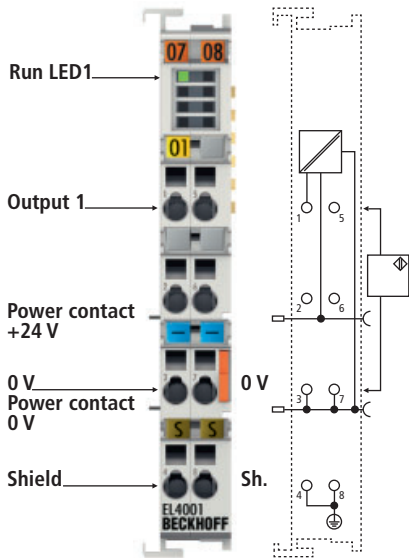
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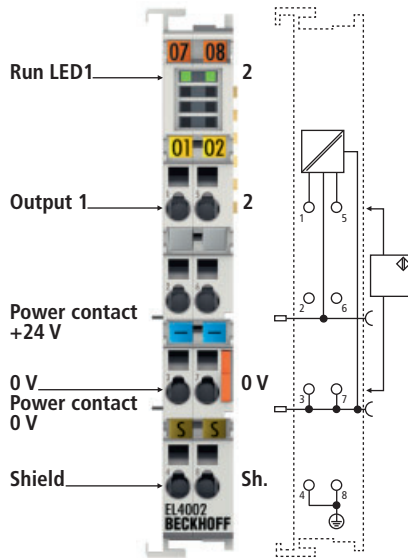
**BECKHOFF**  
**EK 1100**

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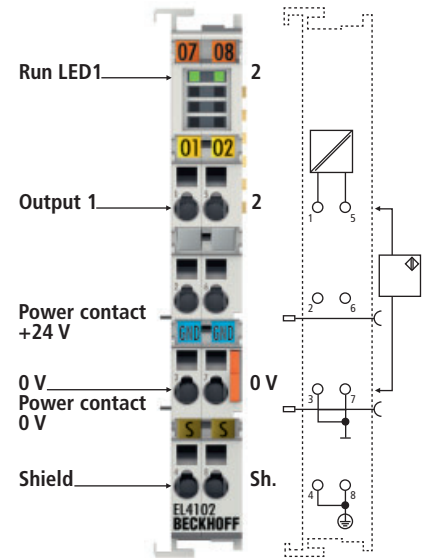
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Top view, contact assembly, connection



Top view, contact assembly, connection

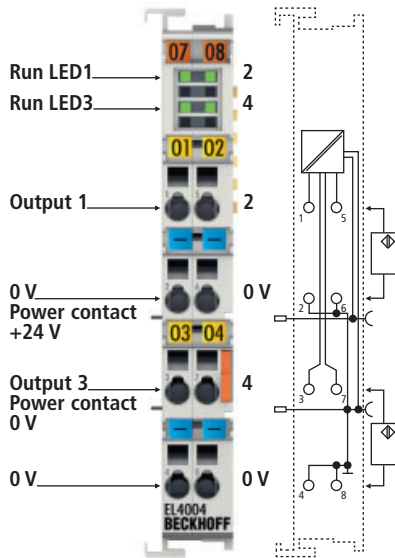


Top view, contact assembly, connection

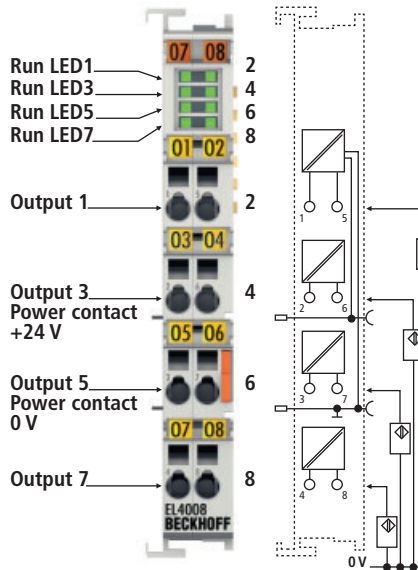
## EL4001, EL4002, EL4102 | 1-, 2-channel analog output terminals 0...10 V, 12/16 bits

The EL4001, EL4002 and EL4102 analog output terminals generate signals in the range between 0 and 10 V. The voltage is supplied to the process level with a resolution of 12 bits (EL4001/EL4002) or 16 bits (EL4102), and is electrically isolated. The output channels of the EtherCAT Terminals have a common ground potential. The EL4001 is the single-channel variant which when combined with the EL95xx is particularly suitable for signals with electrically isolated ground potentials. The EL4002 and EL4102 versions combine two channels in one housing. The output stages are powered by the 24 V supply. The signal state of the EtherCAT Terminals is indicated by light emitting diodes.

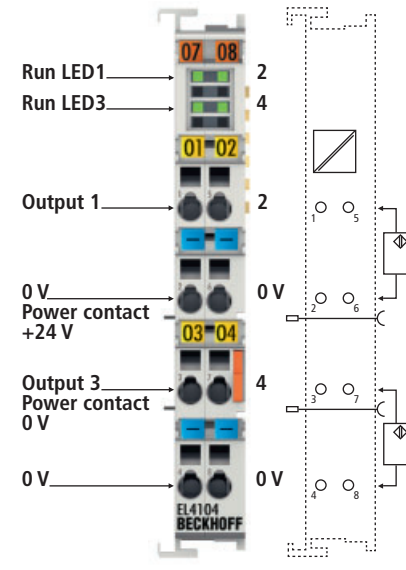
Technical data	EL4001   ES4001	EL4002   ES4002	EL4102   ES4102
Number of outputs	1	2	2
Power supply	24 V DC via the power contacts	24 V DC via the power contacts	via the E-bus
Signal voltage	0...10 V		
Distributed clocks	yes		
Load	> 5 kΩ (short-circuit-proof)		
Measuring error	< 0.1 % (relative to full scale value)	< 0.1 % (relative to full scale value)	±0.1 % (relative to full scale value)
Resolution	12 bits	12 bits	16 bits (incl. sign)
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)		
Conversion time	~ 100 μs	~ 150 μs	~ 40 μs (fast mode ~ 25 μs)
Current consumption E-bus	typ. 190 mA	typ. 190 mA	typ. 210 mA
Bit width in the process image	1 x 16 bit AO output	2 x 16 bit AO output	2 x 16 bit AO output
Weight	approx. 60 g		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all ESxxxx terminals		
Further information	www.beckhoff.com/EL4001		



Top view, contact assembly, connection



Top view, contact assembly, connection

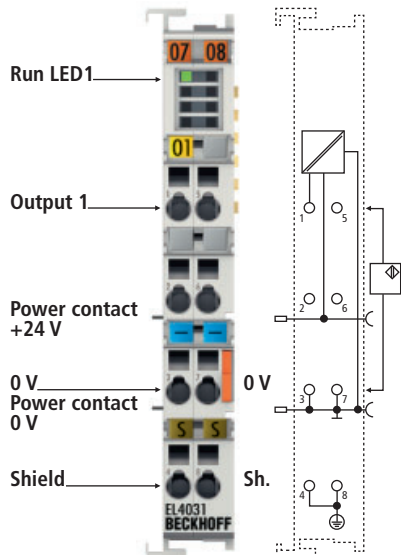


Top view, contact assembly, connection

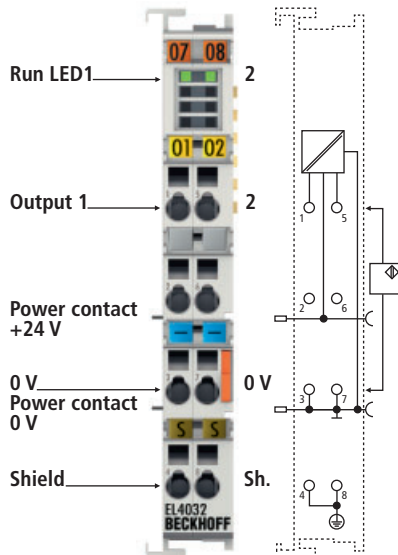
## EL4004, EL4008, EL4104 | 4-, 8-channel analog output terminals 0...10 V, 12/16 bits

The EL4004, EL4008 and EL4104 analog output terminals generate signals in the range between 0 and 10 V. The voltage is supplied to the process level with a resolution of 12 bits (EL4004/EL4008) or 16 bits (EL4104), and is electrically isolated. The output channels of an EtherCAT Terminal have a common ground potential. The EL4004 and EL4104 versions have four channels. The EL4008 combines eight channels in one housing. The output stages are powered by the 24 V supply. The signal state of the EtherCAT Terminals is indicated by light emitting diodes.

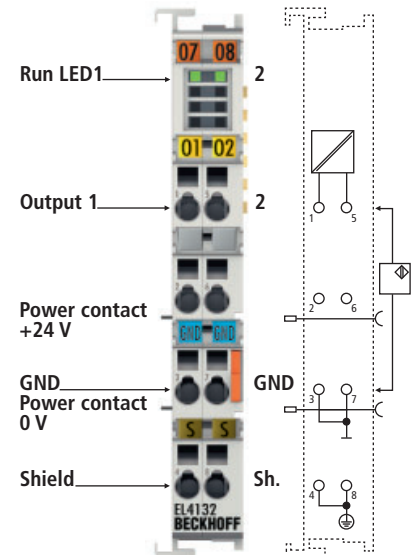
Technical data	EL4004   ES4004	EL4008   ES4008	EL4104   ES4104
Number of outputs	4	8	4
Power supply	24 V DC via the power contacts	24 V DC via the power contacts	via the E-bus
Signal voltage	0...10 V		
Distributed clocks	yes		
Load	> 5 k $\Omega$ (short-circuit-proof)		
Measuring error	< 0.1 % (relative to full scale value)	< 0.1 % (relative to full scale value)	$\pm$ 0.1 % (relative to full scale value)
Resolution	12 bits	12 bits	16 bits (incl. sign)
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)		
Conversion time	~ 250 $\mu$ s	~ 400 $\mu$ s	~ 80 $\mu$ s
Current consumption E-bus	typ. 190 mA		
Bit width in the process image	4 x 16 bit AO output	8 x 16 bit AO output	4 x 16 bit AO output
Weight	approx. 85 g	approx. 85 g	approx. 65 g
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all ESxxxx terminals		
Further information	www.beckhoff.com/EL4004		



Top view, contact assembly, connection



Top view, contact assembly, connection

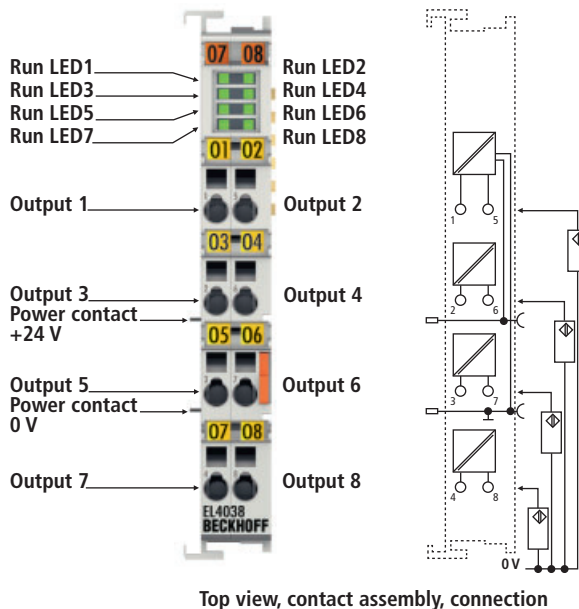
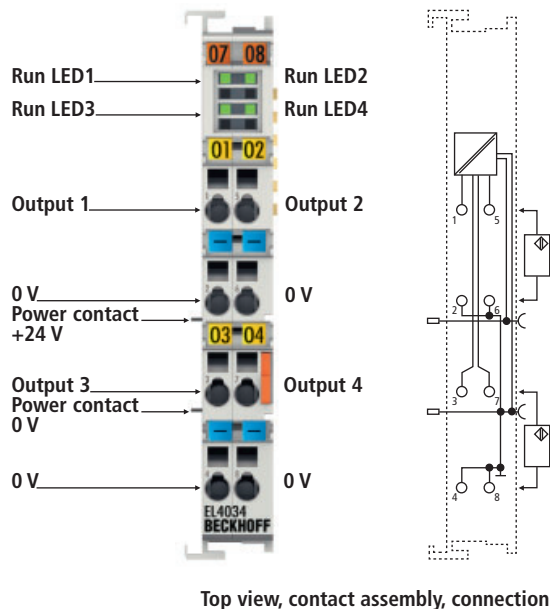


Top view, contact assembly, connection

## EL4031, EL4032, EL4132 | 1-, 2-channel analog output terminals -10...+10 V, 12/16 bits

The EL4031, EL4032 and EL4132 analog output terminals generate signals in the range between -10 and +10 V. The voltage is supplied to the process level with a resolution of 12 bits (EL4031/EL4032) or 16 bits (EL4132) and is electrically isolated. The output channels of an EtherCAT Terminal have a common ground potential. The EL4031 is the single-channel variant which when combined with the EL95xx is particularly suitable for signals with electrically isolated ground potentials. The EL4032 and EL4132 versions combine two channels in one housing. The output stages are powered by the 24 V supply. The signal state of the EtherCAT Terminals is indicated by light emitting diodes.

Technical data	EL4031   ES4031	EL4032   ES4032	EL4132   ES4132
Number of outputs	1	2	2
Power supply	24 V DC via the power contacts	24 V DC via the power contacts	via the E-bus
Signal voltage	-10...+10 V		
Distributed clocks	yes		
Load	> 5 k $\Omega$ (short-circuit-proof)		
Measuring error	< 0.1 % (relative to full scale value)		
Resolution	12 bits	12 bits	16 bits
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)		
Conversion time	~ 100 $\mu$ s	~ 150 $\mu$ s	~ 40 $\mu$ s (fast mode ~ 25 $\mu$ s)
Current consumption E-bus	typ. 190 mA	typ. 190 mA	typ. 210 mA
Bit width in the process image	1 x 16 bit AO output	2 x 16 bit AO output	2 x 16 bit AO output
Weight	approx. 55 g		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all ESxxxx terminals		
Further information	www.beckhoff.com/EL4031		

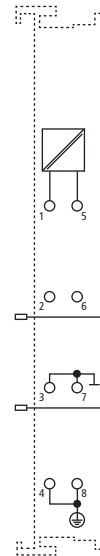
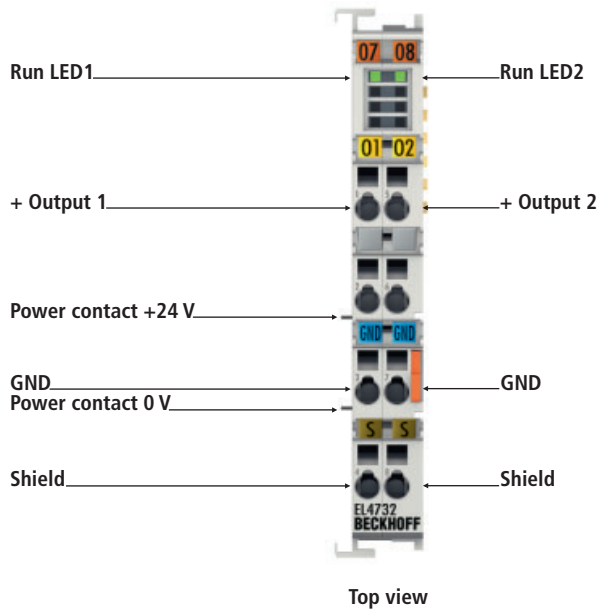


## EL4034, EL4038, EL4134 | 4-, 8-channel analog output terminals -10...+10 V, 12/16 bits

The EL4034, EL4038 and EL4134 analog output terminals generate signals in the range between -10 and +10 V. The voltage is supplied to the process level with a resolution of 12 bits (EL4034/EL4038) or 16 bits (EL4134) and is electrically isolated. The output channels of an EtherCAT Terminal have a common ground potential. The EL4034 and EL4134 versions have four channels. The EL4038 combines eight channels in one housing. The output stages are powered by the 24 V supply. The signal state of the EtherCAT Terminals is indicated by light emitting diodes.

Technical data	EL4034   ES4034	EL4038   ES4038	EL4134   ES4134
Number of outputs	4	8	4
Power supply	24 V DC via the power contacts	24 V DC via the power contacts	via the E-bus
Signal voltage	-10...+10 V		
Distributed clocks	yes		
Load	> 5 k $\Omega$ (short-circuit-proof)		
Measuring error	< 0.1 % (relative to full scale value)		
Resolution	12 bits	12 bits	16 bits
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)		
Conversion time	~ 250 $\mu$ s	~ 400 $\mu$ s	~ 80 $\mu$ s
Current consumption E-bus	typ. 190 mA	typ. 190 mA	typ. 265 mA
Bit width in the process image	4 x 16 bit AO output	8 x 16 bit AO output	4 x 16 bit AO output
Weight	approx. 85 g	approx. 85 g	approx. 65 g
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all ESxxxx terminals		
Further information	www.beckhoff.com/EL4034		





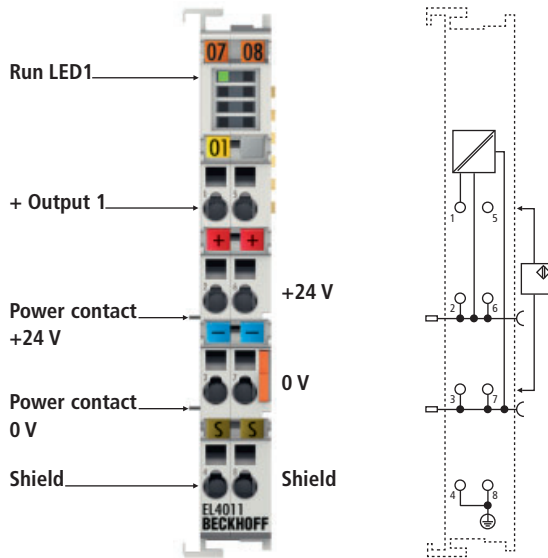
## EL4732 | 2-channel analog output terminal -10...+10 V with oversampling



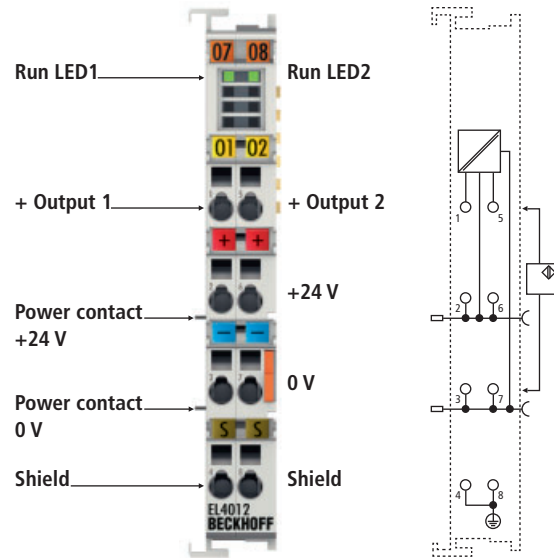
The EL4732 analog output terminal generates signals in the range between -10 V and +10 V. The voltage is supplied to the process level with a resolution of 16 bits and is electrically isolated. The output channels have a common ground potential. The outputs are oversampled with an adjustable, integer multiple (oversampling factor:  $n$ ) of the bus cycle time ( $n$  microcycles per bus cycle). For each microcycle, the EtherCAT Terminal receives a process data block that is output consecutively. The time base of the terminal can be synchronised precisely with other EtherCAT devices via distributed clocks. This procedure enables the temporal resolution of the analog output signals to be increased to  $n$  times the bus cycle time. In conjunction with the EL37xx (analog input terminal with oversampling), responses with equidistant time intervals, e.g. in the event of a threshold value being exceeded, become possible. The EL4732 device can output a maximum of 100,000 values (100 ksamples/s) per channel and second.

Technical data	EL4732   ES4732
Number of outputs	2
Power supply	via the E-bus
Signal voltage	-10...+10 V
Oversampling factor	$n$ = integer multiple of the cycle time, 1...100 selectable
Distributed clock precision	$\ll 1 \mu\text{s}$
Load	$> 5 \text{ k}\Omega$ (short-circuit-proof)
Measuring error	$\pm 0.1 \%$ (relative to full scale value)
Resolution	16 bits
Electrical isolation	$500 \text{ V}_{\text{rms}}$ (E-bus/signal voltage)
Conversion time	min. $10 \mu\text{s}$
Output rate	max. 100 ksamples/s
Current consumption E-bus	typ. 180 mA
Bit width in the process image	$n \times 2 \times 16$ bit output, 32 bit CycleCounter
Operating/storage temperature	$0...+55 \text{ }^\circ\text{C}/-25...+85 \text{ }^\circ\text{C}$
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL4732">www.beckhoff.com/EL4732</a>

XFC technology description see 664



Top view, contact assembly, connection



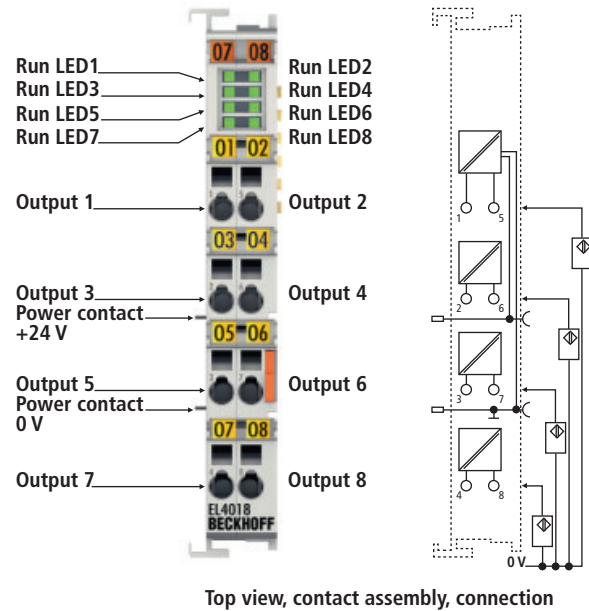
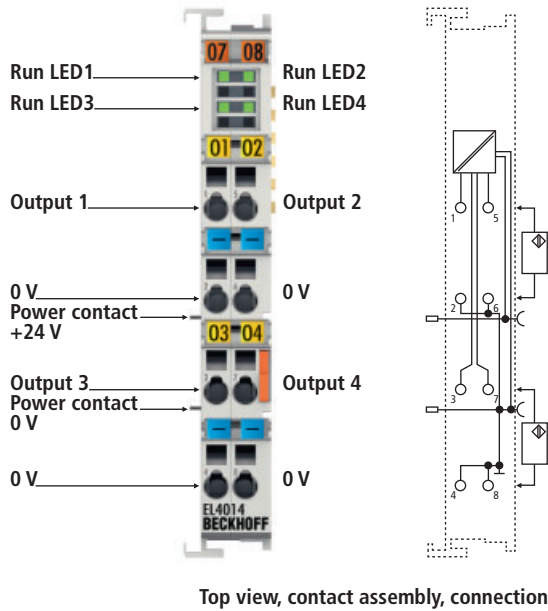
Top view, contact assembly, connection

## EL4011, EL4012, EL4112 | 1-, 2-channel analog output terminals 0...20 mA, 12/16 bits

The EL4011, EL4012 and EL4112 analog output terminals generate analog output signals in the range between 0 and 20 mA. The power is supplied to the process level with a resolution of 12 bits (EL4011/EL4012) or 16 bits (EL4112) and is electrically isolated. Ground potential for the output channels of an EtherCAT Terminal is common with the 0 V DC supply. The output stages are powered by the 24 V supply. The EL4011 is a single-channel version. The EL4012 and the EL4112 combine two channels in one housing. The EtherCAT Terminals indicate their signal state by means of light emitting diodes.

Technical data	EL4011   ES4011	EL4012   ES4012	EL4112   ES4112
Number of outputs	1	2	2
Power supply	24 V DC via the power contacts		
Signal current	0...20 mA		
Distributed clocks	yes		
Load	< 500 Ω (short-circuit-proof)		
Measuring error	< 0.1 % (relative to full scale value)	< 0.1 % (relative to full scale value)	±0.2 % (relative to full scale value)
Resolution	12 bits	12 bits	16 bits (incl. sign)
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)		
Conversion time	~ 100 μs	~ 150 μs	~ 40 μs (fast mode ~ 25 μs)
Current consumption E-bus	typ. 190 mA		
Bit width in the process image	1 x 16 bit AO output	2 x 16 bit AO output	2 x 16 bit AO output
Weight	approx. 60 g		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all ESxxxx terminals		
Further information	www.beckhoff.com/EL4011		

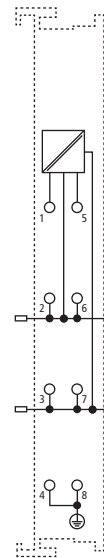
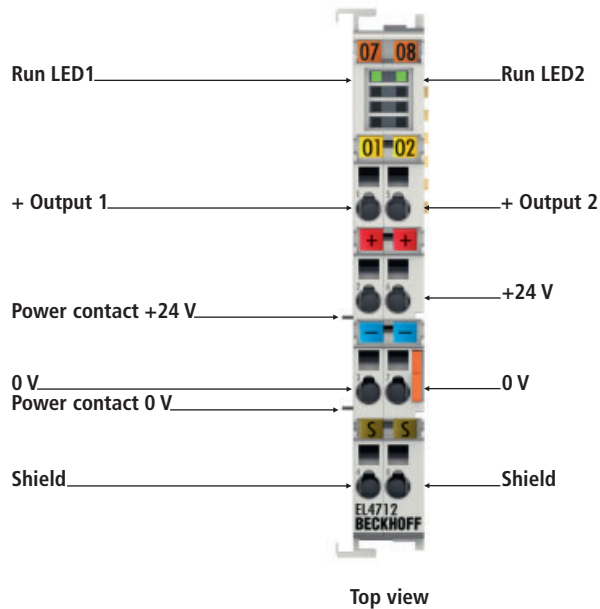
Special terminals	
EL4112-0010   ES4112-0010	signal current ±10 mA



## EL4014, EL4018, EL4114 | 4-, 8-channel analog output terminals 0...20 mA, 12/16 bits

The EL4014, EL4018 and EL4114 analog output terminals generate analog output signals in the range between 0 and 20 mA. The power is supplied to the process level with a resolution of 12 bits (EL4014/EL4018) or 16 bits (EL4114) and is electrically isolated. Ground potential for the output channels of an EtherCAT Terminal is common with the 24 V DC supply. The output stages are powered by the 24 V supply. The EL4014 and EL4114 versions have four channels. The EL4018 combines eight channels in one housing. The EtherCAT Terminals indicate their signal state by means of light emitting diodes.

Technical data	EL4014   ES4014	EL4018   ES4018	EL4114   ES4114
Number of outputs	4	8	4
Power supply	24 V DC via the power contacts		
Signal current	0...20 mA		
Distributed clocks	yes		
Load	< 350 Ω (short-circuit-proof)	< 150 Ω	< 350 Ω (short-circuit-proof)
Measuring error	< 0.1 % (relative to full scale value)	< 0.1 % (relative to full scale value)	±0.2 % (relative to full scale value)
Resolution	12 bits	12 bits	16 bits (incl. sign)
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)		
Conversion time	~ 250 μs	~ 400 μs	~ 80 μs
Current consumption E-bus	typ. 190 mA		
Bit width in the process image	4 x 16 bit AO output	8 x 16 bit AO output	4 x 16 bit AO output
Weight	approx. 65 g		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all ESxxxx terminals		
Further information	www.beckhoff.com/EL4014		



## EL4712 | 2-channel analog output terminal 0...20 mA with oversampling

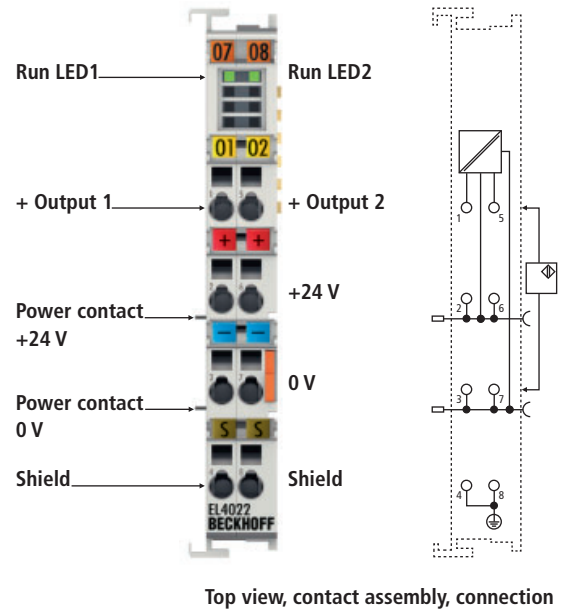
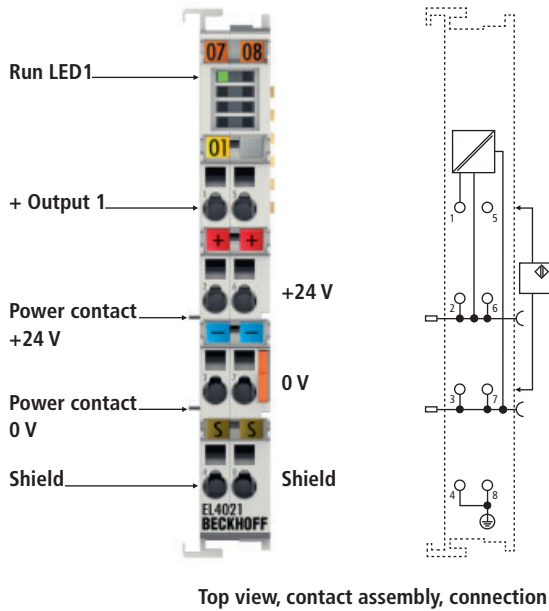


The EL4712 analog output terminal generates output signals in the range between 0 and 20 mA. The voltage is supplied to the process level with a resolution of 16 bits and is electrically isolated. The output channels have a common ground potential. The outputs are sampled with an adjustable, integer multiple (oversampling factor:  $n$ ) of the bus cycle time ( $n$  microcycles per bus cycle). For each microcycle, the EtherCAT Terminal receives a process data block that is output consecutively. The time base of the terminal can be synchronised precisely with other EtherCAT devices via distributed clocks. This procedure enables the temporal resolution of the analog output signals to be increased to  $n$  times the bus cycle time. In conjunction with the EL37xx (analog input terminal with oversampling), responses with equidistant time intervals, e.g. in the event of a threshold value being exceeded, become possible. The EL4712 device can output a maximum of 100,000 values (100 ksamples/s) per channel and second.

Technical data	EL4712   ES4712
Number of outputs	2
Power supply	24 V DC via the power contacts
Signal current	0...20 mA
Oversampling factor	$n$ = integer multiple of the cycle time, 1...100 selectable
Distributed clock precision	$\ll 1 \mu\text{s}$
Load	$< 500 \Omega$ (short-circuit-proof)
Measuring error	$< \pm 0.1 \%$ (relative to full scale value)
Resolution	16 bits (incl. sign)
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)
Conversion time	min. 10 $\mu\text{s}$
Output rate	max. 100 ksamples/s
Current consumption E-bus	typ. 180 mA
Bit width in the process image	output: $n \times 2 \times 16$ bit data, max. 8 byte additional information
Operating/storage temperature	0...+55 °C/-25...+85 °C
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL4712">www.beckhoff.com/EL4712</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL4712](http://www.beckhoff.com/EL4712)

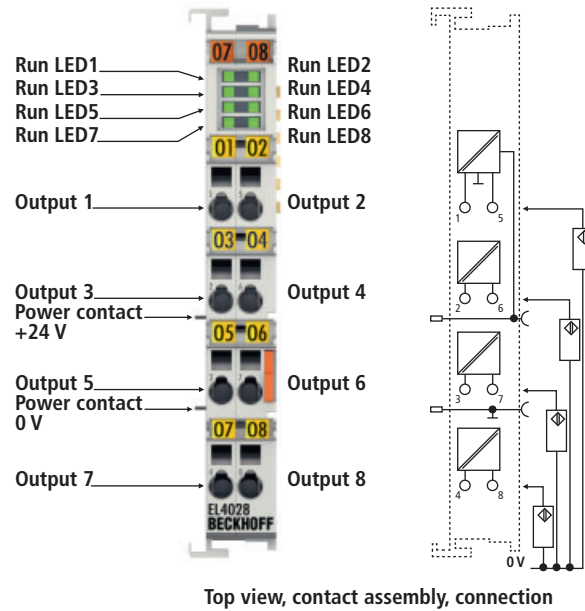
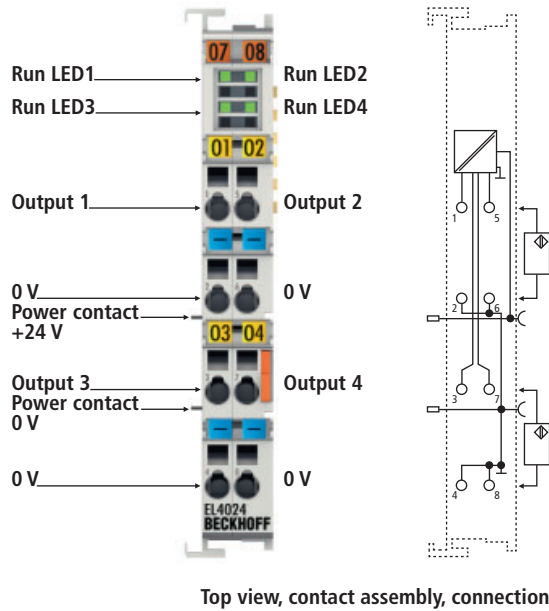
XFC technology description see **664**



## EL4021, EL4022, EL4122 | 1-, 2-channel analog output terminals 4...20 mA, 12/16 bits

The EL4021, EL4022 and EL4122 analog output terminals generate signals in the range between 4 and 20 mA. The power is supplied to the process level with a resolution of 12 bits (EL4021/EL4022) or 16 bits (EL4122) and is electrically isolated. Ground potential for the output channels of an EtherCAT Terminal is common with the 24 V DC supply. The output stages are powered by the 24 V supply. The EL4021 is a single-channel version. The EL4022 and the EL4122 combine two channels in one housing. The signal state of the EtherCAT Terminals is indicated by light emitting diodes.

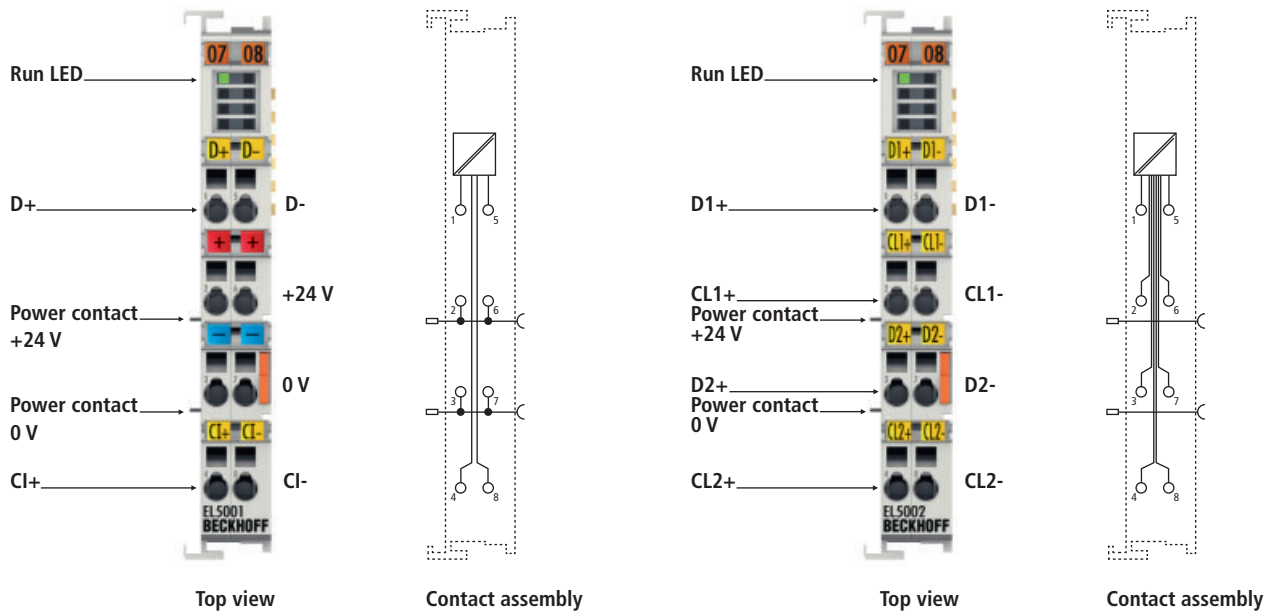
Technical data	EL4021   ES4021	EL4022   ES4022	EL4122   ES4122
Number of outputs	1	2	2
Power supply	24 V DC via the power contacts		
Signal current	4...20 mA		
Distributed clocks	yes		
Load	< 500 Ω (short-circuit-proof)		
Measuring error	< 0.1 % (relative to full scale value)	< 0.1 % (relative to full scale value)	±0.2 % (relative to full scale value)
Resolution	12 bits	12 bits	16 bits (incl. sign)
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)		
Conversion time	~ 100 μs	~ 150 μs	~ 40 μs (fast mode ~ 25 μs)
Current consumption E-bus	typ. 190 mA		
Bit width in the process image	1 x 16 bit AO output	2 x 16 bit AO output	2 x 16 bit AO output
Weight	approx. 60 g		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all ESxxxx terminals		
Further information	www.beckhoff.com/EL4021		



## EL4024, EL4028, EL4124 | 4-, 8-channel analog output terminals 4...20 mA, 12/16 bits

The EL4024, EL4028 and EL4124 analog output terminals generate signals in the range between 4 and 20 mA. The power is supplied to the process level with a resolution of 12 bits (EL4024/EL4028) or 16 bits (EL4124) and is electrically isolated. Ground potential for the output channels of an EtherCAT Terminal is common with the 24 V DC supply. The output stages are powered by the 24 V supply. The EL4024 and the EL4124 have four channels. The EL4028 combines eight channels in one housing. The signal state of the EtherCAT Terminals is indicated by light emitting diodes.

Technical data	EL4024   ES4024	EL4028   ES4028	EL4124   ES4124
Number of outputs	4	8	4
Power supply	24 V DC via the power contacts		
Signal current	4...20 mA		
Distributed clocks	yes		
Load	< 350 Ω (short-circuit-proof)	< 150 Ω	< 350 Ω (short-circuit-proof)
Measuring error	< 0.1 % (relative to full scale value)	< 0.1 % (relative to full scale value)	±0.2 % (relative to full scale value)
Resolution	12 bits	12 bits	16 bits (incl. sign)
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)		
Conversion time	~ 250 μs	~ 400 μs	~ 80 μs
Current consumption E-bus	typ. 190 mA		
Bit width in the process image	4 x 16 bit AO output	8 x 16 bit AO output	4 x 16 bit AO output
Weight	approx. 80 g	approx. 80 g	approx. 65 g
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Pluggable wiring	for all ESxxxx terminals		
Further information	www.beckhoff.com/EL4024		



## EL5001, EL5002 | SSI encoder interfaces

The EL5001 SSI interface EtherCAT Terminal allows an SSI encoder to be connected directly, whereas the EL5002 2-channel SSI interface EtherCAT Terminal allows the direct connection of two SSI encoders. The encoders are powered via the SSI interface. The interface circuit generates a pulse for reading the encoder and makes the incoming data stream available to the controller as a data word in the process image. Various operating modes, transmission frequencies and bit widths can be permanently stored in a control register.

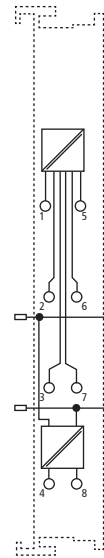
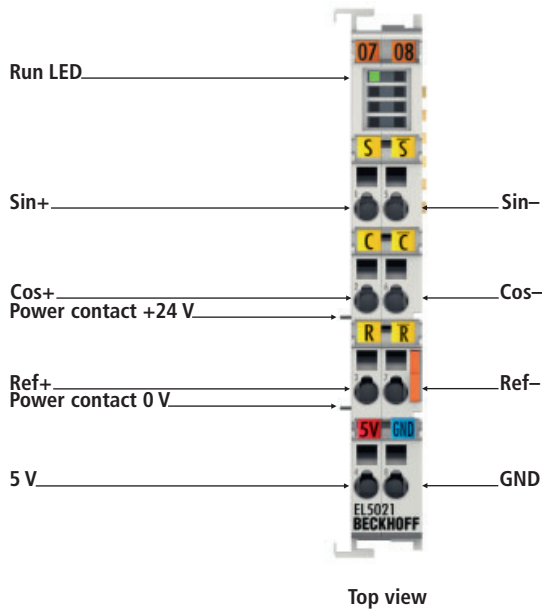
Technical data	EL5001   ES5001	EL5002   ES5002
Encoder connection	binary input: D+, D-; binary output: CI+, CI-	
Power supply	24 V via power contacts	
Current consumption	typ. 20 mA without encoder	
Encoder supply	24 V DC (-15 %/+20 %) via power contacts	24 V DC (-15 %/+20 %) via power contacts, EL91xx potential distribution terminal
Data transfer rates	variable up to 1 MHz, 250 kHz default	
Serial input	24 bit width (variable)	
Data direction	read	
Signal output	difference signal (RS422)	
Signal input	difference signal (RS422)	
Electrical isolation	500 V (E-bus/field potential)	
Current consumption E-bus	typ. 120 mA	typ. 190 mA
Bit width in the process image	1 x 32 bit input, 8 bit status	2 x 32 bit input, 16 bit status
Weight	approx. 55 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all ESxxxx terminals	
Further information	www.beckhoff.com/EL5001	

### Special terminals

EL5001-0011	SSI monitor terminal, no clock output (simply listening)
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For availability status see Beckhoff website at: [www.beckhoff.com/EL5001](http://www.beckhoff.com/EL5001)



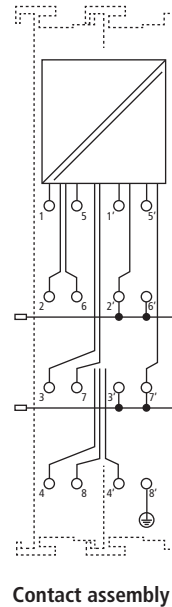
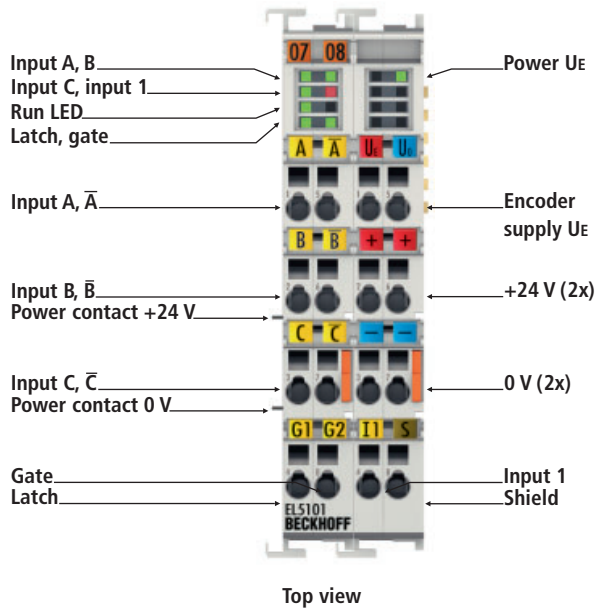
## EL5021 | 1-channel SinCos encoder interface, 1 V<sub>SS</sub>

The EL5021 SinCos EtherCAT Terminal serves as interface for the direct connection of a measuring sensor, e.g. a measuring probe with sinusoidal voltage output 1 V<sub>SS</sub> to the higher-level fieldbus. The measuring signal is processed, interpolated and made available as a 32 bit value. The signal period resolution is 13 bit. The reference mark is also stored in a 32 bit value. The current count and the reference mark value can be read. The input frequency for the measuring signal inputs is 250 kHz. The EL5021 deals with offset, gain and phase error compensation.

Technical data	EL5021   ES5021
Number of channels	1
Encoder connection	A, A (inv), B, B (inv), C, C (inv)
Commands	set count, evaluate reference mark latch (C/C [inv]), change of direction, frequency control
Power supply	24 V via power contacts
Current consumption	130 mA
Sensor supply	5 V DC from power voltage, 0.5 A max.
Input frequency	250 kHz (scanning of the input signals with 70 MHz)
Resolution	13 bits, 1,024 steps per period
Signal input	1 V <sub>SS</sub>
Electrical isolation	500 V (E-bus/field potential)
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL5021">www.beckhoff.com/EL5021</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL5021](http://www.beckhoff.com/EL5021)



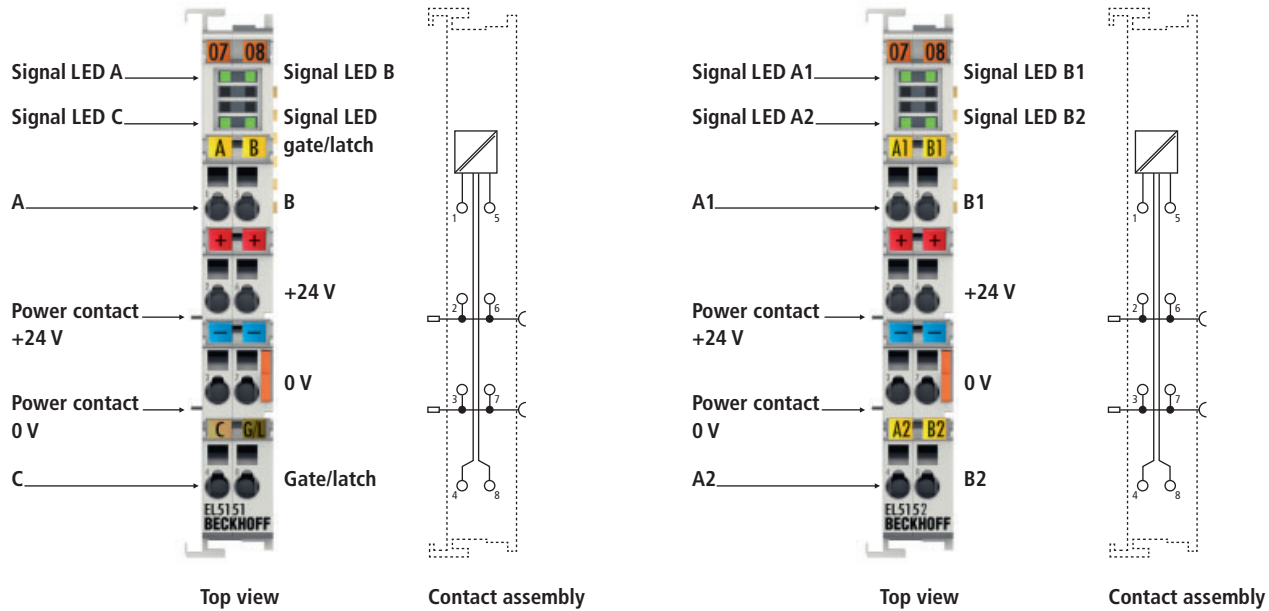


## EL5101 | Incremental encoder interface

The EL5101 EtherCAT Terminal is an interface for the direct connection of incremental encoders with differential inputs (RS485). A 32/16 bit counter with a quadrature decoder and a 32/16 bit latch for the zero pulse can be read, set or enabled. Incremental encoders with alarm outputs can be connected at the interface's status input. Interval measurement with a resolution of up to 100 ns is possible. The gate input allows the counter to be halted. The counter state is taken over with a rising edge at the latch input.

Due to the optional interpolating microincrement function, the EL5101 can supply even more precise axis positions for dynamic axes. In addition, it supports the synchronous reading of the encoder value together with other input data in the EtherCAT system via high-precision EtherCAT distributed clocks (DC).

Technical data	EL5101   ES5101
Encoder connection	A, A (inv), B, B (inv), C, C (inv), differential inputs (RS485); status input
Encoder operating voltage	5 V DC
Encoder output current	0.5 A
Counter	32 or 16 bits, binary
Limit frequency	4 million increments/s (with 4-fold evaluation)
Quadrature decoder	4-fold evaluation
Zero-pulse latch	32 or 16 bits
Commands	read, set, enable
Distributed clocks	yes
Supply voltage	24 V DC (-15 %/+20 %)
Current consumption power contacts	0.1 A (without encoder lead current)
Current consumption E-bus	typ. 130 mA
Bit width in the process image	1 x 32 bit input, 1 x 16 bit output, 8 bit control, 8 bit status
Weight	approx. 100 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL5101">www.beckhoff.com/EL5101</a>

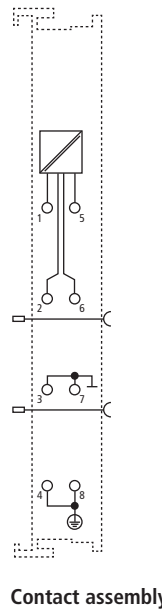
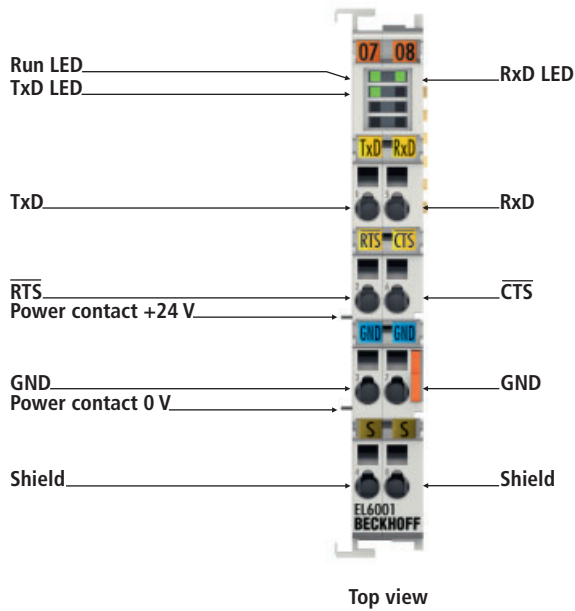


## EL5151, EL5152 | 1-, 2-channel incremental encoder interface

The EL5151/EL5152 EtherCAT Terminal is an interface with 24 V inputs for the direct connection of incremental encoders. With the EL5151, a 32 bit counter with a quadrature decoder and a 32 bit latch for the zero pulse can be read, set or enabled. Alternatively, the EL5151 can be used as up/down counter terminal with gate.

With the EL5152, two 32 bit counters with quadrature decoder can be read and set. The EL515x supports the synchronous reading of the encoder value, together with other input data, into the EtherCAT system via high-precision EtherCAT distributed clocks (DC).

Technical data	EL5151   ES5151	EL5152   ES5152
Encoder connection	A, B, C, gate/latch, 24 V	A1, B1, A2, B2, 24 V
Sensor inputs	1	2
Encoder operating voltage	24 V DC	
Counter	1 x 32 bits, binary	2 x 32 bits, binary
Limit frequency	400,000 increments/s (with 4-fold evaluation)	
Quadrature decoder	4-fold evaluation	
Commands	read, set, latching	
Distributed clocks	yes	
Supply voltage	24 V DC (-15 %/+20 %)	
Current consumption power contacts	0.1 A (without encoder lead current)	
Current consumption E-bus	typ. 130 mA	180 mA (see documentation)
Bit width in the process image	14 byte ENC input, 6 byte ENC output	28 byte ENC input, 12 byte ENC output
Weight	approx. 50 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all ESxxxx terminals	
Further information	www.beckhoff.com/EL5151	



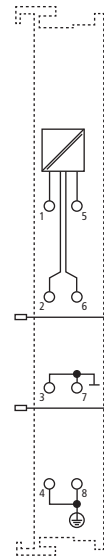
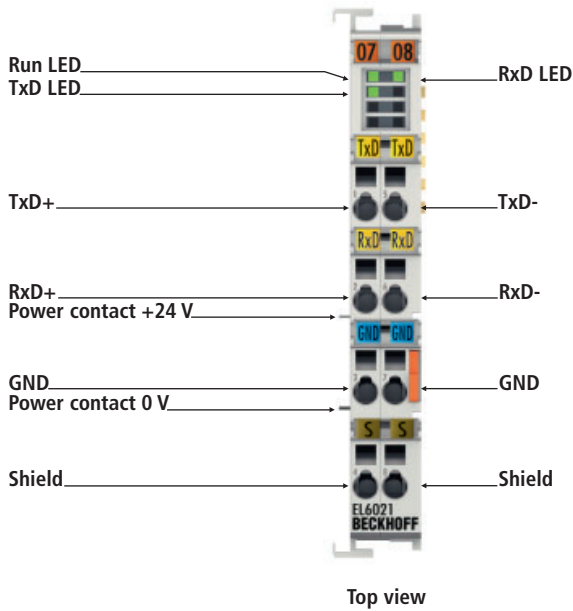
## EL6001 | Serial interface RS232

The EL6001 serial interface enables the connection of devices with RS232 interface and operates in conformity with the CCITT V.28/DIN 66 259-1 standards. The device connected to the EL6001 EtherCAT Terminal communicates with the automation device via the coupler. The active communication channel operates independently of the higher-level bus system in full duplex mode at up to 115.2 kbaud. The RS232 interface guarantees high immunity to interference through electrically isolated signals.

In conjunction with the TwinCAT Virtual Serial COM Driver (see TwinCAT Supplements – Communication) the EL6001 can be used as a normal Windows COM interface.

Technical data	EL6001   ES6001
Data transfer channels	2 (1/1), TxD and RxD, full duplex
Data transfer rates	9,600 baud, 8 data bits, no parity and one stop bit are preset (max. 115,200 baud)
Bit distortion	< 3 %
Cable length	max. 15 m
"0" signal voltage	-18...-3 V
"1" signal voltage	3...18 V
Power supply	via the E-bus
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)
Data buffer	864 bytes receive buffer, 128 bytes transmit buffer
Bit width in the process image	22 x 8 bit input, 22 x 8 bit output, 16 bit control, 16 bit status
Configuration	no address setting, configuration via the controller
Current consumption E-bus	typ. 190 mA
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	www.beckhoff.com/EL6001

Accessories	
TwinCAT PLC Serial Communication	IEC 61131-3 software library for TwinCAT PLC for communication via serial Bus Terminals or PC COM ports <span style="float: right;">1170</span>
TwinCAT PLC Serial Communication 3964R/RK512	licence for using the IEC 61131-3 software library for TwinCAT PLC for communication via serial Bus Terminals or the PC COM ports using the protocol 3964R/RK512 <span style="float: right;">1170</span>
TwinCAT PLC Modbus RTU	IEC 61131-3 software library for TwinCAT PLC with Modbus RTU function blocks for serial communication with Modbus devices <span style="float: right;">1171</span>
TwinCAT Virtual Serial COM Driver	licence for using a driver for Windows XP, Vista and Windows CE platforms <span style="float: right;">1177</span>

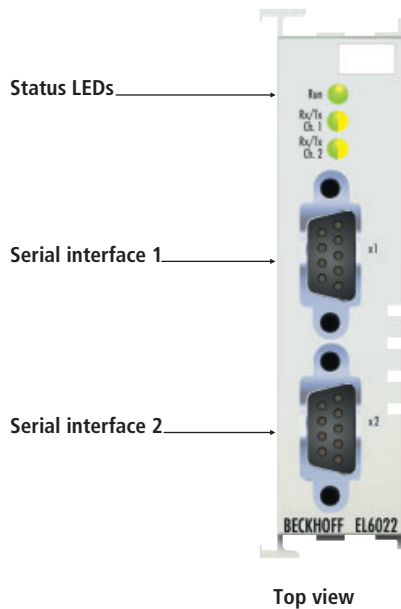


## EL6021 | Serial interface RS422/RS485

The EL6021 serial interface enables the connection of devices with RS422 or RS485 interface. These devices communicate with the automation device via the coupler. The active communication channel operates independently of the higher-level bus system in full or half duplex mode at up to 115.2 kbaud. The transmission of differential signals according to RS422 guarantees high immunity to interference through electrically isolated signals.

In conjunction with the TwinCAT Virtual Serial COM Driver (see TwinCAT Supplements – Communication) the EL6001 can be used as a normal Windows COM interface.

Technical data	EL6021   ES6021
Data transfer channels	TxD and RxD, full/half duplex
Data transfer rates	9,600 baud, 8 data bits, no parity and one stop bit are preset (max. 115,200 baud)
Bit transfer	with differential signal
Line impedance	120 Ω
Cable length	approx. 1,000 m twisted pair
Power supply	via the E-bus
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)
Current consumption	180 mA (see documentation)
Data buffer	864 bytes receive buffer, 128 bytes transmit buffer
Bit width in the process image	22 x 8 bit input, 22 x 8 bit output, 16 bit control, 16 bit status
Configuration	no address setting, configuration via PLC
Current consumption E-bus	typ. 190 mA
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL6021">www.beckhoff.com/EL6021</a>



Top view

## EL6002, EL6022 | 2-channel serial interfaces RS232/RS422/RS485, D-sub connection

The EL6002 and EL6022 serial interfaces enable the connection of devices with two RS232 or two RS422/RS485 interfaces. The devices connected to the EL6002/EL6022 EtherCAT Terminals communicate with the automation device via

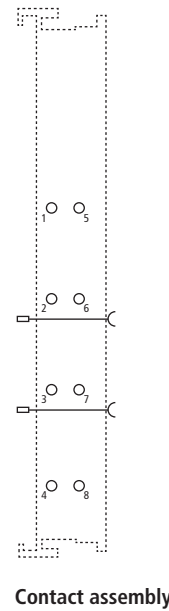
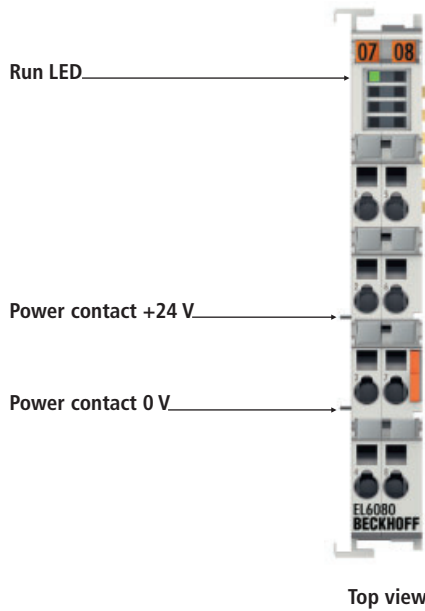
the Coupler. The active communication channel operates independently of the higher-level EtherCAT system in full duplex mode with up to 115.2 kbaud. The RS232/RS422/RS485 interfaces guarantee high interference immunity

through electrically isolated signals.

In conjunction with the TwinCAT Virtual Serial COM Driver, the EL60xx can be used as a normal Windows COM interface.

Technical data	EL6002	EL6022
Data transfer channels	2	
Data transfer rates	9,600 baud, 8 data bits, no parity and one stop bit are preset (min. 2,400 baud, max. 115,200 baud)	
Interfaces	RS232	RS422/RS485
Line impedance	–	120 Ω
Cable length	max. 15 m	approx. 1,000 m twisted pair
Power supply	via the E-bus	
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)	
Data buffer	864 bytes receive buffer, 128 bytes transmit buffer	
Bit width in the process image	22 x 8 bit input, 22 x 8 bit output, 16 bit control, 16 bit status	
Configuration	no address setting, configuration via the controller	
Current consumption E-bus	typ. 250 mA	
Weight	approx. 55 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/EL6002	

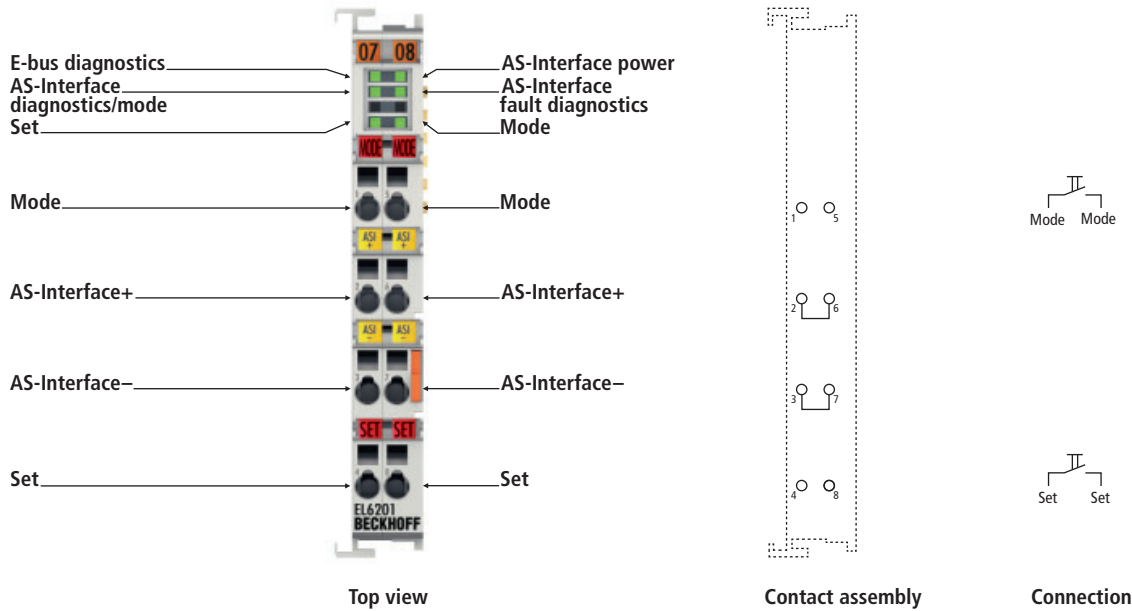
**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL6002](http://www.beckhoff.com/EL6002)



## EL6080 | EtherCAT memory terminal 128 kbyte

The EL6080 EtherCAT memory terminal has 128 kB of non-volatile memory (NOVRAM). The terminal can be used to store and read out parameters and recipes. Part of the memory can also be used for the cyclic storage of machine data such as operating hour meters or production numbers. The terminal is used, for example, for storing module-related data in the machine module in modular machine concepts with a central controller.

Technical data	EL6080
Memory	128 kbyte NOVRAM
Current consumption E-bus	typ. 130 mA
Weight	50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EL6080">www.beckhoff.com/EL6080</a>



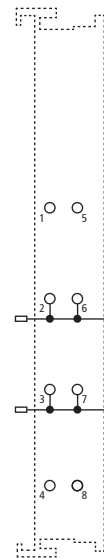
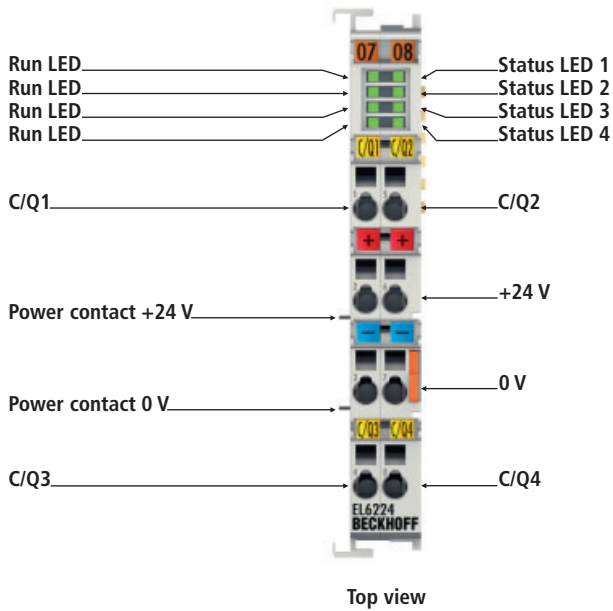
## EL6201 | AS-Interface master terminal



The EL6201 AS-Interface master terminal enables the direct connection of AS-Interface slaves. The AS-Interface compliant interface supports digital and analog slaves, versions 2.0 and 2.1. The connected devices are supplied via the EL9520 AS-Interface potential feed terminal with filter.

Technical data	EL6201   ES6201
AS-Interface channels	1
Number of slaves	31 for V 2.0, 62 for V 2.1
AS-Interface versions	V 2.0 and V 2.1, automatic support
Slave types	digital and analog
Diagnostics	power failure, slave failure, parameterisation fault
AS-Interface address assignment	via configuration or automatic
Cycle time	max. 5 ms (31 devices)
Connection	2 lines via spring force technology
Electrical isolation	500 V (AS-Interface/E-bus)
Power contacts	no
Current consumption	180 mA (E-bus), approx. 60 mA (AS-Interface) (see documentation)
Bit width in the process image	selectable: 12 bytes, 22 bytes or 38 bytes, of which 6 bytes parameter interface
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL6201">www.beckhoff.com/EL6201</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL6201](http://www.beckhoff.com/EL6201)



Contact assembly



I/O-Link devices

Connection

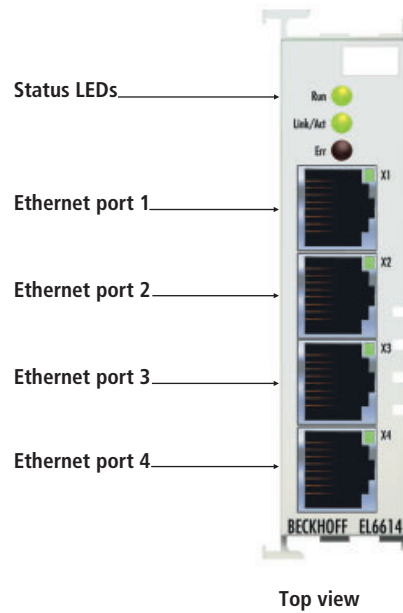
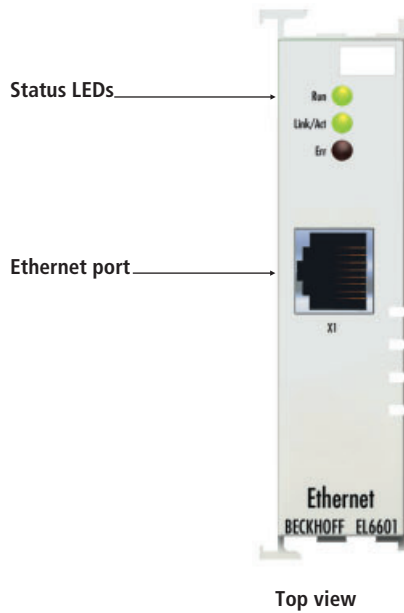
## EL6224 | IO-Link terminal



The IO-Link terminal enables connection of up to four IO-Link devices. A point-to-point connection is used between the terminal and the device. The terminal is parameterised via the master. 2-wire and 3-wire connections are supported. Additional 24 V and 0 V connection points can be realised via the EL918x potential distributor terminal.

Technical data	EL6224   ES6224
IO-Link interfaces	4
Field voltage	24 V DC via power contacts
Connection	physics 1 (2-wire) or physics 2 (3-wire)
Data transfer rates	4.8 kbaud, 38.4 kbaud and 230.4 kbaud
Cable length	max. 20 m
Power supply	via E-bus and power contacts
Electrical isolation	500 V (E-bus/signal voltage)
Power contacts	yes
Supply current for devices	< 200 mA per device (method 1)
Current consumption E-bus	typ. 120 mA
Weight	approx. 60 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL6224">www.beckhoff.com/EL6224</a>





## EL6601, EL6614 | Ethernet switch port terminals

### Ethernet

The EL6601 and EL6614 Ethernet switch port terminals are used for the decentralised connection of Ethernet devices to the EtherCAT Terminal network. The EtherCAT system relays the Ethernet communication of the connected devices fully transparent and collision-free.

The EL6614 Ethernet switch port terminal is a decentralised

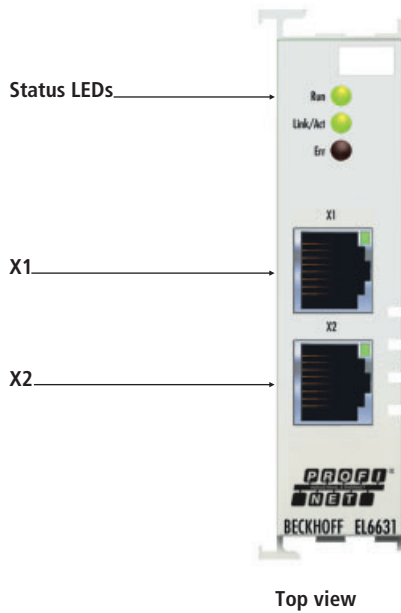
switch that gets power from the E-bus. It relays the frames received from the ports to the destination ports. In full duplex mode, it thus enables collision-free communication of the connected devices with each other.

The switch port terminals can be installed at any location within the EtherCAT strand. No configuration is required.

Further benefits underline the particular suitability for the application in industrial environments:

- compact design in EtherCAT Terminal housing
- 10/100 Mbaud, half or full duplex, with automatic baud rate detection
- support for network variables

Technical data	EL6601	EL6614
Number of Ethernet ports	1	4
Bus system	all Ethernet (IEEE 802.3)-based protocols, store and forward switching mode	
Ethernet interface	10BASE-T/100BASE-TX Ethernet with 1 x RJ 45	10BASE-T/100BASE-TX Ethernet with 4 x RJ 45
Data transfer rates	10/100 Mbit/s, IEEE 802.3u auto-negotiation, half or full duplex at 10 and 100 Mbit/s possible, automatic settings	
Cable length	up to 100 m twisted pair	
Hardware diagnosis	status LEDs	
Power supply	via the E-bus	
Electrical isolation	500 V <sub>rms</sub> (E-bus/Ethernet)	
Configuration	no	
Current consumption E-bus	typ. 310 mA	typ. 450 mA
Weight	approx. 75 g	approx. 95 g
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	<a href="http://www.beckhoff.com/EL6601">www.beckhoff.com/EL6601</a>	



## EL6631 | PROFINET IO controller/device terminal



The EL6631 PROFINET IO controller (master) terminal supports the complete real-time function (RT) as well as extensive diagnostic possibilities. All services in accordance with Conformance Class B are supported. Up to 255 PROFINET IO devices can be projected on the EL6631.

The EL6631-0010 PROFINET IO device (slave) terminal

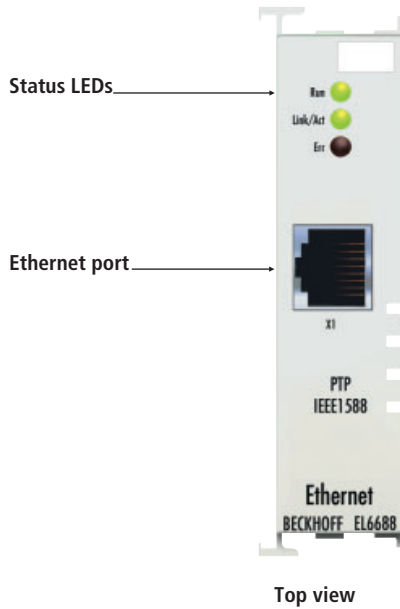
enables simple exchange of data between EtherCAT and PROFINET IO. It is a device in the EtherCAT strand, which can consist of up to 65,535 devices. The EL6631-0010 has a 3-port switch. Two ports are fed to the outside on RJ 45 sockets. This allows the I/O stations to be structured as a line topology, as a result of which the wiring

is simplified. The maximum distance between two devices is 100 m.

Protocols such as LLDP or SNMP can be used for network diagnosis. In addition, full media redundancy functionality (MRP) is integrated. The controller or the device can optionally be operated as an MRP client or as a server.

Technical data	EL6631	EL6631-0010
Number of ports/channels	2	
Ethernet interface	100BASE-TX Ethernet with 2 x RJ 45	
Fieldbus	PROFINET IO controller	PROFINET IO device
Cable length	up to 100 m twisted pair	
Hardware diagnosis	status LEDs	
Power supply	via the E-bus	
Electrical isolation	500 V <sub>rms</sub> (E-bus/Ethernet)	
Configuration	via EtherCAT master	
Current consumption E-bus	typ. 360 mA	
Weight	approx. 75 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	<a href="http://www.beckhoff.com/EL6631">www.beckhoff.com/EL6631</a>	

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL6631](http://www.beckhoff.com/EL6631)



## EL6688 | IEEE 1588 external synchronisation interface

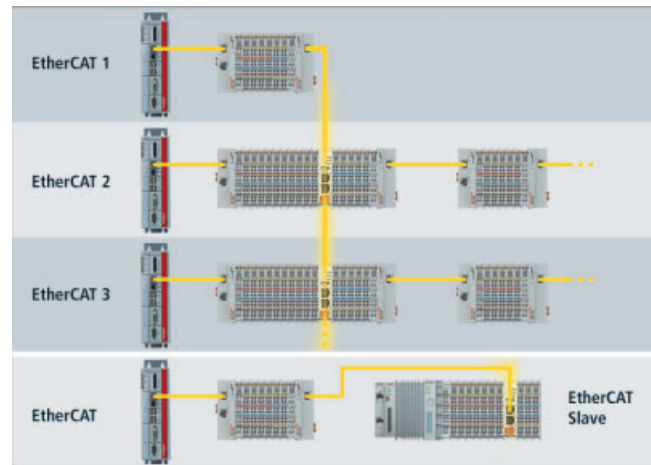
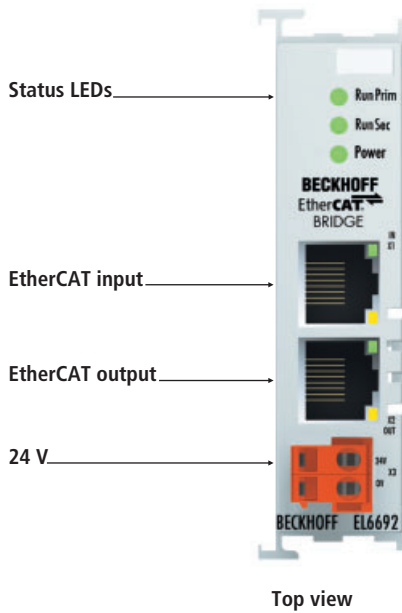
The EL6688 EtherCAT Terminal presents itself as a device in the IEEE 1588 synchronisation system with support for PTPv1 (IEEE 1588-2002) and PTPv2 (IEEE 1588-2008) based on Ethernet.

On the one hand, the EL6688 is an IEEE 1588 clock (master or slave) that is syn-

chronised based on the protocol precision. On the other hand, it is synchronised as an EtherCAT Terminal by the distributed clock system. The following operating modes can be selected via the TwinCAT System Manager: "SlaveOnly", "MasterOnly" and "Best Master Clock". In this way, a consistent timebase can be

created across applications for any number of spatially separated EtherCAT systems and machine sections, e.g. for application with axes or measurement technology. The compact EtherCAT Terminal enables flexible deployment depending on the application requirements.

Technical data	EL6688
Number of Ethernet ports	1
Bus system	Ethernet (IEEE 802.3)
Ethernet interface	10BASE-T/100BASE-TX Ethernet with 1 x RJ 45
Data transfer rates	10/100 Mbit/s, IEEE 802.3u auto-negotiation, half or full duplex at 10 and 100 Mbit/s possible, automatic settings
Cable length	up to 100 m twisted pair
Hardware diagnosis	status LEDs
Power supply	via the E-bus
Electrical isolation	500 V <sub>rms</sub> (E-bus/Ethernet)
Configuration	no
Current consumption E-bus	typ. 310 mA
Weight	approx. 75 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EL6688">www.beckhoff.com/EL6688</a>



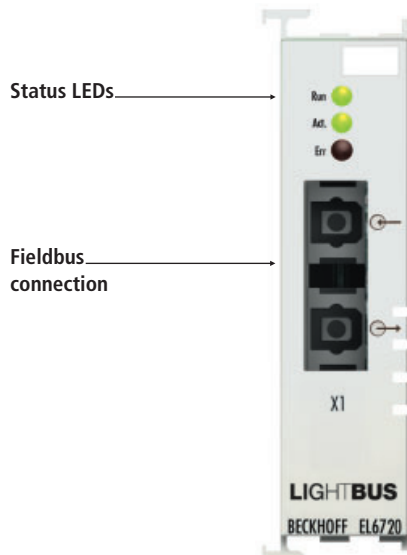
## EL6692 | EtherCAT bridge terminal

The EtherCAT bridge terminal EL6692 enables data exchange between EtherCAT strands with different masters. It also enables synchronisation of the distributed clocks of the individual strands. The power supply on

the primary side (E-bus) comes from the E-bus, on the secondary side (RJ 45) via an external connection. If several EL6692 are used, data traffic to the terminals on the other side can continue in the event of a power supply

failure on one side. The bridge terminal can also be used for integrating a subordinate PC system as an EtherCAT slave.

Technical data	EL6692
Ports	primary: E-bus, secondary: 2 x RJ 45 EtherCAT input/output
Cable length	100 m 100BASE-TX, secondary port
Hardware diagnosis	status LEDs
Power supply	primary: via the E-bus, secondary: via connector
Distributed clocks	yes
Electrical isolation	500 V <sub>rms</sub> (E-bus/secondary side)
Current consumption	E-bus: 120 mA; external: 60 mA/24 V (see documentation)
Bit width in the process image	16 bit SYNC input + IO input/output, max. 480 bytes in each direction
Weight	approx. 85 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EL6692">www.beckhoff.com/EL6692</a>



Top view

## EL6720 | Lightbus master terminal

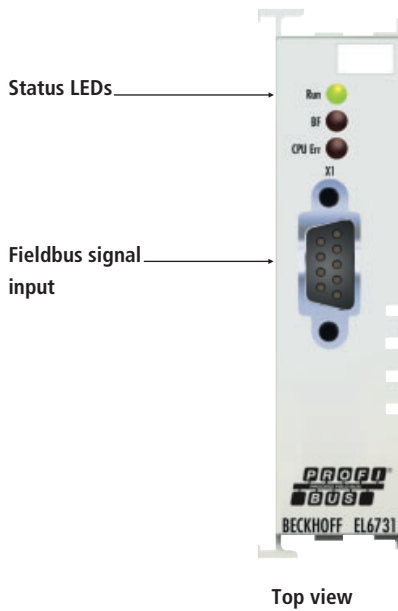
### LIGHTBUS

The EL6720 Lightbus master terminal enables the connection to Lightbus devices just as the Beckhoff FC2001 Lightbus PCI card. Due to the connection via EtherCAT, no PCI slots are required in the PC. The terminal controls the Lightbus protocol

with all its features. Within an EtherCAT Terminal network, the EL6720 enables the integration of any Lightbus slaves. The terminal has a powerful protocol implementation with many features:

- Cycle times up to 100 µs are possible.
- Process data communication can either be free running or synchronised.
- powerful parameter and diagnostics interfaces (ADS)

Technical data	EL6720
Fieldbus	Lightbus
Number of fieldbus channels	1
Function	master
Data transfer rates	2.5 Mbaud
Bus interface	2 x standard fibre optic connector Z1000 (plastic fibre), Z1010 (HCS fibre)
Communication	3 priority controlled logical communication channels
Bus device	max. 254 nodes with a max. of 65,280 I/O points per fieldbus connection
Hardware diagnosis	3 LEDs
Current consumption E-bus	typ. 240 mA
Weight	approx. 70 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EL6720">www.beckhoff.com/EL6720</a>



## EL6731 | PROFIBUS master/slave terminal



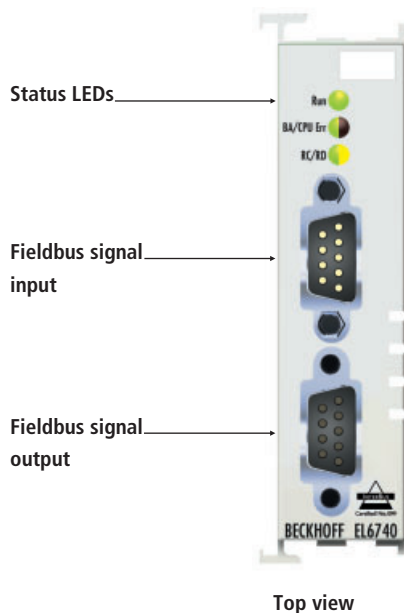
The PROFIBUS master terminal EL6731 corresponds to the Beckhoff FC3101 PROFIBUS PCI card. Due to the connection via EtherCAT, no PCI slots are required in the PC. The terminal controls the PROFIBUS protocol with all its features. Within an EtherCAT Terminal network, it enables the integration of any PROFIBUS devices. Thanks to the PROFIBUS chip developed in-house, the terminal is equip-

ped with the latest version of the PROFIBUS technology – including high-precision isochronous mode for axis control and expanded diagnostic options. These masters are the only ones that support different poll rates for the slaves. Features:

- Cycle times from 200  $\mu$ s are possible.
- PROFIBUS DP, PROFIBUS DP-V1, PROFIBUS DP-V2

- master, slave and PROFIBUS monitor up to 12 Mbit/s
  - powerful parameter and diagnostics interfaces
  - The error management for each bus user is freely configurable.
  - It is possible to read the bus configuration and automatically assign the "GSD" files.
- The EL6731 is optionally also available as a slave version.

Technical data	EL6731	EL6731-0010
Cycle time	differing DP cycle times per slave are possible using the CDL concept	
Fieldbus	PROFIBUS DP (standard), PROFIBUS DP-V1 (Cl. 1+2: acyclic services, alarms), DP-V2, PROFIBUS MC (equidistant)	
Number of fieldbus channels	1	
Function	master	slave
Data transfer rates	9.6 kbaud...12 Mbaud	
Bus interface	1 x D-sub socket, 9-pin, galvanically decoupled	
Bus device	max. 125 slaves with up to 244 bytes input, output, parameter, configuration or diagnostic data per slave	
Hardware diagnosis	status LEDs	
Bit width in the process image	total max.: 7 kbyte input and output data	
Current consumption E-bus	typ. 350 mA	
Weight	approx. 70 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/EL6731	



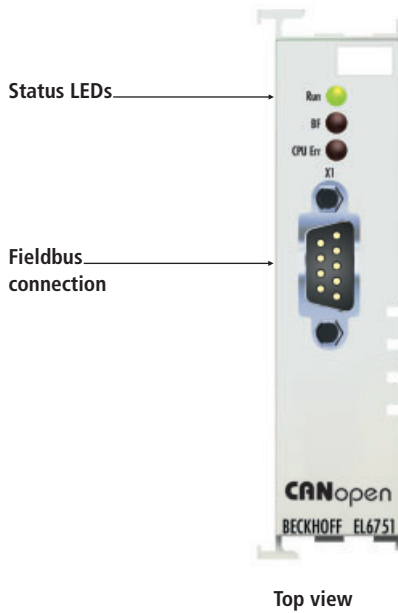
## EL6740 | Interbus slave terminal



The Interbus slave terminal facilitates data exchange between EtherCAT and Interbus. For both bus systems the terminal “mirrors” up to 32 word input and 32 word output to the respective other system. The outputs are written to the inputs of the

other bus with minimum delay. The terminal can use the Interbus protocol up to a baud rate of 2 Mbits. Due to the connection via EtherCAT, no PCI slots are required in the PC.

Technical data	EL6740-0010
Fieldbus	Interbus
Number of fieldbus channels	1
Function	slave
Data transfer rates	500 kbits, 2 Mbits (default)
Bus interface	2 x D-sub plug, 9-pin, plug and socket with screening and vibration lock
Max. number of bytes fieldbus	32 word input and 32 word output
Hardware diagnosis	status LEDs
Current consumption E-bus	450 mA (see documentation)
Weight	approx. 80 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EL6740">www.beckhoff.com/EL6740</a>



## EL6751 | CANopen master/slave terminal

### CANopen

The EL6751 CANopen master terminal corresponds to the Beckhoff FC5101 CANopen PCI card. Due to the connection via EtherCAT, no PCI slots are required in the PC. Within an EtherCAT Terminal network, the EL6751 enables the integration of any CANopen devices and can either be master or slave. In addition, general CAN messages can be sent or received – without having to bother with CAN frames in the applications

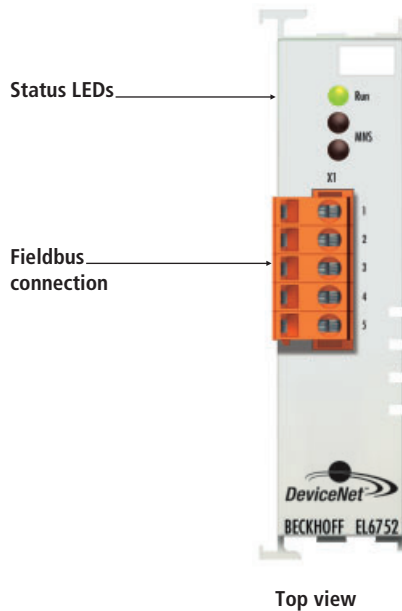
program. The terminal has a powerful protocol implementation with many features:

- All CANopen PDO communication types are supported: event driven, time driven (using an event timer), synchronous, polling.
- synchronisation with the PC controller's task cycle
- SYNC cycle with quartz precision for drive synchronisation, zero cumulative jitter

- parameter communication (SDO) at start-up and when running
  - emergency message handling, guarding and heartbeat
  - powerful parameter and diagnostics interfaces
  - online bus load display
  - bus monitor functionality
- The EL6751 is optionally also available as a slave version.

Technical data	EL6751	EL6751-0010
Fieldbus	CANopen	
Number of fieldbus channels	1	
Function	master	slave
Data transfer rates	10, 20, 50, 100, 125, 250, 500, 800, 1,000 kbaud	
Bus interface	D-sub connector, 9-pin according to CANopen specification, galvanically decoupled	
Communication	CANopen network master and CANopen manager, optionally CANopen slave	
Bus device	max. 127 slaves	
Hardware diagnosis	status LEDs	
Current consumption E-bus	typ. 300 mA	
Weight	approx. 70 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/EL6751	





## EL6752 | DeviceNet master/slave terminal



The DeviceNet master terminal EL6752 corresponds to the Beckhoff FC5201 DeviceNet PCI card. Due to the connection via EtherCAT, no PCI slots are required in the PC. Within an EtherCAT Terminal network, the EL6752 enables the integration of any DeviceNet devices and can either be master or slave. The DeviceNet terminal

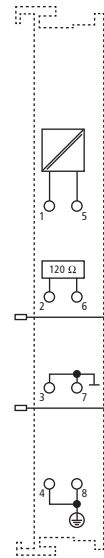
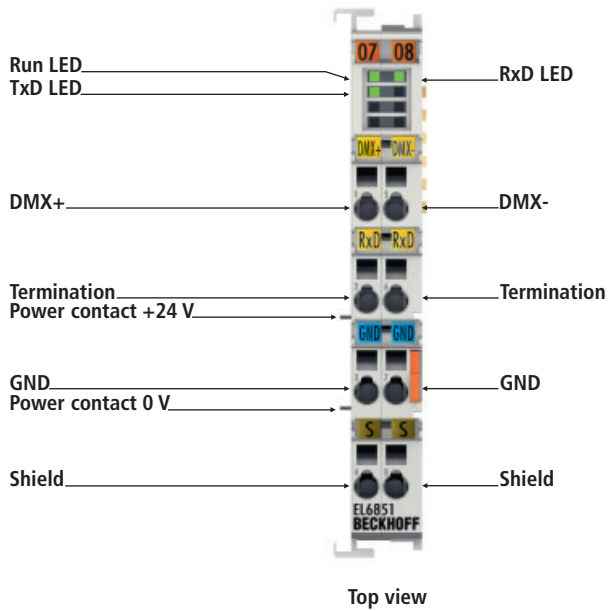
has a powerful protocol implementation with many features:

- All DeviceNet I/O modes are supported: polling, change of state, cyclic, strobed.
- Unconnected Message Manager (UCMM)
- offline connection set, Device Heartbeat Messages, Device Shutdown Messages

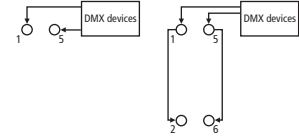
- Auto Device Replacement (ADR)
- powerful parameter and diagnostics interfaces
- The error management for each bus user is freely configurable.

The EL6752 is optionally also available as a slave version.

Technical data	EL6752	EL6752-0010
Fieldbus	DeviceNet	
Number of fieldbus channels	1	
Function	master	slave
Data transfer rates	125, 250, 500 kbaud	
Bus interface	open style connector, 5-pin, according to DeviceNet specification, galvanically decoupled (Connector is supplied.)	
Communication	DeviceNet network master (scanner), optionally DeviceNet slave	
Bus device	max. 63 slaves	
Hardware diagnosis	status LEDs	
Current consumption E-bus	typ. 260 mA	
Weight	approx. 70 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Further information	www.beckhoff.com/EL6752	



Contact assembly

without  
termination  
resistorwith  
termination  
resistor

Connection

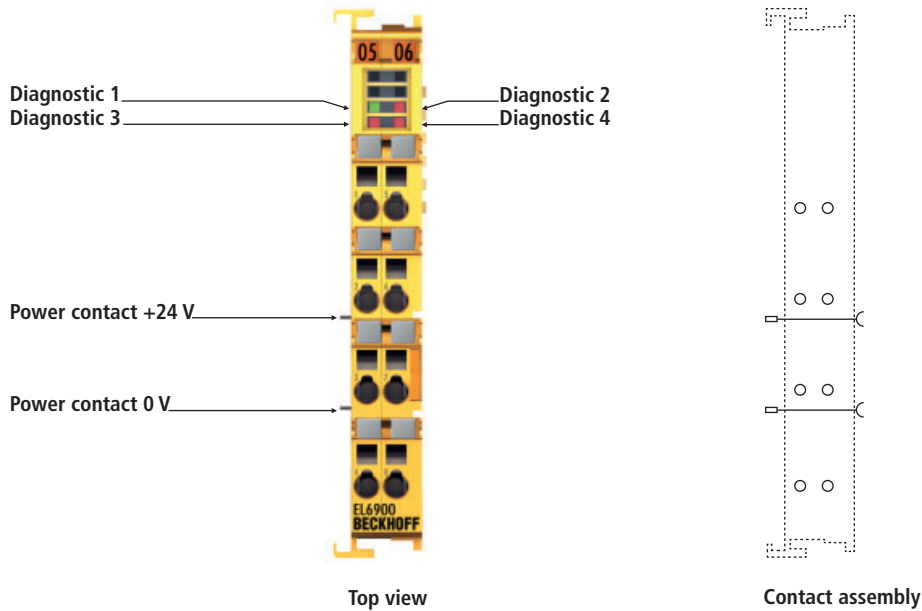
## EL6851 | DMX master

### DMX

The EL6851 EtherCAT Terminal is a DMX master terminal and enables connection of up to 32 devices without repeater. DMX is based on RS485 physics. An integrated termination resistor can be connected through two-wire jumpers in the terminal. The DMX master terminal can send up to 512 bytes of data (this can be set via the terminal). At 250 kbit/s a maximum data rate of 44 kHz is therefore possible. The RS485 interface in the EL6851 is electrically isolated and guarantees high interference immunity.

In addition, the RDM (Remote Device Management) protocol can be run via the EL6851. RDM is an extension of the DMX protocol and enables addressing and parameterisation of devices. TwinCAT offers associated libraries.

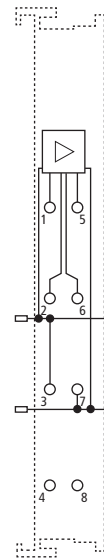
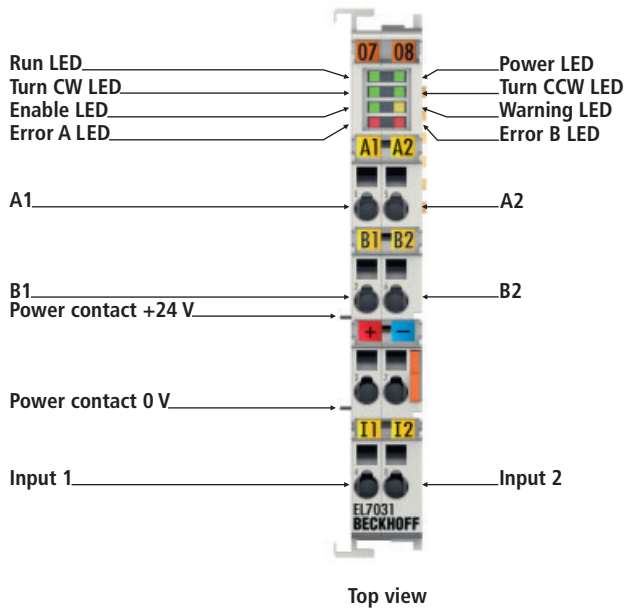
Technical data	EL6851
Data transfer channels	RS485 physics/half duplex
Data transfer rates	250 kbit, one start bit, two stop bits
Bus device	max. 32 without repeater
Line impedance	120 Ω
Power supply	via the E-bus
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)
Protocol	DMX512
Bit width in the process image	variable
Configuration	no address setting, configuration via PLC
Current consumption E-bus	typ. 190 mA
Weight	approx. 55 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EL6851">www.beckhoff.com/EL6851</a>



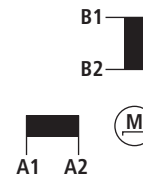
## EL6900 | TwinSAFE PLC

TwinSAFE enables networks with up to 1,024 TwinSAFE devices. The TwinSAFE PLC can establish 128 connections to other TwinSAFE devices. Multiple TwinSAFE PLCs are cascable within a network. The EtherCAT Terminal features certified safety function blocks, which are configured according to the application to be realised. Safety functions such as emergency stop, safety door monitoring, two-hand control, etc. can thus easily be selected and linked. All blocks can be freely connected among each other and are complemented by operators such as AND, OR, etc. The required functions are configured via the TwinCAT System Manager and loaded into the EL6900 TwinSAFE PLC via the fieldbus. The EL6900 is suitable for applications up to SIL 3 according to IEC 61508, EN 954 Cat. 4 and DIN EN ISO 13849 PL<sub>e</sub>.

Technical data	EL6900
Protocol	TwinSAFE/Safety over EtherCAT
Status display	4 LEDs
Connections to other TwinSAFE devices	max. 128
Function blocks	max. 255
Cycle time	500 µs...~25 ms
Current consumption E-bus	approx. 188 mA
Fault response time	≤ watchdog time (parameterisable)
Bit width in the process image	6...1,498 bytes
Supply voltage	24 V DC (-15 %/+20 %)
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+70 °C
Permiss. degree of contamin.	2
Climate class EN60721-3-3	3K3
Electrical interference	EN 61000-6-2/EN 61000-6-4
Vibration/shock resistance	EN 60068-2-6/EN 60068-2-27/29
Installation position	horizontal
Protection class	IP 20
Further information	<a href="http://www.beckhoff.com/EL6900">www.beckhoff.com/EL6900</a>



Contact assembly



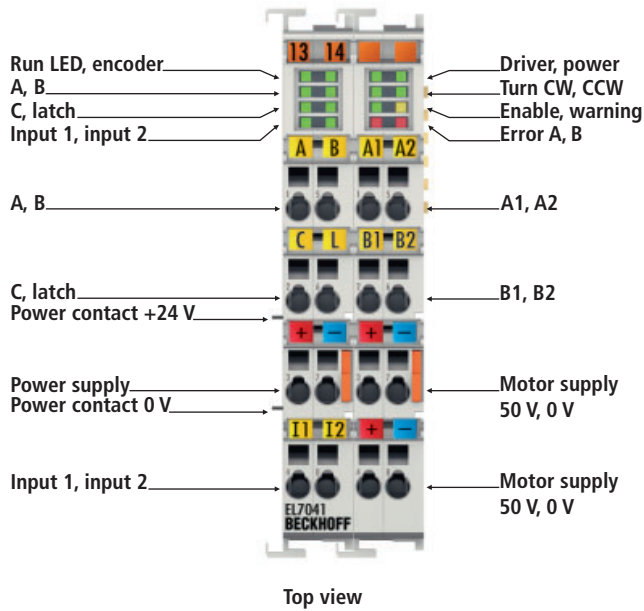
Connection

## EL7031 | Stepper Motor terminal 24 V DC, 1.5 A

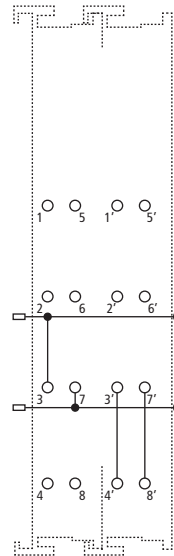
The EL7031 EtherCAT Terminal is intended for the direct connection of different small Stepper Motors. The slimline PWM output stages for two motor coils are located in the EtherCAT Terminal together with two inputs for limit switches. The EL7031 can be adjusted to the motor and the application by changing just a few parameters. 64-fold micro-stepping ensures particularly quiet and precise motor operation. In many applications, integrated zero-speed monitoring makes an encoder system or limit switch unnecessary.

Technical data	EL7031   ES7031
Number of outputs	1 Stepper Motor, 2 phases
Number of inputs	2
Power supply	24 V DC via the power contacts, via the E-bus
Output current	2 x 1 A, 2 x 1.5 A peak current, overload- and short-circuit-proof
Maximum step frequency	1,000, 2,000, 4,000 or 8,000 full steps/s (configurable)
Step pattern	full step, half step, up to 64-fold micro stepping
Current controller frequency	approx. 25 kHz
Diagnostics LED	error phase A and B, loss of step/stagnation, power, enable
Resolution	approx. 5,000 positions in typ. applications (per revolution)
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)
Current consumption E-bus	120 mA
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL7031">www.beckhoff.com/EL7031</a>

Accessories		
AS1xxx	Stepper Motors	1126
ZK4000-6200-2xxx	motor cables for AS1000 Stepper Motors, 4 x 0.5 mm <sup>2</sup>	1131
ZK4000-5100-2xxx	encoder cables for AS1000 Stepper Motors, with shield	1131



Top view



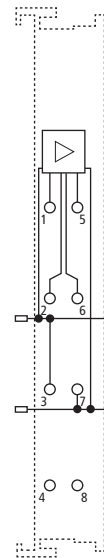
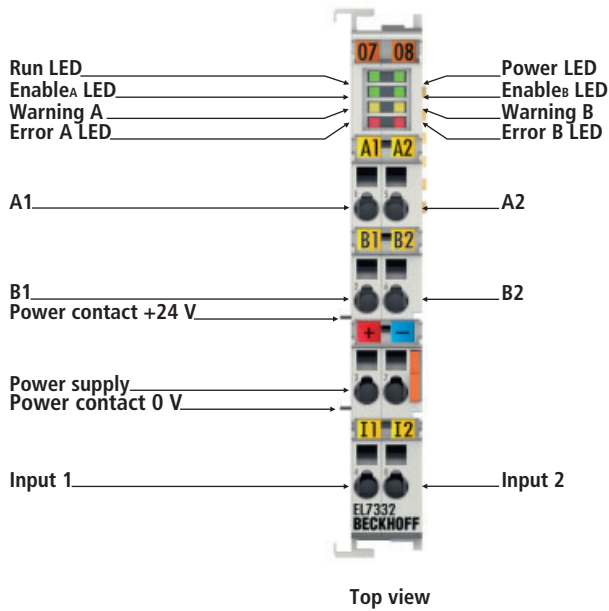
Contact assembly

## EL7041 | Stepper Motor terminal 50 V DC, 5 A, with incremental encoder

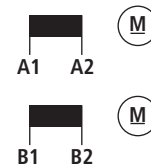
The EL7041 EtherCAT Terminal is intended for Stepper Motors with medium performance range. The PWM output stages cover a wide range of voltages and currents. Together with two inputs for limit switches, they are located in the EtherCAT Terminal. The EL7041 can be adjusted to the motor and the application by changing just a few parameters. 64-fold micro-stepping ensures particularly quiet and precise motor operation. Together with a Stepper Motor, the EL7041 represents an inexpensive small servo axis. The EL7041 Stepper Motor terminal can be adjusted to the motor used by changing just a few parameters.

Technical data	EL7041   ES7041
Number of outputs	1 Stepper Motor, 2 phases
Number of inputs	2 limit position, 4 for an encoder system
Supply voltage	8...50 V DC
Power supply	via the E-bus
Output current	2 x 3.5 A, 2 x 5 A peak current
Maximum step frequency	1,000, 2,000, 4,000 or 8,000 full steps/s (configurable)
Step pattern	64-fold micro stepping
Current controller frequency	approx. 30 kHz
Diagnostics LED	error phase A and B, power, enable
Resolution	approx. 5,000 positions in typ. applications (per revolution)
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)
Current consumption E-bus	140 mA (see documentation)
Weight	approx. 105 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL7041">www.beckhoff.com/EL7041</a>

Accessories		
AS1xxx	Stepper Motors	1126
ZK4000-6200-2xxx	motor cables for AS1000 Stepper Motors, 4 x 0.5 mm <sup>2</sup>	1131
ZK4000-5100-2xxx	encoder cables for AS1000 Stepper Motors, with shield	1131



Contact assembly



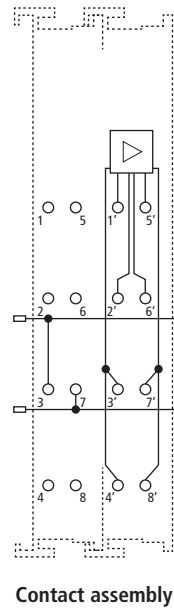
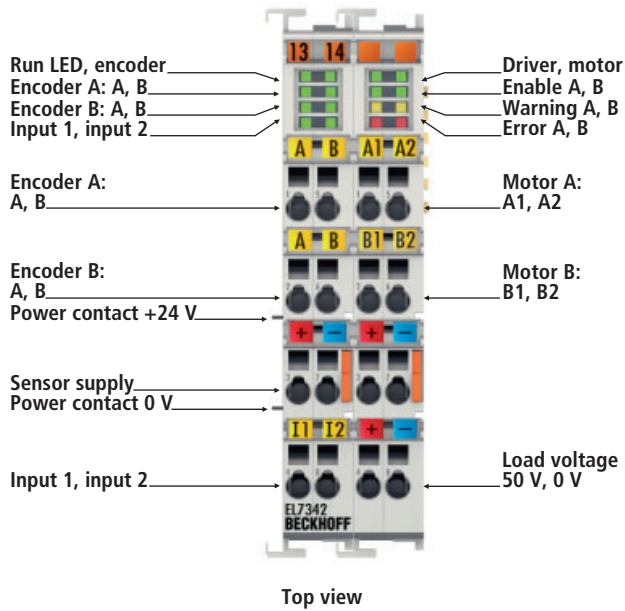
Connection

## EL7332 | 2-channel DC motor output stage 24 V DC, 1 A

The EL7332 EtherCAT Terminal enables direct operation of two DC motors. It is galvanically isolated from the E-bus. The speed is preset by a 16 bit value from the automation unit. The output stage is protected against overload and short-circuit. The EtherCAT Terminal has two channels that indicate their signal state via light emitting diodes. The LEDs enable quick local diagnosis.

Technical data	EL7332   ES7332
Number of outputs	2
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	DC brush motors, inductive
Max. output current	2 x 1 A (short-circuit-proof, common thermal overload warning for both output stages) per channel
PWM clock frequency	30 kHz with 180° phase shift each
Duty factor	0...100 % (voltage-controlled)
Resolution	max. 10 bits current, 16 bits speed
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Current consumption power contacts	typ. 10 mA
Bit width in the process image	2 x 16 bit status, 2 x 16 bit control, 2 x 16 bit output
Current consumption E-bus	140 mA (see documentation)
Weight	approx. 50 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL7332">www.beckhoff.com/EL7332</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL7332](http://www.beckhoff.com/EL7332)

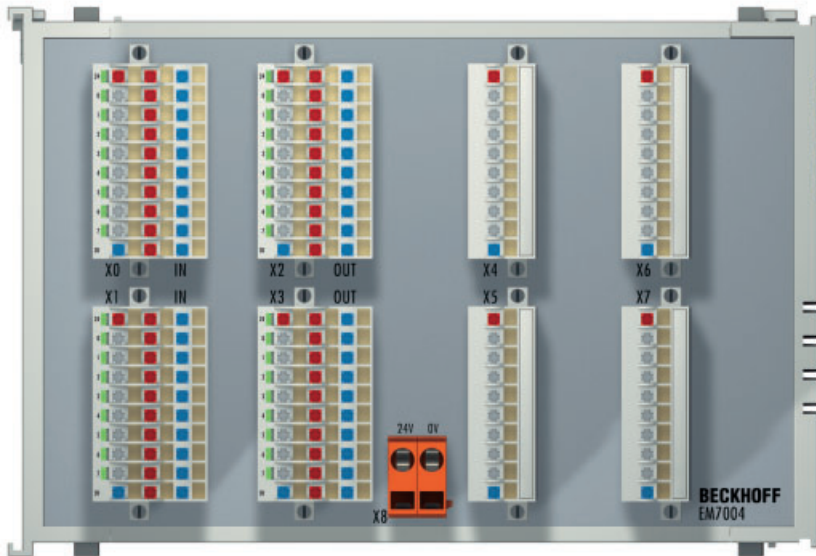


## EL7342 | 2-channel DC motor output stage 50 V DC, 3.5 A

The EL7342 EtherCAT Terminal enables direct operation of two DC motors. It is galvanically isolated from the E-bus. The speed or position is specified by the automation device via a 16 bit value. Connection of an incremental encoder enables a simple servo axis to be realised. The output stage is protected against overload and short-circuit. The EtherCAT Terminal has two channels that indicate their signal state via light emitting diodes. The LEDs enable quick local diagnosis.

Technical data	EL7342   ES7342
Number of outputs	2
Rated load voltage	8...50 V DC
Load type	DC brush motors, inductive
Max. output current	2 x 3.5 A (short-circuit-proof, common thermal overload warning for both output stages) per channel
PWM clock frequency	30 kHz with 180° phase shift each
Duty factor	0...100 % (voltage-controlled)
Resolution	max. 10 bits current, 16 bits speed
Electrical isolation	500 V <sub>rms</sub> (E-bus/field potential)
Bit width in the process image	2 x 32 bit status, 2 x 32 bit control, 2 x 32 bit input, 2 x 32 bit output
Current consumption E-bus	200 mA (see documentation)
Current consumption sensor supply	20 mA (see documentation)
Configuration	adaptation and optimisation of the respective motor via the controller
Weight	approx. 90 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL7342">www.beckhoff.com/EL7342</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL7342](http://www.beckhoff.com/EL7342)



Top view

## EM7004 | 4-axis interface

The EM7004 EtherCAT module interface is optimised for direct connection of four Servo Drives. The compact module features four integrated incremental encoders, 16 digital 24 V DC inputs and outputs, and four analog  $\pm 10$  V outputs. For fast preprocessing, the digital outputs can be connected directly via the four encoders (PLS). This function is parameterisable. All inputs and outputs operate with a 24 V supply. The plug connectors X4, X5, X6 and X7 each feature an encoder input and an analog output. The connectors are galvanically isolated from each other and from the supply voltage. The connectors X0 and X1 with 16 digital inputs as well as the connectors X2 and X3 with 16 digital outputs enable 3-wire connection.

Technical data	EM7004
Digital inputs	16, 24 V DC
Digital outputs	16 (8 x 0.5 A, 8 x 1.5 A), 24 V DC
Analog outputs	4 x $\pm 10$ V (2 mA)
Encoder inputs	4 x (A, /A, B, /B, gate, latch, ground); A B – isolated RS485 inputs (RS422); 4 x 16 bits, quadrature encoder; < 400 kHz
Cycle time	min. 1 ms
Current consumption E-bus	approx. 210 mA (see documentation)
Electrical isolation	500 V <sub>rms</sub> (E-bus/signal voltage)
Bit width in the process image	20 byte ENC/PLS input, 28 byte DO/AO/ENC/PLS output
Dimensions (W x H x D)	147 mm x 100 mm x 56 mm (with connector)
Weight	approx. 260 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/EM7004">www.beckhoff.com/EM7004</a>

Ordering information	included EM/KM plug-in connectors
EM7004-0000	none
EM7004-0002	4 x ZS2001-0002; 4 x ZS2001-0005
EM7004-0004	4 x ZS2001-0004; 4 x ZS2001-0005



## EL91xx, EL92xx | Function terminals

The power feed terminals make it possible to set up various potential groups with any desired voltages (EL9190) or with the standard voltages of 24 V DC or 230 V AC (120 V AC). They are available with or without fine-wire fuse. In order to monitor the

supply voltage, the terminals with diagnostics function report the status of the power feed terminal to the EtherCAT Coupler through two input bits. It is thus possible for the controller to check the distributed peripheral voltage over the fieldbus.

The operating point performance conforms to the input terminals EL1002 (24 V) and EL1702 (230 V).

The EL9180, EL9185 and EL9195 EtherCAT Terminals allow the supply voltage to be accessed a number of times via spring

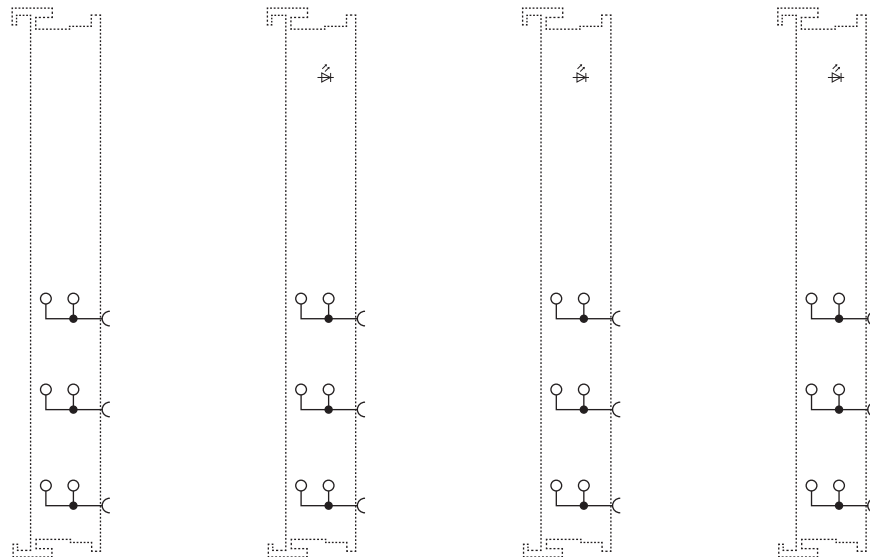
### Meaning of the diagnostic bits:

Bit 0 = 0

no power supply present;

Bit 0 = 1

power supply present; if the bus function terminal does not have a fuse, then bit 1 = 0.



Technical data	EL9190   ES9190	EL9110   ES9110	EL9150   ES9150	EL9160   ES9160
Nominal voltage	arbitrary up to 230 V AC	24 V DC	230 V AC (120 V AC)	230 V AC (120 V AC)
Integrated fine-wire fuse	–	–	–	–
Diagnostics	–	yes	–	yes
Power LED	–	green	green	green
Defect LED	–	–	–	–
Reported to E-bus	–	yes	–	yes
PE contact	yes	–	–	–
Shield connection	–	–	–	–
Renewed infeed	yes	–	–	–
Connection facility to additional power contact	1	–	–	–
Current consumption E-bus	–	typ. 90 mA	–	typ. 90 mA
Bit width in the process image	0	2	0	2
Connection to DIN rail	–	–	–	–
Electrical isolation	yes	–	–	–
Housing width in mm	12	–	–	–
Side by side mount. on EtherCAT Terminals with pow. contact	yes	–	–	–
Side by side mount. on EtherCAT Terminals without pow. contact	yes	–	–	–
Pluggable wiring	for all ESxxxx terminals			
Further information	<a href="http://www.beckhoff.com/EL9190">www.beckhoff.com/EL9190</a>			

force terminals. They make it unnecessary to use additional terminal blocks on the terminal strip. The EL9195 EtherCAT Terminal can be used for the connection of screens. It connects the spring force contacts directly to the DIN rail and can optimally

ground incoming electromagnetic radiation. The two power contacts are looped through by the EL9195, allowing two wires to be connected to each. Each assembly must be terminated at the right hand end with an EL9011 bus end cap. The EL9080 is used to identify

potential groups (e.g. 230 V AC/24 V DC). It is inserted between two potential groups, and indicates the separation through an orange coloured cover.

### Meaning of the diagnostic bits:

Bit 0 = 0

no power supply present;

Bit 0 = 1

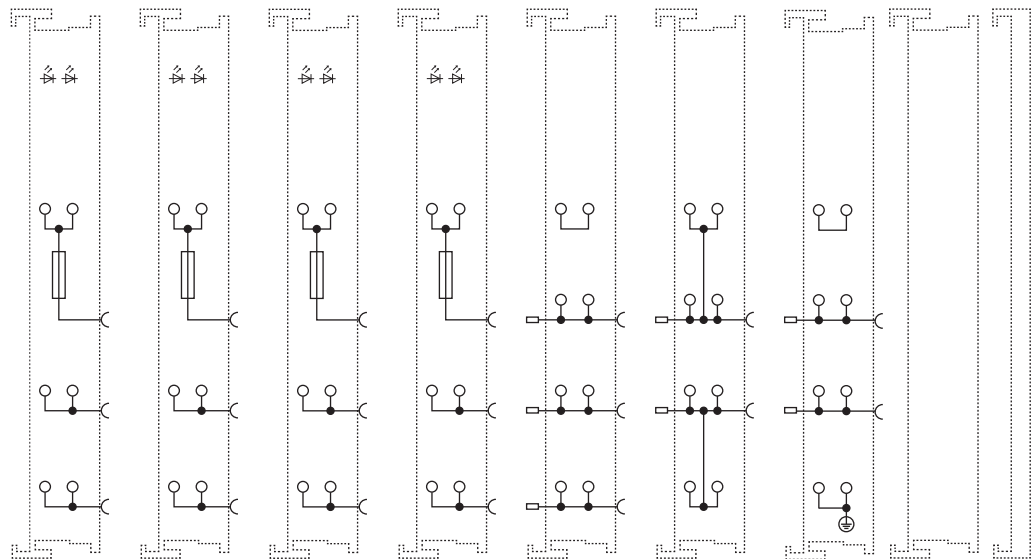
power supply present,

Bit 1 = 0

fuse OK,

Bit 1 = 1

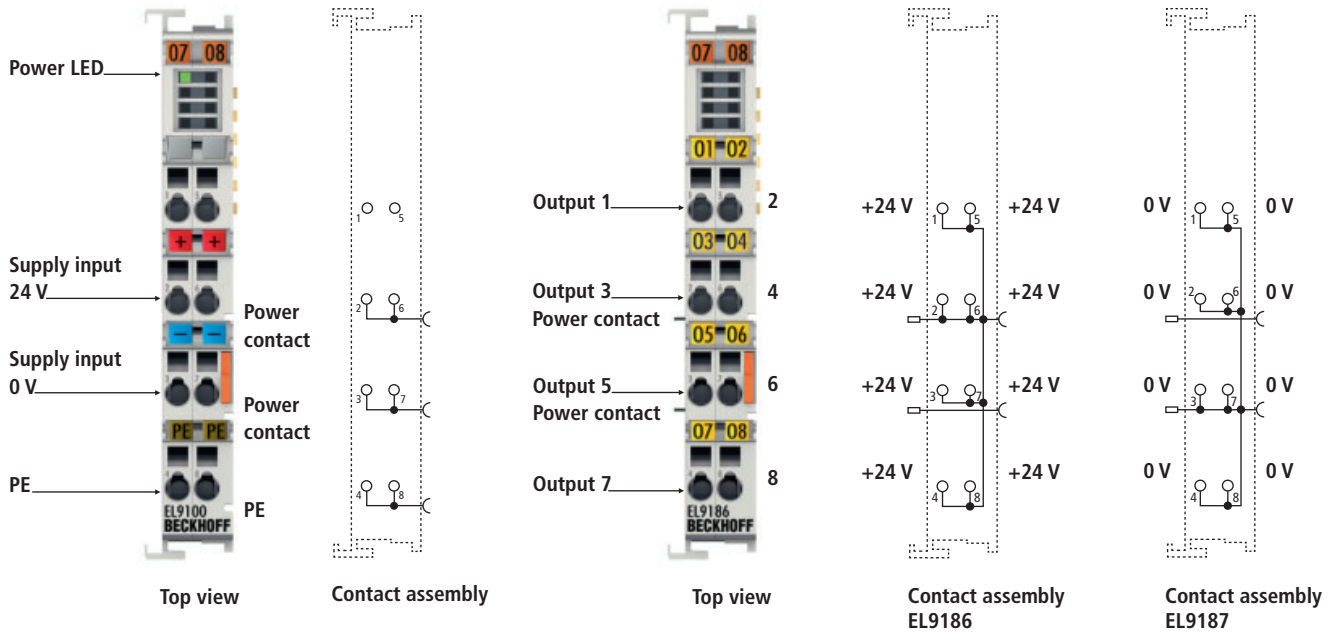
fuse faulty.



Technical data	EL9200 (EL9290)	EL9210	EL9250	EL9260	EL9180 (ES9180)	EL9185 (ES9185)	EL9195 (ES9195)	EL9080 EL9011
Nominal voltage	24 V DC (arbitrary)	24 V DC	230 V AC	230 V AC	arbitrary up to 230 V AC	arbitrary up to 230 V AC	arbitrary up to 230 V AC	separation/ end cap
Integrated fine-wire fuse	...6.3 A	...6.3 A	...6.3 A	...6.3 A	–	–	–	–
Diagnostics	–	y s	e	y s	e	–	–	–
Power LED	green (without)	green	green	green	–	–	–	–
Defect LED	red (without)	red	red	red	–	–	–	–
Reported to E-bus	–	y s	e	y s	e	–	–	–
PE contact	yes	yes	yes	yes	yes	–	–	–
Shield connection	–	–	–	–	–	–	2	–
Renewed infeed	yes	yes	yes	yes	–	–	–	–
Connection facility to additional power contact	1	1	1	1	2	4	1	–
Current consumption E-bus	–	typ. 90 mA	–	typ. 90 mA	–	–	–	–
Bit width in the process image	0	2	0	2	0	0	0	0
Connection to DIN rail	–	–	–	–	–	–	shield terminal	–
Electrical isolation	yes	yes	yes	yes	–	–	–	–
Housing width in mm	12	12	12	12	12	12	12	12/5
Side by side mount. on EtherCAT Terminals with pow. contact	yes	yes	yes	yes	yes	only 2 power contacts	only 2 power contacts	yes
Side by side mount. on EtherCAT Terminals without pow. contact	yes	yes	yes	yes	–	–	–	yes
Pluggable wiring	for all ESxxxx terminals							
Further information	www.beckhoff.com/EL9200							



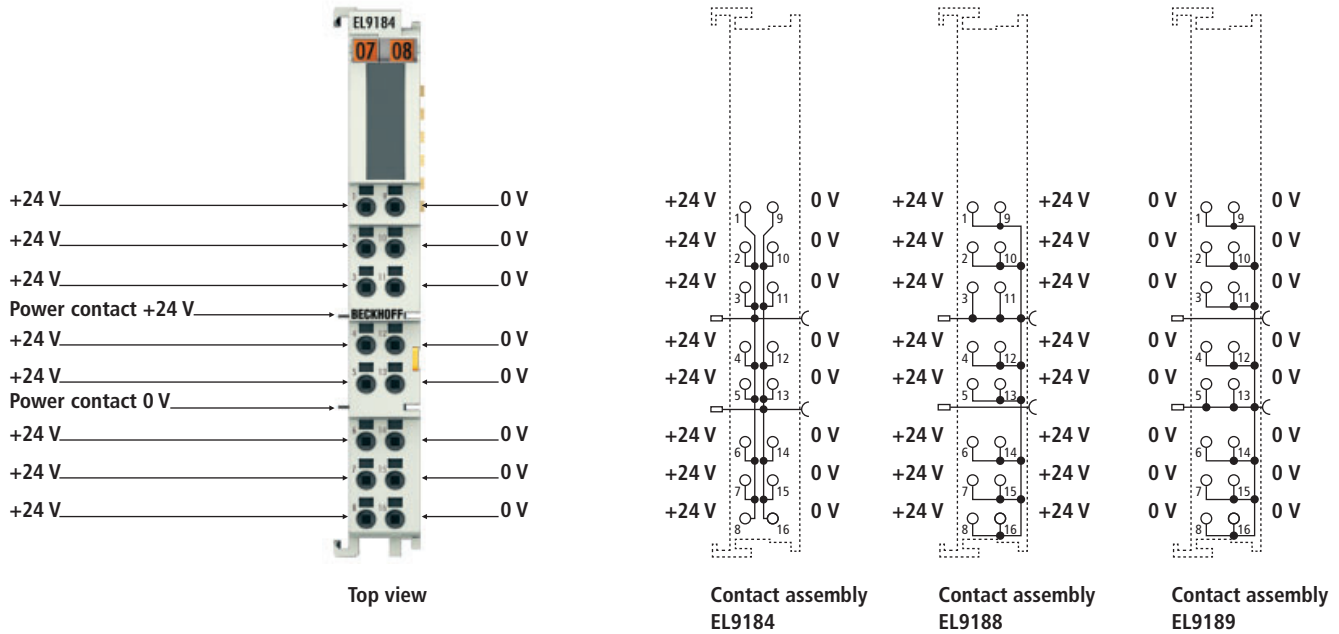
For availability status of the EL9250 and EL9260 see Beckhoff website at: [www.beckhoff.com/EL9250](http://www.beckhoff.com/EL9250)



## EL9100, EL9186, EL9187 | System terminals

The EL9100 feed terminal can be positioned at any location between the input and output terminals for establishing a further potential group or for supplying the terminals following on the right in applications with high current load. The potential distribution terminals EL9186 and EL9187 provide eight terminal points with a potential and enable the voltage to be picked up without further bus terminal blocks or wiring.

Technical data	EL9100   ES9100	EL9186   ES9186	EL9187   ES9187
Nominal voltage	24 V	≤ 60 V	≤ 60 V
Current load	≤ 10 A		
Diagnostics	–		
Reported to E-bus	–		
PE contact	yes	no	no
Number of outputs	–	e.g.: 8 x 24 V contact	e.g.: 8 x 0 V contact
Shield connection	–		
Renewed infeed	yes		
Current consumption E-bus	–		
Bit width in the process image	0		
Connection to DIN rail	–		
Electrical isolation	yes	–	–
Housing width in mm	12		
Side by side mounting on EtherCAT Terminals with power contact	yes, left without PE		
Side by side mounting on EtherCAT Terminals without power contact	yes		
Pluggable wiring	for all ESxxxx terminals		
Further information	www.beckhoff.com/EL9100		

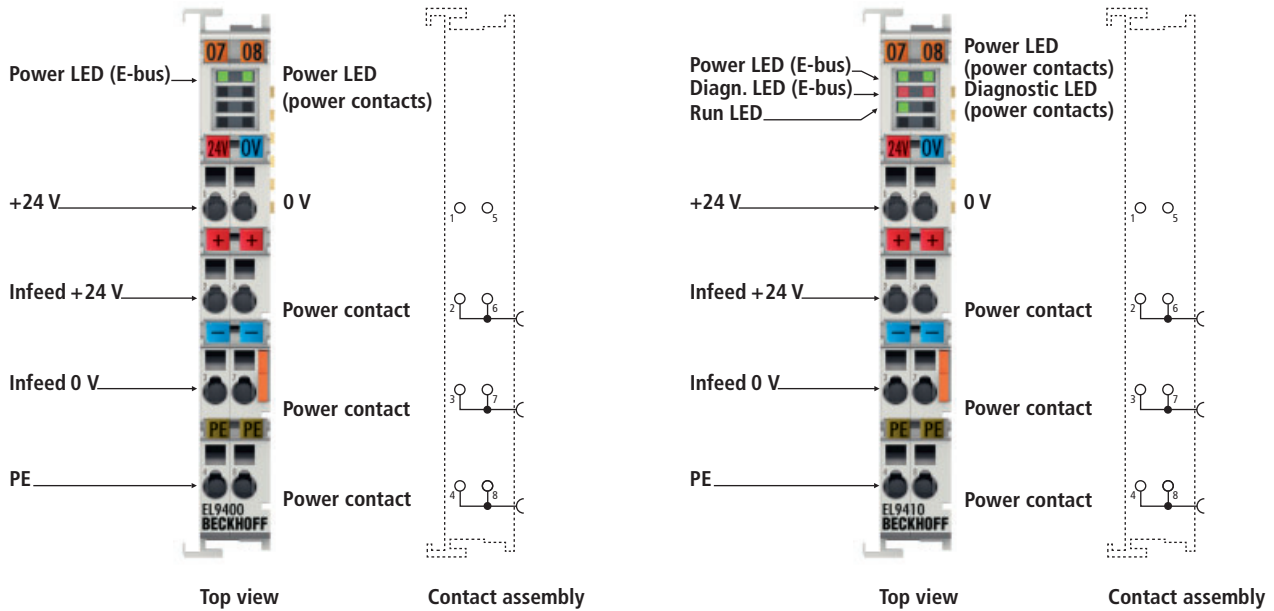


## EL9184, EL9188, EL9189 | 16-channel potential distribution terminals

The potential distribution terminals EL9188 and EL9189 provide 16 terminal points with a potential and enable the voltage to be picked up without further bus terminal blocks or wiring.

The EL9184 provides the potential of the 24 V DC contact at 8 terminal points and the potential of the 0 V contact at 8 terminal points. The conductors can be connected without tools in the case of solid wires using a direct plug-in technique.

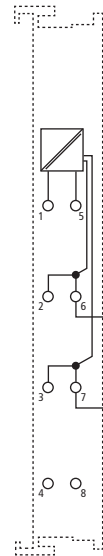
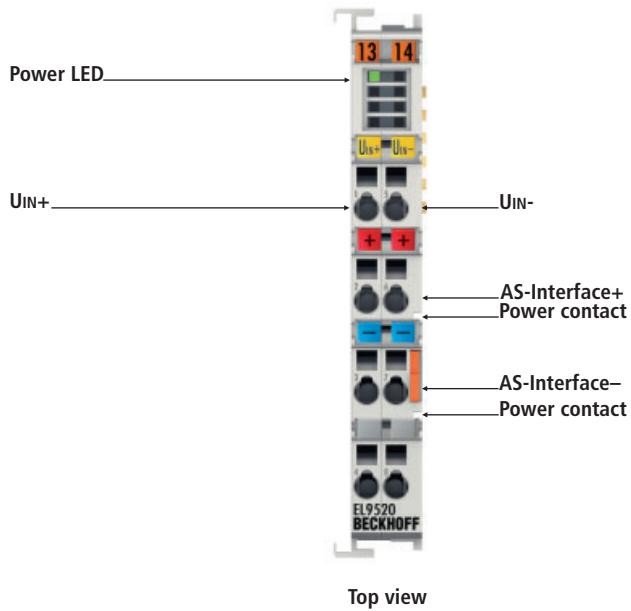
Technical data	EL9184	EL9188	EL9189
Nominal voltage	≤ 60 V		
Current load	≤ 10 A		
Diagnostics	–		
Reported to E-bus	–		
PE contact	no		
Number of outputs	e.g.: 8 x 24 V contact, 8 x 0 V contact	e.g.: 16 x 24 V contact	e.g.: 16 x 0 V contact
Shield connection	–		
Renewed infeed	yes		
Current consumption E-bus	–		
Bit width in the process image	0		
Connection to DIN rail	–		
Electrical isolation	–		
Housing width in mm	12		
Conductor types	solid wire, stranded wire and ferrule		
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver		
Rated cross-section	solid wire: 0.08...1.5 mm <sup>2</sup> ; stranded wire: 0.25...1.5 mm <sup>2</sup> ; ferrule: 0.14...0.75 mm <sup>2</sup>		
Weight	approx. 60 g		
Side by side mounting on EtherCAT Terminals with power contact	yes, left without PE		
Side by side mounting on EtherCAT Terminals without power contact	–	yes	yes
Further information	www.beckhoff.com/EL9184		



## EL9400, EL9410 | Power supply terminals for E-bus

The EL9400 and EL9410 power supply terminals are used to refresh the E-bus. Data is exchanged between the coupler and the EtherCAT Terminal over the E-bus. Each terminal draws a certain amount of current from the E-bus (see "current consumption E-bus" in the technical data). This current is fed into the E-bus by the relevant coupler's power supply unit. In configurations with a large number of terminals it is possible to use the EL9400/EL9410 in order to supply an extra 2 A to the E-bus. As opposed to the EL9400, the EL9410 has a diagnostic function which is displayed by LED and on the process image.

Technical data	EL9400   ES9400	EL9410   ES9410
Input voltage	24 V DC	
Output voltage	5 V/2 A for E-bus supply	
Power contacts	24 V DC max./10 A max.	
Diagnostics	–	via LED and in the process image
Weight	approx. 65 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 20/variable	
Pluggable wiring	for all ESxxxx terminals	
Further information	www.beckhoff.com/EL9400	

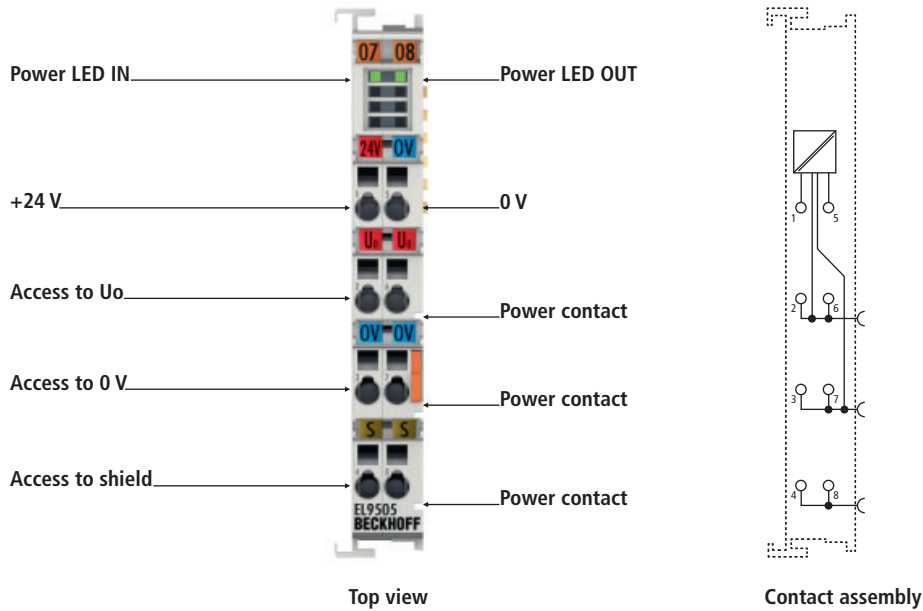


## EL9520 | AS-Interface potential feed terminal with filter

The EL9520 potential feed terminal uncouples the input and output signal through an integrated filter and enables the supply of AS-Interface networks from standard power supply units or another AS-Interface network. The EL9520 can be used directly next to the EL6201 AS-Interface master terminal. Multiple parallel operation of this combination in an EtherCAT Terminal block is possible and saves several AS-Interface power supply units.

Technical data	EL9520   ES9520
Input voltage	up to 35 V
Output voltage	up to 35 V
Current load	max. 2 A
Configuration	no address or configuration setting
Current consumption E-bus	90 mA (see documentation)
Weight	approx. 90 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL9520">www.beckhoff.com/EL9520</a>

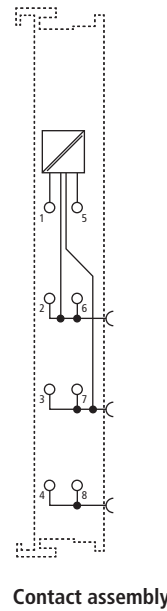
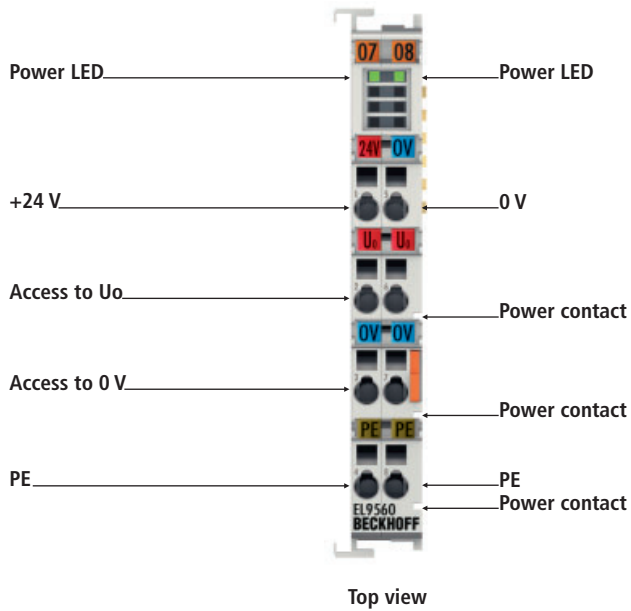
**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL9520](http://www.beckhoff.com/EL9520)



## EL95xx | Power supply terminals 5 V, 8 V, 10 V, 12 V, 15 V DC

The EL9505, EL9508, EL9510, EL9512 and EL9515 power supply unit terminals generate a variety of output voltages from the (24 V DC) input voltage. The output voltage can be accessed at the terminals. The following EtherCAT Terminals are also supplied with this voltage via the power contacts. The power LEDs indicate the terminals' operating state. The input voltage and the output voltage U<sub>o</sub> are not electrically isolated.

Technical data	EL9505   ES9505	EL9508   ES9508	EL9510   ES9510	EL9512   ES9512	EL9515   ES9515
Short-circuit-proof	yes				
Input voltage	24 V DC				
Output voltage	5 V DC ±1 %	8 V DC ±1 %	10 V DC ±1 %	12 V DC ±1 %	15 V DC ±1 %
Output current	0.5 A				
Current consumption E-bus	90 mA (see documentation)				
Weight	approx. 65 g				
Operating/storage temperature	0...+55 °C/-25...+85 °C				
Relative humidity	95 %, no condensation				
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				
Protect. class/installation pos.	IP 20/variable				
Pluggable wiring	for all ESxxxx terminals				
Further information	<a href="http://www.beckhoff.com/EL9505">www.beckhoff.com/EL9505</a>				



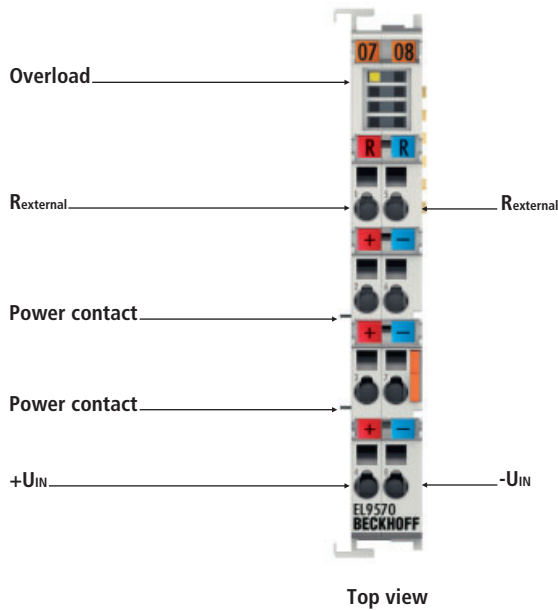
## EL9560 | Power supply terminal 24 V DC/24 V DC, 0.5 A

The EL9560 power supply unit terminal generates an electrically isolated output voltage from the 24 V DC input voltage. The output voltage can be accessed at the terminal. The following EtherCAT Terminals are also supplied with this voltage via the power contacts. The power LEDs indicate the operating state of the terminal. The input voltage and the output voltage of 500 V are electrically isolated.

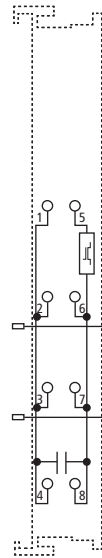
Technical data	EL9560   ES9560
Short-circuit-proof	yes, automatic restart
Input voltage	24 V DC (-15 %/+20 %)
Output voltage	24 V DC (-15 %/+5 %)
Output current	≤ 0.5 A
Short circuit current	approx. 0.6 A
Efficiency	approx. 85 %
Current consumption E-bus	90 mA (see documentation)
Insulation voltage	1,500 V AC constant load field side/E-bus
Insulation voltage input/output	500 V AC permanent load
Weight	approx. 65 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL9560">www.beckhoff.com/EL9560</a>

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL9560](http://www.beckhoff.com/EL9560)

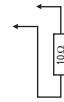




Top view



Contact assembly



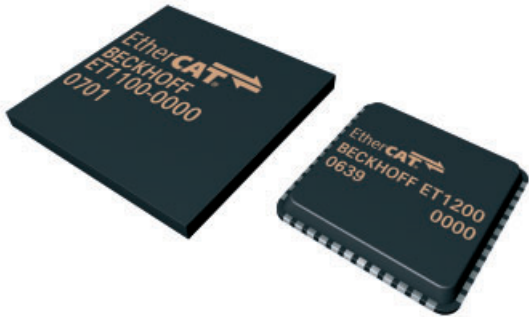
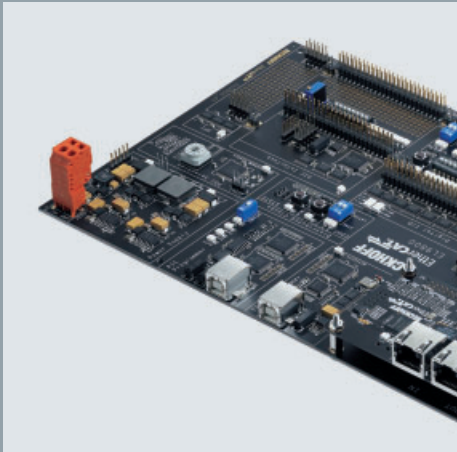
Connection

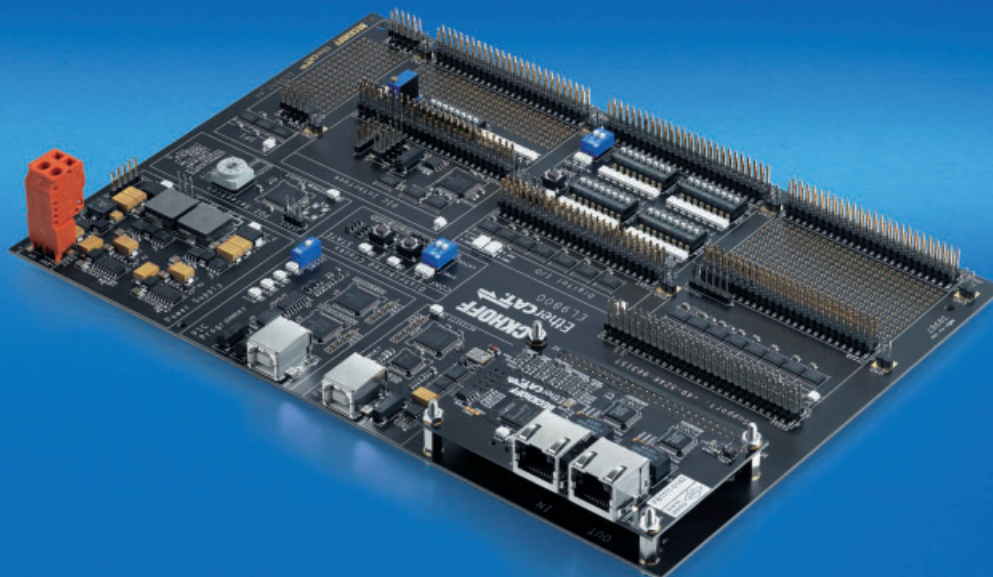
## EL9570 | Buffer capacitor terminal

The EL9570 Bus Terminal contains high-performance capacitors for stabilising supply voltages. The EL9570 can be used in conjunction with the EL7041 stepper motor terminal and the EL7342 DC motor terminal. Low internal resistance and high-pulsed current capability enable good buffering in parallel with a power supply unit. Return currents are stored, particularly in the context of drive applications, thereby preventing overvoltages. If the regenerative energy exceeds the capacity of the capacitors, energy can be dissipated via an external ballast resistor.

Technical data	EL9570   ES9570
Nominal voltage	50 V
Capacity	500 $\mu$ F
Ripple current	10 A in continuous operation
Internal resistance	< 10 m $\Omega$
Surge voltage protection	> 56 V
Recommended ballast resistor	10 $\Omega$ , typ. 10 W
Overvoltage control range	$\pm$ 2 V
Ballast resistor clock rate	load-dependent, 2-point control
Electrical isolation	1,500 V <sub>rms</sub> (terminal/E-bus)
Weight	approx. 90 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Pluggable wiring	for all ESxxxx terminals
Further information	<a href="http://www.beckhoff.com/EL9570">www.beckhoff.com/EL9570</a>

# EtherCAT Development Products





## EL98xx | EtherCAT evaluation kit

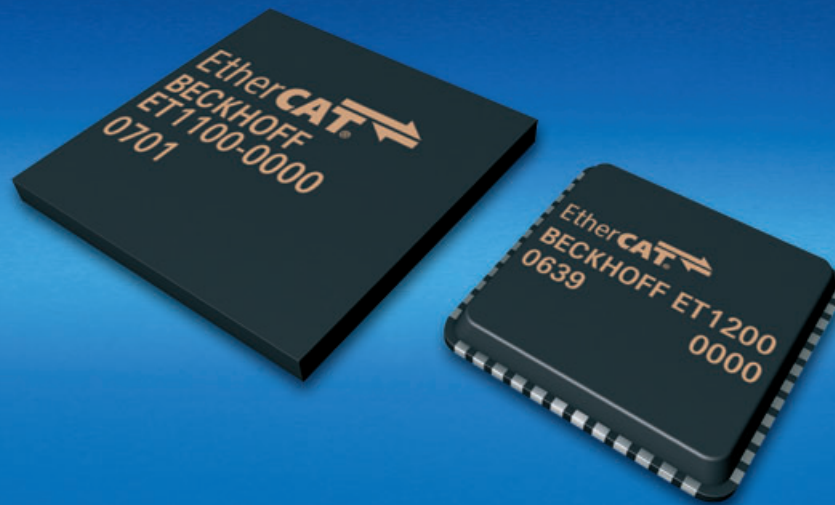
The evaluation kits serve as platform for the development of EtherCAT slaves. The piggyback controller board supplied with the kit realises the complete EtherCAT connection with the ASIC ET1100 or on FPGA basis. A programming interface is integrated for the FPGAs.

All digital I/O, SPI and asynchronous  $\mu$ Controller process data interfaces (PDIs) are connected to pin strips and can be selected via PDI selector switch. The SPI interface can optionally be connected with a PIC microcontroller included with the kit or directly to the pin strip. A programming

and debugging interface for the controller is also provided. The EL98xx can therefore also be used as platform for the ET9300 EtherCAT Slave Sample Code provided with the evaluation kits. The EL9830 and EL9840 EtherCAT evaluation kits are intended as a hardware plat-

form for the EtherCAT IP core. For this reason, these kits are delivered with a demo version (time-limited binary) of the IP core (16 bit digital I/O).

Technical data	EL9820	EL9821	EL9830	EL9840
Evaluation kit	base board			
EtherCAT Slave Controller	ASIC ET1100	ASIC ET1100	Altera FPGA (IP core required)	Xilinx FPGA (IP core required)
EtherCAT piggyback controller board	FB1111-0142 with ASIC ET1100	FB1111-0142 with ASIC ET1100	FB1122 with Altera Cyclone III (EP3C25)	FB1130 with Xilinx Spartan-3E (XC3S1200E)
Software	EtherCAT Slave Sample Code ET9300			
Accessories	cables, documentation			
Workshop	optionally available as TR8100	includes 1-day workshop for 1 person at Verl, Germany (TR8100)	optionally available as TR8100	optionally available as TR8100
Further information	<a href="http://www.beckhoff.com/EL9820">www.beckhoff.com/EL9820</a>			



## ET1100, ET1200 | EtherCAT ASICs

The ET1100 and ET1200 EtherCAT ASICs offer a cost-effective and compact solution for realising EtherCAT slaves. They process the EtherCAT protocol in the hardware and therefore ensure high-performance and real-time capability, independent of any downstream slave microcontrollers and associated software. Through their three process data interfaces – digital I/O, SPI and 8/16 bit  $\mu$ C (not for ET1200) – the EtherCAT ASICs enable realisation of simple digital modules without microcontrollers and development of intelligent devices

with own processor. Both ASICs feature distributed clocks that enable high-precision synchronisation ( $\ll 1 \mu$ s) of the EtherCAT slaves. The supply voltage is 3.3 V or 5 V; the core voltage of 2.5 V is generated by the integrated in-phase regulator or can be supplied directly. The ET1100 is suitable as a universal solution for all types of EtherCAT devices; the ET1200 is optimised for modular devices using E-bus/LVDS (Low Voltage Differential Signalling) as internal interface. Due to their compact design and small number of external components, both ASICs

only require minimum space on the board.

The ET1100 ASIC housing (BGA128) only measures 10 x 10 mm. The chip can support up to four EtherCAT ports. The 8 kB internal memory (DPRAM) for access to process and parameter data is optionally addressed via parallel or serial data bus. Alternatively, the ASICs can also be used without controller. In this case up to 32 digital signals can be connected directly.

The ET1200 ASIC is the “small” variant of the ET1100; with its QFN48 housing measur-

ing only 7 x 7 mm, the chip is even more compact. The device offers 16 digital I/O interfaces and distributed clock hardware for high-precision synchronisation. The 1 kB internal DPRAM is addressed via a fast serial interface (20 Mbit/s). The “small ASIC” offers up to three EtherCAT ports, one of which can be used as MII for connecting a standard PHY. The other ports are used for LVDS, which makes the ET1200 the right choice for modular devices using LVDS as internal bus physics.

Technical data	ET1100-0000	ET1200-0000
Number of EtherCAT ports	4 (max. 4 x MII)	3 (max. 1 x MII)
FMMUs	8	3
SYNC manager	8	4
DPRAM	8 kbyte	1 kbyte
Distributed clocks	yes (64 bit)	yes (64 bit)
Process data interfaces	32 bit digital I/O SPI 8/16 bit $\mu$ C	16 bit digital I/O SPI –
Housing	BGA128, 10 x 10 mm	QFN48, 7 x 7 mm
Further information	<a href="http://www.beckhoff.com/ET1100">www.beckhoff.com/ET1100</a>	

# ET1810, ET1815 | EtherCAT IP core for Altera and Xilinx FPGAs

The EtherCAT IP core enables the EtherCAT communication function and application-specific functions to be implemented on an FPGA (Field Programmable Gate Array – i.e. a device containing programmable logical components). The EtherCAT functionality is freely configurable. The IP core can be combined with own FPGA designs and offers the option of communicating with a soft core processor via the Avalon (Altera)/OPB (Xilinx) interface. The IP core can be connected to Xilinx processors with PLB v4.6 interface via a bridge. The physical interfaces and internal functions, such as the number of FMMUs and SYNC managers, the size of the DPRAM, etc., are adjustable. The process data interface (PDI) and the distributed clocks are also configurable. The functions are compatible with the EtherCAT specification and

the EtherCAT ASICs (ET1100, ET1200).

The number of required logic elements depends on the chosen configuration:

Altera IP core:

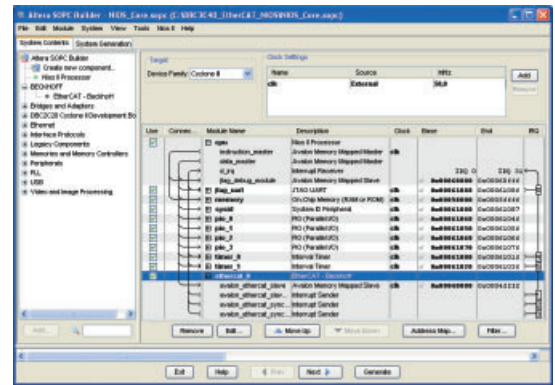
- 32 bit digital I/O, 1 kB RAM without distributed clocks with FMMU and SYNC manager with approx. 6,300 logic elements
- 16 bit  $\mu$ C interface, 60 kB RAM, with distributed clocks, 8 FMMUs and 8 SYNC managers with approx. 23,000 logic elements

Xilinx IP core:

- 32 bit digital I/O, 1 kB RAM without distributed clocks with FMMU and SYNC manager with approx. 3,700 slices (Spartan-3E)
- 16 bit  $\mu$ C interface, 60 kB RAM, with distributed clocks, 8 FMMUs and 8 SYNC managers with approx. 14,000 slices (Spartan-3E)

The EtherCAT Altera IP core can be used with the following FPGAs: Cyclone, Cyclone II, Cyclone III, Stratix, Stratix II, Stratix III, Stratix IV, Stratix GX, Stratix II GX, Arria GX.

The EtherCAT Xilinx IP core can be used with the following FPGAs: Spartan-3, Spartan-3E, Spartan-3A, Spartan-3AN, Spartan-3ADSP, Virtex-II, Virtex-II Pro, Virtex-II Pro X, Virtex-4 and Virtex-5.



Configurable features	ET1810, ET1815
PHY interface	2...3 ports MII or 2 ports RMI1
FMMUs	0...8
SYNC manager	0...8
DPRAM	1...60 kbyte
Distributed clocks	2 x SYNC outputs, 2 x latch inputs (32/64 bit)
Process data interfaces	32 bit digital I/O, SPI, 8/16 bit asynchronous $\mu$ C interface, Avalon (Altera)/OBP (Xilinx) interface, 64 bit general purpose I/O
Further information	www.beckhoff.com/ET1810

Ordering information	Description
ET1810	node-locked buy out licence for Altera
ET1810-0010	extension of the node-locked Altera licence (ET1810) by one additional workstation
ET1810-0020	one-year maintenance extension for node-locked licence (ET1810)
ET1812	EtherCAT IP core licence for Altera FPGA "Floating Licence"
ET1812-0010	extension of the floating licence (ET1812) by one additional workstation
ET1812-0020	one-year maintenance extension for floating licence (ET1812)
ET1815	EtherCAT IP core licence for Xilinx FPGAs "node-locked"
ET1815-0010	extension of the node-locked licence (ET1815) by one additional workstation
ET1815-0020	one-year maintenance extension for node-locked licence (ET1815)
ET1817	EtherCAT IP core licence for Xilinx FPGAs "Floating Licence"
ET1817-0010	extension of the floating licence (ET1817) by one additional workstation
ET1817-0020	one-year maintenance extension for floating licence (ET1817)

# ET1811, ET1816 | Quantity-based EtherCAT IP core licence for Altera and Xilinx FPGAs

The EtherCAT IP core enables the EtherCAT communication function and application-specific functions to be implemented on an FPGA (Field Programmable Gate Array – i.e. a device containing programmable logical components). The EtherCAT functionality is freely configurable. The IP core can be combined with own FPGA designs and offers the option of communicating with a soft core processor via the Avalon (Altera)/OPB (Xilinx) interface. The IP core can be connected to Xilinx processors with PLB v4.6 interface via a bridge. The physical interfaces and internal functions, such as the number of FMMUs and SYNC managers, the size of the DPRAM, etc., are adjustable. The process data interface (PDI) and the distributed clocks are also configurable. The functions are compatible with the

EtherCAT specification and the EtherCAT ASICs (ET1100, ET1200).

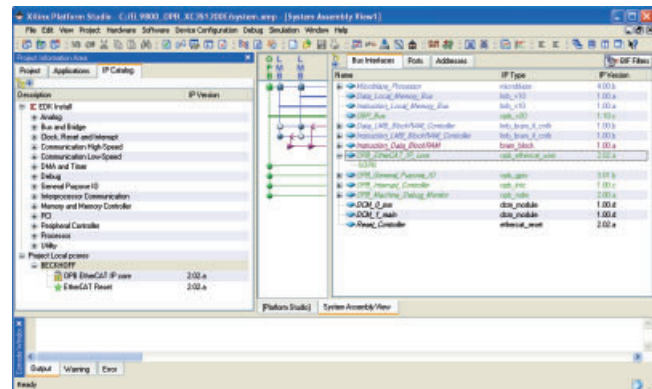
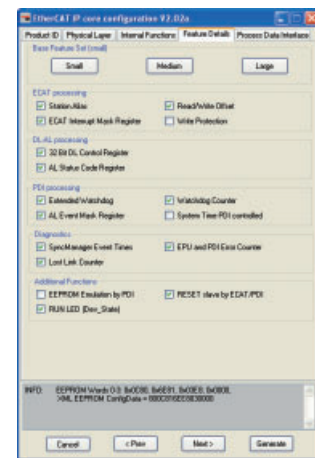
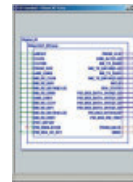
In particular, the ET1811 (Altera) and ET1816 (Xilinx) quantity-based licences offer manufacturers of small lots and development service providers the possibility of entering the world of EtherCAT development with low initial investment. For the development of an EtherCAT device, the ET1811 or ET1816 one-time kick-off charge is required, plus the ET1811-1000 or ET1816-1000 royalty for 1,000 devices. The royalties for 1,000 devices must be paid in advance each time.

Development service providers only require the ET1811 or ET1816 one-time kick-off charge; the ET1811-0030 system integrator OEM licence is required for each customer implementation.

The end customer requires the royalty licence (ET1811-1000 or ET1816-1000).

The licence for the use of the EtherCAT IP core with unlimited lot sizes (ET1810, ET1815) is still available.

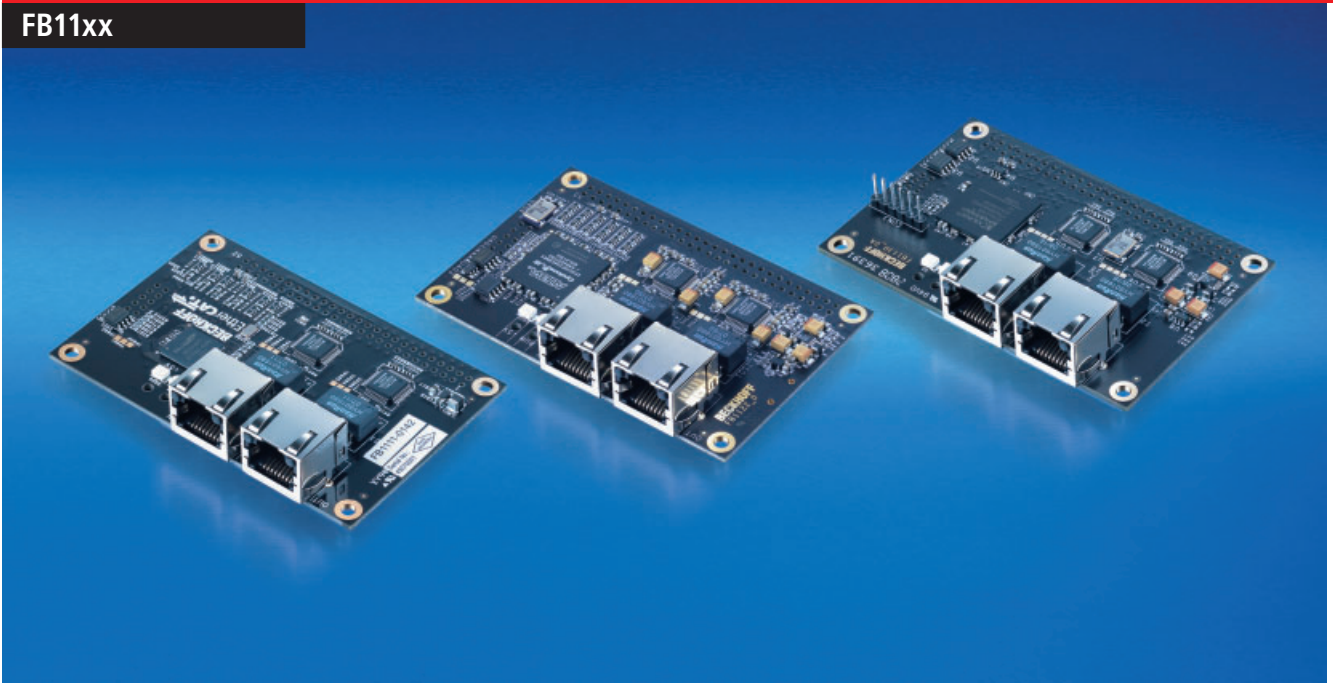
The number of required logic elements and the usable function blocks match the information for ET1810/ET1815.



Ordering information	Description
ET1811	one-time kick-off charge for the node-locked quantity-based licence for using the freely configurable EtherCAT IP cores on one workstation; target hardware: selected Altera devices
ET1811-1000	royalty for 1,000 devices, ET1811 required
ET1811-0020	one-year maintenance extension, ET1811 required
ET1816	one-time kick-off charge for the node-locked quantity-based licence for using the freely configurable EtherCAT IP cores on one workstation; target hardware: selected Xilinx devices
ET1816-1000	royalty for 1,000 devices, ET1816 required
ET1816-0020	one-year maintenance extension, ET1816 required
ET1811-0030	system integrator OEM licence

Further licence options on request

Further information [www.beckhoff.com/ET1811](http://www.beckhoff.com/ET1811)



## FB1111, FB1122, FB1130 | EtherCAT piggyback controller boards

The FB11xx EtherCAT piggyback controller boards offer complete EtherCAT connection based on the ET1100 EtherCAT ASIC or an Altera or Xilinx FPGA in conjunction with the ET18xx EtherCAT IP core. All FB11xx have the same form factor and can be used with the EtherCAT evaluation kit. They can be integrated as EtherCAT interfaces in devices.

The FB1122 and FB1130 piggyback controller boards are intended as a hardware platform for the EtherCAT IP core. For this reason, these boards are delivered with a demo version (time-limited binary) of the IP core (16 bit digital I/O).

Ordering information	Description
FB1111-0140	EtherCAT piggyback controller board with ET1100 and $\mu$ C interface; can be integrated as EtherCAT interface in devices.
FB1111-0141	EtherCAT piggyback controller board with ET1100 and SPI interface; can be integrated as EtherCAT interface in devices.
FB1111-0142	EtherCAT piggyback controller board with ET1100 and digital I/O interface; can be integrated as EtherCAT interface in devices; included in the EL982x evaluation kit.
FB1122	EtherCAT piggyback controller board with Altera Cyclone III (EP3C25) (IP core required)
FB1130	EtherCAT piggyback controller board with Xilinx Spartan-3E (XC3S1200E) (IP core required)

Further information [www.beckhoff.com/FB1111](http://www.beckhoff.com/FB1111)



## ET2000 | Industrial Ethernet multi-channel probe

With the ET2000 multi-channel probe Beckhoff introduces a versatile piece of hardware for analysing any Industrial Ethernet solution. With eight ports this device enables unlimited synchronised recording of up to four independent channels at a speed of 10 or 100 Mbit/s. All real-time Ethernet standards such as EtherCAT, PROFINET, etc. and conventional office Ethernet networks are supported.

Through its compact and rugged design the ET2000 is ideal both for the local application at machines or in the

laboratory. The four channels enable recording and analysis of separate networks or different points within the same network. All frames in transit – in both directions – are furnished with a high-precision time stamp in the probe hardware and copied to the Gbit uplink port. The high time stamp resolution of 1 ns enables very precise timing analysis of the connected network segments. The ET2000 probe is transparent for the connected buses. Thanks to the low cycle delay of  $< 1 \mu\text{s}$  the influence on the system is very small.

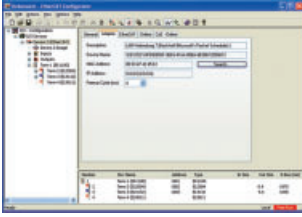
The device can be connected to any Gbit Ethernet interfaces on the PC side. A plug-in for the free Wireshark network monitor enables this network monitor to be used for analysing recordings and high-precision time stamps.

Technical data	ET2000
Number of ports/channels	8/4
Uplink port	1 Gbit/s
Delay	approx. 1 $\mu\text{s}$
Resolution time stamp	1 ns
Software interface	WinPcap
Data transfer rates	probe ports: 10/100 Mbit/s, uplink port: 1 Gbit/s
Hardware diagnosis	2 LEDs per channel (link/activity, 10/100 Mbit), 1 power LED
Power supply	24 (18...30) V DC, 500 mA, 3-pole terminal (+, -, PE)
Dimensions (W x H x D)	approx. 100 mm x 150 mm x 40 mm
Operating temperature	0...55 °C
Further information	<a href="http://www.beckhoff.com/ET2000">www.beckhoff.com/ET2000</a>



# ET9000, ET9200, ET9300 | EtherCAT development software

## ET9000 | EtherCAT configurator



Through clear definition of the interfaces in the EtherCAT specification an EtherCAT master can be developed without having to develop a configurator at the

same time. The EtherCAT configurator is aimed at EtherCAT master developers who want to use it or integrate and distribute it with their software package.

The Windows software for configuring an EtherCAT network includes:

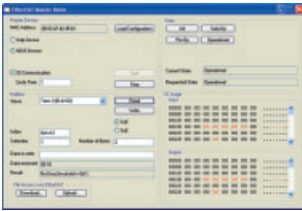
- configurator for:
  - reading XML device descriptions
  - generating XML configuration descriptions

### Properties

- online features
  - scanning of EtherCAT networks
  - diagnostics
  - free-run online mode for commissioning
- topology representation
- Automation software interface starts the configurator as COM server.
  - COM interface
- XML interface for parameter exchange between client and server
- including embedded graphical user interface
- EXE file, executable under Windows 2000, XP and Vista

The EtherCAT configurator is not required if the TwinCAT software from Beckhoff is used.

## ET9200 | EtherCAT Master Sample Code



The EtherCAT Master Sample Code is a user mode Windows application that demonstrates implementation of the EtherCAT master. The TR8200 workshop

for EtherCAT master developers is based on the ET9200.

### Features

- boot-up and configuration
- sending and receiving of "raw" EtherCAT frames to/from a network adapter
- management of EtherCAT slave states
- reading of XML configuration descriptions

- sending of the initialisation commands that are defined for the different state changes to the slave device
- mailbox communication
  - CoE (CANopen over EtherCAT)
  - SoE (Servodrive Profile over EtherCAT)
  - EoE (Ethernet over EtherCAT)
  - FoE (File Access over EtherCAT)
- AoE (ADS over EtherCAT)
- integrated virtual switch functionality
- cyclical process data communication
- distributed clocks state machine

The software is sent as source code and can be adapted to the hardware environment (Ethernet controller) and integrated in a real-time environment.

## ET9300 | EtherCAT Slave Sample Code

The EtherCAT Slave Sample Code is an example source code in ANSI C supporting both the  $\mu$ C and the SPI interface. The code serves as a development base for implementation of EtherCAT in devices with own processor.

### Features

- EtherCAT handling in the controller
- handling of the extended state machine
- mailbox handling
- protocol handling for:

- CoE (CANopen over EtherCAT)
- FoE (File Access over EtherCAT)
- EoE (Ethernet over EtherCAT)
- SoE (Servo Drive Profile over EtherCAT)
- AoE (ADS over EtherCAT)
- sample applications for all variants

The EtherCAT Slave Sample Code is included in the EL98xx EtherCAT evaluation kits.

Ordering information	Description
ET9000	licence for using the EtherCAT configurator
ET9200	licence for using the EtherCAT Master Sample Code
ET9300	licence for using the EtherCAT Slave Sample Code (included in the EtherCAT evaluation kits)

Further information [www.beckhoff.com/ET9000](http://www.beckhoff.com/ET9000)

# ET9400 | EtherCAT conformance test tool

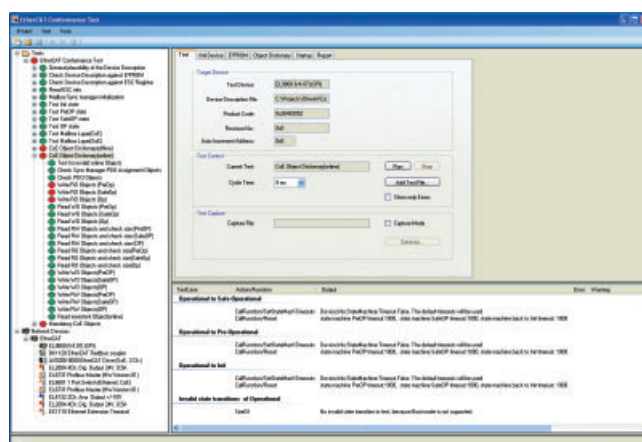
The conformance test tool enables in-house testing of EtherCAT slave devices. Use of the ET9400 tool during the development of an EtherCAT device assists in ensuring conformity and in preparing the device for the official, independent conformance test in an accredited test laboratory of the EtherCAT Technology Group.

The ET9400 tool requires a standard PC with Windows OS; special hardware is not required. The EtherCAT frames for stimulation of the device under test are sent via the standard Ethernet port. The tool processes the standard test cases supplied (XML files) sequentially. In this way, extensions of the test cases are possible without modifying the EtherCAT conformance test tool itself. The official test cases can be supplemented by their

own routines. Test results and remarks are shown in a logger window and can in turn be saved as an XML file. The tool also tests the electronic description of the EtherCAT device (ESI) and includes an editor for this file format, in order to be able to process the ESI (XML file) temporarily for test purposes. EEPROM data can also be read, edited and written. Besides the items described above, the following items are also tested, among others:

- plausibility of the device description (ESI) and the SII (EEPROM)
- test of the status machines
- mailbox communication using SoE and CoE
- CoE object directory
- consistency check of CoE object directory, EEPROM data and device description (ESI)

Real-time behaviour in relationship to distributed clocks (DC) cannot be tested using the ET9400, because a real-time-capable master with DC support is required for this.



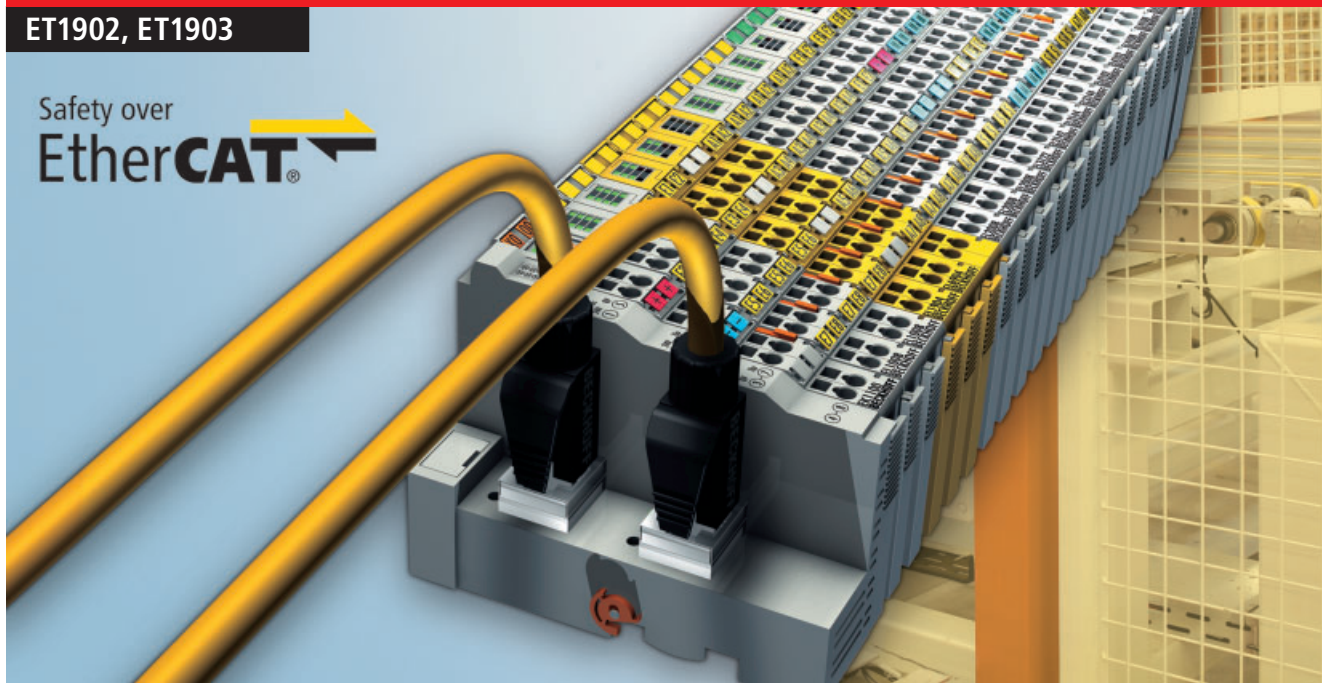
## Ordering information

ET9400

## Description

1-year licence for using the EtherCAT conformance test tool

Further information [www.beckhoff.com/ET9400](http://www.beckhoff.com/ET9400)



## ET1902, ET1903 | Safety over EtherCAT licence

In the interest of realising safe data communication for EtherCAT, the Safety over EtherCAT protocol has been disclosed. The protocol meets the requirements of IEC 61508 up to Safety Integrity Level (SIL) 3, as approved by the German Technical Inspection Agency (TÜV).

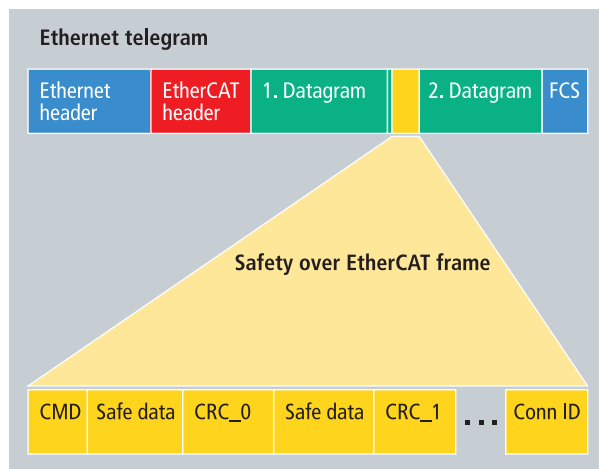
EtherCAT is used as a single-channel communication system. The transport medium is regarded as a "black channel" and not included in the safety considerations. Thus, the protocol can also be transmitted by other communication systems, backplanes, WLAN. The transfer cycle can be as short as required without affecting residual error

probability. The cyclic exchange of safe data between a Safety over EtherCAT master and a Safety over EtherCAT slave is referred to as a connection that is monitored via a watchdog timer. A master can establish and monitor several connections to different slaves.

The Safety over EtherCAT frame includes a command, safe process data that are verified via a checksum (CRC), and a unique connection ID. A minimum frame with 1 byte of safe process data is 6 bytes long. The maximum length is determined by the number of process data required by the slave. The protocol imposes no maximum length restriction.

The licences allow implementation of the Safety over EtherCAT protocol in

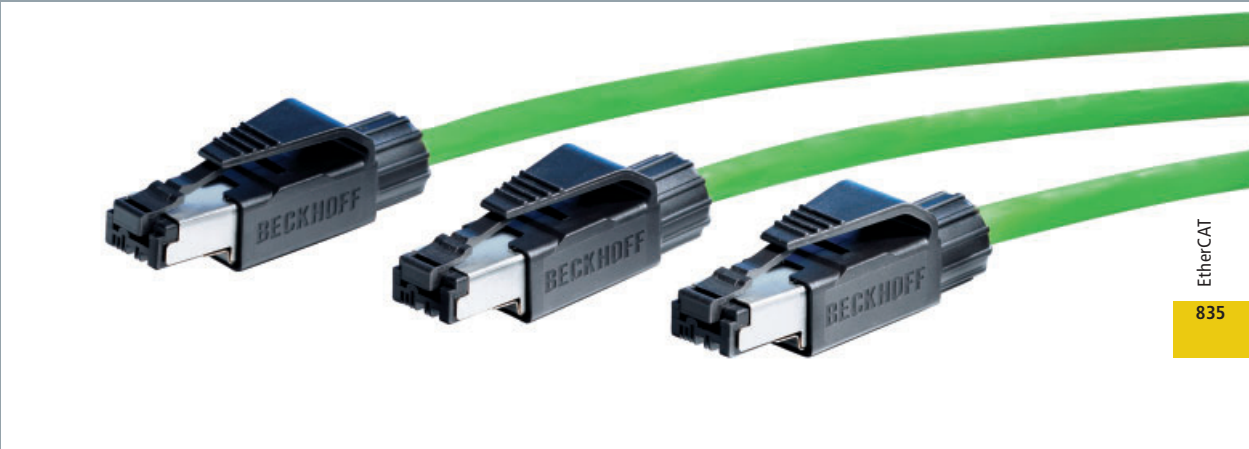
a device. They are general company licences that are independent of the quantity.



Ordering information	Description
ET1902	general licence for producing Safety over EtherCAT-compliant slave devices, including <ul style="list-style-type: none"> <li>– Safety over EtherCAT slave specification</li> <li>– test specification and tests for a Safety over EtherCAT slave</li> <li>– introduction to the technology, 1-day seminar at Verl, Germany</li> <li>– 1-year maintenance contract</li> </ul>
ET1903	general licence for producing Safety over EtherCAT-compliant master devices, including <ul style="list-style-type: none"> <li>– Safety over EtherCAT master specification</li> <li>– test specification and tests for a Safety over EtherCAT master</li> <li>– introduction to the technology, 1-day seminar at Verl, Germany</li> <li>– 1-year maintenance contract</li> </ul>

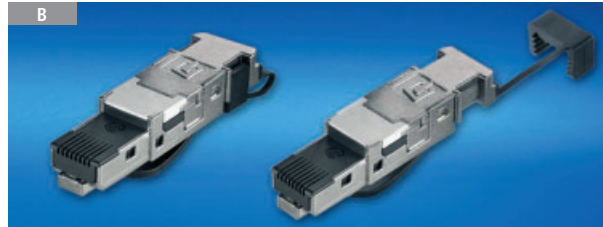
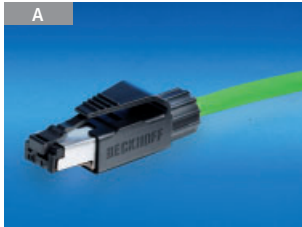
Further information [www.beckhoff.com/ET1902](http://www.beckhoff.com/ET1902)

# Accessories EtherCAT



## Connectors

Ordering information	Description	Pict.
ZS1090-0003	EtherCAT/Ethernet RJ 45 connector, IP 20, 4-pin, for field assembly	A
ZS1090-0005	EtherCAT/Ethernet RJ 45 plug, IP 20, 8-pin, for field assembly	B



## Patch cables

The pre-assembled Ethernet/EtherCAT cables with RJ 45 plug enable fast, easy wiring inside the control cabinet and are suitable for short distances on the machine. The robust, industrial quality PUR cables distinguish themselves from office cables by both their mechanical and their EMC characteristics. Further lengths and variants on request.

Technical data	ZK1090-9191-xxxx
Cross-section	4 x 2 x AWG26/7...4 x 2 x 0.128 mm <sup>2</sup>
Cable sheath material	PUR
Colour	green (RAL 6018)
Line configuration	SF/UTP
Diameter	sheath: typ. 5.9 mm ±0.2 mm
Bending radius	> 5 x diameter
Category/class	CAT5, class D
Operating/installation temp.	-40...+75 °C/-10...+60 °C
Insertion cycles	min. 750

Ordering information	Description
ZK1090-9191-0001	Industrial Ethernet/EtherCAT patch cable, 0.17 m
ZK1090-9191-0002	Industrial Ethernet/EtherCAT patch cable, 0.26 m
ZK1090-9191-0005	Industrial Ethernet/EtherCAT patch cable, 0.5 m
ZK1090-9191-0010	Industrial Ethernet/EtherCAT patch cable, 1.0 m
ZK1090-9191-0020	Industrial Ethernet/EtherCAT patch cable, 2.0 m
ZK1090-9191-0030	Industrial Ethernet/EtherCAT patch cable, 3.0 m
ZK1090-9191-0050	Industrial Ethernet/EtherCAT patch cable, 5.0 m
ZK1090-9191-0100	Industrial Ethernet/EtherCAT patch cable, 10.0 m
ZK1090-9191-0150	Industrial Ethernet/EtherCAT patch cable, 15.0 m
ZK1090-9191-0200	Industrial Ethernet/EtherCAT patch cable, 20.0 m
ZK1090-9191-0250	Industrial Ethernet/EtherCAT patch cable, 25.0 m
ZK1090-9191-0300	Industrial Ethernet/EtherCAT patch cable, 30.0 m
ZK1090-9191-0350	Industrial Ethernet/EtherCAT patch cable, 35.0 m
ZK1090-9191-0400	Industrial Ethernet/EtherCAT patch cable, 40.0 m
ZK1090-9191-0450	Industrial Ethernet/EtherCAT patch cable, 45.0 m
ZK1090-9191-0500	Industrial Ethernet/EtherCAT patch cable, 50.0 m



## Cables

Ordering information	Description
ZB9010	Industrial Ethernet/EtherCAT cable, fixed installation, CAT 5e, 4 wires
ZB9020	Industrial Ethernet/EtherCAT cable, drag chain suitable, CAT 5e, 4 wires
ZB903x	Industrial Ethernet/EtherCAT cable, reduced diameter for M8 wiring

## Fibre-optic cables for EK1501, EK1521

Ordering information	Description
ZK1091-1001-0001	fibre-optic duplex cable, SC connector, 1 m
ZK1091-1001-0005	fibre-optic duplex cable, SC connector, 5 m
ZK1091-1001-0010	fibre-optic duplex cable, SC connector, 10 m

Further lengths and variants on request

## Connectors for KS Bus Terminals, ES EtherCAT Terminals

Ordering information	Description
ZS2010	10 connectors for KS and ES series, spare part (KS/ES terminals are supplied with connector.)

## Connectors for KM and EM modules

Ordering information	Description
ZS2001-0001	connector for KM/EM module, 1-pin, without LED; spare part (KM/EM terminals are supplied with connector.)
ZS2001-0002	connector for KM/EM module, 1-pin, with LED; spare part (KM/EM terminals are supplied with connector.)
ZS2001-0004	connector for KM/EM module, 3-pin, with LED; spare part (KM/EM terminals are supplied with connector.)
ZS2001-0005	connector for KM/EM module, 1-pin, without LED, labelling (1...10); spare part (KM/EM terminals are supplied with connector.)

## Assembly aids

Ordering information	Description
ZB8700	slot screwdriver assembly tool for pressing the spring force clamps on the coupler and the terminals

## Bus system housing

The BG1558 and BG1559 housings are especially suitable for the construction of compact I/O stations with a higher protection class (IP 65). The housings are supplied with mounting rails. If desired, the housings can be supplied fully fitted with EtherCAT Terminals, flanges and PG threaded fittings. Further sizes are available on request.

Ordering information	Description	Pict.
BG1558	bus system housing 400 mm x 200 mm x 120 mm (W x H x D) with mounting rails and holes	A
BG1559	bus system housing 600 mm x 200 mm x 120 mm (W x H x D) with mounting rails and holes	

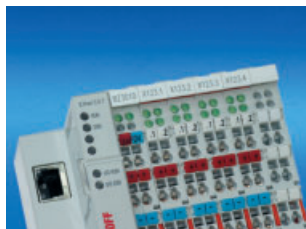


## Marking material

The EtherCAT Terminals can be individually labelled with standard contact signs. The marking material is not included in the EtherCAT Terminal delivery. Other versions in other colours and with other texts are available on request or on the internet ([www.beckhoff.com](http://www.beckhoff.com)).

Ordering information	Unprinted
BZ1000	100 unprinted contact labels
BZ1002	100 unprinted contact labels, yellow
BZ1005	100 unprinted contact labels, red
BZ1006	100 unprinted contact labels, blue
BZ1007	100 unprinted contact labels, orange
BZ1008	100 unprinted contact labels, light green
BZ3000	180 equipment identification labels 12 x 7 mm for Bus Terminals with removable identification section, blank

Ordering information	Printed
BZ1100	100 contact labels, printed with: 0 V, blue
BZ1102	100 contact labels, printed with: -, blue
BZ1104	100 contact labels, printed with: 24 V, red
BZ1106	100 contact labels, printed with: +, red
BZ1107	100 contact labels, printed with: +, white
BZ1108	100 contact labels, printed with: PE, light green
BZ1300	100 contact labels, ten of each printed with: 0...7, 20 unprinted, white
BZ1400	100 contact labels, two of each printed with: 00 01...48 49, white
BZ3010	180 equipment identification labels 12 x 7 mm for Bus Terminals with removable identification section, printed (printed according to customer specification [in Excel file])



## Coding pins and sockets for KS and ES terminals

The coding pins and sockets for ZS2010 and KS/ES terminals with pluggable wiring level enable coding between terminal and plug in order to prevent incorrect plug insertion.

Ordering information	Description
ZS2010-0010	The set contains 100 sockets and 100 pins.



## Demokit

The TC9910-B11x EtherCAT demokit offers a quick introduction into EtherCAT communication. It includes EtherCAT Terminals and a Coupler for testing simple I/O functions. The enclosed CD contains a step-by-step guide and a full version of TwinCAT as programming environment for the Beckhoff EtherCAT master. EtherCAT slaves of any type can be tested with this field-proven EtherCAT master. It also includes a comprehensive help collection that facilitates

familiarisation with Beckhoff ADS communication and programming according to IEC 61131.

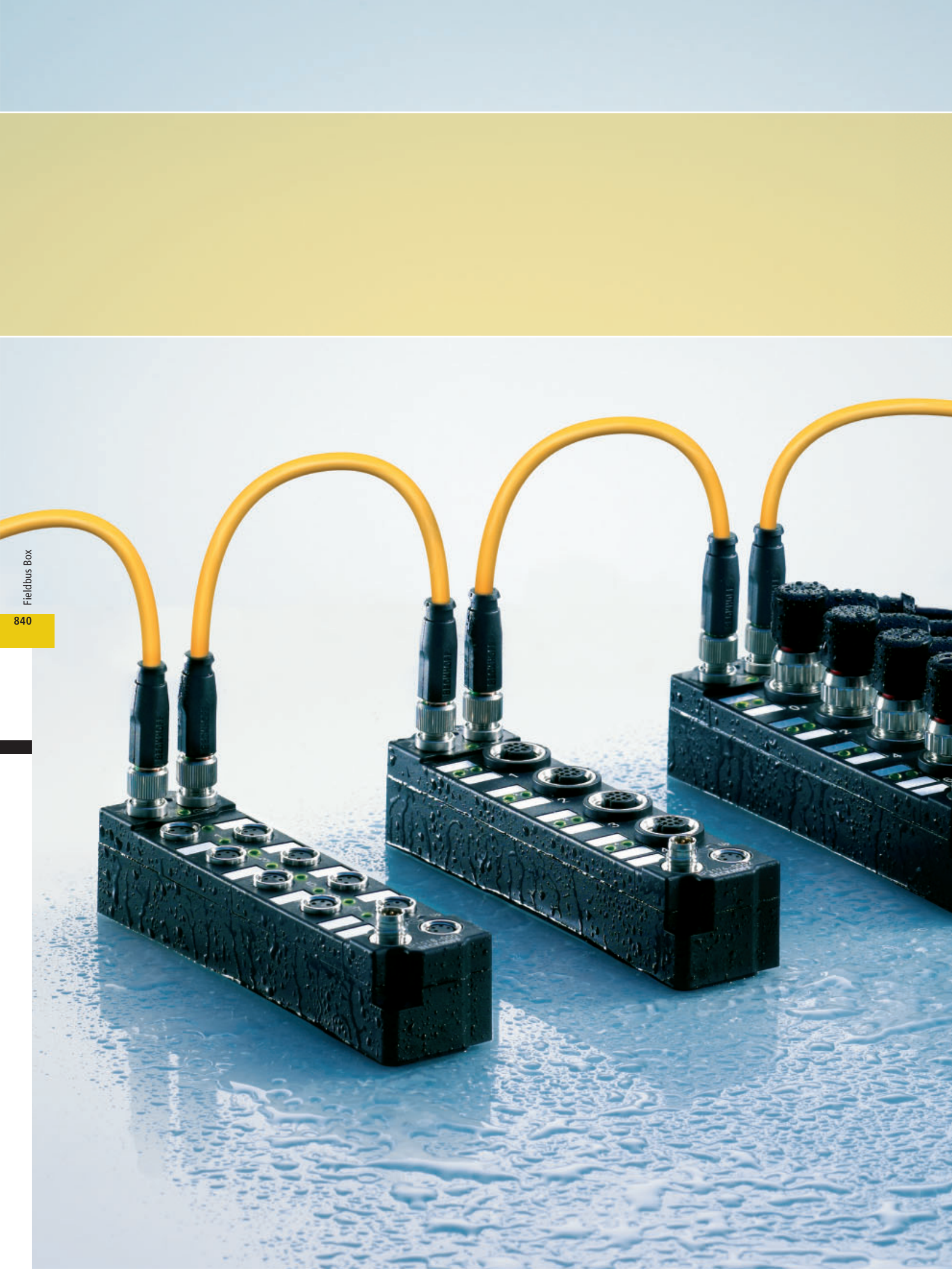
The demokit consists of:

- EK1100 EtherCAT Coupler
- 2 digital input terminals 24 V DC
- 2 digital output terminals 24 V DC
- Beckhoff product folder
- Beckhoff TwinCAT CD
- "TwinCAT Quickstart" documentation
- documentation describing the EK1100
- a 25 cm section of 35 mm mounting rail for fitting the terminal system
- TwinCAT PLC licence (only TC9910-B110)
- end cap
- Ethernet cable

Ordering information	Description
TC9910-B110	EtherCAT demokit, with TwinCAT PLC licence
TC9910-B111	EtherCAT, EK1100, EtherCAT Terminals (without PLC licence)

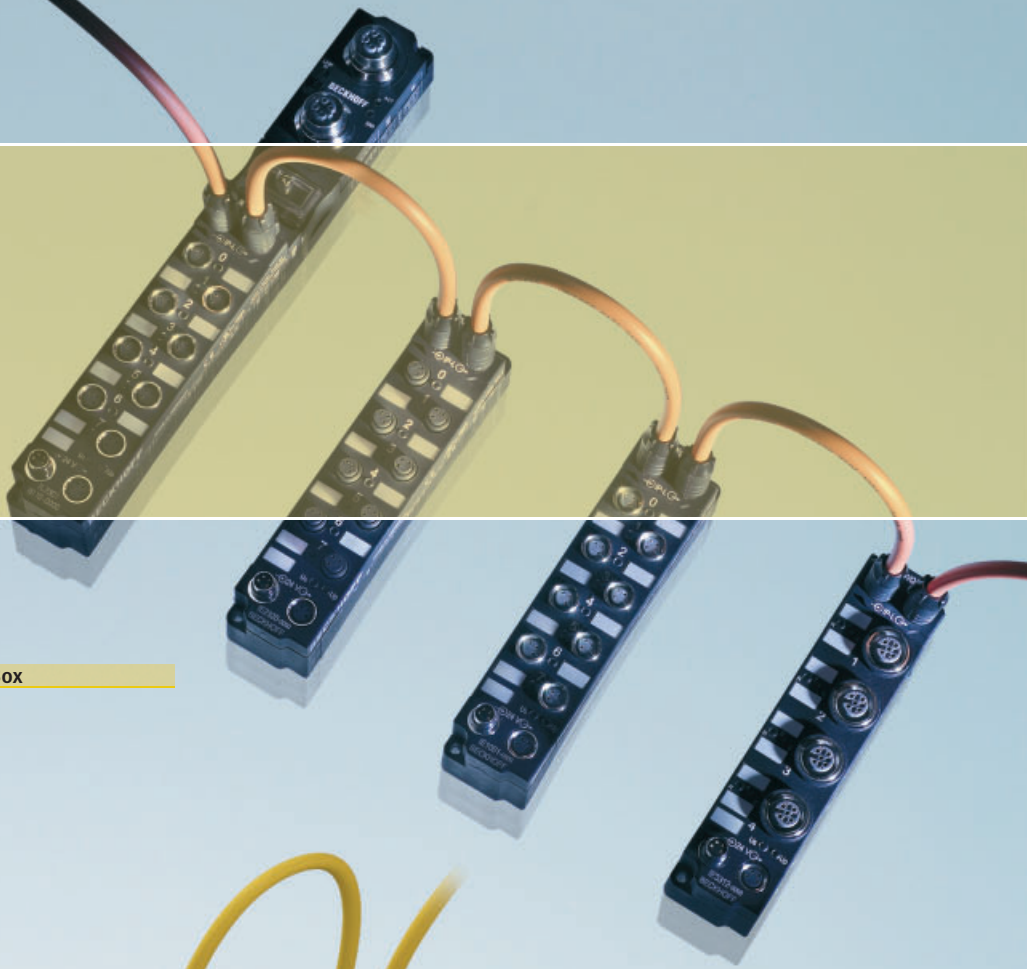




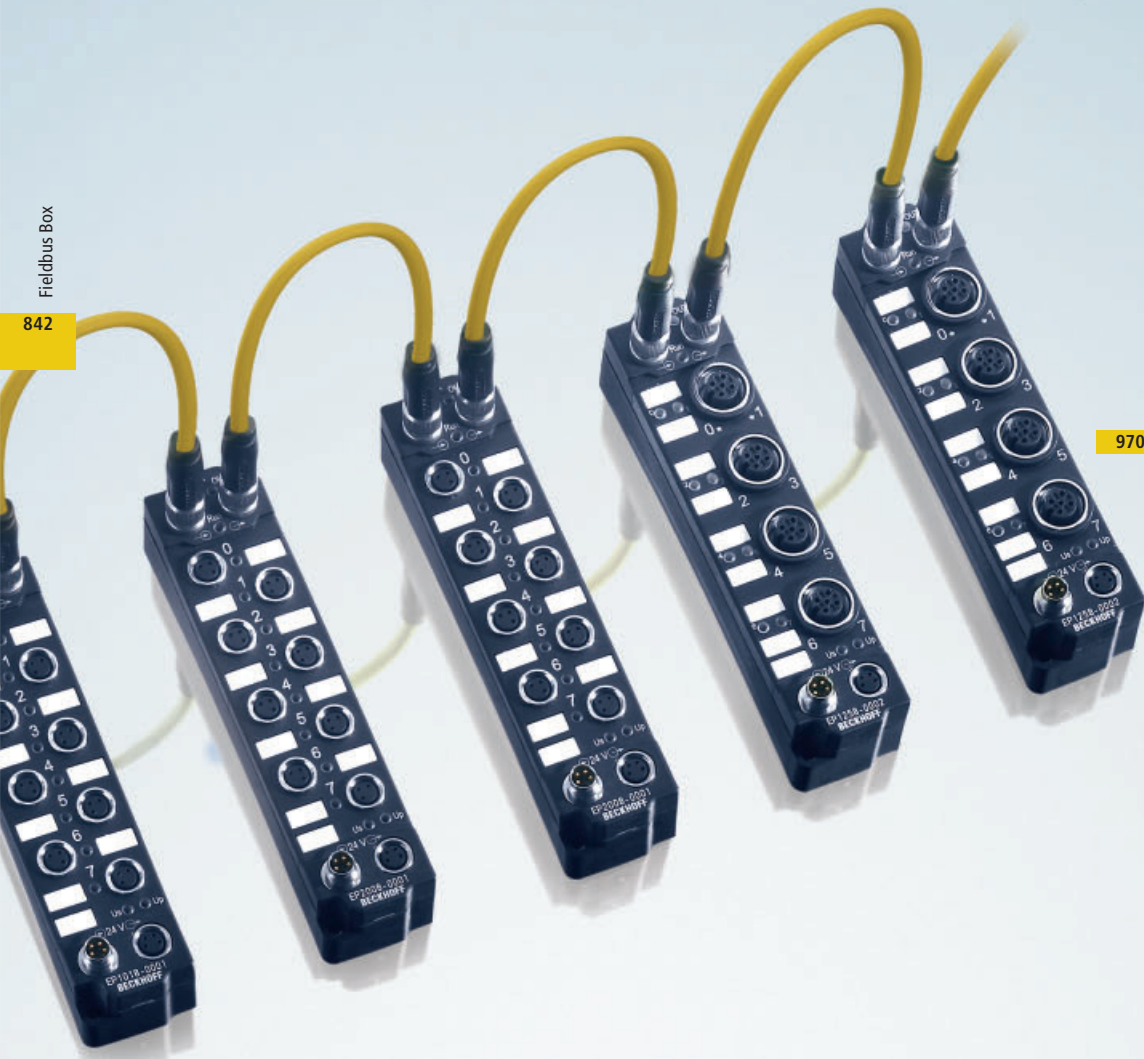


# Fieldbus Box

The compact IP 67 modules



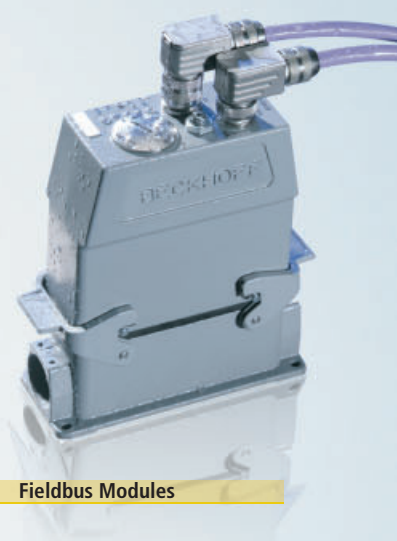
864 Fieldbus Box



Fieldbus Box

842

970 EtherCAT Box



1008 Fieldbus Modules

# Fieldbus Box

The watertight solution

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- 850 System description
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- 856 Features
- 862 Technical data

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- 870 Lightbus IPxxx-B200, IL230x-B200
- 874 PROFIBUS IPxxx-B31x, IL230x-B31x, IL230x-C31x
- 878 Interbus IPxxx-B400, IL230x-B400
- 882 CANopen IPxxx-B51x, IL230x-B51x
- 886 DeviceNet IPxxx-B52x, IL230x-B52x
- 890 Modbus IPxxx-B730, IL230x-B730
- 894 RS485/RS232 IPxxx-B8x0, IL230x-B8x0, IL230x-C810
- 902 Ethernet IL230x-B90x, IL230x-C900
- 906 PROFINET IL230x-B903
- 910 EtherNet/IP IL230x-B905

## 913 Signal types Compact Box

- 914 Digital input IP1xxx-Bxxx
- 916 Digital output IP2xxx-Bxxx
- 920 Digital combi IP23xx-Bxxx, IP24xx-Bxxx
- 924 Analog input IP3xxx-Bxxx
- 928 Analog output IP4xxx-Bxxx
- 930 Special functions IP5xxx-Bxxx, IP6xxx-Bxxx

## 936 Signal types Coupler Box

- 938 Digital combi IL230x-Bxxx

## 940 Signal types PLC Box

- 940 Digital combi IL230x-Cxxx

## 942 Signal types Extension Box

- 944 Digital input IE1xxx
- 946 Digital output IE2xxx
- 951 Digital combi IE23xx, IE24xx
- 956 Analog input IE3xxx
- 960 Analog output IE4xxx
- 962 Special functions IE5xxx, IE6xxx
- 967 Valve terminal with IP-Link interface

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## 970 EtherCAT Box

- 972 EtherCAT junction EP1122
- 973 Digital input EP1xxx
- 976 Digital output EP2xxx
- 979 Digital combi EP23xx
- 982 Analog input EP3xxx
- 985 Analog output EP4174
- 986 Special functions EP7041

## 987 Accessories

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### 1062 Software

- 1064 Configuration software KS2000
- 1146 Programming system TwinCAT

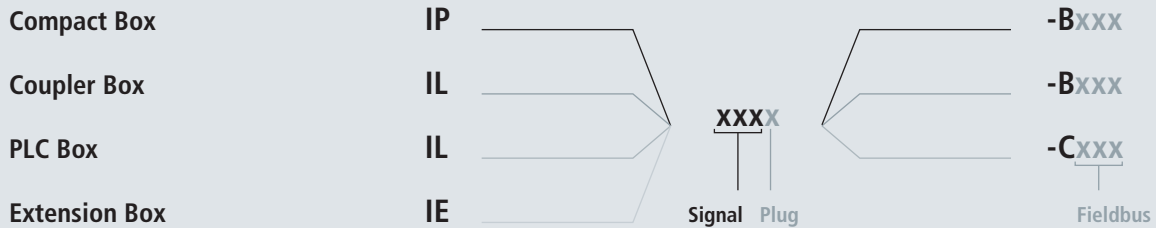
## 1008 Fieldbus Modules

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- 1010 Fieldbus Module, 12/32-channel thermocouple FM33xx-B310

# Product overview

## Fieldbus Box | 4 device classes, 12 fieldbuses, 24 signal types, 4 connection options



### The system is composed of 4 device classes:

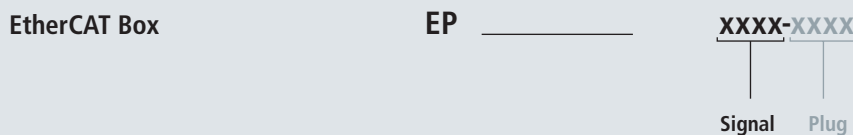
- **Compact Box:**  
rugged signal variety for almost any bus system (IPxxx-Bxxx)
- **Coupler Box:**  
bus module with IP-Link extension interface (IL230x-Bxxx)
- **PLC Box:**  
IEC 61131-3 intelligence in the smallest amount of space, with IP-Link (IL230x-Cxxx)
- **Extension Box:**  
for all signal types, connectable over IP-Link (IExxxx)

### 4 connection options (plugs):

- **0:** connector 8 mm, snap type, 3-pin
- **1:** connector M8, screw type, 3-pin
- **2:** connector M12, screw type, 5-pin
- **8:** D-sub



## EtherCAT Box | Fieldbus Box with direct EtherCAT interface









### The system is composed of:

- one device with direct EtherCAT interface, operation without additional Coupler Box.

### 4 connection options (plugs):

- **0001:** connector M8, screw type, 3-pin
- **0002:** connector M12, screw type, 5-pin
- **0008:** D-sub, 25-pin
- **0010:** D-sub, 9-pin

# Product overview Fieldbus Box

Fieldbus Box	Compact Box	Coupler Box	PLC Box
<b>Fieldbus</b>	<b>Fieldbus Box</b> without IP-Link interface	<b>Fieldbus Box</b> with IP-Link interface	<b>Controller IEC 61131-3</b> with IP-Link interface
<b>EtherCAT</b> 		IL230x-B110 <span style="float: right;">866</span>	
<b>LIGHTBUS</b>	IPxxxx-B200 <span style="float: right;">870</span>	IL230x-B200 <span style="float: right;">870</span>	
<b>PROFIBUS</b> 	IPxxxx-B310 <span style="float: right;">874</span>	IL230x-B310 <span style="float: right;">874</span>	IL230x-C310 <span style="float: right;">874</span>
	IPxxxx-B318 <span style="float: right;">874</span> with integrated tee-connector	IL230x-B318 <span style="float: right;">874</span> with integrated tee-connector	IL230x-C318 <span style="float: right;">874</span> with integrated tee-connector
<b>INTERBUS</b>  Certified No. 099	IPxxxx-B400 <span style="float: right;">878</span>	IL230x-B400 <span style="float: right;">878</span>	
<b>CANopen</b>	IPxxxx-B510 <span style="float: right;">882</span>	IL230x-B510 <span style="float: right;">882</span>	
	IPxxxx-B518 <span style="float: right;">882</span> with integrated tee-connector	IL230x-B518 <span style="float: right;">882</span> with integrated tee-connector	
<b>DeviceNet</b> 	IPxxxx-B520 <span style="float: right;">886</span>	IL230x-B520 <span style="float: right;">886</span>	
	IPxxxx-B528 <span style="float: right;">886</span> with integrated tee-connector	IL230x-B528 <span style="float: right;">886</span> with integrated tee-connector	
<b>Modbus</b>	IPxxxx-B730 <span style="float: right;">890</span>	IL230x-B730 <span style="float: right;">890</span>	
<b>RS485</b>	IPxxxx-B800 <span style="float: right;">894</span>	IL230x-B800 <span style="float: right;">894</span>	
<b>RS232</b>	IPxxxx-B810 <span style="float: right;">898</span>	IL230x-B810 <span style="float: right;">898</span>	IL230x-C810 <span style="float: right;">898</span>
<b>Ethernet TCP/IP</b>		IL230x-B900 <span style="float: right;">902</span>	IL230x-C900 <span style="float: right;">902</span>
		IL230x-B901 <span style="float: right;">902</span>	
<b>PROFINET</b> 		IL230x-B903 <span style="float: right;">906</span>	
<b>EtherNet/IP</b> 		IL230x-B905 <span style="float: right;">910</span>	

# Product overview Fieldbus Box

Fieldbus Box: Digital I/O					
Input		8 mm	M8	M12	
24 V DC	8-channel filter 3.0 ms	IP1000-Bxxx	IP1001-Bxxx	IP1002-Bxxx	914
		IE1000	IE1001	IE1002	944
	8-channel filter 0.2 ms	IP1010-Bxxx	IP1011-Bxxx	IP1012-Bxxx	914
		IE1010	IE1011	IE1012	944
Counter	2-channel up/down counter 24 V DC, 100 kHz			IP1502-Bxxx	915
				IE1502	945
Output		8 mm	M8	M12	
24 V DC	8-channel $I_{max} = 0.5 A$	IP2000-Bxxx	IP2001-Bxxx	IP2002-Bxxx	916
		IE2000	IE2001	IE2002	946
	8-channel $I_{max} = 2 A, \Sigma 4 A$	IP2020-Bxxx	IP2021-Bxxx	IP2022-Bxxx	917
		IE2020	IE2021	IE2022	947
	8-channel $I_{max} = 2 A, \Sigma 12 A$	IP2040-Bxxx	IP2041-Bxxx	IP2042-Bxxx	918
		IE2040	IE2041	IE2042	948
16-channel $I_{max} = 0.5 A, \Sigma 4 A$ , D-sub socket			IE2808	949	
			IE2808-0001	949	
PWM	2-channel PWM, 24 V DC, $I_{max} = 2.5 A$			IP2512-Bxxx	919
				IE2512	950
Combi		8 mm	M8	M12	
24 V DC	8-channel 4 input + 4 output filter 3.0 ms, $I_{max} = 0.5 A$	IP2300-Bxxx	IP2301-Bxxx	IP2302-Bxxx	920
		IL2300-Bxxx	IL2301-Bxxx	IL2302-Bxxx	938
		IL2300-Cxxx	IL2301-Cxxx	IL2302-Cxxx	940
		IE2300	IE2301	IE2302	951
	8-channel, 4 input + 4 output filter 0.2 ms, $I_{max} = 0.5 A$	IP2310-Bxxx	IP2311-Bxxx	IP2312-Bxxx	920
		IE2310	IE2311	IE2312	951
	8-channel, 4 input + 4 output filter 3.0 ms, $I_{max} = 2 A, \Sigma 4 A$	IP2320-Bxxx	IP2321-Bxxx	IP2322-Bxxx	921
		IE2320	IE2321	IE2322	952
	8-channel, 4 input + 4 output filter 0.2 ms, $I_{max} = 2 A, \Sigma 4 A$	IP2330-Bxxx	IP2331-Bxxx	IP2332-Bxxx	921
		IE2330	IE2331	IE2332	952
	16-channel, combi input/output filter 3.0 ms, $I_{max} = 0.5 A$	IP2400-Bxxx	IP2401-Bxxx		922
		IE2400	IE2401		953
	16-channel, combi input/output filter 3.0 ms, $I_{max} = 0.5 A$	IE2403			954
		(IP 20 connector)			

## Fieldbus Box: Analog I/O

Input		M12	
$\pm 10$ V	4-channel	IP3102-Bxxx	924
	differential input, 16 bit	IE3102	956
0/4...20m A	4-channel	IP3112-Bxxx	925
	differential input, 16 bit	IE3112	957
Resistance thermometer	4-channel	IP3202-Bxxx	926
	resistance thermometer (RTD), PT100, PT200, PT500, PT1000, Ni100, 16 bit	IE3202	958
Thermocouples	4-channel	IP3312-Bxxx	927
	thermocouple, type J, K, L, B, E, N, R, S, T, U, 16 bit	IE3312	959
Output		M12	
$\pm 10$ V	4-channel	IP4132-Bxxx	929
	16 bit	IE4132	961
0/4...20m A	4-channel	IP4112-Bxxx	928
	16 bit	IE4112	960

## Fieldbus Box: Special functions

Function	M12	M23	
Position measurement	1-channel	IP5009-Bxxx	930
	SSI encoder interface	IE5009	962
	1-channel	IP5109-Bxxx	931
	incremental encoder interface, 1 MHz	IE5109	963
	1-channel	IP5209-Bxxx (1 V <sub>SS</sub> )	932
	SinCos encoder interface	IP5209-Bxxx-1000 (11 $\mu$ A <sub>SS</sub> )	
Communication	1-channel	IP6002-Bxxx	933
	serial interface, RS232	IE6002	964
	1-channel	IP6012-Bxxx	934
	serial interface, 0 ... 20 mA (TTY)	IE6012	965
	1-channel	IP6022-Bxxx	935
	serial interface, RS422/RS485	IE6022	966
Valve terminal	16-channel	CPV10-VI-IP-8*	967
	16-channel	CPV14-VI-IP-8*	967
	16-channel	EX250*	968

\* The CPV1x-VI-IP-8 valve terminals can be ordered only from Festo AG & Co. ([www.festo.com](http://www.festo.com)); the EX250 valve terminals can be ordered only from SMC ([www.smceu.com](http://www.smceu.com)).



# Product overview EtherCAT Box

EtherCAT Box: Infrastructure				
EtherCAT		M8	M12	
EtherCAT junction	2-channel	EP1122-0001		972
	EtherCAT junction			

EtherCAT Box: Digital I/O				
Input		M8	M12	
24 V DC	8-channel filter 3.0 ms	EP1008-0001	EP1008-0002	973
	8-channel filter 10 $\mu$ s	EP1018-0001	EP1018-0002	973
	8-channel 2-channel time stamp	EP1258-0001	EP1258-0002	975
	16-channel filter 10 $\mu$ s, D-sub socket, 25-pin			EP1816-0008 974

Output		M8	M12	
24 V DC	8-channel, $I_{max} = 0.5$ A	EP2008-0001	EP2008-0002	976
	8-channel, $I_{max} = 2$ A, $\Sigma$ 4 A	EP2028-0001	EP2028-0002	977
	16-channel, $I_{max} = 0.5$ A, $\Sigma$ 4 A, D-sub socket, 25-pin			EP2816-0008 978
	16-channel, $I_{max} = 0.5$ A, $\Sigma$ 4 A, 2 x D-sub socket, 9-pin			EP2816-0010 978

Combi		M8	M12	
24 V DC	8-channel, 4 input + 4 output, filter 3.0 ms, $I_{max} = 0.5$ A	EP2308-0001	EP2308-0002	979
	8-channel, 4 input + 4 output, filter 10 $\mu$ s, $I_{max} = 0.5$ A	EP2318-0001	EP2318-0002	979
	8-channel, 8 input/output, freely configurable, filter 10 $\mu$ s, $I_{max} = 0.5$ A	EP2338-0001	EP2338-0002	981
	16-channel, 8 input + 8 output, filter 10 $\mu$ s, $I_{max} = 0.5$ A, D-sub socket, 25-pin			EP2316-0008 980

## EtherCAT Box: Analog I/O

### Input

M12

$\pm 10\text{ V}, 0/4 \dots 20\text{ mA}$

4-channel

parameterisable, differential input, 16 bit

EP3174-0002

982

Resistance thermometer

4-channel

resistance thermometer (RTD), PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000, 16 bit

EP3204-0002

983

Thermocouples

4-channel

thermocouple, type J, K, L, B, E, N, R, S, T, U, 16 bit

EP3314-0002

984

### Output

M12

$\pm 10\text{ V}, 0/4 \dots 20\text{ mA}$

4-channel

parameterisable, 16 bit

EP4174-0002

985

## EtherCAT Box: Special functions

### Function

M12

Motion

Stepper motor module

50 V DC, 5 A, incremental encoder, 2 digital inputs, 1 digital output

EP7041-0002

986

# The Fieldbus Box

**The Beckhoff Fieldbus Box system is the culmination of the fieldbus concept:**

## Robust

Robust construction allows fieldbus modules to be fitted directly to machines. Control cabinets and terminal boxes are now no longer required.

## Sealed

The modules meet the protection class IP 65, IP 66 and IP 67, are fully casted and thus ideally prepared for use in wet, dirty and dusty working environments.

## Small

The modules are extremely small and are thus suitable for use in applications where there is very little space available. The low weight of the Fieldbus Box modules makes them useful in applications where the I/O interface is in motion (e.g. on a robot arm).

## Open

All the most important fieldbus systems are supported. This substantially frees electrical design from the particular bus system in use. Fast, flexible reactions to customers' requirements are possible. The Fieldbus Box modules are, of course, certified by the respective fieldbus user organisations, and can be combined with Beckhoff Bus Terminals and with devices from third-party manufacturers.

## Modular

Conventional fieldbuses such as PROFIBUS or CANopen are connected via Coupler Box modules. These are modularly extendable through cost-effective extension modules. The EtherCAT Box modules communicate directly with EtherCAT and require no additional Coupler Box.

## Quickly wired

The wiring of the fieldbus and of signals is significantly simplified through the use of pre-assembled cables. Wiring errors are minimised and the system setup is finished quickly.

## Flexible

In addition to the pre-assembled cables, field wireable connectors and cables are also available for maximum flexibility.

## Economical

Combined I/O modules and fine signal granularity lead to low system costs – you only have to buy what you really need.

## Complete

The wide variety of signal types allows the connection of almost any kind of sensor. The communication modules enable decentralised connection of, e.g., label printers, identification systems or special equipment. The Fieldbus Box range also includes encoder interfaces for displacement and angle measurement. Stepper Motor Box modules are also available.

## Fitting

Sensors and actuators are connected through 8 mm diameter snap type or through screw type connectors (M8 or M12). The snap type connectors lock in place positively, forming a vibrationproof connection, while the screw type connectors offer the advantage of high resistance to being pulled out.

## Compatible

The Fieldbus Box devices behave very much like the Beckhoff Bus Terminals – this means that the ideal distributed peripheral device can be used, whatever the particular application.

## Ultra high-speed

In the EtherCAT Box version the box modules have a direct EtherCAT port. Virtually all sensors and actuators can be connected to the control system directly via the 100BASE-TX. XFC boxes are available for additional requirements, e.g. time stamp inputs.

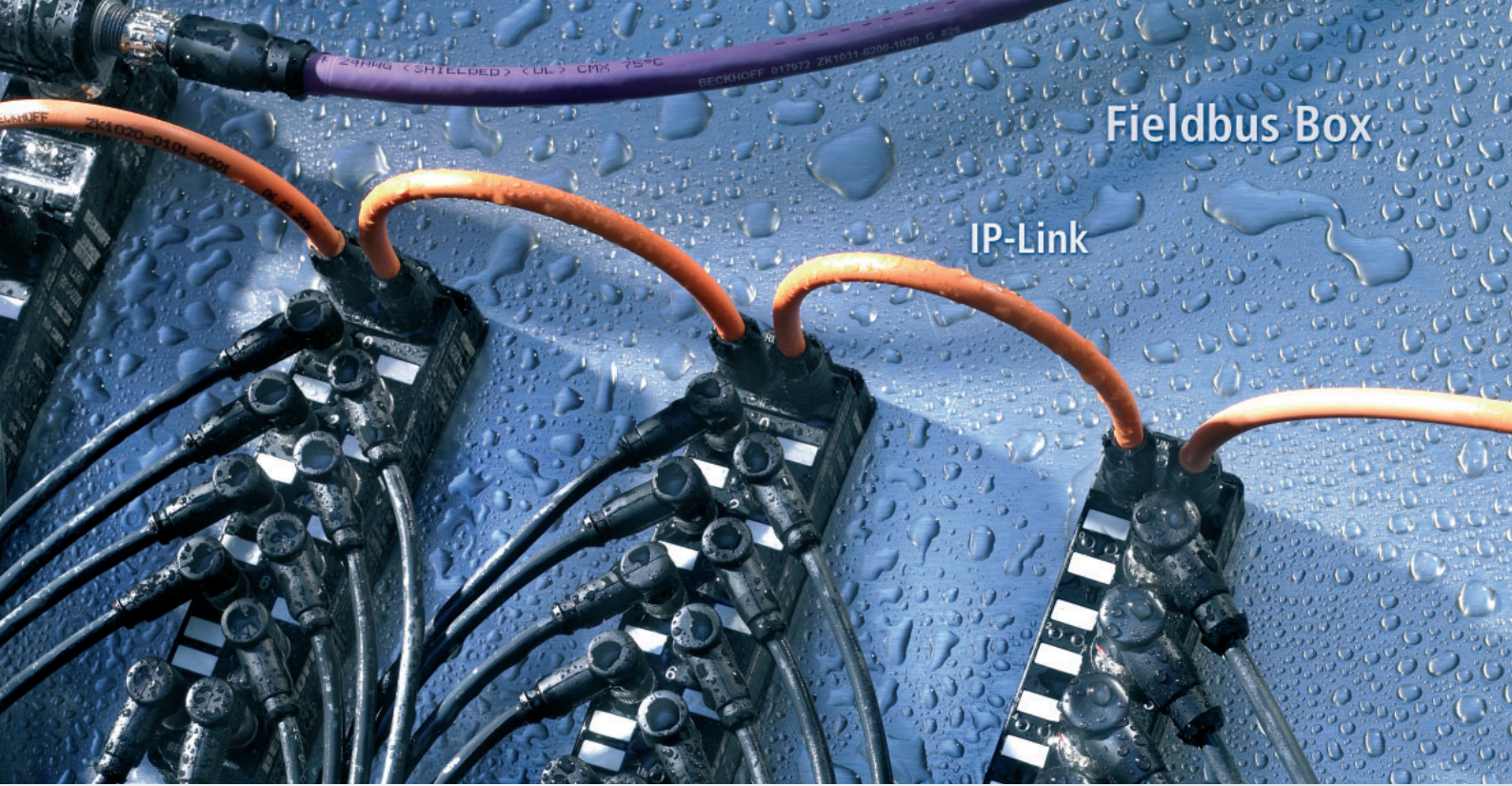


## EtherCAT Box



Fieldbus Box

IP-Link



EtherCAT



Fieldbus Box

851



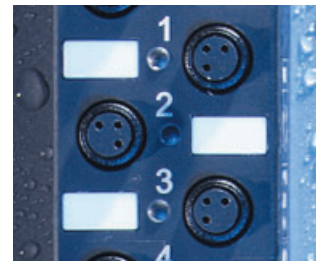
## Fieldbus Box – Compact Box

Compact Box modules are robust fieldbus stations for 12 different fieldbus systems. They offer a wide range of I/O functionality. All relevant industrial signals are supported. In addition to digital and analog inputs and outputs including thermocouple and RTD inputs, there are also incremental encoder interfaces available for displacement and angle measurement in addition to serial interfaces to solve a large number of communication tasks. The digital inputs and outputs can be connected with snap type 8 mm diameter plugs, screw type M8 connectors, or with screw type M12 pendants. The M12 version is provided for analog signals.

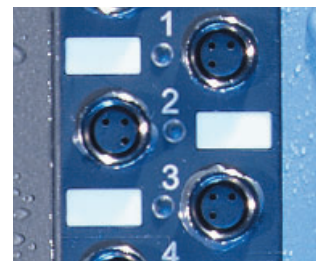
Special input and output channels on the combination I/O modules can be used for either input or output. It is not necessary to configure them, since the fieldbus provides both input and output data for each combination channel. The combination modules give the user all of the advantages of fine signal granularity.

The processor logic, the input circuitry and the sensor power supply are fed from the box supply voltage, the auxiliary power for the outputs can be routed separately. In this way it is possible to achieve cascadable emergency off concepts. In Fieldbus Box modules in which only inputs are available the auxiliary power supply  $U_P$  can optionally be connected in order to pass it on downstream.

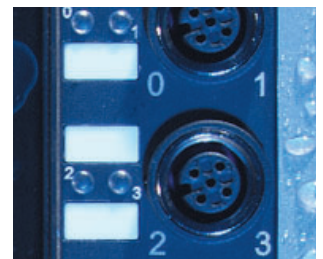
The state of the fieldbus connection, the module status, the status of the power supply and of the signals is indicated by LEDs. The label strips can be machine printed elsewhere and then inserted.



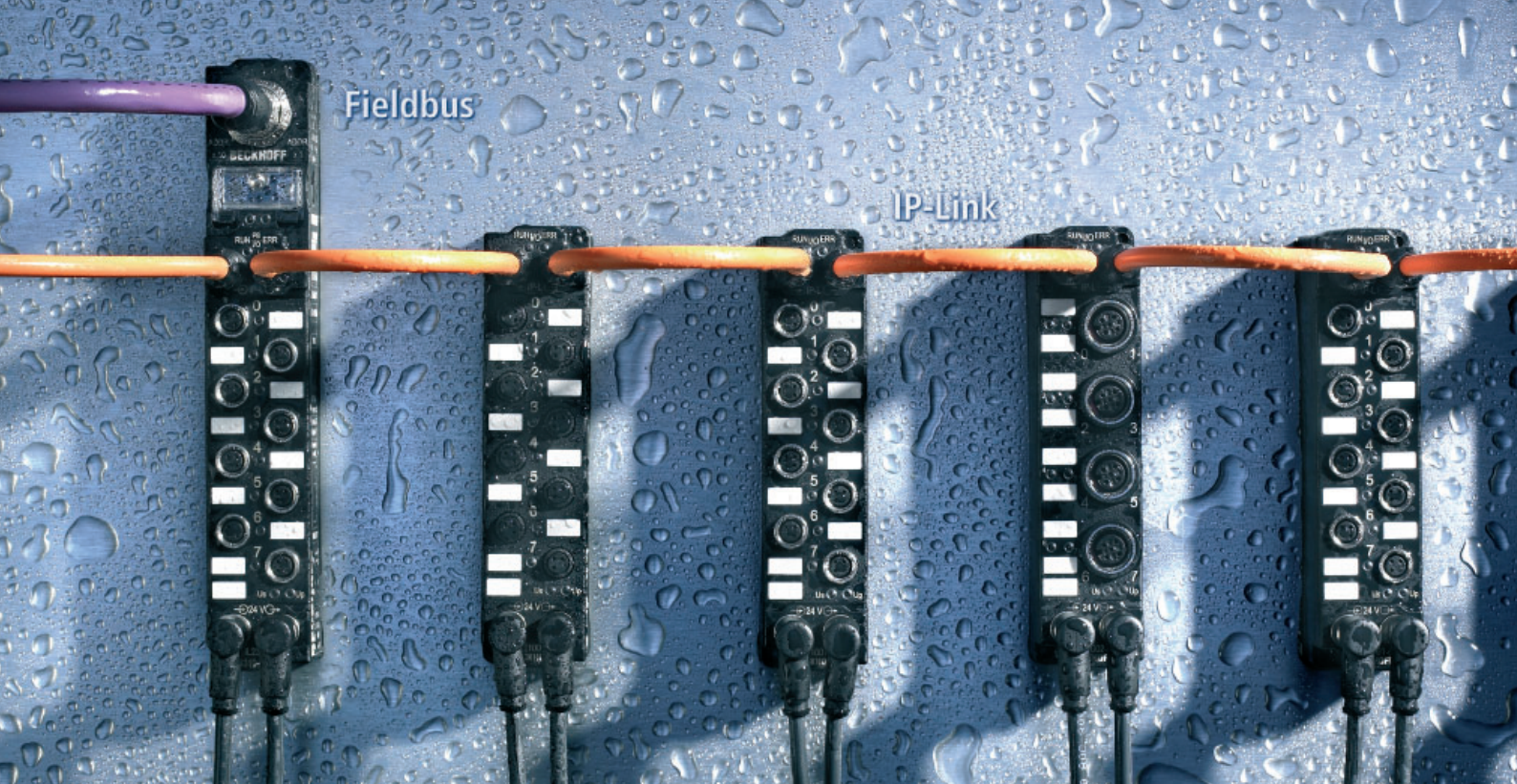
I/O connection for 8 mm connector, snap type, 3-pin



I/O connection for M8 connector, screw type, 3-pin



I/O connection for M12 connector, screw type, 5-pin



## Fieldbus Box – Coupler Box

In addition to Compact Box modules, the Fieldbus Box series includes other extendable units: the Coupler Box and all the extension modules. The Fieldbus Coupler Box gathers the I/O data from the extension modules over the interference-free IP-Link fibre optic cable. IP-Link is a fibre optic communication link with a transmission rate of 2 Mbits/s which is capable of transmitting 1,000 items of binary I/O data in approx. 1 ms, rapidly and securely. Smaller configurations are correspondingly faster. Because of the high usable data rate, the IP-Link coupling does not reduce the performance of the fieldbus at all.

The extension modules can be spaced up to 15 metres apart, and 120 can be connected to one Coupler Box. The Coupler Box modules are capable of automatically recognising the extension modules connected to them during start-up, and map the I/O data automatically into the fieldbus process image – it is not necessary to configure them. The coupler appears, from the fieldbus point of view, along with all of the networked extension modules, as a single participating bus device with a corresponding number of I/O signals.

The Coupler Box corresponds to the Bus Coupler in the Beckhoff Bus Terminal system. Beckhoff fieldbus devices with protection class IP 20 (Bus Terminals) and IP 67 (Fieldbus Box) can be combined without

difficulty – the data is handled in the same way in either case.

Low-priced plug connectors with protection class IP 67 can be used for the rapid and simple preparation of the IP-Link fibre optic cable. The connection does not require special tools and can be performed quickly and simply. The IP-Link cables can also be obtained with prepared plugs if required.

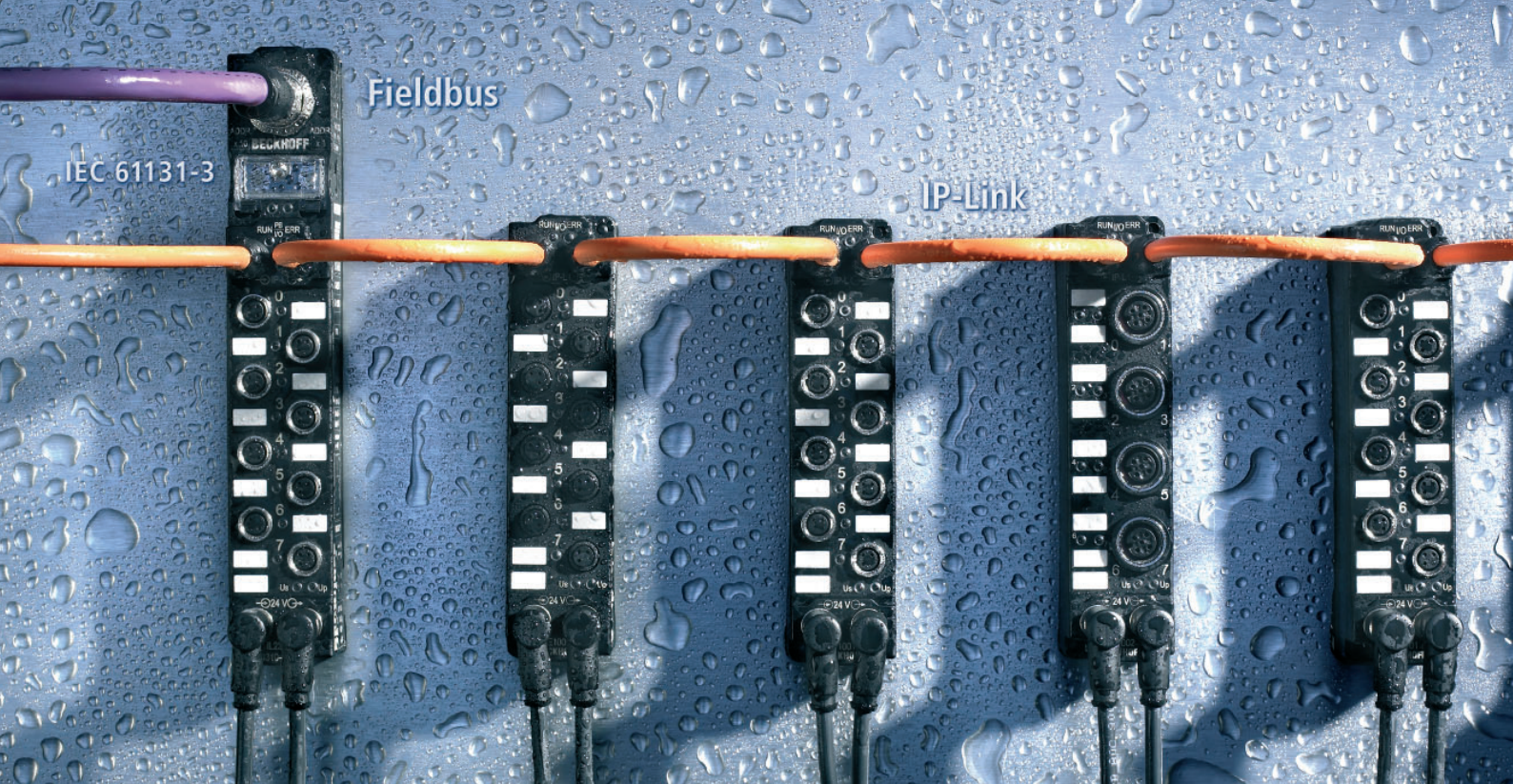
The separate supply of the auxiliary voltage allows output groups to be switched off individually. Differing potentials can also be created within an extension ring without difficulty, since the IP-Link naturally has optimum potential separation.



IP-Link interface on the Coupler Box for the connection of up to 120 extension modules



IP-Link interface on the Extension Box for communication with the fieldbus coupler



## Fieldbus Box – PLC Box

The Beckhoff Fieldbus Box with PLC functionality is an intelligent fieldbus module for the decentralised pre-processing of I/O signals. This is a way of removing parts of the application out of the central control system to relieve the CPU and the fieldbus. Decentralised counting, control or switching are typical applications for the Fieldbus Box with integrated small controller. The reaction times are independent of the bus communication and of the supervising controller. In the event of a bus or controller failure, maintenance of function (e.g. bringing the process to a safe state in an orderly manner) is possible.

Almost unlimited I/O application possibilities result from the extendable Coupler Box with PLC functionality and IP-Link. Up to 120 extension modules, with 960 I/Os, can be directly addressed from the PLC program. The programmable PLC Box modules are therefore particularly suitable as autonomous small PLCs for the control of parts of a plant or of small machines.

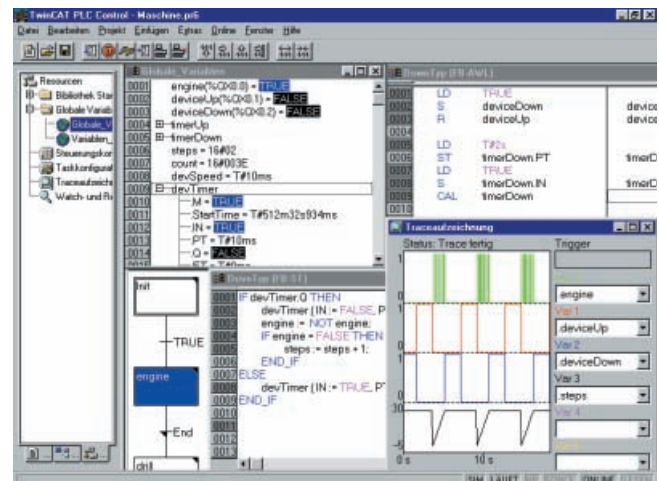
Programming is carried out with TwinCAT in accordance with IEC 61131-3, using the same programming environment as for the TwinCAT PC control system. Five different manufacturer independent programming languages are available: Instruction List (IL), Function Block Diagram (FBD), Ladder Diagram (LD), Sequential Function Chart (SFC) and the high-level language Structured Text

(ST). The program download occurs either via the fieldbus or via the programming interface. Extensive debugging functions (breakpoint, single step, monitoring, etc.) are also available.

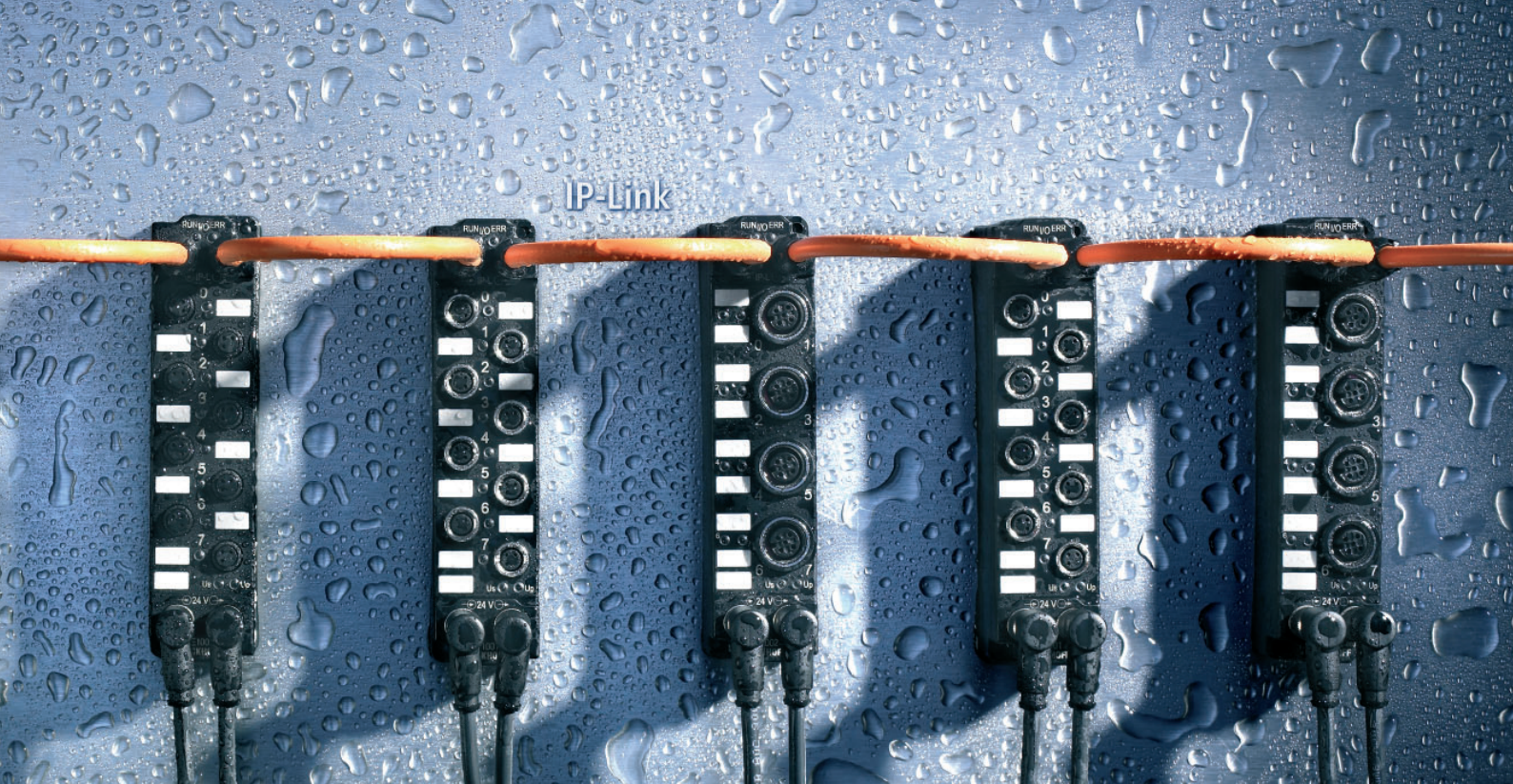
The Fieldbus Box series with PLC functionality uses a powerful 16 bit controller, 32/96 kbyte program memory and 32/64 kbyte data memory. A further 512 bytes of non-volatile memory are available for remanent flags.



Programming interface under hinged inspection window



IEC 61131-3 TwinCAT programming environment

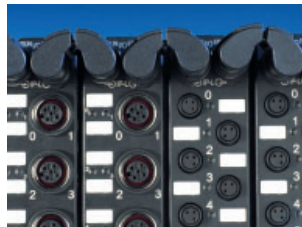


## Fieldbus Box – Extension Box

The Extension Box modules cover the full spectrum of I/O signals: digital inputs with different filters, digital outputs with 0.5 and 2 A output currents, analog inputs and outputs with a 16 bit resolution, thermocoupler and RTD inputs, serial interfaces and encoder inputs.

Similarly to the Compact Box modules, the digital inputs and outputs can be connected either through 8 mm snap type connectors or screw type connectors (M8 and M12). Analog signal types are provided with the M12 version. The snap type connectors lock in place positively, forming a vibration-proof connection, while the screw type connectors offer the advantage of high resistance to being pulled out.

The extension modules are connected to the process level via the fieldbus coupler. Up to 120 extension modules can be connected at distances of 15 m from box to box via the IP-Link communication connection.



IP-Link jumper



Connection version with straight 8 mm snap type connector



Connection version with angled M8 screw type connector



Connection version with straight M8 screw type connector



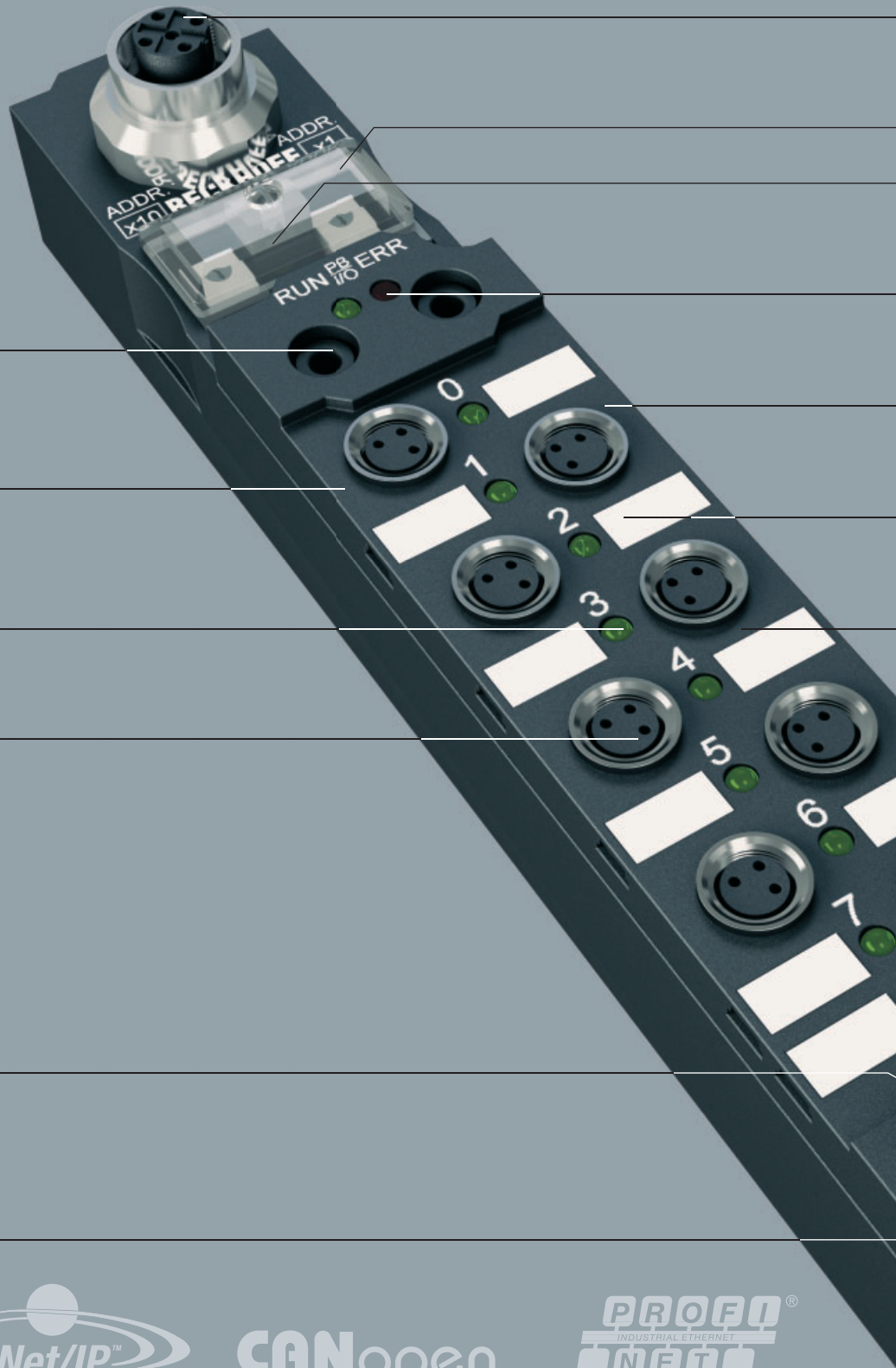
Connection version with angled M12 screw type connector



Connection version with straight M12 screw type connector



# Fieldbus Box features



IP-Link interface on the Coupler Box and PLC Box for the connection of extension modules

Watertight and dust-proof, due to protection class IP65/66/67 (fully protected)

Signal status display

Connection of sensors/actuators via connector:

- 8 mm, snap type
- M8, screw type
- M12, screw type

Power supply input

- box supply
- auxiliary voltage

Mounting holes

Modbus

EtherNet/IP™

CANopen

PROFIBUS  
INDUSTRIAL ETHERNET  
NET

INTERBUS  
Certified! No.099

PROFIBUS  
PROCESS FIELD BUS

LIGHTBUS

RS 232  
↔  
RS 485



Fieldbus interface  
(connection depends on  
the particular fieldbus)

Hinged inspection window

Address selection switch  
and diagnostic interface

Fieldbus status display  
Module or IP-Link  
status display

Robust housing for  
industrial application

Standard labels

Ultra compact dimensions  
175 x 30 x 26.5 mm (H x W x D)

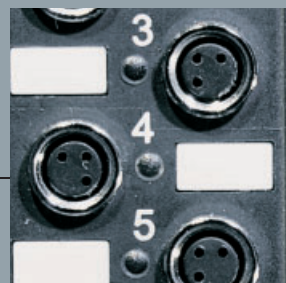
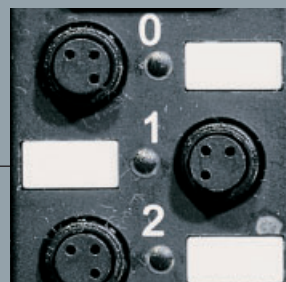
Power supply status display:  
box supply and auxiliary  
voltage

Power supply downstream  
connection

8 mm snap type connector

M8 screw type connector

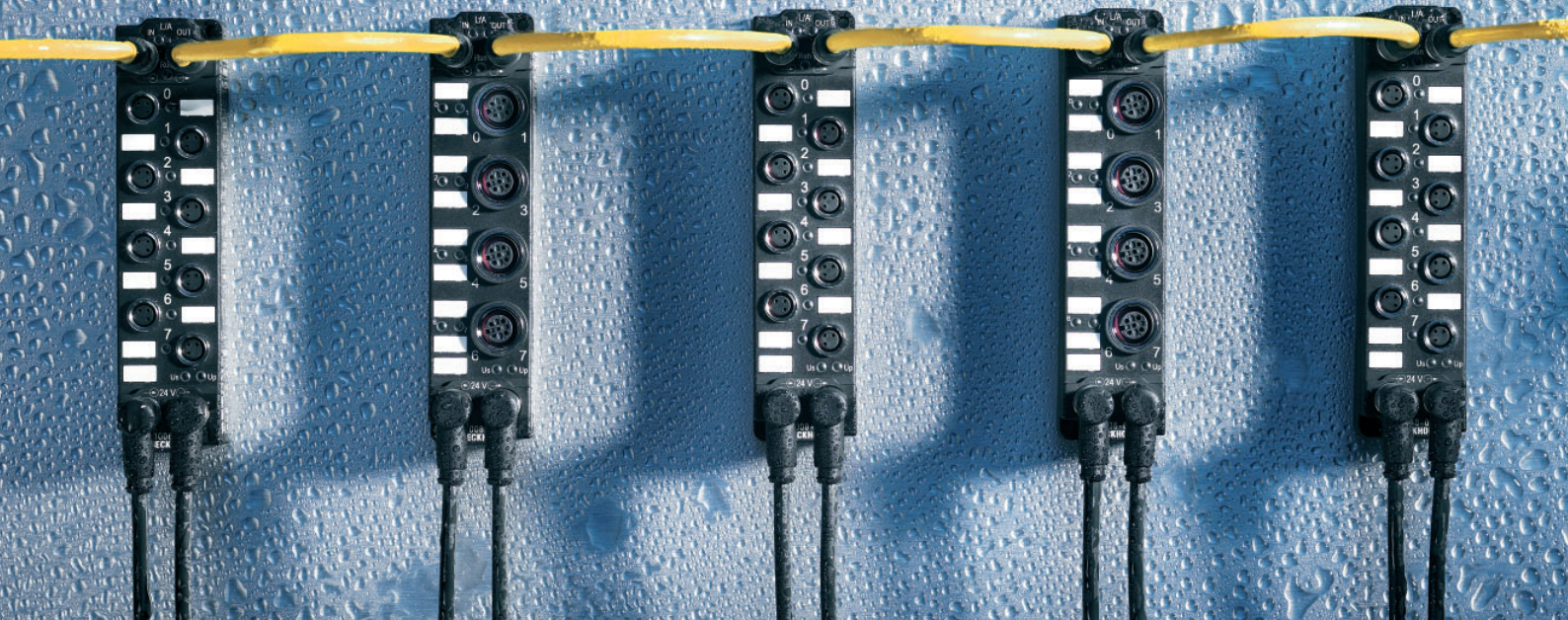
M12 screw type connector



Ethernet TCP/IP

EtherCAT

DeviceNet



## EtherCAT Box – Water- and dust-proof EtherCAT I/Os

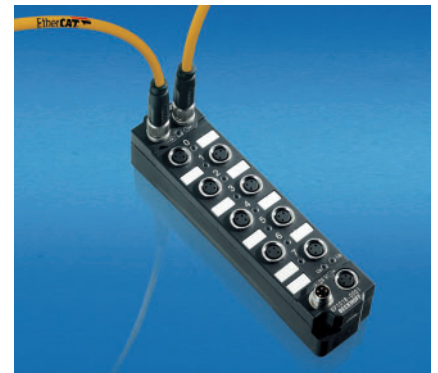
The EtherCAT Box modules in protection class IP 67 extend the Beckhoff Fieldbus Box system. Through the integrated EtherCAT interface the modules can be connected directly to an EtherCAT network without an additional Coupler Box. The high EtherCAT performance is therefore maintained right down to each IP 67 box. Each box is a 100 % EtherCAT device and a self-contained EtherCAT slave, which can be connected directly to any other EtherCAT device via an Ethernet cable with 100BASE-TX.

With dimensions of only 126 x 30 x 26.5 mm (H x W x D) – the same as the Extension Box modules – the modules are exceptionally small and are therefore particularly suitable for applications where space is tight. Typical application areas include handling and assembly as well as the packaging and the semiconductor industry. The low weight of the EtherCAT modules facilitates applications with mobile I/O interface (e.g. on a robot arm). The EtherCAT connection is established via screened M8 screw connectors. The EtherCAT modules can be connected over distances of up to 100 m

using standard Industrial Ethernet cables. In addition, Beckhoff offers a range of Ethernet and EtherCAT cables and sensor/actuator cables and connectors that are optimised for industrial applications.

The robust design of the EtherCAT Box modules enables them to be used directly at the machine. Control cabinets and terminal boxes are now no longer required. The modules are fully sealed and therefore ideally prepared for wet, dirty or dusty conditions. Pre-assembled cables significantly simplify EtherCAT and signal wiring. Commissioning is optimised. In addition to pre-assembled EtherCAT, power and sensor cables, field-configurable connectors and cables are available for maximum flexibility. Depending on the application, the sensors and actuators are connected via M8 or M12 screw-type connectors or D-sub plugs.

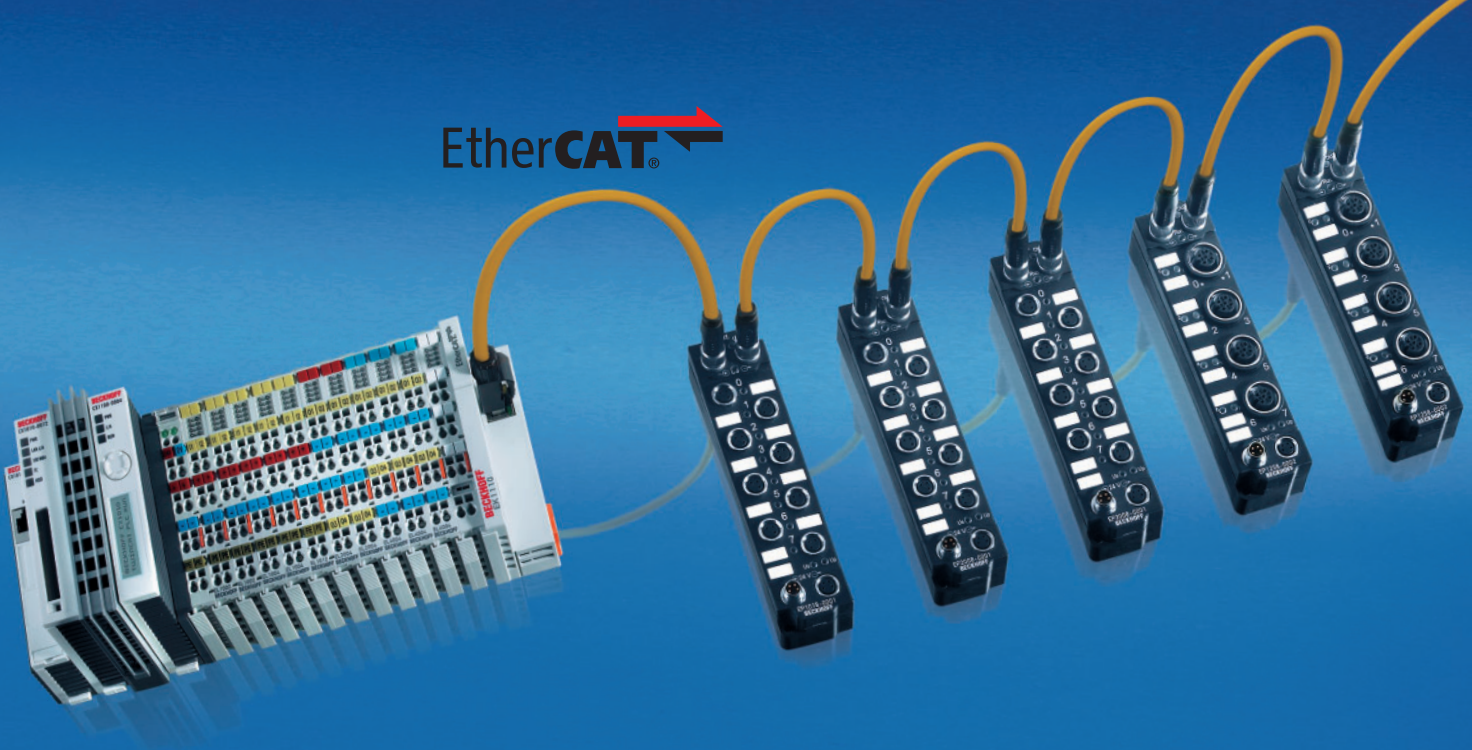
The EtherCAT modules cover the typical range of requirements for IP 67 I/O signals: digital inputs with different filters (3.0 ms or 10 µs), digital outputs with 0.5 and 2 A output current, combination modules with freely selectable inputs or outputs, analog



EtherCAT Box with M8 connectors



EtherCAT Box with M12 connectors



inputs and outputs with 16-bit resolution, thermocouple and RTD inputs, and stepper motor modules. XFC (eXtreme Fast Control Technology) modules, including inputs with time stamp, are also available. The availability of XFC EtherCAT Box modules enables a wide range of new applications that were not possible in the past with an IP 67 module.



Connection version with angled M8 screw type connector



Connection version with straight M8 screw type connector



Connection version with angled M12 screw type connector



Connection version with straight M12 screw type connector

# EtherCAT Box features



EtherCAT input and output

Watertight and dust-proof,  
due to protection class  
IP65/66/67 (fully potted)

Signal status display

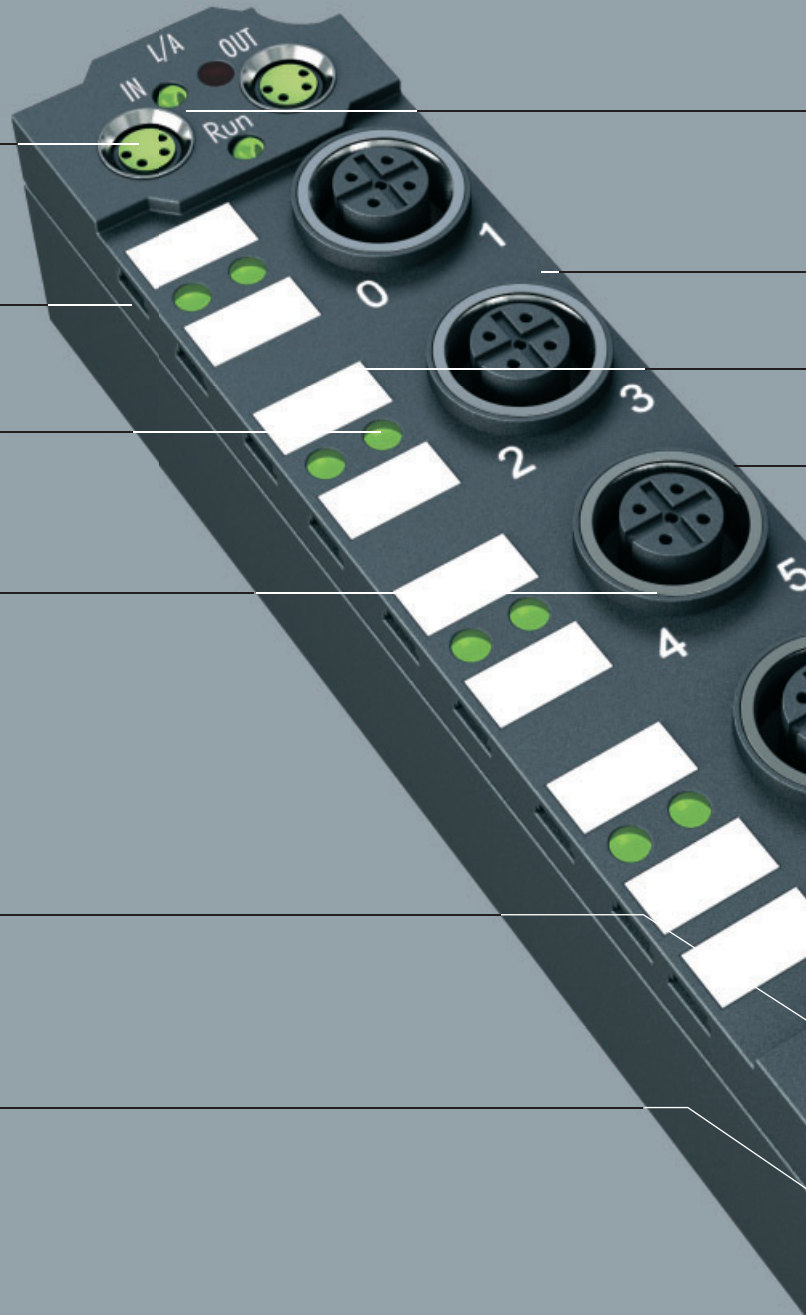
Connection of sensors/  
actuators via connector:

- M8, screw type
- M12, screw type

Power supply input

- box supply
- auxiliary voltage

Mounting holes





EtherCAT signal input

EtherCAT signal output

Status display

Robust housing for industrial application

Standard labels

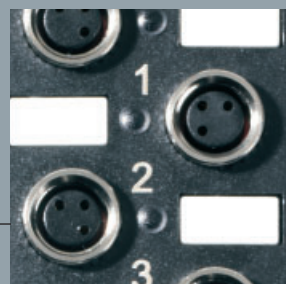
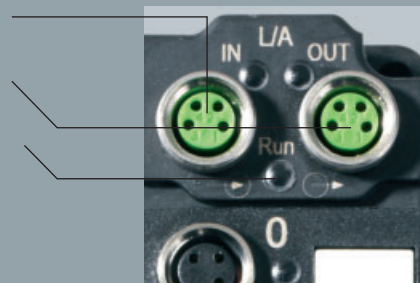
Ultra compact dimensions  
126 x 30 x 26.5 mm (H x W x D)

Power supply status display:  
box supply and auxiliary  
voltage

Power supply downstream  
connection

M8 screw type connector

M12 screw type connector



# Technical data

## Compact Box, Coupler Box, PLC Box



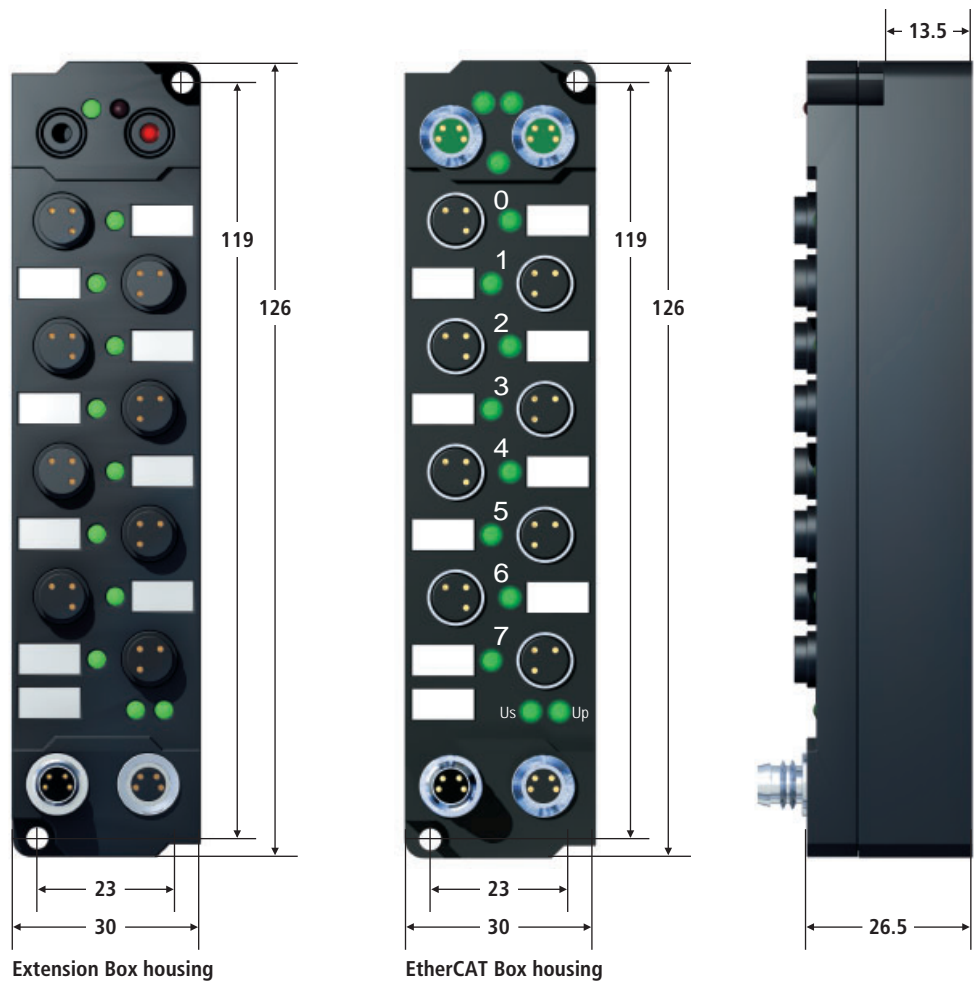
Standard housing

XXL housing

Technical data	Standard housing	XXL housing
Dimensions (W x H x D)	30 mm x 175 mm x 26.5 mm	30 mm x 210 mm x 26.5 mm
Weight	depending on device	
Material	PA6 (polyamide)	
Installation	2 fixing holes 3 mm diameter for M3	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Approval	UL E172151, CE	
Power feed through	I <sub>MAX</sub> = 4 A	

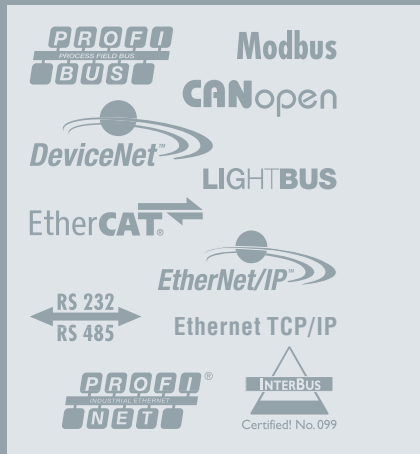
# Technical data

## Extension Box, EtherCAT Box



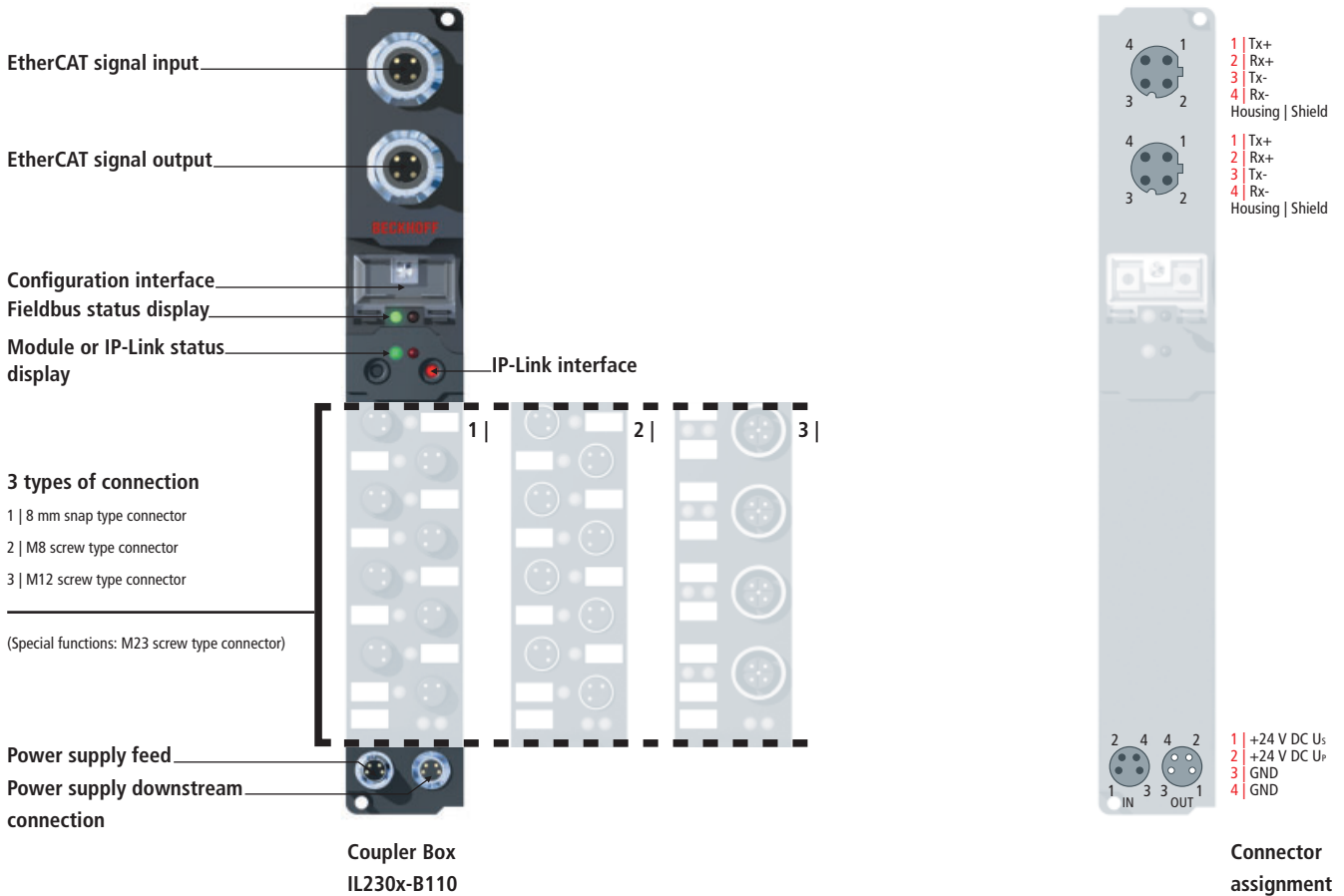
Technical data	Extension Box housing, EtherCAT Box housing
Dimensions (W x H x D)	30 mm x 126 mm x 26.5 mm
Weight	depending on device (typ. 125 g)
Material	PA6 (polyamide)
Installation	2 fixing holes 3 mm diameter for M3
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Approval	UL E172151 (partly in preparation), CE
Power feed through	$I_{MAX} = 4 \text{ A}$





# Fieldbus Box | Fieldbus systems





## IL230x-B110 | Fieldbus Box modules for EtherCAT



EtherCAT (Ethernet Control Automation Technology) is the Ethernet solution for industrial automation, characterised by outstanding performance and particularly simple handling. EtherCAT enables the Ethernet star topology to be replaced with a simple line structure. Optionally, EtherCAT can also be wired in the "classic" way using switches in order to integrate further Ethernet devices. The master requires no special plug-in card and can be implemented on any existing Ethernet controller using a very simple interface. EtherCAT is therefore also well suited for small and medium control applications, where it will open up new areas of application for distributed I/Os.

The IL230x-B110 Coupler Box extends EtherCAT for the IP 67 range. All Extension Box modules from the proven Beckhoff Fieldbus Box range can be connected via IP-Link. A station consists of an IL230x-B110 Coupler Box and any number of Extension Box modules (up to 120).

The Coupler Box detects the connected modules and automatically generates the allocation into the process image of the EtherCAT system. The upper EtherCAT interface is used to connect the Fieldbus Box to the network, the lower M12 socket can be used to connect further EtherCAT devices to the same strand. In the EtherCAT network, the IL230x-B110 Coupler Box can be installed anywhere in the

Ethernet signal transfer section (100BASE-TX) – except directly at the switch.

### Diagnostics

The extensive diagnostic functions of the Beckhoff devices allow rapid fault localisation. Diagnostic messages are transmitted via EtherCAT and collected by the master. LEDs on the module indicate the status of the network connection, the device status, the status of the inputs and outputs and of the power supply.

## Coupler Box

The EtherCAT Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link optical fibre cable. It detects the connected modules and automatically allocates the input and output data to the process image. The Coupler Box has four digital inputs and four digital outputs; all other signal types are available in the form of an Extension Box.

System data	EtherCAT   IL230x-B110
Number of I/O stations	65,535
Number of I/O points	depending on controller
Data transfer medium	Ethernet/EtherCAT CAT5 cable
Distance between stations	100 m (master/box, box/box)
Data transfer rates	100 Mbaud
Topology	line topology

Technical data	IL230x-B110
Extension modules	max. 78 with max. 512 byte input and 512 byte output data
Digital peripheral signals	max. 624 inputs and 624 outputs
Analog peripheral signals	max. 127 inputs and 127 outputs
Protocol	EtherCAT
Configuration possibility	via KS2000
Bus interface	2 x M12 socket, 4-pin (d-coded)
Power supply	control voltage: 24 V DC (-15 %/+20 %); load voltage: according to I/O type
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Box supply current	30 mA + current consumption of sensors, max. 0.5 A
Auxiliary power current	according to I/O type
Electrical isolation	control voltage/fieldbus: yes, control voltage/inputs or outputs: according to I/O type
Weight	approx. 250 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IL230x-B110">www.beckhoff.com/IL230x-B110</a>

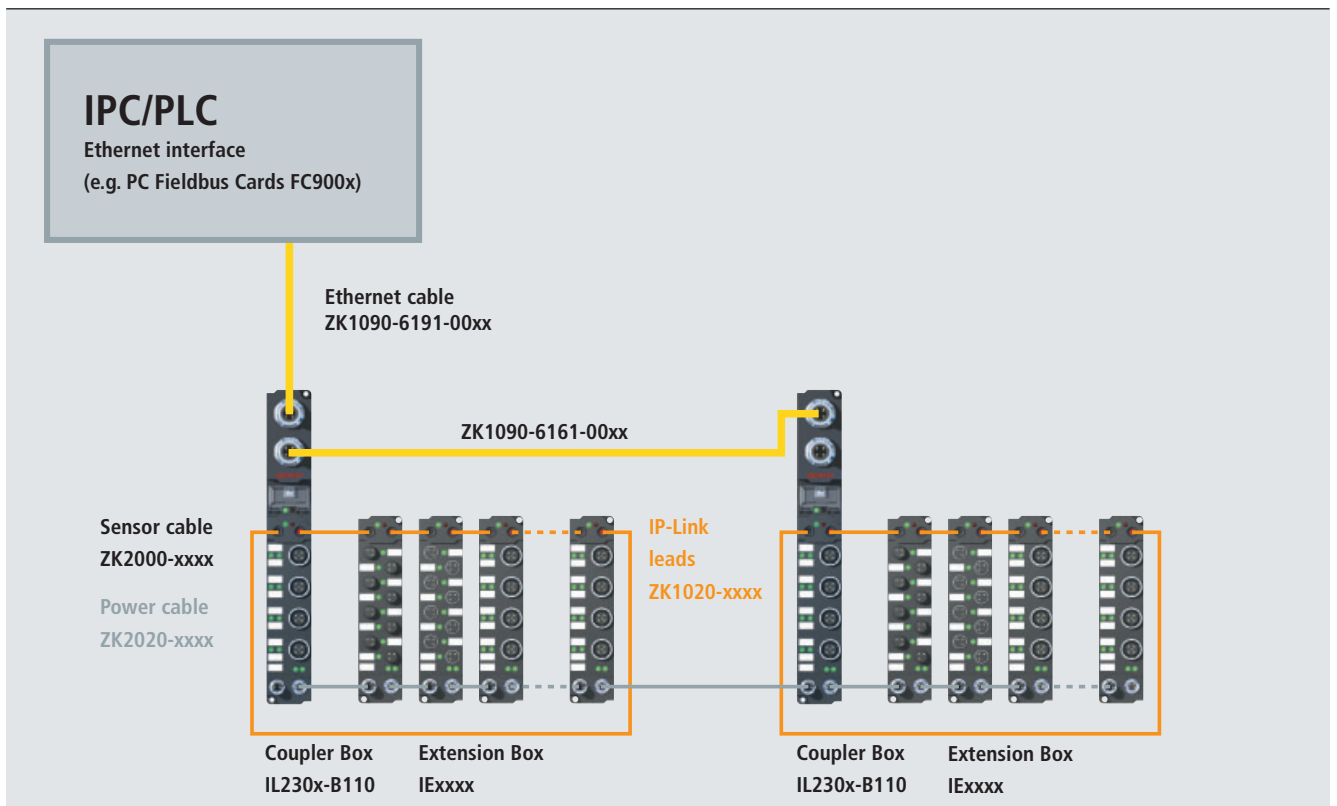
Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	987

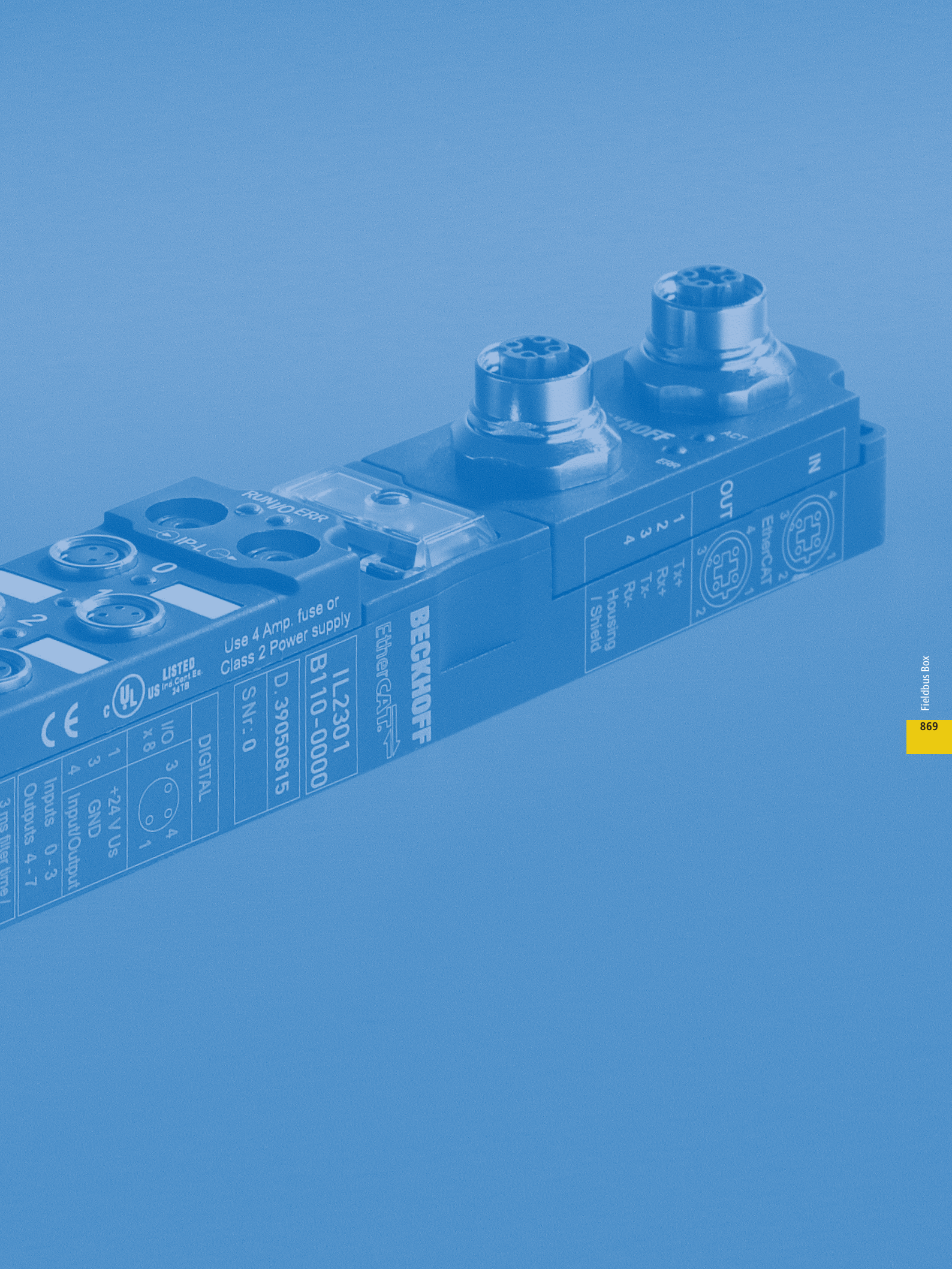
# Coupler Box

The Coupler Box for EtherCAT has four digital inputs and four digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or screw type M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

IL230x-B110	Coupler Box for EtherCAT systems	Plug	Page
<b>Digital combi</b>			
IL2300-B110	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	8 mm	938
IL2301-B110	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M8	938
IL2302-B110	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M12	938

## System overview





RUN/IO ERR  
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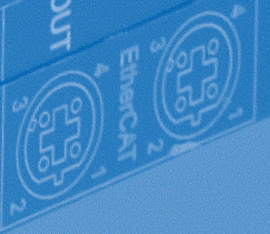
UL LISTED  
 Ind. Cont. Eq.  
 347B

Use 4 Amp. fuse or  
 Class 2 Power supply

IL2301  
 B110-0000  
 D.39050815  
 SNr: 0

**BECKHOFF**  
 EtherCAT

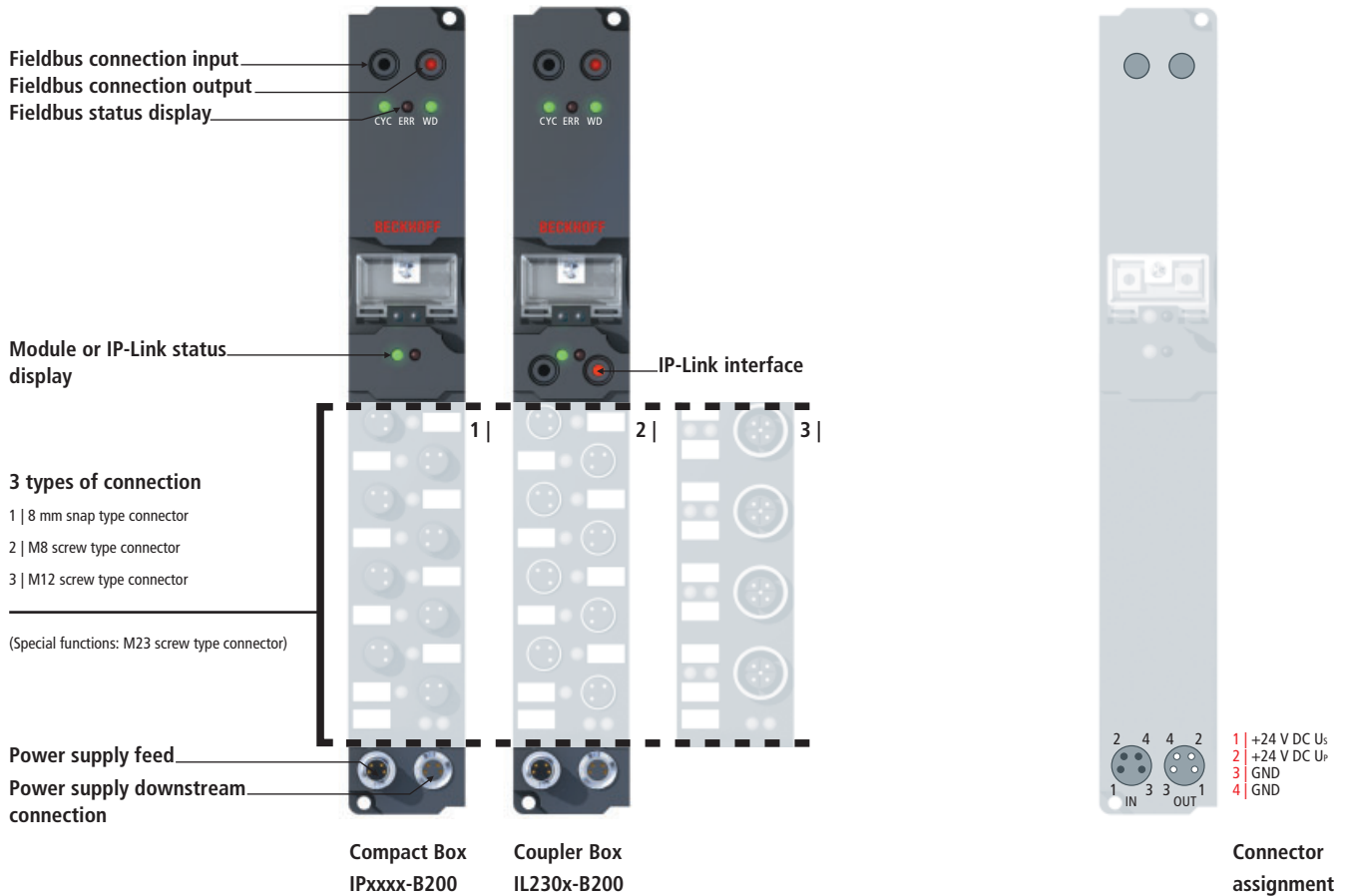
IN  
 1  
 2  
 3  
 4  
 Tx+  
 Rx+  
 Tx-  
 Rx-  
 Housing  
 I Shield



DIGITAL



Inputs 0-3  
 Outputs 4-7  
 3 ms filter time



# IPxxx-, IL230x-B200 | Fieldbus Box modules for Lightbus

## LIGHTBUS

The Lightbus system is a fast and secure serial fieldbus system. Immunity to electromagnetic influences, total electrical isolation of the connected modules from one another and high transmission speed even over large distances are the critical advantages of fibre optic technology. Combined with an optimised and compact telegram structure, the Lightbus achieves a very high transmission rate of 2.5 Mbaud. The Lightbus has a ring structure; up to 254 stations can be operated in one ring. Economical and easily handled standard fibre optic technology is used for the data transfer.

### Configuration

The modules are automatically addressed by the master in the order they are connected. During start-up, the system will check

the cable attenuation and compare the number of projected and actually connected slaves. Special I/O parameters can be set by means of the KS2000 software (serial connection to the configuration interface of the Fieldbus Box).

### Diagnostics

The extensive diagnostic functions of the Beckhoff Lightbus devices allow rapid fault localisation. The error telegrams are output in special counters, so that, in case of an interruption of the fibre optic ring, the location can be determined and displayed. Additionally, each slave has various diagnostic options for reporting the current status to the master. The status of the network connection, the device status, the status of the inputs

and outputs and of the power supply are displayed by LEDs.

### Cables and connectors

The Beckhoff range of ready-assembled cables makes installation a great deal easier. Wiring errors are avoided, and commissioning is more rapidly completed. The range includes fieldbus cables, power supply cables, sensor cables and accessories. The plastic fibre optics are easy to make up. The Lightbus cable is identical to the fibre optic used for the IP-Link connection.

### Compact Box

Compact Box modules for Lightbus are available for all relevant industrial signals. In addition to digital and analog input and output modules including thermocouple and RTD inputs, there are also

incremental encoder interfaces available for displacement and angle measurement in addition to serial interfaces to solve a large number of communication tasks.

### Coupler Box

The Lightbus Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link fibre optic cable. It detects the connected modules and automatically allocates the input and output data to the process image. Both data consistency

and a clear separation of input and output data are ensured. The Coupler Box has four digital inputs and four digital outputs. Other kinds of signals are available in the Extension Box.

System data	Lightbus   IPxxxx-B200, IL230x-B200
Number of I/O stations	254
Number of I/O points	16,192
Data transfer medium	fibre optic conductor: APF (plastic) fibre (1,000 µm)
Distance between stations	45 m
Data transfer time	0.26 ms in the case of 10 modules for 32 bit input and output each (without IP-Link)

Technical data	IPxxxx-B200	IL230x-B200
Extension modules	–	max. 120 with max. 512 byte input and 512 byte output data
Digital peripheral signals	according to I/O type	max. 960 inputs and 960 outputs
Analog peripheral signals	according to I/O type	max. 124 inputs and 124 outputs
Configuration possibility	via KS2000 or the controller	
Data transfer rates	2.5 Mbaud	
Bus interface	2 x fibre optic socket for plug ZS1020-0010	
Power supply	control voltage: 24 V DC (-15 %/+20 %); load voltage: according to I/O type	
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin	
Auxiliary power current	according to I/O type	
Electrical isolation	control voltage/fieldbus: yes, control voltage/inputs or outputs: according to I/O type	
Weight	approx. 250 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Further information	www.beckhoff.com/IPxxxx-B200	

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	987



## Compact Box

The Compact Box modules for Lightbus offer a wide range of I/O functionality. All relevant industrial signals are supported. The digital inputs and outputs can be connected either with snap type 8 mm diameter plugs, screw type M8 or M12 connectors. For analog signals the M12 version is used. The signal properties are described starting on page [913](#)

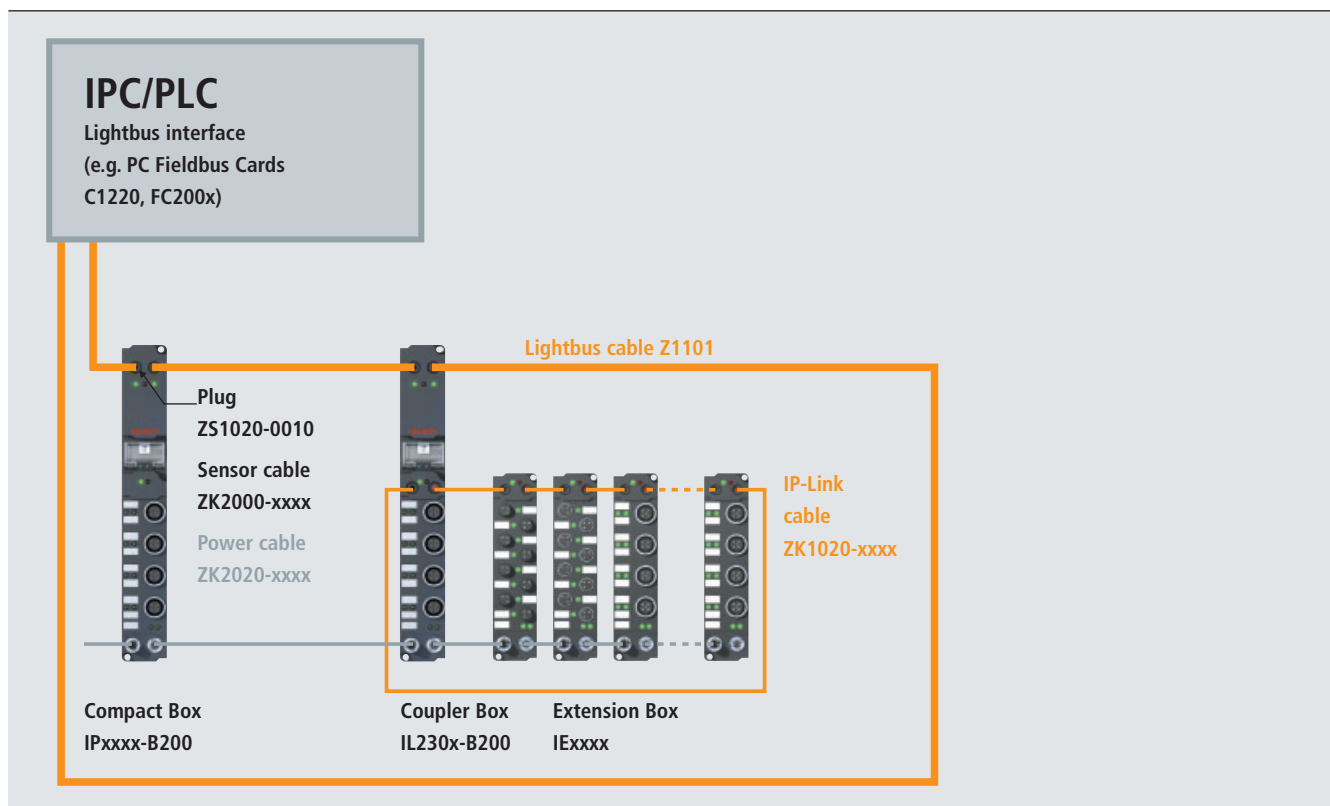
IPxxxx-B200	Compact Box for Lightbus systems	Plug	Page
<b>Digital input</b>			
IP1000-B200	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	8 mm	914
IP1001-B200	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	M8	914
IP1002-B200	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	M12	914
IP1010-B200	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	8 mm	914
IP1011-B200	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	M8	914
IP1012-B200	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	M12	914
IP1502-B200	Compact Box, 2 up/down counter, 24 V DC, 100 kHz	M12	915
<b>Digital output</b>			
IP2000-B200	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	916
IP2001-B200	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	916
IP2002-B200	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	916
IP2020-B200	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\sum 4 A)$	8 mm	917
IP2021-B200	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\sum 4 A)$	M8	917
IP2022-B200	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\sum 4 A)$	M12	917
IP2040-B200	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\sum 12 A)$	8 mm	918
IP2041-B200	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\sum 12 A)$	M8	918
IP2042-B200	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\sum 12 A)$	M12	918
IP2512-B200	Compact Box, 2 digital pulse width outputs 24 V DC, $I_{MAX} = 2.5 A$	M12	919
<b>Digital combi</b>			
IP2300-B200	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	920
IP2301-B200	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	920
IP2302-B200	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	920
IP2310-B200	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	920
IP2311-B200	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	920
IP2312-B200	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	920
IP2320-B200	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\sum 4 A)$	8 mm	921
IP2321-B200	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\sum 4 A)$	M8	921
IP2322-B200	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\sum 4 A)$	M12	921
IP2330-B200	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\sum 4 A)$	8 mm	921
IP2331-B200	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\sum 4 A)$	M8	921
IP2332-B200	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\sum 4 A)$	M12	921
IP2400-B200	Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	8 mm	922
IP2401-B200	Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	M8	922
<b>Analog input</b>			
IP3102-B200	Compact Box, 4 differential analog inputs $\pm 10 V$ , 16 bit	M12	924
IP3112-B200	Compact Box, 4 differential analog inputs 0/4...20 mA, 16 bit	M12	925
IP3202-B200	Compact Box, 4 analog inputs for resistance thermometer (RTD), PT100...1000, Ni100, 16 bit	M12	926
IP3312-B200	Compact Box, 4 analog inputs for thermocouple, types J, K, L, B, E, N, R, S, T, U, 16 bit	M12	927
<b>Analog output</b>			
IP4112-B200	Compact Box, 4 analog outputs 0/4...20 mA, 16 bit	M12	928
IP4132-B200	Compact Box, 4 analog outputs $\pm 10 V$ , 16 bit	M12	929
<b>Special functions</b>			
IP5009-B200	Compact Box, 1 SSI encoder interface	M23	930
IP5109-B200	Compact Box, 1 incremental encoder interface with complementary inputs, 1 MHz	M23	931
IP5209-B200	Compact Box, 1 SinCos encoder interface, 1 V <sub>SS</sub>	M23	932
IP6002-B200	Compact Box, 1 serial interface RS232C	M12	933
IP6012-B200	Compact Box, 1 serial interface, 0...20 mA (TTY)	M12	934
IP6022-B200	Compact Box, 1 serial interface, RS422, RS485	M12	935

## Coupler Box

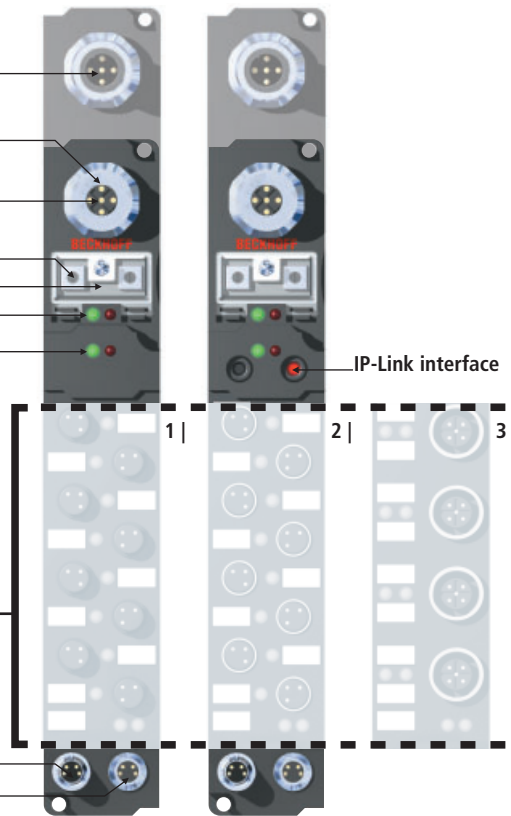
The Coupler Box for Lightbus has four digital inputs and four digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

IL230x-B200	Coupler Box for Lightbus systems	Plug	Page
<b>Digital combi</b>			
IL2300-B200	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	8 mm	938
IL2301-B200	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M8	938
IL2302-B200	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M12	938

## System overview



Variant with integrated tee-connector:  
 Fieldbus connection input (plug)  
 Fieldbus connection output (socket)  
 Fieldbus connection  
 Address selection switch  
 Configuration interface  
 Fieldbus status display  
 Module or IP-Link status display



3 types of connection

- 1 | 8 mm snap type connector
- 2 | M8 screw type connector
- 3 | M12 screw type connector

(Special functions: M23 screw type connector)

Power supply feed  
 Power supply downstream connection

Compact Box  
 IPxxx-B310  
 IPxxx-B318

Coupler Box | PLC  
 IL230x-B310 | C310  
 IL230x-B318 | C318



# IPxxx-, IL230x-B/C31x | Fieldbus Box modules for PROFIBUS



PROFIBUS is a fast, open bus system widely used in automation technology. It is internationally standardised (IEC 61158 and EN50170) and divided into three versions:

- PROFIBUS FMS (Fieldbus Message Specification) is used primarily for communication between controllers. FMS is supported by the Beckhoff BK3100 Bus Coupler (protection class IP 20).
- PROFIBUS PA (Process Automation) is based on an intrinsically safe physical layer and is intended for process automation.
- PROFIBUS DP (Distributed Peripherals) is designed for fast data exchange at the sensor/actuator level.

The PROFIBUS devices in the Fieldbus Box series support

PROFIBUS DP. Central control devices (such as IPCs or programmable logic controllers) communicate here over a fast serial connection with distributed input and output devices. Data is mainly exchanged cyclically, although acyclic services (DP V1) are also available for parameterisation and diagnosis.

The high speed of PROFIBUS DP is most impressive: with a transmission rate of 12 Mbaud, less than 2 ms are needed to exchange 512 bits of input and 512 bits of output data with 32 bus devices. This satisfies the requirement for a short system reaction time.

The Beckhoff PROFIBUS devices have a powerful implementation of the protocol and are certified by PNO, the PROFIBUS user organisation.

The fieldbus modules for PROFIBUS DP are available as standard variant (B/C310) or optionally with integrated tee-connector (B/C318). This makes the fieldbus wiring much easier. The tee-connector that used to be necessary is replaced by a second M12-type fieldbus input/output. This makes the cabling more compact. Straight or angled versions of pre-assembled plugs or field-assembled plugs can be used.

**Configuration**

The node address is set in the range from 1 to 99 using two decimally coded rotary switches. The transmission rate is recognised automatically by the PROFIBUS box (auto baud rate). Device database files (\*.gse) for PROFIBUS configuration tools are available for download from

the Beckhoff internet site [www.beckhoff.com](http://www.beckhoff.com) and on the Beckhoff product CDs. Special I/O parameters can be set by means of the KS2000 software or via acyclic DP V1 services.

**Diagnosics**

The extensive diagnostic functions of the Beckhoff PROFIBUS devices allow rapid fault localisation. The diagnostic messages are transmitted over the bus and collated by the master. The status of the network connection, the device status, the I/O status and the status of the power supply are displayed by LEDs.

**Compact Box**

Compact Box modules for PROFIBUS DP are available for all relevant industrial signals. In addition to digital and analog input and

output modules including thermocouple and RTD inputs, there are also incremental encoder interfaces available for displacement and angle measurement in addition to serial interfaces to solve a large number of communication tasks.

**Coupler Box**

The PROFIBUS Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link fibre optic cable. It detects the connected modules and automatically allocates the input and output data to the process image. Both data consistency and a clear separation of input and output data are ensured. The Coupler Box has four digital inputs and four digital outputs. Other kinds of signals are available in the Extension Box.

**PLC Box**

The PLC Box is an intelligent PROFIBUS node that can perform decentralised processing of I/O data and execute control tasks independently of the function of the PROFIBUS network. The PLC Box, like the Coupler Box, has four digital inputs and four digital outputs. Up to 120 further Extension Box modules can be connected via IP-Link. The I/O data can be made available either to the local PLC program or to the supervising controller. The PLC Box is programmed using TwinCAT over the PROFIBUS or through the configuration interface.

System data	PROFIBUS DP   IPxxxx-B31x, IL230x-B31x, IL230x-C31x				
Number of I/O stations	100 with repeater				
Number of I/O points	approx. 6,000, depending on the master				
Data transfer medium	shielded copper cable, 2 x 0.25 mm <sup>2</sup>				
Distance between stations	1,200 m	1,000 m	400 m	200 m	100 m
Data transfer rates	9.6/19.2/93.75 kbaud	187.5 kbaud	500 kbaud	1,500 kbaud	...3/6/12 Mbaud
Data transfer time	approx. 0.5 ms with 10 stations each with 32 bit input and output				

Technical data	IPxxxx-B310	IPxxxx-B318	IL230x-B310, -C310	IL230x-B318, -C318
Extension modules	–	–	max. 120 with max. 128 byte input and 128 byte output data	max. 120 with max. 128 byte input and 128 byte output data
Digital peripheral signals	according to I/O type	according to I/O type	max. 960 inputs and 960 outputs	max. 960 inputs and 960 outputs
Analog peripheral signals	according to I/O type	according to I/O type	max. 60 inputs and 60 outputs	max. 60 inputs and 60 outputs
Configuration possibility	via KS2000 or the controller, DP-V1 extensions are supported			
Data transfer rates	automatic detection up to 12 Mbaud			
Bus connection (reverse keyed)	1 x M12 socket, 5-pin	1 x M12 socket, 5-pin, 1 x M12 plug, 5-pin (tee-connector integrated)	1 x M12 socket, 5-pin	1 x M12 socket, 5-pin, 1 x M12 plug, 5-pin (tee-connector integrated)
Power supply	control voltage: 24 V DC (-15 %/+20 %); load voltage: according to I/O type			
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin			
Box supply current	85 mA + current consumption of sensors, max. 0.5 A			
Auxiliary power current	according to I/O type			
Electrical isolation	control voltage/fieldbus: no, control voltage/inputs or outputs: according to I/O type			
Weight	approx. 210 g	approx. 250 g	approx. 210 g	approx. 250 g
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable			
Further information	<a href="http://www.beckhoff.com/IPxxxx-B310">www.beckhoff.com/IPxxxx-B310</a>			

Accessories		
KS2000	configuration software for extended parameterisation	1064
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
Cordsets	cordsets and connectors	987

# Compact Box

The Compact Box modules for PROFIBUS DP offer a wide range of I/O functionalities. All relevant industrial signals are supported. The digital inputs and outputs can be connected either with snap type 8 mm diameter plugs, screw type M8 or M12 connectors. For analog signals the M12 version is used. The signal properties are described starting on page [913](#)

IPxxxx-B310 B318	Compact Box for PROFIBUS DP systems (12 Mbaud)	Plug	Page
<b>Digital input</b>			
IP1000-B310 B318	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	8 mm	914
IP1001-B310 B318	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	M8	914
IP1002-B310 B318	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	M12	914
IP1010-B310 B318	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	8 mm	914
IP1011-B310 B318	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	M8	914
IP1012-B310 B318	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	M12	914
IP1502-B310 B318	Compact Box, 2 up/down counter, 24 V DC, 100 kHz	M12	915
<b>Digital output</b>			
IP2000-B310 B318	Compact Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	8 mm	916
IP2001-B310 B318	Compact Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	M8	916
IP2002-B310 B318	Compact Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	M12	916
IP2020-B310 B318	Compact Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (Σ 4 A)	8 mm	917
IP2021-B310 B318	Compact Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (Σ 4 A)	M8	917
IP2022-B310 B318	Compact Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (Σ 4 A)	M12	917
IP2040-B310 B318	Compact Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (Σ 12 A)	8 mm	918
IP2041-B310 B318	Compact Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (Σ 12 A)	M8	918
IP2042-B310 B318	Compact Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (Σ 12 A)	M12	918
IP2512-B310 B318	Compact Box, 2 digital pulse width outputs 24 V DC, I <sub>MAX</sub> = 2.5 A	M12	919
<b>Digital combi</b>			
IP2300-B310 B318	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	8 mm	920
IP2301-B310 B318	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	M8	920
IP2302-B310 B318	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	M12	920
IP2310-B310 B318	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	8 mm	920
IP2311-B310 B318	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	M8	920
IP2312-B310 B318	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	M12	920
IP2320-B310 B318	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (Σ 4 A)	8 mm	921
IP2321-B310 B318	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (Σ 4 A)	M8	921
IP2322-B310 B318	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (Σ 4 A)	M12	921
IP2330-B310 B318	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (Σ 4 A)	8 mm	921
IP2331-B310 B318	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (Σ 4 A)	M8	921
IP2332-B310 B318	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (Σ 4 A)	M12	921
IP2400-B310 B318	Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, I <sub>MAX</sub> = 0.5 A	8 mm	922
IP2401-B310 B318	Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, I <sub>MAX</sub> = 0.5 A	M8	922
<b>Analog input</b>			
IP3102-B310 B318	Compact Box, 4 differential analog inputs ±10 V, 16 bit	M12	924
IP3112-B310 B318	Compact Box, 4 differential analog inputs 0/4...20 mA, 16 bit	M12	925
IP3202-B310 B318	Compact Box, 4 analog inputs for resistance thermometer (RTD), PT100...1000, Ni100, 16 bit	M12	926
IP3312-B310 B318	Compact Box, 4 analog inputs for thermocouple, types J, K, L, B, E, N, R, S, T, U, 16 bit	M12	927
<b>Analog output</b>			
IP4112-B310 B318	Compact Box, 4 analog outputs 0/4...20 mA, 16 bit	M12	928
IP4132-B310 B318	Compact Box, 4 analog outputs ±10 V, 16 bit	M12	929
<b>Special functions</b>			
IP5009-B310 B318	Compact Box, 1 SSI encoder interface	M23	930
IP5109-B310 B318	Compact Box, 1 incremental encoder interface with complementary inputs, 1 MHz	M23	931
IP5209-B310 B318	Compact Box, 1 SinCos encoder interface, 1 V <sub>SS</sub>	M23	932
IP6002-B310 B318	Compact Box, 1 serial interface RS232C	M12	933
IP6012-B310 B318	Compact Box, 1 serial interface, 0...20 mA (TTY)	M12	934
IP6022-B310 B318	Compact Box, 1 serial interface, RS422, RS485	M12	935

## Coupler Box

The Coupler Box for PROFIBUS DP has four digital inputs and four digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

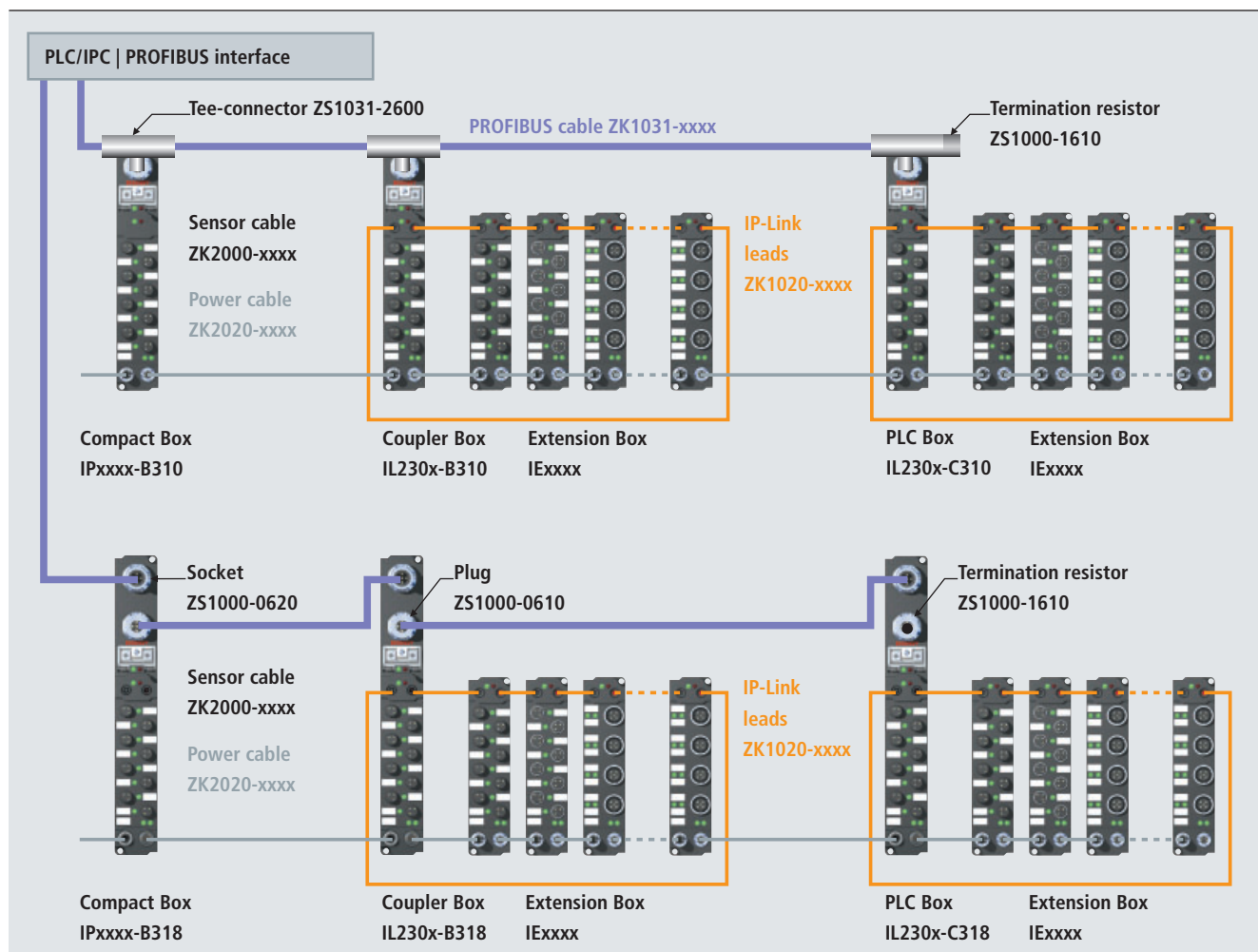
IL230x-B310 B318	Coupler Box for PROFIBUS DP systems (12 Mbaud)	Plug	Page
<b>Digital combi</b>			
IL2300-B310 B318	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	8 mm	938
IL2301-B310 B318	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M8	938
IL2302-B310 B318	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M12	938

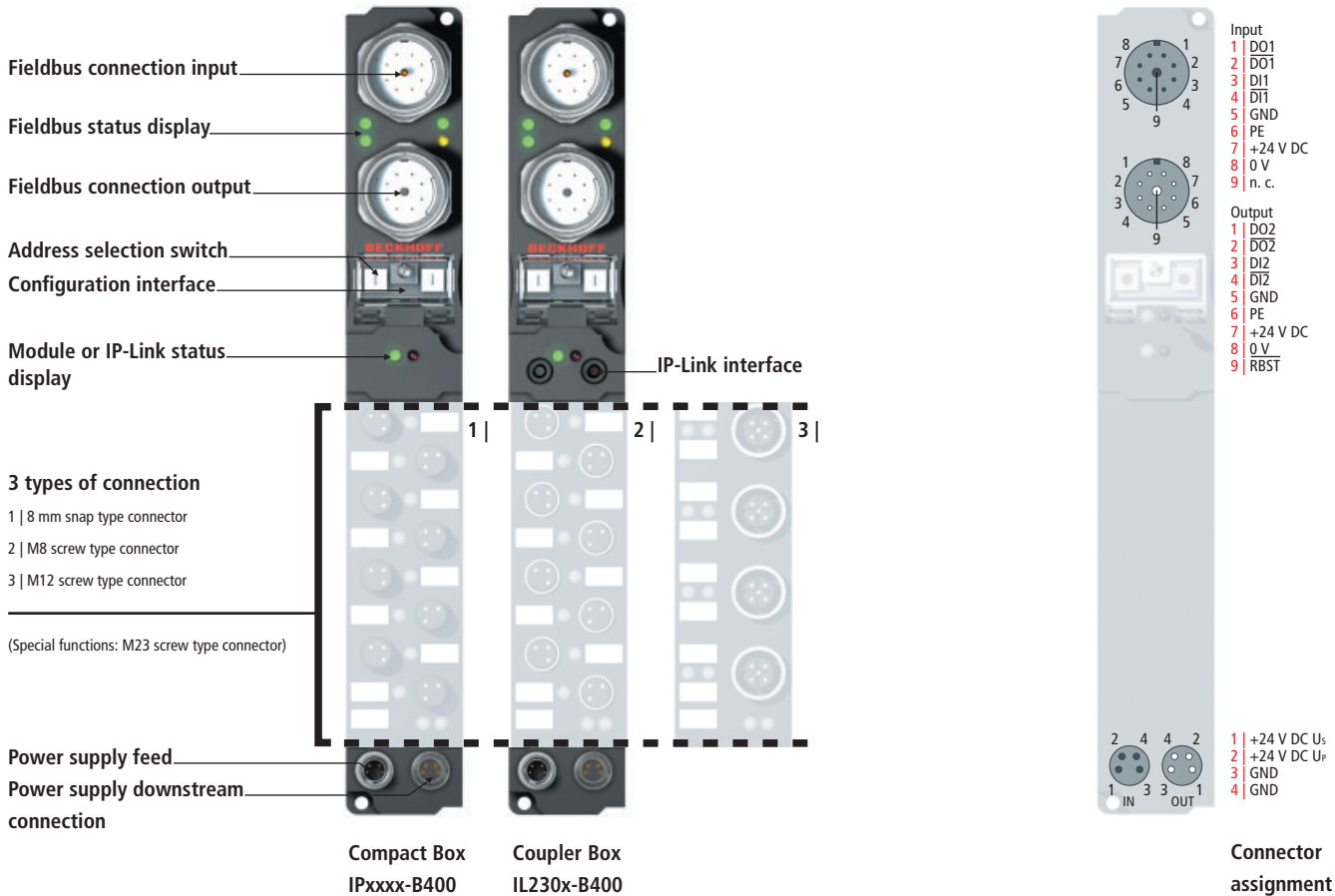
## PLC Box

The PLC Box for PROFIBUS DP, programmable in accordance with IEC 61131-3, has four digital inputs and four digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

IL230x-C310 C318	PLC Box with controller IEC 61131-3 for PROFIBUS DP systems (12 Mbaud)	Plug	Page
<b>Digital combi</b>			
IL2300-C310 C318	PLC Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	8 mm	940
IL2301-C310 C318	PLC Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M8	940
IL2302-C310 C318	PLC Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M12	940

## System overview





## IPxxx-, IL230x-B400 | Fieldbus Box modules for Interbus



Interbus was developed specially for use in machine systems and is specified in DIN E19258/EN50170. The Interbus system is based on a ring structure with active coupling between the devices. The bus access process is a straightforward master/slave system. The data from the master loops through the slaves as in a large shift register. The so-called remote bus can support a maximum of 512 devices with a distance between the slaves of up to 400 m. The entire length of the circuit, if constructed in copper cable, can therefore be up to 13 km. Each slave works on the basis of its active coupling like a repeater, refreshing the signal. The remote bus uses a 6-core cable and RS485 physics. The data transmission is 500 kbaud. The Interbus parameterisation

is very simple since the Interbus can read in its own connected stations via an identification cycle. The master thereby recognises how many and which devices are connected.

All Interbus device manufacturers are obliged to have developed devices certified by the Interbus Club e.V. That means that the devices can be incorporated into any Interbus systems.

### Configuration

Configuration is started with the Interbus via an identification cycle. The master thereby automatically recognises all connected devices. Identification takes place via an identification code, which is stored in each device, and a long code, which contains the length of the transferred data.

### Diagnostics

The extensive diagnostic functions of the Beckhoff Interbus devices allow rapid fault localisation. The status of the network connection, the device status, the status of the inputs and outputs and of the power supply are displayed by LEDs.

### Compact Box

Compact Box modules for Interbus are available for all relevant industrial signals. In addition to digital and analog input and output modules including thermocouple and RTD inputs, there are also incremental encoder interfaces available for displacement and angle measurement in addition to serial interfaces to solve a large number of communication tasks.

## Coupler Box

The Interbus Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link fibre optic cable. It detects the connected modules and automatically allocates the input and output data to the process image. Both data consistency and a clear separation of input and output data are ensured. The Coupler Box has four digital inputs and four digital outputs. Other kinds of signal are available in the Extension Box.

System data	Interbus   IPxxxx-B400, IL230x-B400
Number of I/O stations	depending on the master, max. 256
Number of I/O points	depending on the master
Data transfer medium	LiYCY 3 x 2 x 0.22 mm <sup>2</sup>
Cable length	max. 400 m between modules
Data transfer rates	500 kBaud
Data transfer time	approx. 1 ms in the case of 10 modules for 32 bit input and output each

Technical data	IPxxxx-B400	IL230x-B400
Extension modules	–	max. 120 with max. 64 byte input and 64 byte output data
Digital peripheral signals	according to I/O type	max. 512 inputs and 512 outputs
Analog peripheral signals	according to I/O type	max. 28 inputs and 28 outputs
Configuration possibility	via KS2000	
Bus interface	1 x M23 female socket 9-pin, 1 x M23 male socket 9-pin	
Power supply	control voltage: 24 V DC (20...29 V DC); load voltage: according to I/O type	
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin	
Box supply current	85 mA + current consumption of sensors, max. 0.5 A	
Auxiliary power current	according to I/O type	
Electrical isolation	control voltage/fieldbus: no, control voltage/inputs or outputs: according to I/O type	
Weight	approx. 350 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Further information	www.beckhoff.com/IPxxxx-B400	

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	987



## Compact Box

The Compact Box modules for Interbus offer a wide range of I/O functionalities. All relevant industrial signals are supported. The digital inputs and outputs can be connected either with snap type 8 mm diameter plugs, screw type M8 or M12 connectors. For analog signals the M12 version is used. The signal properties are described starting on page [913](#)

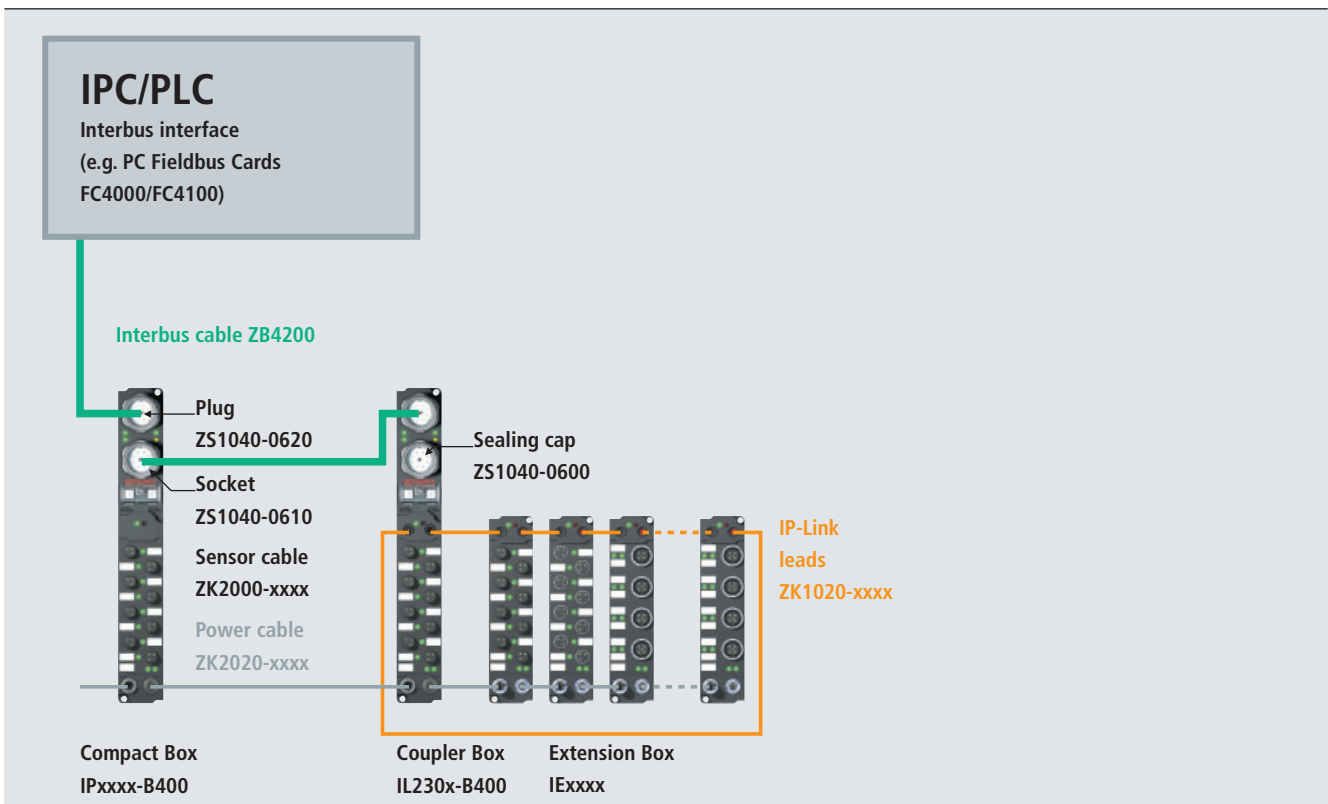
IPxxxx-B400	Compact Box for Interbus systems	Plug	Page
<b>Digital input</b>			
IP1000-B400	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	8 mm	914
IP1001-B400	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	M8	914
IP1002-B400	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	M12	914
IP1010-B400	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	8 mm	914
IP1011-B400	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	M8	914
IP1012-B400	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	M12	914
IP1502-B400	Compact Box, 2 up/down counter, 24 V DC, 100 kHz	M12	915
<b>Digital output</b>			
IP2000-B400	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	916
IP2001-B400	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	916
IP2002-B400	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	916
IP2020-B400	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	917
IP2021-B400	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	917
IP2022-B400	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	917
IP2040-B400	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	8 mm	918
IP2041-B400	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	M8	918
IP2042-B400	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	M12	918
IP2512-B400	Compact Box, 2 digital pulse width outputs 24 V DC, $I_{MAX} = 2.5 A$	M12	919
<b>Digital combi</b>			
IP2300-B400	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	920
IP2301-B400	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	920
IP2302-B400	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	920
IP2310-B400	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	920
IP2311-B400	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	920
IP2312-B400	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	920
IP2320-B400	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	921
IP2321-B400	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	921
IP2322-B400	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	921
IP2330-B400	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	921
IP2331-B400	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	921
IP2332-B400	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	921
IP2400-B400	Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	8 mm	922
IP2401-B400	Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	M8	922
<b>Analog input</b>			
IP3102-B400	Compact Box, 4 differential analog inputs $\pm 10 V$ , 16 bit	M12	924
IP3112-B400	Compact Box, 4 differential analog inputs 0/4...20 mA, 16 bit	M12	925
IP3202-B400	Compact Box, 4 analog inputs for resistance thermometer (RTD), PT100...1000, Ni100, 16 bit	M12	926
IP3312-B400	Compact Box, 4 analog inputs for thermocouple, types J, K, L, B, E, N, R, S, T, U, 16 bit	M12	927
<b>Analog output</b>			
IP4112-B400	Compact Box, 4 analog outputs 0/4...20 mA, 16 bit	M12	928
IP4132-B400	Compact Box, 4 analog outputs $\pm 10 V$ , 16 bit	M12	929
<b>Special functions</b>			
IP5009-B400	Compact Box, 1 SSI encoder interface	M23	930
IP5109-B400	Compact Box, 1 incremental encoder interface with complementary inputs, 1 MHz	M23	931
IP5209-B400	Compact Box, 1 SinCos encoder interface, 1 V <sub>SS</sub>	M23	932
IP6002-B400	Compact Box, 1 serial interface RS232C	M12	933
IP6012-B400	Compact Box, 1 serial interface, 0...20 mA (TTY)	M12	934
IP6022-B400	Compact Box, 1 serial interface, RS422, RS485	M12	935

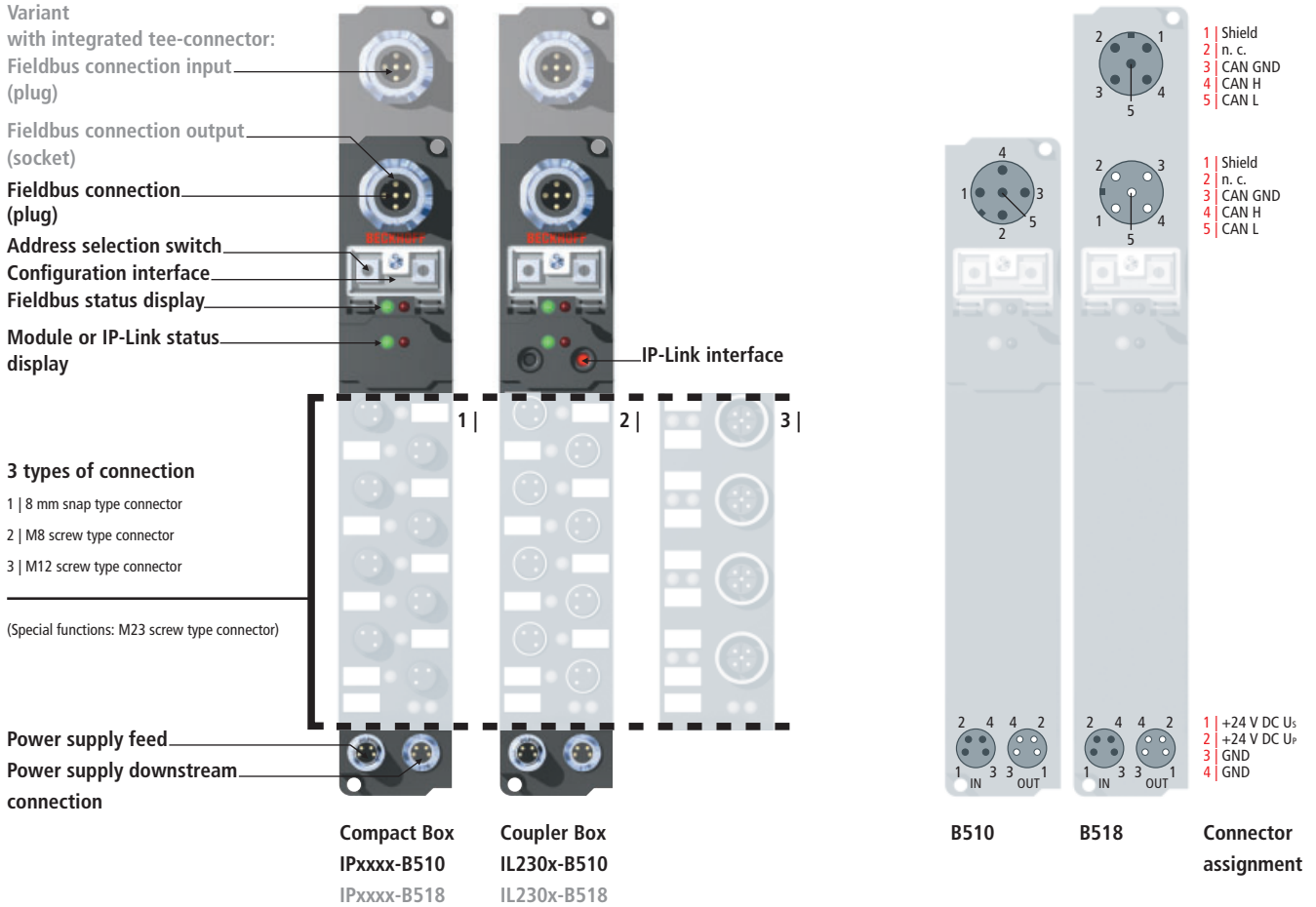
# Coupler Box

The Coupler Box for Interbus has four digital inputs and four digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

IL230x-B400	Coupler Box for Interbus systems	Plug	Page
<b>Digital combi</b>			
IL2300-B400	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	8 mm	938
IL2301-B400	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M8	938
IL2302-B400	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M12	938

## System overview





## IPxxx-, IL230x-B51x | Fieldbus Box modules for CANopen

### CANopen

CANopen is a widely used standard for CAN systems. Input and output data (process data objects) can be communicated in several ways:

- Event driven: Telegrams are sent as soon as their contents have changed.
- Cyclic synchronous: A SYNC telegram causes the modules to accept the output data that was previously received, and to send new input data.
- Polled: A CAN Remote Frame causes the modules to send their input data.

The Beckhoff CANopen devices support all types of CANopen communication, and correspond to the device profile for digital and analog input/output modules (DS401).

Nine transmission rates from 10 kbaud up to 1 Mbaud are available for different bus

lengths. The effective utilisation of the bus bandwidth allows CANopen to achieve short system reaction times at relatively low data rates. The Beckhoff CANopen devices have a powerful implementation of the protocol, and are certified by CiA, the CAN in Automation Association. Through active participation in the CiA's technical committees, Beckhoff is contributing to the further development of this bus system, and has in this way itself gathered profound CANopen expertise.

Apart from the standard variant (B510), the CANopen modules are also available with integrated tee-connector (B518). This makes the fieldbus wiring much easier. The tee-connector that used to be necessary is replaced by a second M12-type fieldbus input/output. This makes

the cabling more compact. Straight or angled versions of pre-assembled plugs or field-assembled plugs can be used.

#### Configuration

The node address is set in the range from 1 to 99 using two decimally coded rotary switches. The transmission rate set is detected automatically by the CANopen box (auto baud rate). "Electronic Data Sheets" (\*.eds files) for CANopen configuration tools are available for download from the Beckhoff internet site [www.beckhoff.com](http://www.beckhoff.com) and on the Beckhoff product CDs. Special I/O parameters not covered by the CANopen standard can be set by means of the KS2000 software (serial connection to the configuration interface of the Fieldbus Box) or via service data object (SDOs).

## Diagnostics

The extensive diagnostic functions of the Beckhoff CANopen devices allow rapid fault localisation. The diagnostic messages (emergency messages) are transmitted over the bus and collated by the master. The status of the network connection, the device status, the status of the inputs and outputs and of the power supply are displayed by LEDs.

## Compact Box

Compact Box modules for CANopen are available for all relevant industrial signals. In addition to digital and analog input and

output modules including thermocouple and RTD inputs, there are also incremental encoder interfaces available for displacement and angle measurement in addition to serial interfaces to solve a large number of communication tasks.

## Coupler Box

The CANopen Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link fibre optic cable. The Coupler Box detects the connected modules and automatically allocates the input and output data to the process data objects.

Both data consistency and a clear separation of input and output data are ensured. The Coupler Box has four digital inputs and four digital outputs. Other kinds of signals are available in the Extension Box.

System data	CANopen   IPxxx-B51x, IL230x-B51x							
Number of I/O stations	63, with repeater: 99							
Number of I/O points	depending on controller							
Data transfer medium	shielded copper cable, 2 x signal, 1 x CAN ground (recommended)							
Distance between stations	5,000 m	2,500 m	1,000 m	500 m	250 m	100 m	50 m	25 m
Data transfer rates	10 kbaud	20 kbaud	50 kbaud	125 kbaud	250 kbaud	500 kbaud	800 kbaud	1 Mbaud
I/O communication types	event driven, cyclic, synchron, polling							

Technical data	IPxxx-B510	IPxxx-B518	IL230x-B510	IL230x-B518
Extension modules	–	–	max. 120 with max. 128 byte input and 128 byte output data	max. 120 with max. 128 byte input and 128 byte output data
Digital peripheral signals	according to I/O type	according to I/O type	max. 960 inputs and 960 outputs	max. 960 inputs and 960 outputs
Analog peripheral signals	according to I/O type	according to I/O type	max. 60 inputs and 60 outputs	max. 60 inputs and 60 outputs
Number of PDOs (CANopen)	16 send and 16 receive process data objects			
Additional CANopen features	life, node guarding, emergency object, variable mapping, store/restore			
Configuration possibility	through KS2000 or the controller (service data objects)			
Data transfer rates	automatic detection of 10, 20, 50, 100, 125, 250, 500, 800, 1,000 kbaud			
Bus interface	1 x M12 plug, 5-pin	1 x M12 plug, 5-pin, 1 x M12 socket, 5-pin (tee-connector integrated)	1 x M12 plug, 5-pin	1 x M12 plug, 5-pin, 1 x M12 socket, 5-pin (tee-connector integrated)
Power supply	control voltage: 24 V DC (-15 %/+20 %); load voltage: according to I/O type			
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin			
Box supply current	45 mA + current consumption of sensors, max. 0.5 A			
Auxiliary power current	according to I/O type			
Electrical isolation	control voltage/fieldbus: 500 V <sub>rms</sub> , control voltage/inputs or outputs: according to I/O type			
Weight	approx. 210 g	approx. 250 g	approx. 210 g	approx. 250 g
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable			
Further information	www.beckhoff.com/IPxxx-B510			

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	987

## Compact Box

The Compact Box modules for CANopen offer a wide range of I/O functionality. All relevant industrial signals are supported. The digital inputs and outputs can be connected either with snap type 8 mm diameter plugs, screw type M8 connectors, or screw type M12 connectors. For analog signals the M12 version is used. The signal properties are described starting on page [913](#)

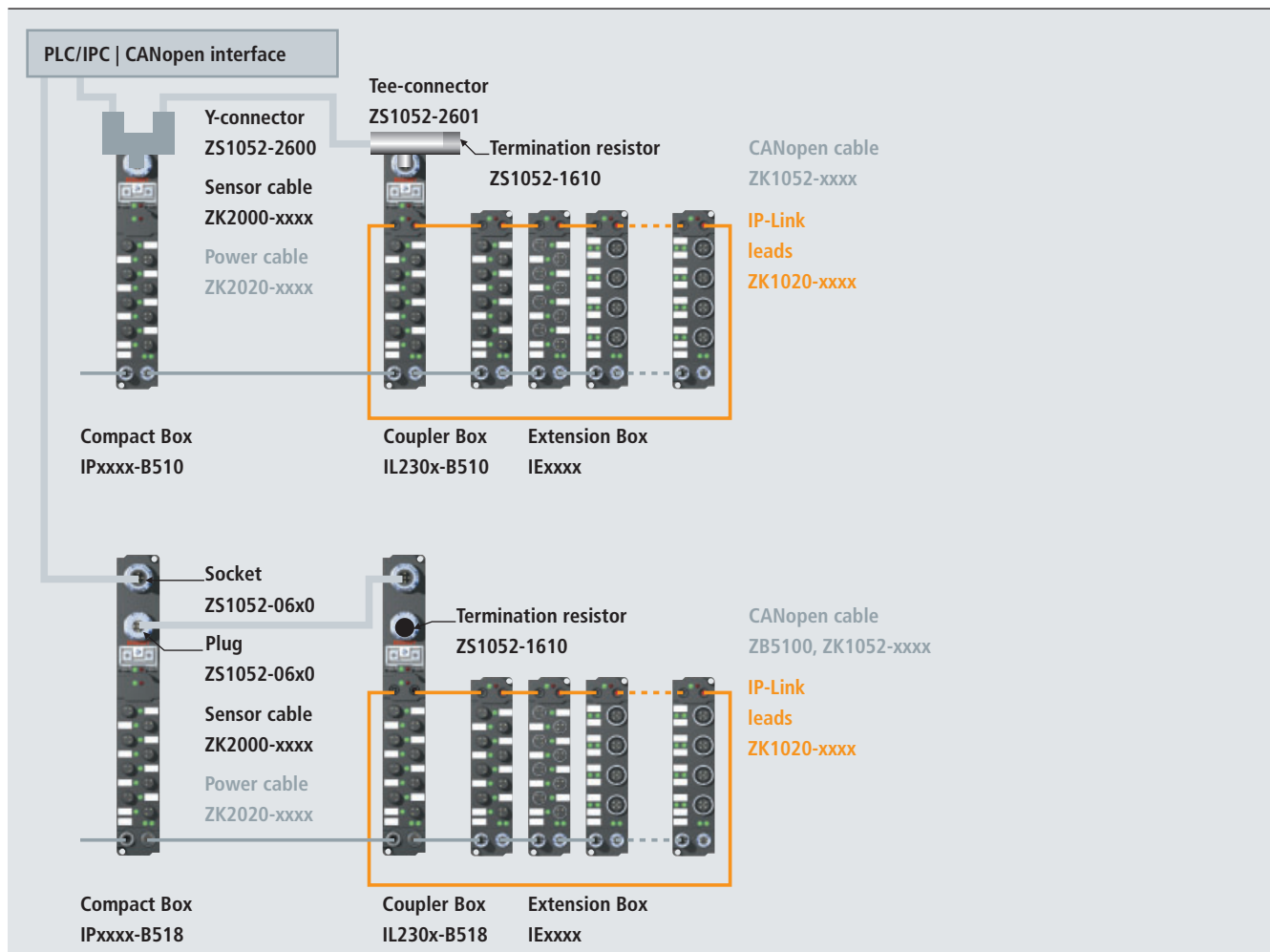
IPxxxx-B510 B518	Compact Box for CANopen systems	Plug	Page
<b>Digital input</b>			
IP1000-B510 B518	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	8 mm	914
IP1001-B510 B518	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	M8	914
IP1002-B510 B518	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	M12	914
IP1010-B510 B518	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	8 mm	914
IP1011-B510 B518	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	M8	914
IP1012-B510 B518	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	M12	914
IP1502-B510 B518	Compact Box, 2 up/down counter, 24 V DC, 100 kHz	M12	915
<b>Digital output</b>			
IP2000-B510 B518	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	916
IP2001-B510 B518	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	916
IP2002-B510 B518	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	916
IP2020-B510 B518	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	917
IP2021-B510 B518	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	917
IP2022-B510 B518	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	917
IP2040-B510 B518	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	8 mm	918
IP2041-B510 B518	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	M8	918
IP2042-B510 B518	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	M12	918
IP2512-B510 B518	Compact Box, 2 digital pulse width outputs 24 V DC, $I_{MAX} = 2.5 A$	M12	919
<b>Digital combi</b>			
IP2300-B510 B518	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	920
IP2301-B510 B518	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	920
IP2302-B510 B518	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	920
IP2310-B510 B518	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	920
IP2311-B510 B518	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	920
IP2312-B510 B518	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	920
IP2320-B510 B518	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	921
IP2321-B510 B518	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	921
IP2322-B510 B518	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	921
IP2330-B510 B518	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	921
IP2331-B510 B518	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	921
IP2332-B510 B518	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	921
IP2400-B510 B518	Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	8 mm	922
IP2401-B510 B518	Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	M8	922
<b>Analog input</b>			
IP3102-B510 B518	Compact Box, 4 differential analog inputs $\pm 10 V$ , 16 bit	M12	924
IP3112-B510 B518	Compact Box, 4 differential analog inputs 0/4...20 mA, 16 bit	M12	925
IP3202-B510 B518	Compact Box, 4 analog inputs for resistance thermometer (RTD), PT100...1000, Ni100, 16 bit	M12	926
IP3312-B510 B518	Compact Box, 4 analog inputs for thermocouple, types J, K, L, B, E, N, R, S, T, U, 16 bit	M12	927
<b>Analog output</b>			
IP4112-B510 B518	Compact Box, 4 analog outputs 0/4...20 mA, 16 bit	M12	928
IP4132-B510 B518	Compact Box, 4 analog outputs $\pm 10 V$ , 16 bit	M12	929
<b>Special functions</b>			
IP5009-B510 B518	Compact Box, 1 SSI encoder interface	M23	930
IP5109-B510 B518	Compact Box, 1 incremental encoder interface with complementary inputs, 1 MHz	M23	931
IP5209-B510 B518	Compact Box, 1 SinCos encoder interface, 1 V <sub>SS</sub>	M23	932
IP6002-B510 B518	Compact Box, 1 serial interface RS232C	M12	933
IP6012-B510 B518	Compact Box, 1 serial interface, 0...20 mA (TTY)	M12	934
IP6022-B510 B518	Compact Box, 1 serial interface, RS422, RS485	M12	935

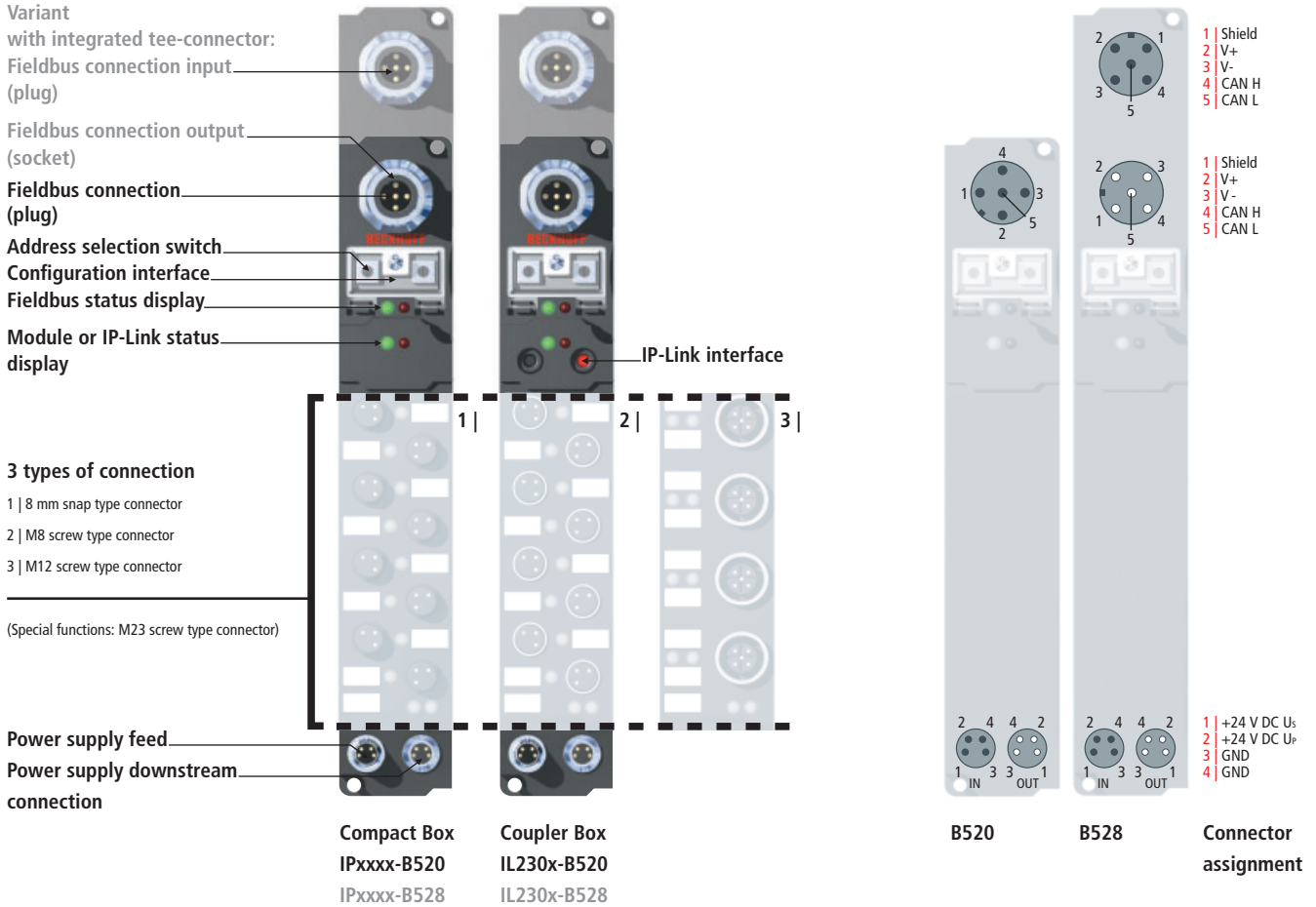
## Coupler Box

The Coupler Box for CANopen has four digital inputs and four digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

IL230x-B510 B518	Coupler Box for CANopen systems	Plug	Page
<b>Digital combi</b>			
IL2300-B510 B518	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	8 mm	938
IL2301-B510 B518	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M8	938
IL2302-B510 B518	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M12	938

## System overview





# IPxxx-, IL230x-B52x | Fieldbus Box modules for DeviceNet



DeviceNet is a sensor/actuator bus system, which is internationally standardised (EN50325) and based on CAN (Controller Area Network). DeviceNet supports a number of communication types for the input and output data:

- Polling: the master module ("scanner") sends the output data cyclically to the assigned devices and receives the input data in an answer telegram.
- Change of State: Telegrams are sent as soon as their contents have changed.
- Cyclic: The modules send the data automatically after a cycle time has elapsed.
- Strobed: The scanner requests the input data using a broadcast telegram to all the devices.

The DeviceNet devices in the Fieldbus Box series support all

these types of I/O communication.

DeviceNet devices are parameterised using acyclic services (Explicit Messaging). The effective utilisation of the bus bandwidth allows DeviceNet, particularly in change of state mode, to achieve short system reaction times in spite of the relatively low data rates.

The Beckhoff DeviceNet devices have a powerful implementation of the protocol. Through active participation in the ODVA's technical committees, Beckhoff is contributing to the further development of this bus system, and has in this way itself gathered profound DeviceNet expertise. The fieldbus modules for DeviceNet are available as standard variant (B520) or optionally with integrated tee-connector (B528). This makes

the fieldbus wiring much easier. Straight or angled versions of pre-assembled plugs or field-assembled plugs can be used.

### Configuration

The node address is set in the range from 0 to 63 using two decimally coded rotary switches. The transmission rate set at the DeviceNet scanner determines the speed of the system and is recognised automatically by the DeviceNet box (auto baud rate). "Electronic Data Sheets" (\*.eds files) for DeviceNet configuration tools are available for download from the Beckhoff internet site [www.beckhoff.com](http://www.beckhoff.com) and on the Beckhoff product CDs. Special I/O parameters not covered by the DeviceNet standard can be set by means of the KS2000 software (serial connection to the configuration interface of

the Fieldbus Box) or via acyclic explicit messages.

### Diagnosics

The extensive diagnostic functions of the Beckhoff DeviceNet devices allow rapid fault localisation. The diagnostic messages are transmitted over the bus and collated by the master. The status of the network connection, the device status, the status of the inputs and outputs and of the power supply are displayed by LEDs.

### Compact Box

Compact Box modules for DeviceNet are available for all relevant industrial signals.

In addition to digital and analog input and output modules including thermocouple and RTD inputs, there are also incremental encoder interfaces available for displacement and angle measurement in addition to serial interfaces to solve a large number of communication tasks.

### Coupler Box

The DeviceNet Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link fibre optic cable. It detects the connected modules and automatically allocates the input and output data to the process image. Both data consistency and a clear separation of input and output

data are ensured. The Coupler Box has four digital inputs and four digital outputs. Other kinds of signals are available in the Extension Box.

System data	DeviceNet   IPxxx-B52x, IL230x-B52x		
Number of I/O stations	63		
Number of I/O points	depending on controller		
Data transfer medium	shielded copper cable, with power supply, typ. 2 x 2 x 0.25 mm <sup>2</sup>		
Distance between stations	500 m	250 m	100 m
Data transfer rates	125 kBaud	250 kBaud	500 kBaud
I/O communication types	bit strobe, polling, cyclic, change of state		

Technical data	IPxxx-B520	IPxxx-B528	IL230x-B520	IL320x-B528
Extension modules	–	–	max. 120 with max. 512 byte input and 512 byte output data	max. 120 with max. 512 byte input and 512 byte output data
Digital peripheral signals	according to I/O type	according to I/O type	max. 960 inputs and 960 outputs	max. 960 inputs and 960 outputs
Analog peripheral signals	according to I/O type	according to I/O type	max. 252 inputs and 252 outputs	max. 252 inputs and 252 outputs
DeviceNet type	according to I/O type	according to I/O type	communications adapter	communications adapter
Configuration possibility	through KS2000 or the controller (explicit messaging)			
Data transfer rates	automatic detection up to 500 kbaud			
Bus interface	1 x M12 plug, 5-pin	1 x M12 plug, 5-pin, 1 x M12 socket, 5-pin (tee-connector integrated)	1 x M12 plug, 5-pin	1 x M12 plug, 5-pin, 1 x M12 socket, 5-pin (tee-connector integrated)
Power supply	control voltage: 24 V DC (-15 %/+20 %); load voltage: according to I/O type			
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin			
Box supply current	45 mA + current consumption of sensors, max. 0.5 A			
Auxiliary power current	according to I/O type			
Electrical isolation	control voltage/fieldbus: 500 V <sub>rms</sub> , control voltage/inputs or outputs: according to I/O type			
Weight	approx. 210 g	approx. 250 g	approx. 210 g	approx. 250 g
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable			
Further information	www.beckhoff.com/IPxxx-B520			

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	987



## Compact Box

The Compact Box modules for DeviceNet offer a wide range of I/O functionality. All relevant industrial signals are supported. The digital inputs and outputs can be connected either with snap type 8 mm diameter plugs, screw type M8 connectors, or screw type M12 connectors. For analog signals the M12 version is used. The signal properties are described starting on page [913](#)

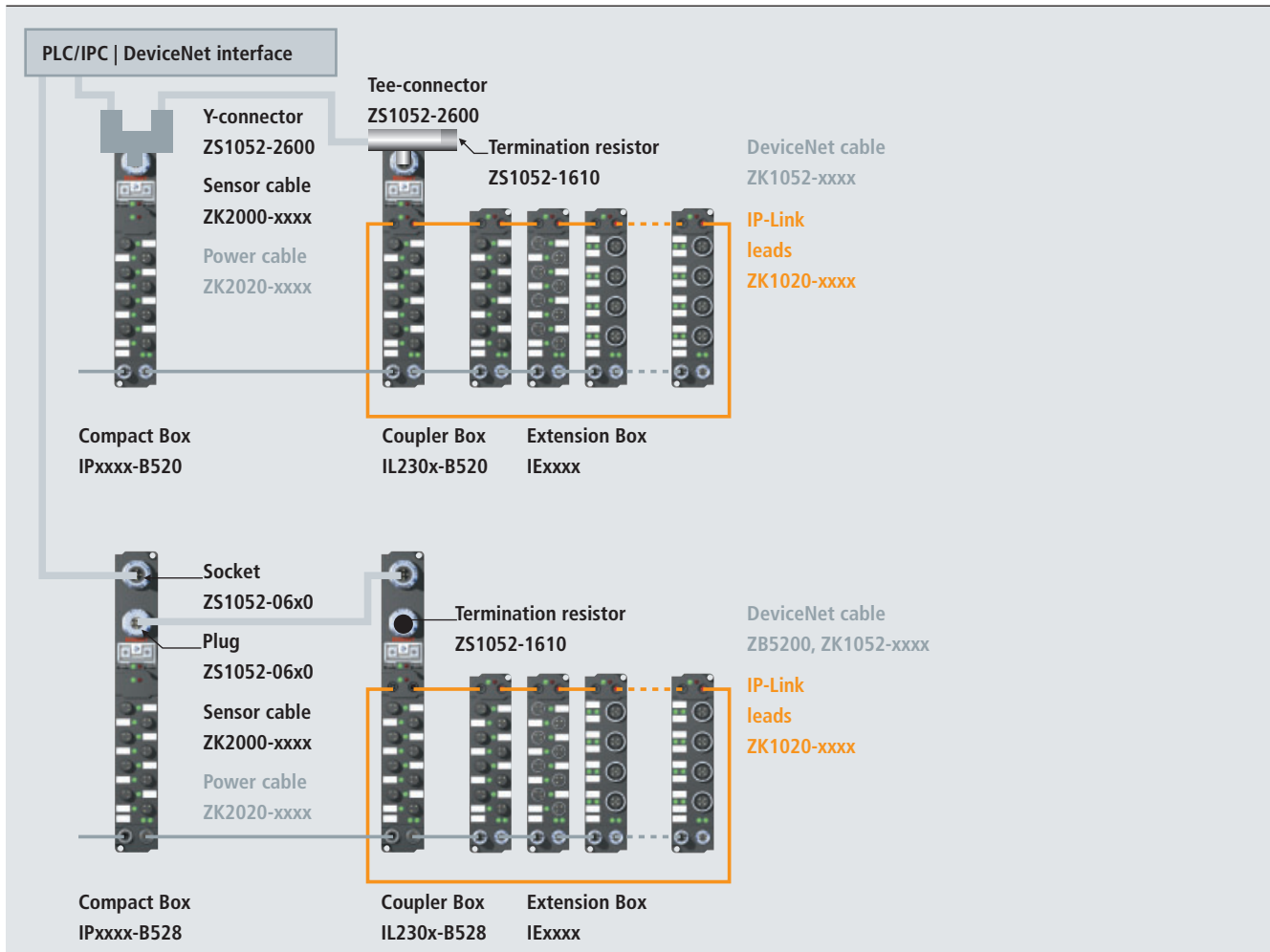
IPxxxx-B520 B528	Compact Box for DeviceNet systems	Plug	Page
<b>Digital input</b>			
IP1000-B520 B528	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	8 mm	914
IP1001-B520 B528	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	M8	914
IP1002-B520 B528	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	M12	914
IP1010-B520 B528	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	8 mm	914
IP1011-B520 B528	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	M8	914
IP1012-B520 B528	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	M12	914
IP1502-B520 B528	Compact Box, 2 up/down counter, 24 V DC, 100 kHz	M12	915
<b>Digital output</b>			
IP2000-B520 B528	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	916
IP2001-B520 B528	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	916
IP2002-B520 B528	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	916
IP2020-B520 B528	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	917
IP2021-B520 B528	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	917
IP2022-B520 B528	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	917
IP2040-B520 B528	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	8 mm	918
IP2041-B520 B528	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	M8	918
IP2042-B520 B528	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	M12	918
IP2512-B520 B528	Compact Box, 2 digital pulse width outputs 24 V DC, $I_{MAX} = 2.5 A$	M12	919
<b>Digital combi</b>			
IP2300-B520 B528	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	920
IP2301-B520 B528	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	920
IP2302-B520 B528	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	920
IP2310-B520 B528	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	920
IP2311-B520 B528	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	920
IP2312-B520 B528	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	920
IP2320-B520 B528	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	921
IP2321-B520 B528	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	921
IP2322-B520 B528	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	921
IP2330-B520 B528	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	921
IP2331-B520 B528	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	921
IP2332-B520 B528	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	921
IP2400-B520 B528	Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	8 mm	922
IP2401-B520 B528	Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	M8	922
<b>Analog input</b>			
IP3102-B520 B528	Compact Box, 4 differential analog inputs $\pm 10 V$ , 16 bit	M12	924
IP3112-B520 B528	Compact Box, 4 differential analog inputs 0/4...20 mA, 16 bit	M12	925
IP3202-B520 B528	Compact Box, 4 analog inputs for resistance thermometer (RTD), PT100...1000, Ni100, 16 bit	M12	926
IP3312-B520 B528	Compact Box, 4 analog inputs for thermocouple, types J, K, L, B, E, N, R, S, T, U, 16 bit	M12	927
<b>Analog output</b>			
IP4112-B520 B528	Compact Box, 4 analog outputs 0/4...20 mA, 16 bit	M12	928
IP4132-B520 B528	Compact Box, 4 analog outputs $\pm 10 V$ , 16 bit	M12	929
<b>Special functions</b>			
IP5009-B520 B528	Compact Box, 1 SSI encoder interface	M23	930
IP5109-B520 B528	Compact Box, 1 incremental encoder interface with complementary inputs, 1 MHz	M23	931
IP5209-B520 B528	Compact Box, 1 SinCos encoder interface, 1 V <sub>SS</sub>	M23	932
IP6002-B520 B528	Compact Box, 1 serial interface RS232C	M12	933
IP6012-B520 B528	Compact Box, 1 serial interface, 0...20 mA (TTY)	M12	934
IP6022-B520 B528	Compact Box, 1 serial interface, RS422, RS485	M12	935

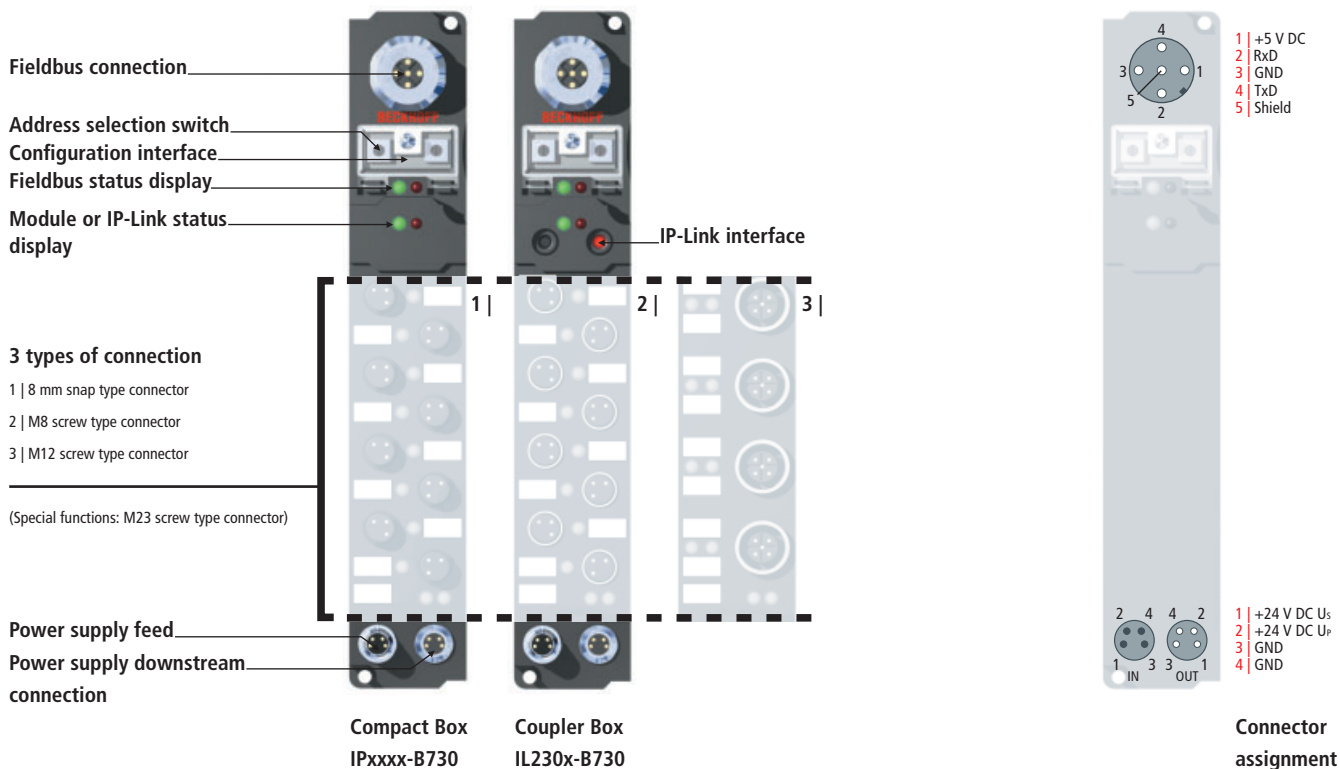
# Coupler Box

The Coupler Box for DeviceNet has four digital inputs and four digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

IL230x-B520 B528	Coupler Box for DeviceNet systems	Plug	Page
<b>Digital combi</b>			
IL2300-B520 B528	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	8 mm	938
IL2301-B520 B528	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M8	938
IL2302-B520 B528	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M12	938

## System overview





## IPxxx-, IL230x-B730 | Fieldbus Box modules for Modbus

# Modbus

Modbus is an open, serial communications protocol based on the master/slave architecture. Since it is easy to implement on all kinds of serial interfaces, it has gained wide acceptance. The Modbus protocol was originally developed in order to link controllers into a network. However, it has been frequently applied for connecting input/output modules. Because of the low transmission rate, which has a maximum of 38.4 kbaud, Modbus is best employed in applications with less numbers of devices and low demands on response time.

The bus consists of a master station and a number of slave stations. The communication is controlled entirely by the master.

Modbus offers two basic communication mechanisms:

- Question/answer (polling): The master sends an inquiry telegram to any one of the stations and waits for the answer telegram.
- Broadcast: The master sends a command to all the stations on the network. These stations execute the command without providing feedback.

The telegrams allow process data (input/output data) to be written and read, either individually or in groups. The data can be transmitted either in ASCII code or packed into RTU format.

Modbus is used on a variety of transmission media. An implementation based physically on the RS485 bus, with a twisted screened two-wire

cable and termination resistors, as in PROFIBUS, is widespread.

### Configuration

The node address is set in the range from 1 to 69 using two decimally coded rotary switches. The transmission rate and other system parameters can be set by the address selection switch or by using the KS2000 software tool through the serial configuration interface on the Fieldbus Box.

### Diagnostics

The Beckhoff Modbus nodes support the diagnostic functions of the Modbus protocol. The diagnostic messages are transmitted over the bus and collated in the master. The status of the network connection, the device status, the

status of the inputs and outputs and of the power supply are displayed by LEDs.

### Compact Box

Compact Box modules for Modbus are available for all relevant industrial signals. In addition to digital and analog input and output modules including thermocouple and RTD inputs, there are also incremental encoder interfaces available for displacement and angle measurement in addition

to serial interfaces to solve a large number of communication tasks.

### Coupler Box

The Modbus Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link fibre optic cable. It detects the connected modules and automatically allocates the input and output data to the process image. Both data consistency and a clear separation of input and output

data are ensured. The Coupler Box has four digital inputs and four digital outputs. Other kinds of signals are available in the Extension Box.

System data	Modbus   IPxxxx-B730, IL230x-B730
Number of I/O stations	69 (with repeater)
Number of I/O points	depending on controller
Data transfer medium	screened, twisted copper cable 2 x 0.25 mm <sup>2</sup> (RS485)
Distance between stations	max. 1,200 m (depending on baud rate)
Data transfer rates	150...38,400 baud
I/O communication types	read/write access, optionally bit oriented or word oriented

Technical data	IPxxxx-B730	IL230x-B730
Extension modules	–	max. 120 with max. 512 byte input and 512 byte output data
Digital peripheral signals	according to I/O type	max. 960 inputs and 960 outputs
Analog peripheral signals	according to I/O type	max. 255 inputs and 255 outputs
Protocol	RTU/ASCII	
Configuration possibility	by means of address selection switch or KS2000	
Data transfer rates	150, 300, 600, 1,200, 2,400, 4,800, 9,600, 19,200, 38,400 baud	
Bus interface	1 x M12 socket, 5-pin, reverse-keyed	
Power supply	control voltage: 24 V DC (-15 %/+20 %); load voltage: according to I/O type	
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin	
Box supply current	45 mA + current consumption of sensors, max. 0.5 A	
Auxiliary power current	according to I/O type	
Electrical isolation	control voltage/fieldbus: yes, control voltage/inputs or outputs: according to I/O type	
Weight	approx. 210 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Further information	www.beckhoff.com/IPxxxx-B730	

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	987

## Compact Box

The Compact Box modules for Modbus offer a wide range of I/O functionality. All relevant industrial signals are supported. The digital inputs and outputs can be connected either with snap type 8 mm diameter plugs, screw type M8 connectors, or screw type M12 connectors. For analog signals the M12 version is used. The signal properties are described starting on page [913](#)

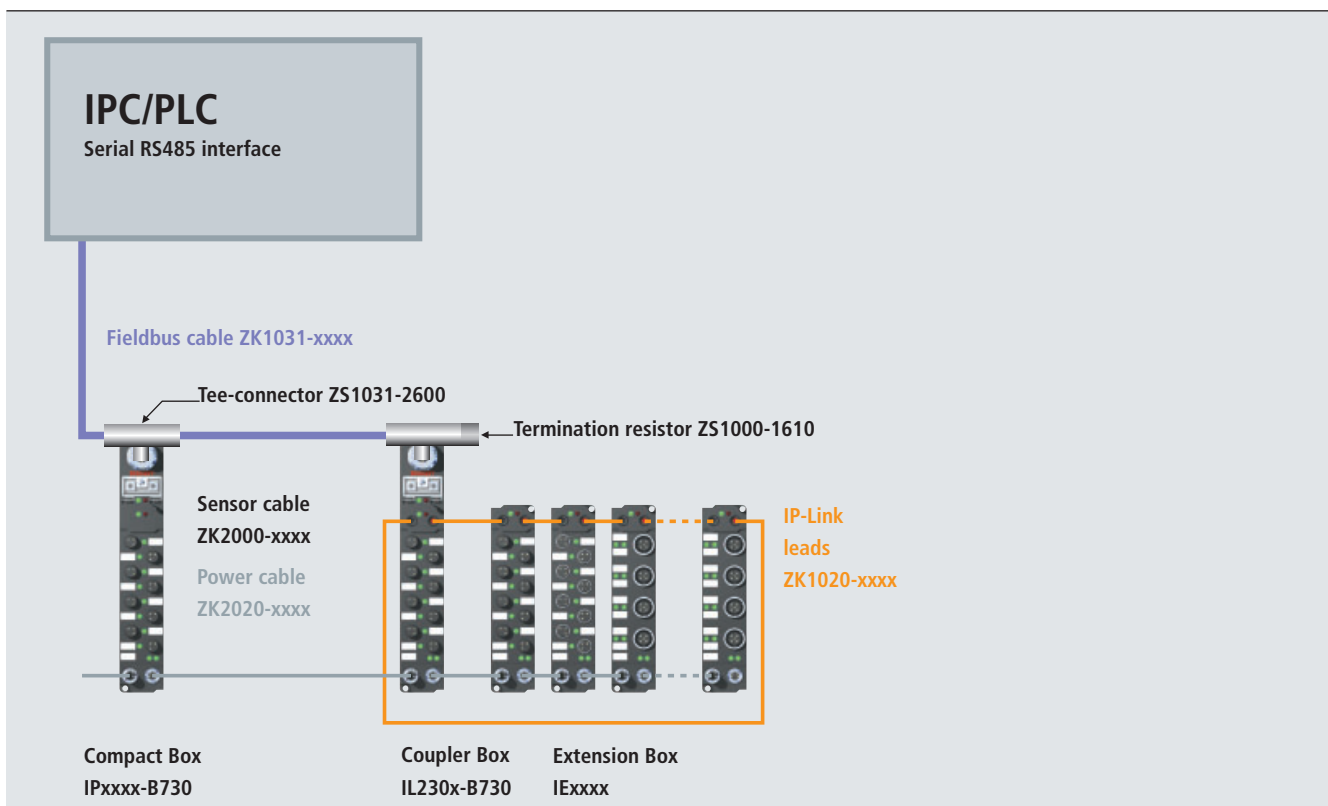
IPxxxx-B730	Compact Box for Modbus systems	Plug	Page
<b>Digital input</b>			
IP1000-B730	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	8 mm	914
IP1001-B730	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	M8	914
IP1002-B730	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	M12	914
IP1010-B730	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	8 mm	914
IP1011-B730	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	M8	914
IP1012-B730	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	M12	914
IP1502-B730	Compact Box, 2 up/down counter, 24 V DC, 100 kHz	M12	915
<b>Digital output</b>			
IP2000-B730	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	916
IP2001-B730	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	916
IP2002-B730	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	916
IP2020-B730	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	917
IP2021-B730	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	917
IP2022-B730	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	917
IP2040-B730	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	8 mm	918
IP2041-B730	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	M8	918
IP2042-B730	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	M12	918
IP2512-B730	Compact Box, 2 digital pulse width outputs 24 V DC, $I_{MAX} = 2.5 A$	M12	919
<b>Digital combi</b>			
IP2300-B730	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	920
IP2301-B730	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	920
IP2302-B730	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	920
IP2310-B730	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	920
IP2311-B730	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	920
IP2312-B730	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	920
IP2320-B730	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	921
IP2321-B730	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	921
IP2322-B730	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	921
IP2330-B730	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	921
IP2331-B730	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	921
IP2332-B730	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	921
IP2400-B730	Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	8 mm	922
IP2401-B730	Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	M8	922
<b>Analog input</b>			
IP3102-B730	Compact Box, 4 differential analog inputs $\pm 10 V$ , 16 bit	M12	924
IP3112-B730	Compact Box, 4 differential analog inputs 0/4...20 mA, 16 bit	M12	925
IP3202-B730	Compact Box, 4 analog inputs for resistance thermometer (RTD), PT100...1000, Ni100, 16 bit	M12	926
IP3312-B730	Compact Box, 4 analog inputs for thermocouple, types J, K, L, B, E, N, R, S, T, U, 16 bit	M12	927
<b>Analog output</b>			
IP4112-B730	Compact Box, 4 analog outputs 0/4...20 mA, 16 bit	M12	928
IP4132-B730	Compact Box, 4 analog outputs $\pm 10 V$ , 16 bit	M12	929
<b>Special functions</b>			
IP5009-B730	Compact Box, 1 SSI encoder interface	M23	930
IP5109-B730	Compact Box, 1 incremental encoder interface with complementary inputs, 1 MHz	M23	931
IP5209-B730	Compact Box, 1 SinCos encoder interface, 1 V <sub>SS</sub>	M23	932
IP6002-B730	Compact Box, 1 serial interface RS232C	M12	933
IP6012-B730	Compact Box, 1 serial interface, 0...20 mA (TTY)	M12	934
IP6022-B730	Compact Box, 1 serial interface, RS422, RS485	M12	935

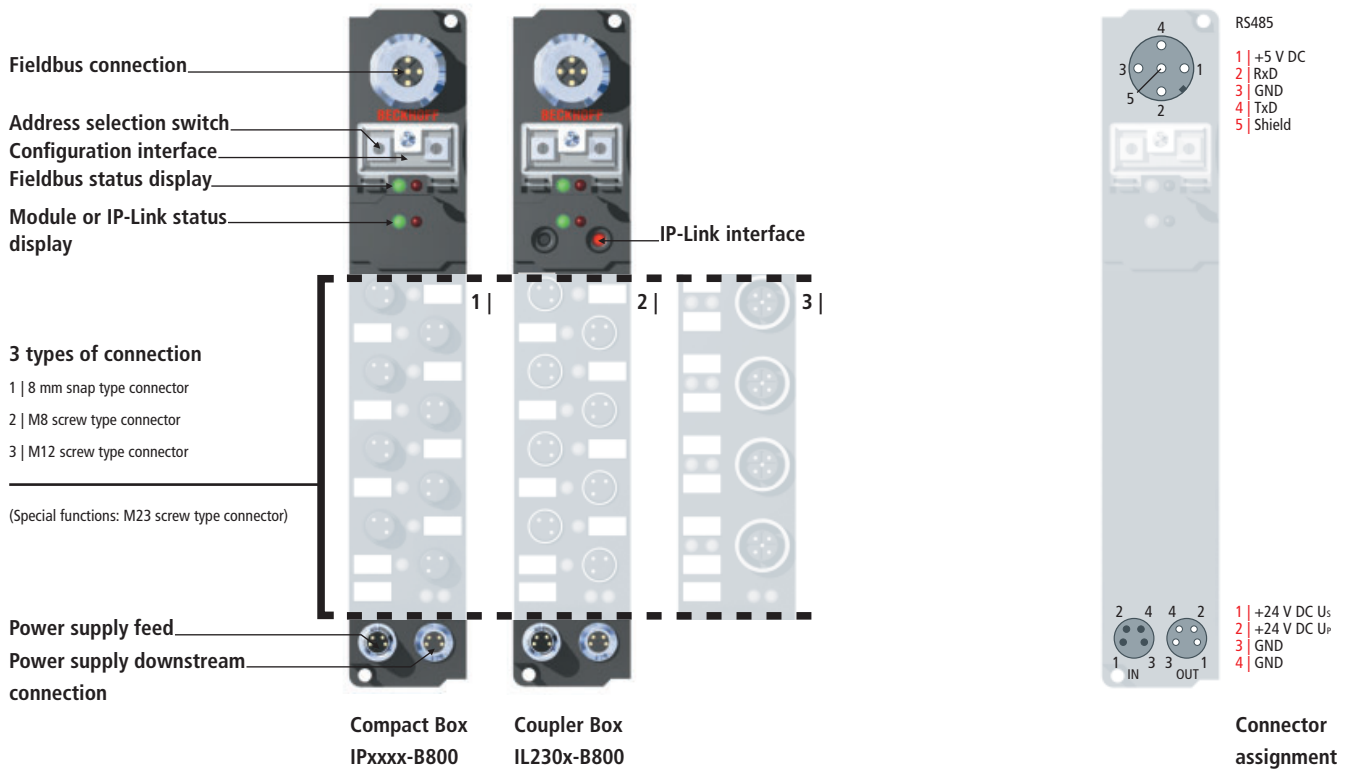
## Coupler Box

The Coupler Box for Modbus has four digital inputs and four digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

IL230x-B730	Coupler Box for Modbus systems	Plug	Page
<b>Digital combi</b>			
IL2300-B730	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	8 mm	938
IL2301-B730	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M8	938
IL2302-B730	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M12	938

## System overview





## IPxxx-, IL230x-B800 | Fieldbus Box modules for RS485



The RS485 input/output modules in the Fieldbus Box series use a simple, open serial communication protocol based on a master/slave architecture. It is quick and easy to implement for any serial interface, since only a few functions are required. Because of the low transmission rate, which has a maximum of 38.4 kbaud, this network is best employed in circumstances where low demands are placed on response time.

In an RS485 system, the bus consists of a master station and of a number of slave stations. The communication is controlled entirely by the master. The master requests the data from the slaves cyclically (polling). When data is exchanged with the bus nodes, the entire process image is always transmitted. In other words, the master sends all of

the output data to the Fieldbus Box, after which it receives all of the input data in an answer telegram.

At 38.4 kbaud, 20 ms are needed to exchange 30 bytes of process data. The data is transmitted in a fixed format binary string secured by a checksum.

### KS8000

The KS8000 communication library for Windows 2000/XP is available for communication with the Fieldbus Box modules. The library offers functions with which it is possible to establish a simple connection from PC applications via the serial PC interface to the Fieldbus Box modules. The OCX interface can be utilised within any programming language that works with the specifications of the Component Object Model (COM)

from Microsoft (e.g. Visual Basic, Visual C, Delphi, Java, etc.). The KS8000 library also has a DLL interface for any other C/C++ programs. KS8000 LV also makes an interface available for the graphical programming system LabVIEW from National Instruments.

### Multiplexer function

As an additional operating mode, autonomous master/slave communication can be established between two serial Fieldbus Box modules. The input data from one device are copied directly to the outputs of the other, without the aid of an additional master – and vice versa. This kind of communication does not require any extensive configuration – it is only necessary for the node addresses to be appropriately selected.

## Configuration

The node address is set in the range from 1 to 69 using two decimally coded rotary switches. The transmission rate is set to 38,400 baud by default. Like the other system parameters, it can be altered if required using the KS2000 software tool through the serial configuration interface of the Fieldbus Box.

## Diagnostics

A status byte is transmitted with each telegram, providing information about the node and communication states. The status of the network connection, the device status, the status of the inputs and outputs and of the power supply are displayed by LEDs.

## Compact Box

Compact Box modules with serial interfaces are available for all relevant industrial signals. In addition to digital and analog input and output modules including thermocouple and RTD inputs, there are also incremental encoder interfaces available for displacement and angle measurement in addition to serial interfaces to solve a large number of communication tasks.

## Coupler Box

The serial Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link fibre optic cable. It detects the connected modules and automatically allocates the input and output data to

the process image. Both data consistency and a clear separation of input and output data are ensured. The Coupler Box has four digital inputs and four digital outputs. Other kinds of signals are available in the Extension Box.

System data	RS485   IPxxxx-B800, IL230x-B800
Number of I/O stations	69
Number of I/O points	depending on controller
Data transfer medium	shielded copper cable, 2 x 0.25 mm <sup>2</sup>
Cable length	max. 1,200 m (depending on baud rate)
Data transfer rates	9.6 kbaud, 19.2 kbaud, 38.4 kbaud (default)
Software tool	KS8000: provides ActiveX control, DLL and LabView interfaces for Windows NT/2000/XP

Technical data	IPxxxx-B800	IL230x-B800
Extension modules	–	max. 120 with max. 512 byte input and 512 byte output data
Digital peripheral signals	according to I/O type	max. 960 inputs and 960 outputs
Analog peripheral signals	according to I/O type	max. 252 inputs and 252 outputs
Protocol	open, documented protocol	
Configuration possibility	via KS2000	
Bus interface	1 x M12 socket, 5-pin, reverse-keyed	
Power supply	control voltage: 24 V DC (-15 %/+20 %); load voltage: according to I/O type	
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin	
Box supply current	45 mA + current consumption of sensors, max. 0.5 A	
Auxiliary power current	according to I/O type	
Electrical isolation	control voltage/fieldbus: yes, control voltage/inputs or outputs: according to I/O type	
Weight	approx. 210 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Further information	www.beckhoff.com/IPxxxx-B800	

Accessories		
KS2000	configuration software for extended parameterisation	1064
KS8000	Active-X control, DLL and LabView interface	1065
Cordsets	cordsets and connectors	987



## Compact Box

The Compact Box modules for RS485 offer a wide range of I/O functionality. All relevant industrial signals are supported. The digital inputs and outputs can be connected either with snap type 8 mm diameter plugs, screw type M8 connectors, or screw type M12 connectors. For analog signals the M12 version is used. The signal properties are described starting on page [913](#)

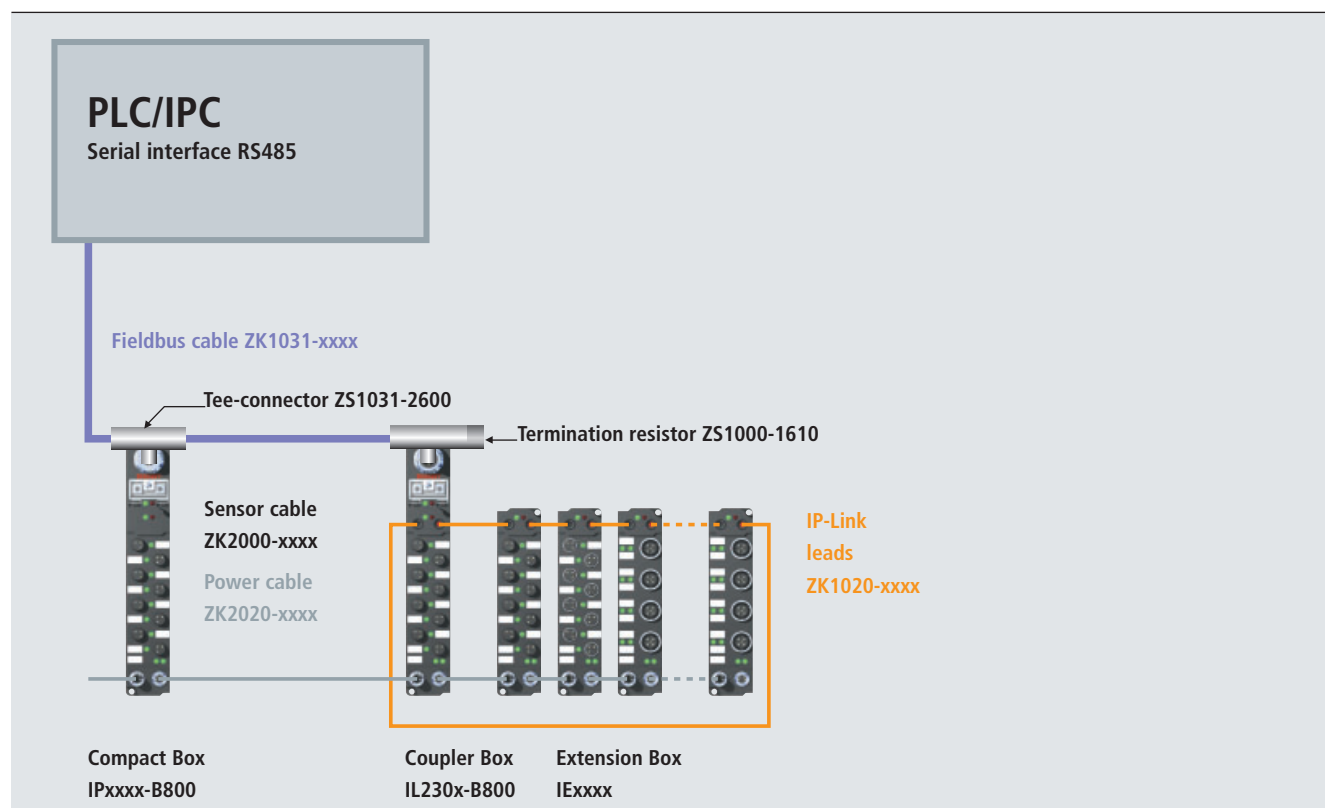
IPxxx-B800	Compact Box for RS485 systems	Plug	Page
<b>Digital input</b>			
IP1000-B800	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	8 mm	914
IP1001-B800	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	M8	914
IP1002-B800	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	M12	914
IP1010-B800	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	8 mm	914
IP1011-B800	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	M8	914
IP1012-B800	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	M12	914
IP1502-B800	Compact Box, 2 up/down counter, 24 V DC, 100 kHz	M12	915
<b>Digital output</b>			
IP2000-B800	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	916
IP2001-B800	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	916
IP2002-B800	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	916
IP2020-B800	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	917
IP2021-B800	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	917
IP2022-B800	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	917
IP2040-B800	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	8 mm	918
IP2041-B800	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	M8	918
IP2042-B800	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	M12	918
IP2512-B800	Compact Box, 2 digital pulse width outputs 24 V DC, $I_{MAX} = 2.5 A$	M12	919
<b>Digital combi</b>			
IP2300-B800	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	920
IP2301-B800	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	920
IP2302-B800	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	920
IP2310-B800	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	920
IP2311-B800	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	920
IP2312-B800	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	920
IP2320-B800	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	921
IP2321-B800	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	921
IP2322-B800	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	921
IP2330-B800	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	921
IP2331-B800	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	921
IP2332-B800	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	921
IP2400-B800	Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	8 mm	922
IP2401-B800	Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	M8	922
<b>Analog input</b>			
IP3102-B800	Compact Box, 4 differential analog inputs $\pm 10 V$ , 16 bit	M12	924
IP3112-B800	Compact Box, 4 differential analog inputs 0/4...20 mA, 16 bit	M12	925
IP3202-B800	Compact Box, 4 analog inputs for resistance thermometer (RTD), PT100...1000, Ni100, 16 bit	M12	926
IP3312-B800	Compact Box, 4 analog inputs for thermocouple, types J, K, L, B, E, N, R, S, T, U, 16 bit	M12	927
<b>Analog output</b>			
IP4112-B800	Compact Box, 4 analog outputs 0/4...20 mA, 16 bit	M12	928
IP4132-B800	Compact Box, 4 analog outputs $\pm 10 V$ , 16 bit	M12	929
<b>Special functions</b>			
IP5009-B800	Compact Box, 1 SSI encoder interface	M23	930
IP5109-B800	Compact Box, 1 incremental encoder interface with complementary inputs, 1 MHz	M23	931
IP5209-B800	Compact Box, 1 SinCos encoder interface, 1 V <sub>SS</sub>	M23	932
IP6002-B800	Compact Box, 1 serial interface RS232C	M12	933
IP6012-B800	Compact Box, 1 serial interface, 0...20 mA (TTY)	M12	934
IP6022-B800	Compact Box, 1 serial interface, RS422, RS485	M12	935

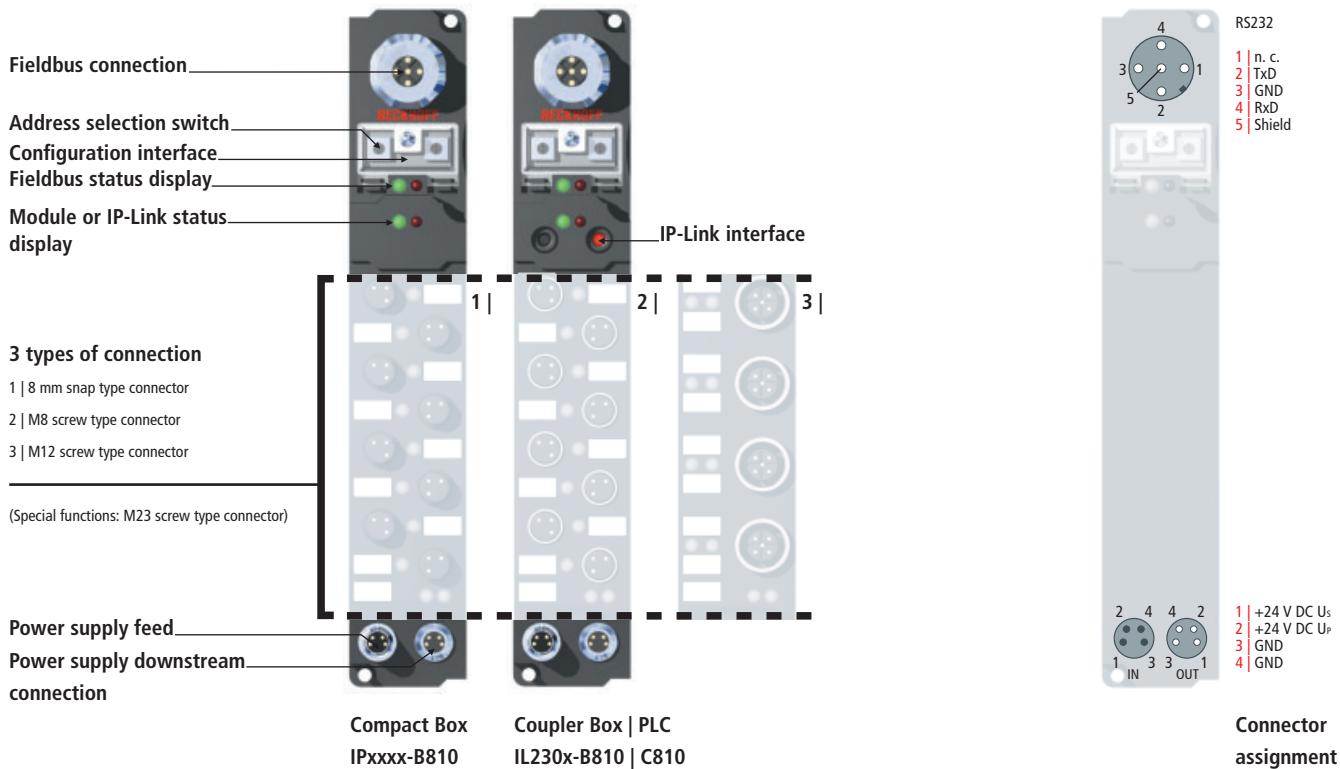
## Coupler Box

The Coupler Box for RS485 has four digital inputs and four digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or screw type M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

IL230x-B800	Coupler Box for RS485 systems	Plug	Page
<b>Digital combi</b>			
IL2300-B800	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	8 mm	938
IL2301-B800	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M8	938
IL2302-B800	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M12	938

## System overview





## IPxxx-, IL230x-B/C810 | Fieldbus Box modules for RS232



The RS232 input/output modules in the Fieldbus Box series use a simple, open serial communication protocol based on a master/slave architecture. It is quick and easy to implement for any serial interface, since only a few functions are required. Because of the low transmission rate, which has a maximum of 38.4 kbaud, this network is best employed in circumstances where low demands are placed on response time.

### KS8000

The KS8000 communication library for Windows 2000/XP is available for communication with the Fieldbus Box modules. The library offers functions with which it is possible to establish a simple connection from PC applications via the serial PC interface to the Fieldbus Box

modules. The OCX interface can be utilised within any programming language that works with the specifications of the Component Object Model (COM) from Microsoft (e.g. Visual Basic, Visual C, Delphi, Java, etc.). The KS8000 library also has a DLL interface for any other C/C++ programs. KS8000 LV also makes an interface available for the graphical programming system LabVIEW from National Instruments.

### Multiplexer function

As an additional operating mode, autonomous master/slave communication can be established between two serial Fieldbus Box modules. The input data from one device are copied directly to the outputs of the other, without the aid of an additional master – and vice versa. This kind of

communication does not require any extensive configuration – it is only necessary for the node addresses to be appropriately selected.

### Configuration

The node address is set in the range from 1 to 69 using two decimally coded rotary switches. The transmission rate is set to 38,400 baud by default. Like the other system parameters, it can be altered if required using the KS2000 software tool through the serial configuration interface of the Fieldbus Box.

### Diagnostics

A status byte is transmitted with each telegram, providing information about the node and communication states. The status of the network connection, the device status, the status of the

inputs and outputs and of the power supply are displayed by LEDs.

### Compact Box

Compact Box modules with serial interfaces are available for all relevant industrial signals. In addition to digital and analog input and output modules including thermocouple and RTD inputs, there are also incremental encoder interfaces available for displacement and angle measurement in addition to serial interfaces to solve a large number of communication tasks.

### Coupler Box

The serial Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link fibre optic cable. It detects the connected modules and automatically allocates the input and output data to the process image. Both data consistency and a clear separation of input and output data are ensured. The Coupler Box has four digital inputs and four digital outputs. Other kinds of signals are available in the Extension Box.

### PLC Box

The PLC Box is an intelligent RS232 coupler that can perform non-central decentralised processing of I/O data and execute control tasks. It has four digital inputs and four digital outputs. Up to 120 further Extension Box modules can be connected via IP-Link. The I/O data can be made available either to the local PLC program or to the supervising controller. The PLC Box is programmed using TwinCAT through the configuration interface.

System data	RS232   IPxxxx-B810, IL230x-B810, IL230x-C810
Number of I/O stations	1 (peer-to-peer connection)
Number of I/O points	depending on controller
Data transfer medium	shielded copper cable, 2 x 0.25 mm <sup>2</sup>
Cable length	15 m
Data transfer rates	9.6 kbaud, 19.2 kbaud, 38.4 kbaud (default)
Software tool	KS8000: provides ActiveX control, DLL and LabView interfaces for Windows NT/2000/XP

Technical data	IPxxxx-B810	IL230x-B810, IL230x-C810
Extension modules	–	max. 120 with max. 512 byte input and 512 byte output data
Digital peripheral signals	according to I/O type	max. 960 inputs and 960 outputs
Analog peripheral signals	according to I/O type	max. 252 inputs and 252 outputs
Protocol	open, documented protocol	
Configuration possibility	via KS2000	
Bus interface	1 x M12 socket, 5-pin, reverse-keyed	
Power supply	control voltage: 24 V DC (-15 %/+20 %); load voltage: according to I/O type	
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin	
Box supply current	45 mA + current consumption of sensors, max. 0.5 A	
Auxiliary power current	according to I/O type	
Electrical isolation	control voltage/fieldbus: yes, control voltage/inputs or outputs: according to I/O type	
Weight	approx. 210 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Further information	www.beckhoff.com/IPxxxx-B810	

Accessories		
KS2000	configuration software for extended parameterisation	1064
KS8000	Active-X control, DLL and LabView interface	1065
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
Cordsets	cordsets and connectors	987

## Compact Box

The Compact Box modules for RS232 offer a wide range of I/O functionalities. All relevant industrial signals are supported. The digital inputs and outputs can be connected either with snap type 8 mm diameter plugs, screw type M8 or M12 connectors. For analog signals the M12 version is used. The signal properties are described starting on page [913](#)

IPxxxx-B810	Compact Box for RS232 systems	Plug	Page
<b>Digital input</b>			
IP1000-B810	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	8 mm	914
IP1001-B810	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	M8	914
IP1002-B810	Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter	M12	914
IP1010-B810	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	8 mm	914
IP1011-B810	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	M8	914
IP1012-B810	Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter	M12	914
IP1502-B810	Compact Box, 2 up/down counter, 24 V DC, 100 kHz	M12	915
<b>Digital output</b>			
IP2000-B810	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	916
IP2001-B810	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	916
IP2002-B810	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	916
IP2020-B810	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	917
IP2021-B810	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	917
IP2022-B810	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	917
IP2040-B810	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	8 mm	918
IP2041-B810	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	M8	918
IP2042-B810	Compact Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	M12	918
IP2512-B810	Compact Box, 2 digital pulse width outputs 24 V DC, $I_{MAX} = 2.5 A$	M12	919
<b>Digital combi</b>			
IP2300-B810	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	920
IP2301-B810	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	920
IP2302-B810	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	920
IP2310-B810	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	920
IP2311-B810	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	920
IP2312-B810	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	920
IP2320-B810	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	921
IP2321-B810	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	921
IP2322-B810	Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	921
IP2330-B810	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	921
IP2331-B810	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	921
IP2332-B810	Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	921
IP2400-B810	Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	8 mm	922
IP2401-B810	Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	M8	922
<b>Analog input</b>			
IP3102-B810	Compact Box, 4 differential analog inputs $\pm 10 V$ , 16 bit	M12	924
IP3112-B810	Compact Box, 4 differential analog inputs 0/4...20 mA, 16 bit	M12	925
IP3202-B810	Compact Box, 4 analog inputs for resistance thermometer (RTD), PT100...1000, Ni100, 16 bit	M12	926
IP3312-B810	Compact Box, 4 analog inputs for thermocouple, types J, K, L, B, E, N, R, S, T, U, 16 bit	M12	927
<b>Analog output</b>			
IP4112-B810	Compact Box, 4 analog outputs 0/4...20 mA, 16 bit	M12	928
IP4132-B810	Compact Box, 4 analog outputs $\pm 10 V$ , 16 bit	M12	929
<b>Special functions</b>			
IP5009-B810	Compact Box, 1 SSI encoder interface	M23	930
IP5109-B810	Compact Box, 1 incremental encoder interface with complementary inputs, 1 MHz	M23	931
IP5209-B810	Compact Box, 1 SinCos encoder interface, 1 V <sub>SS</sub>	M23	932
IP6002-B810	Compact Box, 1 serial interface RS232C	M12	933
IP6012-B810	Compact Box, 1 serial interface, 0...20 mA (TTY)	M12	934
IP6022-B810	Compact Box, 1 serial interface, RS422, RS485	M12	935

## Coupler Box

The Coupler Box for RS232 has four digital inputs and four digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

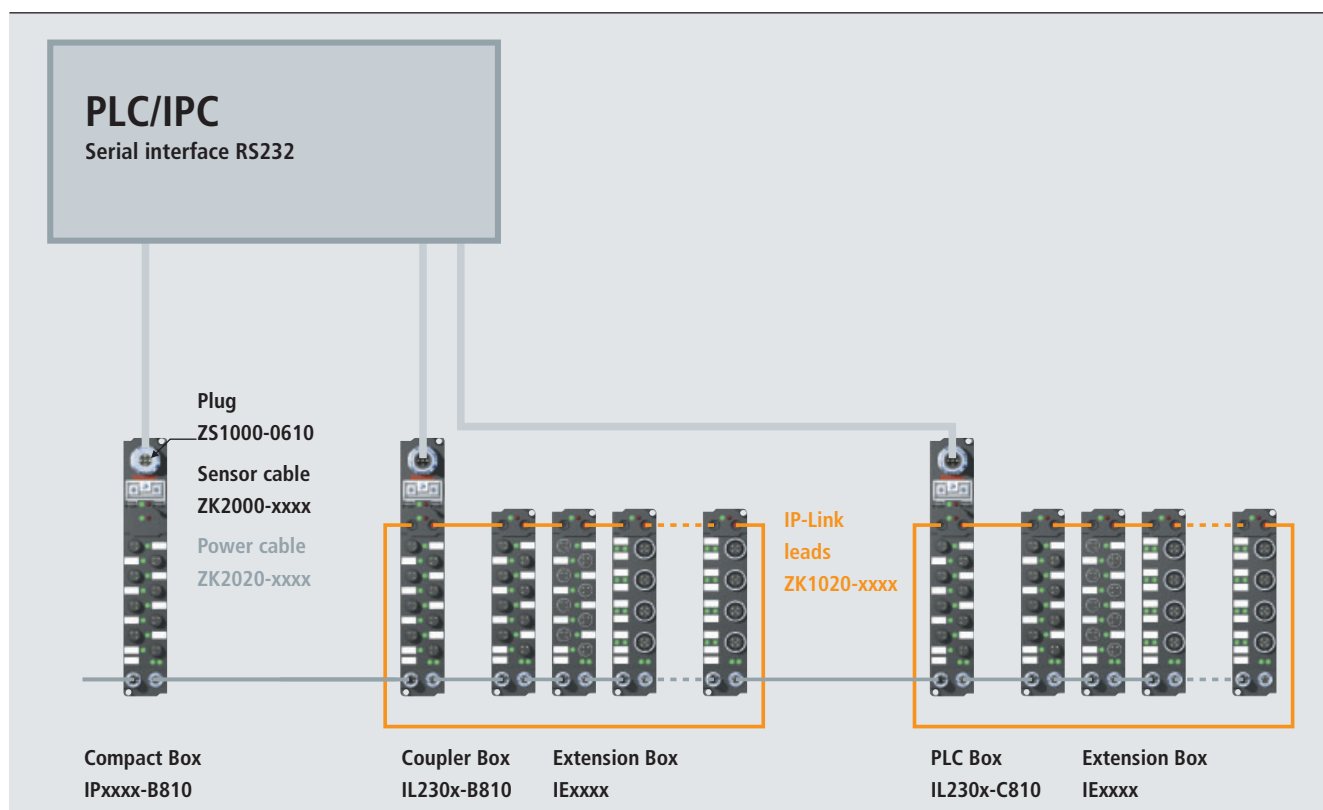
IL230x-B810	Coupler Box for RS232 systems	Plug	Page
<b>Digital combi</b>			
IL2300-B810	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	8 mm	938
IL2301-B810	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M8	938
IL2302-B810	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M12	938

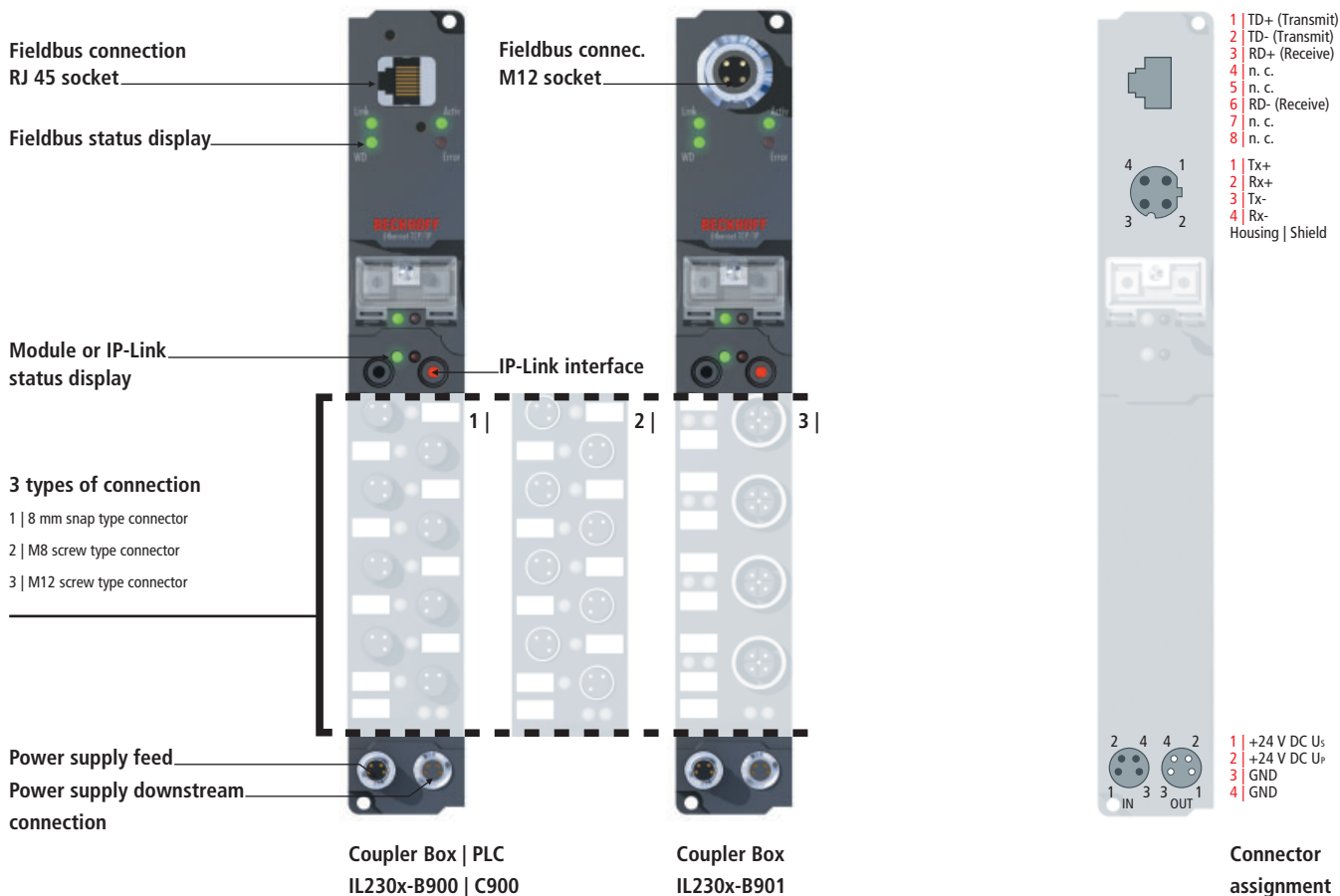
## PLC Box

The PLC Box for RS232, programmable in accordance with IEC 61131-3, has four digital inputs and four digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or screw type M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

IL230x-C810	PLC Box with controller IEC 61131-3 for RS232 systems	Plug	Page
<b>Digital combi</b>			
IL2300-C810	PLC Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	8 mm	940
IL2301-C810	PLC Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M8	940
IL2302-C810	PLC Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M12	940

## System overview





# IL230x-B90x, IL230x-C900 | Fieldbus Box modules for Ethernet

## Ethernet TCP/IP

High speed, simple twisted-pair wiring, availability of industrial hubs/switches, development of appropriate application protocols – all these factors extend the range of applications for Industrial Ethernet and make it suitable for the sensor/actuator level, i.e. the typical application area of Beckhoff Fieldbus Components.

The application of Ethernet as a sensor/actuator bus is of particular interest where an Ethernet infrastructure already exists or is planned – for example in applications using PC-based control technology or in building automation.

The Ethernet Fieldbus Box supports 10 Mbit/s and 100 Mbit/s Ethernet. The Ethernet connection is established via encapsulated RJ 45 connectors (-B900/-C900) or

via a d-coded M12 connector (-B901). The IP address is set via a rotary switch (offset to a freely selectable start address). In networks with DHCP (a service for the allocation of the logical IP address to the physical node address [MAC-ID]) the Fieldbus Box obtains its IP address from the DHCP server.

The Fieldbus Box modules for Ethernet support ADS TwinCAT system communication and real-time Ethernet. TwinCAT I/O makes available configuration tools and Windows/2000/XP drivers for programs in any desired high-level language (DLLs) and for Visual Basic applications (ActiveX). Applications with OPC interfaces can access ADS, and therefore the Ethernet Fieldbus Box, via an OPC server. In addition to ADS, the modules support Modbus (Modbus TCP),

a simple, widely used master/slave protocol based on TCP/IP and real-time Ethernet.

### Configuration

The IP address and other Ethernet parameters are set via two rotary selection switches. Special I/O parameters, for example the type of thermocouple that is used, can be set via KS2000.

### Diagnostics

The extensive diagnostic functions of the Beckhoff devices allow rapid fault localisation. Diagnostic messages are transmitted via Ethernet and collected by the master. LEDs on the module indicate the status of the network connection, the device status, the status of the inputs and outputs and of the power supply.

### Coupler Box

The Ethernet Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link optical fibre cable. It detects the connected modules and automatically allocates the input and output data to the process image. The Coupler Box has four digital inputs and four digital outputs; all other signal types are available in the form of an Extension Box.

### PLC Box

The PLC Box is an intelligent Ethernet node that can perform decentralised processing of I/O data and execute control tasks independently of the function of the Ethernet network. The PLC Box, like the Coupler Box, has four digital inputs and four digital outputs. Up to 120 further Extension Box modules can be connected via IP-Link. The PLC Box is programmed using TwinCAT over Ethernet or through the configuration interface.

System data	Ethernet   IL230x-B90x, IL230x-C900
Number of I/O stations	only limited by the IP address range
Number of I/O points	depending on controller
Data transfer medium	2 x 2 twisted pair; CAT 5 (100 Mbaud)
Distance between stations	100 m (between hub/switch and Ethernet I/O module)
Data transfer rates	10/100 Mbaud
Topology	star over Ethernet hub or Ethernet Switch

Technical data	IL230x-B900, IL230x-C900	IL230x-B901
Extension modules	max. 120 with max. 512 byte input and 512 byte output data	
Digital peripheral signals	max. 964 inputs and 964 outputs	
Analog peripheral signals	max. 127 inputs and 127 outputs	
Protocol	TwinCAT ADS, Modbus TCP, Beckhoff real-time Ethernet (only IL230x-B90x)	
Configuration possibility	via KS2000	
Data transfer rates	10/100 Mbaud, automatic recognition of the transmission rate	
Bus interface	1 x RJ 45 socket	1 x M12 socket, 4-pin (d-coded)
Power supply	control voltage: 24 V DC (-15 %/+20 %); load voltage: according to I/O type	
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin	
Box supply current	30 mA + current consumption of sensors, max. 0.5 A	
Auxiliary power current	according to I/O type	
Electrical isolation	control voltage/fieldbus: no, control voltage/inputs or outputs: according to I/O type	
Weight	approx. 250 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Further information	www.beckhoff.com/IL230x-B900	

Accessories		
KS2000	configuration software for extended parameterisation	1064
TwinCAT PLC	programming system conforms to IEC 61131-3	1146
Cordsets	cordsets and connectors	987



## Coupler Box

The Coupler Box for Ethernet has 4 digital inputs and 4 digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

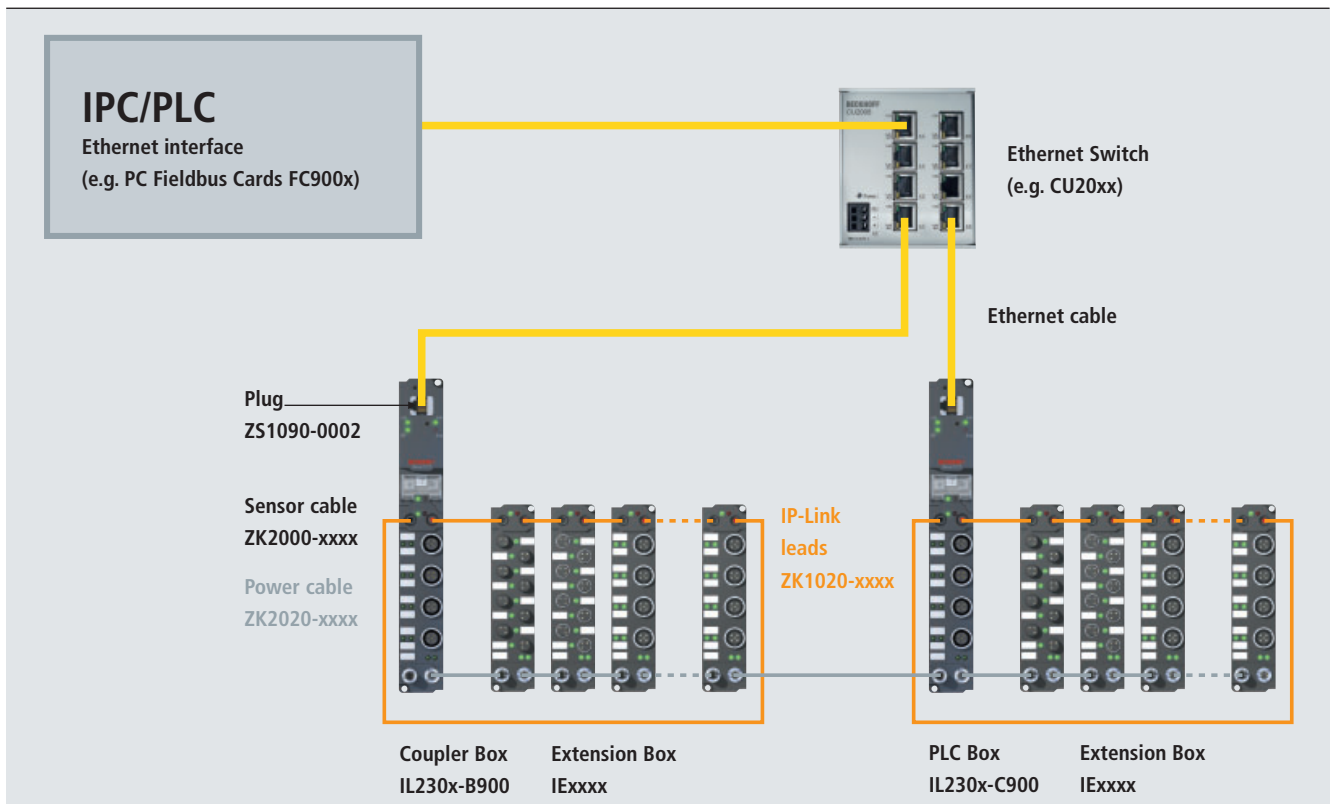
IL230x-B900	Coupler Box for Ethernet systems	Plug	Page
<b>Digital combi</b>			
IL2300-B900	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	8 mm	938
IL2301-B900	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M8	938
IL2302-B900	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M12	938

## PLC Box

The PLC Box for Ethernet, programmable in accordance with IEC 61131-3, has four digital inputs and four digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

IL230x-C900	PLC Box with controller IEC 61131-3 for Ethernet systems	Plug	Page
<b>Digital combi</b>			
IL2300-C900	PLC Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	8 mm	940
IL2301-C900	PLC Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M8	940
IL2302-C900	PLC Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M12	940

## System overview

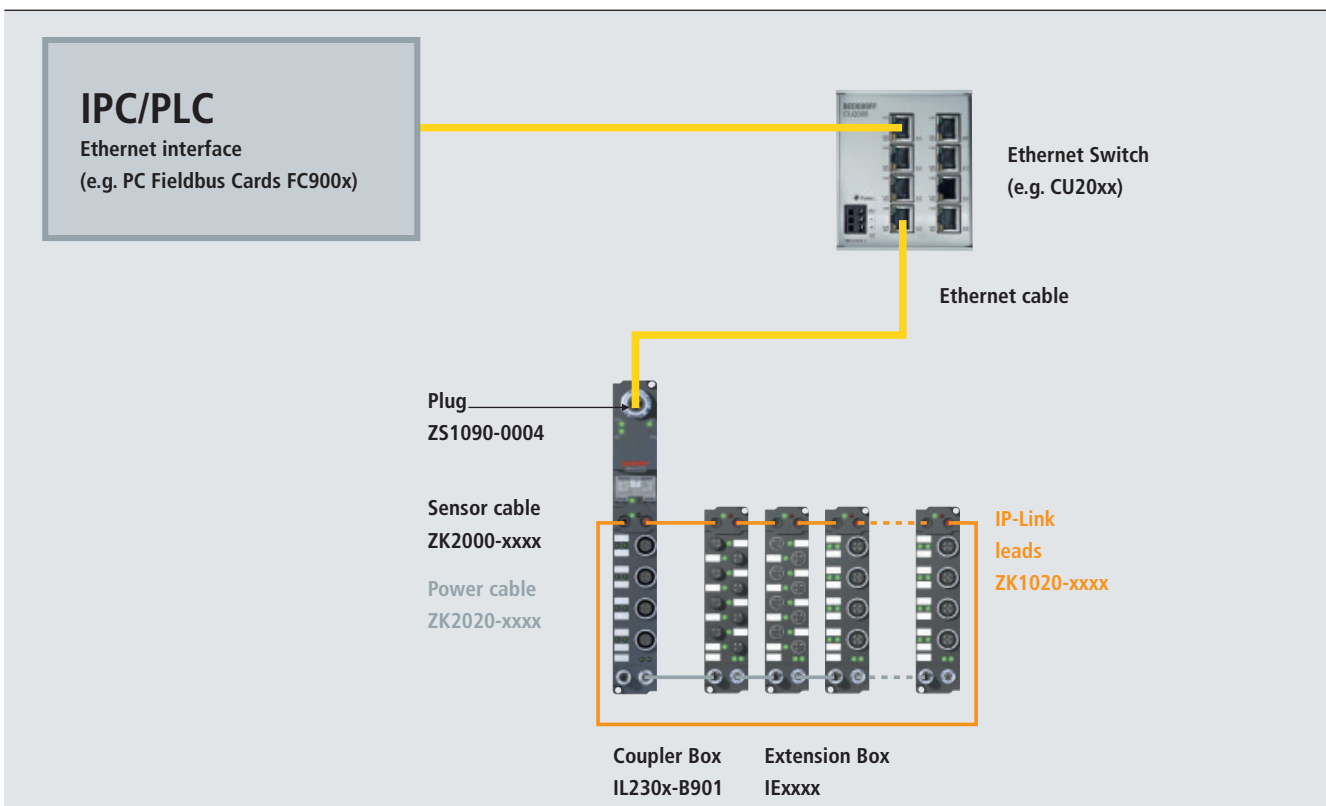


## Coupler Box

The Coupler Box for Ethernet has four digital inputs and four digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

IL230x-B901	Coupler Box for Ethernet systems	Plug	Page
<b>Digital combi</b>			
IL2300-B901	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	8 mm	938
IL2301-B901	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M8	938
IL2302-B901	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M12	938

## System overview



Fieldbus connection  
M12 socket

Fieldbus status display

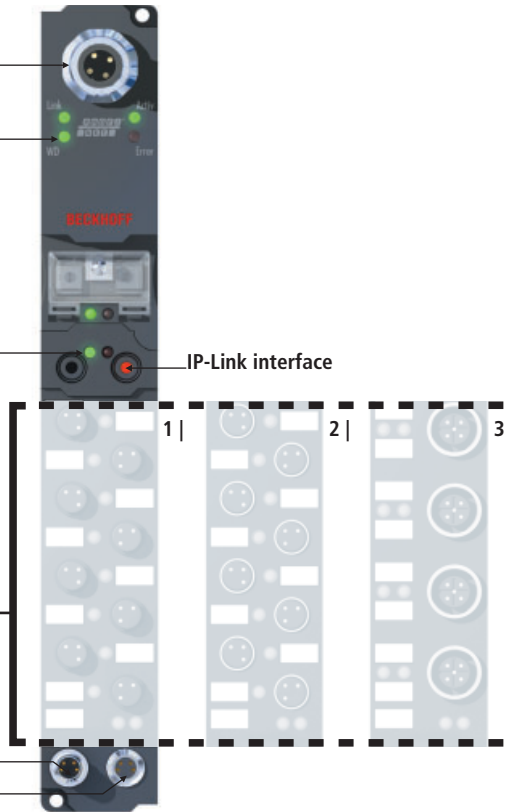
Module or IP-Link  
status display

IP-Link interface

**3 types of connection**

- 1 | 8 mm snap type connector
- 2 | M8 screw type connector
- 3 | M12 screw type connector

Power supply feed  
Power supply downstream  
connection



Coupler Box  
IL230x-B903



Connector  
assignment

## IL230x-B903 | Fieldbus Box modules for PROFINET



PROFINET is the open Industrial Ethernet standard of the PNO (PROFIBUS user organisation). Internationally established IT standards such as TCP/IP are used for communication. PROFINET IO describes data exchange between controllers and field devices. It can be used in standard Ethernet networks and networked via commercially available switches.

The IL230x-B903 Fieldbus Coupler Box connects PROFINET with the modular Extension Box modules. A configuration consists of a Coupler Box and up to 120 different Extension Box modules. The Coupler Box detects automatically the connected extensions and allocates the inputs/outputs to the process image words.

The PROFINET Fieldbus Box supports 10 Mbit/s and

100 Mbit/s PROFINET. The PROFINET connection is established via a d-coded M12 connector. The IP address is set via a rotary switch (offset to a freely selectable start address). In networks with DHCP (a service for the allocation of the logical IP address to the physical node address [MAC-ID]) the Fieldbus Box obtains its IP address from the DHCP server.

**Configuration**

The IP address and other Ethernet parameters are set via two rotary selection switches. Special I/O parameters, for example the type of thermocouple that is used, can be set via KS2000.

**Diagnostics**

The extensive diagnostic functions of the Beckhoff devices

allow rapid fault localisation. Diagnostic messages are transmitted via Ethernet and collected by the master. LEDs on the module indicate the status of the network connection, the device status, the status of the inputs and outputs and of the power supply.

## Coupler Box

The PROFINET Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link optical fibre cable. It detects the connected modules and automatically allocates the input and output data to the process image. The Coupler Box has four digital inputs and four digital outputs; all other signal types are available in the form of an Extension Box.

System data	PROFINET   IL230x-B903
Number of I/O stations	only limited by the IP address range
Number of I/O points	depending on controller
Data transfer medium	2 x 2 twisted pair; CAT 5 (100 Mbaud)
Distance between stations	100 m (between hub/switch and IL230x-B903)
Data transfer rates	10/100 Mbaud
Topology	star over Ethernet hub or Ethernet Switch

Technical data	IL230x-B903
Extension modules	max. 120 with max. 512 byte input and 512 byte output data
Digital peripheral signals	max. 512 inputs and 512 outputs
Analog peripheral signals	max. 127 inputs and 127 outputs
Protocol	PROFINET IO
Configuration possibility	via KS2000
Data transfer rates	10/100 Mbaud, automatic recognition of the transmission rate
Bus interface	1 x M12 socket, 4-pin (d-coded)
Power supply	control voltage: 24 V DC (-15 %/+20 %); load voltage: according to I/O type
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Box supply current	typ. 150 mA + current consumption of sensors, max. 0.5 A
Auxiliary power current	according to I/O type
Electrical isolation	control voltage/fieldbus: no, control voltage/inputs or outputs: according to I/O type
Weight	approx. 250 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IL230x-B903">www.beckhoff.com/IL230x-B903</a>

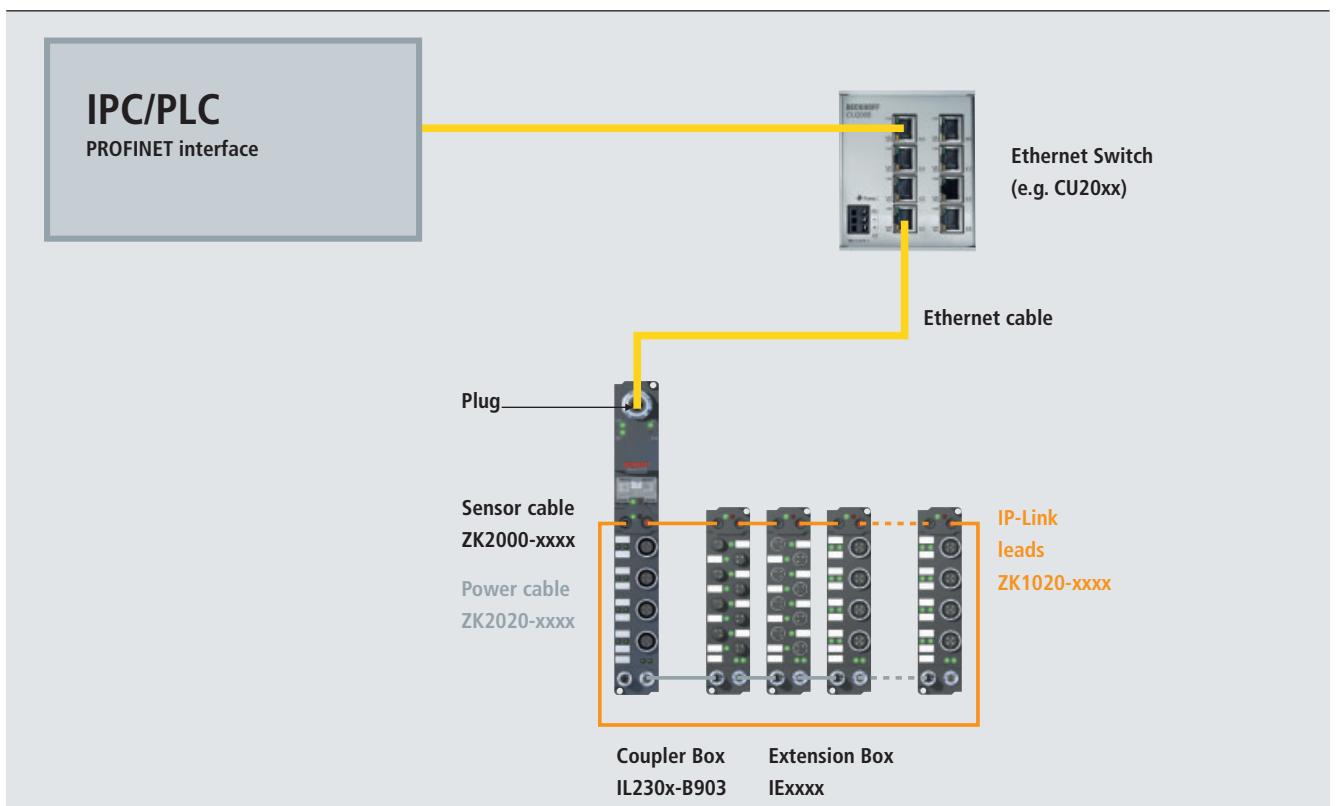
Accessories		
TwinCAT PROFINET IO Controller	licence for using the TwinCAT PROFINET IO Controller	1164
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	987

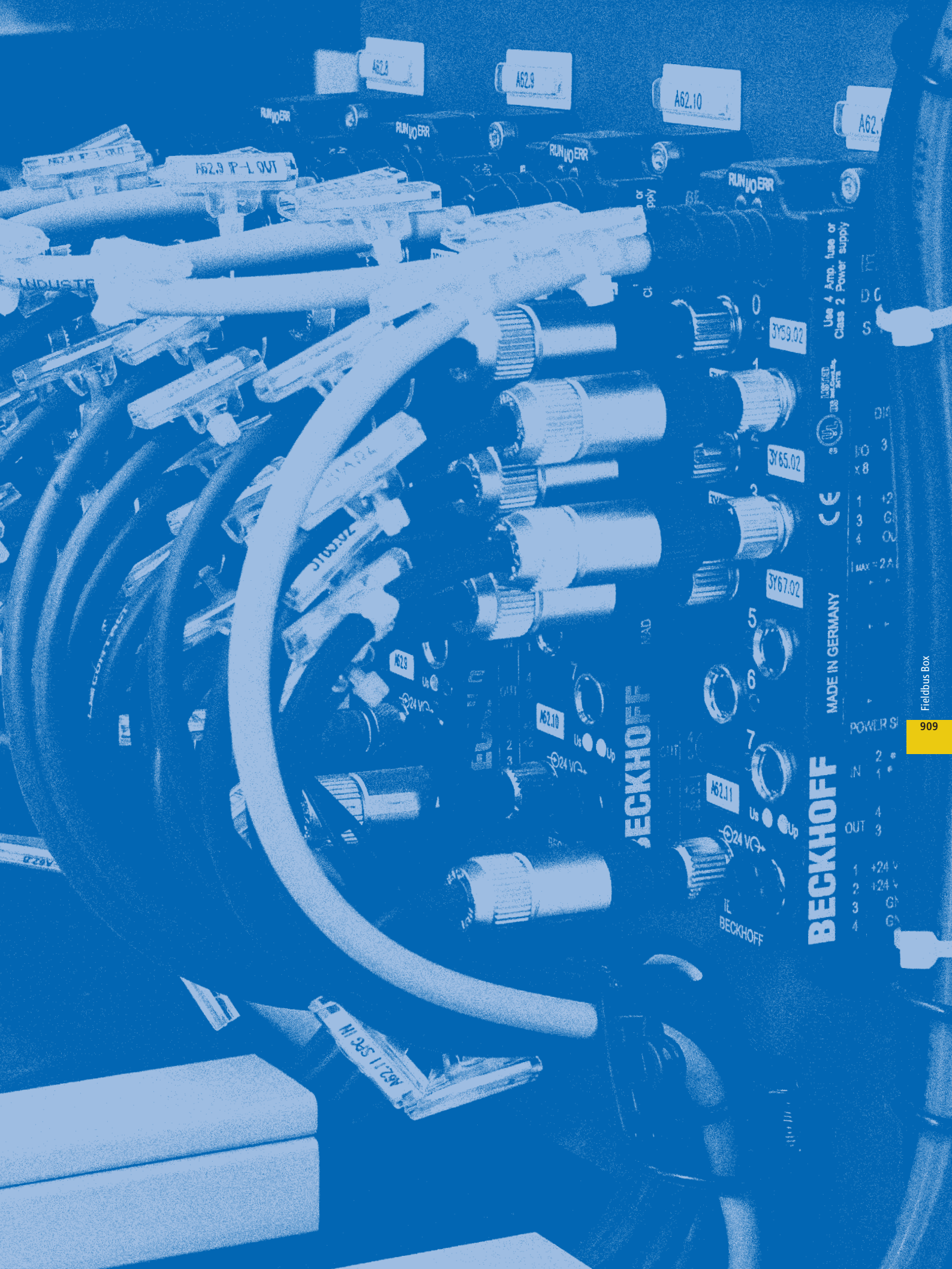
# Coupler Box

The Coupler Box for PROFINET has four digital inputs and four digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or screw type M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

IL230x-B903	Coupler Box for PROFINET systems	Plug	Page
<b>Digital combi</b>			
IL2300-B903	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	8 mm	938
IL2301-B903	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M8	938
IL2302-B903	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M12	938

## System overview





Use 4 Amp. fuse or Class 2 Power supply

IE  
D.C.  
S

10 3  
x 8

1 12  
3 G  
4 O

I max = 2 A

MADE IN GERMANY

**BECKHOFF**

POWER SUPPLY

IN 2 +  
1 \*

OUT 4  
3

1 +24 V  
2 +24 V  
3 G  
4 G

Fieldbus connection  
M12 socket

Fieldbus status display

Module or IP-Link  
status display

IP-Link interface

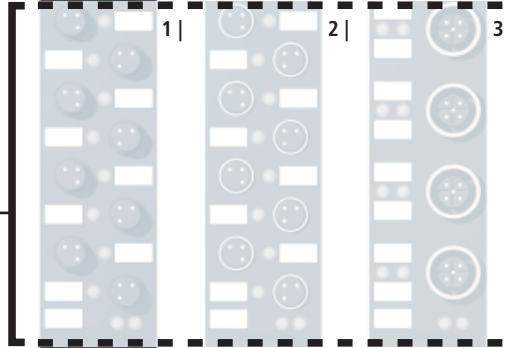
### 3 types of connection

- 1 | 8 mm snap type connector
- 2 | M8 screw type connector
- 3 | M12 screw type connector

Power supply feed  
Power supply downstream  
connection



Coupler Box  
IL230x-B905



1 | Tx+  
2 | Rx+  
3 | Tx-  
4 | Rx-  
Housing | Shield

2 | +24 V DC U<sub>s</sub>  
2 | +24 V DC U<sub>r</sub>  
3 | GND  
4 | GND

Connector  
assignment

Fieldbus Box

## IL230x-B905 | Fieldbus Box modules for EtherNet/IP



EtherNet/IP is the Industrial Ethernet standard of the ODVA (Open DeviceNet Vendor Association). EtherNet/IP is based on Ethernet TCP/IP and UDP/IP; IP stands for Industrial Protocol. Essentially, the CIP (Common Industrial Protocol) used in ControlNet and DeviceNet was ported to Ethernet TCP/IP and UDP/IP.

The IL230x-B905 Fieldbus Coupler Box connects EtherNet/IP with the modular Extension Box modules. A configuration consists of a Coupler Box and up to 120 different Extension Box modules. The Coupler Box automatically detects the connected extensions and allocates the inputs/outputs to the process image words.

The IL230x-B905 EtherNet/IP Coupler Box has a d-coded M12 connection. The IP address is set

via a rotary switch (offset from a freely selectable start address). In networks with DHCP (a service for the allocation of the logical IP address to the physical node address [MAC-ID]), the Fieldbus Box obtains its IP address from the DHCP server.

### Configuration

The IP address and other Ethernet parameters are set via two rotary selection switches. Special I/O parameters, for example the type of thermocouple that is used, can be set via KS2000.

### Diagnostics

The extensive diagnostic functions of the Beckhoff devices allow rapid fault localisation. Diagnostic messages are transmitted via Ethernet and collected by the master. LEDs on the

module indicate the status of the network connection, the device status, the status of the inputs and outputs and of the power supply.

## Coupler Box

The EtherNet/IP Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link optical fibre cable. It detects the connected modules and automatically allocates the input and output data to the process image.

The Coupler Box has four digital inputs and four digital outputs; all other signal types are available in the form of an Extension Box.

System data	EtherNet/IP   IL230x-B905
Number of I/O stations	only limited by the IP address range
Number of I/O points	depending on controller
Data transfer medium	2 x 2 twisted pair; CAT 5 (100 Mbaud)
Distance between stations	100 m (between hub/switch and IL230x-B905)
Data transfer rates	10/100 Mbaud, auto baud
Topology	star over Ethernet hub or Ethernet Switch

Technical data	IL230x-B905
Extension modules	max. 120 with max. 512 byte input and 512 byte output data
Digital peripheral signals	max. 512 inputs and 512 outputs
Analog peripheral signals	max. 127 inputs and 127 outputs
Protocol	EtherNet/IP
Configuration possibility	via KS2000
Data transfer rates	10/100 Mbaud, automatic recognition of the transmission rate
Bus interface	1 x M12 socket, 4-pin (d-coded)
Power supply	control voltage: 24 V DC (-15 %/+20 %); load voltage: according to I/O type
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Box supply current	typ. 150 mA + current consumption of sensors, max. 0.5 A
Auxiliary power current	according to I/O type
Electrical isolation	control voltage/fieldbus: no, control voltage/inputs or outputs: according to I/O type
Weight	approx. 250 g
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IL230x-B905">www.beckhoff.com/IL230x-B905</a>

Accessories		
KS2000	configuration software for extended parameterisation	1064
Cordsets	cordsets and connectors	987

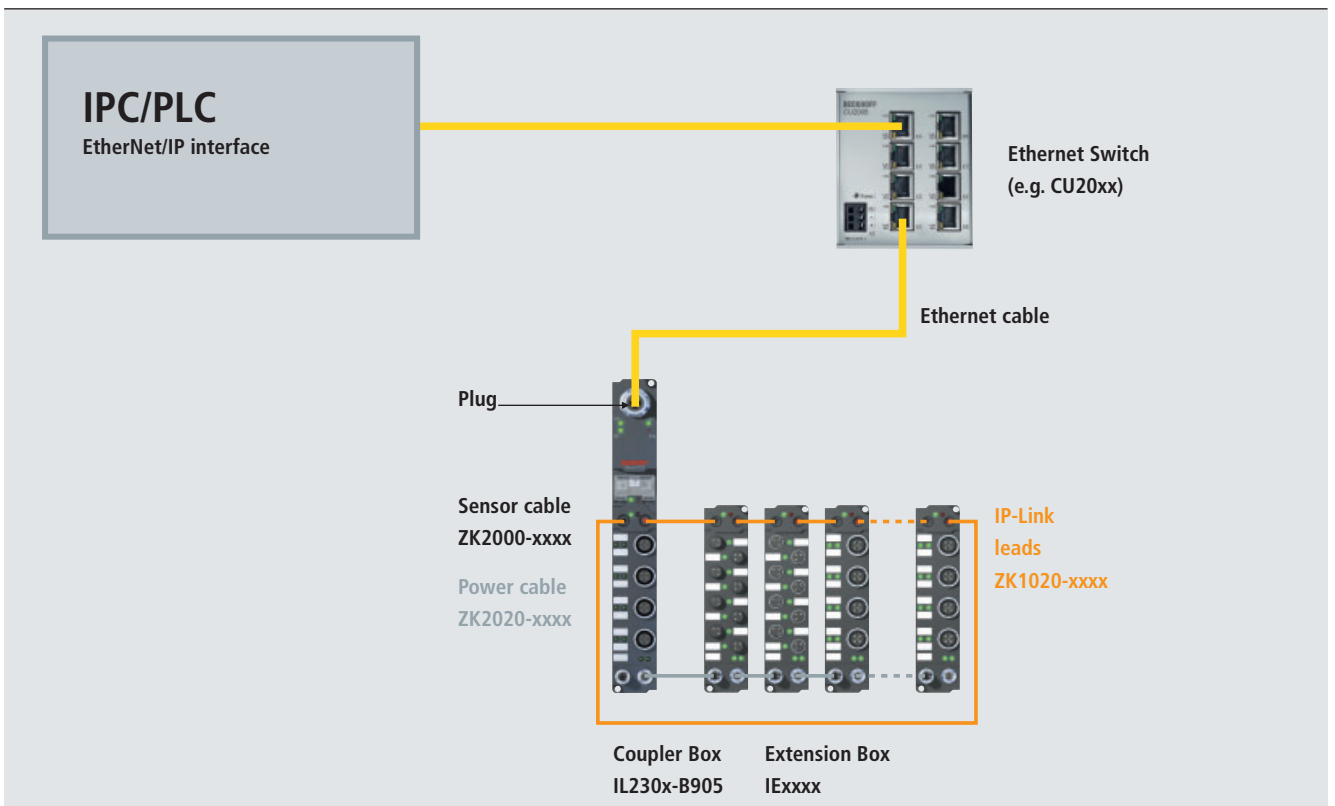


# Coupler Box

The Coupler Box for EtherNet/IP has four digital inputs and four digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or screw type M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

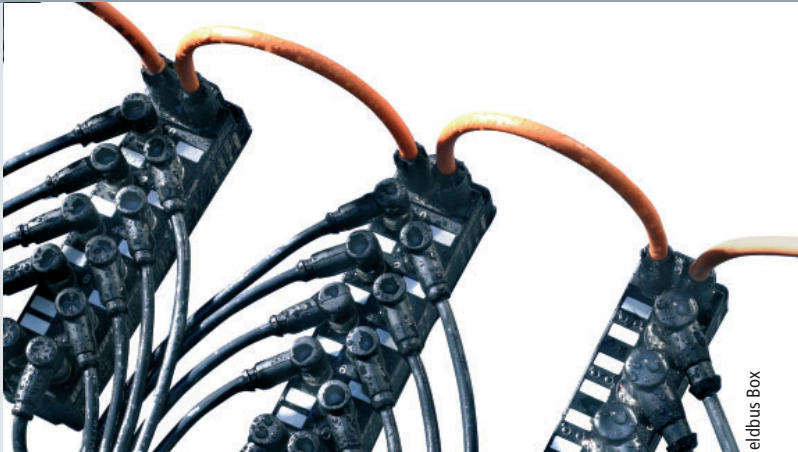
IL230x-B905	Coupler Box for EtherNet/IP systems	Plug	Page
<b>Digital combi</b>			
IL2300-B905	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	8 mm	938
IL2301-B905	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M8	938
IL2302-B905	Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A	M12	938

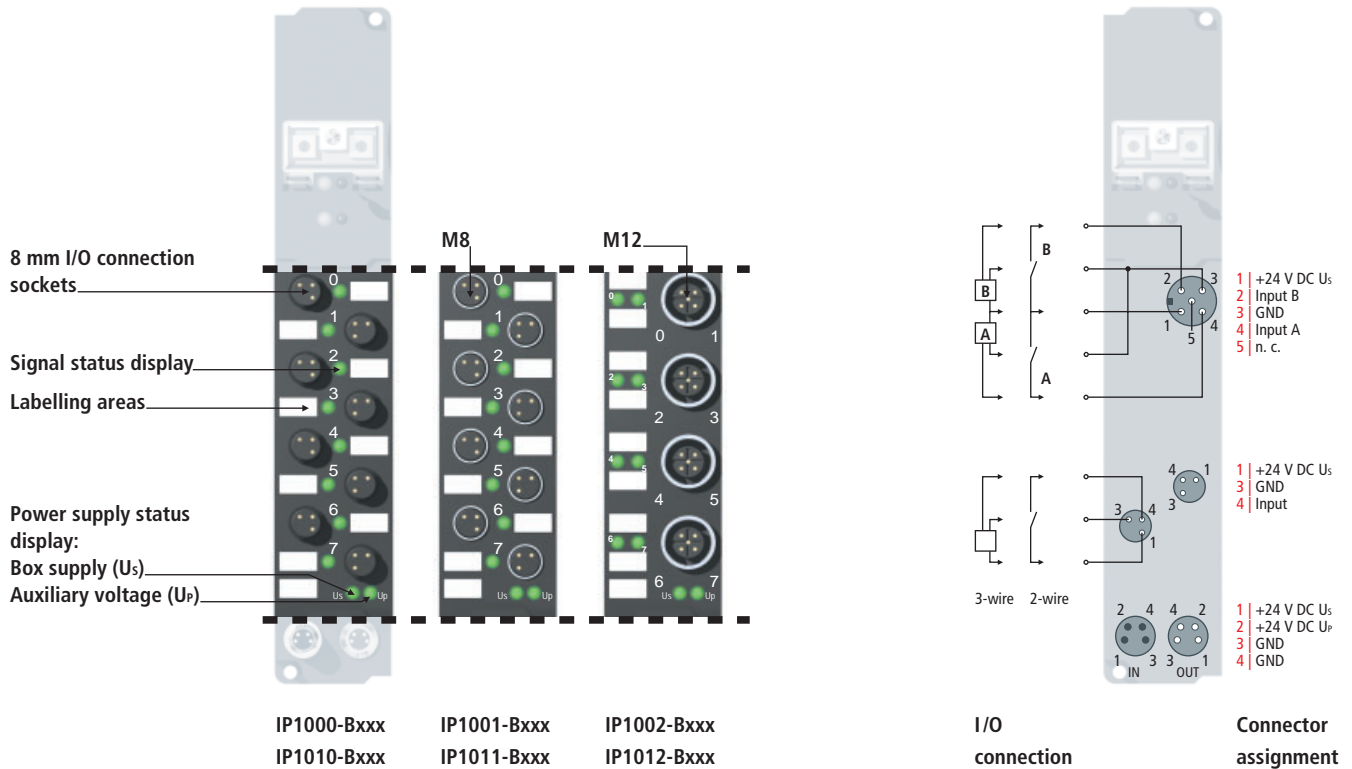
## System overview



# Fieldbus Box | Signal types Compact Box

	RS232
PWM	Analog I / O
Digital I / O	PT100
SSI	SIN/COS



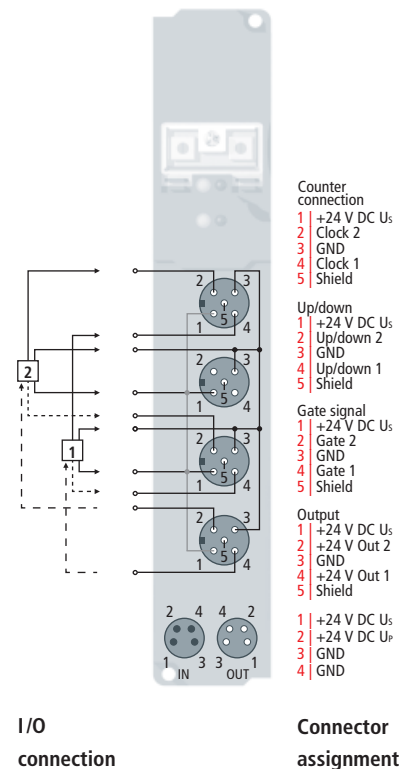
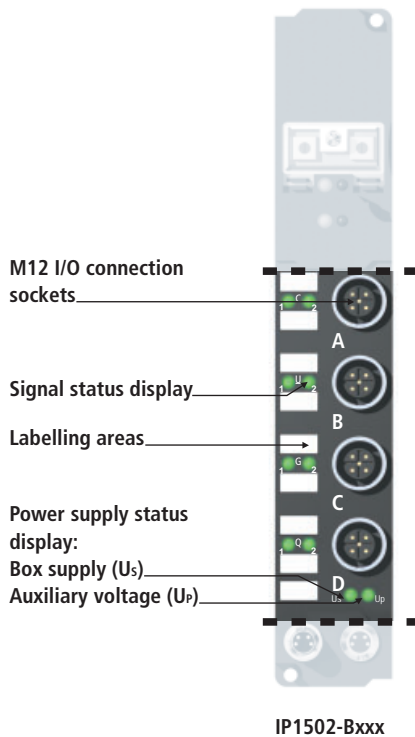


## IP100x-, IP101x-Bxxx | 8-channel digital input 24 V DC

The IP10xx digital input modules acquire the binary control signals from the process level and transmit them to the higher-level automation unit. The state of the signals is indicated by light emitting diodes. The signals are optionally connected via 8 mm snap type (IP1000, IP1010), M8 (IP1001, IP1011) or M12 (IP1002, IP1012) screw type connectors. These versions are also distinguished by input filters of different speeds.

The sensors are supplied from the box supply voltage U<sub>S</sub>. The auxiliary voltage U<sub>P</sub> is not used in the input module, but may be connected in order to be relayed downstream.

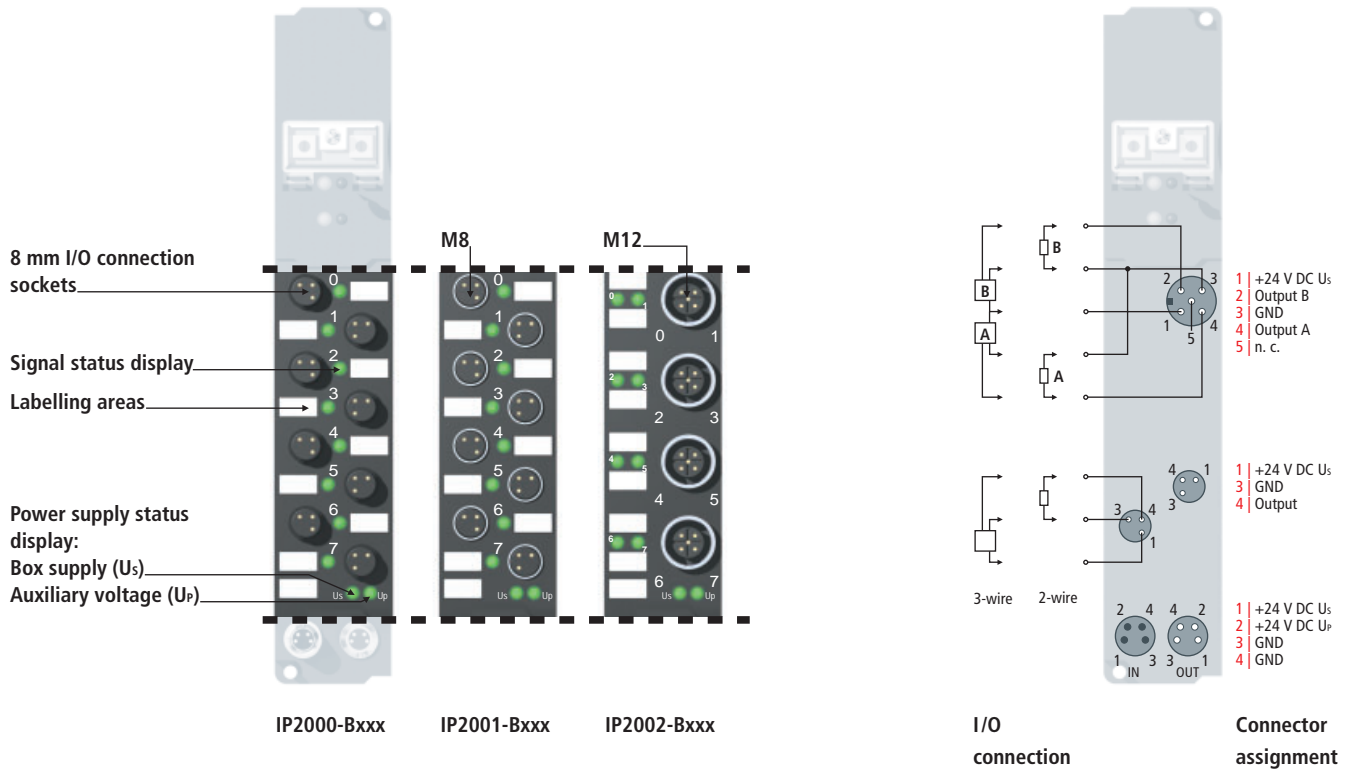
Technical data	IP1000-Bxxx	IP1001-Bxxx	IP1002-Bxxx	IP1010-Bxxx	IP1011-Bxxx	IP1012-Bxxx
Number of inputs	8					
Input connections	8 mm, snap type	M8, screw type	M12, screw type	8 mm, snap type	M8, screw type	M12, screw type
Nominal input voltage	24 V DC (-15 %/+20 %)					
Input filter	3.0 ms	3.0 ms	3.0 ms	0.2 ms	0.2 ms	0.2 ms
"0" signal voltage	-3...+5 V (EN 61131-2, type 2)					
"1" signal voltage	11...30 V (EN 61131-2, type 2)					
Input current	typ. 6 mA (EN 61131-2, type 2)					
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof					
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin					
Bit width in the process image	8 inputs					
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: depends on the bus system					
Operating/storage temperature	0...+55 °C/-25...+85 °C					
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29					
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4					
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable					
Further information	www.beckhoff.com/IP1000-Bxxx					



## IP1502-Bxxx | 2-channel up/down counter 24 V DC, 100 kHz

The counter module has two fast counters running at up to 100 kHz. It counts binary pulses, and transmits the counter state to the higher-level automation unit. The up/down input allows the counters to be switched between upwards and downwards counting (in 32 bits). The gate signals (gate inputs) allow the counters to be triggered: depending on the level at the gate input, the counting function is halted or enabled. The outputs can be switched according to the counter state and therefore be used as fast control signals for field devices. From the controller it is possible to set the counter state, to start or halt the counter function, and to set the outputs. The module shows the states of the input and output signals by means of light emitting diodes.

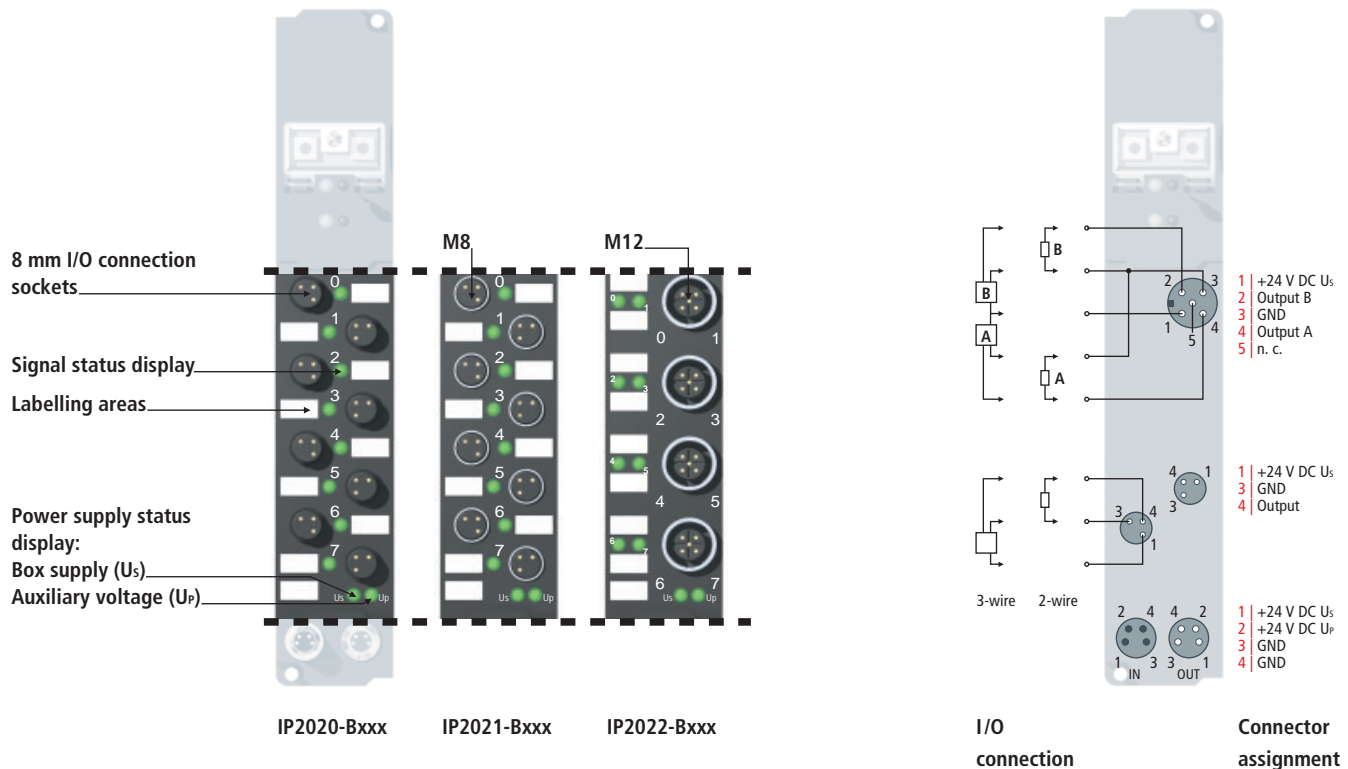
Technical data	IP1502-Bxxx
Number of counters	2, each with a depth of 32 bits
Counting frequency	100 kHz (2 kHz for switching between up and down)
Signal connection	M12, screw type
Number of inputs	2 counter inputs + 2 gate inputs + 2 up/down switches
Nominal input voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V (EN 61131-2, type 2)
"1" signal voltage	11...30 V (EN 61131-2, type 2)
Number of outputs	2 x 24 V DC, 0.5 A, individually short-circuit-proof
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	80 inputs/outputs: 2 x 32 bit data (2 x 8 bit control/status)
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: depends on the bus system
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	www.beckhoff.com/IP1502-Bxxx



## IP200x-Bxxx | 8-channel digital output 24 V DC, I<sub>MAX</sub> = 0.5 A

The IP200x digital output modules connect the binary control signals from the automation unit on to the actuators at the process level. The eight outputs handle load currents of up to 0.5 A and indicate their status through light emitting diodes. The signals are optionally connected via 8 mm snap type (IP2000), M8 (IP2001) or M12 (IP2002) screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.

Technical data	IP2000-Bxxx	IP2001-Bxxx	IP2002-Bxxx
Number of outputs	8		
Output connections	8 mm, snap type	M8, screw type	M12, screw type
Load type	ohmic, inductive, lamp load		
Max. output current	max. 0.5 A on each channel, individually short-circuit safe		
Short circuit current	typ. 1.5 A		
Auxiliary power current	typ. 20 mA per channel		
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin		
Bit width in the process image	8 outputs		
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: depends on the bus system		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable		
Further information	www.beckhoff.com/IP2000-Bxxx		

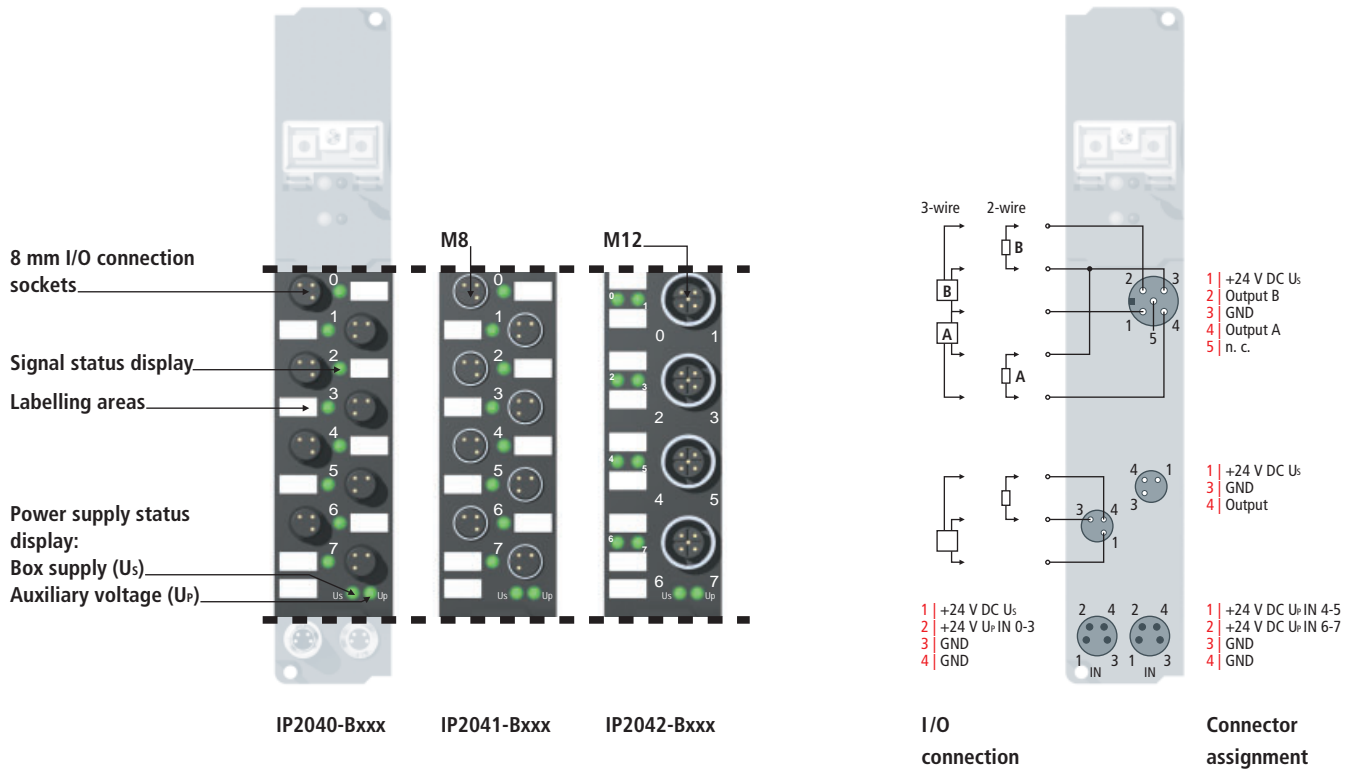


## IP202x-Bxxx | 8-channel digital output 24 V DC, $I_{MAX} = 2 \text{ A}$ ( $\sum 4 \text{ A}$ )

The IP202x digital output modules connect the binary control signals from the automation unit on to the actuators at the process level. The eight outputs handle load currents of up to 2 A each, although the total current is limited to 4 A. This makes these modules particularly suitable for applications in which not all of the outputs are active at the same time or in which not all of the actuators draw 2 A signal current.

The signal state is indicated by means of light emitting diodes. The signals are optionally connected via 8 mm snap type (IP2020), M8 (IP2021) or M12 (IP2022) screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.

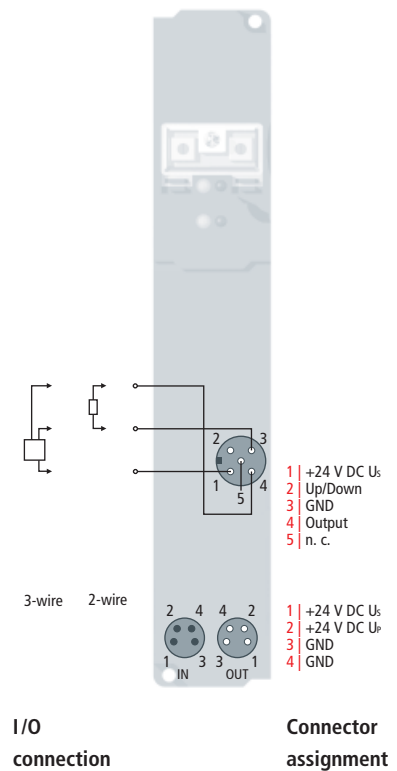
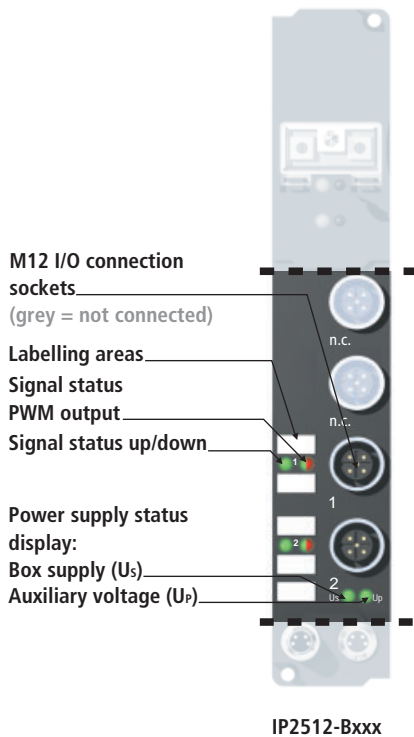
Technical data	IP2020-Bxxx	IP2021-Bxxx	IP2022-Bxxx
Number of outputs	8		
Output connections	8 mm, snap type	M8, screw type	M12, screw type
Load type	ohmic, inductive, lamp load		
Nominal output voltage	24 V DC (-15 %/+20 %)		
Max. output current	2 A each channel, individually short-circuit safe, total current max. 4 A		
Short circuit current	max. 4 A		
Auxiliary power current	typ. 30 mA per channel		
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin		
Bit width in the process image	8 outputs		
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: depends on the bus system		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable		
Further information	www.beckhoff.com/IP2020-Bxxx		



## IP204x-Bxxx | 8-channel digital output 24 V DC, I<sub>MAX</sub> = 2 A (Σ 12 A)

The IP204x digital output modules connect the binary control signals from the automation unit on to the actuators at the process level. The eight outputs handle load currents of up to 2 A each, although the total current is limited to 12 A. The outputs are supplied by three load circuits; for this reason these modules do not relay the supply voltage. The signal state is indicated by means of light emitting diodes. The signals are optionally connected via 8 mm snap type (IP2040), M8 (IP2041) or M12 (IP2042) screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.

Technical data	IP2040-Bxxx	IP2041-Bxxx	IP2042-Bxxx
Number of outputs	8		
Output connections	8 mm, snap type	M8, screw type	M12, screw type
Load type	ohmic, inductive, lamp load		
Nominal output voltage	24 V DC (-15 %/+20 %)		
Max. output current	2 A each channel, individ. short-circuit-proof, total current max. 12 A (channel 0...3: Σ 4 A, 4+5: Σ 4 A, 6+7: Σ 4 A)		
Short circuit current	typ. 4 A		
Auxiliary power current	typ. 50 mA per channel		
Power supply connection	feed: 2 x M8 male socket, 4-pin; no downstream connection		
Bit width in the process image	8 outputs		
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: depends on the bus system		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable		
Further information	www.beckhoff.com/IP2040-Bxxx		

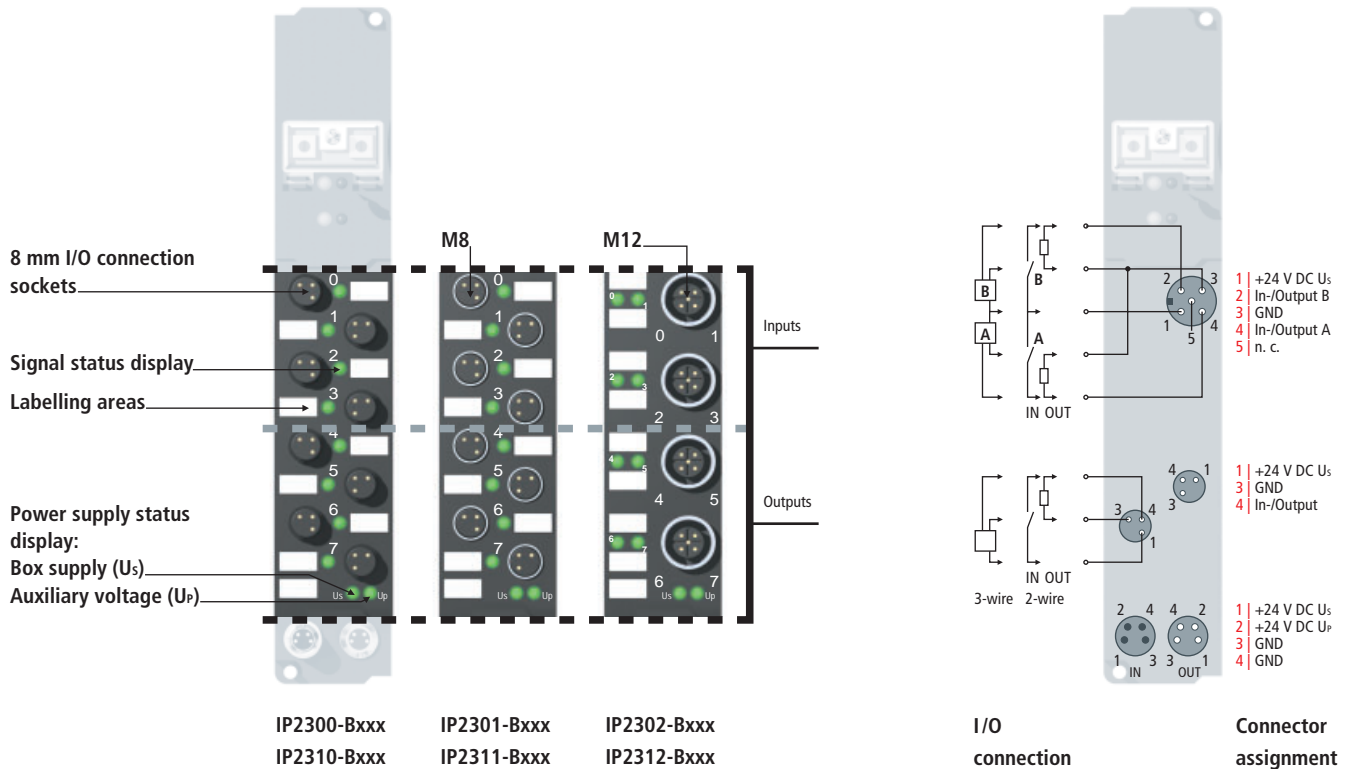


## IP2512-Bxxx | 2-channel pulse width output 24 V DC

The outputs of the IP2512 module provide a pulse width modulated version of a binary signal. The keying ratio is prescribed by a 16 bit value from the automation unit. The output is protected against overload and short circuit. In addition to the PWM operating mode, the outputs can also be frequency modulated or used to control stepper motors with specified pulses and direction. The module contains two channels that indicate their state by means of light emitting diodes. The LEDs are driven in time with the outputs and show the keying ratio by their brightness.

Technical data	IP2512-Bxxx
Number of outputs	2
Output connections	M12, screw type
Load type	ohmic, inductive
Nominal output voltage	24 V DC (-15 %/+20 %)
Max. output current	2.5 A on each channel, individually short-circuit-proof
Up/down channel	24 V DC, 0.5 A, short-circuit-proof
Base frequency	8 Hz...80 kHz, Default: 250 Hz
Duty factor	0...100 % ( $T_{ON} > 750$ ns, $T_{OFF} > 500$ ns)
Resolution	max. 10 bits
Freewheeling diode (output)	yes
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	48 inputs/outputs: 2 x 16 bit data + 2 x 8 bit status
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: depends on the bus system
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	www.beckhoff.com/IP2512-Bxxx

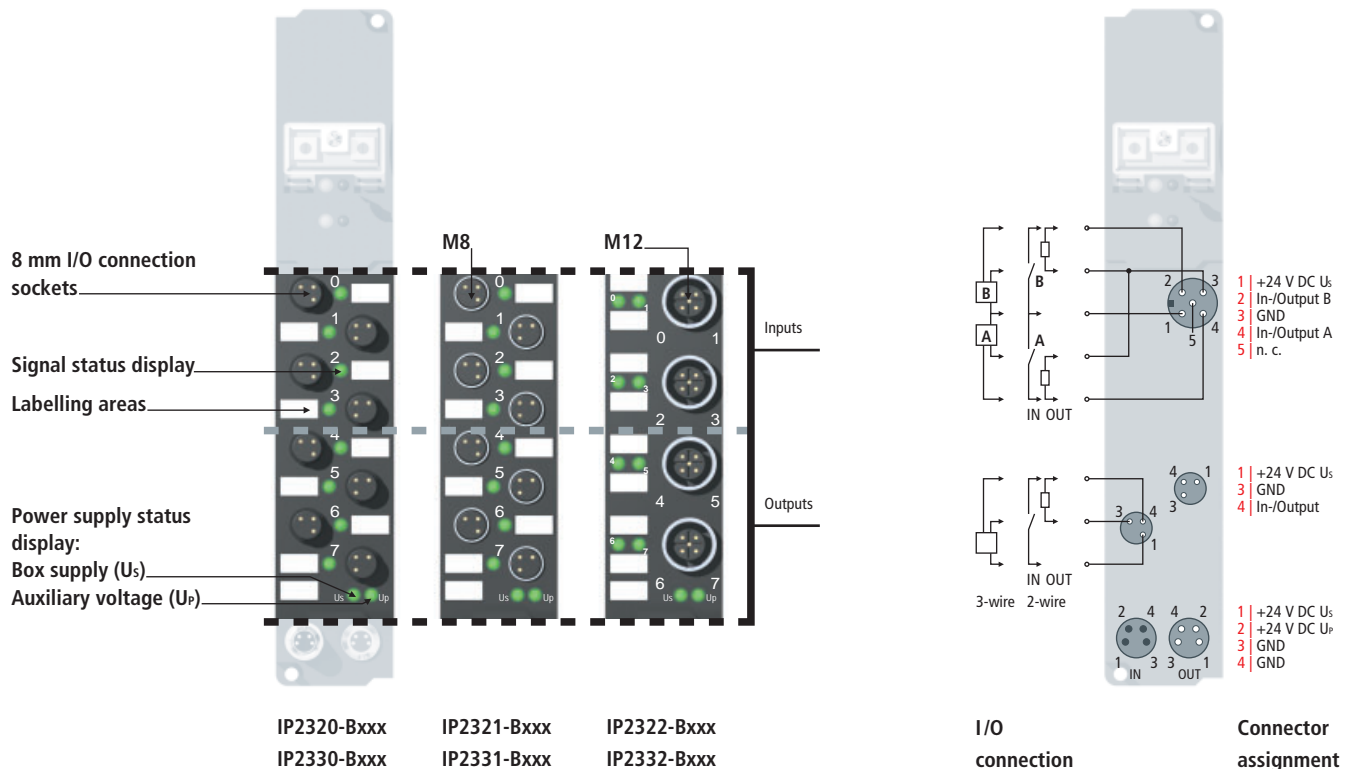




# IP230x-, IP231x-Bxxx | 4 x digital input + 4 x digital output 24 V DC, I<sub>MAX</sub> = 0.5 A

The IP23xx digital I/O modules combine four digital inputs and four digital outputs in one device. Various filter constants are available for the inputs. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The state of each signal is indicated by means of light emitting diodes. The signals are connected optionally via 8 mm snap type (IP2300, IP2310), M8 (IP2301, IP2311) or M12 (IP2302, IP2312) screw type connectors.

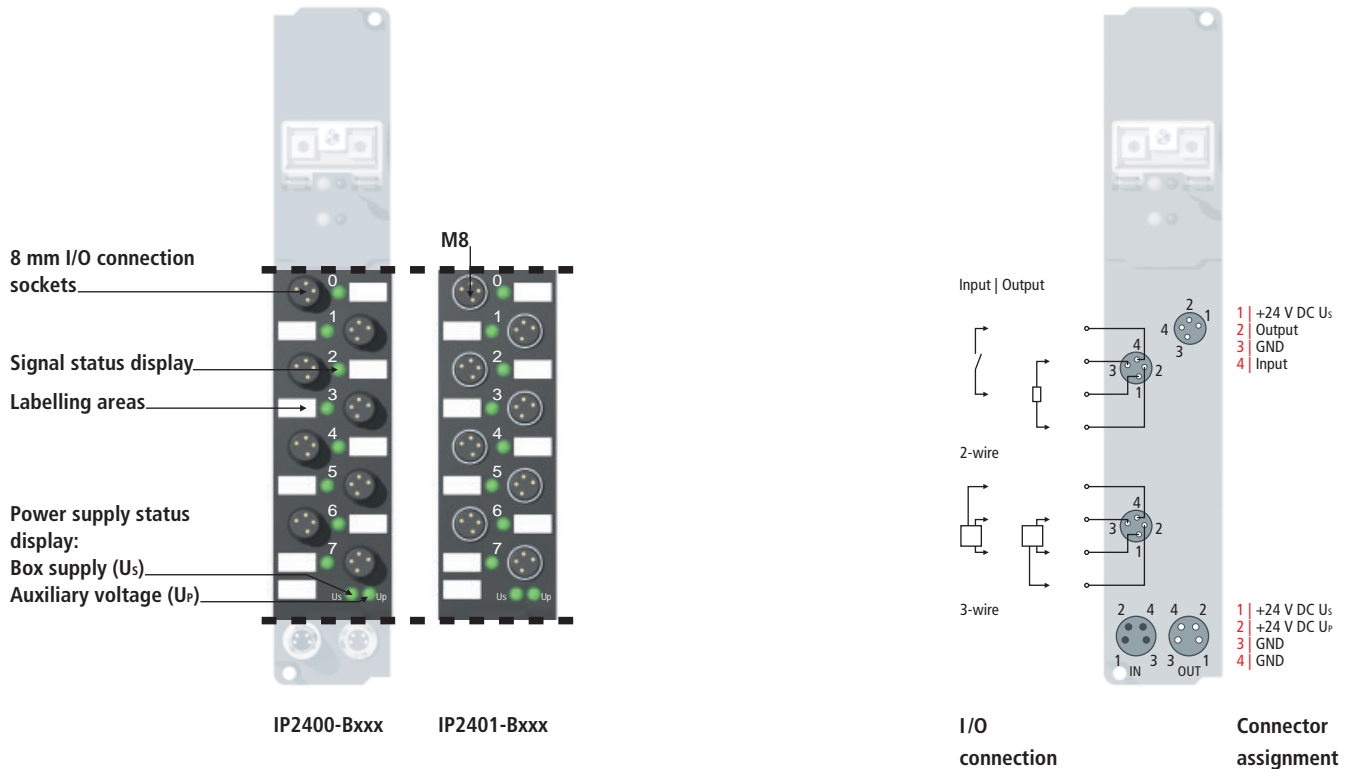
Technical data	IP2300-Bxxx	IP2301-Bxxx	IP2302-Bxxx	IP2310-Bxxx	IP2311-Bxxx	IP2312-Bxxx
Number of channels	4 inputs + 4 outputs					
Input/output connections	8 mm, snap type	M8, screw type	M12, screw type	8 mm, snap type	M8, screw type	M12, screw type
Input filter	3.0 ms	3.0 ms	3.0 ms	0.2 ms	0.2 ms	0.2 ms
"0" signal voltage	-3...+5 V					
"1" signal voltage	11...30 V, 6 mA input current (EN 61131-2, type 2)					
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof					
Load type	ohmic, inductive, lamp load					
Rated load voltage	24 V DC (-15 %/+20 %)					
Max. output current	0.5 A on each channel, individually short-circuit-proof					
Short circuit current	typ. 1.5 A					
Auxiliary power current	typ. 20 mA per channel					
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin					
Bit width in the process image	4 inputs + 4 outputs					
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: depends on the bus system					
Operating/storage temperature	0...+55 °C/-25...+85 °C					
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29					
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4					
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable					
Further information	www.beckhoff.com/IP2300-Bxxx					



## IP232x-, IP233x-Bxxx | 4 x digital input + 4 x digital output 24 V DC, $I_{MAX} = 2 A$

The IP23xx digital I/O modules combine four digital inputs and four digital outputs in one device. Various filter constants are available for the inputs. The outputs handle load currents of up to 2 A, are short-circuit-proof and protected against inverse polarity. The total current for all four outputs is limited to 4 A. This makes these modules particularly suitable for applications in which not all of the outputs are active at the same time or in which not all of the actuators draw 2 A signal current. The state of each signal is indicated by means of light emitting diodes. The signals are connected optionally via 8 mm snap type (IP2320, IP2330), M8 (IP2321, IP2331) or M12 (IP2322, IP2332) screw type connectors.

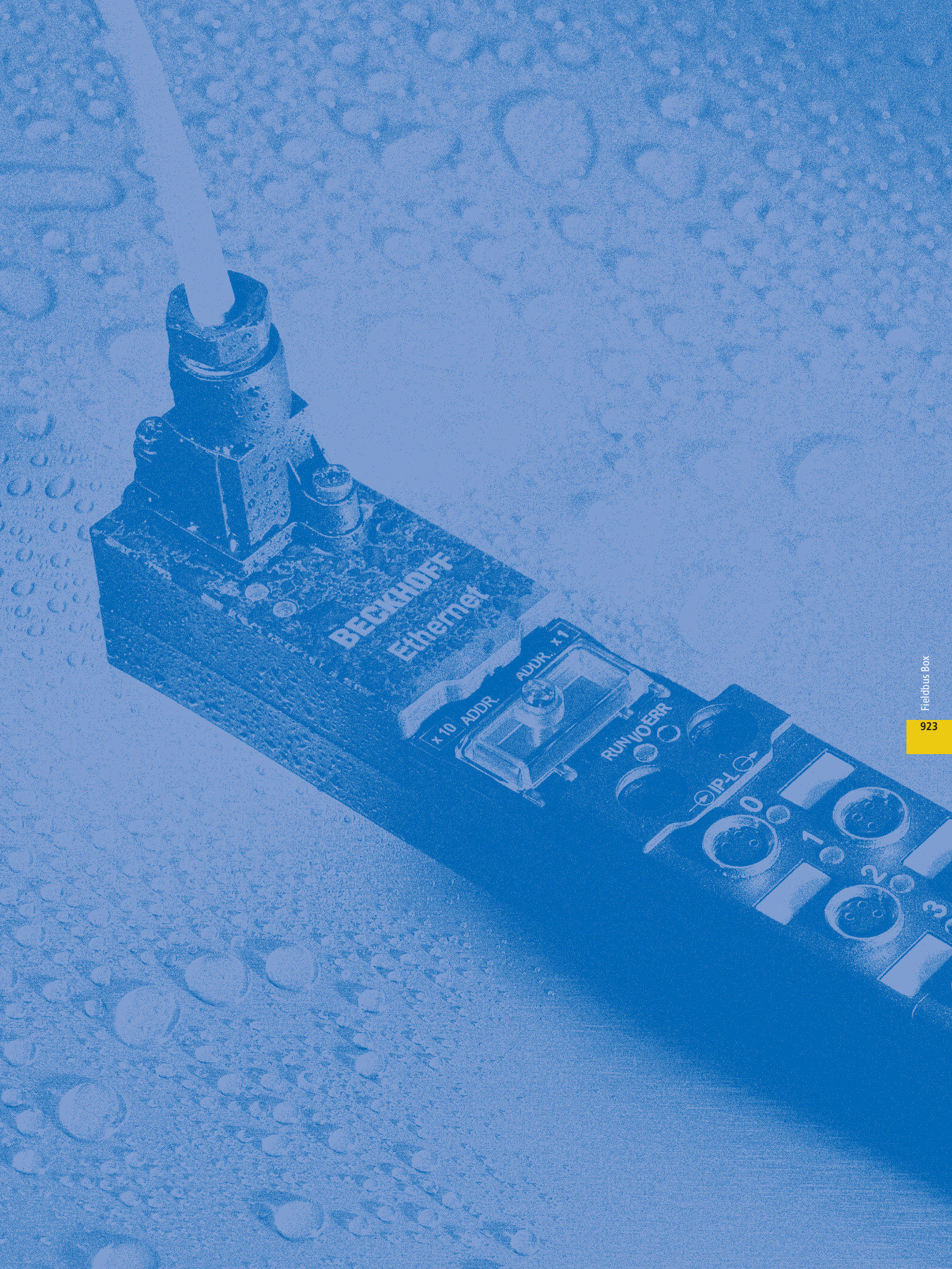
Technical data	IP2320-Bxxx	IP2321-Bxxx	IP2322-Bxxx	IP2330-Bxxx	IP2331-Bxxx	IP2332-Bxxx
Number of channels	4 inputs + 4 outputs					
Input/output connections	8 mm, snap type	M8, screw type	M12, screw type	8 mm, snap type	M8, screw type	M12, screw type
Input filter	3.0 ms	3.0 ms	3.0 ms	0.2 ms	0.2 ms	0.2 ms
"0" signal voltage	-3...+5 V					
"1" signal voltage	11...30 V, 6 mA input current (EN 61131-2, type 2)					
Actuator/sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof					
Load type	ohmic, inductive, lamp load					
Rated load voltage	24 V DC (-15 %/+20 %)					
Max. output current	2 A each channel, individually short-circuit safe, total current max. 4 A					
Short circuit current	typ. 4 A					
Auxiliary power current	typ. 30 mA per channel					
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin					
Bit width in the process image	4 inputs + 4 outputs					
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: depends on the bus system					
Operating/storage temperature	0...+55 °C/-25...+85 °C					
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29					
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4					
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable					
Further information	www.beckhoff.com/IP2320-Bxxx					

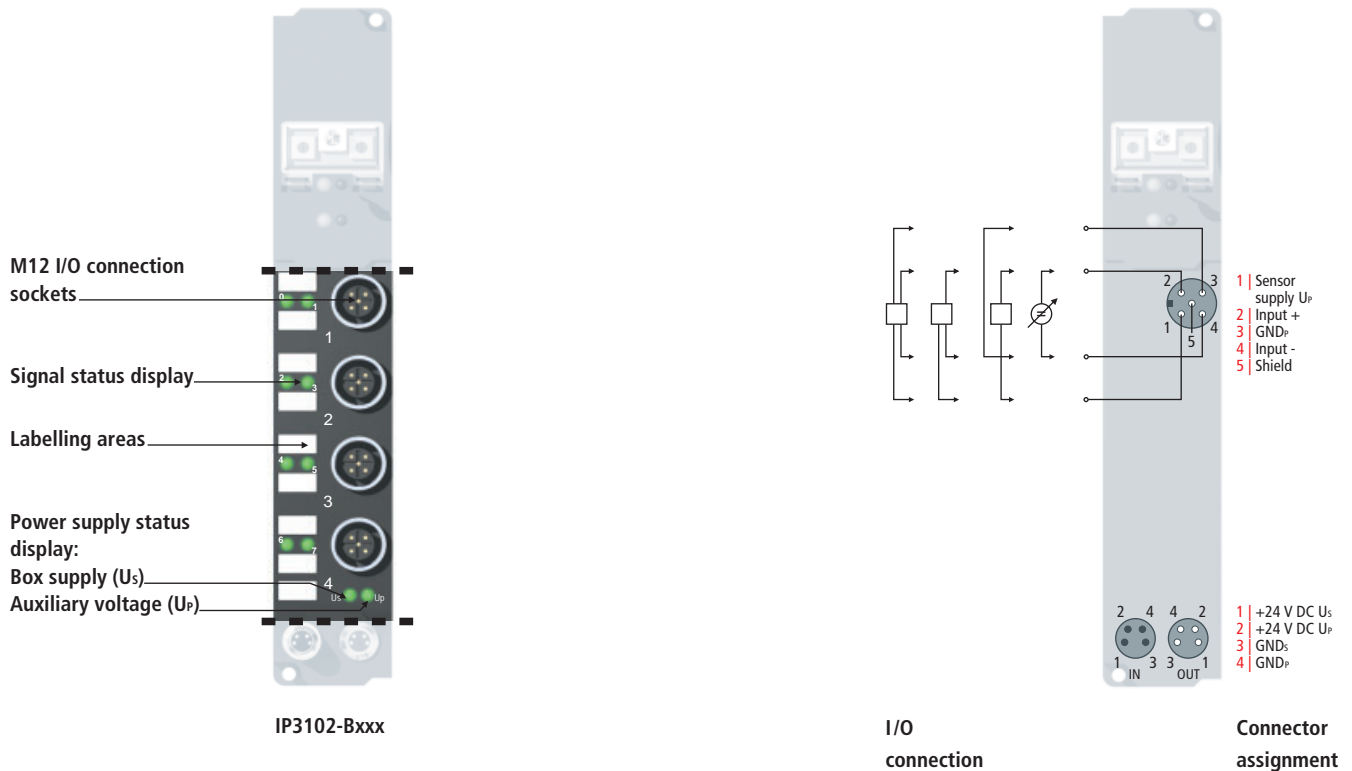


## IP240x-Bxxx | 16-channel digital combi input/output 24 V DC, $I_{MAX} = 0.5 A$

The IP240x digital I/O modules have sixteen channels that can be used as eight inputs and eight outputs. The device can therefore be flexibly adapted to the requirements of the application. The signals are connected optionally through 8 mm snap type connectors (IP2400) or through connector M8 screw type (IP2401), both of which have four pins (with separate input and output pins). This makes it possible to connect anti-valent sensors. Adapter cables are available for use in input-only or output-only cases, as well as connectors for field wireable. It is also possible to use the power supply cable directly as the sensor cable. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The state of each signal is indicated by means of light emitting diodes.

Technical data	IP2400-Bxxx	IP2401-Bxxx
Number of channels	16 channels, useable optionally as input and output	
Input/output connections	8 mm, snap type	M8, screw type
Input filter	3.0 ms	
"0" signal voltage	-3...+5 V	
"1" signal voltage	11...30 V, 6 mA input current (EN 61131-2, type 2)	
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof	
Load type	ohmic, inductive, lamp load	
Rated load voltage	24 V DC (-15 %/+20 %)	
Max. output current	0.5 A on each channel, individually short-circuit-proof	
Short circuit current	typ. 1.5 A	
Auxiliary power current	typ. 20 mA per channel	
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin	
Bit width in the process image	8 inputs + 8 outputs	
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: depends on the bus system	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Further information	www.beckhoff.com/IP2400-Bxxx	



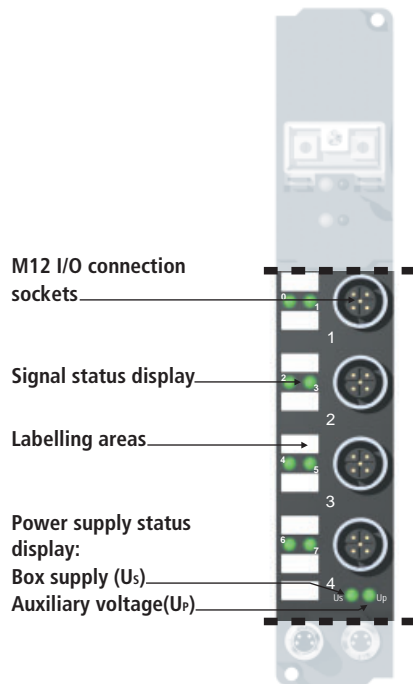


## IP3102-Bxxx | 4-channel analog input $\pm 10$ V

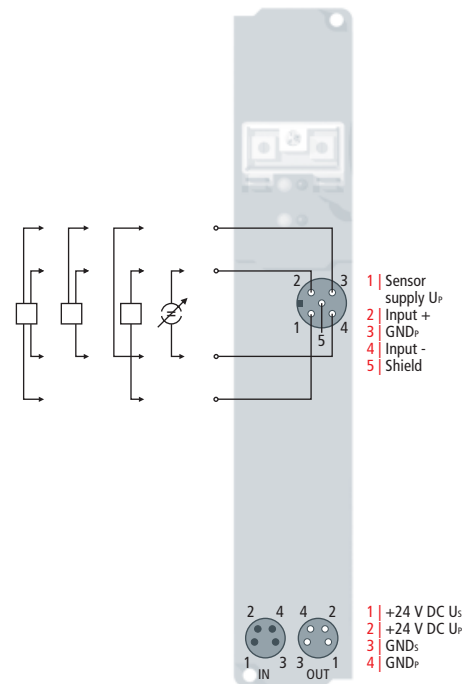
The IP3102 analog input module handles signals in the range from -10 to +10 V. The voltage is digitised to a resolution of 16 bits and transmitted, electrically isolated, to the higher-level automation device. The four input channels have differential inputs and possess a common, internal ground potential. The applied auxiliary voltage (which can be any value up to 30 V DC) is fed through to supply the sensor. It is thus possible, for instance, to supply a measuring potentiometer with 10 V DC from an external voltage source.

The module is quite versatile, but default settings have been selected in such a way that in most cases it is not necessary to perform configuration. The input filter and associated conversion times can be set within a wide range; several data output formats may be chosen. If required, the inputs can be scaled differently. Automatic limit monitoring is also available. Parameterisation may be carried out either via the fieldbus or using the KS2000 software tool.

Technical data	IP3102-Bxxx
Number of inputs	4
Input connections	M12, screw type
Signal voltage	-10/0...+10 V
Internal resistance	> 100 k $\Omega$
Common-mode voltage U <sub>CM</sub>	35 V max.
Resolution	16 bits (for 0...10 V range: resolution 15 bits)
Conversion time	250 ms, configurable to 5 ms
Measuring error	< $\pm 0.3$ % (relative to full scale value)
Input filter	configurable
Sensor supply	from load supply voltage U <sub>P</sub> , DC, any value up to 30 V
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input: 4 x 16 bit data, optional: 4 x 8 bit control/status
Electrical isolation	channels/control voltage: 500 V <sub>rms</sub> , between the channels: no, control voltage/fieldbus: depends on the bus system
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IP3102-Bxxx">www.beckhoff.com/IP3102-Bxxx</a>



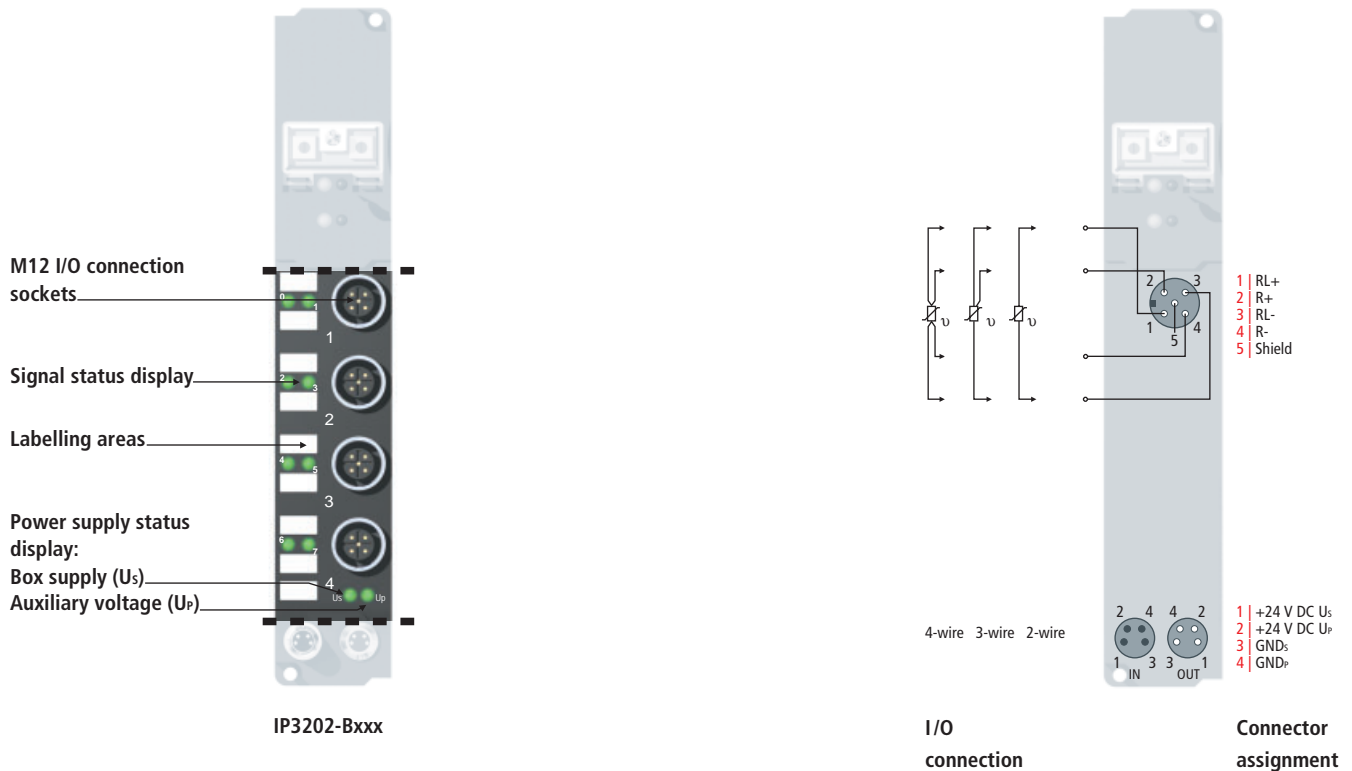
IP3112-Bxxx

I/O  
connectionConnector  
assignment

## IP3112-Bxxx | 4-channel analog input 0/4...20 mA

The IP3112 analog input module handles signals in the range from 0/4 to 20 mA. The input current is digitised to a resolution of 16 bits (the default is 15 bits) and is transmitted, electrically isolated, to the higher-level automation device. The four input channels have differential inputs and possess a common, internal ground potential. The applied auxiliary voltage (which can be any value up to 30 V DC) is fed through to supply the sensor. The module is quite versatile, but default settings have been selected in such a way that in most cases it is not necessary to perform configuration. The input filter and associated conversion times can be set within a wide range; several data output formats may be chosen. If required, the inputs can be scaled differently. Automatic limit monitoring is also available. Parameterisation may be carried out either via the fieldbus or, using the KS2000 software tool, through the configuration interface. The parameters are stored in the module.

Technical data	IP3112-Bxxx
Number of inputs	4
Input connections	M12, screw type
Signal voltage	0/4...20 mA
Internal resistance	80 $\Omega$ measuring shunt
Common-mode voltage $U_{CM}$	35 V max.
Resolution	16 bits
Conversion time	250 ms, configurable to 5 ms
Measuring error	$< \pm 0.3\%$ (relative to full scale value)
Input filter	configurable
Sensor supply	from load supply voltage $U_p$ , DC, any value up to 30 V
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input: 4 x 16 bit data, optional: 4 x 8 bit control/status
Electrical isolation	channels/control voltage: 500 $V_{rms}$ , between the channels: no, control voltage/fieldbus: depends on the bus system
Operating/storage temperature	0...+55 $^{\circ}C$ /-25...+85 $^{\circ}C$
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IP3112-Bxxx">www.beckhoff.com/IP3112-Bxxx</a>



IP3202-Bxxx

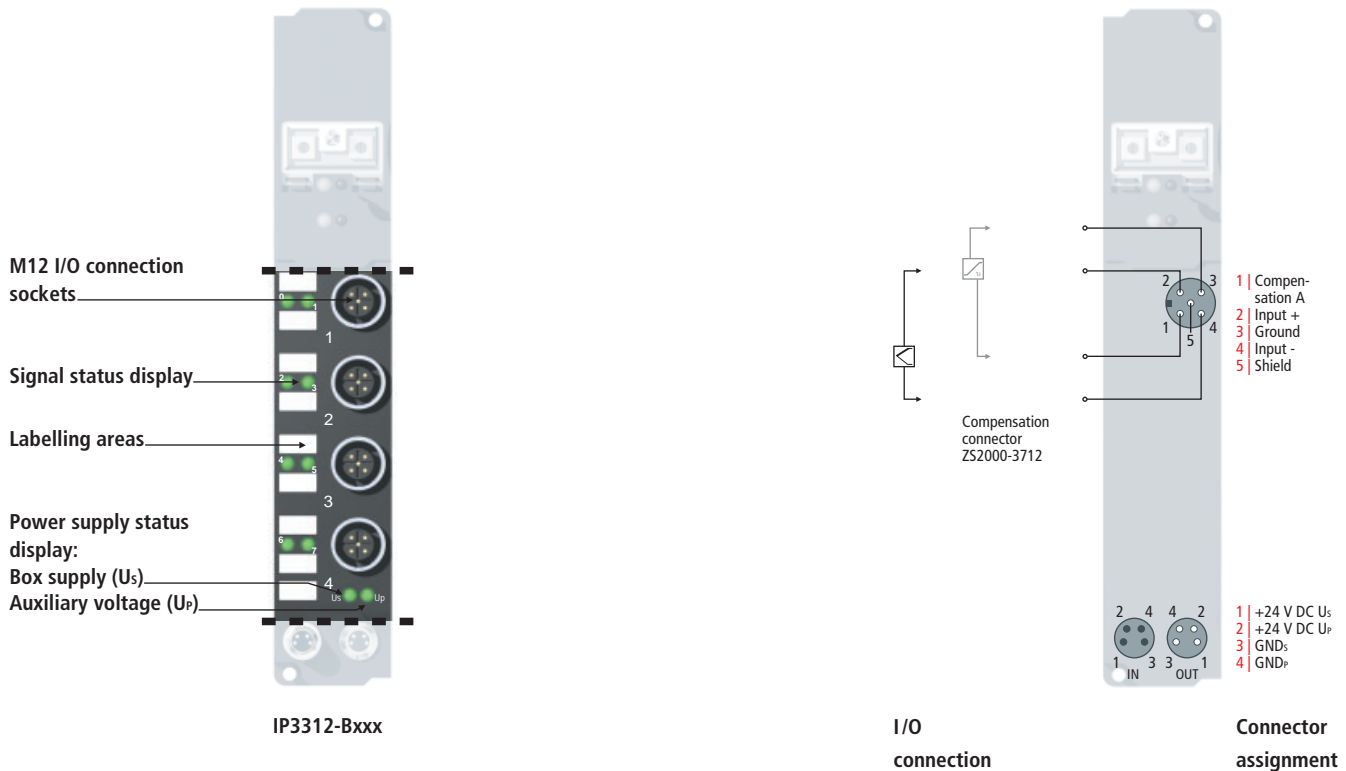
I/O  
connectionConnector  
assignment

## IP3202-Bxxx | 4-channel analog input PT100 (RTD)

The IP3202 analog input module allows resistance sensors to be connected directly. The module's circuitry can operate the sensors using 2-, 3- or 4-wire connection techniques. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The module can also be used for simple resistance measurement with the output in ohms. The module's standard settings are: resolution 0.1 °C in the temperature range of PT100 sensors in 4-wire connection. Sensor malfunctions such as broken wires are indicated by error LEDs.

The module is quite versatile, but the default values are selected in such a way that in most cases it is not necessary to perform configuration. The input filter and associated conversion times can be set within a wide range; several data output formats may be chosen. If required, the inputs can be scaled differently. Automatic limit monitoring is also available. Parameterisation may be carried out either via the fieldbus or using the KS2000 software tool.

Technical data	IP3202-Bxxx
Number of inputs	4
Connection method	screw type M12 for 2-, 3- and 4-wire connections, presetting: 4-wire
Sensor types	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer)
Temperature range	-250...+850 °C (PT sensors); -60...+250 °C (Ni sensors)
Resolution	0.1 °C per digit
Conversion time	approx. 250 ms (configurable up to 65 ms)
Measuring error	< ±1 °C
Measuring current	typ. 0.5 mA
Input filter	5 variations, configurable
Sensor supply	from control voltage $U_s$
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input: 4 x 16 bit data, optional: 4 x 8 bit control/status
Electrical isolation	channels/control voltage: 500 V <sub>rms</sub> , between the channels: no, control voltage/fieldbus: depends on the bus system
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IP3202-Bxxx">www.beckhoff.com/IP3202-Bxxx</a>



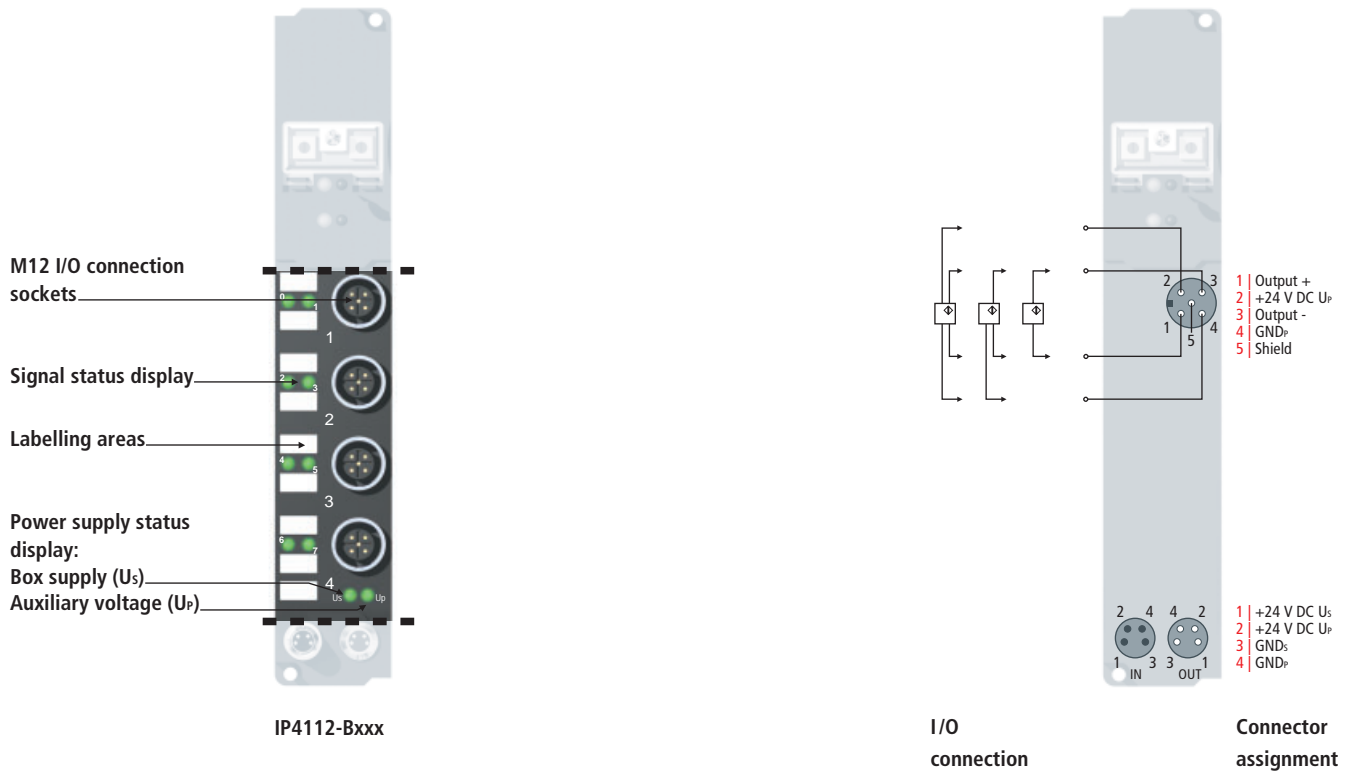
## IP3312-Bxxx | 4-channel analog input thermocouple

The IP3312 analog input module permits four thermocouples to be directly connected. The module's circuit can operate thermocouple sensors using the 2-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The error LEDs indicate a broken wire. Compensation for the cold junction is made through a temperature measurement in the connecting plugs. This means that standard extension leads can be connected. The IP3312 can also be used for mV measurement.

The module is quite versatile, but the default values are selected in such a way that in most cases it is not necessary to perform configuration. The input filter and associated conversion times can be set within a wide range; several data output formats may be chosen. If required, the inputs can be scaled differently. Automatic limit monitoring is also available. Parameterisation may be carried out either via the fieldbus or, using the KS2000 software tool, through the configuration interface. The parameters are stored in the module. For the temperature compensation a PT1000 element is needed. Beckhoff offers a connector with temperature compensation (ZS2000-3712).

Technical data	IP3312-Bxxx
Number of inputs	4
Connection method	screw type M12, 2-wire connection for thermocouple
Sensor types	types J, K, L, B, E, N, R, S, T, U (default setting type K), mV measurement
Temperature range	depending on sensor type; preset value is type K, -100...+1,370 °C
Resolution	0.1 °C per digit
Conversion time	approx. 250 ms (configurable up to 70 ms)
Measuring error	< ±0.5 % (relative to full scale value)
Input filter	5 variations, configurable
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input: 4 x 16 bit data, optional: 4 x 8 bit control/status
Electrical isolation	channels/control voltage: 500 V <sub>rms</sub> , between the channels: no, control voltage/fieldbus: depends on the bus system
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	www.beckhoff.com/IP3312-Bxxx





IP4112-Bxxx

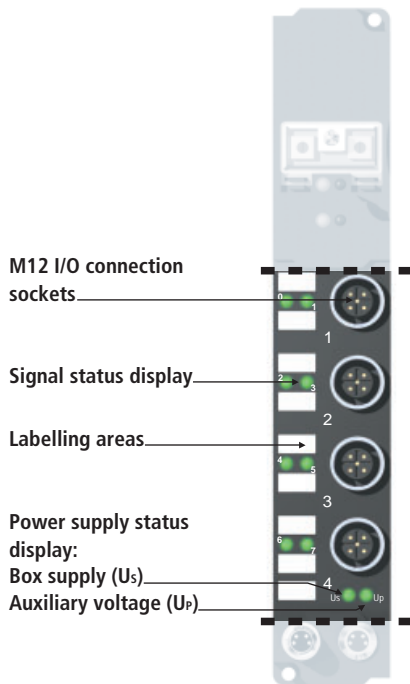
I/O  
connectionConnector  
assignment

## IP4112-Bxxx | 4-channel analog output 0/4...20 mA

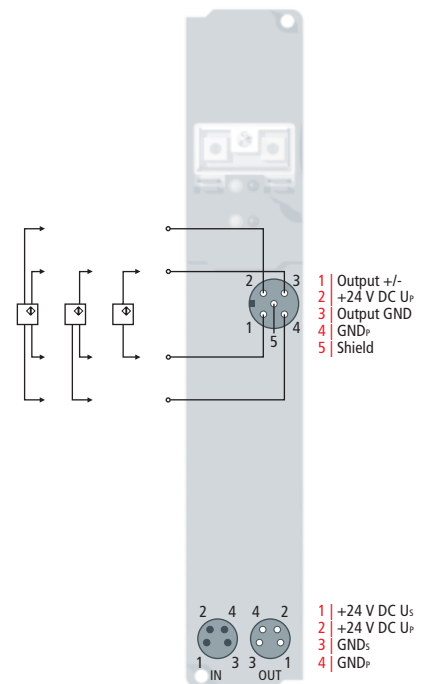
The IP4112 analog output module generates analog output signals in the range from 0/4 to 20 mA. The power is supplied to the process level with a resolution of 15 bits (default), and is electrically isolated. If the input is transmitted without an arithmetical sign, 16 bit resolution may also be selected. If necessary, the output scaling can be altered.

Ground potential for the four output channels is common with the 24 V DC supply. The analog actuators are powered by the load voltage. The applied auxiliary voltage (which can be any value up to 30 V DC) is fed through to supply the actuators.

Technical data	IP4112-Bxxx
Number of outputs	4
Output connections	M12, screw type
Signal current	0/4...20 mA
Load	< 500 Ω
Resolution	15 bit, configurable to 16 bit
Conversion time	< 4 ms
Measuring error	< ±0.1 % (relative to full scale value)
Actuator supply	from the auxiliary voltage U <sub>P</sub>
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	output: 4 x 16 bit data, optional: 4 x 8 bit control/status
Electrical isolation	channels/control voltage: yes, between the channels: no, control voltage/fieldbus: depends on the bus system
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	www.beckhoff.com/IP4112-Bxxx



IP4132-Bxxx

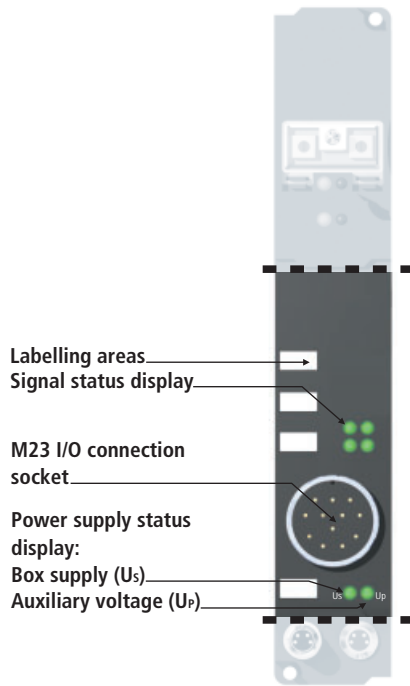
I/O  
connectionConnector  
assignment

## IP4132-Bxxx | 4-channel analog output $\pm 10$ V

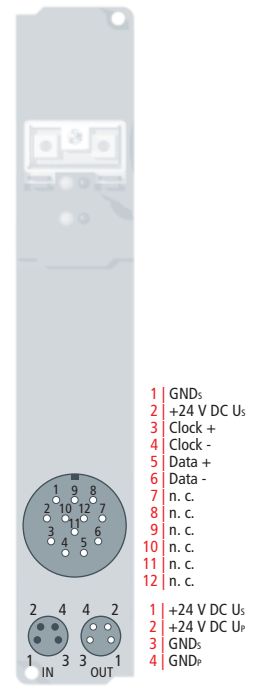
The IP4132 analog output module generates analog output signals in the range from -10 to +10 V. The voltage is supplied to the process level with a resolution of 16 bits, and is electrically isolated. If necessary, the output scaling can be altered.

Ground potential for the four output channels is common with the 24 V DC supply. The analog actuators are powered by the control voltage. The applied auxiliary voltage (which can be any value up to 30 V DC) is available for supply of the actuators.

Technical data	IP4132-Bxxx
Number of outputs	4
Output connections	M12, screw type
Signal current	-10/0...10 V
Load	> 5 k $\Omega$
Resolution	16 bits
Conversion time	< 4 ms
Measuring error	< $\pm 0.1$ % (relative to full scale value)
Actuator supply	from the auxiliary voltage $U_P$
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	output: 4 x 16 bit data, optional: 4 x 8 bit control/status
Electrical isolation	channels/control voltage: yes, between the channels: no, control voltage/fieldbus: depends on the bus system
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IP4132-Bxxx">www.beckhoff.com/IP4132-Bxxx</a>



IP5009-Bxxx

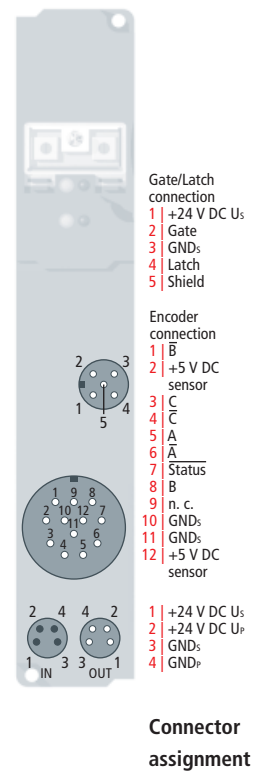
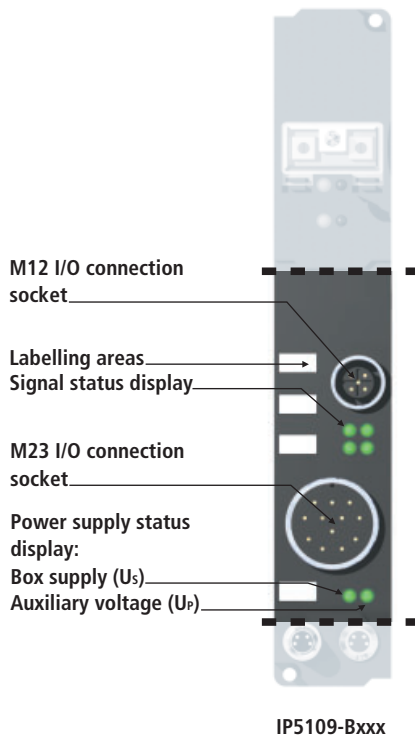


Connector assignment

## IP5009-Bxxx | 1-channel SSI encoder interface

The IP5009 SSI interface module allows an SSI encoder to be connected directly. The encoder is powered via the SSI interface. The interface circuit generates a pulse for reading the encoder and makes the incoming data stream available to the controller as a data word in the process image. The module can optionally provide the data as binary numbers or as a binary gray code. Adaptation for the direction of rotation can be configured. Various operating modes, transmission frequencies and bit widths can be permanently stored in a control register.

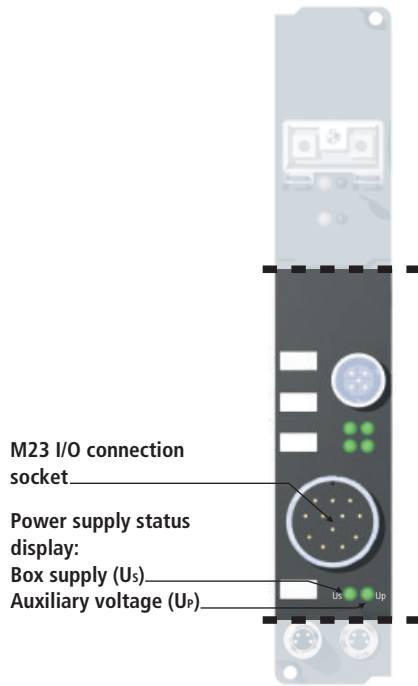
Technical data	IP5009-Bxxx
Number of channels	1
SSI encoder connection	M23 connector with outer thread, 12-pin
Signal input	difference signal (RS485)
Encoder supply	24 V DC, from load voltage
Data transfer rates	variable up to 1 MHz, 250 kHz default
Serial input	24 bits (adjustable)
Data direction	read
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input: 1 x 32 bit data (1 x 8 bit control/status optional)
Electrical isolation	depends on the bus system
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IP5009-Bxxx">www.beckhoff.com/IP5009-Bxxx</a>



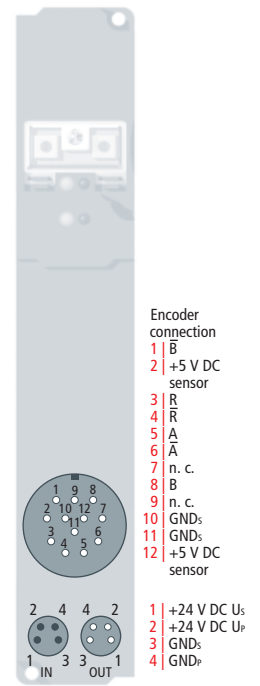
## IP5109-Bxxx | 1-channel incremental encoder interface, 1 MHz

The IP5109 module is an interface for the direct connection of incremental encoders with differential inputs (RS485) or with single inputs. A 16 bit counter with a quadrature decoder and a 16 bit latch for the zero pulse can be read, set or enabled. The inputs can optionally be used as complementary or as single inputs. Incremental encoders with alarm outputs can be connected at the interface's status input. Interval measurement with a resolution of 200 ns is possible. The gate input allows the counter to be halted (high = stop). The value is read with a rising edge at the latch input.

Technical data	IP5109-Bxxx
Number of channels	1
Connection encoder/sensor	M23 connector with outer thread, 12-pin
Gate/latch connection	M12, screw type
Encoder supply	5 V DC
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof
Counter	16 bits, binary
Limit frequency	1 MHz (with 4-fold evaluation)
Quadrature decoder	1-, 2-, or 4-fold evaluation
Zero-pulse latch	16 bits
Commands	read, set, enable
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input/output: 2 x 16 bit data + 1 x 8 bit control/status
Electrical isolation	depends on the bus system
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IP5109-Bxxx">www.beckhoff.com/IP5109-Bxxx</a>



IP5209-Bxxx

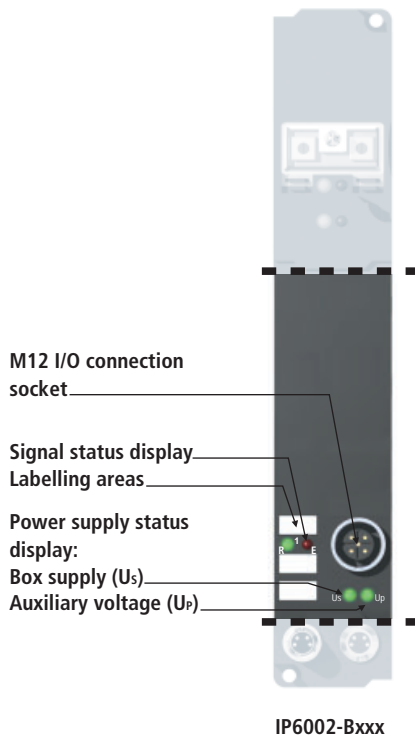


Connector assignment

## IP5209-Bxxx | 1-channel SinCos encoder interface

The SinCos module IP5209-Bxxx serves as interface for the direct connection of a measuring sensor, for example a measuring probe with sinusoidal voltage output  $1 V_{SS}$  to the higher-level fieldbus. In contrast to the standard version, instead of a voltage input the special IP5209-Bxxx-1000 version has a current input for  $11 \mu A_{SS}$  measuring probes. The measuring signal is processed, interpolated and made available as a 32 bit value. The signal period resolution is 10 bits, i.e. 1,024 steps. The reference mark is also stored in a 32 bit value. The current count and the reference mark value can be read. The limit frequency for the measuring signal inputs is 100 kHz.

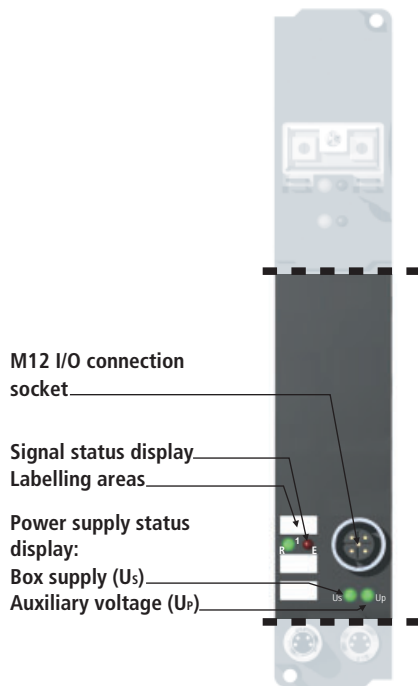
Technical data	IP5209-Bxxx	IP5209-Bxxx-1000
Number of channels	1	
Connection encoder/sensor	M23 connector with outer thread, 12-pin	M23 connector with outer thread, 9-pin
Signal input	$1 V_{SS}$	$11 \mu A_{SS}$
Sensor supply	5 V DC from control voltage, 0.5 A max.	
Limit frequency	100 kHz (scanning of the input signals with 500 kHz)	
Resolution	10 bits, 1,024 steps per period	
Commands	set count, evaluate reference mark latch, change of direction, frequency control	
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin	
Current consumption	130 mA	
Bit width in the process image	input/output: 2 x 32 bit data, 1 x 8 bit control/status	
Electrical isolation	depends on the bus system	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Further information	www.beckhoff.com/IP5209-Bxxx	



## IP6002-Bxxx | 1-channel serial interface, RS232

The IP6002 serial interface module allows the connection of devices with an RS232 interface, which operates in conformity with the CCITT V.28/DIN 66 259-1 standards. The module transmits the data in a fully transparent manner to the higher-level automation device. The data is transferred via the fieldbus using a simple handshake protocol. This does not have any effect on the protocol of the serial interface. The active serial communication channel functions independently of the higher-level bus system in full duplex mode at up to 115,200 baud, while a 128 bytes receive buffer and a 16 bytes send buffer are available. The RS232 interface guarantees high immunity to interference through electrically isolated signals.

Technical data	IP6002-Bxxx
Data transfer channels	2 (1/1), TxD and RxD, full duplex
Data transfer rates	1,200...115,200 baud, 9,600 baud (8 bits, no parity, 1 stop bit) is preset
RS232 connection	M12, screw type
Bit distortion	< 3 %
Cable length	max. 15 m
"0" signal voltage	-18...+3 V
"1" signal voltage	3...18 V
Data buffer	128 bytes receive buffer, 16 bytes transmit buffer
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input/output: 3 x 8 bit user data, 1 x 8 bit control/status (up to 5 x 8 bit user data are possible)
Electrical isolation	RS232/control voltage: 500 V <sub>rms</sub> , to the fieldbus: depends on the bus system
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	www.beckhoff.com/IP6002-Bxxx



IP6012-Bxxx

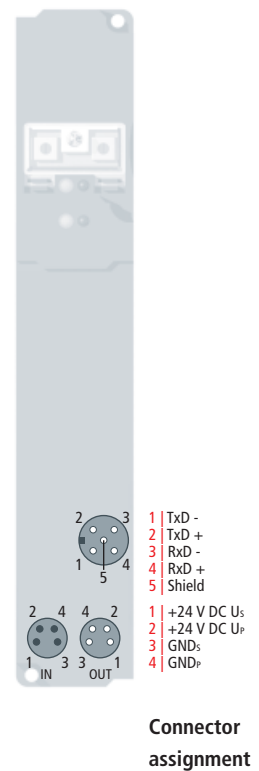
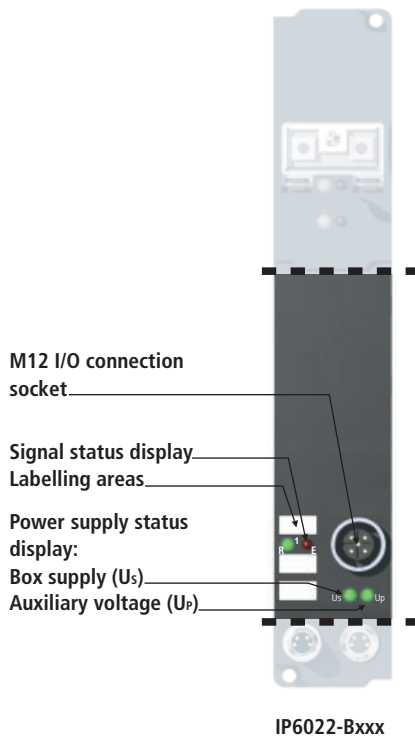


Connector assignment

## IP6012-Bxxx | 1-channel serial interface TTY, 20 mA current loop

The IP6012 serial interface module allows the connection of devices with a 20 mA current interface. The interface operates passively. The module transmits the data in a fully transparent manner to the higher-level automation device. The data is transferred via the fieldbus using a simple handshake protocol. This does not have any effect on the protocol of the serial interface. The active serial communication channel functions independently of the higher-level bus system in full duplex mode at up to 115,200 baud, while a 128 bytes receive buffer and a 16 bytes send buffer are available. The current interface guarantees high immunity to interference through electrically isolated signals with injected current.

Technical data	IP6012-Bxxx
Data transfer channels	2 (1/1), TxD and RxD
Data transfer rates	1,200...115,200 baud, 9,600 baud (8 bits, no parity, 1 stop bit) is preset
TTY connection	M12, screw type
Bit transfer	2 x 20 mA
Load	< 500 Ω
Cable length	max. 1,000 m twisted pair
"0" signal current	0...3 mA
"1" signal current	14...20 mA
Data buffer	128 bytes receive buffer, 16 bytes transmit buffer
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input/output: 3 x 8 bit user data, 1 x 8 bit control/status (up to 5 x 8 bit user data are possible)
Electrical isolation	TTY/control voltage: 500 V <sub>rms</sub> , to the fieldbus: depends on the bus system
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IP6012-Bxxx">www.beckhoff.com/IP6012-Bxxx</a>



## IP6022-Bxxx | 1-channel serial interface, RS422/RS485

The IP6022 serial interface module allows the connection of devices with a RS422 or RS485 interface. The module transmits the data in a fully transparent manner to the higher-level automation device. The data is transferred via the fieldbus using a simple handshake protocol. This does not have any effect on the protocol of the serial interface. The active serial communication channel functions independently of the higher-level bus system in full duplex mode at up to 115,200 baud, while a 128 bytes receive buffer and a 16 bytes send buffer are available. The transmission of differential signals according to RS232 guarantees high immunity to interference through electrically isolated signals.

Technical data	IP6022-Bxxx
Data transfer channels	TxD and RxD, full/half duplex
Data transfer rates	1,200...115,200 baud, 9,600 baud (8 bits, no parity, 1 stop bit) is preset
RS422 connection	M12, screw type
Bit transfer	with differential signal
Line impedance	120 $\Omega$
Cable length	max. 500 m twisted pair
Common-mode voltage $U_{CM}$	max. -7...+12 V to ground
Data buffer	128 bytes receive buffer, 16 bytes transmit buffer
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input/output: 3 x 8 bit user data, 1 x 8 bit control/status (up to 5 x 8 bit user data are possible)
Electrical isolation	RS485/control voltage: 500 V <sub>rms</sub> , to the fieldbus: depends on the bus system
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	www.beckhoff.com/IP6022-Bxxx



RS232

PWM

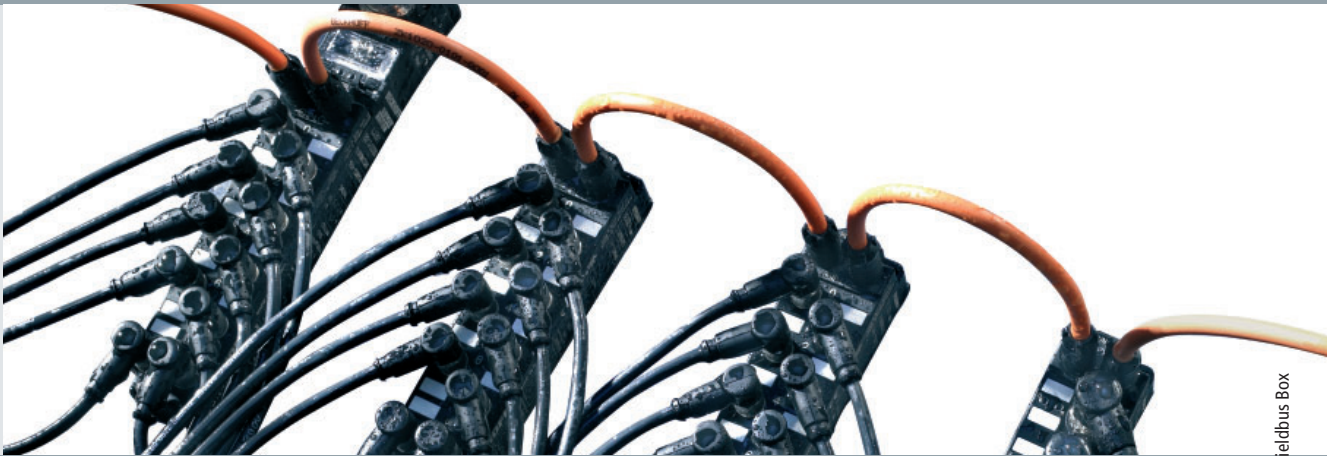
Analog I / O

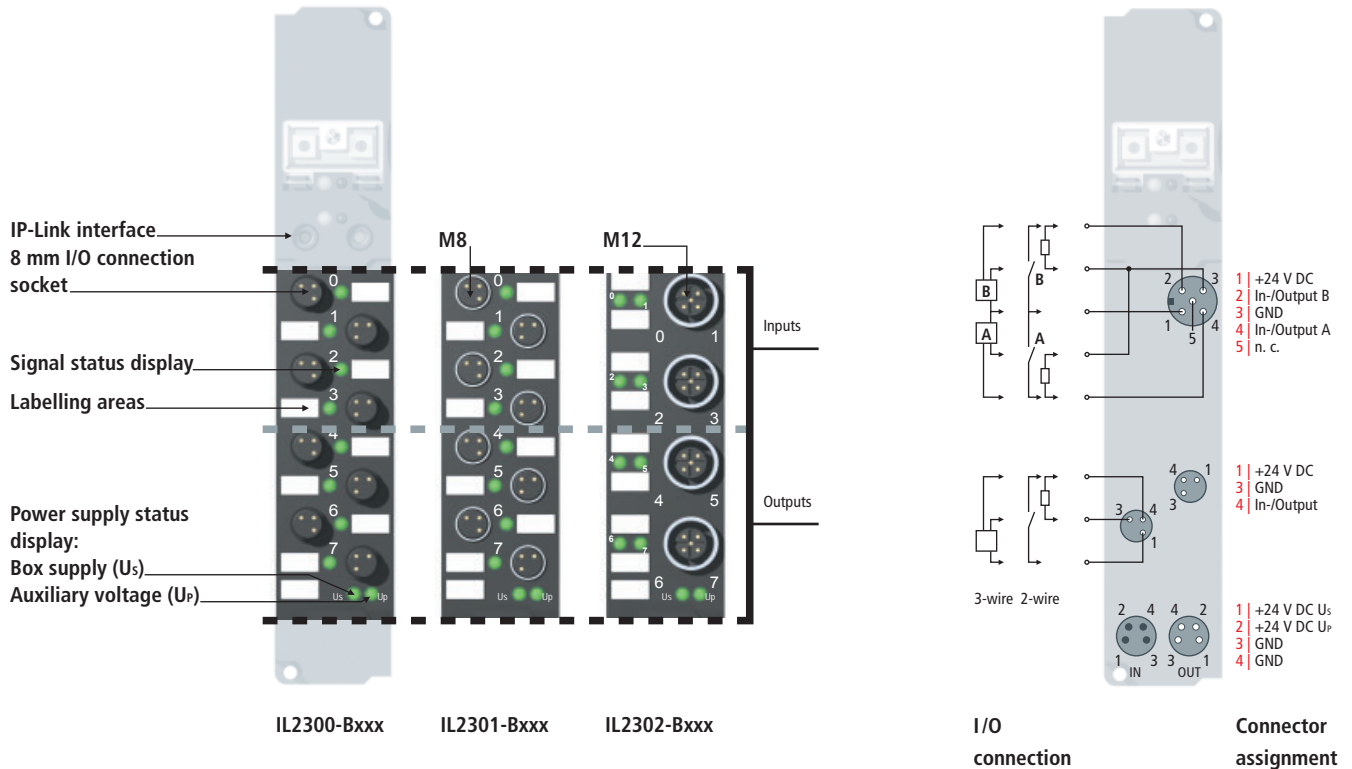
Digital I / O

PT100

SSI

# Fieldbus Box | Signal types Coupler Box, PLC Box





## IL230x-Bxxx | 4 x digital input + 4 x digital output 24 V DC, I<sub>MAX</sub> = 0.5 A

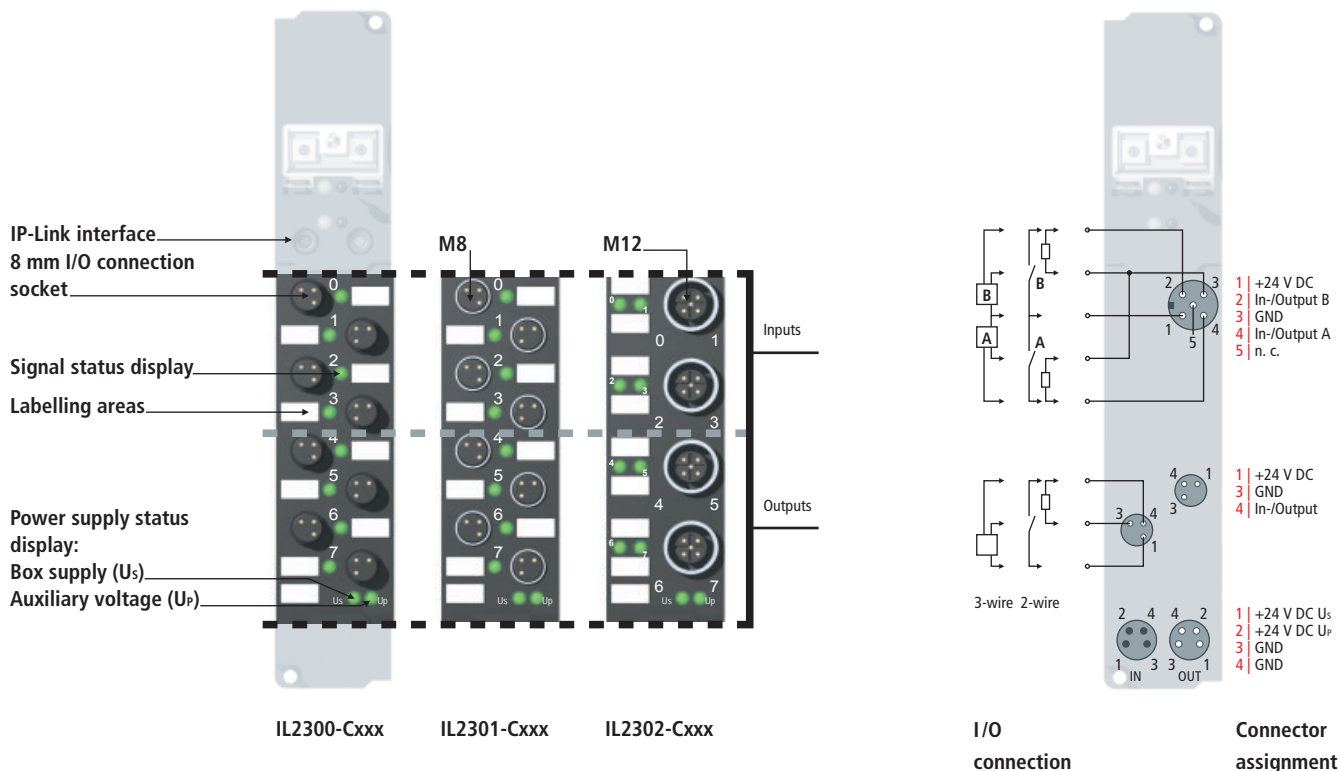
The IL230x Coupler Box modules combine four digital inputs and four digital outputs in one device. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The state of each signal is indicated by means of light emitting diodes. The signals are connected optionally via 8 mm snap type (IL2300), M8 (IL2301) or M12 (IL2302) screw type connectors.

Technical data	IL2300-Bxxx	IL2301-Bxxx	IL2302-Bxxx
Number of channels	4 inputs + 4 outputs		
Input/output connections	8 mm, snap type	M8, screw type	M12, screw type
Input filter	3.0 ms		
"0" signal voltage	-3...+5 V		
"1" signal voltage	11...30 V, 6 mA input current (EN 61131-2, type 2)		
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof		
Load type	ohmic, inductive, lamp load		
Rated load voltage	24 V DC (-15 %/+20 %)		
Max. output current	0.5 A on each channel, individually short-circuit-proof		
Short circuit current	typ. 1.5 A		
Auxiliary power current	typ. 20 mA		
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin		
Bit width in the process image	4 inputs + 4 outputs		
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: depends on the bus system		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable		
Further information	www.beckhoff.com/IL2300-Bxxx		

## Extension Box

Up to 120 Extension Box modules can be connected to the Coupler Box via the IP-Link communication facility. The Extension Box modules cover the full spectrum of I/O signals with various connection techniques. See page [942](#)

IExxxx	Extension Box	Plug	Page
<b>Digital input</b>			
IE1000	Extension Box, 8 digital inputs 24 V DC, 3.0 ms filter	8 mm	944
IE1001	Extension Box, 8 digital inputs 24 V DC, 3.0 ms filter	M8	944
IE1002	Extension Box, 8 digital inputs 24 V DC, 3.0 ms filter	M12	944
IE1010	Extension Box, 8 digital inputs 24 V DC, 0.2 ms filter	8 mm	944
IE1011	Extension Box, 8 digital inputs 24 V DC, 0.2 ms filter	M8	944
IE1012	Extension Box, 8 digital inputs 24 V DC, 0.2 ms filter	M12	944
IE1502	Extension Box, up/down counter, 24 V DC, 100 kHz	M12	945
<b>Digital output</b>			
IE2000	Extension Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	946
IE2001	Extension Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	946
IE2002	Extension Box, 8 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	946
IE2020	Extension Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	947
IE2021	Extension Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	947
IE2022	Extension Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	947
IE2040	Extension Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	8 mm	948
IE2041	Extension Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	M8	948
IE2042	Extension Box, 8 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 12 A)$	M12	948
IE2808	Extension Box, 16 digital outputs 24 V DC, $I_{MAX} = 0.5 A (\Sigma 4 A)$	D-sub	949
IE2512	Extension Box, 2 digital pulse width outputs 24 V DC, $I_{MAX} = 2.5 A$	M12	950
<b>Digital combi</b>			
IE2300	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	951
IE2301	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	951
IE2302	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	951
IE2310	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	8 mm	869
IE2311	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M8	951
IE2312	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 0.5 A$	M12	951
IE2320	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	952
IE2321	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	952
IE2322	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	952
IE2330	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	8 mm	952
IE2331	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M8	952
IE2332	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX} = 2 A (\Sigma 4 A)$	M12	952
IE2400	Extension Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	8 mm	953
IE2401	Extension Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	M8	953
IE2403	Extension Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX} = 0.5 A$	IP 20 connector	954
<b>Analog input</b>			
IE3102	Extension Box, 4 differential analog inputs $\pm 10 V$ , 16 bit	M12	956
IE3112	Extension Box, 4 differential analog inputs 0/4...20 mA, 16 bit	M12	957
IE3202	Extension Box, 4 analog inputs for resistance thermometer, PT100...1000, Ni100, 16 bit	M12	958
IE3312	Extension Box, 4 analog inputs for thermocouple, types J, K, L, B, E, N, R, S, T, U, 16 bit	M12	959
<b>Analog output</b>			
IE4112	Extension Box, 4 differential analog outputs 0/4...20 mA, 16 bit	M12	960
IE4132	Extension Box, 4 analog outputs $\pm 10 V$ , 16 bit	M12	961
<b>Special functions</b>			
IE5009	Extension Box, 1 SSI encoder interface	M23	962
IE5109	Extension Box, 1 incremental encoder interface with complementary inputs, 1 MHz	M23	963
IE6002	Extension Box, 1 serial interface RS232C	M12	964
IE6012	Extension Box, 1 serial interface, 0...20 mA (TTY)	M12	965
IE6022	Extension Box, 1 serial interface, RS422, RS485	M12	966



# IL230x-Cxxx | 4 x digital input + 4 x digital output 24 V DC, I<sub>MAX</sub> = 0.5 A

The IL230x PLC Box modules combine four digital inputs and four digital outputs in one device. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The state of each signal is indicated by means of light emitting diodes. The signals are connected optionally via 8 mm snap type (IL2300), M8 (IL2301) or M12 (IL2302) screw type connectors.

Technical data	IL2300-Cxxx	IL2301-Cxxx	IL2302-Cxxx
Number of channels	4 inputs + 4 outputs		
Input/output connections	8 mm, snap type	M8, screw type	M12, screw type
Input filter	3.0 ms		
"0" signal voltage	-3...+5 V		
"1" signal voltage	11...30 V, 6 mA input current (EN 61131-2, type 2)		
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof		
Load type	ohmic, inductive, lamp load		
Rated load voltage	24 V DC (-15 %/+20 %)		
Max. output current	0.5 A on each channel, individually short-circuit-proof		
Short circuit current	typ. 1.5 A		
Auxiliary power current	typ. 20 mA		
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin		
Bit width in the process image	4 inputs + 4 outputs		
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: depends on the bus system		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable		
Further information	www.beckhoff.com/IL2300-Cxxx		

# Extension Box

Up to 120 Extension Box modules can be connected to the PLC Box via the IP-Link communication facility. The Extension Box modules cover the full spectrum of I/O signals with various connection techniques. See page [942](#)

IExxxx	Extension Box	Plug	Page
<b>Digital input</b>			
IE1000	Extension Box, 8 digital inputs 24 V DC, 3.0 ms filter	8 mm	944
IE1001	Extension Box, 8 digital inputs 24 V DC, 3.0 ms filter	M8	944
IE1002	Extension Box, 8 digital inputs 24 V DC, 3.0 ms filter	M12	944
IE1010	Extension Box, 8 digital inputs 24 V DC, 0.2 ms filter	8 mm	944
IE1011	Extension Box, 8 digital inputs 24 V DC, 0.2 ms filter	M8	944
IE1012	Extension Box, 8 digital inputs 24 V DC, 0.2 ms filter	M12	944
IE1502	Extension Box, up/down counter, 24 V DC, 100 kHz	M12	945
<b>Digital output</b>			
IE2000	Extension Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	8 mm	946
IE2001	Extension Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	M8	946
IE2002	Extension Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	M12	946
IE2020	Extension Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (∑ 4 A)	8 mm	947
IE2021	Extension Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (∑ 4 A)	M8	947
IE2022	Extension Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (∑ 4 A)	M12	947
IE2040	Extension Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (∑ 12 A)	8 mm	948
IE2041	Extension Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (∑ 12 A)	M8	948
IE2042	Extension Box, 8 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (∑ 12 A)	M12	948
IE2808	Extension Box, 16 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A (∑ 4 A)	D-sub	949
IE2512	Extension Box, 2 digital pulse width outputs 24 V DC, I <sub>MAX</sub> = 2.5 A	M12	950
<b>Digital combi</b>			
IE2300	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	8 mm	951
IE2301	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	M8	951
IE2302	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	M12	951
IE2310	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	8 mm	869
IE2311	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	M8	951
IE2312	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 0.5 A	M12	951
IE2320	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (∑ 4 A)	8 mm	952
IE2321	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (∑ 4 A)	M8	952
IE2322	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (∑ 4 A)	M12	952
IE2330	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (∑ 4 A)	8 mm	952
IE2331	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (∑ 4 A)	M8	952
IE2332	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I <sub>MAX</sub> = 2 A (∑ 4 A)	M12	952
IE2400	Extension Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, I <sub>MAX</sub> = 0.5 A	8 mm	953
IE2401	Extension Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, I <sub>MAX</sub> = 0.5 A	M8	953
IE2403	Extension Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, I <sub>MAX</sub> = 0.5 A	IP 20 connector	954
<b>Analog input</b>			
IE3102	Extension Box, 4 differential analog inputs ±10 V, 16 bit	M12	956
IE3112	Extension Box, 4 differential analog inputs 0/4...20 mA, 16 bit	M12	957
IE3202	Extension Box, 4 analog inputs for resistance thermometer, PT100...1000, Ni100, 16 bit	M12	958
IE3312	Extension Box, 4 analog inputs for thermocouple, types J, K, L, B, E, N, R, S, T, U, 16 bit	M12	959
<b>Analog output</b>			
IE4112	Extension Box, 4 differential analog outputs 0/4...20 mA, 16 bit	M12	960
IE4132	Extension Box, 4 analog outputs ±10 V, 16 bit	M12	961
<b>Special functions</b>			
IE5009	Extension Box, 1 SSI encoder interface	M23	962
IE5109	Extension Box, 1 incremental encoder interface with complementary inputs, 1 MHz	M23	963
IE6002	Extension Box, 1 serial interface RS232C	M12	964
IE6012	Extension Box, 1 serial interface, 0...20 mA (TTY)	M12	965
IE6022	Extension Box, 1 serial interface, RS422, RS485	M12	966

RS232

PWM

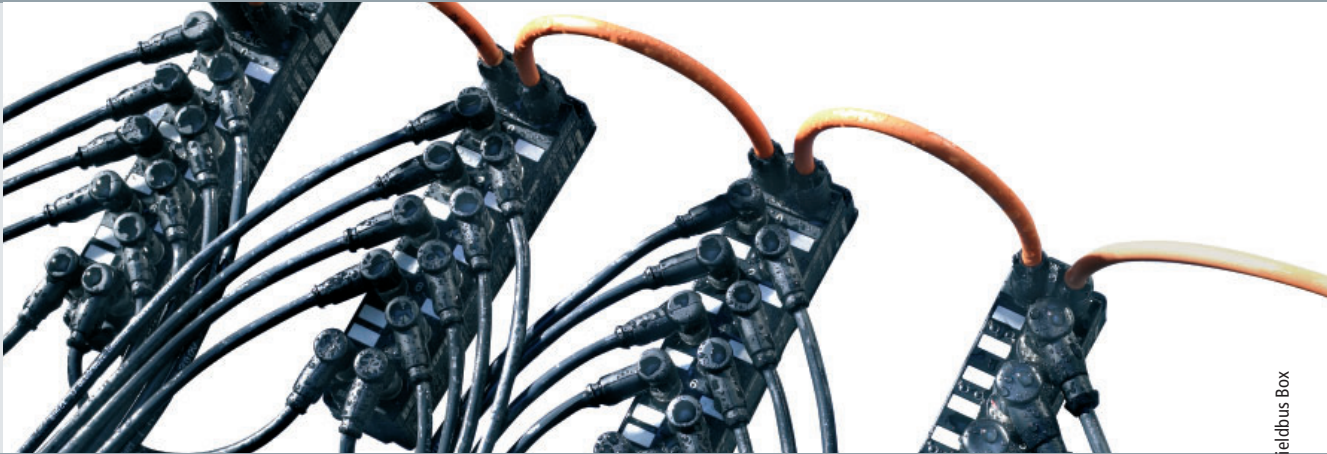
Analog I / O

Digital I / O

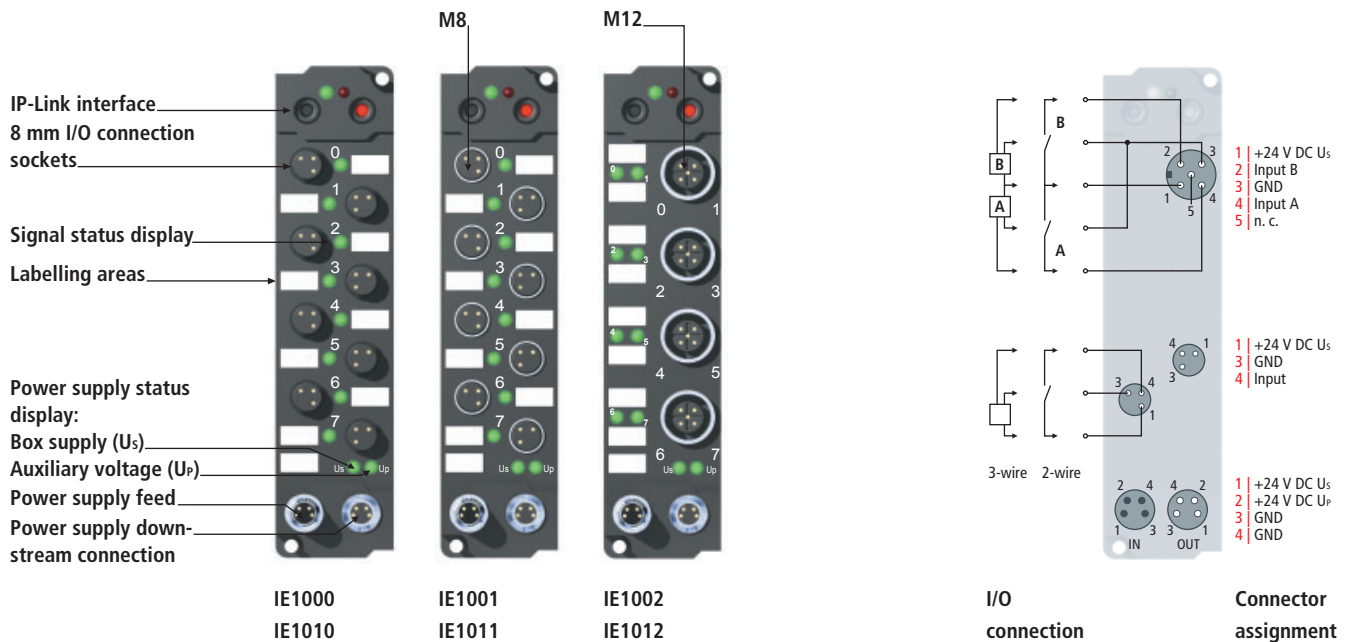
PT100

SSI

# Fieldbus Box | Signal types Extension Box





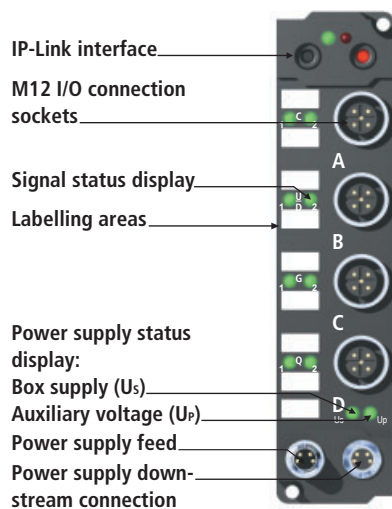


## IE100x, IE101x | 8-channel digital input 24 V DC

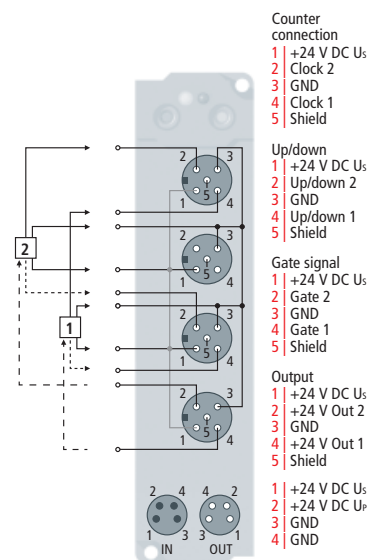
The IE10xx digital input modules acquire the binary control signals from the process level and transmit them to the higher-level automation unit. The state of the signals is indicated by light emitting diodes. The signals are optionally connected via 8 mm snap type (IE1000, IE1010), M8 (IE1001, IE1011) or M12 (IE1002, IE1012) screw type connectors. These versions are distinguished by input filters of different speeds.

The sensors are supplied from the box supply voltage  $U_s$ . The auxiliary voltage  $U_P$  is not used in the input module, but may be connected in order to be relayed downstream.

Technical data	IE1000	IE1001	IE1002	IE1010	IE1011	IE1012
Number of inputs	8					
Input connections	8 mm, snap type	M8, screw type	M12, screw type	8 mm, snap type	M8, screw type	M8, screw type
Nominal input voltage	24 V DC (-15 %/+20 %)					
Input filter	3.0 ms	3.0 ms	3.0 ms	0.2 ms	0.2 ms	0.2 ms
"0" signal voltage	-3...+5 V (EN 61131-2, type 2)					
"1" signal voltage	11...30 V (EN 61131-2, type 2)					
Input current	typ. 6 mA (EN 61131-2, type 2)					
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof					
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin					
Bit width in the process image	8 inputs					
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: yes, via IP-Link					
Operating/storage temperature	0...+55 °C/-25...+85 °C					
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29					
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4					
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable					
Further information	www.beckhoff.com/IE1000					



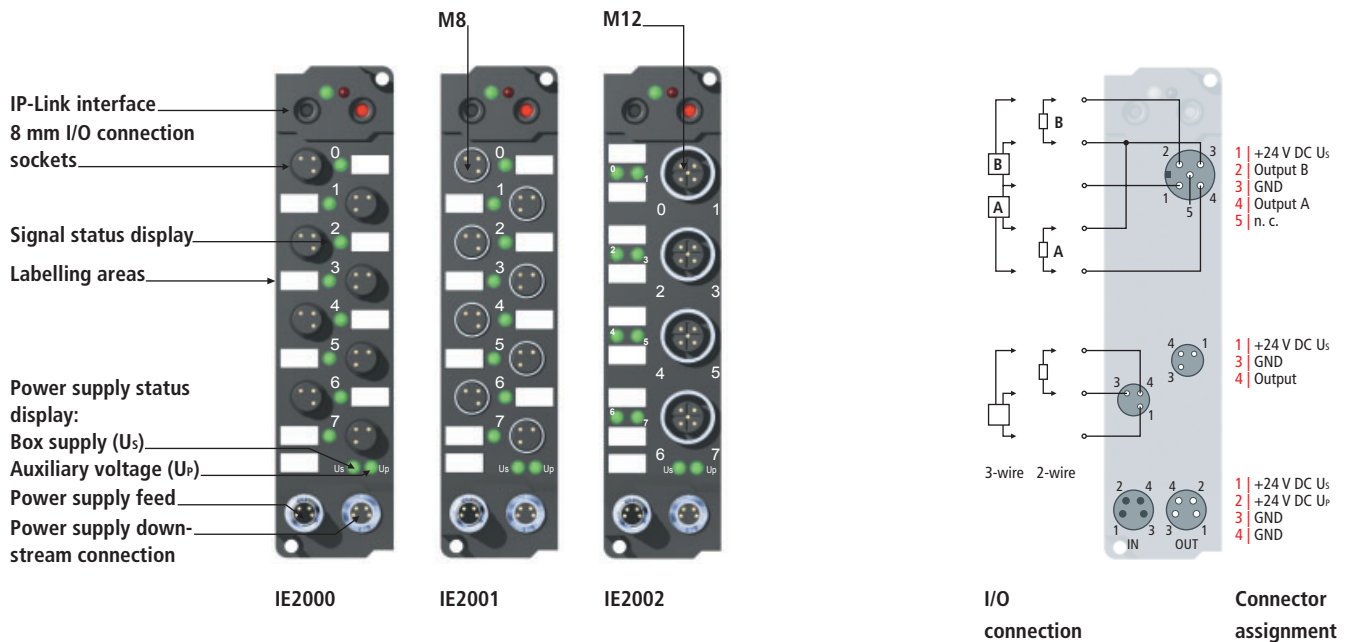
IE1502

I/O  
connectionConnector  
assignment

## IE1502 | 2-channel up/down counter 24 V DC, 100 kHz

The counter module has two fast counters running at up to 100 kHz. It counts binary pulses and transmits the counter state to the higher-level automation unit. The up/down input allows the counters to be switched between upwards and downwards counting (in 32 bits). The gate signals (gate inputs) allow the counters to be triggered: Depending on the level at the gate input, the counting function is halted or enabled. The outputs can be switched according to the counter state, and can therefore be used as fast control signals for field devices. From the controller it is possible to set the counter state, to start or halt the counter function, and to set the outputs. The signal state of the inputs and outputs is indicated by light emitting diodes.

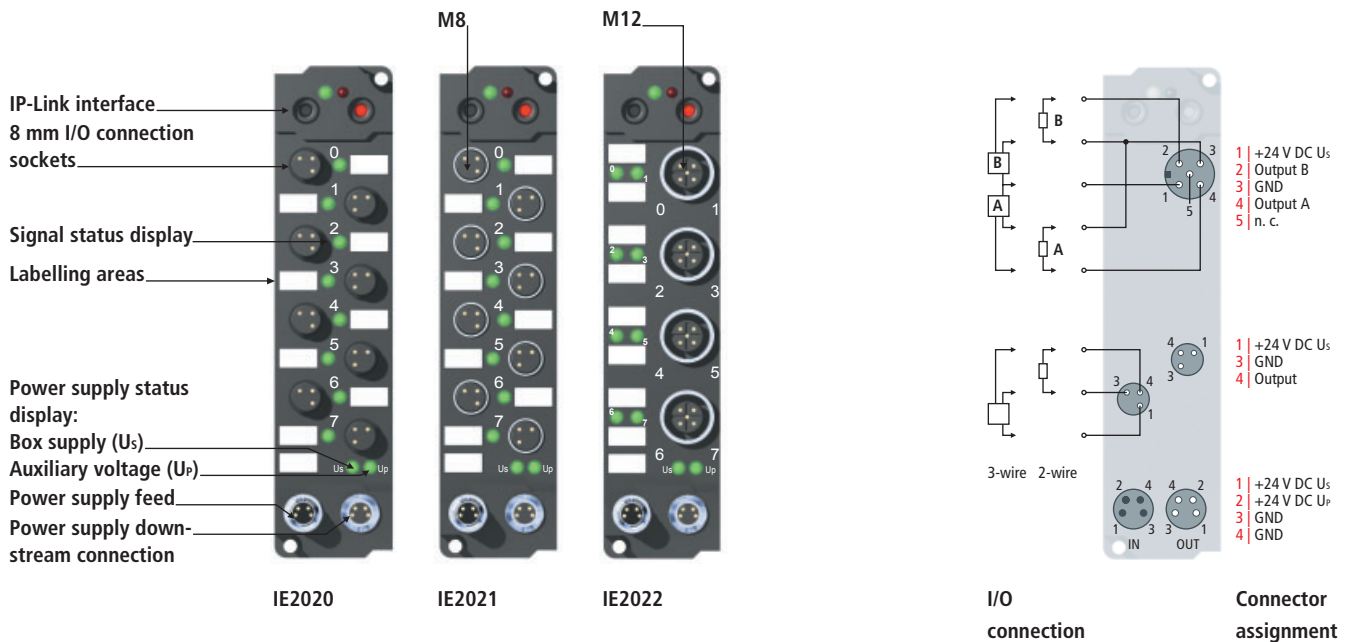
Technical data	IE1502
Number of counters	2, each with a depth of 32 bits
Counting frequency	100 kHz (2 kHz for switching between up and down)
Signal connection	M12, screw type
Number of inputs	2 counter inputs + 2 gate inputs + 2 up/down switches
Nominal input voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V (EN 61131-2, type 2)
"1" signal voltage	11...30 V (EN 61131-2, type 2)
Number of outputs	2 x 24 V DC, 0.5 A, individually short-circuit-proof
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	80 inputs/outputs: 2 x 32 bit data (2 x 8 bit control/status)
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: yes, via IP-Link
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	www.beckhoff.com/IE1502



## IE200x | 8-channel digital output 24 V DC, I<sub>MAX</sub> = 0.5 A

The IE200x digital output modules connect the binary control signals from the automation unit on to the actuators at the process level. The eight outputs handle load currents of up to 0.5 A and indicate their status through light emitting diodes. The signals are optionally connected via 8 mm snap type (IE2000), M8 (IE2001) or M12 (IE2002) screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.

Technical data	IE2000	IE2001	IE2002
Number of outputs	8		
Output connections	8 mm, snap type	M8, screw type	M12, screw type
Load type	ohmic, inductive, lamp load		
Nominal output voltage	24 V DC (-15 %/+20 %)		
Max. output current	0.5 A on each channel, individually short-circuit-proof		
Short circuit current	typ. 1.5 A		
Auxiliary power current	typ. 20 mA per channel		
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin		
Bit width in the process image	8 outputs		
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: yes, via IP-Link		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable		
Further information	www.beckhoff.com/IE2000		

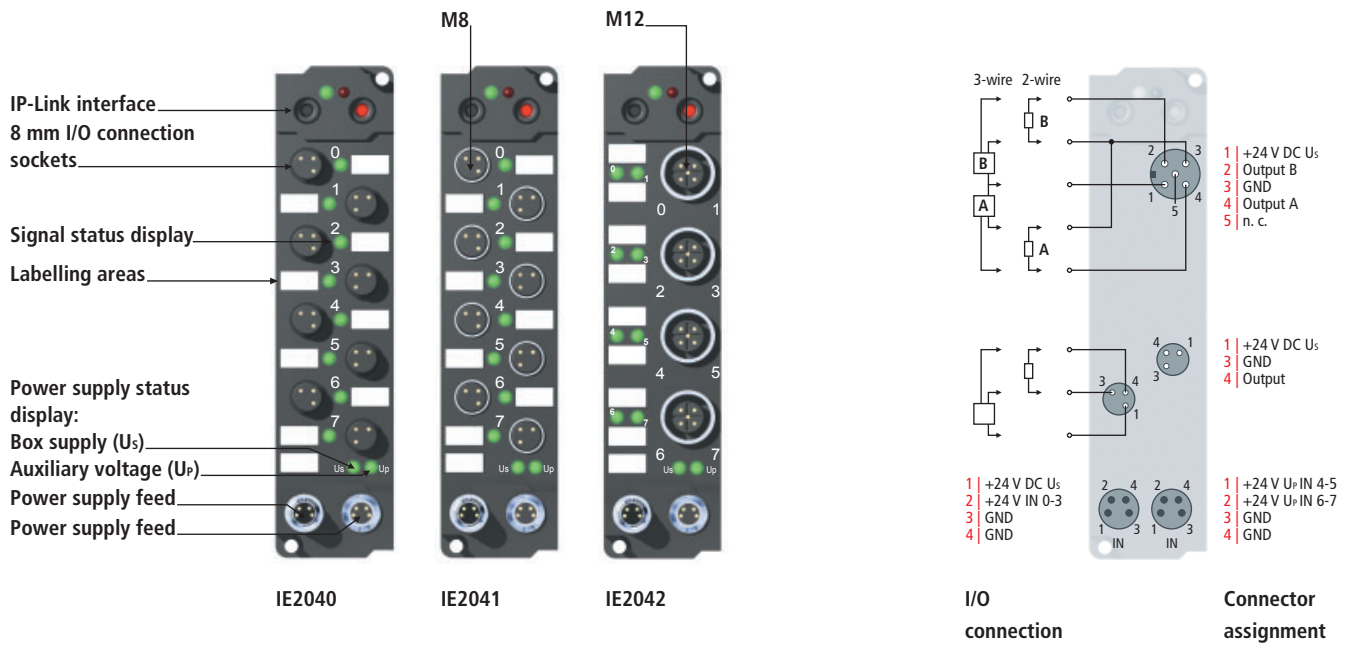


## IE202x | 8-channel digital output 24 V DC, $I_{MAX} = 2 \text{ A}$ ( $\Sigma 4 \text{ A}$ )

The IE202x digital output modules connect the binary control signals from the automation unit on to the actuators at the process level. The eight outputs handle load currents of up to 2 A each, although the total current is limited to 4 A. This makes these modules particularly suitable for applications in which not all of the outputs are active at the same time, or in which not all of the actuators draw 2 A signal current.

The signal state is indicated by means of light emitting diodes. The signals are optionally connected via 8 mm snap type (IE2020), M8 (IE2021) or M12 (IE2022) screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.

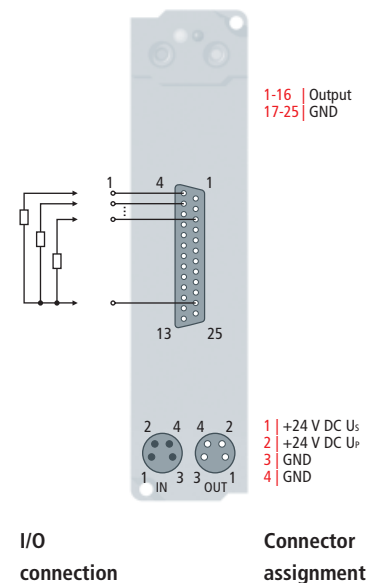
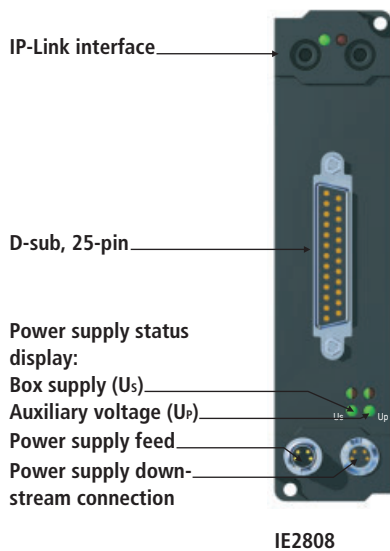
Technical data	IE2020	IE2021	IE2022
Number of outputs	8		
Output connections	8 mm, snap type	M8, screw type	M12, screw type
Load type	ohmic, inductive, lamp load		
Nominal output voltage	24 V DC (-15 %/+20 %)		
Max. output current	2 A each channel, individually short-circuit safe, total current max. 4 A		
Short circuit current	max. 4 A		
Auxiliary power current	typ. 30 mA per channel		
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin		
Bit width in the process image	8 outputs		
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: yes, via IP-Link		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable		
Further information	www.beckhoff.com/IE2020		



# IE204x | 8-channel digital output 24 V DC, I<sub>MAX</sub> = 2 A (Σ 12 A)

The IE204x digital output modules connect the binary control signals from the automation unit on to the actuators at the process level. The eight outputs handle load currents of up to 2 A each, although the total current is limited to 12 A. The outputs are supplied by three load circuits; for this reason these modules do not relay the supply voltage. The signal state is indicated by means of light emitting diodes. The signals are optionally connected via 8 mm snap type (IE2040), M8 (IE2041) or M12 (IE2042) screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.

Technical data	IE2040	IE2041	IE2042
Number of outputs	8		
Output connections	8 mm, snap type	M8, screw type	M12, screw type
Load type	ohmic, inductive, lamp load		
Nominal output voltage	24 V DC (-15 %/+20 %)		
Max. output current	2 A each channel, individ. short-circuit-proof, total current max. 12 A (channel 0...3: Σ 4 A, 4+5: Σ 4 A, 6+7: Σ 4 A)		
Short circuit current	typ. 4 A		
Auxiliary power current	typ. 50 mA per channel		
Power supply connection	feed: 2 x M8 male socket, 4-pin; no downstream connection		
Bit width in the process image	8 outputs		
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: yes, via IP-Link		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable		
Further information	www.beckhoff.com/IE2040		



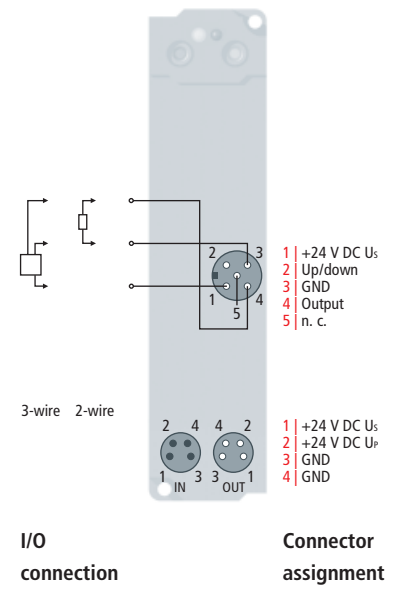
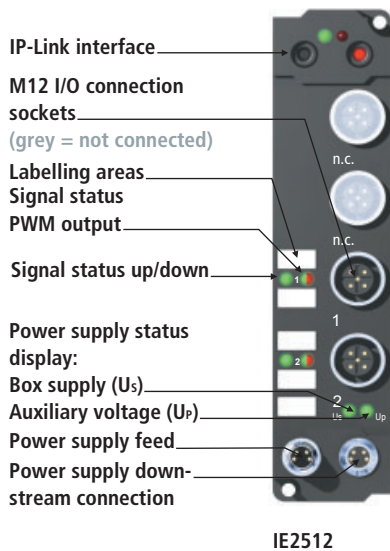
## IE2808 | 16-channel digital output 24 V DC, $I_{MAX} = 0.5 A$ ( $\Sigma 4 A$ )

The IE2808 digital output module connects the binary control signals from the automation unit on to the actuators at the process level. The sixteen outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. This makes these modules particularly suitable for applications in which not all of the outputs are active at the same time, or in which not all of the actuators draw 0.5 A current. An output short-circuit is recognised and passed on to the controller. The signal state is indicated in groups by means of light emitting diodes. The signal connection is realised by the 25-pin D-sub socket. All outputs are short-circuit-proof, protected against inverse connection and can be diagnosed.

After a fault, e.g. a short circuit at an output, the IE2808-0001 version starts up again automatically. The IE2808 version waits for the fault to be reset by the master (CTRL byte).

Technical data	IE2808	IE2808-0001
Number of outputs	16	
Output connections	D-sub socket, 25-pin	
Load type	ohmic, inductive, lamp load	
Nominal output voltage	24 V DC (-15 %/+20 %)	
Max. output current	0.5 A each channel, individually short-circuit-proof, total current max. 4 A	
Short circuit current	max. 1.5 A	
Auxiliary power current	typ. 30 mA	
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin	
Error handling	fault acknowledgement by master required	automatically
Bit width in the process image	16 outputs, 16 inputs (diagnostics) optional: control/status	
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: yes, via IP-Link	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Further information	www.beckhoff.com/IE2808	

Accessories	
ZS2002-0111	D-sub plug, 25-pin, solder contacts, IP 67

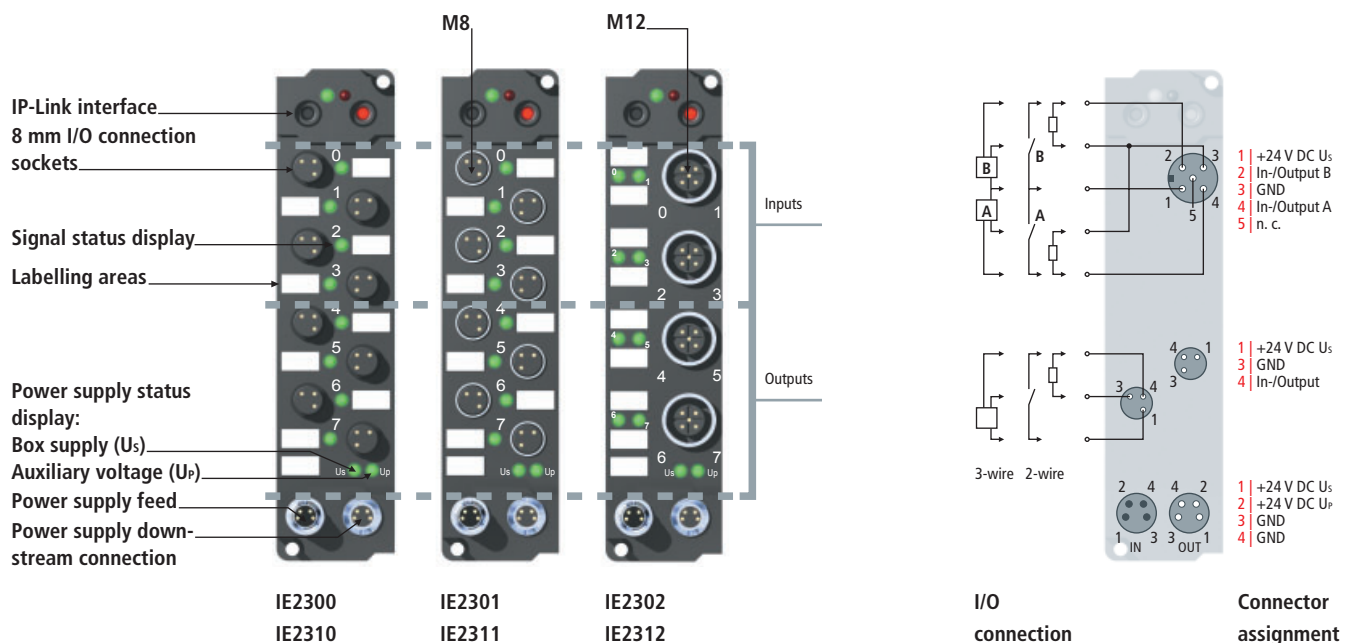


## IE2512 | 2-channel pulse width output 24 V DC

The outputs of the IE2512 module provide a pulse width modulated version of a binary signal. The keying ratio is prescribed by a 16 bit value from the automation unit. The output is protected against overload and short circuit. In addition to the PWM operating mode, the outputs can also be frequency modulated or used to control stepper motors with specified pulses and direction. The module contains two channels that indicate their state by means of light emitting diodes. The LEDs are driven in time with the outputs and show the keying ratio by their brightness.

Fieldbus Box

Technical data	IE2512
Number of outputs	2
Output connections	M12, screw type
Load type	ohmic, inductive
Nominal output voltage	24 V DC (-15 %/+20 %)
Max. output current	2.5 A on each channel, individually short-circuit-proof
Up/down channel	24 V DC, 0.5 A, short-circuit-proof
Base frequency	8 Hz...80 kHz, Default: 250 Hz
Duty factor	0...100 % (T <sub>ON</sub> > 750 ns, T <sub>OFF</sub> > 500 ns)
Resolution	max. 10 bits
Freewheeling diode (output)	yes
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	48 inputs/outputs: 2 x 16 bit data, 2 x 8 bit control/status
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: yes, via IP-Link
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	www.beckhoff.com/IE2512

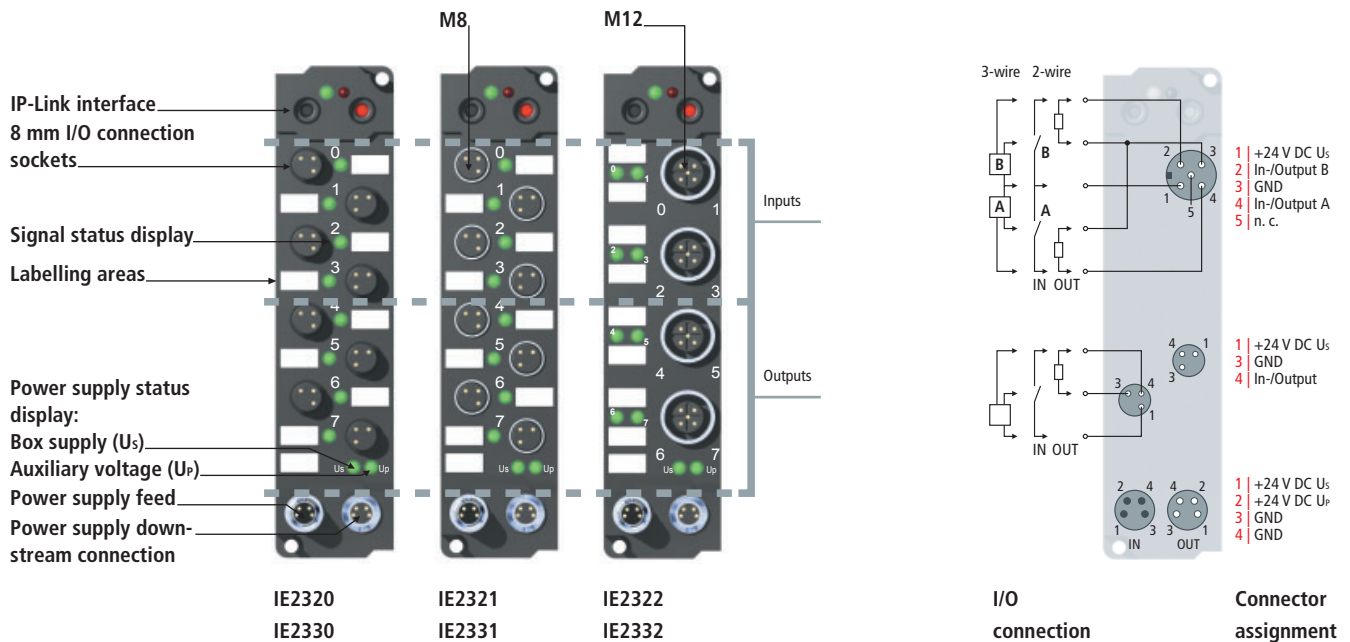


## IE230x, IE231x | 4 x digital input + 4 x digital output 24 V DC, $I_{MAX} = 0.5 A$

The IE23xx digital I/O modules combine four digital inputs and four digital outputs in one device. Various filter constants are available for the inputs. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The state of each signal is indicated by means of light emitting diodes. The signals are connected optionally via 8 mm diameter snap types (IE2300, IE2310), screw type M8 connectors (IE2301, IE2311) or connector M12 screw type (IE2302, IE2312).

Technical data	IE2300	IE2301	IE2302	IE2310	IE2311	IE2312
Number of channels	4 inputs + 4 outputs					
Input/output connections	8 mm, snap type	M8, screw type	M12, screw type	8 mm, snap type	M8, screw type	M12, screw type
Input filter	3.0 ms	3.0 ms	3.0 ms	0.2 ms	0.2 ms	0.2 ms
"0" signal voltage	-3...+5 V					
"1" signal voltage	11...30 V, 6 mA input current (EN 61131-2, type 2)					
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof					
Load type	ohmic, inductive, lamp load					
Rated load voltage	24 V DC (-15 %/+20 %)					
Max. output current	0.5 A on each channel, individually short-circuit-proof					
Short circuit current	typ. 1.5 A					
Auxiliary power current	typ. 20 mA per channel					
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin					
Bit width in the process image	4 inputs + 4 outputs					
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: yes, via IP-Link					
Operating/storage temperature	0...+55 °C/-25...+85 °C					
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29					
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4					
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable					
Further information	www.beckhoff.com/IE2300					

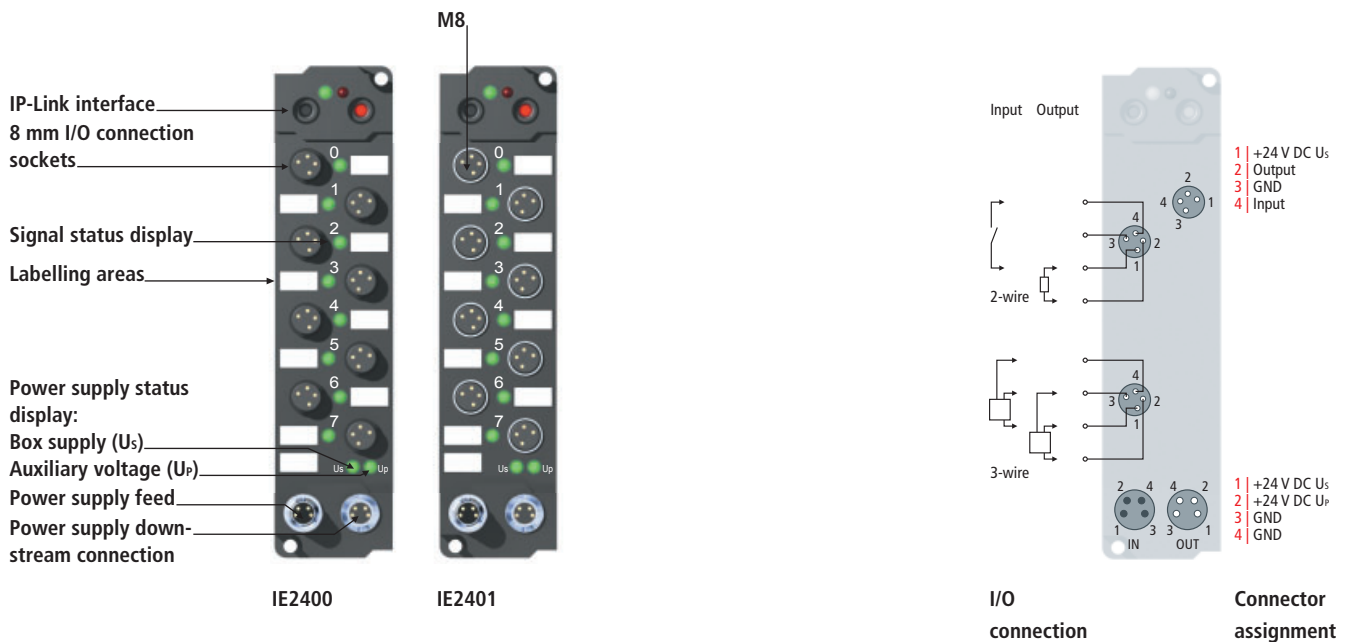




## IE232x, IE233x | 4 x digital input + 4 x digital output 24 V DC, I<sub>MAX</sub> = 2 A

The IE23xx digital I/O modules combine four digital inputs and four digital outputs in one device. Various filter constants are available for the inputs. The outputs handle load currents of up to 2 A, are short-circuit-proof and protected against inverse polarity. The total current for all four outputs is limited to 4 A. This makes these modules particularly suitable for applications in which not all of the outputs are active at the same time, or in which not all of the actuators draw 2 A signal current. The state of each signal is indicated by means of light emitting diodes. The signals are connected optionally via 8 mm diameter snap types (IE2320, IE2330), M8 (IE2321, IE2331) or M12 (IE2322, IE2332) screw type connectors.

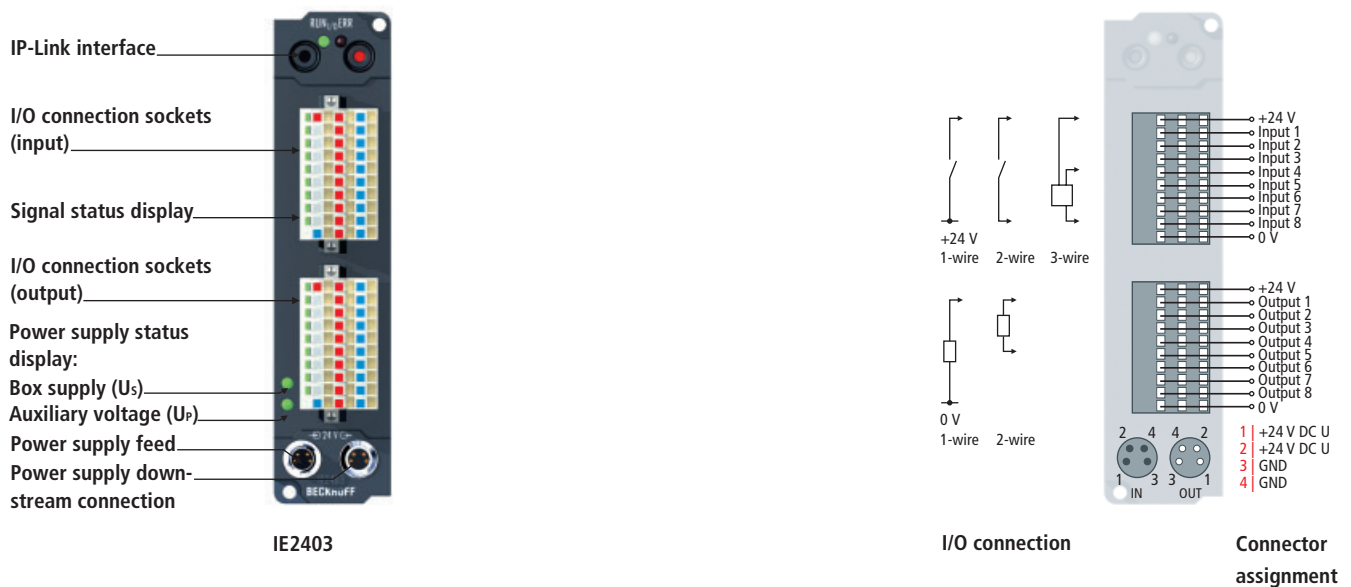
Technical data	IE2320	IE2321	IE2322	IE2330	IE2331	IE2332
Number of channels	4 inputs + 4 outputs					
Input/output connections	8 mm, snap type	M8, screw type	M12, screw type	8 mm, snap type	M8, screw type	M12, screw type
Input filter	3.0 ms	3.0 ms	3.0 ms	0.2 ms	0.2 ms	0.2 ms
"0" signal voltage	-3...+5 V					
"1" signal voltage	11...30 V, 6 mA input current (EN 61131-2, type 2)					
Actuator/sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof					
Load type	ohmic, inductive, lamp load					
Rated load voltage	24 V DC (-15 %/+20 %)					
Max. output current	2 A each channel, individually short-circuit safe, total current max. 4 A					
Short circuit current	typ. 4 A					
Auxiliary power current	typ. 30 mA per channel					
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin					
Bit width in the process image	4 inputs + 4 outputs					
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: yes, via IP-Link					
Operating/storage temperature	0...+55 °C/-25...+85 °C					
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29					
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4					
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable					
Further information	www.beckhoff.com/IE2320					



## IE240x | 16-channel digital combi input/output 24 V DC, $I_{MAX} = 0.5 A$

The IE240x digital I/O modules have sixteen channels that can be used as eight inputs and eight outputs. The device can therefore be flexibly adapted to the requirements of the application. The signals are connected optionally through snap type 8 mm diameter connectors (IE2400) or through M8 screw type (IE2401), both of which have four pins (with separate input and output pins). This makes it possible to connect anti-valent sensors. Adapter cables are available for use in input-only or output-only cases, as well as connectors for field wireable. It is also possible to use the power supply cable directly as the sensor cable. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The state of each signal is indicated by means of light emitting diodes.

Technical data	IE2400	IE2401
Number of channels	16 channels, useable optionally as input and output	
Input/output connections	8 mm, snap type	M8, screw type
Input filter	3.0 ms	
"0" signal voltage	-3...+5 V	
"1" signal voltage	11...30 V, 6 mA input current (EN 61131-2, type 2)	
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof	
Load type	ohmic, inductive, lamp load	
Rated load voltage	24 V DC (-15 %/+20 %)	
Max. output current	0.5 A on each channel, individually short-circuit-proof	
Short circuit current	typ. 1.5 A	
Auxiliary power current	typ. 20 mA per channel	
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin	
Bit width in the process image	8 inputs + 8 outputs	
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: yes, via IP-Link	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Further information	www.beckhoff.com/IE2400	

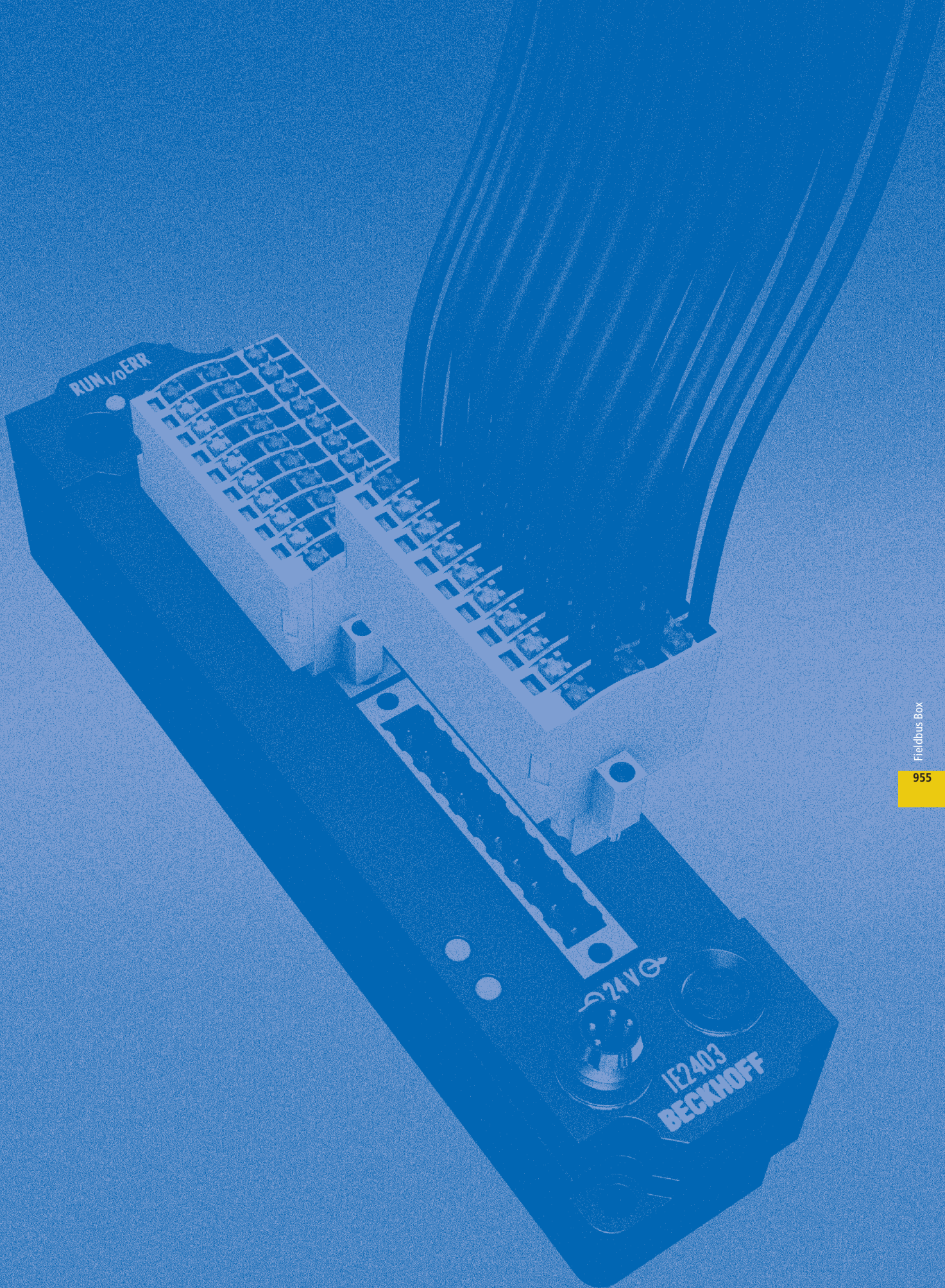


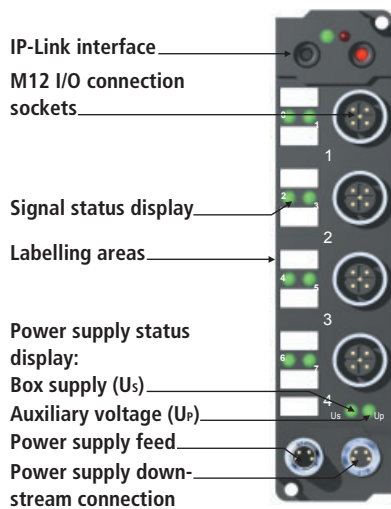
## IE2403 | 16-channel digital combi input/output 24 V DC

The digital IE2403 I/O module has sixteen channels with eight inputs and eight outputs. The device can therefore be flexibly adapted to the requirements of the application. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. For the signal connection connectors with a spring-loaded system are used, optionally available with 1 or 3 pins. The module is supplied with-out connectors.

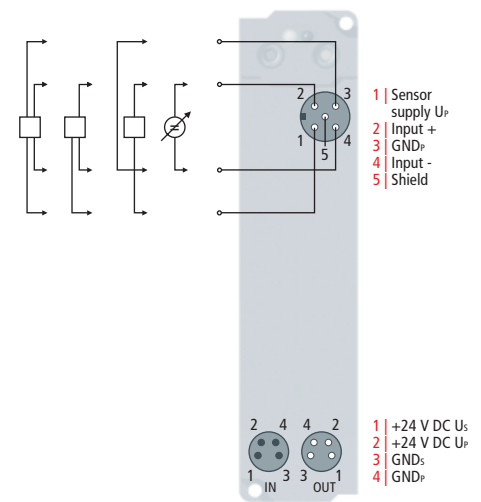
Technical data	IE2403
Number of channels	16 channels (8 inputs and 8 outputs)
Input/output connections	connector with spring-loaded system
Input filter	3 ms
"0" signal voltage	-3...+5 V
"1" signal voltage	11...30 V, 6 mA input current (EN 61131-2, type 2)
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof
Load type	ohmic, inductive, lamp load
Rated load voltage	24 V DC (-15 %/+20 %)
Max. output current	max. 0.5 A on each channel, individually short-circuit safe
Short circuit current	typ. 1.5 A
Auxiliary power current	typ. 20 mA per channel
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	8 inputs + 8 outputs
Electrical isolation	channels/control voltage: no, between the channels: no, control voltage/fieldbus: yes, via IP-Link
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Further information	<a href="http://www.beckhoff.com/IE2403">www.beckhoff.com/IE2403</a>

Accessories	
ZS2001-0001	connector, 1-pin, without LED
ZS2001-0002	connector, 1-pin, with LED
ZS2001-0004	connector, 3-pin, with LED





IE3102

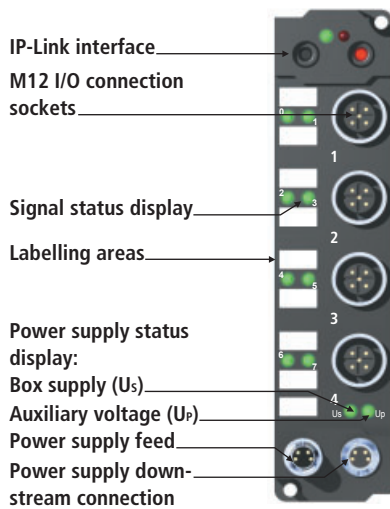
I/O  
connectionConnector  
assignment

## IE3102 | 4-channel analog input $\pm 10$ V

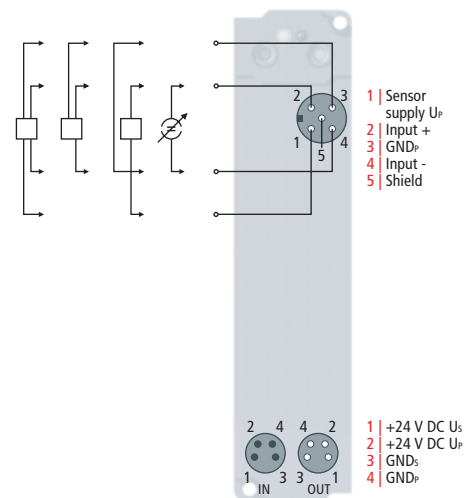
The IE3102 analog input module handles signals in the range from -10 to +10 V. The voltage is digitised to a resolution of 16 bits and is transmitted, electrically isolated, to the higher-level automation device. The four input channels have differential inputs and possess a common, internal ground potential. The applied auxiliary voltage (which can be any value up to 30 V DC) is fed through to supply the sensor. It is thus possible, for instance, to supply a measuring potentiometer with 10 V DC from an external voltage source.

The module is quite versatile, but default settings have been selected in such a way that in most cases it is not necessary to perform configuration. The input filter and associated conversion times can be set within a wide range; several data output formats may be chosen. If required, the inputs can be scaled differently. Automatic limit monitoring is also available. Parameterisation may be carried out either via the fieldbus or using the KS2000 software tool.

Technical data	IE3102
Number of inputs	4
Input connections	M12, screw type
Signal voltage	-10/0...+10 V
Internal resistance	> 100 k $\Omega$
Common-mode voltage $U_{CM}$	35 V max.
Resolution	16 bits (for 0...10 V range: resolution 15 bits)
Conversion time	250 ms, configurable to 5 ms
Measuring error	< $\pm 0.3$ % (relative to full scale value)
Input filter	configurable
Sensor supply	from load supply voltage $U_P$ , DC, any value up to 30 V
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input: 4 x 16 bit data (4 x 8 bit control/status optional)
Electrical isolation	channels/control voltage: 500 V <sub>rms</sub> , between the channels: no, control voltage/fieldbus: yes, via IP-Link
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IE3102">www.beckhoff.com/IE3102</a>



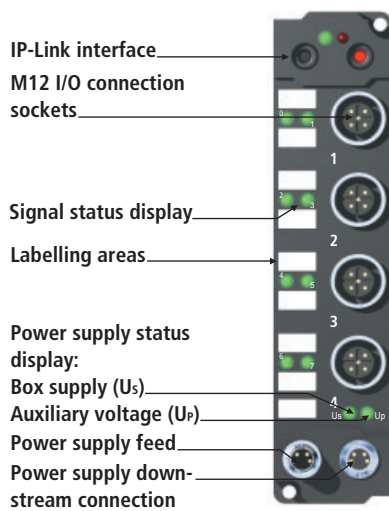
IE3112

I/O  
connectionConnector  
assignment

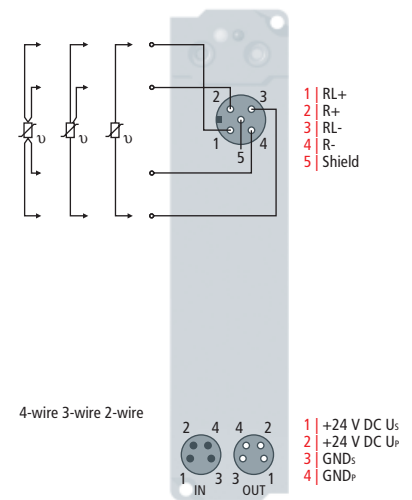
## IE3112 | 4-channel analog input 0/4...20 mA

The IE3112 analog input module handles signals in the range from 0/4 to 20 mA. The input current is digitised to a resolution of 16 bits (the default is 15 bits), and is transmitted, electrically isolated, to the higher-level automation device. The four input channels have differential inputs and possess a common, internal ground potential. The applied load voltage (which can be any value up to 30 V DC) is fed through to supply the sensor. The module is quite versatile, but default settings have been selected in such a way that in most cases it is not necessary to perform configuration. The input filter and associated conversion times can be set within a wide range; several data output formats may be chosen. If required, the inputs can be scaled differently. Automatic limit monitoring is also available. Parameterisation may be carried out either via the fieldbus or using the KS2000 software tool through the Coupler Box configuration interface. The parameters are stored in the module.

Technical data	IE3112
Number of inputs	4
Input connections	M12, screw type
Signal voltage	0/4...20 mA
Internal resistance	80 $\Omega$ measuring shunt
Common-mode voltage $U_{CM}$	35 V max.
Resolution	16 bits
Conversion time	250 ms, configurable to 5 ms
Measuring error	< $\pm 0.3$ % (relative to full scale value)
Input filter	configurable
Sensor supply	from load supply voltage $U_p$ , DC, any value up to 30 V
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input: 4 x 16 bit data (4 x 8 bit control/status optional)
Electrical isolation	channels/control voltage: 500 $V_{rms}$ , between the channels: no, control voltage/fieldbus: yes, via IP-Link
Operating/storage temperature	0...+55 $^{\circ}C$ /-25...+85 $^{\circ}C$
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IE3112">www.beckhoff.com/IE3112</a>



IE3202

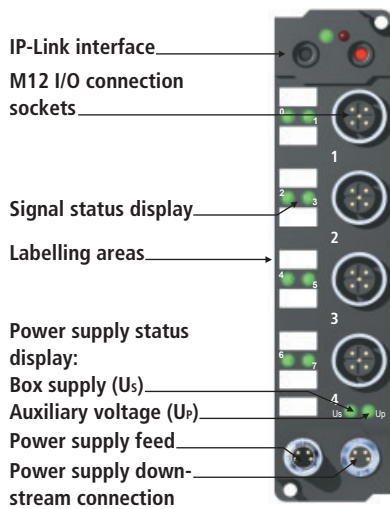
I/O  
connectionConnector  
assignment

## IE3202 | 4-channel analog input PT100 (RTD)

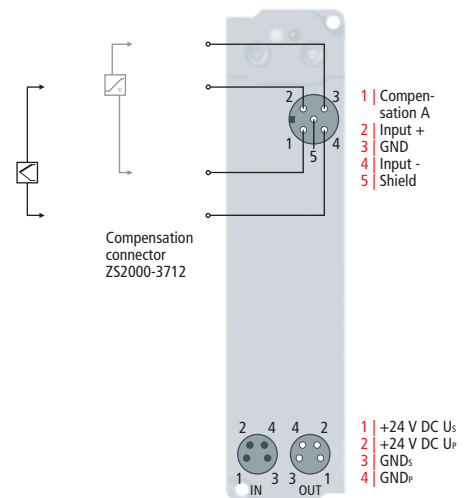
The IE3202 analog input module allows resistance sensors to be connected directly. The module's circuitry can operate the sensors using 2-, 3- or 4-wire connection techniques. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The module can also be used for simple resistance measurement with the output in ohms. The module's standard settings are: resolution 0.1 °C in the temperature range of PT100 sensors in 4-wire connection. Sensor malfunctions such as broken wires are indicated by error LEDs.

The module is quite versatile, but the default values are selected in such a way that in most cases it is not necessary to perform configuration. The input filter and associated conversion times can be set within a wide range; several data output formats may be chosen. If required, the inputs can be scaled differently. Automatic limit monitoring is also available. Parameterisation may be carried out either via the fieldbus or using the KS2000 software tool.

Technical data	IE3202
Number of inputs	4
Connection method	screw type M12 for 2-, 3- and 4-wire connections, presetting: 4-wire
Sensor types	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer)
Temperature range	-250...+850 °C (PT sensors); -60...+250 °C (Ni sensors)
Resolution	0.1 °C per digit
Conversion time	approx. 250 ms (configurable up to 65 ms)
Measuring error	< ±1 °C
Measuring current	typ. 0.5 mA
Input filter	5 variations, configurable
Sensor supply	from control voltage $U_s$
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input: 4 x 16 bit data (4 x 8 bit control/status optional)
Electrical isolation	channels/control voltage: 500 V <sub>rms</sub> , between the channels: no, control voltage/fieldbus: yes, via IP-Link
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	www.beckhoff.com/IE3202



IE3312

I/O  
connectionConnector  
assignment

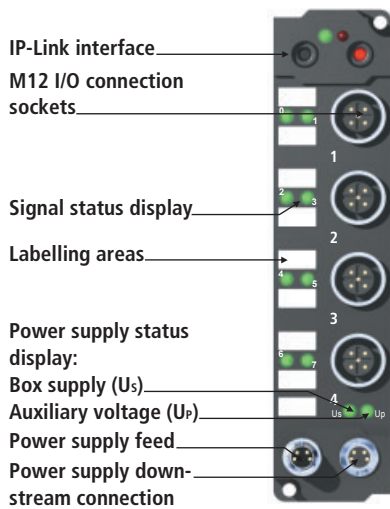
## IE3312 | 4-channel analog input thermocouple

The IE3312 analog input module permits four thermocouples to be directly connected. The module's circuit can operate thermocouple sensors using the 2-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The error LEDs indicate a broken wire. Compensation for the cold junction is made through a temperature measurement in the connecting plugs. This means that standard extension leads can be connected. The IE3312 can also be used for mV measurement.

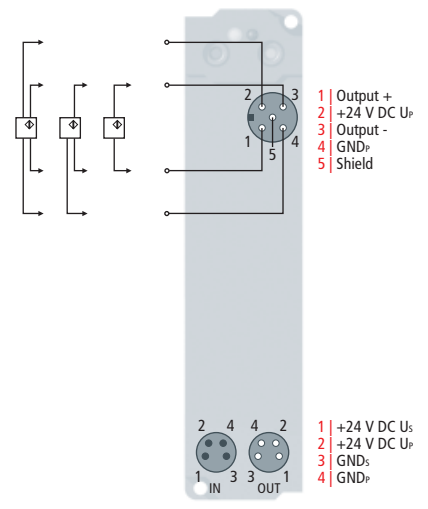
The module is quite versatile, but the default values are selected in such a way that in most cases it is not necessary to perform configuration. The input filter and associated conversion times can be set within a wide range; several data output formats may be chosen. If required, the inputs can be scaled differently. Automatic limit monitoring is also available. Parameterisation may be carried out either via the fieldbus or using the KS2000 software tool through the Coupler Box configuration interface. The parameters are stored in the module. For the temperature compensation a PT1000 element is needed. Beckhoff offers a connector with temperature compensation (ZS2000-3712).

Technical data	IE3312
Number of inputs	4
Connection method	screw type M12, 2-wire connection for thermocouple
Sensor types	types J, K, L, B, E, N, R, S, T, U (default setting type K), mV measurement
Temperature range	depending on sensor type; preset value is type K, -100...+1,370 °C
Resolution	0.1 °C per digit
Conversion time	approx. 250 ms (configurable up to 70 ms)
Measuring error	< ±0.5 % (relative to full scale value)
Input filter	5 variations, configurable
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input: 4 x 16 bit data (4 x 8 bit control/status optional)
Electrical isolation	channels/control voltage: 500 V <sub>rms</sub> , between the channels: no, control voltage/fieldbus: yes, via IP-Link
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	www.beckhoff.com/IE3312





IE4112



I/O connection

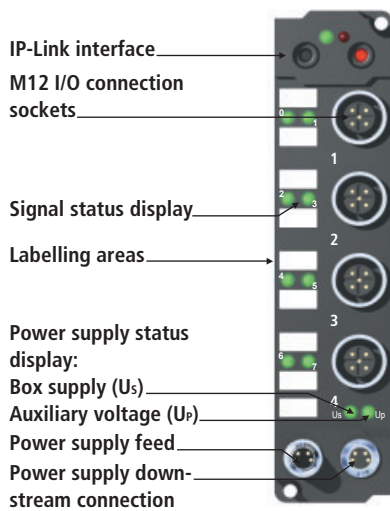
Connector assignment

## IE4112 | 4-channel analog output 0/4...20 mA

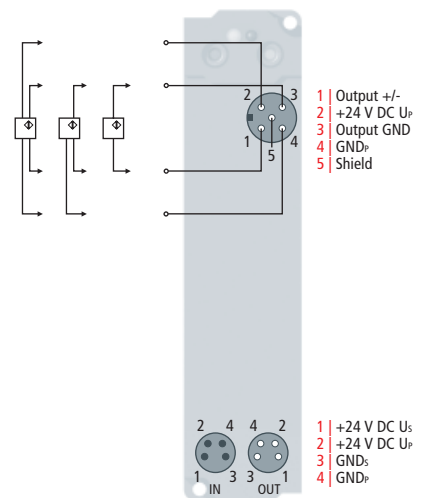
The IE4112 analog output module generates analog output signals in the range from 0/4 to 20 mA. The power is supplied to the process level with a resolution of 15 bits (default), and is electrically isolated. If the input is transmitted without an arithmetical sign, 16 bit resolution may also be selected. If necessary, the output scaling can be altered.

Ground potential for the four output channels is common with the 24 V DC supply. The analog actuators are powered by the load voltage. The applied load voltage (which can be any value up to 30 V DC) is fed through to supply the actuators.

Technical data	IE4112
Number of outputs	4
Output connections	M12, screw type
Signal current	0/4...20 mA
Load	< 500 Ω
Resolution	15 bit, configurable to 16 bit
Conversion time	< 4 ms
Measuring error	< ±0.1 % (relative to full scale value)
Actuator supply	from the auxiliary voltage $U_p$
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	output: 4 x 16 bit data (4 x 8 bit control/status optional)
Electrical isolation	channels/control voltage: yes, between the channels: no, control voltage/fieldbus: yes, via IP-Link
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	www.beckhoff.com/IE4112



IE4132

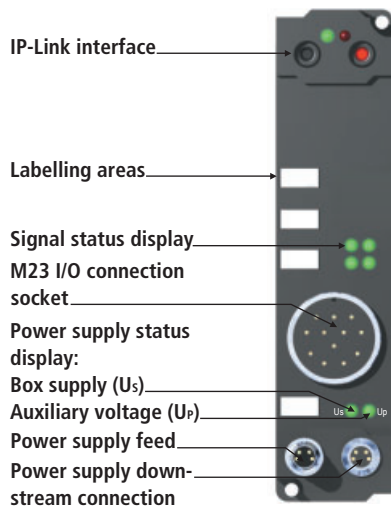
I/O  
connectionConnector  
assignment

## IE4132 | 4-channel analog output $\pm 10$ V

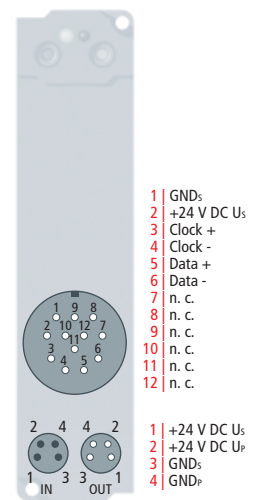
The IE4132 analog output module generates analog output signals in the range from -10 to +10 V. The voltage is supplied to the process level with a resolution of 16 bits, and is electrically isolated. If necessary, the output scaling can be altered.

Ground potential for the four output channels is common with the 24 V DC supply. The analog actuators are powered by the control voltage. The applied load voltage (which can be any value up to 30 V DC) is available for supply of the actuators.

Technical data	IE4132
Number of outputs	4
Output connections	M12, screw type
Signal current	-10/0...10 V
Load	> 5 k $\Omega$
Resolution	16 bit (incl. sign)
Conversion time	< 4 ms
Measuring error	< $\pm 0.1$ % (relative to full scale value)
Actuator supply	from the auxiliary voltage $U_p$
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	output: 4 x 16 bit data (4 x 8 bit control/status optional)
Electrical isolation	channels/control voltage: yes, between the channels: no, control voltage/fieldbus: yes, via IP-Link
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IE4132">www.beckhoff.com/IE4132</a>



IE5009

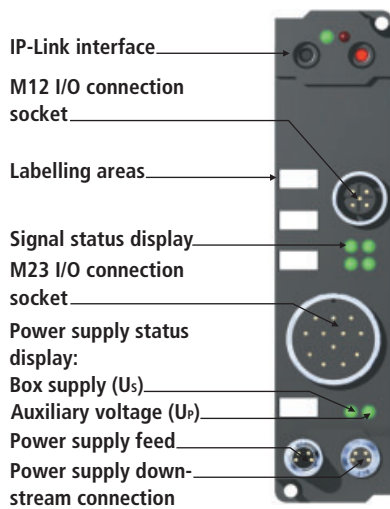


Connector assignment

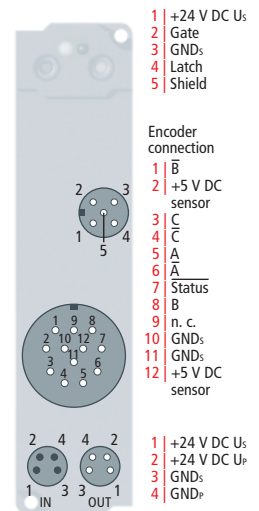
## IE5009 | 1-channel SSI encoder interface

The IE5009 SSI interface module allows an SSI encoder to be connected directly. The encoder is powered via the SSI interface. The interface circuit generates a pulse for reading the encoder and makes the incoming data stream available to the controller as a data word in the process image. The module can optionally provide the data as binary numbers or as a binary gray code. Adaptation for the direction of rotation can be configured. Various operating modes, transmission frequencies and bit widths can be permanently stored in a control register.

Technical data	IE5009
Number of channels	1
SSI encoder connection	M23 connector with outer thread, 12-pin
Signal input	difference signal (RS485)
Encoder supply	24 V DC, from load voltage
Data transfer rates	variable up to 1 MHz, 250 kHz default
Serial input	24 bits (adjustable)
Data direction	read
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input: 1 x 32 bit data (1 x 8 bit control/status optional)
Electrical isolation	yes, via IP-Link
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IE5009">www.beckhoff.com/IE5009</a>



IE5109



Connector assignment

## IE5109 | 1-channel incremental encoder interface, 1 MHz

The IE5109 module is an interface for the direct connection of incremental encoders with differential inputs (RS485) or with single inputs. A 16 bit counter with a quadrature decoder and a 16 bit latch for the zero pulse can be read, set or enabled. The inputs can optionally be used as complementary or as single inputs. Incremental encoders with alarm outputs can be connected at the interface's status input. Interval measurement with a resolution of 200 ns is possible. The gate input allows the counter to be halted (high = stop). The value is read with a rising edge at the latch input.

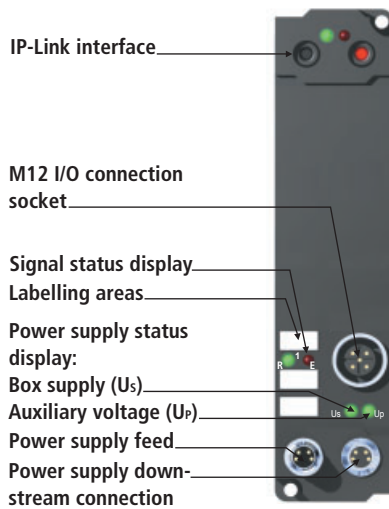
Technical data	IE5109
Number of channels	1
Connection encoder/sensor	M23 connector with outer thread, 12-pin
Gate/latch connection	M12, screw type
Encoder supply	5 V DC
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof
Counter	16 bits, binary
Limit frequency	1 MHz (with 4-fold evaluation)
Quadrature decoder	1-, 2-, or 4-fold evaluation
Zero-pulse latch	16 bits
Commands	read, set, enable
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input/output: 2 x 16 bit data + 1 x 8 bit control/status
Electrical isolation	yes, via IP-Link
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IE5109">www.beckhoff.com/IE5109</a>



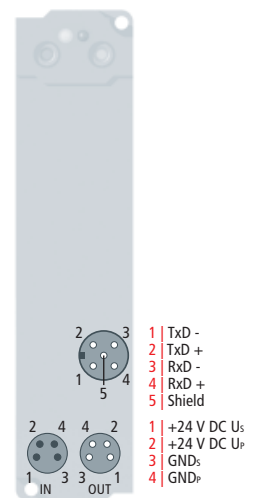
## IE6002 | 1-channel serial interface, RS232

The IE6002 serial interface module allows the connection of devices with an RS232 interface, which operates in conformity with the CCITT V.28/ DIN 66 259-1 standards. The module transmits the data in a fully transparent manner to the higher-level automation device. The data is transferred via the fieldbus using a simple handshake protocol. This does not have any effect on the protocol of the serial interface. The active serial communication channel functions independently of the higher-level bus system in full duplex mode at up to 115,200 baud, while a 128 byte receive buffer and a 16 byte send buffer are available. The RS232 interface guarantees high immunity to interference through electrically isolated signals.

Technical data	IE6002
Data transfer channels	2 (1/1), TxD and RxD
Data transfer rates	1,200...115,200 baud, 9,600 baud (8 bits, no parity, 1 stop bit) is preset
RS232 connection	M12, screw type
Bit distortion	< 3 %
Cable length	max. 15 m
"0" signal voltage	-18...+3 V
"1" signal voltage	3...18 V
Data buffer	128 bytes receive buffer, 16 bytes transmit buffer
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input/output: 3 x 8 bit user data, 1 x 8 bit control/status (up to 5 x 8 bit user data are possible)
Electrical isolation	RS232/control voltage: 500 V <sub>rms</sub> , to the fieldbus: yes, via IP-Link
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IE6002">www.beckhoff.com/IE6002</a>



IE6012

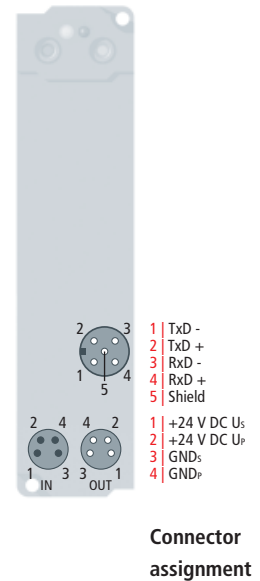
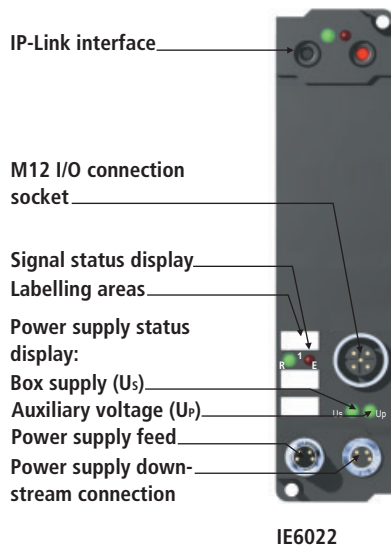


Connector assignment

## IE6012 | 1-channel serial interface TTY, 20 mA current loop

The IE6012 serial interface module allows the connection of devices with a 20 mA current interface, which operates passively. The module transmits the data in a fully transparent manner to the higher-level automation device. The data is transferred via the fieldbus using a simple handshake protocol. This does not have any effect on the protocol of the serial interface. The active serial communication channel functions independently of the higher-level bus system in full duplex mode at up to 115,200 baud, while a 128 byte receive buffer and a 16 byte send buffer are available. The current interface guarantees high immunity to interference through electrically isolated signals with injected current.

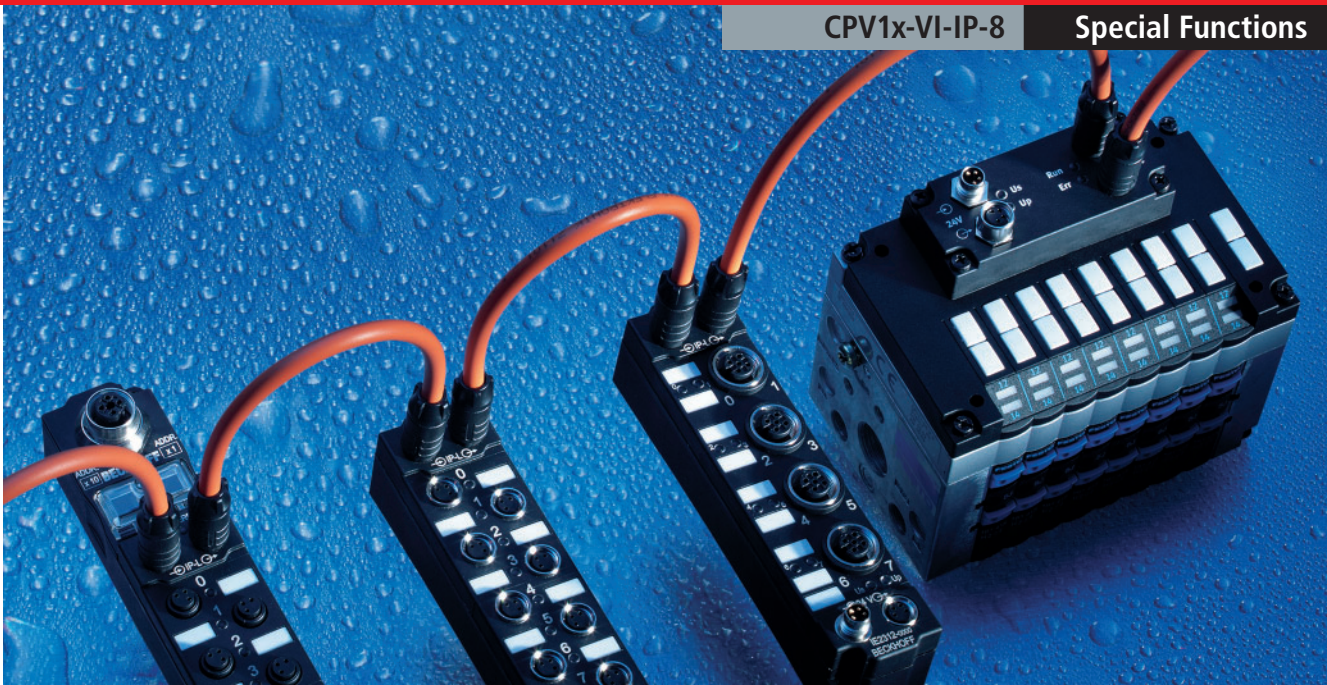
Technical data	IE6012
Data transfer channels	2 (1/1), TxD and RxD, full duplex
Data transfer rates	1,200...115,200 baud, 9,600 baud (8 bits, no parity, 1 stop bit) is preset
TTY connection	M12, screw type
Bit transfer	2 x 20 mA
Load	< 500 Ω
Cable length	max. 1,000 m twisted pair
"0" signal current	0...3 mA
"1" signal current	14...20 mA
Data buffer	128 bytes receive buffer, 16 bytes transmit buffer
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input/output: 3 x 8 bit user data, 1 x 8 bit control/status (up to 5 x 8 bit user data are possible)
Electrical isolation	TTY/control voltage: 500 V <sub>rms</sub> , to the fieldbus: yes, via IP-Link
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	www.beckhoff.com/IE6012



## IE6022 | 1-channel serial interface, RS422/RS485

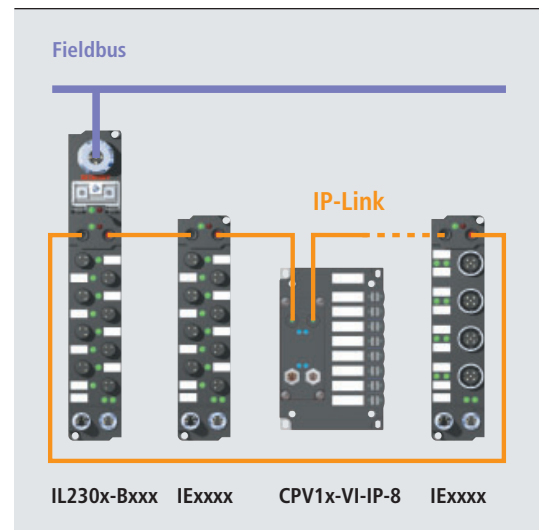
The IE6022 serial interface module allows the connection of devices with a RS422 or RS485 interface. The module transmits the data in a fully transparent manner to the higher-level automation device. The data is transferred via the fieldbus using a simple handshake protocol. This does not have any effect on the protocol of the serial interface. The active serial communication channel functions independently of the higher-level bus system in full duplex mode at up to 115,200 baud, while a 128 byte receive buffer and a 16 byte send buffer are available. The transmission of differential signals according to RS232 guarantees high immunity to interference through electrically isolated signals.

Technical data	IE6022
Data transfer channels	TxD and RxD, full/half duplex
Data transfer rates	1,200...115,200 baud, 9,600 baud (8 bits, no parity, 1 stop bit) is preset
RS422 connection	M12, screw type
Bit transfer	with differential signal
Line impedance	120 $\Omega$
Cable length	max. 500 m twisted pair
Common-mode voltage $U_{CM}$	max. -7...+12 V to ground
Data buffer	128 bytes receive buffer, 16 bytes transmit buffer
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	input/output: 3 x 8 bit user data, 1 x 8 bit control/status (up to 5 x 8 bit user data are possible)
Electrical isolation	RS485/control voltage: 500 V <sub>rms</sub> , to the fieldbus: yes, via IP-Link
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/IE6022">www.beckhoff.com/IE6022</a>



## CPV1x-VI-IP-8 | Festo valve terminal with IP-Link interface for Fieldbus Box system

The Festo CPV1x-VI-IP-8 valve terminals have an IP-Link interface and can therefore be integrated into the Fieldbus Box system. The combination of fieldbus and I/O variety with pneumatics offers a large number of application options. Like an Extension Box, the valve terminal is connected to the Coupler Box via the IP-Link bus; the distance may be up to 15 m. The Coupler Box is the head station with integrated fieldbus connection, to which up to 120 extension modules can be connected. No special configuration is required in the system integration, because the Coupler Box automatically recognises the modules. The CPV valve terminals differ in terms of their physical size.



Technical data	CPV10-VI-IP-8	CPV14-VI-IP-8
Number of channels	max. 16 valves on max. 8 valve discs	
Size	10 mm	14 mm
Diagnostics	message in case of under-voltage < 20.4 V DC/LED and status byte	
Rated load voltage	24 V DC (-15 %/+20 %)	
IP-Link connection	2 x IP-Link socket for ZS1020-0010 connector	
Distance between stations	max. 15 m	
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin	
Bit width in the process image	2 byte output (compact)/3 byte input and output (complex)	
Electrical isolation	between control voltage $U_s$ and load voltage $U_r$ : yes	
Protection class	IP 65	
Further information	<a href="http://www.beckhoff.com/CPV10-VI-IP-8">www.beckhoff.com/CPV10-VI-IP-8</a>	

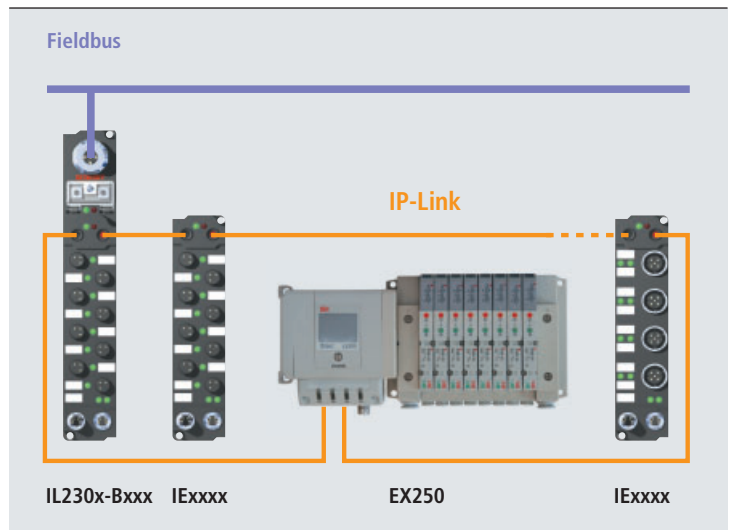
The CPV1x-VI-IP-8 valve terminals can be ordered only from Festo AG & Co. ([www.festo.com](http://www.festo.com)).





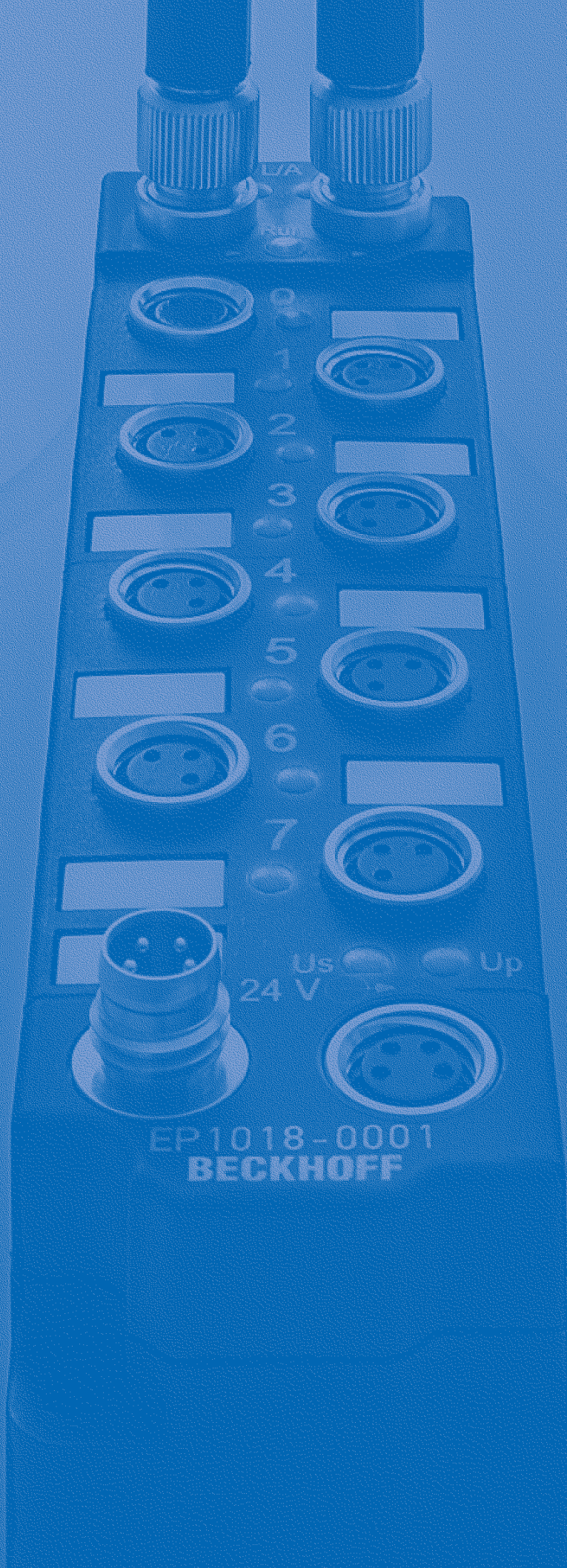
## EX250 | SMC valve terminal with IP-Link interface for Fieldbus Box system

The SMC EX250 valve terminal has an IP-Link interface and can therefore be integrated into the Fieldbus Box system. The direct combination of fieldbus and I/O variety with pneumatics offers a large number of application options. Like an Extension Box, the valve terminal is connected to the Coupler Box via the IP-Link bus; the distance may be up to 15 m. The Coupler Box is the head station with the integrated fieldbus connection, to which up to 120 extension modules can be connected. No special configuration is required in the system integration, because the Coupler Box automatically recognises the modules.



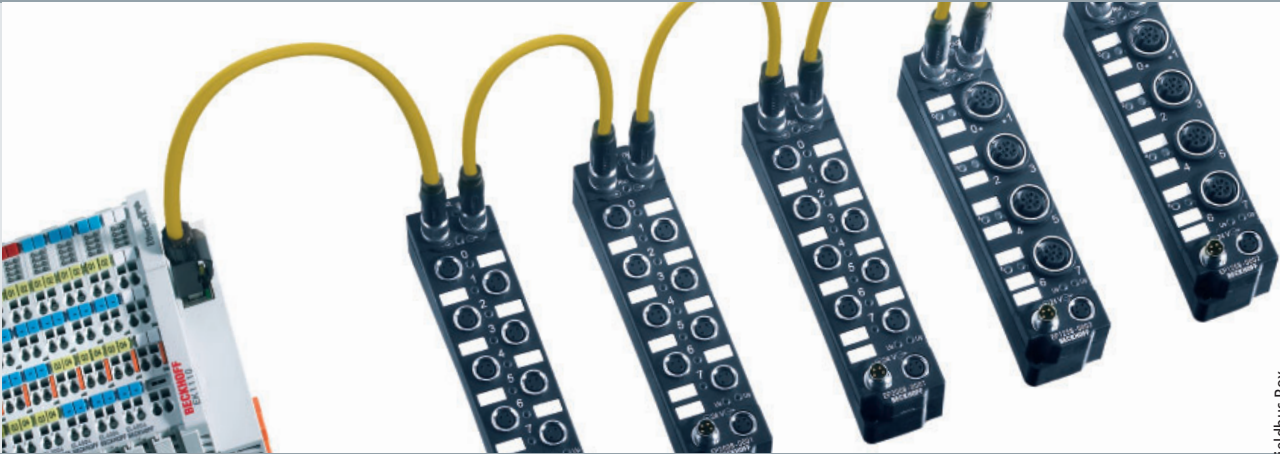
Technical data	EX250
Number of channels	max. 16 valves
Diagnostics	message in case of under-voltage, LED and status byte
Rated load voltage	24 V DC (-15 %/+20 %)
IP-Link connection	2 x IP-Link socket for ZS1020-0010 connector
Distance between stations	max. 15 m
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	2 byte output (compact)/3 byte input and output (complex)
Electrical isolation	between control voltage $U_s$ and load voltage $U_r$ : yes
Protection class	IP 67
Further information	<a href="http://www.beckhoff.com/EX250">www.beckhoff.com/EX250</a>

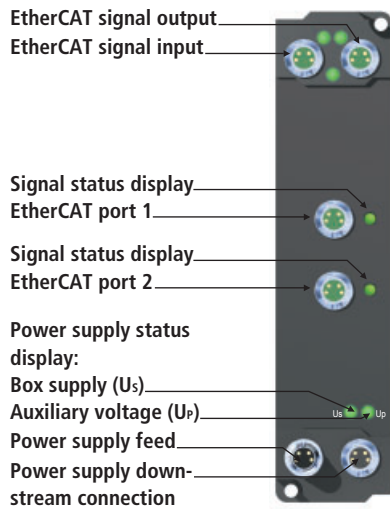
The EX250 valve terminals can be ordered only from SMC ([www.smceu.com](http://www.smceu.com)).



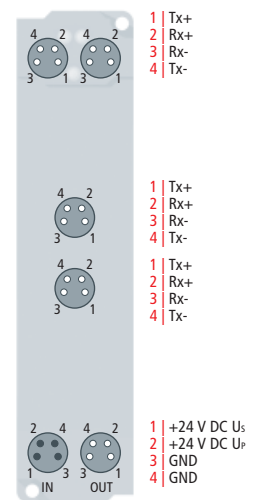


# EtherCAT Box





EP1122-0001

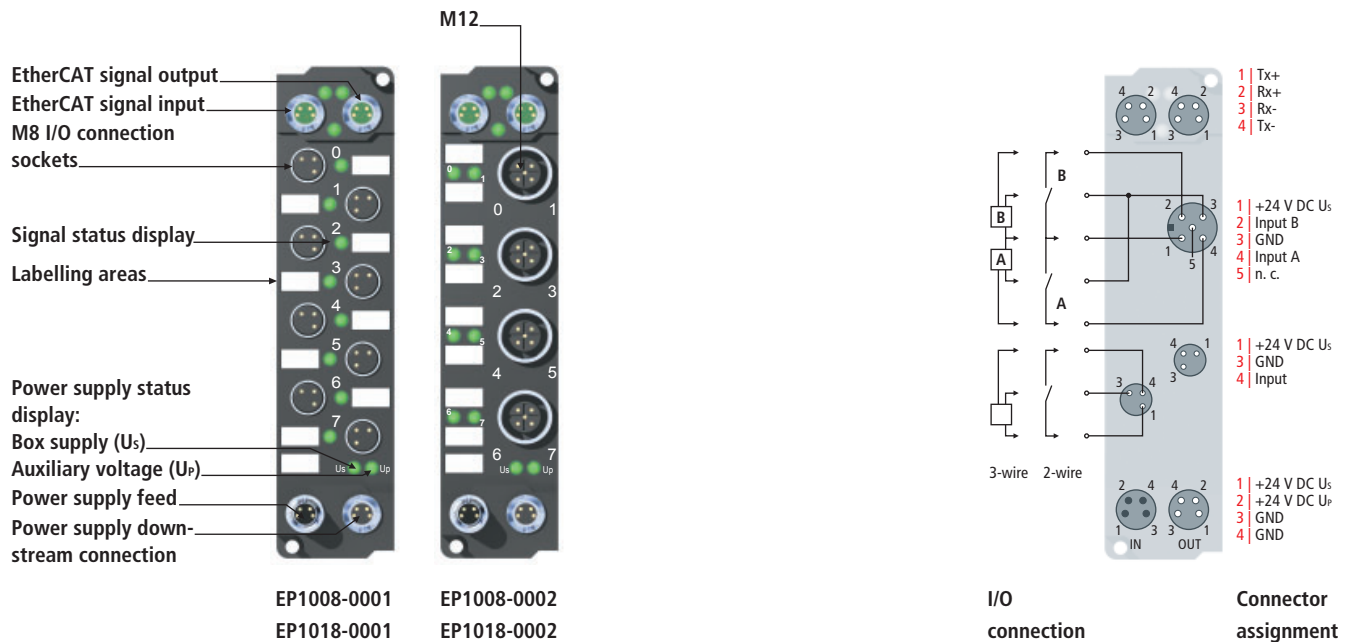


Connector assignment

## EP1122-0001 | 2-port EtherCAT junction

The 2-port EtherCAT junction enables configuration of EtherCAT star topologies. A modular EtherCAT star can be realised by using several EP1122 units in a station. Individual devices or complete EtherCAT strands can be connected at the junction ports. The EtherCAT junctions are connected via shielded M8 screw connectors with direct display of link and activity status. The Run LED indicates the status of the EP1122. Through TwinCAT and other suitable EtherCAT masters the EP1122 also supports coupling and uncoupling of EtherCAT strands during operation (Hot Connect).

Technical data	EP1122-0001
Number of EtherCAT ports	2
Task within EtherCAT system	coupling of EtherCAT junctions
Data transfer medium	Ethernet/EtherCAT cable (min. CAT5)
Distance between stations	100 m (100BASE-TX)
Protocol	EtherCAT
Data transfer rates	100 Mbaud
Configuration	not required
Bus interface	2 x M8, screw type
Power supply	from E-bus
Current consumption	typ. 220 mA
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/EP1122">www.beckhoff.com/EP1122</a>

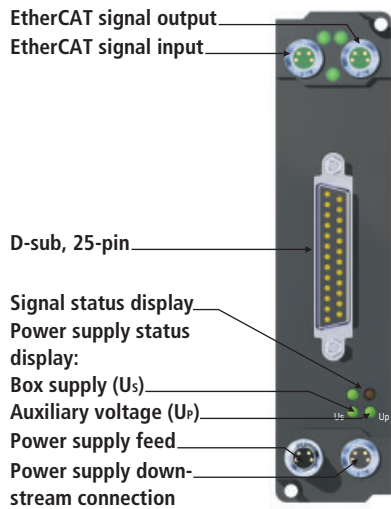


## EP1008-, EP1018-000x | 8-channel digital input 24 V DC

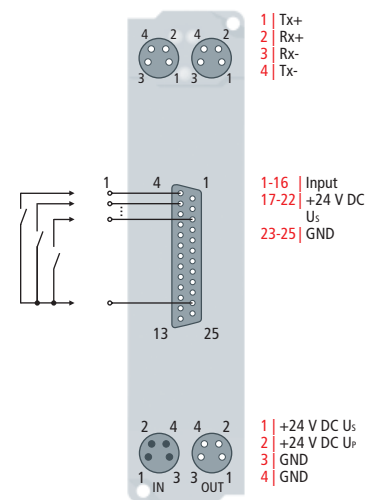
The EP1008 and EP1018 EtherCAT Box modules with digital inputs acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the controller. The state of the signals is indicated by light emitting diodes. The signals are optionally connected via M8 (EP1008-0001, EP1018-0001) or M12 (EP1008-0002, EP1018-0002) screw type connectors. These versions are distinguished by input filters of different speeds.

The sensors are supplied from the box supply voltage  $U_s$ . The auxiliary voltage  $U_p$  is not used in the input module, but may be connected in order to be relayed downstream.

Technical data	EP1008-0001	EP1008-0002	EP1018-0001	EP1018-0002
Number of inputs	8			
Input connections	M8, screw type	M12, screw type	M8, screw type	M12, screw type
Protocol	EtherCAT			
Bus interface	2 x M8, screw type			
Nominal input voltage	24 V DC (-15 %/+20 %)			
Input filter	3.0 ms	3.0 ms	10 $\mu$ s	10 $\mu$ s
"0" signal voltage	-3...+5 V (EN 61131-2, type 3)			
"1" signal voltage	11...30 V (EN 61131-2, type 3)			
Input current	typ. 3 mA (EN 61131-2, type 3)			
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof			
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin			
Bit width in the process image	8 inputs			
Electrical isolation	control voltage/fieldbus: yes			
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable			
Further information	www.beckhoff.com/EP1008			



EP1816-0008

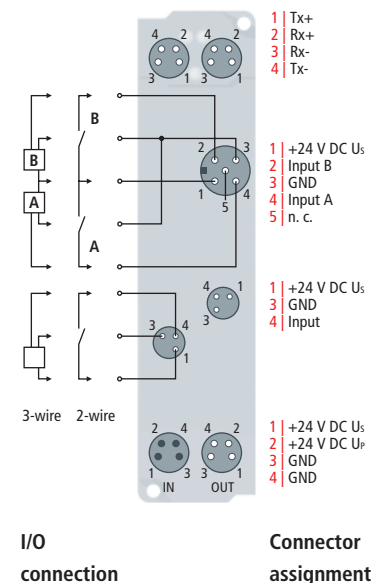
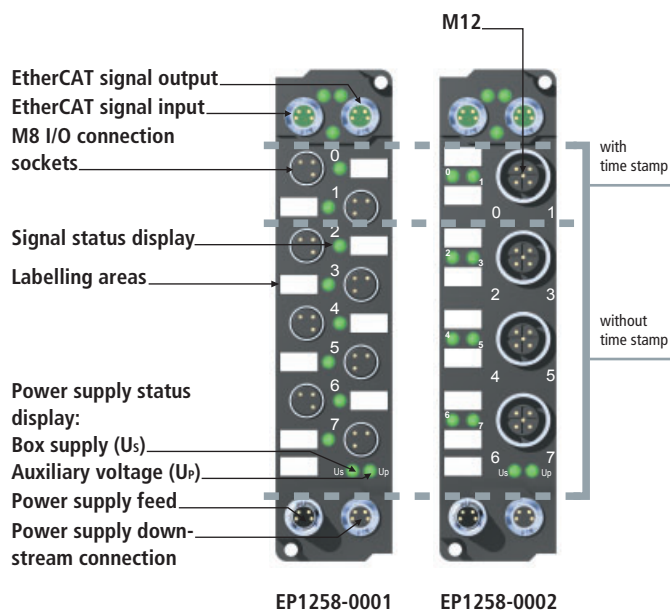
I/O  
connectionConnector  
assignment

## EP1816-0008 | 16-channel digital input 24 V DC

The EP1816 EtherCAT Box with digital inputs acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The state of the signals is indicated by light emitting diodes. The signals are connected via 25-pin D-sub socket.

The sensors are supplied from the box supply voltage  $U_s$ . The auxiliary voltage  $U_a$  is not used in the input module, but may be connected in order to be relayed downstream.

Technical data	EP1816-0008
Number of inputs	16
Input connections	D-sub socket, 25-pin
Protocol	EtherCAT
Bus interface	2 x M8, screw type
Nominal input voltage	24 V DC (-15 %/+20 %)
Input filter	10 $\mu$ s
"0" signal voltage	-3...+5 V (EN 61131-2, type 3)
"1" signal voltage	11...30 V (EN 61131-2, type 3)
Input current	typ. 3 mA (EN 61131-2, type 3)
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	8 inputs
Electrical isolation	control voltage/fieldbus: yes
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/EP1816">www.beckhoff.com/EP1816</a>



## EP1258-000x | 8-channel digital input with 2-channel time stamp

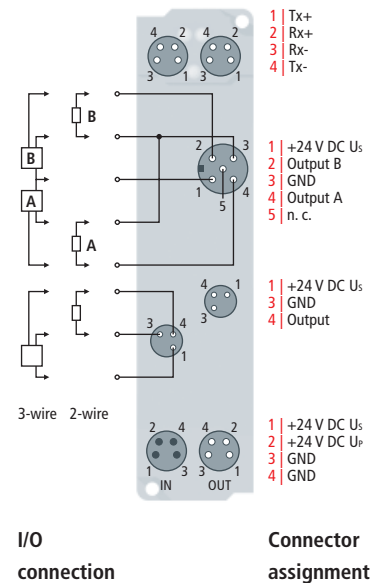
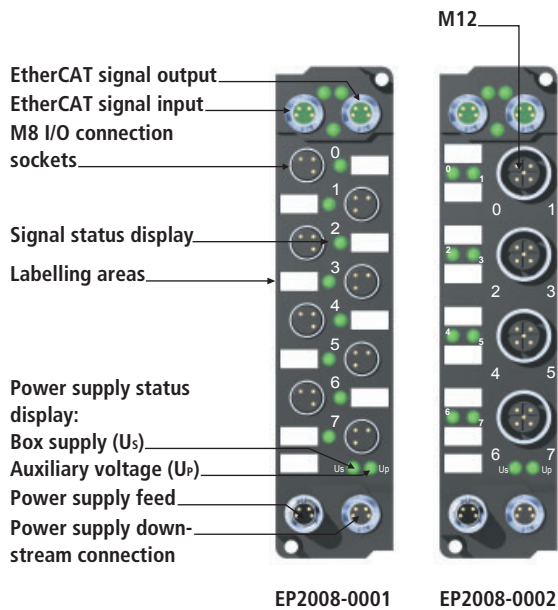


The EP1258 EtherCAT Box with digital inputs acquires the fast binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The signals are furnished with a time stamp that identifies the time of the last edge change with a resolution of 1 ns. This technology enables signals to be traced exactly over time and synchronised with the distributed clocks across the system. With this technology, machine-wide parallel hardware wiring of digital inputs or encoder signals for synchronisation purposes is often no longer required. In this way, the EP1258 enables responses with equidistant time intervals, largely independent of the bus cycle time.

Technical data	EP1258-0001	EP1258-0002
Number of inputs	8	
Input connections	M8, screw type	M12, screw type
Protocol	EtherCAT	
Bus interface	2 x M8, screw type	
Nominal input voltage	24 V DC (-15 %/+20 %)	
Input filter	10 $\mu$ s	
"0" signal voltage	-3...+5 V (similar to EN 61131-2, type 3)	
"1" signal voltage	11...30 V (similar to EN 61131-2, type 3)	
Input current	typ. 3 mA (similar to EN 61131-2, type 3)	
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof	
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin	
Resolution time stamp	1 ns (channel 0/1)	
Precision of time stamp	10 ns (+ input delay) (channel 0/1)	
Distributed clock precision	< 100 ns (channel 0/1)	
Bit width in the process image	8 inputs + 36 byte time stamp	
Electrical isolation	control voltage/fieldbus: yes	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Further information	www.beckhoff.com/EP1258	

XFC technology description see **664**

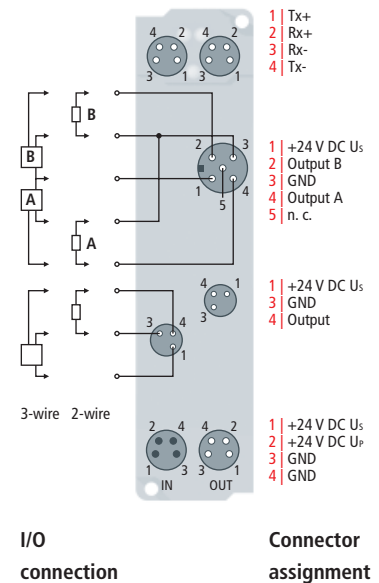
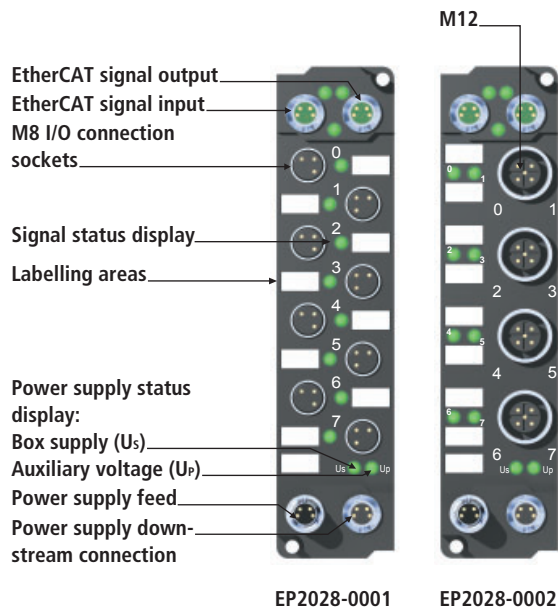




# EP2008-000x | 8-channel digital output 24 V DC, I<sub>MAX</sub> = 0.5 A

The EP2008 EtherCAT Box with digital outputs connects binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 0.5 A and indicate their status through light emitting diodes. The signals are optionally connected via M8 (EP2008-0001) or M12 (EP2008-0002) screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.

Technical data	EP2008-0001	EP2008-0002
Number of outputs	8	
Output connections	M8, screw type	M12, screw type
Protocol	EtherCAT	
Bus interface	2 x M8, screw type	
Load type	ohmic, inductive, lamp load	
Nominal output voltage	24 V DC (-15 %/+20 %)	
Max. output current	0.5 A	
Short circuit current	typ. 1.5 A	
Auxiliary power current	typ. 20 mA per channel	
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin	
Bit width in the process image	8 outputs	
Electrical isolation	control voltage/fieldbus: yes	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Further information	www.beckhoff.com/EP2008	

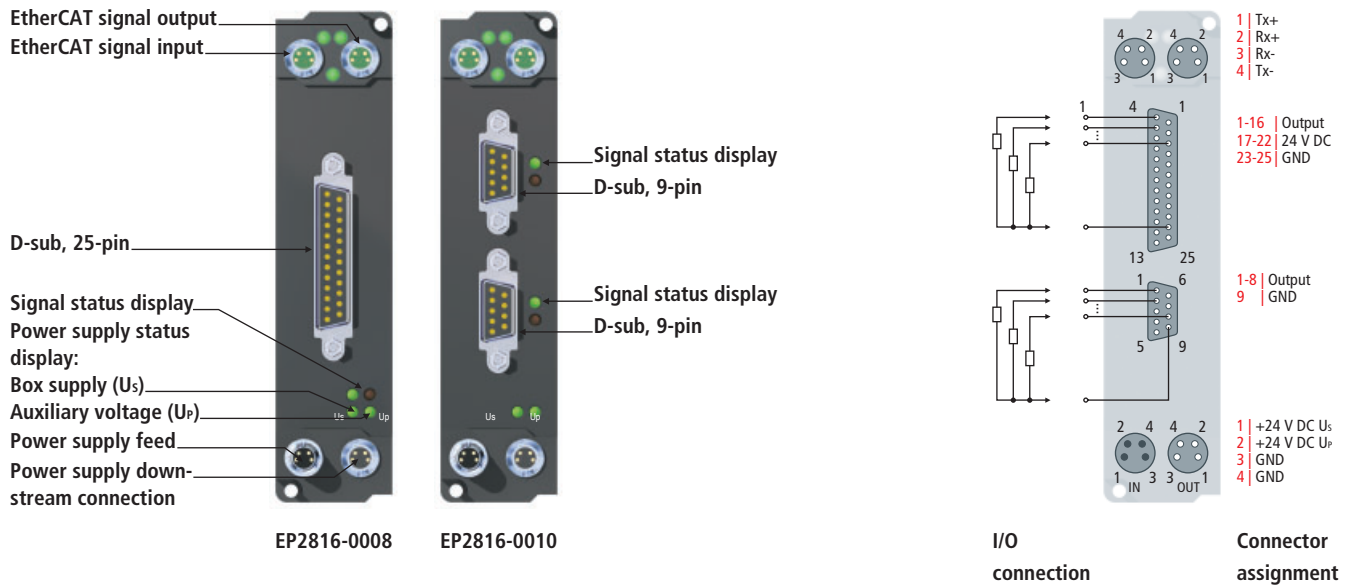


## EP2028-000x | 8-channel digital output 24 V DC, $I_{MAX} = 2 A (\sum 4 A)$

The EP2028 EtherCAT Box with digital outputs connects binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 2 A each, although the total current is limited to 4 A. This makes these modules particularly suitable for applications in which not all of the outputs are active at the same time, or in which not all of the actuators draw 2 A signal current.

The signal state is indicated by means of light emitting diodes. The signals are optionally connected via M8 (EP2028-0001) or M12 (EP2028-0002) screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.

Technical data	EP2028-0001	EP2028-0002
Number of outputs	8	
Output connections	M8, screw type	M12, screw type
Protocol	EtherCAT	
Bus interface	2 x M8, screw type	
Load type	ohmic, inductive, lamp load	
Nominal output voltage	24 V DC (-15 %/+20 %)	
Max. output current	2.0 A	
Short circuit current	max. 4 A	
Auxiliary power current	typ. 30 mA per channel	
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin	
Bit width in the process image	8 outputs	
Electrical isolation	control voltage/fieldbus: yes	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Further information	www.beckhoff.com/EP2028	

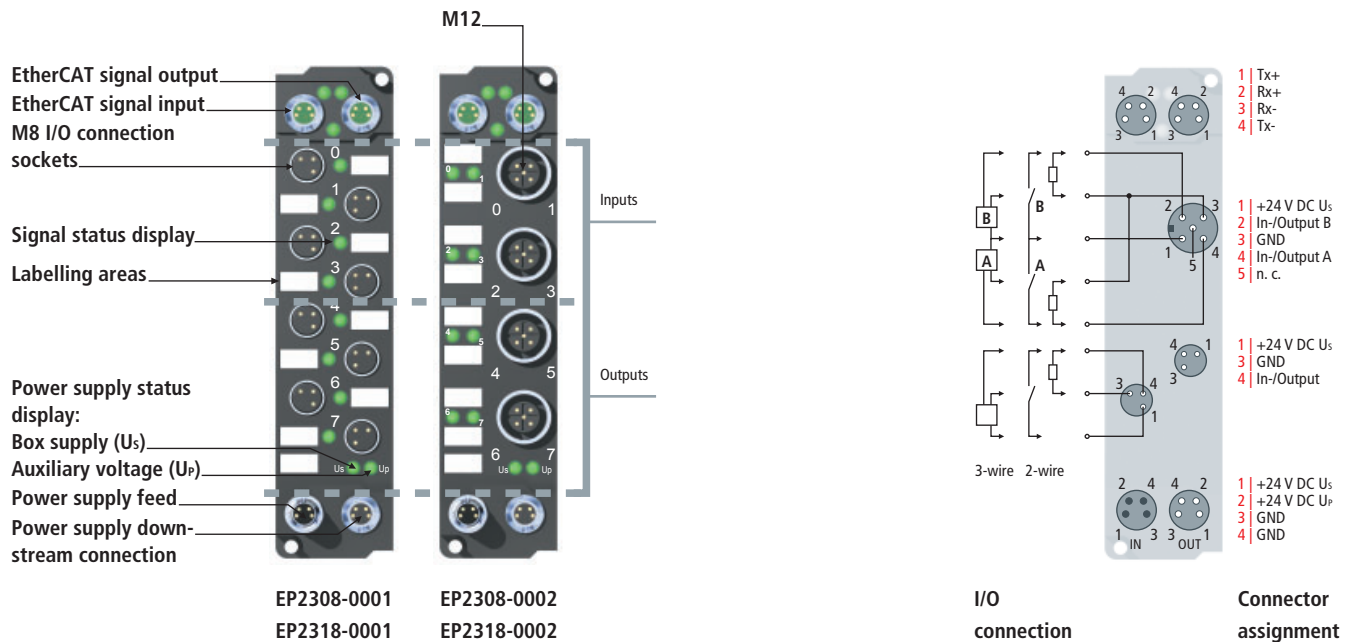


## EP2816-00xx | 16-channel digital output 24 V DC, $I_{MAX} = 0.5 A (\Sigma 4 A)$

The EP2816 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The sixteen outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. This makes these modules particularly suitable for applications in which not all of the outputs are active at the same time, or in which not all of the actuators draw 0.5 A current. An output short-circuit is recognised and passed on to the controller.

The signal state is indicated in groups by means of light emitting diodes. The signal connection is realised by the 25-pin D-sub socket. All outputs are short-circuit-proof, protected against inverse connection and can be diagnosed.

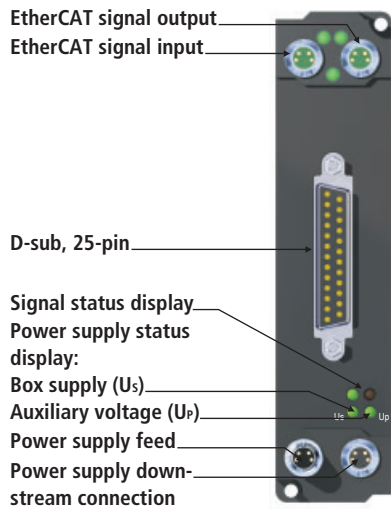
Technical data	EP2816-0008	EP2816-0010
Number of outputs	16	
Output connections	D-sub socket, 25-pin	2 x D-sub socket, 9-pin
Protocol	EtherCAT	
Load type	ohmic, inductive, lamp load	
Nominal output voltage	24 V DC (-15 %/+20 %)	
Max. output current	0.5 A each channel, individually short-circuit-proof, total current max. 4 A	
Short circuit current	max. 1.5 A	
Auxiliary power current	typ. 30 mA	
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin	
Bit width in the process image	16 outputs, 16 inputs (diagnostics)	
Electrical isolation	control voltage/fieldbus: yes	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Further information	www.beckhoff.com/EP2816	



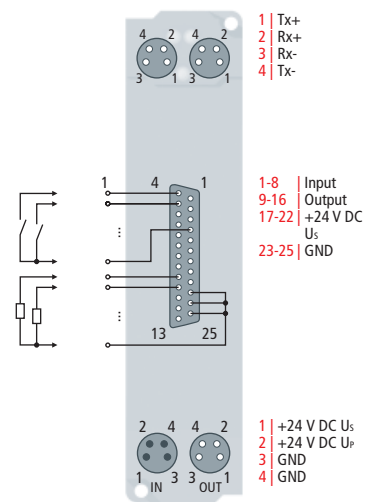
## EP2308-, EP2318-000x | 4 x digital input + 4 x digital output 24 V DC, $I_{MAX} = 0.5 A$

The EP2308 and EP2318 EtherCAT Box modules combine four digital inputs and four digital outputs in one device. Various filter constants are available for the inputs. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The state of each signal is indicated by means of light emitting diodes. The signals are connected optionally via screw type M8 connectors (EP23x8-0001) or connector M12 screw type (EP23x8-0002).

Technical data	EP2308-0001	EP2308-0002	EP2318-0001	EP2318-0002
Number of channels	4 inputs + 4 outputs			
Input/output connections	M8, screw type	M12, screw type	M8, screw type	M12, screw type
Protocol	EtherCAT			
Bus interface	2 x M8, screw type			
Input filter	3.0 ms	3.0 ms	10 $\mu$ s	10 $\mu$ s
"0" signal voltage	-3...+5 V			
"1" signal voltage	11...30 V, 6 mA input current (EN 61131-2, type 3)			
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof			
Load type	ohmic, inductive, lamp load			
Rated load voltage	24 V DC (-15 %/+20 %)			
Max. output current	0.5 A			
Short circuit current	typ. 1.5 A			
Auxiliary power current	typ. 20 mA per channel			
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin			
Bit width in the process image	4 inputs + 4 outputs			
Electrical isolation	control voltage/fieldbus: yes			
Operating/storage temperature	0...+55 °C/-25...+85 °C			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable			
Further information	www.beckhoff.com/EP2308			



EP2316-0008

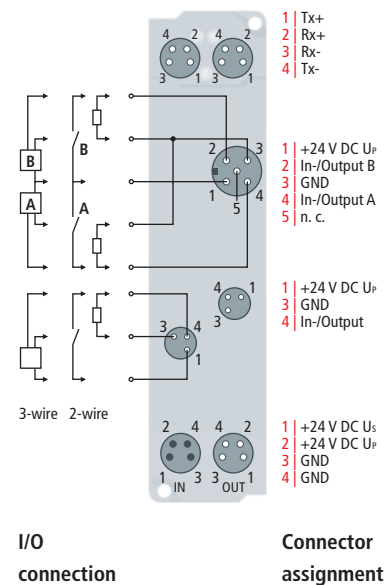
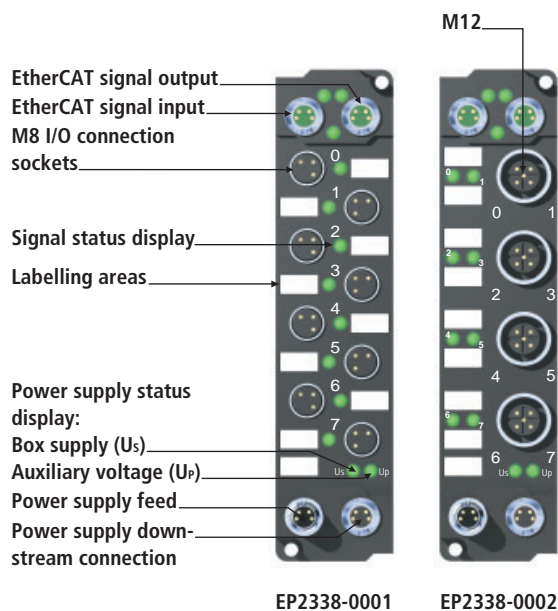
I/O  
connectionConnector  
assignment

## EP2316-0008 | 8 x digital input + 8 x digital output

### 24 V DC, $I_{MAX} = 0.5 A$

The EP2316 EtherCAT Box combines eight digital inputs and eight digital outputs in one device. A filter constant of 10  $\mu s$  is available for the inputs. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. Signal state and status are indicated by means of light emitting diodes. The signals are connected via a 25-pin D-sub socket.

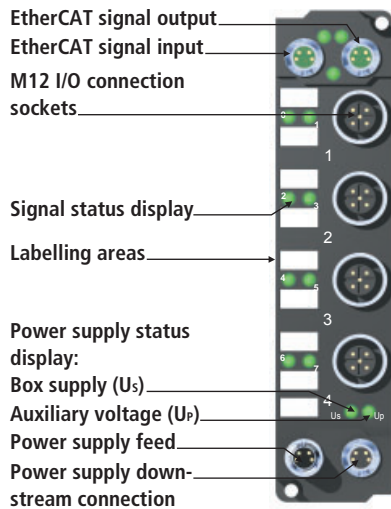
Technical data	EP2316-0008
Number of channels	8 inputs + 8 outputs
Input/output connections	D-sub socket, 25-pin
Protocol	EtherCAT
Bus interface	2 x M8, screw type
Input filter	10 $\mu s$
"0" signal voltage	-3...+5 V
"1" signal voltage	11...30 V, 6 mA input current (EN 61131-2, type 3)
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof
Load type	ohmic, inductive, lamp load
Rated load voltage	24 V DC (-15 %/+20 %)
Max. output current	0.5 A
Short circuit current	typ. 1.5 A
Auxiliary power current	typ. 20 mA per channel
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	8 inputs + 8 outputs (8 inputs diagnostics)
Electrical isolation	control voltage/fieldbus: yes
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	www.beckhoff.com/EP2316



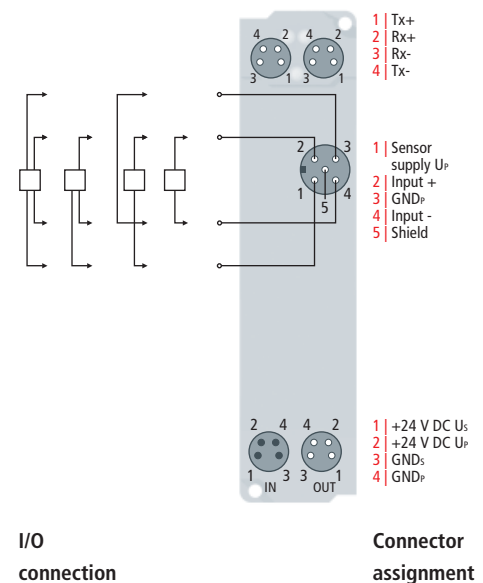
## EP2338-000x | 8-channel digital input or output 24 V DC, freely configurable

The EP2338 EtherCAT Box has eight freely configurable digital inputs or outputs in one device. A filter constant of 10  $\mu$ s is available for the inputs. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The state of each signal is indicated by means of light emitting diodes. The signals are connected optionally via screw type M8 connectors (EP2338-0001) or connector M12 screw type (EP2338-0002).

Technical data	EP2338-0001	EP2338-0002
Number of channels	8 digital inputs or outputs, freely configurable	
Input/output connections	M8, screw type	M12, screw type
Protocol	EtherCAT	
Bus interface	2 x M8, screw type	
Input filter	10 $\mu$ s	
"0" signal voltage	-3...+5 V	
"1" signal voltage	11...30 V, 6 mA input current (EN 61131-2, type 3)	
Sensor supply	derived from load supply voltage, max. 0.5 A total, short-circuit-proof	
Load type	ohmic, inductive, lamp load	
Rated load voltage	24 V DC (-15 %/+20 %)	
Max. output current	0.5 A	
Short circuit current	typ. 1.5 A	
Auxiliary power current	typ. 20 mA per channel	
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin	
Bit width in the process image	8 inputs + 8 outputs	
Electrical isolation	control voltage/fieldbus: yes	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Further information	www.beckhoff.com/EP2338	



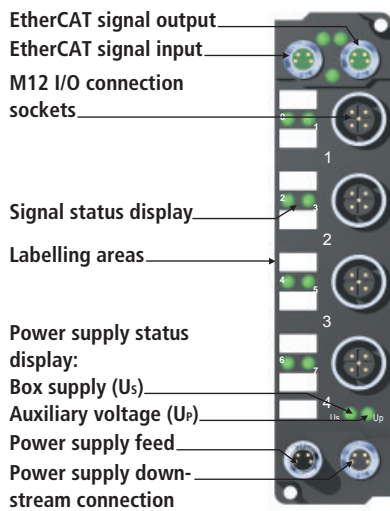
EP3174-0002



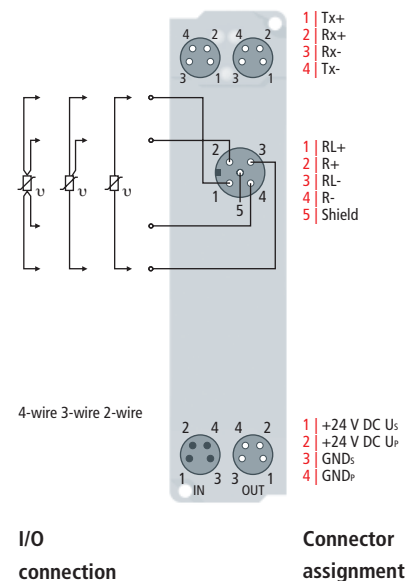
## EP3174-0002 | 4-channel analog input $\pm 10$ V or 0/4...20 mA, parameterisable, differential input, 16 bit

The EP3174 EtherCAT Box has four analog inputs which can be individually parameterised, so that they process signals either in the  $-10 \dots +10$  V or the 0/4...20 mA range. The voltage or input current is digitised with a resolution of 16 bits, and is transmitted (electrically isolated) to the higher-level automation device. The four input channels have differential inputs and possess a common, internal ground potential. The input filter and therefore the conversion times are configurable in a wide range. If required, the inputs can be scaled differently, and automatic limit monitoring is also available. EtherCAT is used for parameterisation purposes. The parameters are stored in the module.

Technical data	EP3174-0002
Number of inputs	4
Input connections	M12, screw type
Protocol	EtherCAT
Bus interface	2 x M8, screw type
Signal type	$-10/0 \dots +10$ V   0/4...20 mA
Internal resistance	$> 200$ k $\Omega$   33 $\Omega$ typ. + diode voltage
Common-mode voltage $U_{CM}$	35 V max.
Resolution	16 bit (incl. sign)
Input filter limit frequency	5 kHz
Conversion time	$\sim 100$ $\mu$ s
Measuring error	$< \pm 0.3$ % (relative to full scale value)
Input filter	configurable
Sensor supply	from load supply voltage $U_P$ , DC, any value up to 30 V
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	4 x 16 bit input, 4 x 8 bit status
Electrical isolation	control voltage/fieldbus: yes
Operating/storage temperature	0...+55 °C/-25...+85 °C
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/EP3174">www.beckhoff.com/EP3174</a>



EP3204-0002

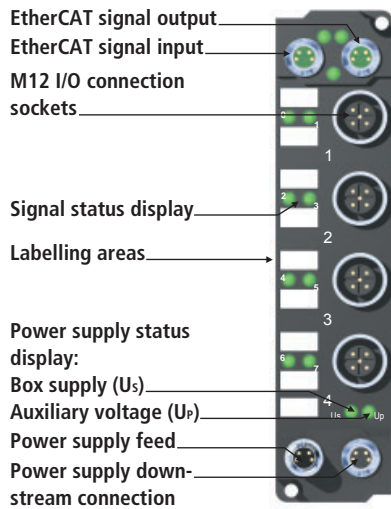


## EP3204-0002 | 4-channel analog input PT100 (RTD)

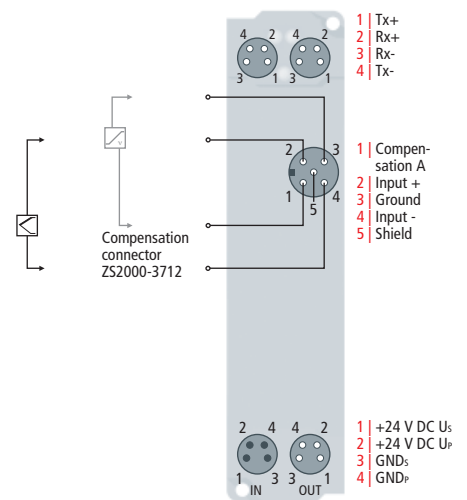
The EP3204 EtherCAT Box with analog inputs allows resistance sensors to be connected directly. The module's circuitry can operate the sensors using 2-, 3- or 4-wire connection techniques. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The module can also be used for simple resistance measurement with the output in ohms. The module's standard settings are: resolution 0.1°C in the temperature range of PT100 sensors in 4-wire connection. Sensor malfunctions such as broken wires are indicated by error LEDs. The module is quite versatile, but the default values are selected in such a way that in most cases it is not necessary to perform configuration. The input filter and associated conversion times can be set within a wide range; several data output formats may be chosen. If required, the inputs can be scaled differently. Automatic limit monitoring is also available. Parameterisation is carried out via EtherCAT.

Technical data	EP3204-0002
Number of inputs	4
Connection method	screw type M12 for 2-, 3- and 4-wire connections, presetting: 4-wire
Protocol	EtherCAT
Bus interface	2 x M8, screw type
Sensor types	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer)
Temperature range	-200...+850 °C (PT sensors); -60...+250 °C (Ni sensors)
Resolution	0.1 °C per digit
Conversion time	approx. 800 ms up to 2 ms, depending on configuration and filter setting, see documentation, default: approx. 85 ms
Measuring error	< ±0.5 °C for PT sensors (further types see documentation)
Measuring current	typ. 0.5 mA
Input filter	5 variations, configurable
Sensor supply	from control voltage $U_s$
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	4 x 32 bit RTD input
Electrical isolation	control voltage/fieldbus: yes
Operating/storage temperature	0...+55 °C/-25...+85 °C
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/EP3204">www.beckhoff.com/EP3204</a>





EP3314-0002

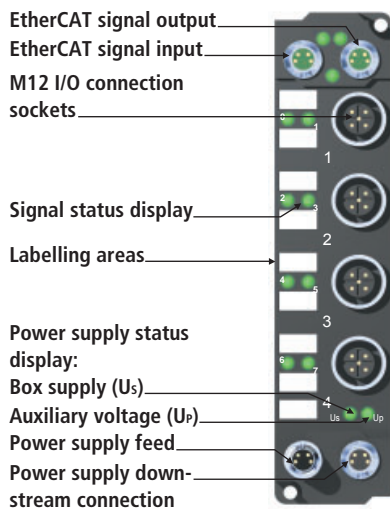
I/O  
connectionConnector  
assignment

## EP3314-0002 | 4-channel analog input thermocouple

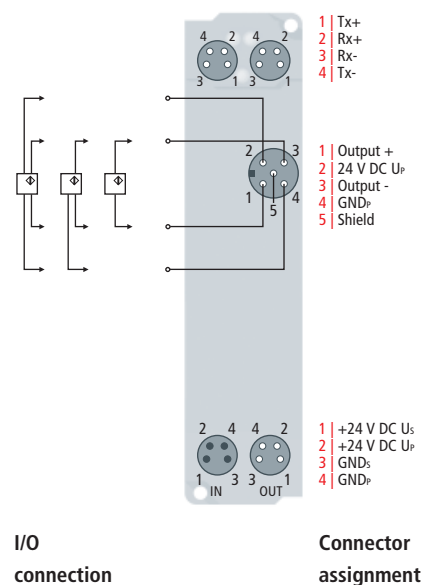
The EP3314 EtherCAT Box with analog inputs permits four thermocouples to be directly connected. The module's circuit can operate thermocouple sensors using the 2-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The error LEDs indicate a broken wire. Compensation for the cold junction is made through a temperature measurement in the connecting plugs. This means that standard extension leads can be connected. The EP3314 can also be used for mV measurement.

The module is quite versatile, but the default values are selected in such a way that in most cases it is not necessary to perform configuration. The input filter and associated conversion times can be set within a wide range; several data output formats may be chosen. If required, the inputs can be scaled differently. Automatic limit monitoring is also available. Parameterisation is carried out via EtherCAT. The parameters are stored in the module. For the temperature compensation a PT1000 element is needed. Beckhoff offers a connector with temperature compensation (ZS2000-3712).

Technical data	EP3314-0002
Number of inputs	4
Connection method	screw type M12, 2-wire connection for thermocouple
Protocol	EtherCAT
Bus interface	2 x M8, screw type
Sensor types	types J, K, L, B, E, N, R, S, T, U (default setting type K), mV measurement
Temperature range	depending on sensor type; preset value is type K, -100...+1,370 °C
Resolution	0.1 °C per digit
Conversion time	approx. 2.5 s up to 20 ms, depending on configuration and filter setting, see documentation, default: approx. 250 ms
Measuring error	< ±0.3 % for type K (relative to full scale value), further types see documentation
Input filter	5 variations, configurable
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	4 x 32 bit TC input, 4 x 16 bit TC output
Electrical isolation	control voltage/fieldbus: yes
Operating/storage temperature	0...+55 °C/-25...+85 °C
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/EP3314">www.beckhoff.com/EP3314</a>



EP4174-0002

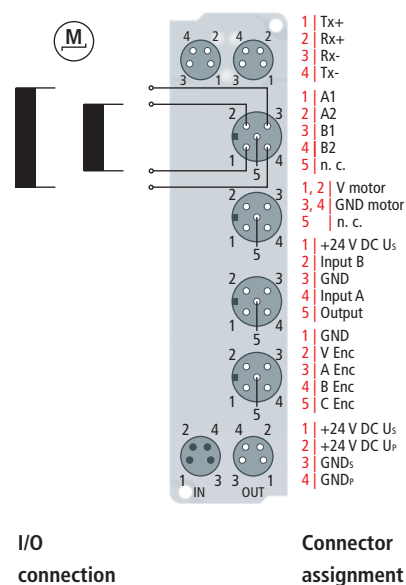
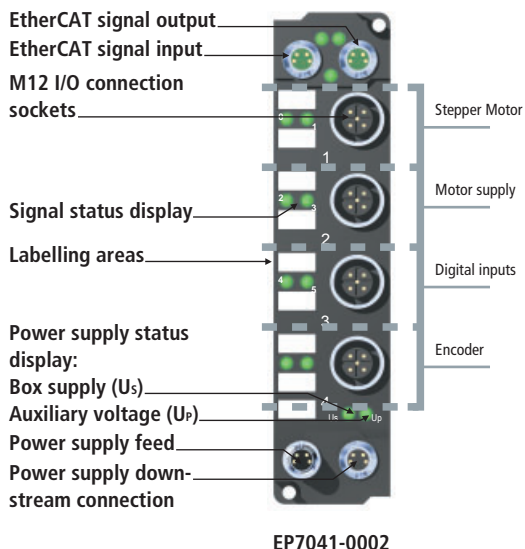


## EP4174-0002 | 4-channel analog output $\pm 10$ V or 0/4...20 mA, parameterisable, 16 bit

The EP4174 EtherCAT Box has four analog outputs which can be individually parameterised, so that they generate signals either in the  $-10 \dots +10$  V or the 0/4...20 mA range. The power is supplied to the process level with a resolution of 15 bit (default), and is electrically isolated. The output scaling can be changed if required.

Ground potential for the four output channels is common with the 24 V DC supply. The output drivers are supplied from the load voltage (freely selectable up to 30 V DC). The applied load voltage is available for actuator supply of further EtherCAT Box modules.

Technical data	EP4174-0002
Number of outputs	4
Output connections	M12, screw type
Protocol	EtherCAT
Bus interface	2 x M8, screw type
Signal type	$-10/0 \dots +10$ V   0/4...20 mA
Load	$> 5 \text{ k}\Omega$   $< 500 \Omega$
Resolution	16 bits
Conversion time	$< 4$ ms
Measuring error	$< 0.1 \%$ (relative to full scale value)
Actuator supply	from the auxiliary voltage $U_p$
Power supply connection	feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin
Bit width in the process image	4 x 16 bit AO output
Electrical isolation	control voltage/fieldbus: yes
Operating/storage temperature	$0 \dots +55 \text{ }^\circ\text{C}$ / $-25 \dots +85 \text{ }^\circ\text{C}$
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	<a href="http://www.beckhoff.com/EP4174">www.beckhoff.com/EP4174</a>



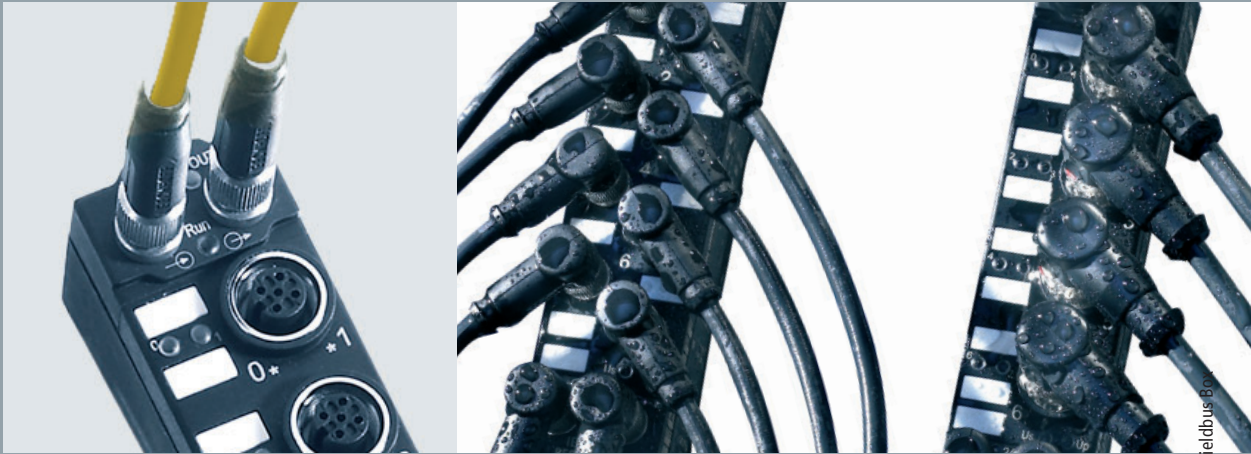
# EP7041-0002 | Stepper Motor module 50 V DC, with incremental encoder, 2 digital inputs, 1 digital output

The EP7041 EtherCAT Box is intended for the direct connection of different Stepper Motors. The PWM output stages for two motor coils with compact design are located in the module together with two inputs for limit switches and cover a wide voltage and current range. The EP7041 can be adjusted to the motor and the application by changing just a few parameters. 64-fold micro-stepping ensures particularly quiet and precise motor operation. In many applications, integrated zero-speed monitoring makes an encoder system or limit switch unnecessary. Connection of an incremental encoder enables a simple servo axis to be realised. Two digital inputs and a digital 0.5 A output enable connection of end switches and a motor brake.

Technical data	EP7041-0002
Number of outputs	1 Stepper Motor, 2 phases + 1 digital 24 V DC output
Number of inputs	2 end position, 4 encoder system (24 V DC encoder)
Connection method	screw type M12
Protocol	EtherCAT
Output current	2 x 3.5 A, 2 x 5 A peak current
Maximum step frequency	12,500 steps/s
Step pattern	full step, half step, up to 64-fold micro stepping
Current controller frequency	approx. 25 kHz
Diagnostics LED	error phase A and B, loss of step/stagnation, power, enable
Resolution	approx. 5,000 positions in typ. applications (per revolution)
Bit width in the process image	input/output: 2 x 16 bit data + 1 x 16 bit control/status
Electrical isolation	control voltage/fieldbus: yes
Operating/storage temperature	0...+55 °C/-25...+85 °C
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	www.beckhoff.com/EP7041

Accessories		
AS1xxx	Stepper Motors	1126
ZK4000-6261-xxxx	motor cables for AS1000 Stepper Motors, 4 x 0.5 mm <sup>2</sup>	1131
ZK4000-5151-xxxx	encoder cables for AS1000 Stepper Motors, with shield	1131

# Accessories



## Accessories for EtherCAT M8

Ordering information	PUR cable, Highflex	Connector	Contacts	Length
ZK1090-3131-0001	straight plug, straight plug	M8, M8, screw type	4-pin	0.10 m
ZK1090-3131-0003	straight plug, straight plug	M8, M8, screw type	4-pin	0.30 m
ZK1090-3131-0005	straight plug, straight plug	M8, M8, screw type	4-pin	0.50 m
ZK1090-3131-0010	straight plug, straight plug	M8, M8, screw type	4-pin	1.00 m
ZK1090-3131-0020	straight plug, straight plug	M8, M8, screw type	4-pin	2.00 m
ZK1090-3131-0030	straight plug, straight plug	M8, M8, screw type	4-pin	3.00 m
ZK1090-3131-0040	straight plug, straight plug	M8, M8, screw type	4-pin	4.00 m
ZK1090-3131-0050	straight plug, straight plug	M8, M8, screw type	4-pin	5.00 m
ZK1090-3131-0075	straight plug, straight plug	M8, M8, screw type	4-pin	7.50 m
ZK1090-3131-0100	straight plug, straight plug	M8, M8, screw type	4-pin	10.00 m
ZK1090-3131-0150	straight plug, straight plug	M8, M8, screw type	4-pin	15.00 m
ZK1090-3131-0200	straight plug, straight plug	M8, M8, screw type	4-pin	20.00 m
ZK1090-3131-0250	straight plug, straight plug	M8, M8, screw type	4-pin	25.00 m
ZK1090-3131-0300	straight plug, straight plug	M8, M8, screw type	4-pin	30.00 m
ZK1090-3131-0350	straight plug, straight plug	M8, M8, screw type	4-pin	35.00 m
ZK1090-3131-0400	straight plug, straight plug	M8, M8, screw type	4-pin	40.00 m
ZK1090-3131-0450	straight plug, straight plug	M8, M8, screw type	4-pin	45.00 m
ZK1090-3131-0500	straight plug, straight plug	M8, M8, screw type	4-pin	50.00 m
ZK1090-3100-0020	straight plug, open end	M8, screw type	4-pin	2.00 m
ZK1090-3100-0050	straight plug, open end	M8, screw type	4-pin	5.00 m
ZK1090-3191-0020	straight plug, straight plug	RJ 45, M8, screw type	4-pin	2.00 m
ZK1090-3191-0050	straight plug, straight plug	RJ 45, M8, screw type	4-pin	5.00 m

Ordering information	PVC cable	Connector	Contacts	Length
ZK1090-3131-3020	straight plug, straight plug	M8, M8, screw type	4-pin	2.00 m
ZK1090-3131-3030	straight plug, straight plug	M8, M8, screw type	4-pin	3.00 m
ZK1090-3131-3040	straight plug, straight plug	M8, M8, screw type	4-pin	4.00 m
ZK1090-3131-3050	straight plug, straight plug	M8, M8, screw type	4-pin	5.00 m
ZK1090-3131-3075	straight plug, straight plug	M8, M8, screw type	4-pin	7.50 m
ZK1090-3131-3100	straight plug, straight plug	M8, M8, screw type	4-pin	10.00 m
ZK1090-3131-3150	straight plug, straight plug	M8, M8, screw type	4-pin	15.00 m
ZK1090-3131-3200	straight plug, straight plug	M8, M8, screw type	4-pin	20.00 m
ZK1090-3131-3250	straight plug, straight plug	M8, M8, screw type	4-pin	25.00 m
ZK1090-3131-3300	straight plug, straight plug	M8, M8, screw type	4-pin	30.00 m
ZK1090-3131-3350	straight plug, straight plug	M8, M8, screw type	4-pin	35.00 m
ZK1090-3131-3400	straight plug, straight plug	M8, M8, screw type	4-pin	40.00 m
ZK1090-3131-3450	straight plug, straight plug	M8, M8, screw type	4-pin	45.00 m
ZK1090-3131-3500	straight plug, straight plug	M8, M8, screw type	4-pin	50.00 m
ZK1090-3100-3020	straight plug, open end	M8, screw type	4-pin	2.00 m
ZK1090-3100-3050	straight plug, open end	M8, screw type	4-pin	5.00 m
ZK1090-3191-3020	straight plug, straight plug	RJ 45, M8, screw type	4-pin	2.00 m
ZK1090-3191-3050	straight plug, straight plug	RJ 45, M8, screw type	4-pin	5.00 m

## Further lengths on request

Ordering information	Plug/socket	Connector	Contacts
ZS1090-0005	Ethernet/EtherCAT plug, IP 20	RJ 45, field assembly	8-pin
ZS1090-0006	straight plug, metal housing	M8, screw type	4-pin
ZS1090-0007	straight socket, metal housing	M8, screw type	4-pin

Ordering information	Fieldbus cable for M8	Length
ZB9030	EtherCAT/Ethernet cable, PVC, thin, with shield	sold by the metre
ZB9031	EtherCAT/Ethernet cable, PUR, thin, drag chain suitable, with shield	sold by the metre
ZB9032	EtherCAT/Ethernet cable, PUR, thin, drag chain suitable, Highflex	sold by the metre

For technical data sheets see [www.beckhoff.com/FieldbusBox](http://www.beckhoff.com/FieldbusBox)

# Accessories for Ethernet M12

Ordering information		Pict.
ZS1090-0002	RJ 45 plug, protection class IP 65/67	A
ZS1090-0004	M12 connector, d-coded, protection class IP65/67	B
ZK1090-6100-0020	EtherCAT cordset, d-coded M12 plug, open end, 2.0 m, IP 65/67	
ZK1090-6100-0050	EtherCAT cordset, d-coded M12 plug, open end, 5.0 m, IP 65/67	
ZK1090-6100-0100	EtherCAT cordset, d-coded M12 plug, open end, 10.0 m, IP 65/67	
ZK1090-6161-0005	EtherCAT cordset, d-coded M12 plug on both sides, 0.5 m, IP 65/67	C
ZK1090-6161-0010	EtherCAT cordset, d-coded M12 plug on both sides, 1.0 m, IP 65/67	C
ZK1090-6161-0020	EtherCAT cordset, d-coded M12 plug on both sides, 2.0 m, IP 65/67	C
ZK1090-6161-0025	EtherCAT cordset, d-coded M12 plug on both sides, 2.5 m, IP 65/67	C
ZK1090-6161-0050	EtherCAT cordset, d-coded M12 plug on both sides, 5.0 m, IP 65/67	C
ZK1090-6161-0100	EtherCAT cordset, d-coded M12 plug on both sides, 10.0 m, IP 65/67	C
ZK1090-6191-0005	EtherCAT cordset, d-coded M12 plug, RJ 45 plug, 0.5 m, IP 65/67	
ZK1090-6191-0020	EtherCAT cordset, d-coded M12 plug, RJ 45 plug, 2.0 m, IP 65/67	
ZK1090-6191-0050	EtherCAT cordset, d-coded M12 plug, RJ 45 plug, 5.0 m, IP 65/67	
ZK1090-6191-0100	EtherCAT cordset, d-coded M12 plug, RJ 45 plug, 10.0 m, IP 65/67	
ZK1090-6292-0005	EtherCAT cordset, d-coded M12 flange, RJ 45 plug, 0.5 m, IP 65/67	D
ZK1090-6292-0020	EtherCAT cordset, d-coded M12 flange, RJ 45 plug, 2.0 m, IP 65/67	D
ZK1090-6292-0050	EtherCAT cordset, d-coded M12 flange, RJ 45 plug, 5.0 m, IP 65/67	D
ZK1090-6292-0100	EtherCAT cordset, d-coded M12 flange, RJ 45 plug, 10.0 m, IP 65/67	D
ZK1090-6600-0005	EtherCAT cordset, d-coded M12 flange, open end, 0.5 m, IP 65/67	
ZK1090-6600-0010	EtherCAT cordset, d-coded M12 flange, open end, 1.0 m, IP 65/67	
ZK1090-6600-0020	EtherCAT cordset, d-coded M12 flange, open end, 2.0 m, IP 65/67	
ZK1090-6600-0050	EtherCAT cordset, d-coded M12 flange, open end, 5.0 m, IP 65/67	
ZK1090-6600-0100	EtherCAT cordset, d-coded M12 flange, open end, 10.0 m, IP 65/67	
ZB9020	EtherCAT cable, drag chain suitable, ø 6.5 mm	
ZK1090-6292-0000	adapter M12 socket to RJ 45 socket, straight	E
ZK1090-6294-0000	adapter M12 socket to RJ 45 socket, angled	F
ZS1090-0003	EtherCAT/Ethernet RJ 45 connector, IP 20, 4-pin, for field assembly	
ZS1090-0005	EtherCAT/Ethernet RJ 45 plug, IP 20, 8-pin, field assembly	

Further lengths on request

A Illustrations similar



RJ 45 plug

B



M12 plug

C



EtherCAT cordset, M12 plug on both sides

D



EtherCAT cordset, M12 flange, RJ 45 plug

E



Adapter M12 socket to RJ 45, straight

F



Adapter M12 socket to RJ 45, angled

## IP-Link accessories

Ordering information	Plug	Pict.
ZS1020-0010	plug, unit pack 1	B
ZS1021-0010	plug, unit pack 10	B
ZS1022-0010	IP-Link plug, unit pack 10, clip type	A
ZK1020-0101-1000	IP-Link jumper	C

Ordering information	IP-Link cable	Length
ZK1020-0101-0001	pre-assembled IP-Link cable, drag chain suitable	0.15 m
ZK1020-0101-0002	pre-assembled IP-Link cable, drag chain suitable	0.20 m
ZK1020-0101-0003	pre-assembled IP-Link cable, drag chain suitable	0.30 m
ZK1020-0101-0005	pre-assembled IP-Link cable, drag chain suitable	0.50 m
ZK1020-0101-0010	pre-assembled IP-Link cable, drag chain suitable	1.00 m
ZK1020-0101-0020	pre-assembled IP-Link cable, drag chain suitable	2.00 m
ZK1020-0101-0025	pre-assembled IP-Link cable, drag chain suitable	2.50 m
ZK1020-0101-0030	pre-assembled IP-Link cable, drag chain suitable	3.50 m
ZK1020-0101-0035	pre-assembled IP-Link cable, drag chain suitable	3.50 m
ZK1020-0101-0040	pre-assembled IP-Link cable, drag chain suitable	4.00 m
ZK1020-0101-0045	pre-assembled IP-Link cable, drag chain suitable	4.50 m
ZK1020-0101-0050	pre-assembled IP-Link cable, drag chain suitable	5.00 m
ZK1020-0101-0075	pre-assembled IP-Link cable, drag chain suitable	7.50 m
ZK1020-0101-0100	pre-assembled IP-Link cable, drag chain suitable	10.00 m
ZK1020-0101-0150	pre-assembled IP-Link cable, drag chain suitable	15.00 m
Z1101	plastic fibre optic, single core, 1,000 µm with protective PU cladding and Kevlar strain relief, drag chain suitable	
Z1103	plastic fibre optics, 1,000 µm, PUR sheath ø 6 mm, heavy duty, drag chain suitable	

Ordering information	IP-Link accessories	Pict.
ZS5300-0001	mounting plate for 15 Extension Box or EtherCAT Box modules, V2A, stainless steel 500 mm	D
ZS5300-0003	mounting plate for Coupler Box, zinc-coated steel sheet, 270 mm	
ZS5400-0001	sanding gauge for IP-Link connector	
ZS5400-0010	abrasive paper P600, 10 sheets	
ZS1022-0000	locking device IP-Link, stainless steel	

A Illustrations similar



IP-Link connector,  
clip type

B



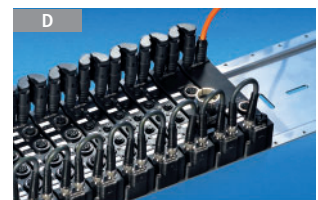
IP-Link connector

C



IP-Link jumper

D



Mounting rail for up to  
15 IE or EP modules

For technical data sheets see [www.beckhoff.com/FieldbusBox](http://www.beckhoff.com/FieldbusBox)

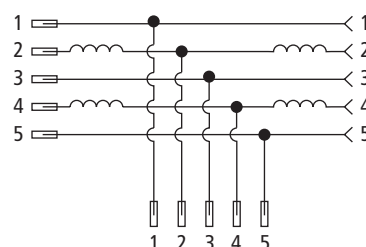
# Accessories for PROFIBUS, Modbus, RS232, RS485

Ordering information		Pict.
ZS1031-2600	tee-connector, 12 Mbaud (blue ID ring)	A
ZS1031-2610	tee-connector, 12 Mbaud for the direct connection to the other tee-connectors (yellow ID ring)	B
ZS1000-2600	Y-connector, 12 Mbaud (plug, socket)	C
ZS1000-1610	termination resistor (plug)	D
ZS1000-0610	plug for field assembly	E
ZS1000-0620	socket for field assembly	F
ZS1000-0630	plug for field assembly, angled	G
ZS1000-0640	socket for field assembly, angled	H
ZS1031-6610	control cabinet feed through M12, plug-coupling	I
ZB3200	PROFIBUS cable 12 Mbaud 1 x 2 x 0.64 mm <sup>2</sup>	
ZB3300	PROFIBUS cable 12 Mbaud 1 x 2 x 0.64 mm <sup>2</sup> , 5-wires, drag chain suitable	

A Illustrations similar



Tee-connector

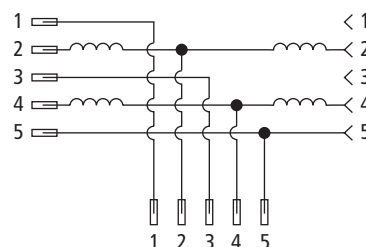


Wiring diagramm tee-connector

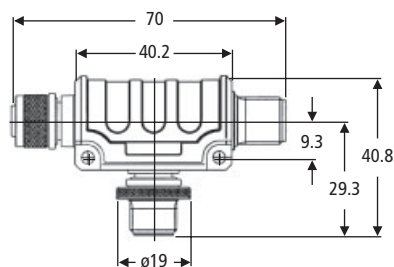
B



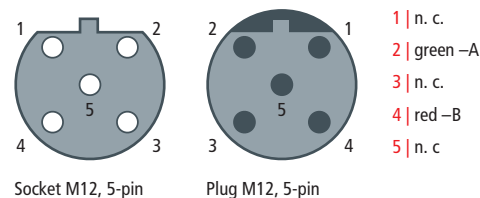
Tee-connector



Wiring diagramm tee-connector



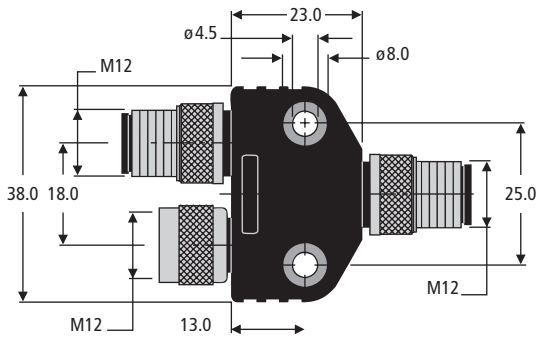
Dimensions in mm



Pin assignment

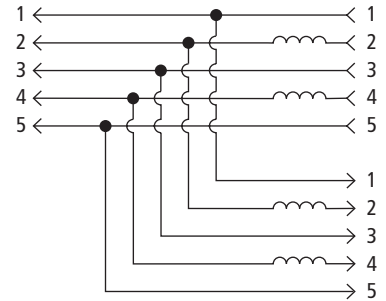


## C Illustrations similar

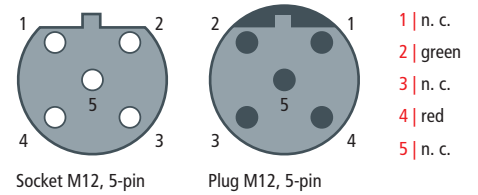


Dimensions in mm, Y-connector

(Attention: due to the size of the field wireable connectors, at least one premoulded cable has to be used.)



Wiring diagram, Y-connector

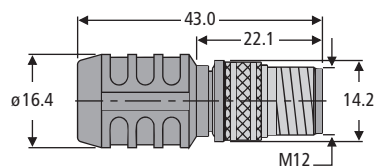


Pin assignment

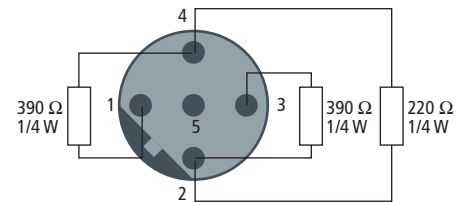
## D



Termination resistor



Dimensions in mm

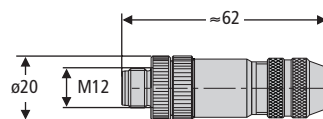


Pin assignment

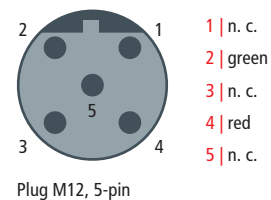
## E



Plug



Dimensions in mm

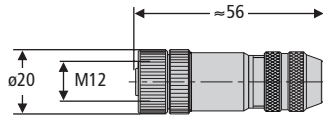


Pin assignment

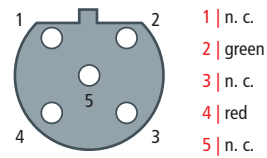
F Illustrations similar



Socket



Dimensions in mm



Socket M12, 5-pin

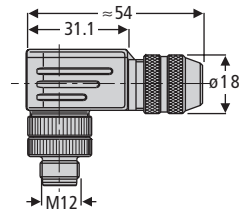
Pin assignment

- 1 | n. c.
- 2 | green
- 3 | n. c.
- 4 | red
- 5 | n. c.

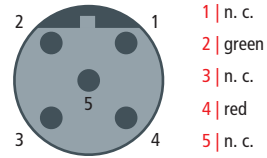
G



Plug



Dimensions in mm



Socket M12, 5-pin

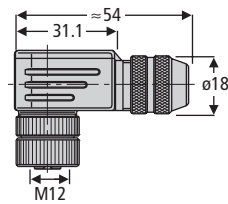
Pin assignment

- 1 | n. c.
- 2 | green
- 3 | n. c.
- 4 | red
- 5 | n. c.

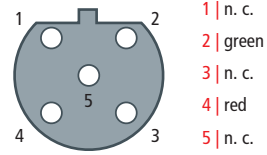
H



Socket



Dimensions in mm



Socket M12, 5-pin

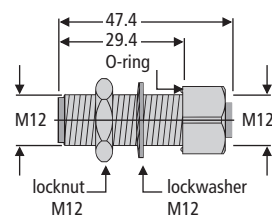
Pin assignment

- 1 | n. c.
- 2 | green
- 3 | n. c.
- 4 | red
- 5 | n. c.

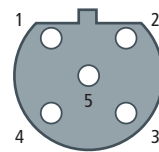
I



Control cabinet lead-in

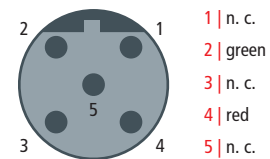


Dimensions in mm



Socket M12, 5-pin

Pin assignment



Plug M12, 5-pin

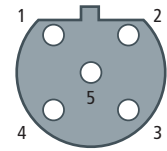
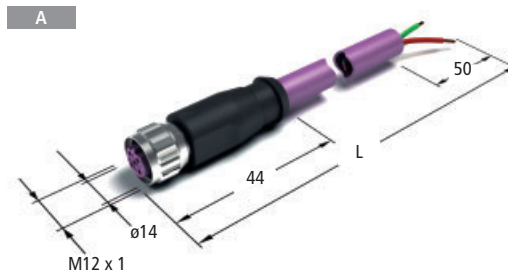
- 1 | n. c.
- 2 | green
- 3 | n. c.
- 4 | red
- 5 | n. c.

## Cordsets for PROFIBUS, Modbus, RS485

Ordering information	Fieldbus cable	Connector	Contacts	Cross-section	Length	Pict.
ZK1031-6200-1020	straight socket, open end	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	2.00 m	A
ZK1031-6200-1050	straight socket, open end	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	5.00 m	A
ZK1031-6200-1100	straight socket, open end	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	10.00 m	A
ZK1031-6200-1150	straight socket, open end	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	15.00 m	A
ZK1031-6100-1020	straight plug, open end	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	2.00 m	B
ZK1031-6100-1050	straight plug, open end	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	5.00 m	B
ZK1031-6100-1100	straight plug, open end	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	10.00 m	B
ZK1031-6100-1150	straight plug, open end	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	15.00 m	B
ZK1031-6251-1003	straight socket, straight plug	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	0.30 m	A, B
ZK1031-6251-1005	straight socket, straight plug	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	0.50 m	A, B
ZK1031-6251-1010	straight socket, straight plug	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	1.00 m	A, B
ZK1031-6251-1020	straight socket, straight plug	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	2.00 m	A, B
ZK1031-6251-1050	straight socket, straight plug	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	5.00 m	A, B
ZK1031-6251-1100	straight socket, straight plug	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	10.00 m	A, B
ZK1031-6251-1150	straight socket, straight plug	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	15.00 m	A, B
ZK1031-6400-1020	angled socket, open end	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	2.00 m	C
ZK1031-6400-1050	angled socket, open end	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	5.00 m	C
ZK1031-6400-1100	angled socket, open end	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	10.00 m	C
ZK1031-6400-1150	angled socket, open end	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	15.00 m	C
ZK1031-6300-1020	angled plug, open end	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	2.00 m	D
ZK1031-6300-1050	angled plug, open end	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	5.00 m	D
ZK1031-6300-1100	angled plug, open end	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	10.00 m	D
ZK1031-6300-1150	angled plug, open end	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	15.00 m	D
ZK1031-6354-1003	angled socket, angled plug	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	0.30 m	C, D
ZK1031-6354-1005	angled socket, angled plug	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	0.50 m	C, D
ZK1031-6354-1010	angled socket, angled plug	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	1.00 m	C, D
ZK1031-6354-1020	angled socket, angled plug	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	2.00 m	C, D
ZK1031-6354-1050	angled socket, angled plug	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	5.00 m	C, D
ZK1031-6354-1100	angled socket, angled plug	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	10.00 m	C, D
ZK1031-6354-1150	angled socket, angled plug	M12, screw type	5-pin	2 x 0.32 mm <sup>2</sup>	15.00 m	C, D

Electrical data	
Ratings	160 V (according to IEC 61076-2-101)
Material	outer cladding PUR, inner insulation polyethylene
Installation	drag chain suitable
DC resistance	54.13 Ω/km
Line capacitance	28.5 nF/km
Nominal impedance	150 Ω at 1 MHz
Approval	UL style 119100 vol. 1 sec. 8, RoHS-compliant, halogen-free, flame-resistant

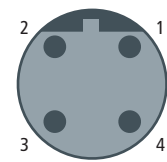
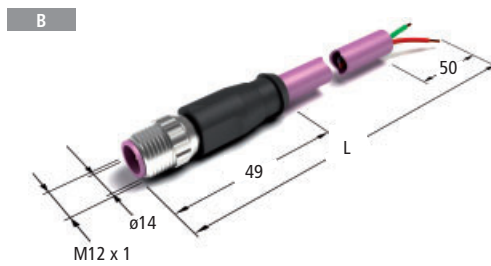
For technical data sheets see [www.beckhoff.com/FieldbusBox](http://www.beckhoff.com/FieldbusBox)



- 1 | n. c.
- 2 | green
- 3 | n. c.
- 4 | red
- 5 | n. c.

Socket M12, 5-pin

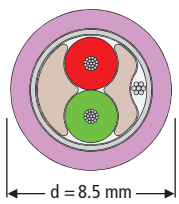
Pin assignment



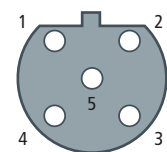
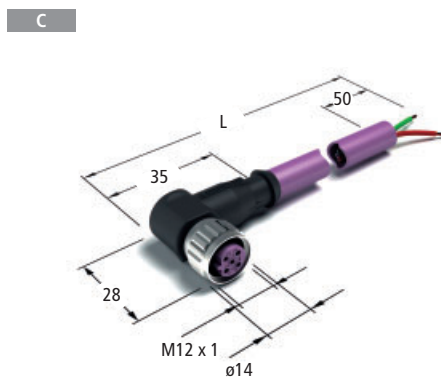
- 1 | n. c.
- 2 | green
- 3 | n. c.
- 4 | red

Plug M12, 4-pin

Pin assignment



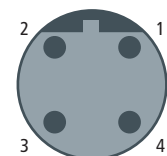
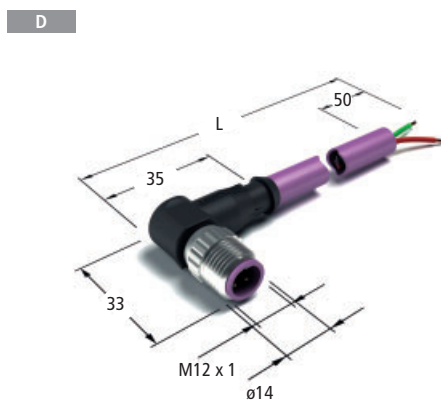
Sectional view



- 1 | n. c.
- 2 | green
- 3 | n. c.
- 4 | red
- 5 | n. c.

Socket M12, 5-pin

Pin assignment



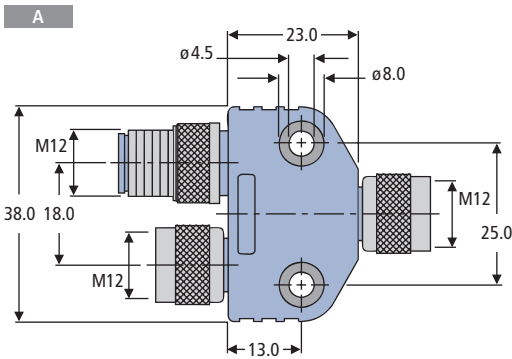
- 1 | n. c.
- 2 | green
- 3 | n. c.
- 4 | red

Plug M12, 4-pin

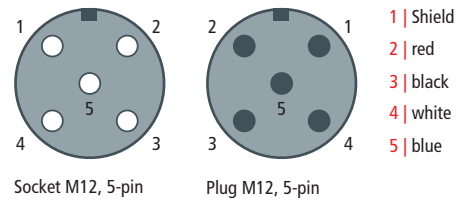
Pin assignment

# Accessories for CANopen, DeviceNet

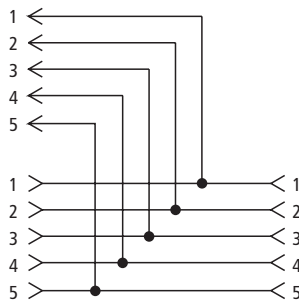
Ordering information		Pict.
ZS1052-2600	Y-connector (plug, socket)	A
ZS1052-2602	Y-connector with stub, 1 m (plug, socket)	B
ZS1052-1610	termination resistor (plug)	
ZS1052-0620	straight socket, screw type connection	
ZS1052-0640	angled socket, screw type connection	
ZS1052-0610	straight plug, screw type connection	
ZS1052-0630	angled plug, screw type connection	C
ZS5052-4500	distribution box: 1 x 5-pin plug, 4 x 5-pin socket	D
ZS1052-6610	control cabinet lead-in M12, plug-coupling	E



Dimensions in mm



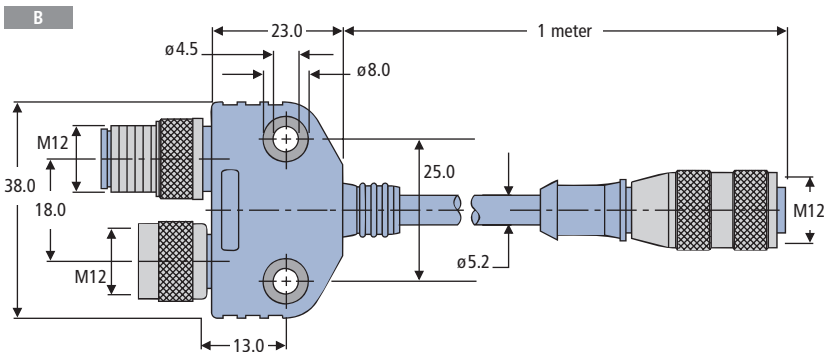
Pin assignment



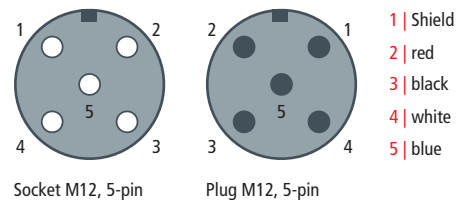
Wiring diagram

A

B



Dimensions in mm

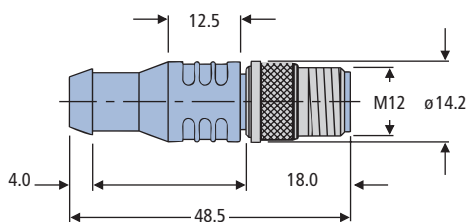


Pin assignment

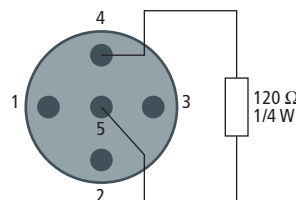
C Illustrations similar



Termination resistor

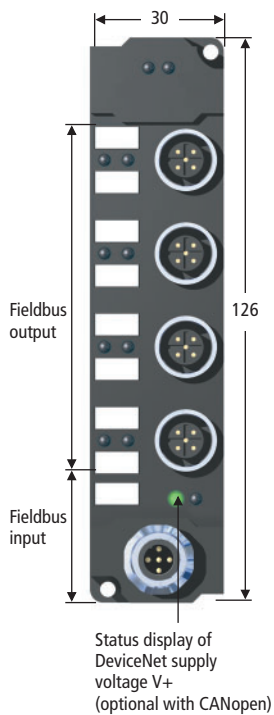


Dimensions in mm



Pin assignment

D



Technical data	
Fieldbus	CANopen or DeviceNet
Bus plug	M12 plug, 5-pin, screwed
Data transfer rates	up to 1 Mbaud (CANopen) or 500 kbaud (DeviceNet)
Supply voltage (V+)	11...30 V, max. 4 A
Protection class	IP 67
Temperature range	0...+55 °C

The following stub lines are not to be exceeded:

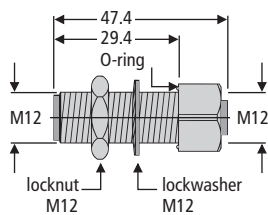
Baud rates	max. stub length (multidrop)	max. bus length with multidrop technology (without stubs)
1,000 kbaud	0.3 m	25 m
500 kbaud	1.2 m	60 m
250 kbaud	2.4 m	120 m
125 kbaud	4.8 m	310 m

Distribution box

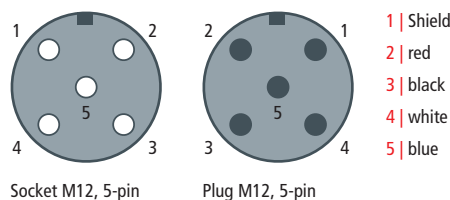
E



Control cabinet lead-in



Dimensions in mm



Pin assignment

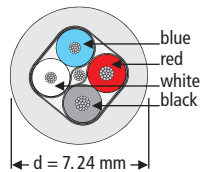
For technical data sheets see [www.beckhoff.com/FieldbusBox](http://www.beckhoff.com/FieldbusBox)

## Cordsets for CANopen, DeviceNet

Ordering information	Fieldbus cable	Connector	Contacts	Cross-section	Length	Pict.
ZK1052-6200-3020	straight socket, open end	M12, screw type	5-pin	0.32 mm <sup>2</sup>	2.00 m	A
ZK1052-6200-3050	straight socket, open end	M12, screw type	5-pin	0.32 mm <sup>2</sup>	5.00 m	A
ZK1052-6200-3100	straight socket, open end	M12, screw type	5-pin	0.32 mm <sup>2</sup>	10.00 m	A
ZK1052-6100-3020	straight plug, open end	M12, screw type	5-pin	0.32 mm <sup>2</sup>	2.00 m	B
ZK1052-6100-3050	straight plug, open end	M12, screw type	5-pin	0.32 mm <sup>2</sup>	5.00 m	B
ZK1052-6100-3100	straight plug, open end	M12, screw type	5-pin	0.32 mm <sup>2</sup>	10.00 m	B
ZK1052-6152-3003	straight socket, straight plug	M12, screw type	5-pin	0.32 mm <sup>2</sup>	0.30 m	A, B
ZK1052-6152-3005	straight socket, straight plug	M12, screw type	5-pin	0.32 mm <sup>2</sup>	0.50 m	A, B
ZK1052-6152-3010	straight socket, straight plug	M12, screw type	5-pin	0.32 mm <sup>2</sup>	1.00 m	A, B
ZK1052-6152-3020	straight socket, straight plug	M12, screw type	5-pin	0.32 mm <sup>2</sup>	2.00 m	A, B
ZK1052-6152-3050	straight socket, straight plug	M12, screw type	5-pin	0.32 mm <sup>2</sup>	5.00 m	A, B
ZK1052-6152-3100	straight socket, straight plug	M12, screw type	5-pin	0.32 mm <sup>2</sup>	10.00 m	A, B
ZK1052-6152-3150	straight socket, straight plug	M12, screw type	5-pin	0.32 mm <sup>2</sup>	15.00 m	A, B
ZK1052-6400-3020	angled socket, open end	M12, screw type	5-pin	0.32 mm <sup>2</sup>	2.00 m	C
ZK1052-6400-3050	angled socket, open end	M12, screw type	5-pin	0.32 mm <sup>2</sup>	5.00 m	C
ZK1052-6400-3100	angled socket, open end	M12, screw type	5-pin	0.32 mm <sup>2</sup>	10.00 m	C
ZK1052-6300-3020	angled plug, open end	M12, screw type	5-pin	0.32 mm <sup>2</sup>	2.00 m	D
ZK1052-6300-3050	angled plug, open end	M12, screw type	5-pin	0.32 mm <sup>2</sup>	5.00 m	D
ZK1052-6300-3100	angled plug, open end	M12, screw type	5-pin	0.32 mm <sup>2</sup>	10.00 m	D
ZK1052-6354-3003	angled socket, angled plug	M12, screw type	5-pin	0.32 mm <sup>2</sup>	0.30 m	C, D
ZK1052-6354-3005	angled socket, angled plug	M12, screw type	5-pin	0.32 mm <sup>2</sup>	0.50 m	C, D
ZK1052-6354-3010	angled socket, angled plug	M12, screw type	5-pin	0.32 mm <sup>2</sup>	1.00 m	C, D
ZK1052-6354-3020	angled socket, angled plug	M12, screw type	5-pin	0.32 mm <sup>2</sup>	2.00 m	C, D
ZK1052-6354-3050	angled socket, angled plug	M12, screw type	5-pin	0.32 mm <sup>2</sup>	5.00 m	C, D
ZK1052-6354-3100	angled socket, angled plug	M12, screw type	5-pin	0.32 mm <sup>2</sup>	10.00 m	C, D
ZK1052-6354-3150	angled socket, angled plug	M12, screw type	5-pin	0.32 mm <sup>2</sup>	15.00 m	C, D

Fieldbus Box

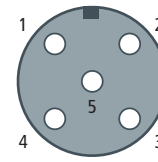
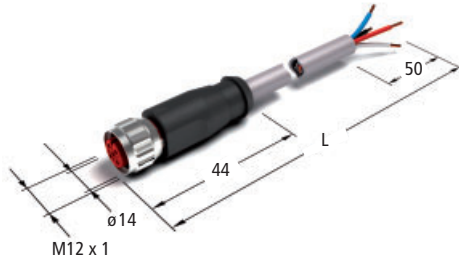
998



Electrical data	
Ratings	300 V, 80 °C
Material	outer cladding PVC, inner insulation polyethylene
Supply cable	black, red
Data lead	blue, white
DC resistance	54.13 Ω/km
Line capacitance	37.17 pF/m
Nominal impedance	126 Ω at 1 MHz
Approval	UL approval, AWM 2476, 80 °C, 300 V; CSA AWM I/II A/B, 80 °C, 300 V, FT1

For technical data sheets see [www.beckhoff.com/FieldbusBox](http://www.beckhoff.com/FieldbusBox)

A Illustrations similar

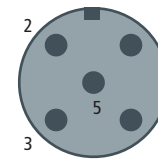
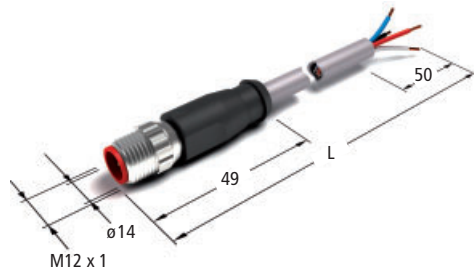


- 1 | Shield
- 2 | red
- 3 | black
- 4 | white
- 5 | blue

Socket M12, 5-pin

Pin assignment

B

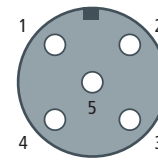
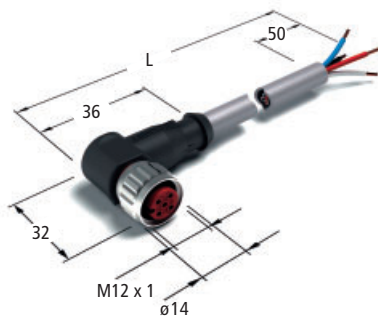


- 1 | Shield
- 2 | red
- 3 | black
- 4 | white
- 5 | blue

Plug M12, 5-pin

Pin assignment

C

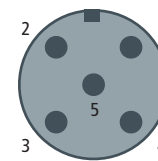
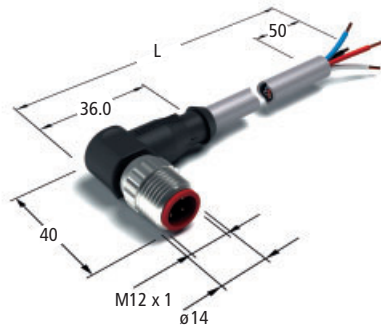


- 1 | Shield
- 2 | red
- 3 | black
- 4 | white
- 5 | blue

Socket M12, 5-pin

Pin assignment

D



- 1 | Shield
- 2 | red
- 3 | black
- 4 | white
- 5 | blue

Plug M12, 5-pin

Pin assignment



## USB cable for KS2000

The KS2000 cable establishes a connection between the Fieldbus Box modules and the PC. The KS2000 can be used for parametering modules, local diagnostics, forcing data, monitoring values, updating firmware and programming Beckhoff mini PLCs via TwinCAT. The USB cable features electrical isolation. Status LEDs indicate whether data are sent or received. On the connected PC the USB cable behaves like a COM port and can therefore be used for all Beckhoff tools using serial communication.

Ordering information	Description
KS2000-Z3-USB	connection cable for KS2000 or TwinCAT for serial conversion from USB for Fieldbus Box, length 3 m



## Power cables

Ordering information	Power cable	Connector	Contacts	Cross-section	Length	Pict.
ZK2020-3200-0020	straight socket, open end	M8, screw type	4-pin	0.34 mm <sup>2</sup>	2.00 m	A
ZK2020-3200-0050	straight socket, open end	M8, screw type	4-pin	0.34 mm <sup>2</sup>	5.00 m	A
ZK2020-3200-0100	straight socket, open end	M8, screw type	4-pin	0.34 mm <sup>2</sup>	10.00 m	A
ZK2020-3400-0020	angled socket, open end	M8, screw type	4-pin	0.34 mm <sup>2</sup>	2.00 m	B
ZK2020-3400-0050	angled socket, open end	M8, screw type	4-pin	0.34 mm <sup>2</sup>	5.00 m	B
ZK2020-3400-0100	angled socket, open end	M8, screw type	4-pin	0.34 mm <sup>2</sup>	10.00 m	B
ZK2020-3132-1000	straight socket, straight plug	M8, screw type	4-pin	0.34 mm <sup>2</sup>	0.10 m	
ZK2020-3132-0001	straight socket, straight plug	M8, screw type	4-pin	0.34 mm <sup>2</sup>	0.15 m	
ZK2020-3132-0005	straight socket, straight plug	M8, screw type	4-pin	0.34 mm <sup>2</sup>	0.50 m	
ZK2020-3132-0010	straight socket, straight plug	M8, screw type	4-pin	0.34 mm <sup>2</sup>	1.00 m	
ZK2020-3132-0020	straight socket, straight plug	M8, screw type	4-pin	0.34 mm <sup>2</sup>	2.00 m	
ZK2020-3132-0025	straight socket, straight plug	M8, screw type	4-pin	0.34 mm <sup>2</sup>	2.50 m	
ZK2020-3132-0030	straight socket, straight plug	M8, screw type	4-pin	0.34 mm <sup>2</sup>	3.00 m	
ZK2020-3132-0040	straight socket, straight plug	M8, screw type	4-pin	0.34 mm <sup>2</sup>	4.00 m	
ZK2020-3132-0050	straight socket, straight plug	M8, screw type	4-pin	0.34 mm <sup>2</sup>	5.00 m	
ZK2020-3132-0075	straight socket, straight plug	M8, screw type	4-pin	0.34 mm <sup>2</sup>	7.50 m	
ZK2020-3132-0100	straight socket, straight plug	M8, screw type	4-pin	0.34 mm <sup>2</sup>	10.00 m	
ZK2020-3334-0001	angled socket, angled plug	M8, screw type	4-pin	0.34 mm <sup>2</sup>	0.15 m	
ZK2020-3334-0005	angled socket, angled plug	M8, screw type	4-pin	0.34 mm <sup>2</sup>	0.50 m	
ZK2020-3334-0010	angled socket, angled plug	M8, screw type	4-pin	0.34 mm <sup>2</sup>	1.00 m	
ZK2020-3334-0020	angled socket, angled plug	M8, screw type	4-pin	0.34 mm <sup>2</sup>	2.00 m	
ZK2020-3334-0050	angled socket, angled plug	M8, screw type	4-pin	0.34 mm <sup>2</sup>	5.00 m	
ZB9001	power supply cable, drag chain suitable	–	–	0.34 mm <sup>2</sup>	–	

For technical data sheets see [www.beckhoff.com/FieldbusBox](http://www.beckhoff.com/FieldbusBox)

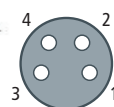
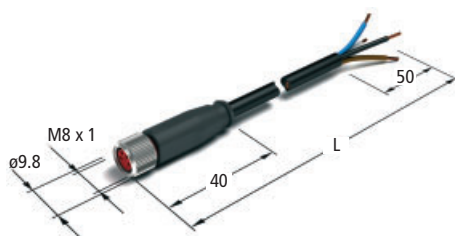
Electrical data	
Rated voltage according to IEC 61076-2-101	30 V
Contamination level according to IEC 60 664-1	3/2
Insulation resistance according to IEC 60 512-2	> 10 <sup>9</sup> Ω
Rated current according to IEC 61076-2-101	4 A
Volume resistance according to IEC 60 512-2	< 5 mΩ

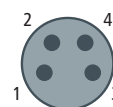
Mechanical data	
Protection class according to IEC 60 529	IP 65/66/67, when screwed together
Ambient temperature	-30 °C...+80 °C



Straight connector



Socket, 4-pin



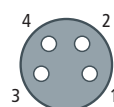
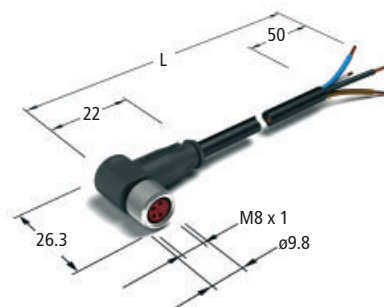
Plug, 4-pin

- 1 | brown
- 2 | white
- 3 | blue
- 4 | black

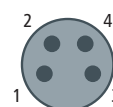
Pin assignment



Angled connector



Socket, 4-pin



Plug, 4-pin

- 1 | brown
- 2 | white
- 3 | blue
- 4 | black

Pin assignment

## Marking material

Ordering information	Marking material
ZS5000-0000	Fieldbus Box set M8 (contact labels, plugs)
ZS5000-0001	Fieldbus Box set 8 mm (contact labels, plugs)
ZS5000-0002	Fieldbus Box set M12 (contact labels, plugs)
ZS5000-0010	plugs M8, IP 67 (50 pieces)
ZS5000-0020	plugs M12, IP 67 (50 pieces)
ZS5100-0000	marking labels, white, 40 pieces
ZS5100-xxxx	printed marking labels, on request

## Sensor cables

Ordering information	Sensor cable	Connector	Contacts	Cross-section	Length	Pict.
ZK2000-4100-0020	straight plug, open end	8 mm, snap on	3-pin	0.25 mm <sup>2</sup>	2.00 m	A
ZK2000-4100-0050	straight plug, open end	8 mm, snap on	3-pin	0.25 mm <sup>2</sup>	5.00 m	A
ZK2000-2100-0020	straight plug, open end	M8, screw type	3-pin	0.25 mm <sup>2</sup>	2.00 m	B
ZK2000-2100-0050	straight plug, open end	M8, screw type	3-pin	0.25 mm <sup>2</sup>	5.00 m	B
ZK2000-2100-0100	straight plug, open end	M8, screw type	3-pin	0.25 mm <sup>2</sup>	10.00 m	B
ZK2000-2300-0020	angled plug, open end	M8, screw type	3-pin	0.25 mm <sup>2</sup>	2.00 m	C
ZK2000-2300-0050	angled plug, open end	M8, screw type	3-pin	0.25 mm <sup>2</sup>	5.00 m	C
ZK2000-6100-0020	straight plug, open end	M12, screw type	4-pin	0.34 mm <sup>2</sup>	2.00 m	D
ZK2000-6100-0050	straight plug, open end	M12, screw type	4-pin	0.34 mm <sup>2</sup>	5.00 m	D
ZK2000-7100-0020	straight plug, open end, with shield	M12, screw type	5-pin	0.34 mm <sup>2</sup>	2.00 m	D
ZK2000-7100-0050	straight plug, open end, with shield	M12, screw type	5-pin	0.34 mm <sup>2</sup>	5.00 m	D
ZK2000-6300-0020	angled plug, open end	M12, screw type	4-pin	0.34 mm <sup>2</sup>	2.00 m	E
ZK2000-6300-0050	angled plug, open end	M12, screw type	4-pin	0.34 mm <sup>2</sup>	5.00 m	E
ZK2000-6300-0100	angled plug, open end	M12, screw type	4-pin	0.34 mm <sup>2</sup>	10.00 m	E
ZK2000-6500-0005	straight plug, open end, 2 wires	M12, screw type	4-pin	0.34 mm <sup>2</sup>	0.50 m	F
ZK2000-6500-0020	straight plug, open end, 2 wires	M12, screw type	4-pin	0.34 mm <sup>2</sup>	2.00 m	F
ZK2000-6500-0050	straight plug, open end, 2 wires	M12, screw type	4-pin	0.34 mm <sup>2</sup>	5.00 m	F
ZK2000-6500-0100	straight plug, open end, 2 wires	M12, screw type	4-pin	0.34 mm <sup>2</sup>	10.00 m	F

For illustrations see 1004

Ordering information	Connection cable	Connector	Contacts	Cross-section	Length
ZK2000-2122-0005	straight plug, straight socket	M8, screw type	3-pin	0.25 mm <sup>2</sup>	0.50 m
ZK2000-2122-0010	straight plug, straight socket	M8, screw type	3-pin	0.25 mm <sup>2</sup>	1.00 m
ZK2000-2122-0020	straight plug, straight socket	M8, screw type	3-pin	0.25 mm <sup>2</sup>	2.00 m
ZK2000-2122-0050	straight plug, straight socket	M8, screw type	3-pin	0.25 mm <sup>2</sup>	5.00 m
ZK2000-2124-0005	straight plug, angled socket	M8, screw type	3-pin	0.25 mm <sup>2</sup>	0.50 m
ZK2000-2124-0010	straight plug, angled socket	M8, screw type	3-pin	0.25 mm <sup>2</sup>	1.00 m
ZK2000-2124-0020	straight plug, angled socket	M8, screw type	3-pin	0.25 mm <sup>2</sup>	2.00 m
ZK2000-2124-0050	straight plug, angled socket	M8, screw type	3-pin	0.25 mm <sup>2</sup>	5.00 m
ZK2000-2162-0005	straight plug, straight socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	0.50 m
ZK2000-2162-0010	straight plug, straight socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	1.00 m
ZK2000-2162-0020	straight plug, straight socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	2.00 m
ZK2000-2162-0050	straight plug, straight socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	5.00 m
ZK2000-2162-0100	straight plug, straight socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	10.00 m
ZK2000-2164-0005	straight plug, angled socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	0.50 m
ZK2000-2164-0010	straight plug, angled socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	1.00 m
ZK2000-2164-0020	straight plug, angled socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	2.00 m
ZK2000-2164-0050	straight plug, angled socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	5.00 m
ZK2000-6162-0005	straight plug, straight socket	M12, screw type	4-pin	0.25 mm <sup>2</sup>	0.50 m
ZK2000-6162-0010	straight plug, straight socket	M12, screw type	4-pin	0.25 mm <sup>2</sup>	1.00 m
ZK2000-6162-0020	straight plug, straight socket	M12, screw type	4-pin	0.25 mm <sup>2</sup>	2.00 m
ZK2000-6162-0050	straight plug, straight socket	M12, screw type	4-pin	0.25 mm <sup>2</sup>	5.00 m
ZK2000-6164-0005	straight plug, angled socket	M12, screw type	4-pin	0.25 mm <sup>2</sup>	0.50 m
ZK2000-6164-0010	straight plug, angled socket	M12, screw type	4-pin	0.25 mm <sup>2</sup>	1.00 m
ZK2000-6164-0020	straight plug, angled socket	M12, screw type	4-pin	0.25 mm <sup>2</sup>	2.00 m
ZK2000-6164-0050	straight plug, angled socket	M12, screw type	4-pin	0.25 mm <sup>2</sup>	5.00 m

Ordering information	Connection cable	Connector	Contacts	Cross-section	Length
ZK2000-6562-0003	straight plug, 2 x M12 straight socket, 2 wires	M12, screw type	4-pin	0.25 mm <sup>2</sup>	2 x 0.30 m
ZK2000-6562-0005	straight plug, straight socket	M12, 2 x M12, screw type	4-pin	0.25 mm <sup>2</sup>	0.50 m
ZK2000-6562-0010	straight plug, straight socket	M12, 2 x M12, screw type	4-pin	0.25 mm <sup>2</sup>	1.00 m
ZK2000-6562-0020	straight plug, straight socket	M12, 2 x M12, screw type	4-pin	0.25 mm <sup>2</sup>	2.00 m
ZK2000-6562-0050	straight plug, straight socket	M12, 2 x M12, screw type	4-pin	0.25 mm <sup>2</sup>	5.00 m
ZK2000-6522-0005	straight plug, straight socket	M12, 2 x M8, screw type	4-pin, 2 x 3-pin	0.25 mm <sup>2</sup>	0.50 m
ZK2000-6522-0010	straight plug, straight socket	M12, 2 x M8, screw type	4-pin, 2 x 3-pin	0.25 mm <sup>2</sup>	1.00 m
ZK2000-6522-0020	straight plug, straight socket	M12, 2 x M8, screw type	4-pin, 2 x 3-pin	0.25 mm <sup>2</sup>	2.00 m
ZK2000-6522-0050	straight plug, straight socket	M12, 2 x M8, screw type	4-pin, 2 x 3-pin	0.25 mm <sup>2</sup>	5.00 m
ZK2000-2322-0005	angled plug, straight socket	M8, screw type	3-pin	0.25 mm <sup>2</sup>	0.50 m
ZK2000-2322-0010	angled plug, straight socket	M8, screw type	3-pin	0.25 mm <sup>2</sup>	1.00 m
ZK2000-2322-0020	angled plug, straight socket	M8, screw type	3-pin	0.25 mm <sup>2</sup>	2.00 m
ZK2000-2322-0050	angled plug, straight socket	M8, screw type	3-pin	0.25 mm <sup>2</sup>	5.00 m
ZK2000-2324-0005	angled plug, angled socket	M8, screw type	3-pin	0.25 mm <sup>2</sup>	0.50 m
ZK2000-2324-0010	angled plug, angled socket	M8, screw type	3-pin	0.25 mm <sup>2</sup>	1.00 m
ZK2000-2324-0020	angled plug, angled socket	M8, screw type	3-pin	0.25 mm <sup>2</sup>	2.00 m
ZK2000-2324-0050	angled plug, angled socket	M8, screw type	3-pin	0.25 mm <sup>2</sup>	5.00 m
ZK2000-2362-0005	angled plug, straight socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	0.50 m
ZK2000-2362-0010	angled plug, straight socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	1.00 m
ZK2000-2362-0020	angled plug, straight socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	2.00 m
ZK2000-2362-0050	angled plug, straight socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	5.00 m
ZK2000-2364-0005	angled plug, angled socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	0.50 m
ZK2000-2364-0010	angled plug, angled socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	1.00 m
ZK2000-2364-0020	angled plug, angled socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	2.00 m
ZK2000-2364-0050	angled plug, angled socket	M8, M12, screw type	3-pin, 4-pin	0.25 mm <sup>2</sup>	5.00 m

Further cables on request

Ordering information	Only for combi I/Os (IP/IE240x)	Connector	Contacts	Cross-section	Length	Pict.
ZK2000-5100-0020	straight plug, open end	8 mm, snap on	4-pin	0.25 mm <sup>2</sup>	2.00 m	A
ZK2000-5100-0050	straight plug, open end	8 mm, snap on	4-pin	0.25 mm <sup>2</sup>	5.00 m	A
ZK2000-3100-0020	straight plug, open end	M8, screw type	4-pin	0.25 mm <sup>2</sup>	2.00 m	B
ZK2000-3100-0050	straight plug, open end	M8, screw type	4-pin	0.25 mm <sup>2</sup>	5.00 m	B
ZK2000-3300-0020	angled plug, open end	M8, screw type	4-pin	0.25 mm <sup>2</sup>	2.00 m	C
ZK2000-3300-0050	angled plug, open end	M8, screw type	4-pin	0.25 mm <sup>2</sup>	5.00 m	C
ZK2000-3300-0100	angled plug, open end	M8, screw type	4-pin	0.25 mm <sup>2</sup>	10.00 m	C

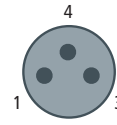
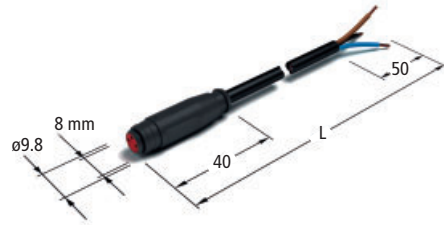
For illustrations see [1004](#)

Ordering information	Sensor cable	Contacts	Cross-section	Length
ZB9002	sensor cable, drag chain suitable	3-pin	0.25 mm <sup>2</sup>	sold by the metre

# Sensor cables

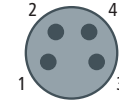


Straight 8 mm snap type



Plug, 3-pin

- 1 | brown
- 3 | blue
- 4 | black



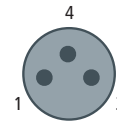
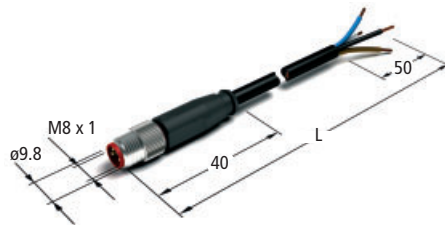
Plug, 4-pin  
(Combi I/Os)

- 1 | brown
- 2 | white
- 3 | blue
- 4 | black

Pin assignment

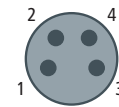


Straight M8 screw type



Plug, 3-pin

- 1 | brown
- 3 | blue
- 4 | black



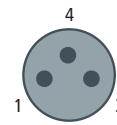
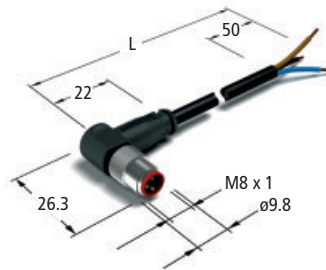
Plug, 4-pin  
(Combi I/Os)

- 1 | brown
- 2 | white
- 3 | blue
- 4 | black

Pin assignment

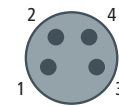


Angled M8 screw type



Plug, 3-pin

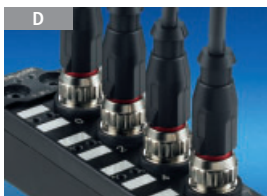
- 1 | brown
- 3 | blue
- 4 | black



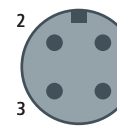
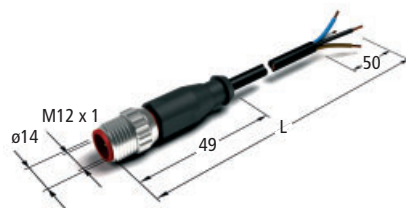
Plug, 4-pin  
(Combi I/Os)

- 1 | brown
- 2 | white
- 3 | blue
- 4 | black

Pin assignment

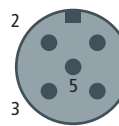


Straight M12 screw type



Plug, 4-pin

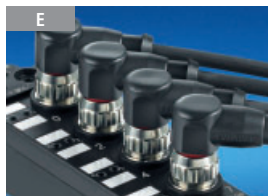
- 1 | brown
- 2 | white
- 3 | blue
- 4 | black



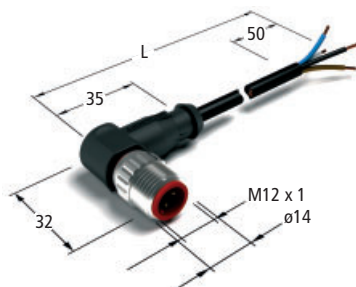
Plug, 5-pin

- 1 | brown
- 2 | white
- 3 | blue
- 4 | black
- 5 | Shield

Pin assignment



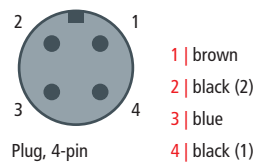
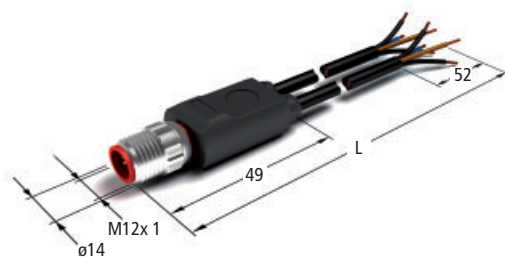
Angled M12 screw type



Plug, 4-pin

Pin assignment

F



Plug, 4-pin

Pin assignment

Electrical data	
Rated voltage according to IEC 61076-2-101	3-pin M8/8 mm: 60 V 4-pin M8/8 mm: 30 V 4-pin M12: 250 V 5-pin M12: 60 V
Contamination level according to IEC 60 664-1	3/2
Insulation resistance according to IEC 60 512-2	> 10 <sup>9</sup> Ω
Rated current according to IEC 61076-2-101	4 A
Volume resistance according to IEC 60 512-2	< 5 mΩ
Mechanical data	
Protection class according to IEC 60 529	IP 65/66/67, when screwed together
Ambient temperature	-25 °C...+80 °C

For technical data sheets see [www.beckhoff.com/FieldbusBox](http://www.beckhoff.com/FieldbusBox)

## Sensor/power leads accessories for field assembly

Ordering information	Plug/socket	Connection	Connector	Contacts	Pict.
ZS2000-1213	straight plug	IDC	M8, screw type	3-pin	
ZS2000-1313	straight plug	IDC	M8, screw type	4-pin	
ZS2000-1613	straight plug	IDC	M12, screw type	4-pin	
ZS2000-1223	straight socket	IDC	M8, screw type	3-pin	
ZS2000-1323	straight socket	IDC	M8, screw type	4-pin	
ZS2000-2311	straight plug	soldered	M8, screw type	4-pin	A
ZS2000-2331	angled plug	soldered	M8, screw type	4-pin	B
ZS2000-2221	straight socket	soldered	M8, screw type	3-pin	C
ZS2000-2321	straight socket	soldered	M8, screw type	4-pin	C
ZS2000-2241	angled socket	soldered	M8, screw type	3-pin	D
ZS2000-2341	angled socket	soldered	M8, screw type	4-pin	D
ZS2000-2610	straight plug	screwed	M12, screw type	4-pin	E
ZS2000-2710	straight plug	screwed	M12, screw type	5-pin	E
ZS2000-2630	angled plug	screwed	M12, screw type	4-pin	F
ZS2000-2730	angled plug	screwed	M12, screw type	5-pin	F
ZS2000-2620	straight socket	screwed	M12, screw type	4-pin	G
ZS2000-2720	straight socket	screwed	M12, screw type	5-pin	G
ZS2000-2640	angled socket	screwed	M12, screw type	4-pin	H
ZS2000-2740	angled socket	screwed	M12, screw type	5-pin	H
ZS2000-2210	straight plug	screwed	M8, screw type	3-pin	I
ZS2000-2310	straight plug	screwed	M8, screw type	4-pin	I
ZS2000-2220	straight socket	screwed	M8, screw type	3-pin	J
ZS2000-2320	straight socket	screwed	M8, screw type	4-pin	J
ZS2000-3712	straight plug for thermocouples with temperature compensation element	screwed	M12, screw type	5-pin	
ZS2000-3711	straight plug for small cable cross sections	screwed	M12, screw type	5-pin	
ZS2000-4722	Y distributor M12-ST-2xM12	–	–	4-pin	
ZS2000-5911	straight plug	soldered	M23, screw type	12-pin	
ZS2002-0111	D-sub plug	soldered	D-sub	25-pin	

A Illustrations similar



Straight plug, soldered, M8

B



Angled plug, soldered, M8

C



Straight socket, soldered, M8

D



Angled socket, soldered, M8

E



Straight plug, screwed, M12

F



Angled plug, screwed, M12

G



Straight socket, screwed, M12

H



Angled socket, screwed, M12

I



Straight plug, screwed, M8

J

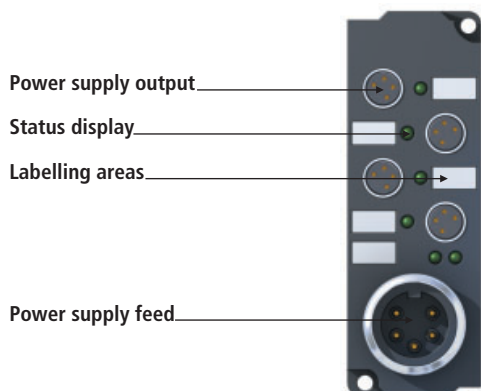


Straight socket, screwed, M8

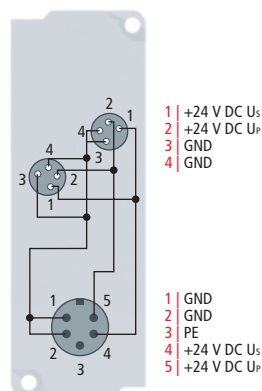
# Power distribution box

Technical data	ZS2020-4304	ZS2020-4308
Number of outputs	4	8
Power supply connection	7/8" connector, 5-pin	
Outgoing circuits	M8, screw type, 4-pin	
Current load	$I_N = 4 \text{ A}$	
Dimensions (W x H x D)	30 mm x 86 mm x 31 mm	30 mm x 126 mm x 31 mm
Operating temperature	0...55 °C	
Storage temperature	-25...+85 °C	
Protection class	IP 65/66/67 (according to EN 60529)	
Installation position	variable	

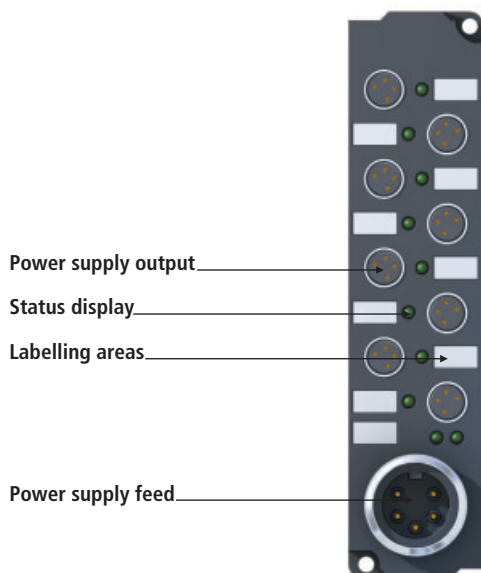
Ordering information	
ZS2020-4304	power distribution box, 4 x M8, 4-pin, 1 x 7/8" 5-pin
ZS2020-4308	power distribution box, 8 x M8, 4-pin, 1 x 7/8" 5-pin
ZS2020-2820	7/8" straight socket, field assembly, 5-pin
ZS2020-2810	7/8" straight connector, field assembly, 5-pin
ZS2020-2840	7/8" angled socket, field assembly, 5-pin
ZS2020-2830	7/8" angled connector, field assembly, 5-pin



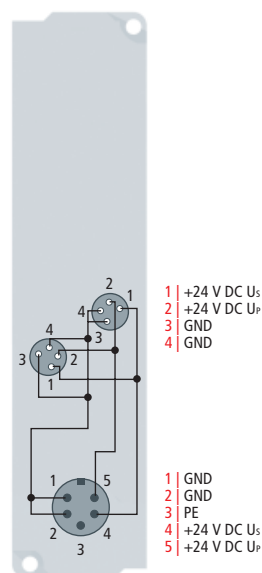
Power distribution box ZS2020-4304



Connector assignment



Power distribution box ZS2020-4308



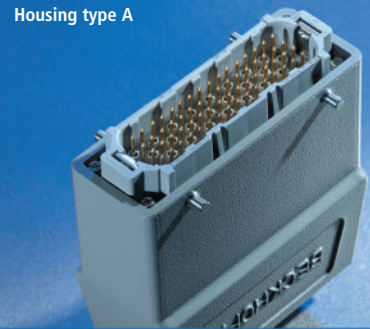
Connector assignment





# Fieldbus Modules





## FM33xx | Fieldbus Modules



acyclic services ("DP-V1") are also available for parameterisation and diagnosis.

The module's circuit can operate thermocouple sensors using a 2-wire connection. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The error LEDs indicate a broken wire. Compensation for the cold junction is made through a temperature measurement in the connecting plugs. This means that standard extension leads can be connected. The Fieldbus Modules have back-voltage protection circuitry to protect against external voltages applied to the thermocouple inputs. Voltages of up to 230 V AC are withstood without damage to the module. Those thermocou-

ple inputs that are not affected remain functionally operative or are only affected for a short time.

The extended parameterisation may be carried out either via the fieldbus or, using the KS2000 software tool, through the configuration interface. The parameters are stored in the module. The status of the Fieldbus Module is indicated via LEDs.

The different versions of the FM33xx Fieldbus Module differ in terms of the number of available thermocouple input channels (12 or 32 channels), the type of thermocouple that is implemented (type J or K), and the housing type (clip-on housing A or add-on housing B). The add-on housing (type B) features two locking latches and a continuous rubber seal to provide an IP 65 connection

to the socket element. In addition, housing type B features two cast brackets with holes for attaching the FM module to mounting plates (through-hole mounting).



The FM33xx fieldbus modules allow 12 or 32 thermocouples to be connected to a module. The connecting circuitry for these multiple thermocouples is housed in a compact, splash-proof housing and has a PROFIBUS DP interface with a transmission rate of 12 Mbaud. Data are mainly exchanged cyclically, although

Ordering information	FM33xx	Housing type
FM3312-B310-0000	Fieldbus Module, thermocouple, 12-channel, type K, PROFIBUS interface	A
FM3312-B310-0010	Fieldbus Module, thermocouple, 12-channel, type J, PROFIBUS interface	A
FM3312-B310-1000	Fieldbus Module, thermocouple, 12-channel, type K, PROFIBUS interface	B
FM3312-B310-1010	Fieldbus Module, thermocouple, 12-channel, type J, PROFIBUS interface	B
FM3332-B310-0000	Fieldbus Module, thermocouple, 32-channel, type K, PROFIBUS interface	A
FM3332-B310-0010	Fieldbus Module, thermocouple, 32-channel, type J, PROFIBUS interface	A
FM3332-B310-1000	Fieldbus Module, thermocouple, 32-channel, type K, PROFIBUS interface	B
FM3332-B310-1010	Fieldbus Module, thermocouple, 32-channel, type J, PROFIBUS interface	B

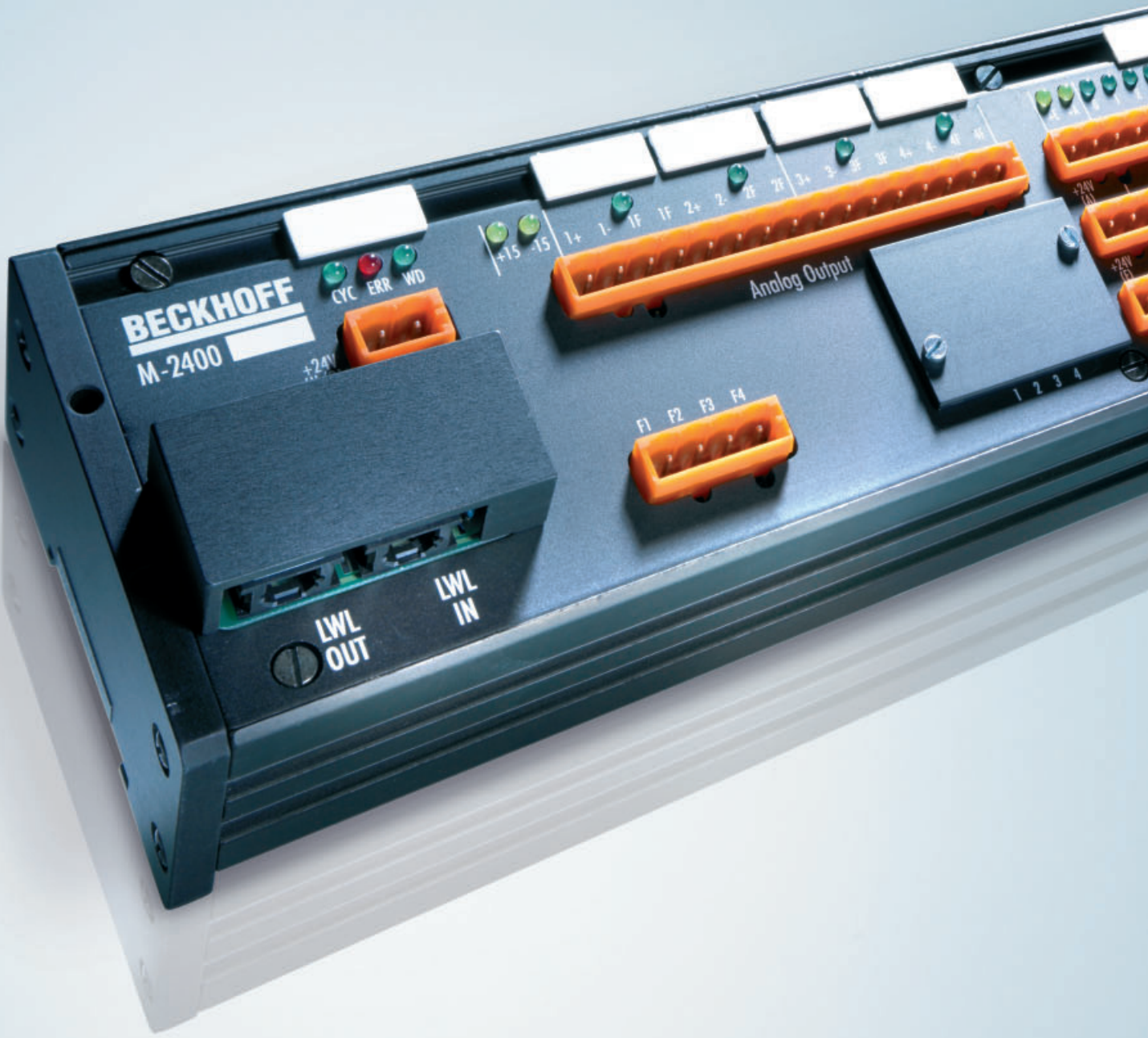
Technical data	FM3312	FM3332
Fieldbus	PROFIBUS DP	
Data transfer rates	max. 12 Mbaud	
Configuration possibility	via KS2000 or the controller	
Fieldbus connection method	DIN 45322, 6-pin, screwed	
Thermocouple channels	12	32
Thermocouple connections	industrial plug-in connection (Han24E, Han64D), 2-wire connection	
Cable length	max. 10 m	
Sensor types	type J, K, mV measurement	
Temperature range	type J: -10...+900 °C; type K: -100...+1,370 °C	
Resolution	0.1 °C per digit	
Conversion time	approx. 250 ms	
Measuring error	< ±0.5 % (of the full scale value)	
Input filter	5 variations, configurable	
Power supply	24 V DC (-15 %/+20 %)	
Current consumption	typ. 90 mA/max. 120 mA	typ. 100 mA/max. 130 mA
Bit width in the process image	input: 4 x 16 bit data, optional: 4 x 8 bit control/status	
Electrical isolation	channels/control voltage: 500 V <sub>rms</sub> , between the channels: no, control voltage/fieldbus: 100 V <sub>rms</sub> (PROFIBUS)	
Housing type A	industrial plug-in connector, Han24B	
Housing type B	add-on housing AGG + locking bracket	
Housing pin insert	Han24E	Han64D
Contacts	hard gold plated	
Dimensions (L x W x H)	type A: 120 mm x 52 mm x 129 mm, type B: 150 mm x 52 mm x 129 mm	
Weight	type A: 950 g, type B: 1030 g	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration resistance	conforms to IEC 68, Part 2-6/IEC 68, Part 2-27	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	housing to IP 65 (PROFIBUS connector: IP 67)/variable	
Further information	www.beckhoff.com/FM3312	

## Accessories

Ordering information	Accessories
ZS3100-0831	angled PROFIBUS plug, DIN 45322, 6-pin
ZS3100-0841	angled PROFIBUS socket, DIN 45322, 6-pin
ZS3100-1810	straight PROFIBUS plug terminating resistor, 6-pin
ZB3300	PROFIBUS cable 12 Mbaud 1 x 2 x 0.64 mm <sup>2</sup> , 5-wires, drag chain suitable
KS2000	configuration software for extended parameterisation

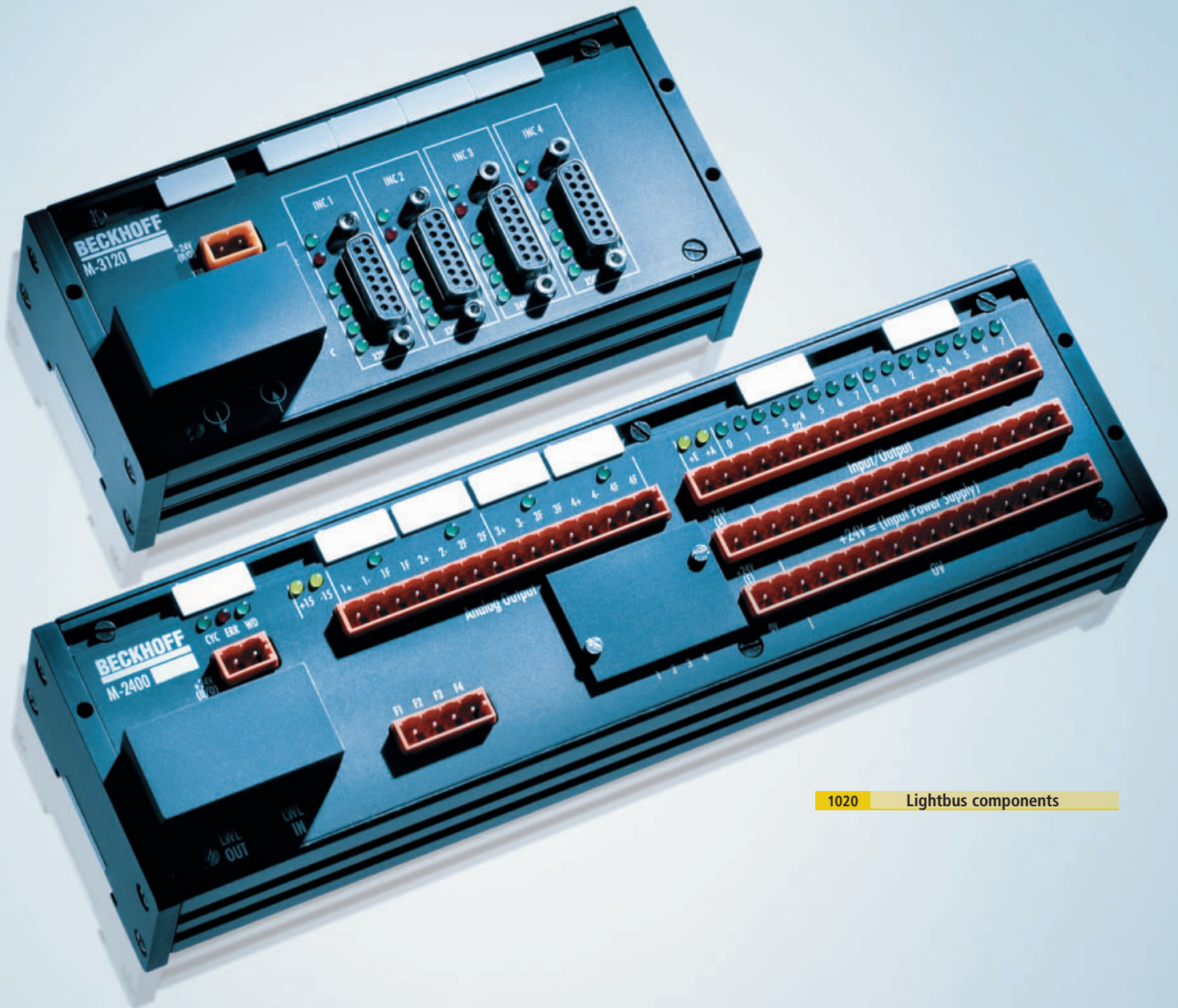
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# Lightbus

The fast fibre optic fieldbus



# Lightbus

Interference-free fieldbus communication for fast machine controls

- 1016** Product overview
- 1018** System description

## **1020** Lightbus components

- 1022** PCI interface FC2001, FC2002
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- 1031** Incremental encoder M3200
- 1032** Incremental encoder interface M3100, M3120
- 1034** Control units M63x0
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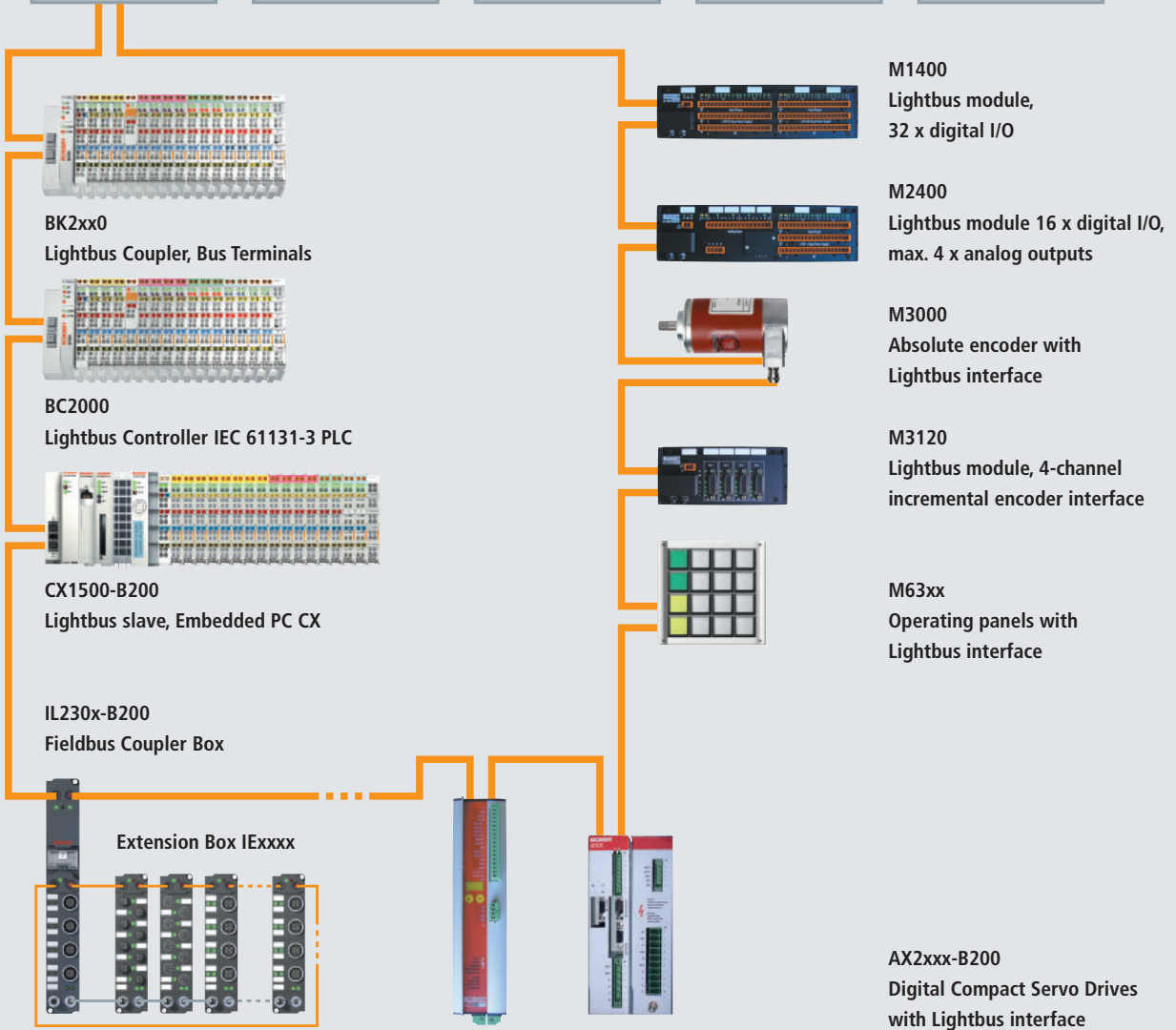
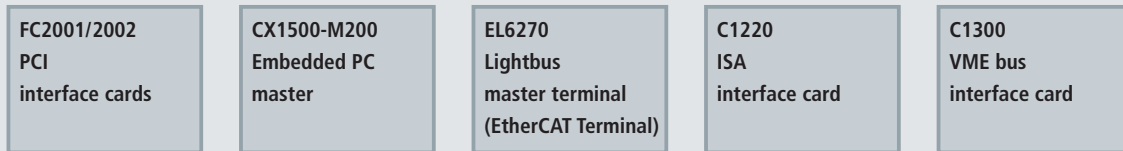
# Product overview Lightbus

Lightbus		Embedded PC		Bus Terminal		EtherCAT Terminals	
Interface Cards		Master		Coupler		EtherCAT Terminals	
PCI-Bus	FC2001 1022 1-channel	CX1500-M200 302		BK2000 398 standard	EL6720 804 master terminal		
	FC2002 1022 2-channel			BK2010 398 Economy			
ISA bus	C1200 1023	CX1500-B200 304		BK2020 398 Economy plus			
	C1220 1024 with communication processor			PLC BC2000 444			
VME bus	C1300 1025			Bus Terminals			
				Digital I/O			
				KL1xxx   KS1xxx 476 digital input			
				KL2xxx   KS2xxx 507 digital output			
				Analog I/O			
				KL3xxx   KS3xxx 548 analog input			
				KL4xxx   KS4xxx 576 analog output			
				Special functions			
				KL5xxx   KS5xxx 588 angle and displacement measurement			
				KL6xxx   KS6xxx 593 communication			
				Power terminals			
				KL8xxx 608 power terminals			
				System terminals			
				KL9xxx   KS9xxx 612 system terminals			

Fieldbus Box		Modules		Drive Technology					
Compact Box	IPxxxx-B200	870	Interface module	M1200, M1210	1026	Servo Drive with Lightbus interface	AX2003-B200	1098	
				CMOS interface			AX2006-B200	1098	
Coupler Box	IL230x-B200	870	Digital I/O	M1110	1027	AX2010-B200	1098		
				16-channel digital I/O (configurable), 24 V DC, 0.5 A, IP 65					
Extension Box	IExxxx	942	Combi I/O	M1400, M1410	1028	AX2020-B200	1098		
				16/32-channel digital I/O (configurable), 24 V DC, 0.5 A					
			Analog input	M2400	1029	AX2040-B200	1098		
				16-channel digital I/O, 24 V DC, 0.5 A, 4-channel analog output, 12 bit					
			Special functions	M2510	1030	AX2070-B200	1098		
				4-channel analog input, 12 bit					
			Operation panels	M3000	1031	AX2503-B200	1100		
				absolute encoder, 24 bit					
				M3100	1032			AX2506-B200	1100
				incremental encoder interface, 24 bit, IP 65					
			M3120	1033	AX2513-B200	1100			
			incremental encoder interface, 1–4-channel, 24 bit						
			M3200	1031	AX2516-B200	1100			
			incremental encoder, 24 bit, IP 65						
				M63x0	1034	AX2523-B200	1100		
				built-in panel, aluminium or plastic housing					
						Servomotors	AMxxxx	1106	
							Synchronous Servomotors		
						ALxxxx	1106		
						Linear Servomotors			

# System overview Lightbus

## System overview



# The Beckhoff Lightbus system

## Simple, low-cost installation

Light up the dark with the Beckhoff Lightbus system by replacing complete cable routes with one single fibre optic conductor. Instead of extensive I/O interfacing units, only one intelligent Beckhoff Lightbus interface board is integrated in the control computer and the decentralised Lightbus modules are directly situated locally. Installation effort and costs are reduced drastically, handling and maintenance are simplified, and interference immunity and performance are increased. The Lightbus was introduced as far back as 1989 as the Beckhoff system bus for fast machine controllers and has become the market leader in some sectors. These include, for instance, production machines for windows, wood processing machines, presses, packaging machines, machine tools, and applications in metrology and technical building services.

## Fast and fail-safe industrial communication

The Beckhoff Lightbus system is a fast and fail-safe serial fieldbus system that was conceived for the needs of automation

technology. Low-cost and easy-to-process standard fibre optic conductor technology is used for transmission. The crucial advantages of the fibre optic conductor are interference immunity to electromagnetic influences, complete electrical isolation of connected modules from one another and a high data transfer rate. In conjunction with an optimised, compact telegram structure, the Lightbus permits a very high user information data transfer rate of up to 2.5 Mbits/s. With one Lightbus interface board, up to 255 decentralised modules can be operated with a maximum distance of up to 300 m between two modules.

## Reliability and flexibility

Reliability is a must – with efficient test and diagnostic functions, functioning of the individual Lightbus modules and communication in the entire Lightbus ring are monitored cyclically and automatically.

Changes or additions to a system configuration can be realised easily and reliably by means of configuration programs in the Lightbus system. The Lightbus system is open and universally applicable. Lightbus interfaces are available for common bus

and computer architectures, from the standard PC up to VME computers, and for control systems in use around the world.

The wide range of distributed Lightbus components covers the requirements found in automation technology for items from displacement sensors, through universal Bus Terminals up to drive controllers.

## Easy assembly – high data rate

The Lightbus system, based on standard plastic fibre optics, offers simple assembly and very high data rates combined with total immunity to interference; its simple and efficient bus protocol, using a master/slave principle, is ideal for automation applications.

## Communication services for process and parameter data

Services for system operation and data transfer are handled within a simple protocol frame. Intelligent interface cards for all computer architectures offer convenient communication services via logical channels to the modules.

The protocol is implemented in hardware for high-speed communication without delays.

## Deterministic behaviour for eight independent channels

Its fast, deterministic behaviour, interrupt signal handling, together with random access to individual components make the Lightbus particularly suitable for control and regulation tasks. Fast communication, such as position control or process functions, can be carried out at the same time as slower communication for the purposes, for instance, of PLC functions.

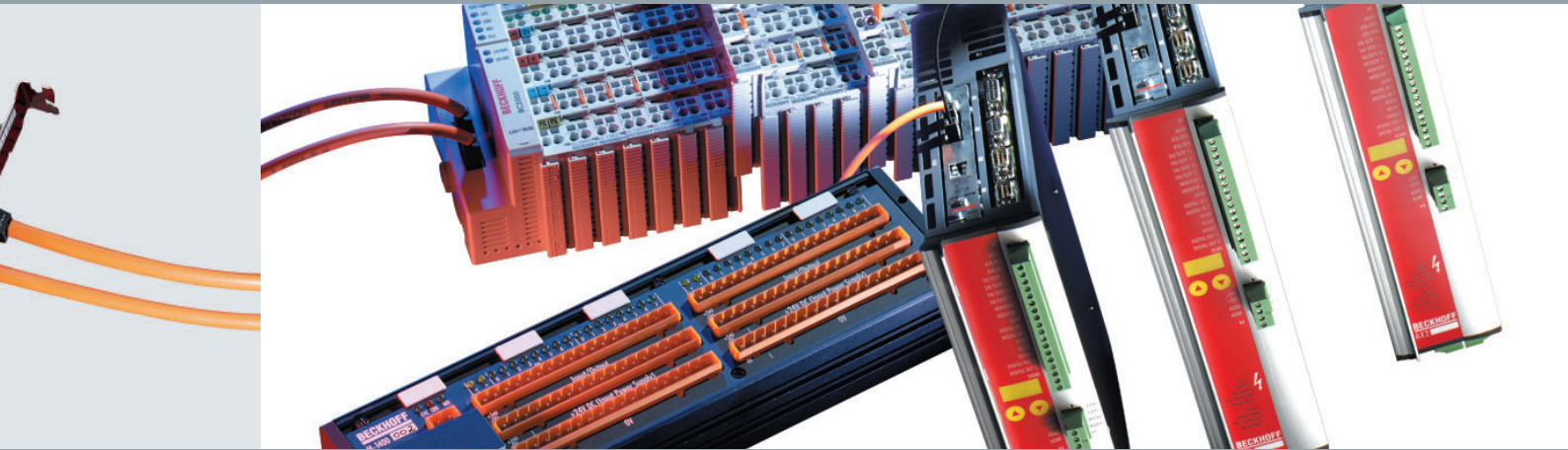
A process image with 1,280 inputs and outputs is fully read and written within 1 ms. Process signals can be observed with a 25 µs sampling interval at the same time. This functionality allows one to meet all PLC, NC and control requirements with one single fieldbus.

## Lightbus features

- 2.5 Mbaud data rate
- 25 µs transmission time for 32 bits of user information
- Intelligent commands for read, write, address initialisation, configuration and line test; communication is executed automatically.
- up to 255 I/O modules in one ring with up to 65,280 I/O points (e.g. 64 x 4-channel Bus Terminals x 255)
- up to 300 m transmission distance between two I/O modules with HCS fibre, 45 m using PMMA fibre



# Lightbus components





## FC2001, FC2002 | Lightbus PCI interface cards

The PCI Fieldbus Cards from Beckhoff are characterised by outstanding features. They are tailor-made for TwinCAT, the software solution for PC-compatible control technology. The power of TwinCAT comes into its own with this interface generation:

- Cycle times up to 100 µs are possible.
  - Process data communication can either be free running or synchronised.
  - It is possible to select two parallel fieldbus channels on one card.
  - powerful parameter and diagnostics interfaces (ADS)
- TwinCAT I/O provides configuration tools and Windows NT/2000/XP drivers for programs in any desired high-level language (DLLs) and for Visual Basic applications (ActiveX). Applications with OPC interface can access the cards via an OPC server.

Technical data	FC2001	FC2002
Fieldbus	Lightbus	
Number of fieldbus channels	1	2
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 µs	
Interface to the PC	plug-and-play PCI interface 32 bit with 4 kbyte DPRAM for 8 communication channels, data, control and status register	
Bus interface	2 x standard fibre optic connector Z1000 (plastic fibre), Z1010 (HCS fibre)	4 x standard fibre optic connector Z1000 (plastic fibre), Z1010 (HCS fibre)
Communication	8 priority controlled logical communication channels	
Bus device	max. 254 nodes with a max. of 65,280 I/O points per fieldbus connection	
Interrupt	initiation of 2 PC hardware interrupts is possible	
Hardware diagnosis	3 LEDs per channel	
Dimensions	approx. 106 mm x 187 mm	
Operating temperature	0...55 °C	
Further information	<a href="http://www.beckhoff.com/FC2001">www.beckhoff.com/FC2001</a>	
Ordering information	FC2001-0000	FC2002-0000
FC200x-0000	standard configuration	



## C1200 | Lightbus ISA interface card

Up to 255 distributed Lightbus input and output modules can be connected to a standard PC with the C1200 interface card. Fibre optics carry data at 2.5 Mbaud between the PC and the industrial peripherals, rapidly and without interference.

Drivers and high level language libraries for various

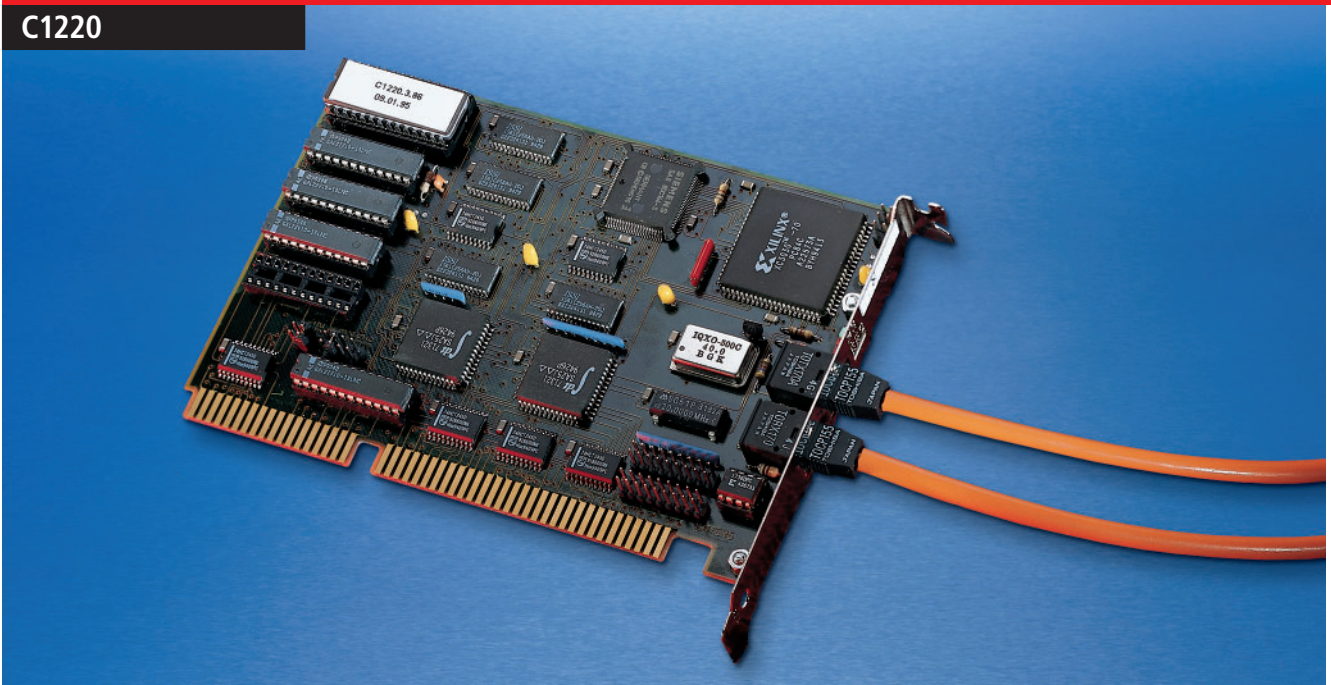
operating systems and programming languages are available for programming the interface card.

### Features

- integration of all communication functions into a single LCA (Logic Cell Array) circuit
- two 8 byte register sets for the transmit buffer
- two 8 byte register sets for the receive buffer
- automatic CRC generation and checking
- automatic transmit for interrupt polling
- short 8 bit PC plug-in card

<b>Technical data</b>	<b>C1200</b>
Fieldbus	Lightbus
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 µs
Data security	hamming distance d = 3
Transmit register	2 register sets of 8 bytes each
Receive register	2 register sets of 8 bytes each
Status register	2 registers
Software	Beckhoff TwinCAT, DOS drivers, high-level language libraries
Supply voltage	5 V DC via PC bus
Dimensions	short 8 bit PC plug-in card, L = 116 mm
Operating temperature	0...55 °C
Further information	<a href="http://www.beckhoff.com/C1200">www.beckhoff.com/C1200</a>
<b>Ordering information</b>	<b>C1200</b>
C1200	standard version





## C1220 | Lightbus ISA interface card

Up to 255 distributed Lightbus input and output modules can be connected to a standard PC with the C1220 interface card. Fibre optics carry data at 2.5 Mbaud between the PC and the industrial peripherals, rapidly and without interference.

The interface card has its own microprocessor (80C166) and a 4 kbyte dual port memory to the PC bus, in which the process image of the connected

Lightbus modules is represented in real-time. Up to eight priority-controlled logical communication channels permit a simple program interface and relieve the load on the PC's processor. Drivers and high level language libraries for various operating systems and programming languages are available for programming the communication card. The C1220 interface card uses the Lightbus system's interrupt

capability: signal sampling at 25  $\mu$ s intervals and fast interrupts are available over the Lightbus.

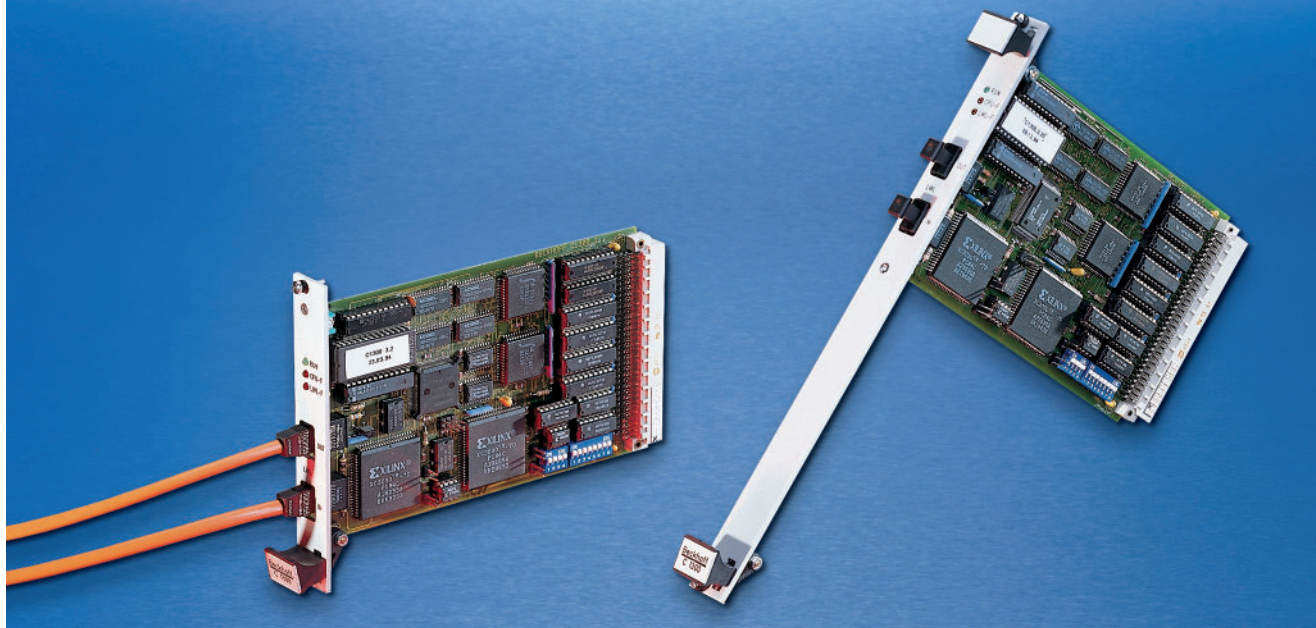
### Features

- An on-board microprocessor (Siemens 80C166) implements the Lightbus communication procedure.
- representation of the I/O data in dual port memory

- simple software interface using CDLs (Communication Description Lists), status and control registers in dual port memory
- 16 bit PC plug-in card for PC ISA bus
- PC interrupts generated by the Lightbus system

Technical data	C1220
Fieldbus	Lightbus
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 $\mu$ s
Data security	hamming distance $d = 3$
Communication processor	Siemens 80C166
Interface to the PC	4 kbyte DPRAM for 8 communication channels, data, control and status registers
Communication	8 priority controlled logical communication channels
Interrupt	initiation of 2 PC hardware interrupts
Software	Beckhoff TwinCAT, DOS drivers, high-level language libraries
Supply voltage	5 V via PC bus
Dimensions	16 bit PC plug-in card, short ISA card, L = 162 mm
Operating temperature	0...55 °C
Further information	<a href="http://www.beckhoff.com/C1220">www.beckhoff.com/C1220</a>

Ordering information	C1220-00x
C1220-000	standard version (as Lightbus master)
C1220-002	slave version (as Lightbus slave)



## C1300 | Lightbus VME bus interface card

Up to 255 distributed Lightbus input and output modules can be connected to the VME bus with a single C1300 interface card. Fibre optics carry data at 2.5 Mbaud between the VME bus rack and the industrial peripherals, rapidly and without interference.

The interface card has its own communications processor and 4 kbytes of dual ported RAM to the VME bus, in which

the process image of the connected Lightbus modules is represented in real-time. Up to eight priority-controlled logical communication channels and convenient interrupt handling permit a simple program interface and relieve the load on the VME bus CPU.

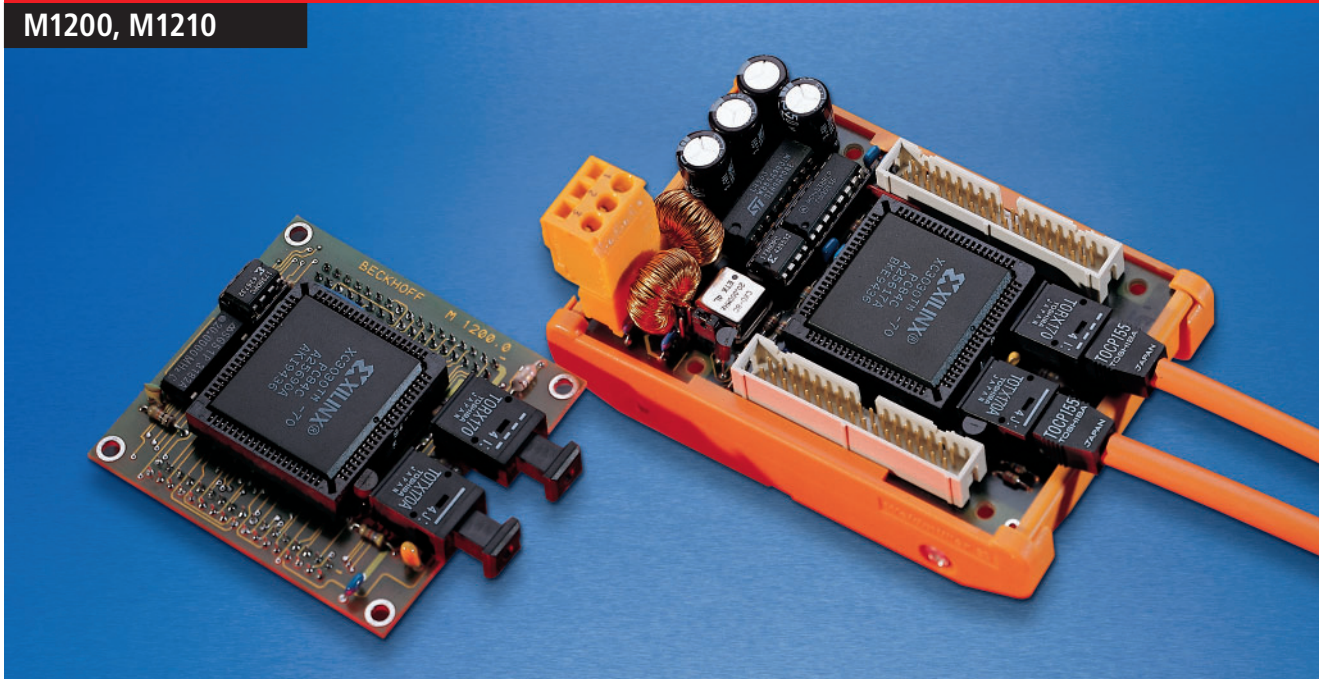
Software solutions are available for integration in OS/9 and other operating systems for VME computers.

### Features

- 16 bit VME bus slave
- single or double card format available
- Microprocessor (Siemens 80C166) implements the Lightbus communication procedure.
- 4 kbyte dual-port RAM to the VME bus
- representation of the I/O data in dual ported RAM
- simple software interface using CDLs (communication description lists), status and control registers in dual ported RAM
- initiation of up to 4 VME bus interrupts

Technical data	C1300
Fieldbus	Lightbus
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 µs
Data security	hamming distance d = 3
Communication processor	Siemens 80C166
Interface to VME bus	4 kbytes DPRAM for 8 communication channels, data, control and status registers
Communication	8 priority controlled logical communication channels
Interrupt	initiation of 4 VME bus interrupts, triggered by the Lightbus interrupt channels
Software	OS-9 drivers, support for implementations using other operating systems
Supply voltage	5 V DC via VME bus
Operating temperature	0...55 °C
Further information	<a href="http://www.beckhoff.com/C1300">www.beckhoff.com/C1300</a>

Ordering information	C1300-0xx
C1300-000	standard version (as Lightbus master), 3 rack units
C1300-001	standard version (as Lightbus master), 6 rack units
C1300-010	slave version (as Lightbus slave), 3 rack units
C1300-011	slave version (as Lightbus slave), 6 rack units



## M1200, M1210 | Lightbus interface modules

The M1200 is a Lightbus interface card for the integration of customer-specific electronics into the Lightbus system. The M1210 interface module features an integrated 24 V DC/5 V DC switched/mode power supply and a card carrier for simple installation. 32 parallel data inputs/outputs, four "fast" interrupts, and interface con-

trol signals permit easy adaptation to a wide variety of applications.

### Features

- integration of all digital functions into a single LCA (Logic Cell Array) circuit
- communication protocol optimised for 32 bit data transfer

- designed as piggyback card with 2 x 34-pin connector
- fast data transmission from PC, PLC or CNC to application-specific circuitry
- integration of additional application-specific functions into the LCA communications IC, including, for example, counters or bus interface (up to 6,000 equivalent gates)

- easy integration of the customer's own devices into the Lightbus System
- microprocessor bus interfaces available for Intel® and Motorola processors

Technical data	M1200-000	M1210-000	M1210-001
Fieldbus	Lightbus		
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 µs		
Inputs/outputs	4 parallel ports (8 bit), 4 interrupts (25 µs resolution)		
Input/output specification	CMOS/CMOS, I <sub>OUT</sub> = 4 mA		
Control signals	data read, data write, I/O select, busy, error		
Supply voltage	5 V DC (±5 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption	0.15 A (with no load or input currents)	0.1 A	0.1 A
Connectors	2 x 34-pin female	2 x 34-pin female	2 x 34-pin male connectors
Dimensions (W x H x D)	63 mm x 72 mm x 20 mm	65 mm x 100 mm x 33 mm	72 mm x 111 mm x 60 mm
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Further information	www.beckhoff.com/M1200		

Ordering information	M12x0-00x
M1200-000	print card for plug-in or screw mounting
M1210-000	print card for plug-in or screw mounting
M1210-001	open in card carrier, clip-on on mounting rail



## M1110 | Lightbus digital input/output module

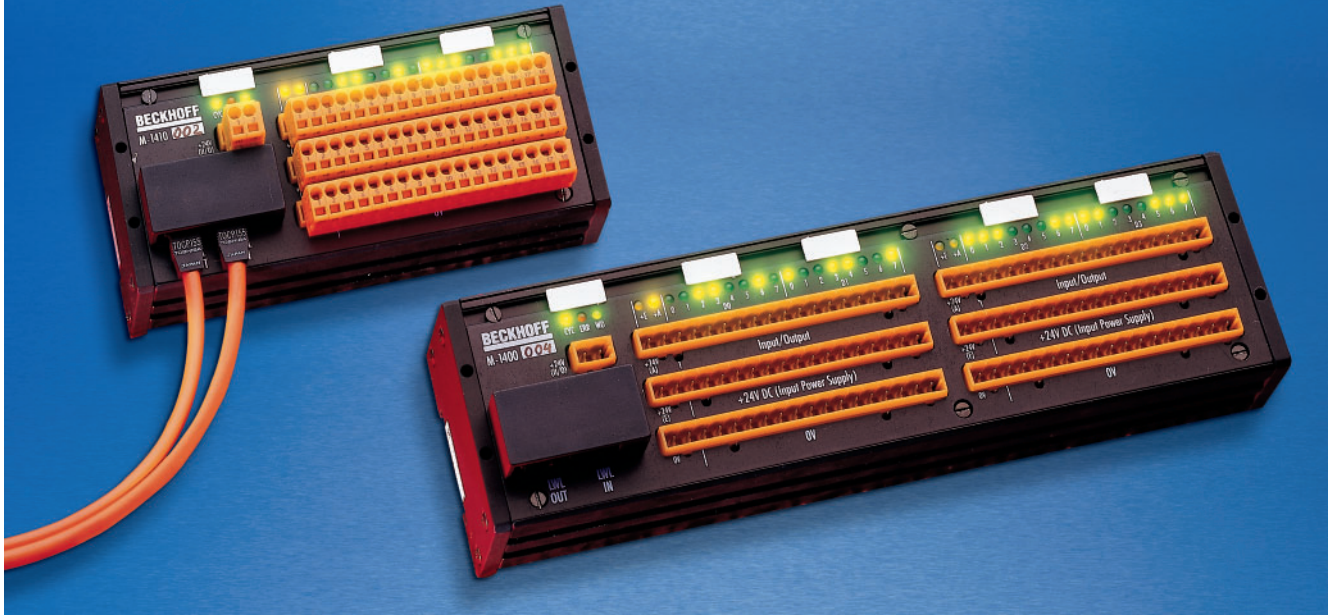
The M1110 16 bit input/output module is designed to meet protection class IP 65 for tough, industrial application directly at the machine or plant. The electronics and input/output connectors (initiator standard) are integrated into a strong die-cast aluminium housing. Initiators and actuators are connected through molded cord sets.

### Features

- 16 inputs/outputs, configurable in 2 groups of 8 bits
- outputs 24 V DC, 500 mA, short-circuit protected
- inputs 24 V DC, 8 mA, digitally filtered
- LED status indicator for all I/Os
- watchdog circuit for output monitoring
- separate power supplies for control and power circuits
- direct fitting to the machine
- die-cast housing can easily be mounted at the machine
- connection through round connector designed to initiator standard
- time saved through pre-assembled connecting cables
- power supply and Lightbus fibres pluggable

Technical data	M1110-000	M1110-001	M1110-002
Fieldbus	Lightbus		
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 µs		
Inputs/outputs	0/16	8/8	16/0
Input specification	24 V DC, 8 mA		
Output specification	24 V DC, max. 500 mA, short-circuit protected		
I/O connections	M12 connectors meeting protection class IP 67 according to initiator standard; +, -, signal		
Supply voltage	24 V DC (-15 %/+20 %)		
Current consumption	0.1 A (with no load or input currents)		
Housing form	die-cast aluminium housing		
Dimensions (W x H x D)	250 mm x 80 mm x 52 mm		
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protection class	IP 65		
Further information	<a href="http://www.beckhoff.com/M1110">www.beckhoff.com/M1110</a>		

Ordering information	M1110-00x
M1110-000	0 inputs and 16 outputs
M1110-001	8 inputs and 8 outputs
M1110-002	16 inputs and 0 outputs



## M1400, M1410 | Lightbus digital input/output modules

The M1400 and M1410 digital input/output modules are fitted locally at the machine, plant or in the control cabinet. The electrical switchgears are connected directly by three wires (+, -, signal) to up to 32 inputs or outputs.

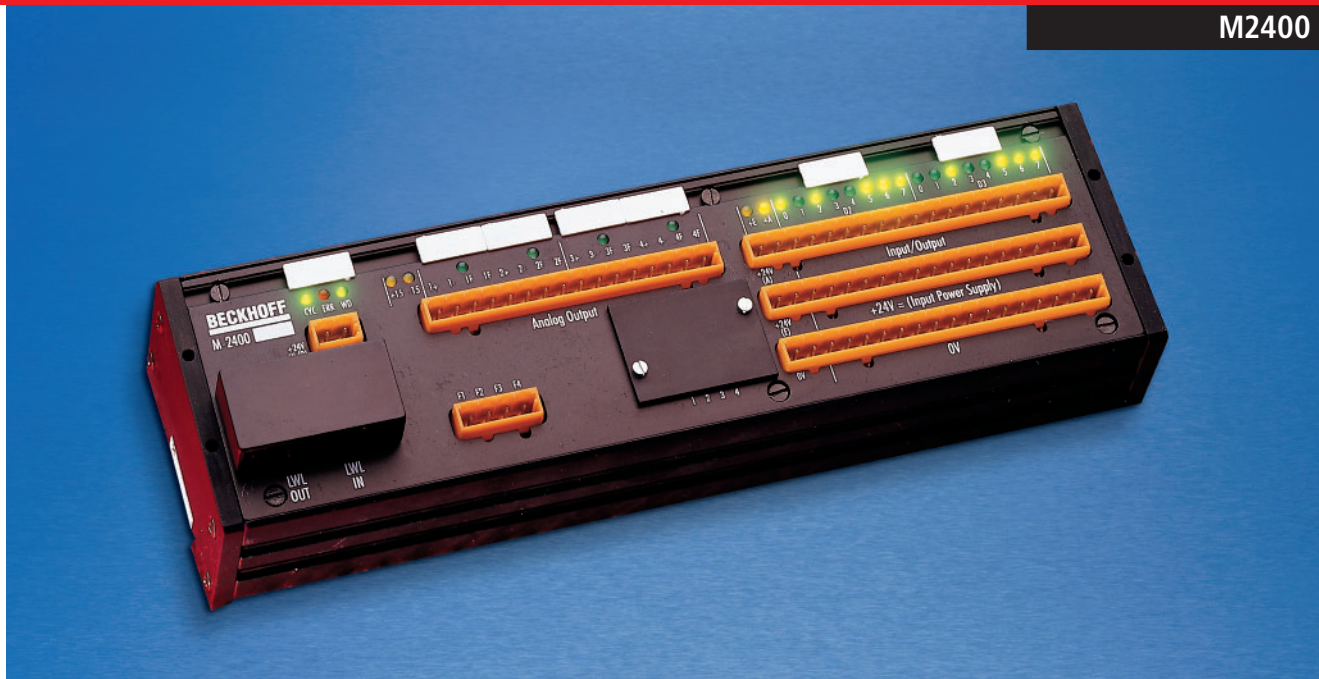
### Features

- max. 32 inputs/outputs, configurable in 4 groups of 8 bits
- M1400, M1410 outputs: 24 V DC, 500 mA, short-circuit protected
- inputs 24 V DC, 8 mA, digitally filtered
- LED status indicator for all I/Os
- watchdog circuit for output monitoring
- separate power supplies for control and power circuits
- 3-wire terminals (+, -, signal) for direct connection of sensors and actuators

- all connections are of plug-in type
- snap-on mounting on a DIN rail

Technical data	M1400	M1410
Fieldbus	Lightbus	
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 µs	
Inputs/outputs	32/32 (500 mA)	16/16 (500 mA)
Input/output specification	24 V DC, 8 mA/24 V DC, max. 500 mA, short-circuit protected	
Connections	can be plugged in for each of 8...16 I/Os; +, -, signal	
Supply voltage	24 V DC (-15 %/+20 %)	
Current consumption	0.1 A (with no load or input currents)	
Housing form	compact aluminium housing for DIN rail mounting	
Dimensions (W x H x D)	270 mm x 76 mm x 68 mm	166 mm x 76 mm x 68 mm
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Further information	www.beckhoff.com/M1400	

Ordering information	M1400-00x	M1410-00x
M14x0-000	0 inputs and 32 outputs (0.5 A)	0 inputs and 16 outputs (0.5 A)
M14x0-001	8 inputs and 24 outputs (0.5 A)	8 inputs and 8 outputs (0.5 A)
M14x0-002	16 inputs and 16 outputs (0.5 A)	16 inputs and 0 outputs (0.5 A)
M1400-003	24 inputs and 8 outputs (0.5 A)	
M1400-004	32 inputs and 0 outputs (0.5 A)	



## M2400 | Lightbus combi input/output module

The M2400 analog output module has up to four analog output channels ( $\pm 10$  V) and 16 digital inputs/outputs (24 V DC). The module is particularly suitable for the operation of four servo axes.

Four analog velocity command values and the necessary auxiliary signals can be set and read. The fibre optics

connection of the Lightbus system allows the transducer values to be transmitted at high speed and without interference to a central device such as a PC, PLC or CNC within 25  $\mu$ s.

### Features

- 4 analog outputs,  $\pm 10$  V, 12 bit resolution

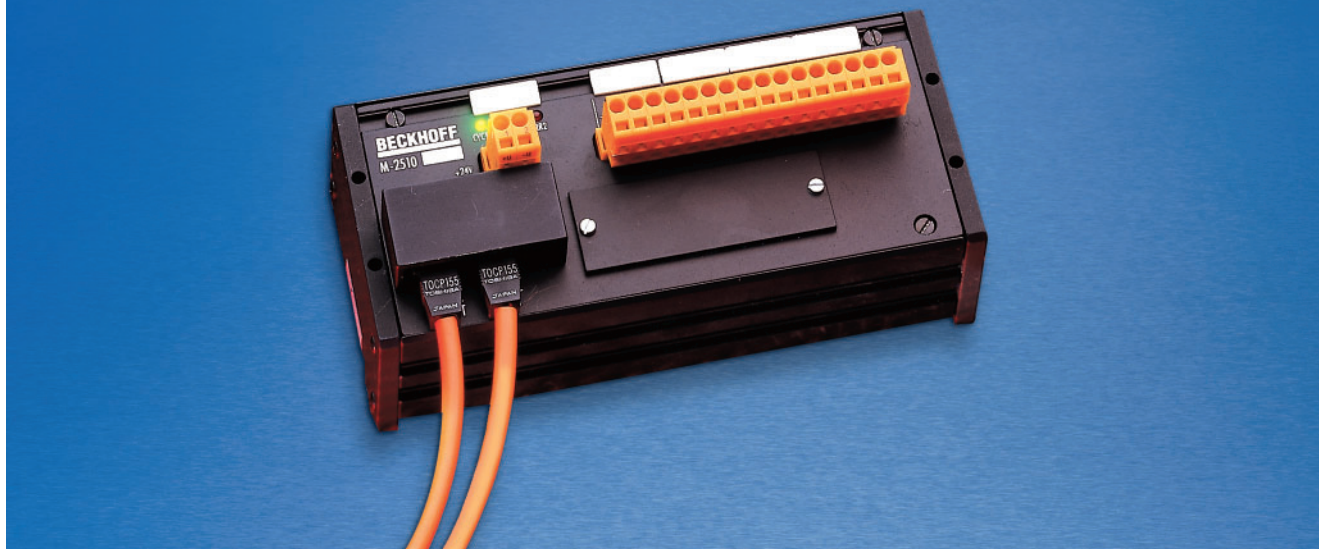
- digital outputs 24 V DC, 500 mA, short-circuit protected
- digital inputs 24 V DC, 8 mA, digitally filtered
- LED status indicator for all I/Os
- watchdog circuit for output monitoring
- Just one 24 V DC power connection, auxiliary volt-

ages are generated on the module.

- direct mounting in the power control cabinet
- All connections are of plug-in type.
- snap-on mounting on a DIN rail

Technical data	M2400
Fieldbus	Lightbus
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 $\mu$ s
Analog inputs/outputs	max. 4
Analog specifications	$U_{OUT} = \pm 10$ V, $I_{OUT} = 10$ mA, 12 bit resolution
Digital inputs/outputs	16, configurable as 0 input/16 outputs, 8 inputs/8 outputs, 16 inputs/0 output
Input specification	24 V DC, 8 mA
Output specification	24 V DC, max. 500 mA, short-circuit protected
Connections	plug-in; +, -, signal
Supply voltage	24 V DC (-15 %/+20 %)
Current consumption	0.15 A (with no load or input currents)
Housing form	compact aluminium housing for DIN rail mounting
Dimensions (W x H x D)	270 mm x 76 mm x 68 mm
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Further information	<a href="http://www.beckhoff.com/M2400">www.beckhoff.com/M2400</a>

Ordering information	M2400-0yx
M2400-0y0	0 digital inputs and 16 digital outputs (number of analog outputs y = 1, 2, 3, 4)
M2400-0y1	8 digital inputs and 8 digital outputs (number of analog outputs y = 1, 2, 3, 4)
M2400-0y2	16 digital inputs and 0 digital outputs (number of analog outputs y = 1, 2, 3, 4)



## M2510 | Lightbus analog input module

The M2510 analog input module has four analog input channels with sample and hold, a 12 bit resolution and a conversion time of 25  $\mu$ s. Jumpers can be used to select from the input ranges 0 to 10 V, 4 to 20 mA or  $\pm$ 10 V. The fibre optics connection of the Lightbus system allows the transducer

values to be transmitted at high speed and without interference to a central device such as a PC, PLC or CNC within 25  $\mu$ s.

### Features

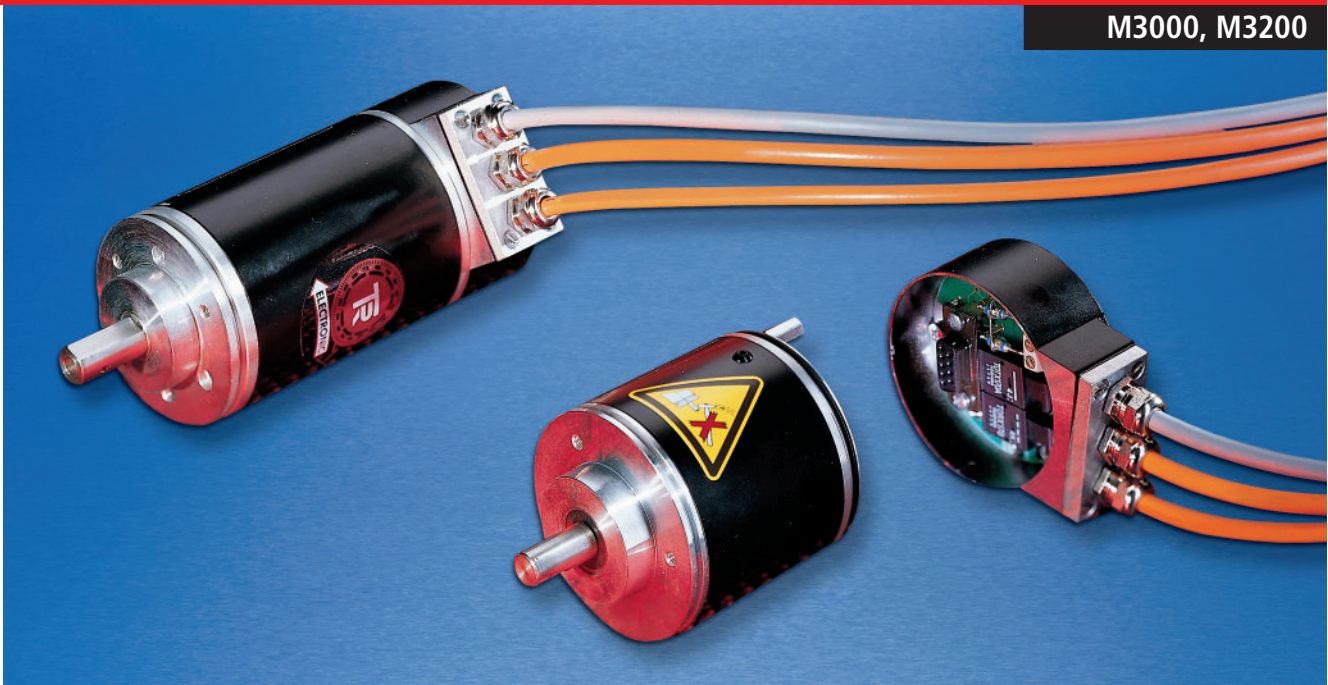
- 4 analog inputs
- 12 bit resolution, 25  $\mu$ s conversion time

- sample and hold input amplifier
- input ranges from 0 to 10 V, 4 to 20 mA,  $\pm$ 10 V
- Just one 24 V DC power connection, auxiliary voltages are generated on the module.
- direct mounting in the power control cabinet

- all connections are of plug-in type
- snap-on mounting on a DIN rail

Technical data	M2510
Fieldbus	Lightbus
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 $\mu$ s
Analog inputs/outputs	4/0
Analog specifications	$U_{IN} = \pm 10$ V, 0...10 V, 4...20 mA, 12 bit resolution
Connections	plug-in; +, -, signal
Supply voltage	24 V DC (-15 %/+20 %)
Current consumption	0.15 A (with no load or input currents)
Housing form	compact aluminium housing for DIN rail mounting
Dimensions (W x H x D)	166 mm x 76 mm x 68 mm
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Further information	<a href="http://www.beckhoff.com/M2510">www.beckhoff.com/M2510</a>

Ordering information	M2510-00x
M2510-000	4 analog inputs, auxiliary voltage $\pm$ 15 V
M2510-001	4 analog inputs, auxiliary voltage +24 V, -15 V



## M3000, M3200 | Absolute encoder, Incremental encoder

The M3000 absolute encoder allows displacements to be acquired with immunity to power failure and with a measurement range corresponding to a word length with a 24 bit measurement range. The compact optoelectronic multi-turn absolute encoder (manufactured by T+R/Beckhoff) achieves a 24 bit

resolution with 4,096 steps per revolution and 4,096 revolutions. The incremental transducer has a resolution of up to 36,000 pulses per revolution. Up to 255 transducers can be interrogated over one Lightbus ring.

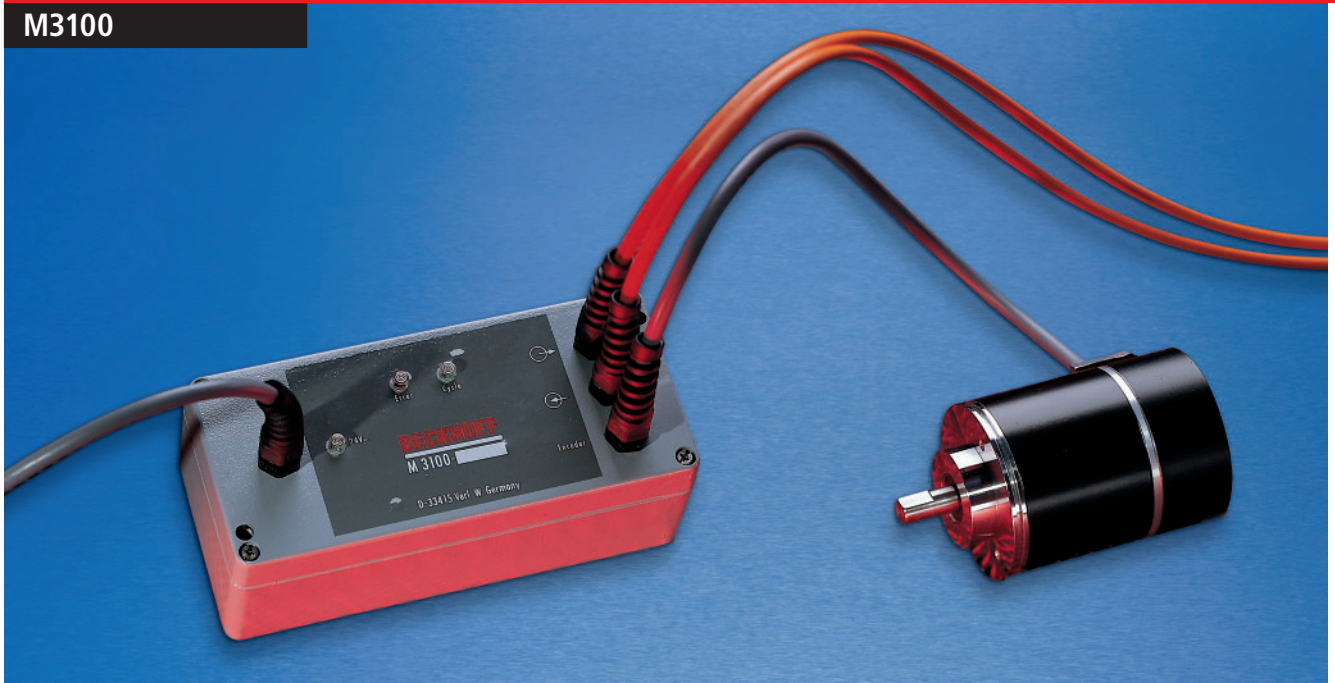
### Features

- 24 bit resolution
- 4,096 steps/revolution and 4,096 revolutions (absolute transducer)
- data output as binary number
- up to 36,000 pulses per revolution, 1 MHz frequency limit (incremental transducer)
- standard power supply voltage 24 V DC
- compact; requires little space
- standard flange
- adapter flanges for special mechanical requirements
- shock absorber modules (only optionally)

Technical data	M3000	M3200
Fieldbus	Lightbus	
Data transfer rates	2.5 Mbaud, 25 µs for actual value interrogation	
Resolution	24 bits	–
Steps/revolution	4,096	–
Revolutions	4,096	–
Data format	24 bit binary number	–
Number of pulses	–	100...9,000 (x 1, 2, 4)
Encoder connection	–	A, B, common
Counter	–	24 bits, binary
Base frequency	–	1 MHz
Zero-pulse latch	–	24 bits
Supply voltage	24 V DC (±10 %)	
Current consumption	0.25 A	
Diameter	65 mm	
Length (without shaft)	110 mm	
Further information	<a href="http://www.beckhoff.com/M3000">www.beckhoff.com/M3000</a>	

Ordering information	M3x00-0xx
M3000-000	absolute encoder, 24 bit
M3200-004	incremental encoder, 4,000 step version
M3200-036	incremental encoder, 36,000 step version





## M3100 | Lightbus incremental encoder interface

The M3100 module permits any incremental encoder to be connected to the Lightbus system. A 24 bit counter with a quadrature decoder and a 24 bit latch for the zero pulse can be read, set or enabled. The fibre optics connection of the Lightbus sys-

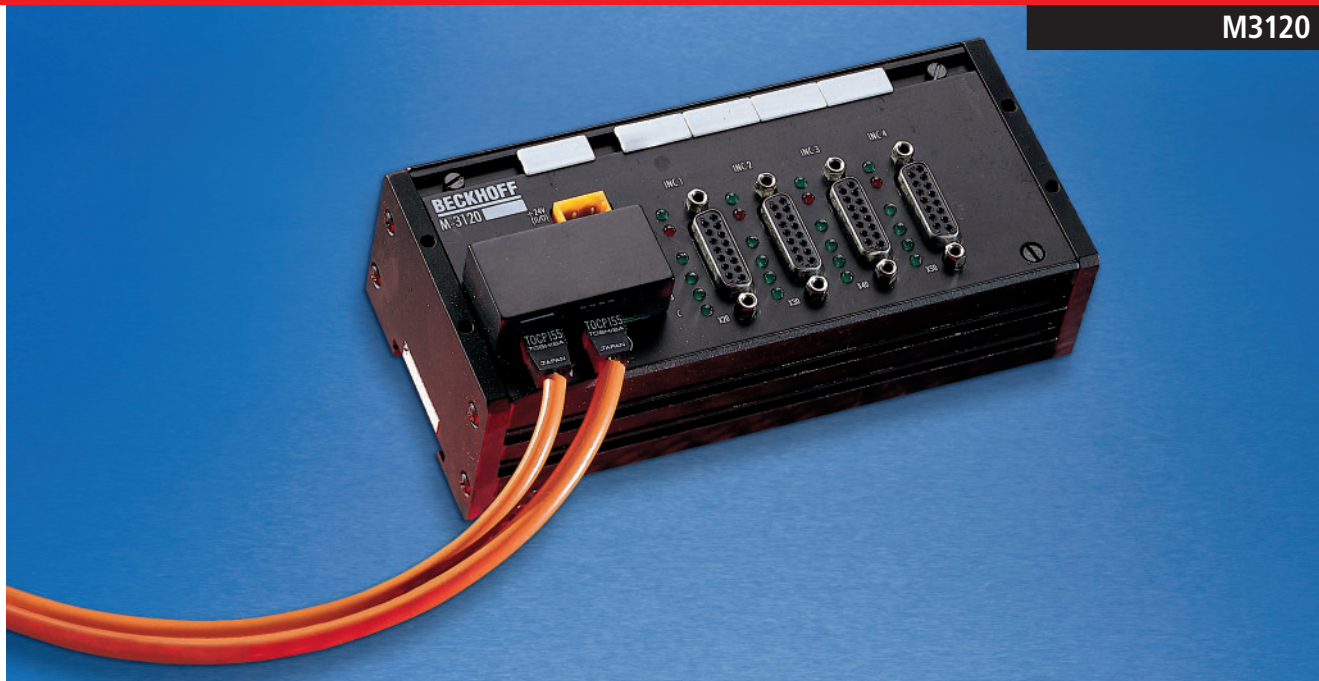
tem allows the transducer values to be transmitted at high speed and without interference to a central device such as a PC, PLC or CNC within 25 µs. Up to 255 transducers can be interrogated over one Lightbus ring.

### Features

- integration of all digital functions into a single LCA (logic cell array) circuit
- quadrature decoder with 1-, 2- and 4-fold evaluation
- 24 bit counter with 1 MHz frequency limit
- 24 bit latch for counter value at zero pulse
- read, set and activate commands for counter and zero-pulse registers via Lightbus system
- connection for 3-channel incremental transducer

Technical data	M3100
Fieldbus	Lightbus
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 µs
Encoder connection	A, A(inv), B, B(inv), zero, zero(inv), status
Encoder operating voltage	optionally 5 V DC/15 V DC
Counter	24 bits, binary
Limit frequency	1 MHz
Quadrature decoder	1-, 2-, or 4-fold evaluation
Zero-pulse latch	24 bits
Commands	read, set, enable
Supply voltage	24 V DC (-15 %/+20 %)
Current consumption	0.1 A (without sensor load current)
Housing form	die-cast aluminium (IP 65) with screw fastening
Dimensions (W x H x D)	80 mm x 175 mm x 52 mm
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protection class	IP 65
Further information	<a href="http://www.beckhoff.com/M3100">www.beckhoff.com/M3100</a>

Ordering information	M3100-00x
M3100-000	standard version
M3100-001	version with additional enable input
M3100-002	version with cable entry from the side
M3100-003	version with additional enable input and cable entry from the side



## M3120 | Lightbus incremental encoder interface

The M3120 module permits up to four incremental encoders to be connected to the Lightbus system. A 24 bit counter with a quadrature decoder and a 24 bit latch for the zero pulse can be read, set or enabled for each transducer. The fibre optics

connection of the Lightbus system allows the transducer values to be transmitted at high speed and without interference to a central device such as a PC, PLC or CNC. Up to 255 transducers can be interrogated over one fibre optic ring.

### Features

- integration of all digital functions into one LCA (logic cell array) circuit
- quadrature decoder with 1-, 2- and 4-fold evaluation
- 24 bit counter with 1 MHz frequency limit
- 24 bit latch for counter value at zero pulse
- read, set and activate commands for counter and zero-pulse registers via Lightbus system
- 4 connections for 3-channel incremental transducers

Technical data	M3120
Fieldbus	Lightbus
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 µs
Encoder connection	A, A(inv), B, B(inv), zero, zero(inv), status
Encoder operating voltage	optionally 5 V DC/15 V DC
Counter	24 bits, binary
Limit frequency	1 MHz
Quadrature decoder	1-, 2-, or 4-fold evaluation
Zero-pulse latch	24 bits
Commands	read, set, enable
Supply voltage	24 V DC (-15 %/+20 %)
Current consumption	0.1 A (without sensor load current)
Housing form	compact continuously cast aluminium housing, can be clipped to device carrier rail
Dimensions (W x H x D)	166 mm x 76 mm x 63 mm
Operating/storage temperature	0...+55 °C/-25...+85 °C
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Further information	<a href="http://www.beckhoff.com/M3120">www.beckhoff.com/M3120</a>

Ordering information	M3120-00x
M3120-001	1-channel incremental encoder interface module
M3120-002	2-channel incremental encoder interface module
M3120-003	3-channel incremental encoder interface module
M3120-004	4-channel incremental encoder interface module



## M6310, M6320, M6330, M6350 | Lightbus control units

The M63xx series consists of pushbutton control units with Lightbus interface. The combination of Industrial PC, keyboard and machine operating panel leads to compact and powerful machine controllers.

The control units are fitted with a choice of switching elements. Switch positions are read via the Lightbus. Indicator lamps are driven by the central controller. Some of the switching elements are wired to screw terminals, for

instance to control emergency stop keys or a main connector.

Technical data	M6310	M6320/M6330	M6350
Fieldbus	Lightbus		
Number of keys	17	16/32	8
Lightbus inputs	10	16/32	8
Lightbus outputs	10	16/32	8
Emergency stop	1	1/2	1
Screw terminal change-over contacts	6	4/8	–
Supply voltage	24 V DC (-15 %/+20 %)		
Current consumption	max. 0.8 A (30 mA per lamp)	max. 1.4 A (30 mA per lamp)	max. 0.5 A (30 mA per lamp)
Housing form	built-in panel	built-in panel, aluminium housing, plastic housing	built-in panel, plastic housing
Dimensions (W x H x D)	410 mm x 70 mm x 50 mm	16: 160 mm x 160 mm x 117 mm 32: 240 mm x 160 mm x 117 mm	153 mm x 100 mm x 75 mm
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protection class	IP 54 to the front	IP 54	IP 54
Further information	<a href="http://www.beckhoff.com/M6310">www.beckhoff.com/M6310</a>		

**M6310: Machine control panel for Lightbus**

- ten electromechanical, illuminated switches, connected to the Lightbus as normally open inputs and indicator lamp outputs
- six electromechanical, illuminated switches, wired as change-over contacts to D-sub connectors
- emergency stop key, wired to D-sub connector
- designed for fitting to front panel or in K2001/K2011 PC keyboard

**M6320: 4 \* 4 keypad for Lightbus**

- stackable 4 \* 4 keypad to be fitted with a choice of keyswitches, indicator lights, emergency stop keys, etc.
- 16 electromechanical, illuminated switches, wired to the Lightbus as normally open inputs and indicator lamp outputs, of which four are additionally wired to screw terminals as changeover contacts
- keys and switching elements: manufactured by Schlegel
- constructed in aluminium housing, plastic housing or as built-in panel

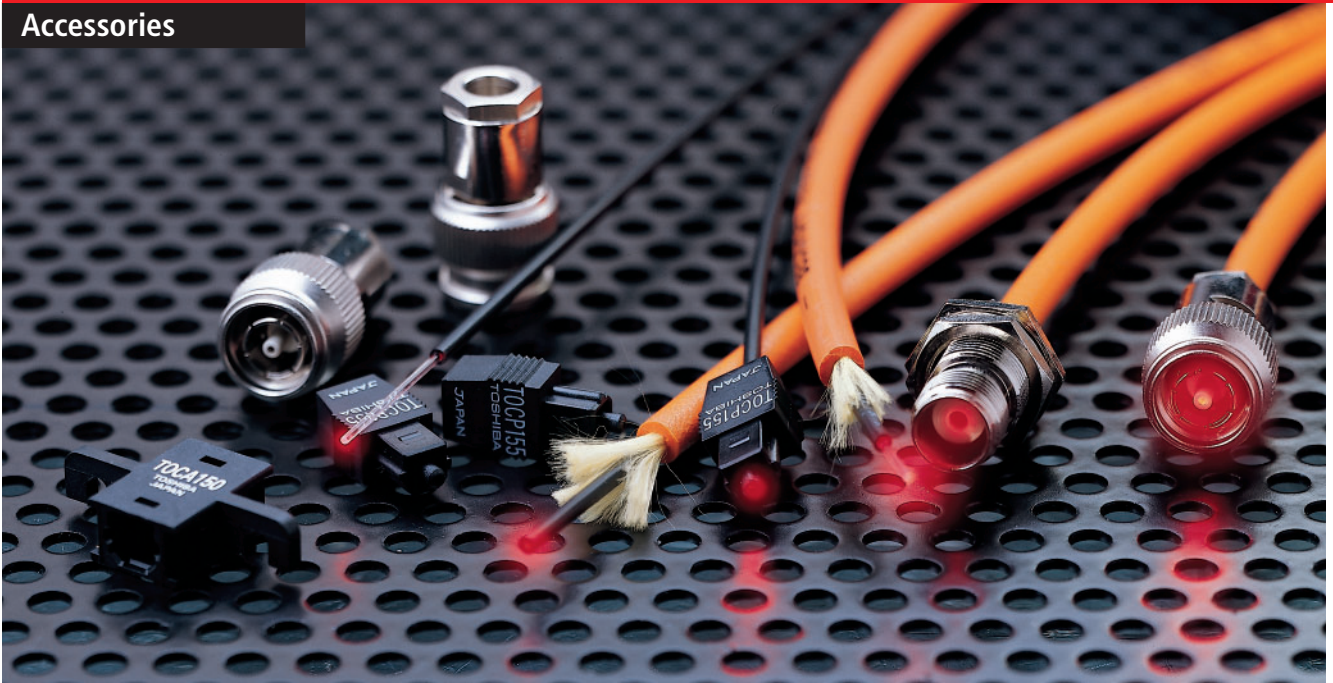
**M6330: 8 \* 4 keypad for Lightbus**

- stackable 8 \* 4 keypad to be fitted with a choice of keyswitches, indicator lights, emergency stop keys, etc.
- 32 electromechanical, illuminated switches, wired to the Lightbus as normally open inputs and indicator lamp outputs, of which eight are additionally wired to screw terminals as changeover contacts
- keys and switching elements: manufactured by Schlegel
- constructed in aluminium housing, plastic housing or as built-in panel

**M6350: 2 \* 4 keypad for Lightbus**

- stackable 2 \* 4 keypad to be fitted with a choice of keyswitches, indicator lights, emergency stop keys, etc.
- eight electromechanical, illuminated switches, wired to the Lightbus as normally open inputs and indicator lamp outputs, of which one is additionally wired as changeover contact to screw terminals for use as an emergency stop key
- keys and switching elements: manufactured by Moeller
- constructed in plastic housing or as built-in panel

Ordering information	Description
M6310-001	front panel, 16 keys, type "Schlegel" + emergency stop
M6310-010	front panel, without keys
M6310-030	front panel, customer-specific
M6320-001	aluminium housing to IP 65, 15 keys, type "Schlegel" + emergency stop
M6320-010	aluminium housing to IP 65, without keys
M6320-030	aluminium housing to IP 65, customer-specific
M6321-000	built-in panel, 16 keys, type "Schlegel"
M6321-001	built-in panel, 15 keys, type "Schlegel" + emergency stop
M6321-010	built-in panel, without keys
M6321-030	built-in panel, customer-specific
M6330-000	aluminium housing to IP 65, 32 keys, type "Schlegel"
M6330-001	aluminium housing to IP 65, 31 keys, type "Schlegel" + emergency stop
M6330-010	aluminium housing to IP 65, without keys
M6330-030	aluminium housing to IP 65, customer-specific
M6331-000	built-in panel, 32 keys, type "Schlegel"
M6331-001	built-in panel, 31 keys, type "Schlegel" + emergency stop
M6331-010	built-in panel, without keys
M6331-030	built-in panel, customer-specific
M6350-000	plastic housing to IP 65, 8 keys, type "Moeller"
M6350-001	plastic housing to IP 65, 7 keys, type "Moeller" + emergency stop
M6350-010	plastic housing to IP 65, without keys
M6350-030	plastic housing to IP 65, customer-specific
M6351-000	front panel, 8 keys, type "Moeller"
M6351-001	front panel, 7 keys, type "Moeller" + emergency stop
M6351-010	front panel, without keys
M6351-030	front panel, customer-specific



## Z1xxx | Fibre optics and accessories

Fibre optics connect the Lightbus modules in an industrial environment. Four different types of fibre optic are available for this connection. The Lightbus system uses plastic fibre optics made with PMMA and HCS fibres. PMMA plastic fibres permit distances of 45 metres between one module and the next, whereas 300 metre segments can be achieved with HCS fibres.

Plugs, sockets and other couplings provide solutions for

laying fibre optics between control cabinets, terminal boxes and machine parts, and satisfy a variety of protection classes. Fibre optics and plugs can be quickly and easily connected.

### Features

- temperature range: -20 to +70 °C
- bend radius 30 mm
- may be used in trailing cable installations

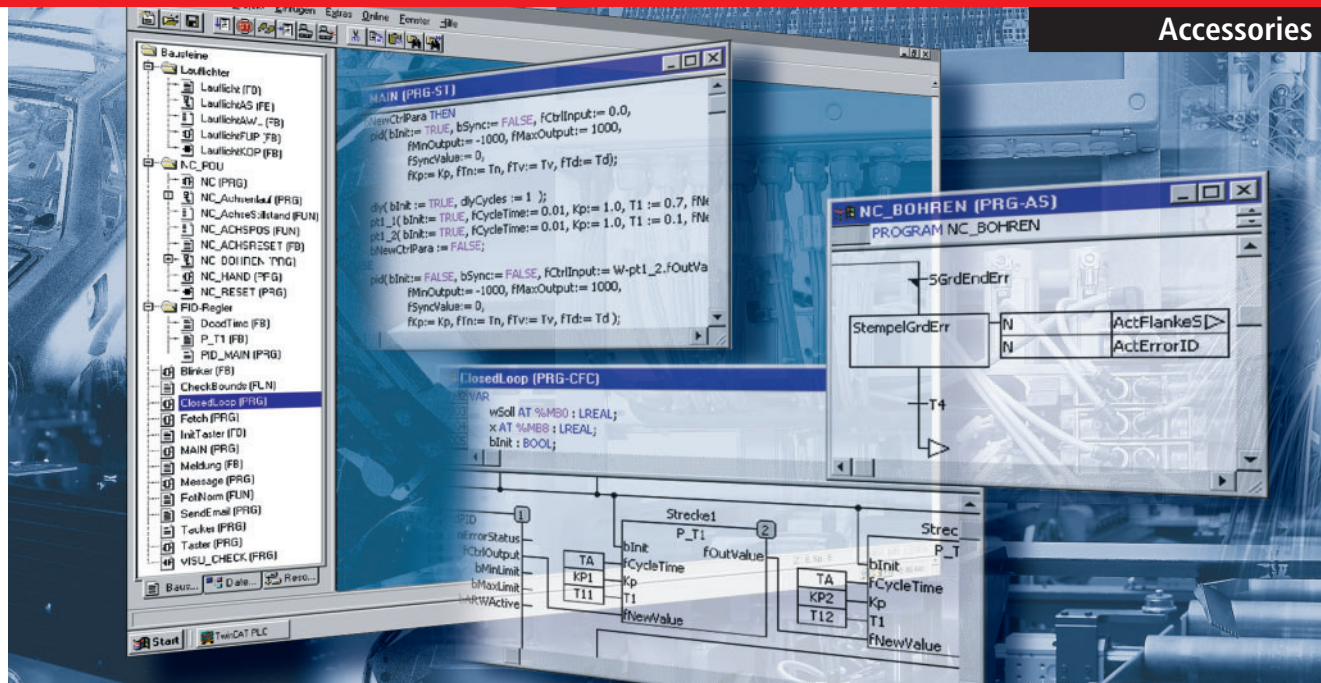
- transmission lengths 0.3 to 45 metres (PMMA fibre), or up to 300 metres (HCS fibre)
- industrial strength PU sheath

- contactless data transmission via the Lightbus system using laser light up to 1 km away from mobile machines or plant

### Application solutions

- connectors to various protection classes
- couplings for connecting fibre optics
- one-way and two-way lead-throughs for rotating axes on moving machinery or plant

Ordering information	Fibre optics and accessories
Z1100	plastic fibre optic, single core, 1,000 µm, 2.2 mm
Z1101	plastic fibre optic, single core, 1,000 µm with protective PU cladding and Kevlar strain relief
Z1110	HCS fibre optic, core ø 200 µm, sheath ø 2.2 mm
Z1111	HCS fibre optic, single core, 200 µm with protective PU cladding and Kevlar strain relief
Z1000	standard connector for 1,000 µm plastic fibre
Z1010	standard connector for 200 µm PCS fibre
Z1020	coupling for Z1000
Z1002	standard connector for 1,000 µm/5.5 mm plastic fibre, IP 65
Z1022	standard socket for 1,000 µm/5.5 mm plastic fibre, IP 65



## Software libraries

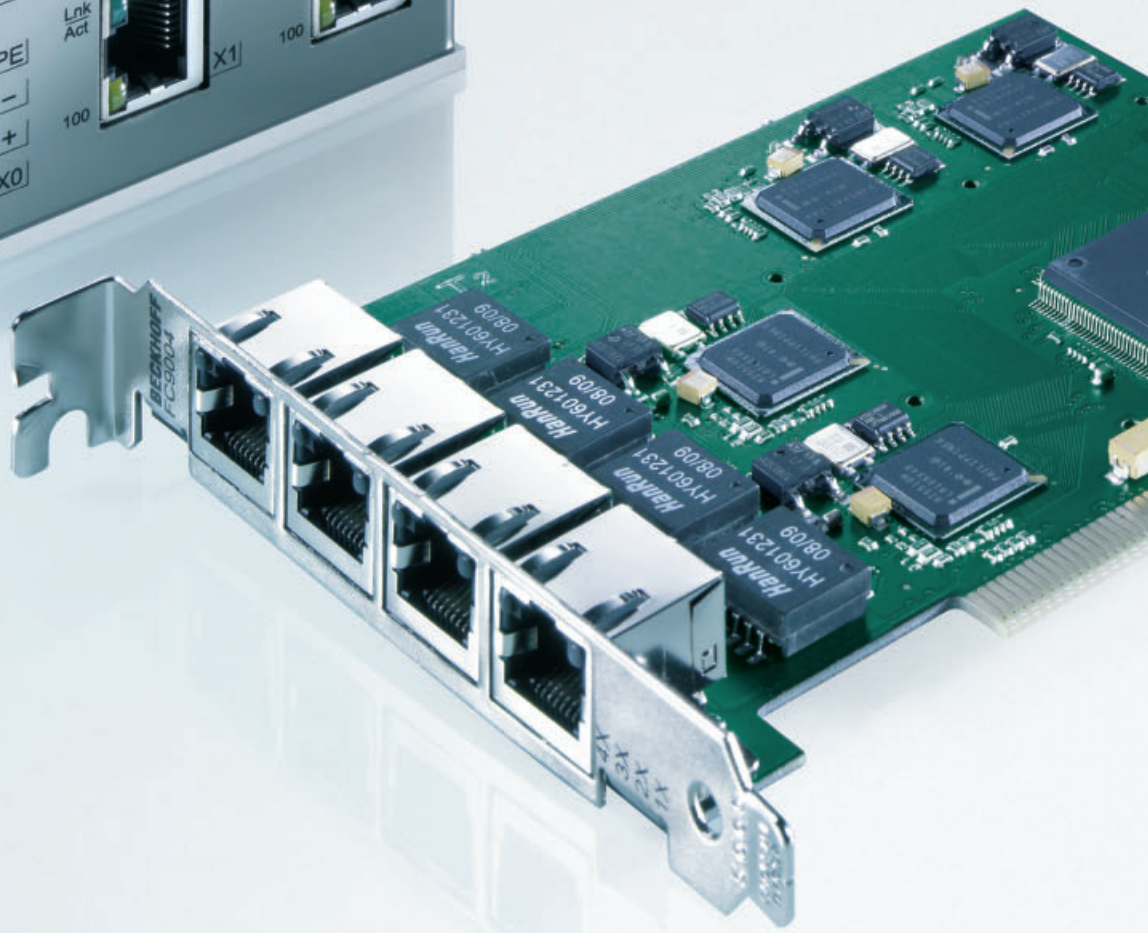
Software libraries for Windows operating systems are available for the Lightbus. All the necessary functions for communication over the Lightbus are implemented. The communication interface is linked into the operating system as a device. A large number of functions are conveniently utilised within customer's own software written in high-level languages.

Using active communication interfaces with a dedicated communication processor, the Lightbus system's process image is cyclically made available in dual-ported RAM. This leaves the system processor entirely free for application tasks.

The fast interrupt capability of the Lightbus system is supported by the active communication cards, permitting signals

to be sampled every 25  $\mu$ s over large distances. The Lightbus system and its software libraries provide an ideal input/output medium for many computer systems.

Ordering information	Driver for interface cards	
TwinCAT I/O	configuration tool, driver for Windows NT/2000/XP/Vista	1154
TwinCAT PLC	programming system conforms to IEC 61131-3	1146

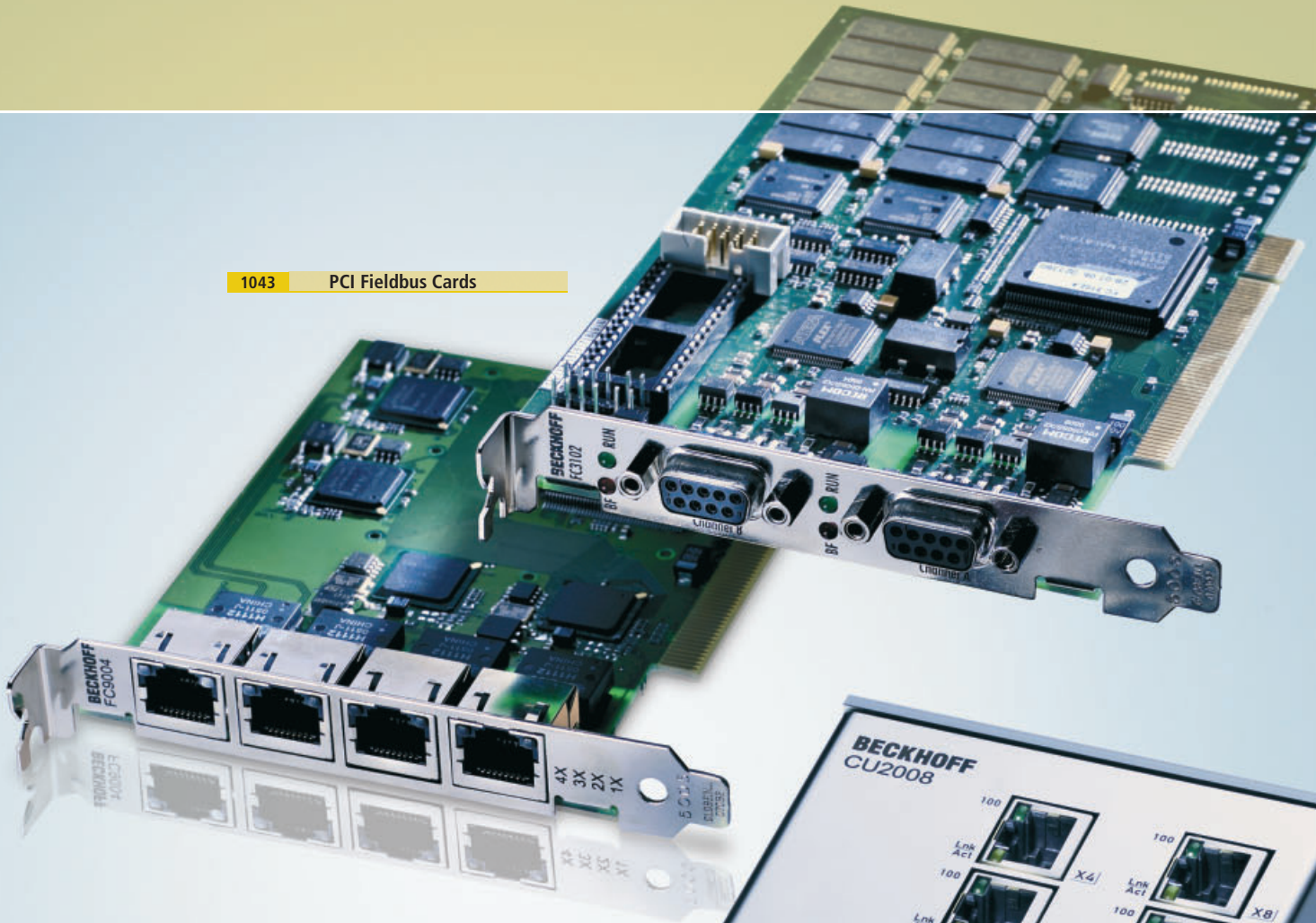


# PC Fieldbus Cards, Switches

The intelligent interface generation



1043 PCI Fieldbus Cards



1056 Ethernet Switches

# PC Fieldbus Cards, Switches

Maximum performance from fieldbus to PCI bus

## 1043 PCI Fieldbus Cards

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- 1043 Lightbus FC2001, FC2002
- 1044 PROFIBUS FC3101, FC3102
- 1045 CANopen FC5101, FC5102
- 1046 DeviceNet FC5201, FC5202
- 1047 SERCOS interface FC7501, FC7502
- 1048 Ethernet FC9001-0010, FC9011, FC9002, FC9004
- 1050 EtherCAT slave FC1100

## 1051 Mini PCI Fieldbus Cards

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- 1051 PROFIBUS FC3151
- 1052 CANopen FC5151
- 1053 DeviceNet FC5251
- 1054 SERCOS interface FC7551
- 1055 Ethernet FC9051

## 1062 Software

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- 1064 Configuration tool and drivers for fieldbus components TwinCAT I/O

## 1056 Ethernet Switches

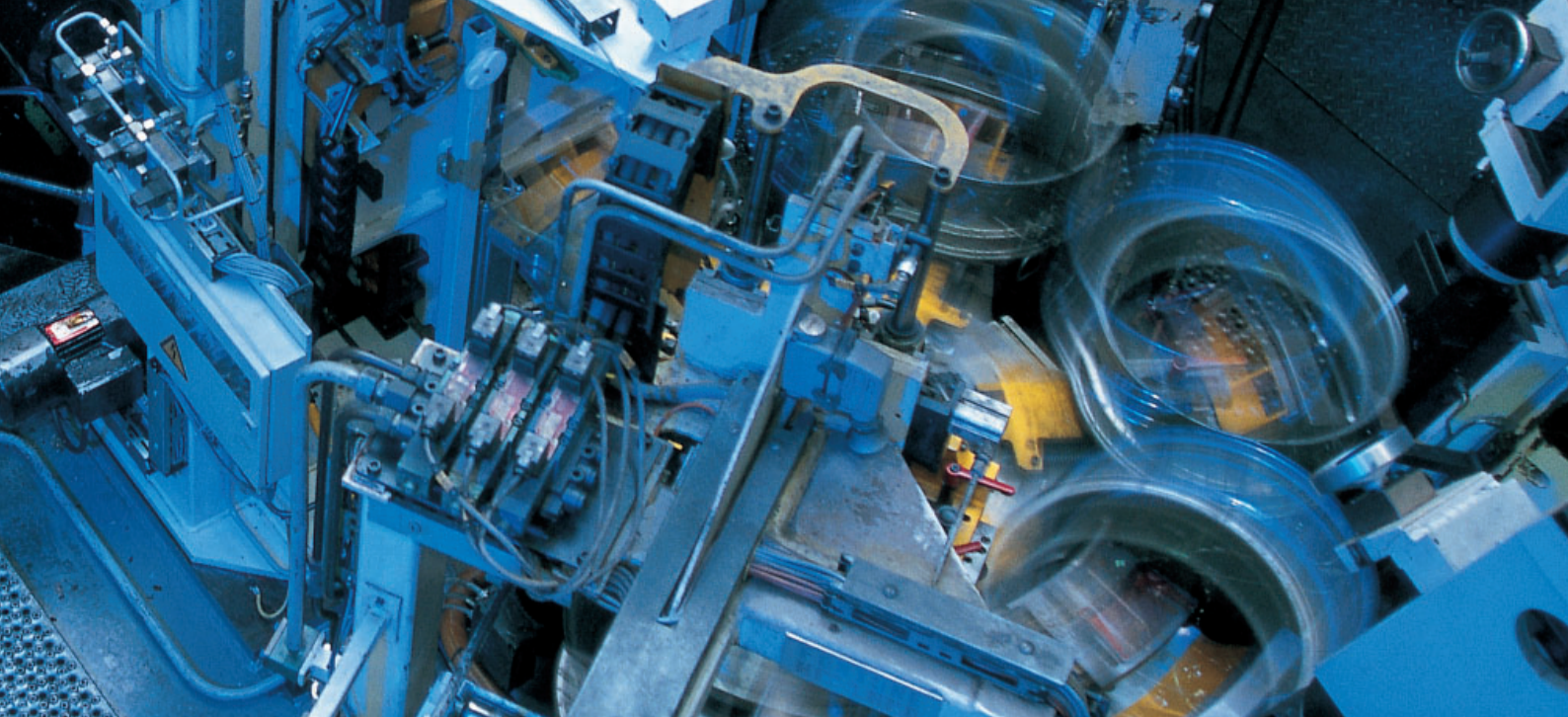
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- 1058 CU2008 (8-port)
- 1059 CU2016 (16-port)

## 1060 Real-time Ethernet port multiplier

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- 1061 CU2508



## PC Fieldbus cards: Fieldbus know-how with PCI bus interface

### PCI Fieldbus Cards

Beckhoff completes its offer of fieldbus components with the PCI-based PC Fieldbus Cards for Lightbus, PROFIBUS, CANopen, DeviceNet, SERCOS interface and Ethernet. The cards have been particularly developed for fast controls and for real-time tasks such as drive position control and can therefore be applied to a wide range of applications. To enable universal application,

the interface cards are fitted with either one or two fieldbus channels. The Ethernet variant FC9004 contains four channels altogether. The power of the PC Fieldbus Cards can be most easily seen in combination with the TwinCAT software PLC and NC. But other applications also benefit from the intelligent PCI cards that handle the fieldbus protocol efficiently on their own processors. The process image is

available in the DPRAM interface to the PC. Drivers for Windows NT/2000/XP and convenient configuration tools are included in the TwinCAT I/O software package. High-level language programs use the DLL, Visual Basic applications the ActiveX interface. Applications with OPC interface can access process data and parameters via an OPC server.

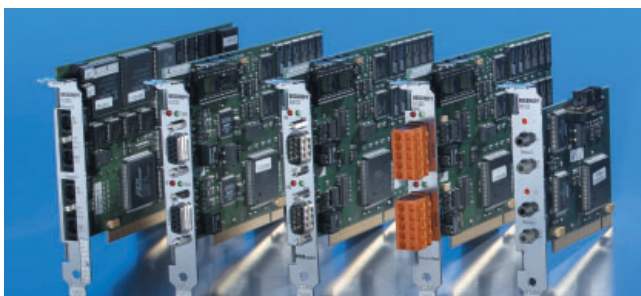
All cards are characterised by concentrated fieldbus know-how in the form of the following features:

- fast data exchange through short cycle times (e.g. EtherCAT: up to 50  $\mu$ s)
- process data communication is either free running, synchronised, synchronised with delay or equidistant
- powerful parameter and diagnostics interfaces
- freely configurable bus management for every device

### Mini PCI Fieldbus Cards

New Mini PCI cards for PROFIBUS, CANopen, DeviceNet, SERCOS interface and Ethernet enhance the Beckhoff PC Fieldbus Card range. Like the standard PCI cards from Beckhoff, the interfaces are optimised for fast controllers with small construction volume and real-time tasks.

The new generation of Beckhoff Industrial PCs, including the C69xx control cabinet PCs as well as the CP62xx Panel PCs and CP66xx Control Panels, are extremely compact. With each device featuring two Ethernet ports, they represent high-performance Industrial PCs for Ethernet- and EtherCAT-based control applications. The IPCs can optionally be extended with Mini PCI cards or with fieldbus technology. The bus interface is not implemented on the fieldbus card but separately in the respective housing (device-specific).





## FC2001, FC2002 | Lightbus PCI interface cards

### LIGHTBUS

The PCI Fieldbus Cards from Beckhoff are characterised by outstanding features. They are tailor-made for TwinCAT, the software solution for PC-compatible control technology. The power of TwinCAT comes into its own with this interface generation:

- Cycle times up to 100 µs are possible.
- Process data communication can either be free running or synchronised.
- It is possible to select two parallel fieldbus channels on one card.
- powerful parameter and diagnostics interfaces (ADS)

TwinCAT I/O provides configuration tools and Windows NT/2000/XP/Vista or Windows 7 drivers for programs in any desired high-level language (DLLs) and for Visual Basic applications (ActiveX). Applications with OPC interface can access the cards via an OPC server.

Technical data	FC2001	FC2002
Fieldbus	Lightbus	
Number of fieldbus channels	1	2
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 µs	
Interface to the PC	plug-and-play PCI interface 32 bit with 4 kbyte DPRAM for 8 communication channels, data, control and status register	
Bus interface	2 x standard fibre optic connector Z1000 (plastic fibre), Z1010 (HCS fibre)	4 x standard fibre optic connector Z1000 (plastic fibre), Z1010 (HCS fibre)
Communication	8 priority controlled logical communication channels	
Bus device	max. 254 nodes with a max. of 65,280 I/O points per fieldbus connection	
Interrupt	initiation of 2 PC hardware interrupts is possible	
Hardware diagnosis	3 LEDs per channel	
Dimensions	approx. 106 mm x 187 mm	
Operating temperature	0...55 °C	
Further information	www.beckhoff.com/FC2001	

Ordering information	FC2001-0000	FC2002-0000
FC200x-0000	standard configuration	

Accessories		
TwinCAT I/O	I/O driver	1154
Cordsets	cordsets and connectors	632



## FC3101, FC3102 | PCI PROFIBUS



PROFIBUS DP, DP-V1 and DP-V2 (MC): the PROFIBUS PCI Fieldbus Cards from Beckhoff can master the PROFIBUS protocol with all its features. Thanks to the PROFIBUS chip developed in-house, the cards are equipped with the latest version of the

PROFIBUS technology – including high-precision isochronous mode for axis control and expanded diagnostic options. These cards are the only ones to support different polling rates for the slaves and can even synchronise several channels accurately with each other. Features:

- cycle times from 200 µs
- master, slave and PROFIBUS monitor up to 12 Mbit/s

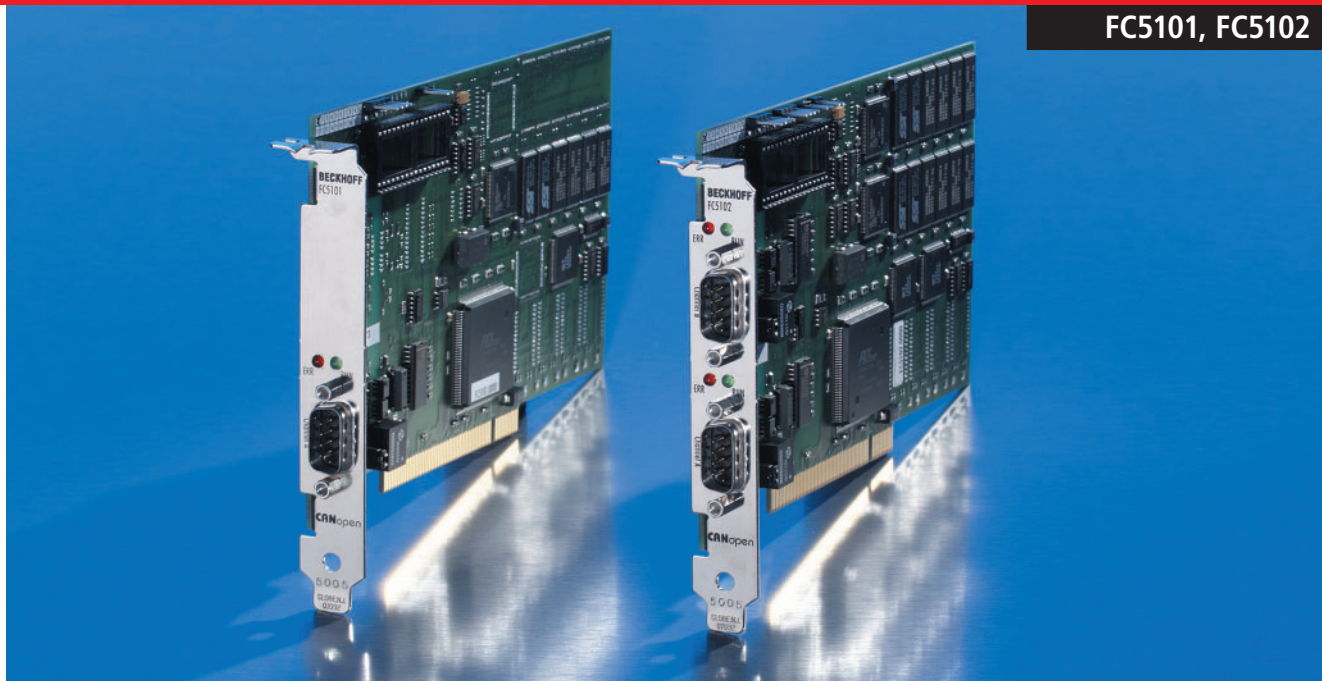
- powerful parameter and diagnostics interfaces
- The error management for each bus user is freely configurable.
- It is possible to read the bus configuration and automatically assign the "GSE" files. In TwinCAT, all functions are conveniently available. But other applications also benefit from the diverse features: general

drivers for Windows NT/2000/XP/Vista or Windows 7 and convenient configuration tools are included in the TwinCAT I/O software package. High-level language programs use the DLL, Visual Basic applications the ActiveX interface. Applications with OPC interface can access process data and parameters via an OPC server.

Technical data	FC3101	FC3102
Fieldbus	PROFIBUS DP (standard), PROFIBUS DP-V1 (Cl. 1+2: acyclic services, alarms), DP-V2, PROFIBUS MC (equidistant)	
Number of fieldbus channels	1	2
Data transfer rates	9.6 kbaud...12 Mbaud	
Interface to the PC	plug-and-play PCI interface 32 bit with 4 kbyte DPRAM per channel	
Bus interface	1 x D-sub socket, 9-pin, galvanically decoupled	2 x D-sub socket, 9-pin, galvanically decoupled
Communication	master and slave functionality (also mixed)	
Bus device	per channel: max. 125 slaves with up to 244 bytes input, output, parameter, configuration or diagnostic data per slave	
Cycle time	differing DP cycle times per slave are possible using the CDL concept	
Hardware diagnosis	2 LEDs per channel	
Bit width in the process image	total max.: 3 kbyte input and output data	
Dimensions	approx. 106 mm x 175 mm	
Operating temperature	0...55 °C	
Further information	www.beckhoff.com/FC3101	

Ordering information	FC3101-000x	FC3102-000x
FC310x-0000	standard configuration	
FC310x-0002	configuration with 32 kbytes NOVDRAM	

Accessories		
TwinCAT I/O	I/O driver	1154
Cordsets	cordsets and connectors	632



## FC5101, FC5102 | PCI CANopen

### CANopen

The FC510x PC plug-in cards link the PC to a CANopen network. They optionally act as network master or slave. In addition, general CAN messages can be sent or received – without having to

bother with CAN frames in the application program. The cards provide a powerful implementation of the protocol, offering many desirable features:

- All CANopen PDO communication types are supported: event driven, time driven (using an event timer), synchronous, polling.
- individual monitoring of the process data objects

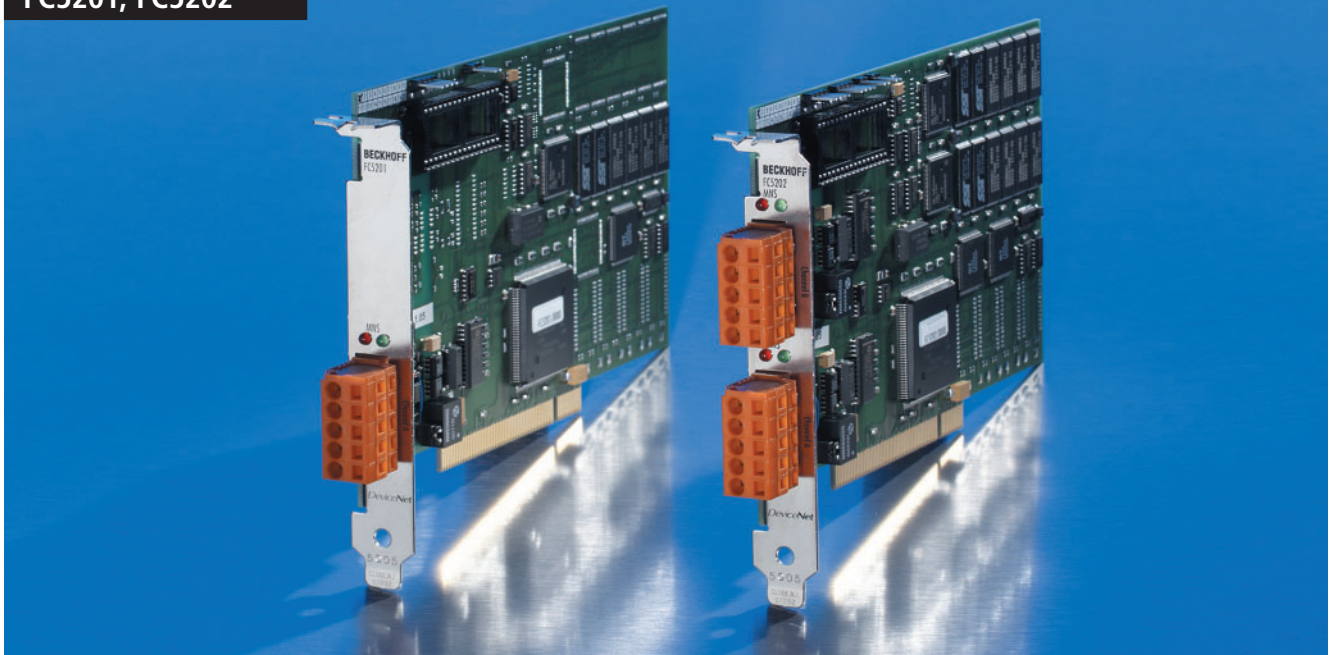
- synchronisation with the PC controller's task cycle
- SYNC cycle with quartz precision for drive synchronisation, zero cumulative jitter
- SDO parameter communication at start-up and run-time
- emergency message handling
- Guarding and Heartbeat
- boot-up according to DS302

- powerful parameter and diagnostics interfaces
  - The error management for each bus user is freely configurable.
  - It is possible to read the bus configuration and the node parameters.
  - online bus load display
  - bus monitor functionality
- In TwinCAT, all functions are conveniently available.

Technical data	FC5101	FC5102
Fieldbus	CANopen	
Number of fieldbus channels	1	2
Data transfer rates	10, 20, 50, 100, 125, 250, 500, 800, 1,000 kbaud	
Interface to the PC	plug-and-play PCI interface 32 bit with 4 kbyte DPRAM per channel	
Bus interface	D-sub connector, 9-pin according to CANopen specification, galvanically decoupled	
Communication	CANopen network master and CANopen manager, optionally CANopen slave	
Bus device	per channel: max. 127 slaves	
Termination resistor	switchable	
Hardware diagnosis	2 LEDs per channel	
Bit width in the process image	total max.: 3 kbyte input and output data	
Dimensions	approx. 106 mm x 175 mm	
Operating temperature	0...55 °C	
Further information	www.beckhoff.com/FC5101	

Ordering information	FC5101-000x	FC5102-000x
FC510x-0000	standard configuration	
FC510x-0002	configuration with 32 kbytes NOVRAM	

Accessories		
TwinCAT I/O	I/O driver	1154
Cordsets	cordsets and connectors	632



## FC5201, FC5202 | PCI DeviceNet



The FC520x PC plug-in cards link the PC to a DeviceNet network. They can act there as master or as slave modules. The PCI bus interface ensures both high transmission rates to the PC and

fully automatic configuration of the cards in the PC hardware. The DeviceNet cards provide a powerful implementation of the protocol, offering many desirable features:

- All DeviceNet I/O modes are supported: polling, change of state, cyclic, strobed.
- unconnected message manager (UCMM)
- Device Heartbeat Messages, Device Shutdown Messages
- Optionally two DeviceNet channels in parallel on one card are possible.
- powerful parameter and diagnostics interfaces
- The error management for each bus user is freely configurable.
- It is possible to read the bus configuration and automatically assign the "eds" files.

In TwinCAT, all functions are conveniently available. High-level language programs use the DLL, Visual Basic applications the ActiveX interface. OPC applications can access process data and parameters via an OPC server.

Technical data	FC5201	FC5202
Fieldbus	DeviceNet	
Number of fieldbus channels	1	2
Data transfer rates	125, 250, 500 kbaud	
Interface to the PC	plug-and-play PCI interface 32 bit with 4 kbyte DPRAM per channel	
Bus interface	open style connector, 5-pin, according to DeviceNet specification, galvanically decoupled (Connector is supplied.)	
Communication	DeviceNet network master (scanner), optionally DeviceNet slave	
Bus device	per channel: max. 63 slaves	
Termination resistor	switchable	
Hardware diagnosis	2 LEDs per channel	
Bit width in the process image	total max.: 3 kbyte input and output data	
Dimensions	approx. 106 mm x 175 mm	
Operating temperature	0...55 °C	
Further information	www.beckhoff.com/FC5201	

Ordering information	FC5201-000x	FC5202-000x
FC520x-0000	standard configuration	
FC520x-0002	configuration with 32 kbytes NOVDRAM	

Accessories		
TwinCAT I/O	I/O driver	1154
Cordsets	cordsets and connectors	632



## FC7501, FC7502 | PCI SERCOS interface



The SERCOS interface PCI Fieldbus Cards from Beckhoff allow direct access to the SERCON816-ASIC. The driver for these passive cards is incorporated into the TwinCAT software and allows optimum access to the SERCOS

interface. There are no artificial limitations with regard to the number of bus devices and I/O data per device. The power of TwinCAT comes into its own with this interface generation:

- up to 254 devices (axes, I/O modules, e.g. Bus Terminals with Bus Coupler BK7500)
- any assignment and length of the I/O data
- exact synchronisation between TwinCAT and SERCOS
- cycle times from 62.5 µs are possible
- synchronous communication of process data
- Master mode can be parameterised by software.
- It is possible to select two parallel fieldbus channels on one card (2 x SERCON816).
- Synchronisation of both channels and other cards along with PC is possible.
- Upload of network configuration is supported.

TwinCAT I/O provides configuration tools and Windows NT/2000/XP/Vista or Windows 7 drivers for programs in any desired high level language (DLLs) and for Visual Basic applications (ActiveX). Applications with OPC interfaces can access the cards via an OPC server.

Technical data	FC7501	FC7502
Fieldbus	SERCOS interface	
Number of fieldbus channels	1	2
Data transfer rates	2, 4, 8, 16 Mbaud	
Interface to the PC	plug-and-play PCI interface 32 bit, direct access to DPRAM and SERCON816 register	
Bus interface	2 x connector F-SMA according to IEC 874-2	4 x connector F-SMA according to IEC 874-2
Synchronisation	synchronisation of several cards via ribbon cable	
Bus device	≤ 254	
Cycle time	all cycle times supported by SERCOS interface (down to 62.5 µs)	
Hardware diagnosis	1 LED per channel	
Dimensions	approx. 95 mm x 120 mm	
Operating temperature	0...55 °C	
Further information	www.beckhoff.com/FC7501	

Ordering information	FC7501-0000	FC7502-0000
FC750x-0000	standard configuration	

Accessories		
TwinCAT I/O	I/O driver	1154
Cordsets	cordsets and connectors	632





## FC9001-0010, FC9011 | PCI Ethernet

### Ethernet TCP/IP

The Ethernet PCI network cards from Beckhoff save space and costs. They can be used in office and automation networks and offer the following benefits:

- plug-and-play interface
- 10/100/1,000 Mbit/s (FC9011), 10/100 Mbit/s (FC9001-0010), full duplex

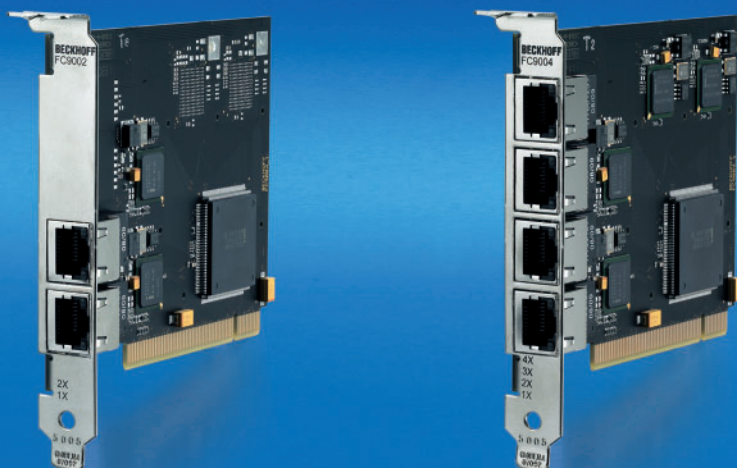
- automatic baud rate setting according to IEEE 802.3u
- maximum performance through hardware-integrated checksum creation and verification
- The hardware side supports Quality of Service (QoS) through prioritised multiple queues.

- Wake on LAN
  - Boot from LAN (PXE) (only FC9011)
- Naturally, the cards (or individual channels) can also be operated with TwinCAT drivers – and therefore in real-time.

Technical data	FC9001-0010	FC9011
Fieldbus	all Ethernet (IEEE 802.3) based protocols	
Number of Ethernet channels	1	
Data transfer rates	10/100 Mbit/s, IEEE 802.3u auto-negotiation, full duplex at 10 and 100 Mbit/s	10/100/1,000 Mbit/s, IEEE 802.3ab auto-negotiation, full duplex at 10, 100 and 1,000 Mbit/s
Interface to the PC	plug-and-play PCI interface 32 bit	
Ethernet interface	10BASE-T/100BASE-TX Ethernet	10BASE-T/100BASE-TX/1,000BASE-TX Ethernet
Ethernet plug	1 x RJ 45	
Cable length	100 m (up to switch or end device)	
Standard drivers	standard operating system drivers for Intel®-compatible NIC real-time driver or Beckhoff driver for Windows 2000/XP (available from Beckhoff website)	
Real-time drivers	TwinCAT drivers for EtherCAT/real-time Ethernet. Drivers can be selected separately for each channel.	
Hardware diagnosis	2 LEDs per channel (activity, link)	
Dimensions	approx. 51 mm x 120 mm	
Operating temperature	0...55 °C	
Further information	www.beckhoff.com/FC9001	

Ordering information	FC9001-0010	FC9011-0000
FC90xx-00xx	standard configuration	

Accessories	
Cordsets	cordsets and connectors



Ethernet TCP/IP

EtherCAT®

EtherNet/IP™

PROFI  
INDUSTRIAL ETHERNET  
NET

## FC9002, FC9004 | PCI Ethernet

### Ethernet TCP/IP

Up to four Ethernet channels in one slot: The Ethernet PCI network cards from Beckhoff save space and costs. They can be used in office and automation networks and offer the following benefits:

- plug-and-play interface
- 10/100 Mbit/s, full duplex

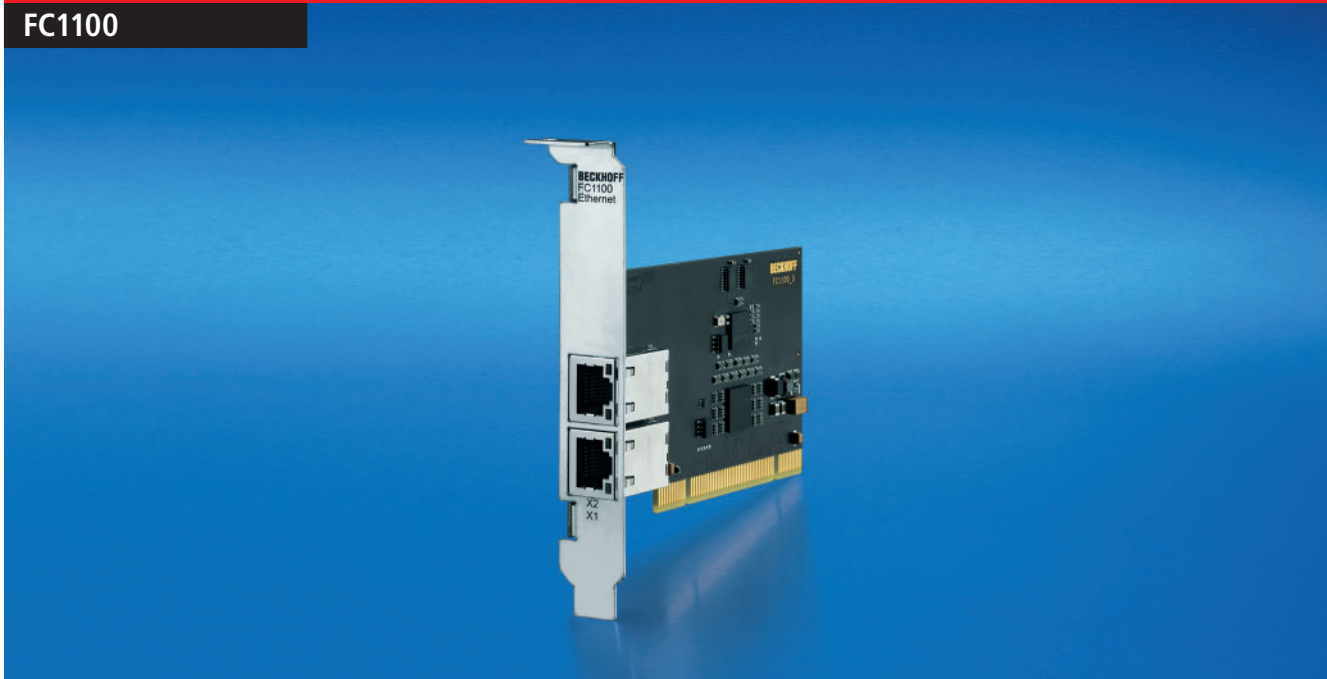
- automatic baud rate setting according to IEEE 802.3u for each channel
- maximum performance through hardware-integrated checksum creation and verification
- The hardware side supports Quality of Service (QoS) through prioritised multiple queues.

Naturally, the cards (or individual channels) can also be operated with TwinCAT drivers – and therefore in real-time.

Technical data	FC9002	FC9004
Fieldbus	all Ethernet (IEEE 802.3) based protocols	
Number of Ethernet channels	2	4
Data transfer rates	10/100 Mbit/s, IEEE 802.3u auto-negotiation, full duplex at 10 and 100 Mbit/s, separate settings for each channel	
Interface to the PC	plug-and-play PCI interface 32 bit	
Ethernet interface	10BASE-T/100BASE-TX Ethernet	
Ethernet plug	2 x RJ 45	4 x RJ 45
Cable length	100 m (up to hub, switch or end device)	
Standard drivers	standard drivers for Intel® 8255xER series or Beckhoff driver for Windows 2000/XP (available from Beckhoff website)	
Real-time drivers	TwinCAT drivers for EtherCAT/real-time Ethernet. Drivers can be selected separately for each channel.	
Hardware diagnosis	2 LEDs per channel (activity, link)	
Operating temperature	0...55 °C	
Further information	<a href="http://www.beckhoff.com/FC9002">www.beckhoff.com/FC9002</a>	

Ordering information	FC9002-0000	FC9004-0000
FC900x-0000	standard configuration	
Accessories		
Cordsets	cordsets and connectors	

632



## FC1100 | PCI EtherCAT slave card



The FC1100 PCI EtherCAT card can be used to integrate a PC as a slave in an EtherCAT network. The card has an EtherCAT

channel with two ports (IN/OUT) and is also supported in the ET9300 EtherCAT Slave Sample Code. The FC1100 can therefore

also be used for the development of EtherCAT slave software on the PC.

Technical data	FC1100
Fieldbus	EtherCAT (direct mode)
EtherCAT plug	2 x RJ 45, EtherCAT IN/OUT
Data transfer rates	100 Mbit/s
Interface to the PC	PCI 32 bit
EtherCAT Slave Controller	ET1100
Distributed clocks	yes (64 bit)
RAM	8 kbyte
SYNC manager	8
FMMUs	8
Cable length	up to 100 m
Hardware diagnosis	2 LEDs per channel (activity, link)
Dimensions	ca. 65 mm x 125 mm
Operating temperature	0...55 °C
Driver	TwinCAT driver for EtherCAT support in the EtherCAT Slave Sample Code ET9300
Further information	<a href="http://www.beckhoff.com/FC1100">www.beckhoff.com/FC1100</a>

Ordering information	
FC1100	standard configuration

Accessories		
TwinCAT I/O	I/O driver	1154
Cordsets	cordsets and connectors	632

**i** For availability status see Beckhoff website at: [www.beckhoff.com/FC1100](http://www.beckhoff.com/FC1100)



## FC3151 | Mini PCI PROFIBUS



The FC3151 Mini PCI Card brings fieldbus functionalities to the Industrial PC in a compact construction. The bus interface is not implemented on the fieldbus card, but separately in the respective housing (device-specific). The FC3151 is available for Beckhoff Industrial PCs with Mini PCI option. Like the standard PCI cards, the Mini PCI variants are specifically optimised for fast controllers and real-time tasks:

- Cycle times up to 100  $\mu$ s are possible.
- Process data communication can either be free running, synchronised, synchronised with a delay, or equidistant.
- powerful parameter and diagnostics interfaces
- The error management for each bus user is freely configurable.

The power of the Fieldbus Cards can be most easily seen in combination with the TwinCAT software PLC and NC. But other applications also benefit from the intelligent PCI cards that handle the fieldbus protocol efficiently on their own processors. The Fieldbus Cards are optionally available with 128 kbyte NOVRAM.

<b>Technical data</b>	<b>FC3151</b>
Fieldbus	PROFIBUS DP (standard), PROFIBUS DP-V1 (Cl. 1+2: acyclic services, alarms), DP-V2, PROFIBUS MC (equidistant)
Number of fieldbus channels	1
Data transfer rates	9.6 kbaud...12 Mbaud
Interface to the PC	Mini PCI interface, 32 bit with 4 kbyte DPRAM per channel
Communication	master and slave functionality (also mixed)
Bus device	max. 125 slaves
Cycle time	differing DP cycle times per slave are possible using the CDL concept
Dimensions	59.75 mm x 50.95 mm (type III A)
Operating temperature	0...55 °C
Driver	TwinCAT I/O and higher levels
Further information	<a href="http://www.beckhoff.com/FC3151">www.beckhoff.com/FC3151</a>
<b>Ordering information</b>	<b>FC3151-000x</b>
FC3151-0000	standard configuration (can only be ordered with a Beckhoff Industrial PC with Mini PCI option)
FC3151-0002	configuration with 128 kbytes NOVRAM (can only be ordered with a Beckhoff Industrial PC with Mini PCI option)
<b>Accessories</b>	
TwinCAT I/O	I/O driver



## FC5151 | Mini PCI CANopen

### CANopen

The FC5151 Mini PCI Card brings fieldbus functionalities to the Industrial PC in a compact construction. The bus interface is not implemented on the fieldbus card, but separately in the respective housing (device-specific). The FC5151 is available for Beckhoff Industrial PCs with Mini PCI option. Like the standard PCI cards, the Mini PCI variants are specifically optimised

for fast controllers and real-time tasks:

- connection of the PC to a CANopen network (optionally network master or slave)
- powerful parameter and diagnostics interfaces
- The error management for each bus user is freely configurable.
- switchable termination resistor

The power of the Fieldbus Cards can be most easily seen in combination with the TwinCAT software PLC and NC. But other applications also benefit from the intelligent PCI cards that handle the fieldbus protocol efficiently on their own processors. The Fieldbus Cards are optionally available with 128 kbyte NOVRAM.

Technical data	FC5151
Fieldbus	CANopen
Number of fieldbus channels	1
Data transfer rates	10, 20, 50, 100, 125, 250, 500, 800, 1,000 kbaud
Interface to the PC	Mini PCI interface, 32 bit with 4 kbyte DPRAM per channel
Communication	CANopen network master and CANopen manager, optionally CANopen slave
Bus device	max. 127 slaves
Termination resistor	switchable
Dimensions	59.75 mm x 50.95 mm (type III A)
Operating temperature	0...55 °C
Driver	TwinCAT I/O and higher levels
Further information	<a href="http://www.beckhoff.com/FC5151">www.beckhoff.com/FC5151</a>

Ordering information	FC5151-000x
FC5151-0000	standard configuration (can only be ordered with a Beckhoff Industrial PC with Mini PCI option)
FC5151-0002	configuration with 128 kbytes NOVRAM (can only be ordered with a Beckhoff Industrial PC with Mini PCI option)

Accessories	
TwinCAT I/O	I/O driver



## FC5251 | Mini PCI DeviceNet



The FC5251 Mini PCI Card brings fieldbus functionalities to the Industrial PC in a compact construction. The bus interface is not implemented on the fieldbus card, but separately in the respective housing (device-specific). The FC5251 is available for Beckhoff Industrial PCs with Mini PCI option. Like the standard PCI cards, the Mini PCI variants are specifically optimised

for fast controllers and real-time tasks:

- connection of the PC to a DeviceNet network (optionally master or slave units)
- powerful parameter and diagnostics interfaces
- The error management for each bus user is freely configurable.
- switchable termination resistor

The power of the Fieldbus Cards can be most easily seen in combination with the TwinCAT software PLC and NC. But other applications also benefit from the intelligent PCI cards that handle the fieldbus protocol efficiently on their own processors. The Fieldbus Cards are optionally available with 128 kbyte NOVRAM.

Technical data	FC5251
Fieldbus	DeviceNet
Number of fieldbus channels	1
Data transfer rates	125, 250, 500 kbaud
Interface to the PC	Mini PCI interface, 32 bit with 4 kbyte DPRAM per channel
Communication	DeviceNet network master (scanner), optionally DeviceNet slave
Bus device	max. 63 slaves
Termination resistor	switchable
Dimensions	59.75 mm x 50.95 mm (type III A)
Operating temperature	0...55 °C
Driver	TwinCAT I/O and higher levels
Further information	<a href="http://www.beckhoff.com/FC5251">www.beckhoff.com/FC5251</a>

Ordering information	FC5251-000x
FC5251-0000	standard configuration (can only be ordered with a Beckhoff Industrial PC with Mini PCI option)
FC5251-0002	configuration with 128 kbytes NOVRAM (can only be ordered with a Beckhoff Industrial PC with Mini PCI option)

Accessories	
TwinCAT I/O	I/O driver

1154



## FC7551 | Mini PCI SERCOS interface



The FC7551 Mini PCI Cards brings fieldbus functionalities to the Industrial PC in a compact construction. The bus interface is not implemented on the fieldbus card, but separately in the respective housing (device-specific). The FC7551 is available for Beckhoff Industrial PCs with Mini PCI option. Like the standard PCI cards, the Mini PCI variants are specifically optimised

for fast controllers and real-time tasks:

- All cycle times supported by the SERCOS interface (from 62.5  $\mu$ s) are possible.
- communication via SERCON 816 chip
- up to 254 devices

The power of the Fieldbus Cards can be most easily seen in combination with the TwinCAT software PLC and NC. But other

applications also benefit from the intelligent PCI cards that handle the fieldbus protocol efficiently on their own processors. The Fieldbus Cards are optionally available with 128 kbyte NOVRAM.

Technical data	FC7551
Fieldbus	SERCOS interface
Number of fieldbus channels	1
Data transfer rates	2, 4, 8, 16 Mbaud
Interface to the PC	Mini PCI interface, 32 bit with 4 kbyte DPRAM per channel
Communication	SERCON 816 chip
Bus device	$\leq$ 254
Cycle time	all cycle times supported by SERCOS interface (down to 62.5 $\mu$ s)
Dimensions	59.75 mm x 50.95 mm (type III A)
Operating temperature	0...55 °C
Driver	TwinCAT I/O and higher levels
Further information	<a href="http://www.beckhoff.com/FC7551">www.beckhoff.com/FC7551</a>

Ordering information	FC7551-000x
FC7551-0000	standard configuration (can only be ordered with a Beckhoff Industrial PC with Mini PCI option)
FC7551-0002	configuration with 128 kbytes NOVRAM (can only be ordered with a Beckhoff Industrial PC with Mini PCI option)

Accessories	
TwinCAT I/O	I/O driver



## FC9051, FC9151 | Mini PCI Ethernet

### Ethernet TCP/IP

The FC9x51 Mini PCI Card brings further Ethernet ports to the Industrial PC in a compact construction. The bus interface is not implemented on the fieldbus card, but separately in the respective housing (device-specific). The FC9x51 is available for Beckhoff Industrial PCs with Mini PCI option. Like the standard PCI cards, the Mini PCI variants are specifically optimised for fast controllers and real-time tasks:

- automatic baud rate setting according to IEEE 802.3u
- Ethernet and real-time Ethernet protocols, EtherCAT-ready
- full duplex at 10 and 100 Mbit/s

In combination with the Ethernet Mini PCI Cards, a third Ethernet port is available in the Industrial PC with 10 Mbit/s, 100 Mbit/s or 1,000 Mbit/s. While the 100 Mbit/s Ethernet port offers optimum performance for all EtherCAT

control tasks, a gigabit port is available for connecting the higher-level network.

The power of the Fieldbus Cards can be most easily seen in combination with the TwinCAT software PLC and NC. But other applications also benefit from the intelligent PCI cards that handle the fieldbus protocol efficiently on their own processors.

Technical data	FC9051	FC9151
Bus system	Ethernet (all IEEE 802.3-based protocols), EtherCAT	
Number of Ethernet channels	1	
Data transfer rates	10/100 Mbit/s, IEEE 802.3u auto-negotiation, full duplex at 10 and 100 Mbit/s, separate settings for each channel	10/100/1,000 Mbit/s, IEEE 802.3u auto-negotiation, full duplex at 10 and 100 Mbit/s, separate settings for each channel
Interface to the PC	Mini PCI interface	
Communication	Ethernet and real-time Ethernet protocols, EtherCAT-ready	
Bus device	Ethernet standard	
Standard drivers	standard operating system drivers for Intel®-compatible NIC real-time driver	
Real-time drivers	TwinCAT drivers for real-time Ethernet. Drivers can be selected separately for each channel.	
Dimensions	59.75 mm x 44.60 mm (type III B)	
Operating temperature	0...55 °C	
Further information	<a href="http://www.beckhoff.com/FC9051">www.beckhoff.com/FC9051</a>	

Ordering information	FC9051-0000	FC9151-0000
FC9x51-0000	standard configuration (can only be ordered with a Beckhoff Industrial PC with Mini PCI option)	

Accessories		
TwinCAT I/O	I/O driver	1154





# Switches





## CU2008 | 8-port Ethernet Switch

The Beckhoff Ethernet Switches offer eight RJ 45 Ethernet ports. Switches relay incoming Ethernet frames to the destination ports. In full duplex mode, they prevent collisions. They can be used universally in automation and office networks. User-friendly installation via integrated DIN rail adapter.

The switches meet the special requirements of real-time-capable Industrial Ethernet solutions through several outstanding features:

- compact design in stainless steel housing
- 10/100 Mbaud, half or full duplex, with automatic baud rate detection
- cross-over detection: automatic detection and correction of crossover and straight-through Ethernet cables
- clear, quick diagnosis, two LEDs for each Ethernet port
- fast DIN rail mounting
- industrial design

Technical data	CU2008
Bus system	all Ethernet (IEEE 802.3)-based protocols, store and forward switching mode
Number of Ethernet ports	8
Ethernet interface	10BASE-T/100BASE-TX Ethernet with 8 x RJ 45
Cable length	up to 100 m twisted pair
Data transfer rates	10/100 Mbit/s, IEEE 802.3u auto-negotiation, half or full duplex at 10 and 100 Mbit/s possible, automatic settings
Hardware diagnosis	2 LEDs per channel (activity, link, 10/100 Mbit)
Power supply	24 (18...30) V DC, 100 mA, 3-pin Cage Clamp® connection (+, -, PE)
Dimensions (W x H x D)	approx. 85 mm x 100 mm x 30 mm
Further information	<a href="http://www.beckhoff.com/CU2008">www.beckhoff.com/CU2008</a>

Accessories	
Cordsets	cordsets and connectors



## CU2016 | 16-port Ethernet Switch

The Beckhoff Ethernet Switches offer 16 RJ 45 Ethernet ports. Switches relay incoming Ethernet frames to the destination ports. In full duplex mode, they prevent collisions. They can be used universally in automation and office networks. User-friendly installation via integrated DIN rail adapter.

The switches meet the special requirements of real-time-capable Industrial Ethernet solutions through several outstanding features:

- compact design in stainless steel housing
- 10/100 Mbaud, half or full duplex, with automatic baud rate detection
- cross-over detection: automatic detection and correction of crossover and straight-through Ethernet cables
- clear, quick diagnosis, two LEDs for each Ethernet port
- fast DIN rail mounting
- industrial design

Technical data	CU2016
Bus system	all Ethernet (IEEE 802.3)-based protocols, store and forward switching mode
Number of Ethernet ports	16
Ethernet interface	10BASE-T/100BASE-TX Ethernet with 16 x RJ 45
Cable length	up to 100 m twisted pair
Data transfer rates	10/100 Mbit/s, IEEE 802.3u auto-negotiation, half or full duplex at 10 and 100 Mbit/s possible, automatic settings
Hardware diagnosis	2 LEDs per channel (activity, link, 10/100 Mbit)
Power supply	24 (18...30) V DC, 150 mA, 3-pin Cage Clamp® connection (+, -, PE)
Dimensions (W x H x D)	approx. 146 mm x 100 mm x 30 mm
Further information	<a href="http://www.beckhoff.com/CU2016">www.beckhoff.com/CU2016</a>

Accessories	
Cordsets	cordsets and connectors

# Real-time Ethernet port multiplier



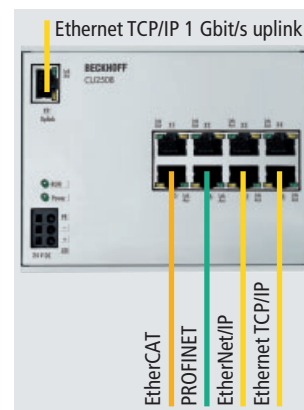


## CU2508 | Real-time Ethernet port multiplier

The real-time Ethernet port multiplier allows the connection of eight independent Ethernet networks. The CU2508 is connected to the PC via a gigabit uplink. The PC offers high-performance data transfer to the multiplier, which allocates the data to the relevant 100BASE-TX port based on an analysis of a frame prefix and sends them time-controlled with  $\mu\text{s}$  precision. Received frames are also allocated a prefix including a timestamp and sent to the PC. With the support of

a driver, users have eight independent ports with full real-time characteristics available. The CU2508 is used in applications in which several Ethernet ports are required that need to be realised outside the PC. TwinCAT supports the CU2508 and makes further network ports at the PC unnecessary. For extremely high demands, an EtherCAT installation can, for example, be distributed or expanded to up to eight lines in order to multiply the performance. The distributed

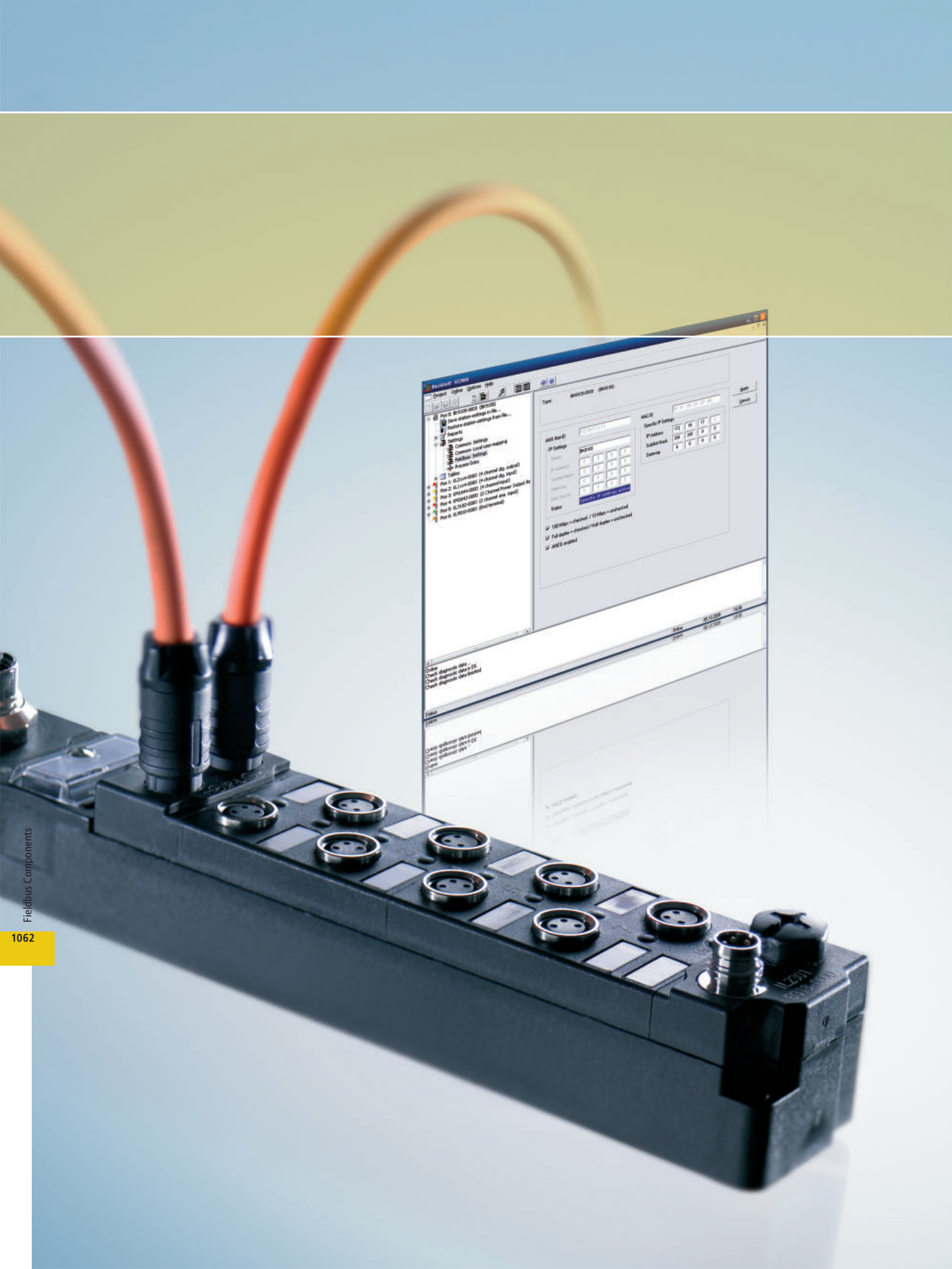
clocks of the EtherCAT lines are synchronised. An EtherCAT cable redundancy can also be realised using two ports of the CU2508.



Technical data	CU2508
Protocol	Ethernet TCP/IP; real-time protocols: EtherCAT, PROFINET, EtherNet/IP and others (depending on driver)
Number of Ethernet ports	8 x 100 Mbit/s and 1 x 1 Gbit/s (uplink)
Ethernet interface	RJ 45
Cable length	up to 100 m twisted pair
Data transfer rates	100BASE-TX and 1 Gbit/s
Hardware diagnosis	LEDs
Power supply	24 (18...30) V DC, 100 mA, 3-pin Cage Clamp® connection (+, -, PE)
Dimensions (W x H x D)	approx. 146 mm x 100 mm x 30 mm
Further information	<a href="http://www.beckhoff.com/CU2508">www.beckhoff.com/CU2508</a>

Accessories	
Cordsets	cordsets and connectors

**i** For availability status see Beckhoff website at: [www.beckhoff.com/CU2508](http://www.beckhoff.com/CU2508)



AVS-Net-ID: 123456789

IP Settings: 192.168.1.1

Specific IP Settings			
IP Address	192	168	1
Subnet Mask	255	255	0
Gateway	192	168	1

Status:  
 100Mbps + checked / 10 Mbps + unchecked  
 Full duplex + checked / Half duplex + unchecked  
 J45E3 enabled

Order: @diagnose\_004  
Check: @diagnose\_004 - 04  
Check: @diagnose\_004 blocked  
Check: @diagnose\_004

Order: @diagnose\_004 prepnt  
Check: @diagnose\_004 - 04  
Check: @diagnose\_004  
Check: @diagnose\_004

# Accessories Fieldbus Components





## KS2000 | Configuration software

The KS2000 configuration software permits project design, commissioning and parameterisation of the Beckhoff Fieldbus Box modules and of the Beckhoff Bus Terminals. The connection between the fieldbus components and the PC is established via the connection cable provided, or via the network and TCP/IP. The KS2000 configuration software for Windows NT/2000/XP/Vista or Windows 7 operating systems has a friendly user interface, making work comfortable and convenient.

### Parameterisation

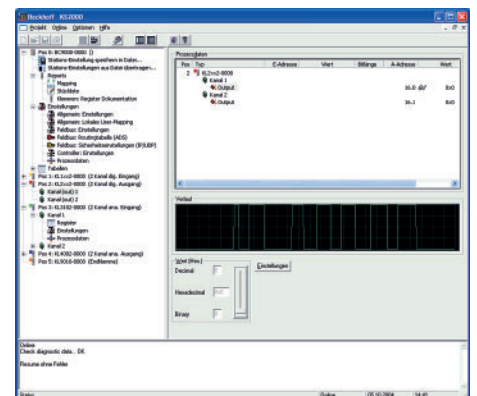
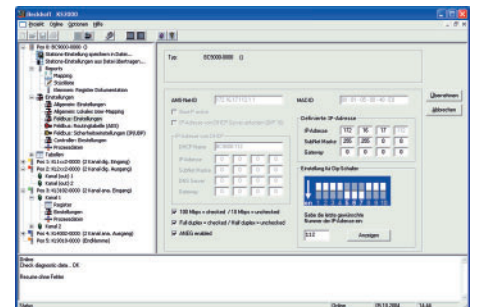
The KS2000 software provides an easy way to access the parameters in the fieldbus station. Specific high-level dialogues are available for all the Bus Couplers and all the intelligent Bus Terminals as well as the Fieldbus Box modules. They can be used to modify the settings easily. It is, alternatively, possible to parameterise the fieldbus components through direct access to all the internal registers.

### Start-up procedure

The KS2000 offers access to the process images of the fieldbus components. In this way it is possible to monitor the input and output images of the Bus Terminals. Access to individual signal channels is additionally supported via a scope functionality, which enables, for example, a wiring test to be carried out.

In addition to the serial connection, the KS2000 services are also available via the fieldbus (e.g. PROFIBUS, Lightbus, Ethernet) via ADS. Via Ethernet, the KS2000 can thus also access BC9000 Ethernet controller Bus Terminals or CX10x0, CX90x0 Embedded PC Bus Terminals.

The settings of a complete station can be saved and reinstated on the controller if required.



Ordering information	Description
KS2000	software tool for project design and extended parameterisation of the Beckhoff Bus Terminals and Fieldbus Box modules configuration package consisting of: configuration software for Windows NT/2000/XP/Vista or Windows 7, cable for connection of the fieldbus components to the PC



## KS8000 | Communication software

The Beckhoff KS8000 communication library provides functions with which it is possible to communicate with the serial Bus Couplers (BK8000, BK8100) or the Fieldbus Box modules (IXxxx-B800/B810) easily via a serial PC interface. KS8000 can be employed in the form of an OCX by any programming language that functions in accordance with the specifications of the Component Object Model (COM) from Microsoft: VC++, Visual Basic (from version 4.0), Delphi, Java, etc. A KS8000 DLL is also available.

### Accessing the process image

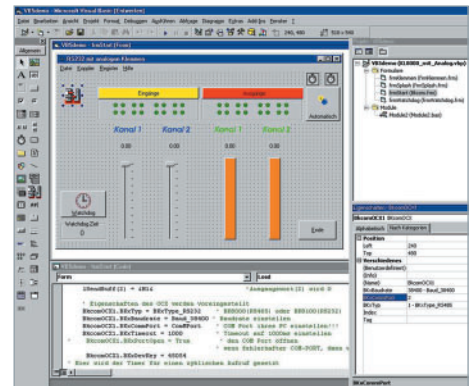
KS8000 permits access to the input and output process image of the fieldbus components via the serial PC interface. Such communication transfers the whole of the input and output process image. The time required for this communication therefore depends on the size of the process image (Bus Coupler example: RS232 coupler, 38,400 baud, process image; one word requires about 6 ms, 15 words take about 20 ms).

### Interface for LabView applications

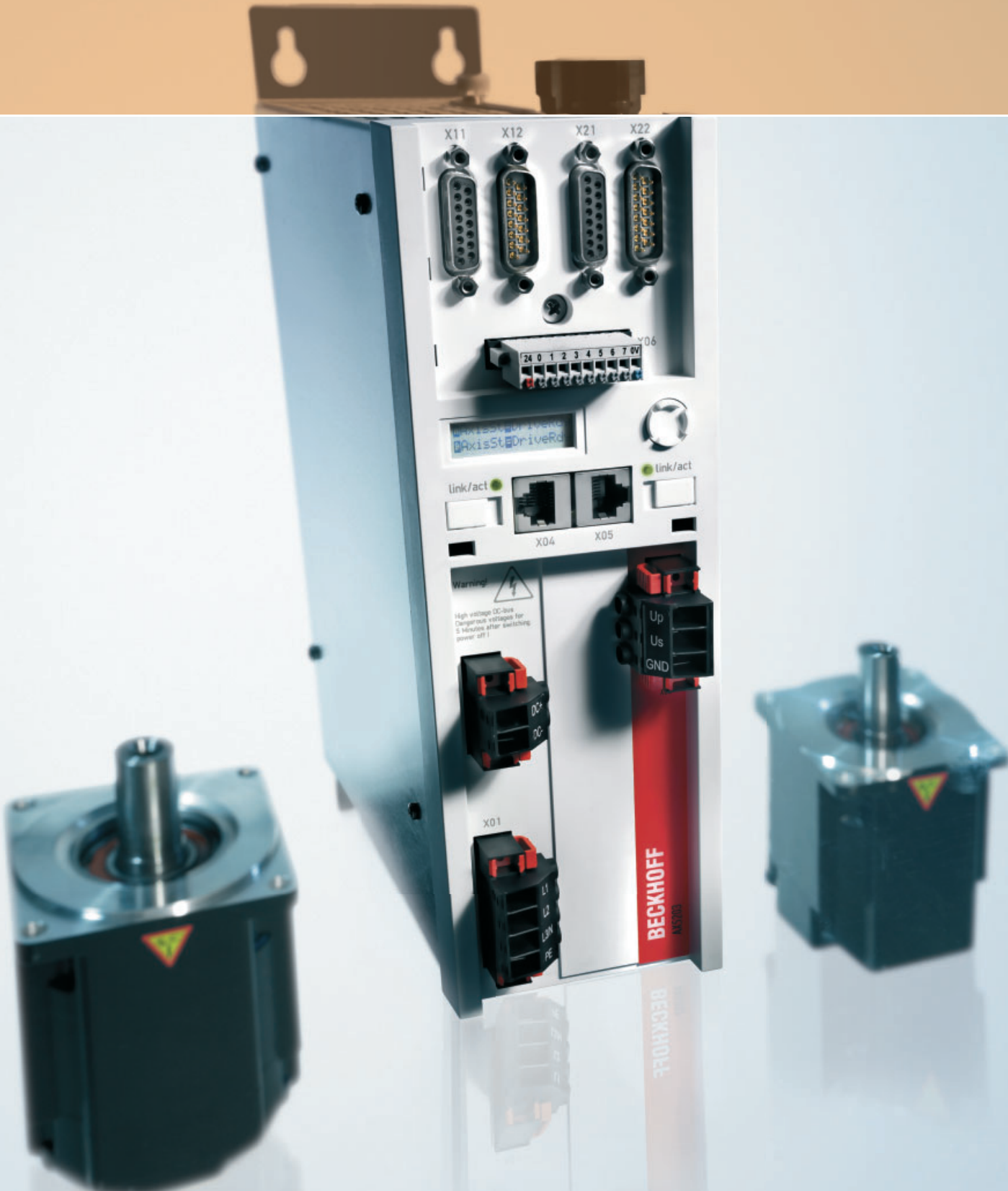
The KS8000 contains an interface for the LabView programming software from National Instruments. LabView solutions consist of what are known as front panels, which serve as the human-machine interface, and of a block diagram, which embodies the actual control program. KS8000 provides LabView users with a greatly simplified method of access to all the process data.

### Programming examples

Examples are available for the KS8000 communication library in all common programming languages: Microsoft Visual Basic, Microsoft Visual C++, LabView, Borland C++, Borland Delphi.



Ordering information	Description
KS8000	communication library in the form of an OCX and DLL software package consisting of: communication library with examples



# Drive Technology

The drive system for high dynamic positioning tasks



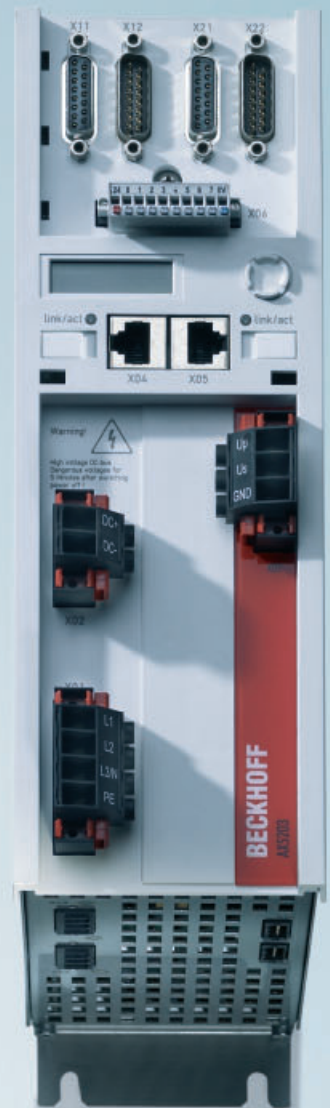
1106 Synchronous Servomotors



1106 Linear Servomotors



1106 Stepper Motors



1072 Digital Compact Servo Drives

# Drive Technology

Digital Compact Servo Drives, Synchronous Servomotors, Linear Motors, Stepper Motors and Planetary Gears

**1070** System description

**1072** Servo Drives AX5000

- 1073** System description
- 1078** Features
- 1082** Digital Compact Servo Drives AX5000
- 1088** Accessories for Servo Drives AX5000

**1096** Servo Drives AX2000, AX2500

- 1098** Digital Compact Servo Drives AX2000
- 1100** Digital Compact Servo Drives AX2500
- 1102** Accessories for Servo Drives AX2000, AX2500

**1106** Motor series AMxxxx, ALxxxx, ASxxxx

- 1108** Synchronous Servomotors AM3000
- 1112** Synchronous Servomotors AM3500
- 1114** Synchronous Servomotors AM2000
- 1118** Linear Servomotors AL2000
- 1120** Linear Servomotors AL2400
- 1122** Linear Servomotors AL2800
- 1124** Linear Servomotors AL3800
- 1126** Stepper Motors AS1000
- 1128** Planetary gear unit AG1000
- 1129** Accessories for motor series AMxxxx, ALxxxx, ASxxxx



## Beckhoff Drive Technology

In combination with the Motion Control solutions offered by the TwinCAT automation software, Beckhoff Drive Technology represents an advanced and complete drive system. PC-based control technology from Beckhoff is ideally suited for single and multiple axis positioning tasks with highly dynamic requirements. The AX5000 Servo Drive series with high-performance EtherCAT system communication offers maximum performance and dynamics.

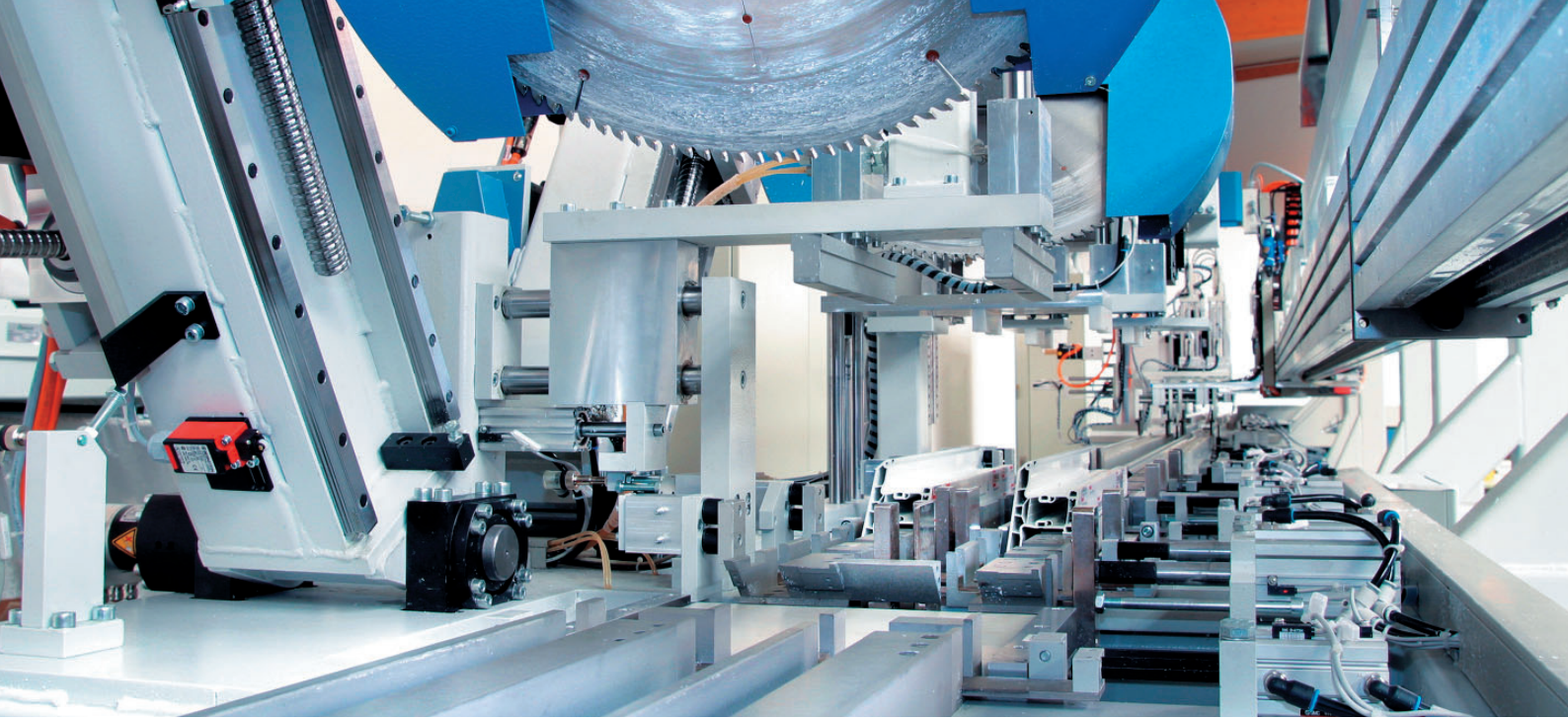
TwinCAT offers comprehensive NC and CNC functionalities. Associated PLC libraries and engineering tools round off the software solution.

The complete Drive Technology solution from Beckhoff consists of:

- Compact Servo Drives AX5000, AX2000, AX2500,
- Synchronous Servomotors AM2000, AM3000, AM3500,
- Linear Servomotors AL2000, AL2400, AL2800, AL3800,
- Stepper Motors AS1000,
- planetary gear units for servomotors and stepper motors,
- and a comprehensive range of accessories.

The open control technology of Beckhoff is consistently continued into the drive unit. Fieldbus standards such as EtherCAT, Ethernet, PROFIBUS, CANopen, DeviceNet, SERCOS interface or Lightbus enable the drives to be integrated into complex systems.





### **AX5000 – the EtherCAT drives**

The AX5000 Servo Drive product line from Beckhoff sets new standards in Drive Technology. The AX5000 series is available in single- or multi-channel form and is optimised in terms of function and cost-effectiveness.

The integrated, fast control technology with a current control cycle of up to 31.25 µs supports fast and highly dynamic positioning tasks. EtherCAT as high-performance system communication enables ideal interfacing with PC-based control technology and supports coupling with other communication systems.

The AX51xx 1-channel Servo Drives are designed for rated currents up to 170 A (further variants up to 315 A are in preparation). The AX52xx 2-channel Servo Drive enables operation of two motors with identical or even with different capacity, up to a total current of 12 A. The multi-axis drives with variable motor output allocation optimise packaging density and the cost per drive channel.

The AX5000 is very flexible with regard to motor types: A wide range of motor sizes and types can be connected without additional measures. Examples include synchronous, linear, torque or asynchronous motors. The multi-feedback interface supports all common standards. Several AX5000 devices can be connected easily and quickly to form a multi-axis system using the “AX-Bridge” quick connection system.

### **Servo Drives AX2000, AX2500**

The AX2000 and AX2500 series complement the Compact Servo Drive segment with two types: The AX2000 series is a powerful variant designed for a nominal current of up to 80 A. The AX2500 series Servo Drives are modularly expandable and are optimised for applications where space is tight. The maximum nominal current is 6 A.

### **Servomotors AM2000, AM3000, AM3500**

The Synchronous Servomotors are brushless, three-phase motors meeting DIN 42950, and are equipped with permanent magnets in the rotor. This high quality neodymium magnetic material makes a significant contribution to the motors’ exceptional dynamic properties. The AM2000 motors feature angled connectors (up to 90°) for the power supply and the feedback signals. The AM3000/AM3500 features continuously rotatable connectors. Beckhoff offers resolver, encoder and power leads as ready-assembled accessories in different lengths. In contrast to current trends, the AM3500 servomotors have a higher moment of inertia, making them particularly suitable for machine tool axes with stringent synchronism requirements. They are also ideal for applications with higher inertia, such as rotary tables, for example – without the need for an additional gear unit.

### **Linear Servomotors AL2xxx, AL3800**

The three-phase Linear Servomotors from the AL2000, AL2400 and AL2800 series as well as the ironless AL3800 Linear Servomotors complement the motor range. The linear motors can be used wherever the rotary design reaches mechanical limits during installation or where special drive characteristics in terms of dynamics, synchronism or acceleration are required.

### **Stepper Motors AS1000**

The Stepper Motors of the AS1xxx series are a cost-effective alternative to Synchronous Servomotors for the small and medium capacity range. Different Stepper Motor types with torques ranging between 0.38 Nm and 5 Nm can be used as actuators or auxiliary axes for machine construction and automation applications.



# Servo Drives AX5000

Digital Compact Servo Drives





## AX5000 | Digital Compact Servo Drives

### The EtherCAT drives

The AX5000 Servo Drive product line from Beckhoff sets new standards in drive performance. The AX5000 series is available in single- or multi-channel form and is optimised for exceptional functionality and cost-effectiveness. Featuring integrated, high-speed control technology with a current control cycle of down to 31.25  $\mu\text{s}$ , the AX5000 drives support fast and highly dynamic positioning tasks. The drives utilise EtherCAT as a high-performance communication system, providing an ideal interface with PC-based control technology while supporting coupling with other fieldbus systems.

The 2-channel Servo Drives with variable motor output allocation optimise the packaging density and the cost per drive channel. The compact design and simple and safe installation through the "AX-Bridge" quick connection system significantly simplify control cabinet assembly.

### Technical highlights

- **fast control technology**
  - current control: min. 31.25  $\mu\text{s}$
  - speed control: min. 125  $\mu\text{s}$
  - position control: min. 125  $\mu\text{s}$
- **high-speed EtherCAT system communication**
- **1- or 2-channel Servo Drive**
  - optimised for multi-axis applications
  - variable motor output allocation in 2-channel drives
- **active DC-Link and brake energy management**
- **variable motor interface with**
  - multi-feedback interface
  - flexible motor type selection
  - scalable, wide range motor current measurement
- **high-speed capture inputs**
- **wide voltage range 100...480 V AC**
- **integrated mains filter**
- **integration of safety functions (optional)**
  - restart lock
  - TwinSAFE: intelligent safety functions for Motion Control
- **compact design for simple control cabinet installation (300 mm depth)**
- **AX-Bridge – the quick connection system for power supply, DC-Link and control voltage**
- **variable cooling concept (fanless, forced cooling, cold plate)**



AX5101–AX5112 | 1-channel, up to 12 A

AX52xx | 2-channel, up to 2 x 6 A

AX5118–AX5140 | 1-channel, 18/25/40 A

## AX5000 | System overview

The AX5000 Servo Drive series enhances the Beckhoff drive range with a generation of drives for fast and highly dynamic positioning tasks. The universal drive concept is suitable for almost any application and system requirement.

### AX51xx | 1-channel Servo Drive

- Servo Drive for one drive axis
- rated current: 1.5 A, 3 A, 6 A, 12 A, 18 A, 25 A, 40 A, 60 A, 72 A, 90 A, 110 A, 143 A, 170 A (up to 315 A in preparation)
- wide voltage range: 100 V AC -10 %...480 V AC +10 %
- AX5160...AX5193: 3 x 400 V AC -10 %...3 x 480 V AC +10 %

### AX52xx | 2-channel Servo Drive

- Servo Drive for two drive axes
- rated current: 2 x 1.5 A, 2 x 3 A, 2 x 6 A
- flexible allocation of the total device current to both axes
- wide voltage range: 100 V AC -10 %...480 V AC +10 %

### AX5xxx | System modules

#### AX5001 | DC-Link expansion

- capacitor module for dynamic DC-Link expansion
- 24 V DC power management
  - The auxiliary voltage is generated from the DC-Link.
  - automatic switchover from external to internal 24 V supply
  - replaces external UPS
- can be combined with multi-axis systems through AX-Bridge
- EtherCAT interface for parameterisation and diagnosis

#### AX5021 | Brake module

- with internal 250 W braking resistor and active cooling
- integrated brake chopper for external braking resistor up to 6 kW continuous output
- EtherCAT interface for parameterisation and diagnosis

#### AX504x | Energy recovery modules

- mains inverter for feeding brake energy back into the supply network
- EtherCAT interface for parameterisation and diagnosis

#### AX59xx | AX-Bridge

- supply module for multi-axis systems
- connection of mains and supply voltage
- connection module for multi-axis system with integrated power rails



1-axis AX51xx Servo Drive for motors up to 170 A rated current (additional variants are in preparation)



2-axis AX52xx Servo Drive for two motors with a total current up to 12 A



AX5160, AX5172 | 1-channel, 60/72 A



AX5190, AX5191 | 1-channel, 90/110 A



AX5192, AX5193 | 1-channel, 143/170 A

## AX5000 | High-speed Servo Drives

### High-speed control algorithms

The AX5000 Servo Drives are designed for fast and highly dynamic positioning tasks:

- current controller with cycle times down to 31.25  $\mu$ s for highly dynamic regulation of ironless linear motors or low-induction motors
- speed controller 125  $\mu$ s
- position controller 125  $\mu$ s

### High-speed EtherCAT system communication

The AX5000 was developed specifically for use with EtherCAT, the real-time Ethernet system. The outstanding features of EtherCAT are particularly beneficial for Drive Technology:

- Ethernet right down to the I/O terminal and drives
- high-precision system synchronisation through distributed clocks
- high-speed capture with time stamp, e.g. for print mark control
- ultra high-speed communication with update times of:
  - 100 axes in 100  $\mu$ s
  - 1,000 distributed I/Os in 30  $\mu$ s
- transparent line topology with flexible branches
- simple system wiring using Industrial Ethernet patch cables

### 2-channel Servo Drive with variable motor output allocation

One highlight of the AX5000 series is the dual power section that enables operation of two motors with the same or different capacity with a single Servo Drive. An asynchronous motor with a rated current of 3 A and a linear motor with a rated current of 9 A can be operated with a 2 x 6 A Servo Drive, for example. The total current is relevant for the device utilisation.

- For two-channel devices (AX5206) the channel current is adjustable between 1...9 A.
- "Active current sensing" automatically and optimally adapts the current resolution to the connected current.

### Optimised for multi-axis applications

The AX5000-Bridge system enables simple and fast connection to several AX5000 devices with a multi-axis system through pluggable feed and connection modules:

- integration of power supply, DC-Link, 24 V DC control and braking voltage
- connection module with power rail system, current carrying capacity up to 85 A
- straightforward installation and disassembly without additional wiring effort
- visible and safe contacting

### Active DC-Link and brake energy management

With the AX-Bridge, the DC-Links are automatically connected through: This ensures economic energy balancing between axes.

- short-circuit-proof
- intelligent utilisation of all available system ballast resistors

### Braking resistor

The integrated braking resistor is sufficient for most applications. In multi-axis systems the overall braking capacity of all braking resistors is available. The brake module enables external ballast resistors with a continuous output up to 6 kW to be connected, making extreme applications possible.

### Familiar drive profile

The SERCOS interface is acknowledged and appreciated worldwide as a high-performance real-time communication interface, particularly for Motion Control applications. The SERCOS profile for Servo Drives is standardised in IEC 61491. It is also used for EtherCAT and is implemented in the AX5000. This means that for users with SERCOS experience, the drive will seem familiar, since the process data layout and the IDN parameter and status machine were retained.

Connection module with power rail system for multi-axis systems, current carrying capacity up to 85 A

Power supply module AX5901 with snap-on connection for the Servo Drive



Power distribution module AX5911 with snap-on connection for power supply, DC-Link and control voltage

## AX5000 | One for all

### Variable motor interface

The AX5000 offers flexible and universal connection options. Almost all feedback systems and motor types are supported. The AX5000 supports electronic name plates (mechanically and electronically relevant motor data) of servomotors, which simplifies commissioning and operation. The AX5000 is very flexible with regard to supported motor types; different motor sizes and types can be connected without additional measures, e.g.:

- synchronous motors
- linear motors
- torque motors
- asynchronous motors

### Multi-feedback interface

AX5000 supports the right feedback system for any application:

- resolver
- SinCos encoder 1 Vpp
- TTL encoder with/without Hall
- single- or multi-turn encoder with Hiperface, EnDat or bidirectional sensor interface (BiSS)
- connection option for further feedback

### Flexible motor current measurement

The Servo Drives enable a scalable, wide range motor current measurement with high-resolution measuring range specification. A 6 A amplifier can control a 1 A motor without loss of measuring resolution. For 2-channel devices the total device current is significant: 12 A = 2 x 6 A or 1 x 3 A + 1 x 9 A.

### High-speed capture inputs

Each AX5000 Servo Drive features eight additional on-board, programmable digital I/Os:

- choice of standard functions such as enable, output stage lock or axis-limit switch
- Due to the short response time of 11  $\mu$ s, two of these inputs can also be used as capture inputs with time stamp.
- Possible applications include precise referencing and measurement processes or print mark control.
- Three digital outputs for controlling the motor brake or fault reporting are also integrated.
- Additional integrated functions include smooth start-up, overvoltage detection, short circuit protection and phase failure monitoring.

### Diagnostic and parameter display

The AX5000 features a backlit, two-line plain text display. This display enables fast device diagnosis and maintenance on site. In two-channel devices the axis identifier is also displayed. Navigation buttons enable simple and convenient operation of the diagnostic display.

### Wide voltage range

The AX5000 can be connected to a wide range of voltage systems worldwide without additional components, including 1 x 100 V AC, for the Japanese market or 3 x 480 V AC for North America, for example. This significantly reduces the inventory management effort for the machine manufacturer and minimises the risk of damage through incorrect mains connection.

- can be used in all supply networks worldwide
- No additional auto-transformers or mains chokes are required.



Variable motor interface



## AX5000 | Integrated safety

### Integrated mains filter

The device features integrated filters for the power supply and the 24 V auxiliary supply for operation directly from the mains. No additional shielding is required for the mains cable.

### Integration of safety functions (optional)

Optional cards are available for the different safety categories: The **AX5801 option card** offers personal protection against inadvertent restart of the drive axis (STO):

- meets safety category 3 according to EN 954-1
- Safe Torque Off (STO) according to IEC 61800-5-2
- control through digital outputs
- mains voltage and motor line remain connected

The **AX5805 option card** provides further drive-integrated safety functions according to IEC 61800-5-2. Control is performed via EtherCAT; no further wiring is required.

- STO: Safe Torque Off
- SS1: Safe Stop 1
- SS2: Safe Stop 2
- SOS: Safe Operating Stop
- SLS: Safely Limited Speed
- SLP: Safely Limited Position
- SDI: Safe Direction

### Safe system stop in the event of power failure

A power failure can lead to uncontrolled run-out of drive axes, which means that linear axes or lifting axes would hit the limit stop unbraked. The 24 V DC supply of the AX5000 has two channels so that separate power supplies can be used for control electronics and brake control. This enables the supply voltage for the control electronics to be buffered via the UPS of the Industrial PCs until all axes are stopped safely.

### Compact design for simple control cabinet installation

The AX5000 Servo Drive series (up to 40 A) enables simple and fast connection of several drives to form a multi-axis system via AX-Bridge modules. The pluggable supply and connection module combines supply voltage, DC-Link, 24 V DC control and braking voltage. It enables fast installation and commissioning. The system consists of:

- AX5901 power supply module with snap-on connection for the Servo Drive
- AX5911/AX5912 power distribution module for multi-axis systems with integrated power rails

### Variable cooling concept

The specially developed heat sink enables fanless operation of the AX5000 through natural convection of up to 2 x 3 A rated current. Devices with higher output feature integrated, temperature-controlled ventilation. The rear of the AX5000 can be designed with a cold plate and then enables straightforward installation on common cooling systems.

# AX5000 features

Motor feedback: Sin/Cos 1 Vpp,  
EnDat, Hiperface, BiSS, TTL

Motor feedback: Resolver, Hall

8 digital I/Os, e.g. enable,  
limit switch, capture input,  
error message

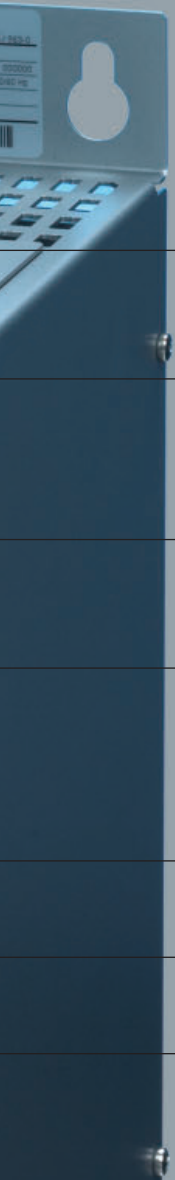
EtherCAT system bus

DC-Link,  
external braking resistor

Power supply  
100 V AC -10% ... 480 V AC +10% /  
DC power supply

Brake control/motor temperature  
monitoring





Optional slot for interface boards, e.g. additional feedback

Optional slot for restart lock or optional TwinSAFE safety cards

Motor feedback (only for AX52xx 2-axis module): Sin/Cos 1 Vpp, EnDat, Hiperface, BiSS, TTL

Motor feedback (only for AX52xx 2-axis module): Resolver, Hall

Status display, e.g. axis identifier or error message

Navigation buttons (Enter, Up/Down)

Operating material identification

24 V DC control and braking voltage



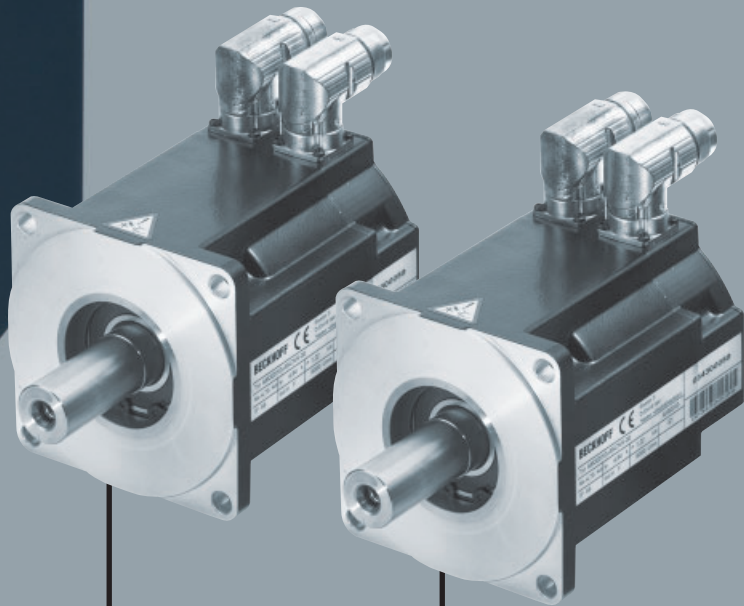
Multi-feedback interface for all common feedback systems and connection option for an additional encoder



The double width of the AX5118 up to the AX5140 (rated current 18/25/40 A) compared to AX5x01–AX5112 supports modular control cabinet installation.



Ultra high-speed communication via EtherCAT enables update times of 100 µs for 100 axes.

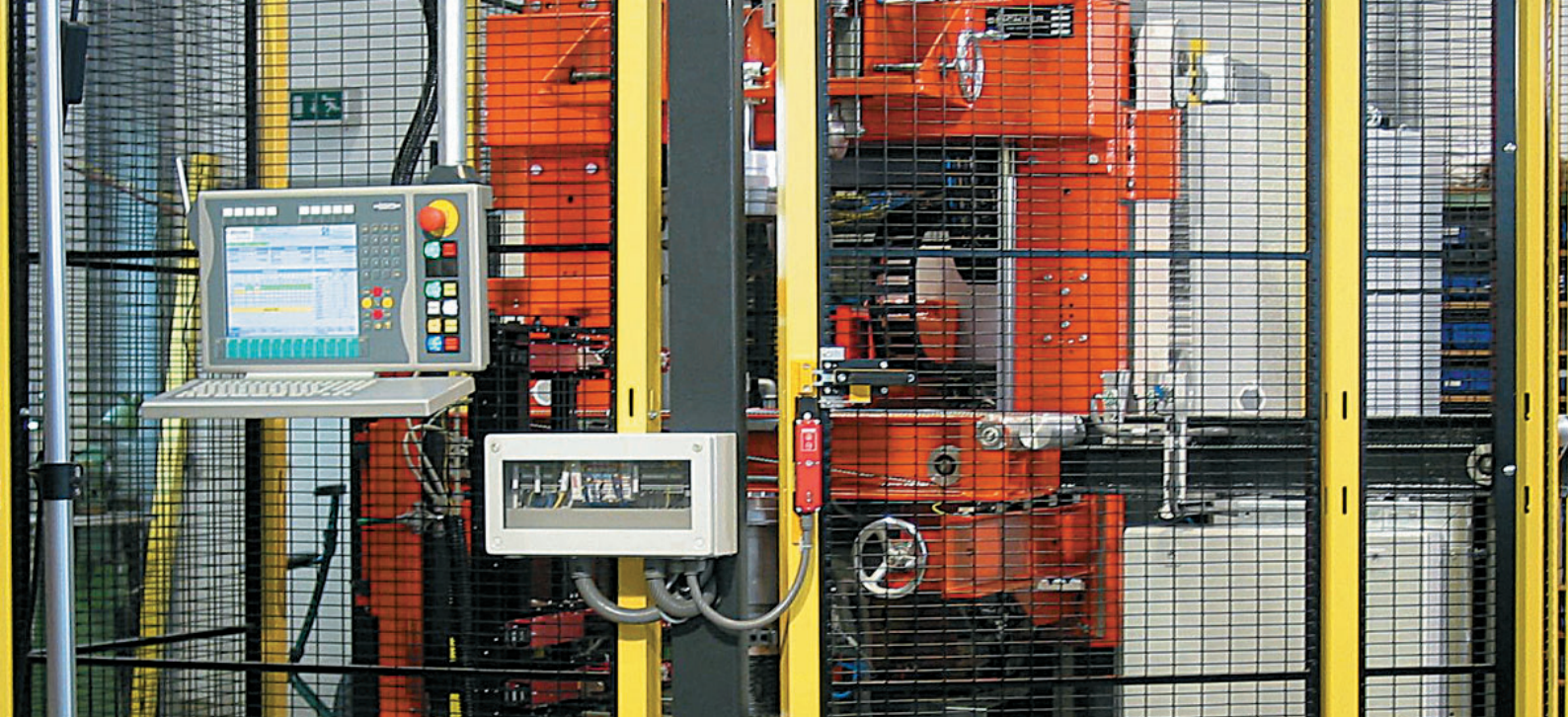


Motor outputs



Connection module with power rail system for multi-axis systems, current carrying capacity up to 85 A.





## Integrated safety functions in the AX5000

Machine movements create a range of hazards for machine operators and maintenance personnel. Anyone coming into contact with the machine therefore has to be protected from injuries at all times and during all operating phases, from commissioning to decommissioning. Integrated control and safety technology is a prerequisite for safe and economic automation. With the integration of safety technology into drive technology, Beckhoff consistently developed the TwinSAFE system philosophy further. TwinSAFE enables integrated automation, ranging from digital inputs and logic systems to drives or digital outputs. Simple handling,

diagnostic and support functions help the user to implement the required application quickly and safely.

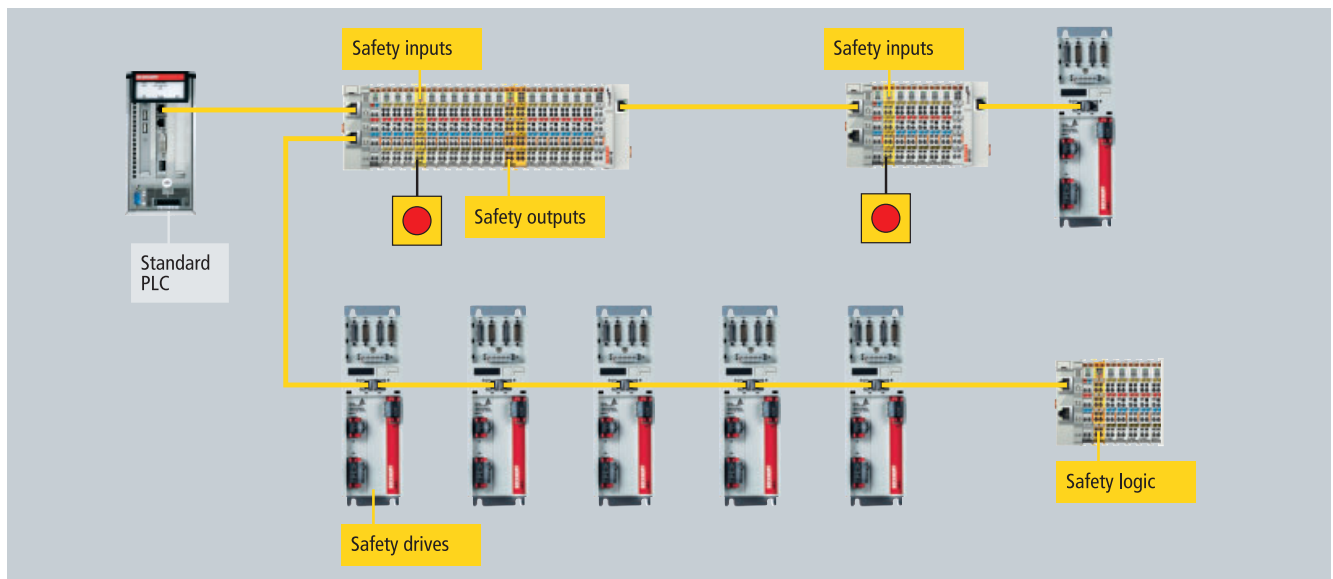
The "Safety of machinery" standard, EN ISO 13849-1:2006, which replaces the existing EN 954-1, places even greater responsibility on the machine manufacturer.

The safety of a machine is either assessed by Performance Level (PL a-e) EN ISO 13849-1:2006 or Safety Integrity Level (SIL 1-4) IEC 62061. To this end, the safety-related functions for drives are defined in IEC 61800-5-2.

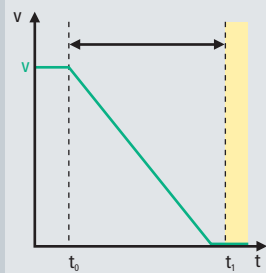
Drive-integrated safety significantly simplifies the realisation of the required

safety functions. Safety sensors (e.g. light curtains, emergency stop buttons, OK buttons) are collected via the fieldbus where they are installed. The required function is triggered in the TwinSAFE Logic Bus Terminal or the TwinSAFE PLC, and the Servo Drive carries it out.

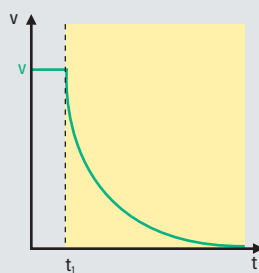
Two TwinSAFE option cards are available for the AX5000: AX5801-0000 and AX5805-0000 (for functional descriptions see next page).



**Option card AX5801-0000** | Control takes place via a digital output of a TwinSAFE Terminal to AX5801-0000.  
For all functions the mains voltage remains connected at the Servo Drive.



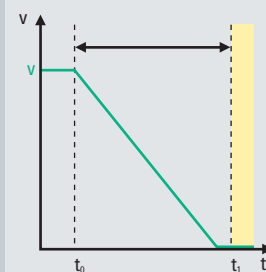
- The motor is shut down in a controlled manner.
- The motor can no longer generate a dangerous rotary field.
- Suspended loads must be secured with further measures.



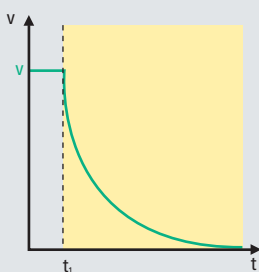
- The motor coasts down when activated. The axis should therefore be stopped before activation.
- The motor can no longer generate a dangerous rotary field.
- Suspended loads must be secured with further measures.

**Option card AX5805-0000** | Control is performed via EtherCAT; no further wiring is required.  
For all functions the mains voltage remains connected at the Servo Drive.

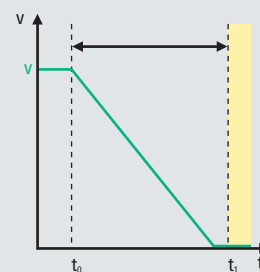
Function examples:



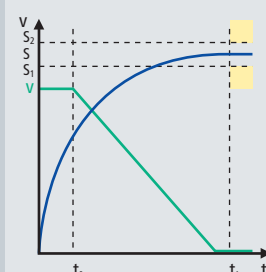
- The motor is shut down in a controlled manner.
- The motor can no longer generate a dangerous rotary field.
- Suspended loads must be secured with further measures.



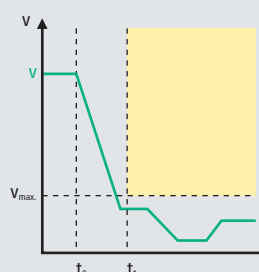
- The motor coasts down when activated. The axis should therefore be stopped before activation.
- The motor can no longer generate a dangerous rotary field.
- Suspended loads must be secured with further measures.



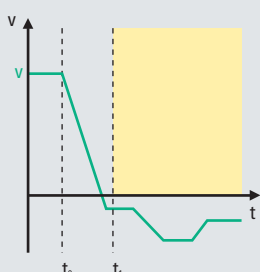
- The motor is shut down in a controlled manner.
- Safe stopping with full torque



- Monitoring of the reached stop position within limits with full torque
- Exceedance of the limits leads to STO.



- Monitoring for compliance with max. velocity
- Exceedance of  $v_{max}$  leads to safe shutdown STO.



- Monitoring of compliance with specified direction of rotation
- Movement in the blocked direction leads to safe shutdown STO.



AX5118/AX5125/AX5140

## AX51xx | Digital Compact Servo Drives (1-channel)

The AX5000 Servo Drive series is available in single- or multi-channel form and is optimised in terms of function and cost-effectiveness. Integrated control technology supports fast and highly dynamic positioning tasks. EtherCAT as a high-performance communication system enables ideal interfacing with PC-based control technology.

The AX51xx 1-channel Servo Drives are designed for rated currents up to 170 A (additional variants up to 315 A are in preparation).

The AX5000 system enables simple and fast connection of several AX5000 devices to form a multi-axis system through the "AX-Bridge" quick connection system. The pluggable supply and connection module combines power supply, DC-Link and 24 V DC control and braking voltage.

A wide range of motor types can be connected to the AX5000. Motors of different size and type can be connected without additional measures. Examples include synchronous, linear, torque and asynchronous motors. The multi-feedback interface supports all common standards.

The AX5000 was developed specifically for use with the EtherCAT real-time Ethernet system. The outstanding features of EtherCAT are particularly beneficial for Drive Technology. They include short cycle time, synchronicity and simultaneity. EtherCAT enables very short cycle times, even in networks containing a large number of devices.

### Features

- high-speed EtherCAT system communication
  - rated current (1-channel Servo Drive): 1.5 A, 3 A, 6 A, 12 A, 18 A, 25 A, 40 A
  - wide voltage range: 1 x 100 -10 %... 3 x 480 V AC +10 %
  - active DC-Link and brake energy management
  - multi-feedback interface
  - flexible motor type selection
  - scalable, wide range motor current measurement
  - high-speed capture inputs
  - diagnostic and parameter display
  - integrated mains filter Cat. C3, according to EN 61800-3
  - optional safety functions: restart lock, intelligent TwinSAFE safety functions
  - compact design for simple control cabinet installation
- AX-Bridge – the quick connection system for power supply, DC-Link and control voltage
  - variable cooling concept

Technical data	AX5101	AX5103	AX5106	AX5112	AX5118	AX5125	AX5140
Rated output current at 50 °C (1-phase connection)	1 x 1.5 A	1 x 3 A	1 x 4.5 A	–	–	–	–
Rated output current at 50 °C (3-phase connection)	1 x 1.5 A	1 x 3 A	1 x 6 A	1 x 12 A	1 x 18 A	1 x 25 A	1 x 40 A
Minimum rated motor current at full current resolution	0.35 A	1 A	1 A	6 A	12 A	12 A	18 A
Rated supply voltage	3 x 100 V AC -10 %...3 x 480 V AC +10 % 1 x 100 V AC -10 %...1 x 240 V AC +10 %			3 x 100 V AC -10 %... 3 x 480 V AC +10 %		3 x 100 V AC -10 %... 3 x 480 V AC +10 %	
DC-Link voltage	max. 890 V DC						
Peak output current <sup>(1)</sup>	4.5 A	7.5 A	13 A	26 A	36 A	50 A	80 A
Rated apparent power for S1 operation (selection)							
120 V (1-/3-phase connection)	0.3 kVA	0.6 kVA	1.2 kVA	2.5 kVA	3.4 kVA	4.8 kVA	8.3 kVA
230 V (1-/3-phase connection)	0.6 kVA	1.2 kVA	2.4 kVA	4.8 kVA	7.2 kVA	10.0 kVA	16.0 kVA
400 V (only 3-phase connection)	1.0 kVA	2.1 kVA	4.2 kVA	8.3 kVA	12.5 kVA	17.3 kVA	28.0 kVA
480 V (only 3-phase connection)	1.2 kVA	2.5 kVA	5.0 kVA	10.0 kVA	15.0 kVA	20.8 kVA	33.0 kVA
Continuous braking power <sup>(2)</sup>	50 W	50 W	150 W	90 W	200 W	200 W	200 W
Max. braking power <sup>(2)</sup>	14 kW	14 kW	14 kW	14 kW	27 kW	27 kW	27 kW
Power loss <sup>(3)</sup>	35 W	50 W	85 W	160 W	255 W	340 W	550 W
System bus	EtherCAT						
Weight	4.0 kg	4.0 kg	5.0 kg	5.0 kg	11.0 kg	11.0 kg	14.0 kg
Further information	www.beckhoff.com/AX51xx						

<sup>(1)</sup>RMS for max. 7 seconds, <sup>(2)</sup>internal brake resistor, <sup>(3)</sup>S1 operation, incl. power supply, without brake chopper

Dimensions	AX5101	AX5103	AX5106	AX5112	AX5118	AX5125	AX5140
Height without connectors	274 mm	274 mm	274 mm	274 mm	274 mm	274 mm	300 mm
Width	92 mm	92 mm	92 mm	92 mm	185 mm	185 mm	185 mm
Depth without connectors	232 mm	232 mm	232 mm	232 mm	232 mm	232 mm	232 mm

Ordering information	AX51xx-0000
AX5101-0000	Digital Compact Servo Drive, 1-axis module, 100...480 V AC, rated output current 1.5 A, EtherCAT interface
AX5103-0000	Digital Compact Servo Drive, 1-axis module, 100...480 V AC, rated output current 3 A, EtherCAT interface
AX5106-0000	Digital Compact Servo Drive, 1-axis module, 100...480 V AC, rated output current 6 A, EtherCAT interface
AX5112-0000	Digital Compact Servo Drive, 1-axis module, 100...480 V AC, rated output current 12 A, EtherCAT interface
AX5118-0000	Digital Compact Servo Drive, 1-axis module, 100...480 V AC, rated output current 18 A, EtherCAT interface
AX5125-0000	Digital Compact Servo Drive, 1-axis module, 100...480 V AC, rated output current 25 A, EtherCAT interface
AX5140-0000	Digital Compact Servo Drive, 1-axis module, 100...480 V AC, rated output current 40 A, EtherCAT interface

**i** For availability status of the AX5140 see Beckhoff website at: [www.beckhoff.com/AX5140](http://www.beckhoff.com/AX5140)



## AX52xx | Digital Compact Servo Drives (2-channel)

The AX5000 Servo Drive series is available in single- or multi-channel form and is optimised in terms of function and cost-effectiveness. Integrated control technology supports fast and highly dynamic positioning tasks. EtherCAT as a high-performance communication system enables ideal interfacing with PC-based control technology.

The AX52xx 2-channel Servo Drive enables operation of two motors with identical or even with different capacity, up to a total current of 12 A. The multi-axis drives with variable motor output allocation offer optimised packaging density and costs per drive channel.

The AX5000 system enables simple and fast connection of several AX5000 devices to form a multi-axis system through the

“AX-Bridge” quick connection system. The pluggable supply and connection module combines power supply, DC-Link and 24 V DC control and braking voltage.

A wide range of motor types can be connected to the AX5000. Motors of different size and type can be connected without additional measures. Examples include synchronous, linear, torque and asynchronous motors. The multi-feedback interface supports all common standards.

The AX5000 was developed specifically for use with the EtherCAT real-time Ethernet system. The outstanding features of EtherCAT are particularly beneficial for Drive Technology. They include short cycle time, synchronicity and simultaneity. EtherCAT

enables very short cycle times, even in networks containing a large number of devices.

### Features

- high-speed EtherCAT system communication
- rated current (2-channel Servo Drive):  
2 x 1.5 A, 2 x 3 A, 2 x 6 A
- wide voltage range:  
1 x 100 -10 %...  
3 x 480 V AC +10 %
- active DC-Link and brake energy management
- multi-feedback interface
- flexible motor type selection
- scalable, wide range motor current measurement
- high-speed capture inputs
- diagnostic and parameter display
- integrated mains filter Cat. C3, according to EN 61800-3

- optional safety functions: restart lock, intelligent TwinSAFE safety functions
- compact design for simple control cabinet installation
- AX-Bridge – the quick connection system for power supply, DC-Link and control voltage
- variable cooling concept

Technical data	AX5201	AX5203	AX5206
Rated output current at 50 °C	2 x 1.5 A	2 x 3 A	2 x 6 A <sup>(1)</sup>
Minimum rated channel current at full current resolution	0.35 A	1 A	1 A
Max. rated channel current at full current resolution (1-phase connection)	3 A	4.5 A	9 A
Max. rated channel current at full current resolution (3-phase connection)	3 A	6 A	9 A
Rated supply voltage	3 x 100 V AC -10 %...3 x 480 V AC +10 % 1 x 100 V AC -10 %...1 x 240 V AC +10 %		
DC-Link voltage	max. 890 V DC		
Peak output current <sup>(1)</sup>	2 x 5 A	2 x 10 A	2 x 13 A
Peak output current as total device current <sup>(1)</sup>	10 A	20 A	26 A
Rated apparent power for S1 operation (selection)			
120 V (1-/3-phase connection)	0.6 kVA	1.2 kVA	2.5 kVA
230 V (1-/3-phase connection)	1.2 kVA	2.4 kVA	4.8 kVA
400 V (only 3-phase connection)	2.1 kVA	4.2 kVA	8.3 kVA
480 V (only 3-phase connection)	2.5 kVA	5.0 kVA	10.0 kVA
Continuous braking power <sup>(2)</sup>	50 W	150 W	90 W
Max. braking power	14 kW		
Power loss <sup>(3)</sup>	55 W	85 W	160 W
System bus	EtherCAT		
Weight	5.0 kg	6.0 kg	6.0 kg
Further information	www.beckhoff.com/AX52xx		

<sup>(1)</sup>RMS for max. 7 seconds, <sup>(2)</sup>internal brake resistor, <sup>(3)</sup>S1 operation, incl. power supply, without brake chopper

<sup>(4)</sup>For 1-phase mains the total current is limited to 9 A.

Dimensions	AX5201	AX5203	AX5206
Height without connectors	274 mm	274 mm	274 mm
Width	92 mm	92 mm	92 mm
Depth without connectors	232 mm	232 mm	232 mm

Ordering information	AX520x-0000
AX5201-0000	Digital Compact Servo Drive, 2-axis module, 100...480 V AC, rated output current 2 x 1.5 A, EtherCAT interface
AX5203-0000	Digital Compact Servo Drive, 2-axis module, 100...480 V AC, rated output current 2 x 3 A, EtherCAT interface
AX5206-0000	Digital Compact Servo Drive, 2-axis module, 100...480 V AC, rated output current 2 x 6 A, EtherCAT interface



AX5160/AX5172



AX5190/AX5191



AX5192/AX5193

## AX51xx | Digital Compact Servo Drives: Performance class up to 120 kW

Demand for higher output has increased significantly in all sectors, for example in order to replace a pneumatic or hydraulic drive motor with a more maintenance-friendly electrical axis, or in order to meet stringent dynamic demands even for high loads. For this reason, higher power servo drives have been added to the AX5000 drive family. These amplifiers, with nominal device currents of up to 170 A (315 A in preparation), fit seamlessly into the world of the smaller AX5000.

The AX5000 amplifiers are available in three sizes with rated currents of 60 A, 72 A, 90 A, 110 A, 143 A and 170 A (315 A in preparation). In each case, the controllers deliver 1.3 to 2 times the rated current for up to 3 seconds and are designed for 3-phase operation at 400 to 480 V AC.

The versions up to 72 A feature integrated mains filters

for compliance with EN 61800-3 requirements. Provision is made for the connection of an external ballast resistor. The EtherCAT connection to the PC-based control technology enables optimum utilisation of available resources.

The AX5000 is very flexible with regard to the motors that can be connected: different motor sizes and types such as synchronous, linear, torque and asynchronous motors can be connected without additional measures. The multi-feedback interface supports all common standards.

The AX5000 was developed specifically for the EtherCAT real-time Ethernet system. The outstanding features of EtherCAT are particularly beneficial for drive technology. They include short cycle time, synchronicity and simultaneity. EtherCAT enables very short cycle times, even in networks containing a large number of devices.

### Features

- high-speed EtherCAT system communication
- available in three sizes
- rated currents: 60 A, 72 A, 90 A, 110 A, 143 A, 170 A (315 A in preparation)
- Supply voltage: 3 x 400...480 V AC  $\pm 10\%$ ; the ratings are reduced by 10 % when connecting 480 V AC.
- multi-feedback interface
- flexible motor type selection
- scalable wide range motor current measurement
- high-speed capture inputs
- diagnostic and parameter display
- integrated mains filters up to 72 A rated current, Cat. C3 according to EN 61800-3
- optional safety functions:
  - restart lock
  - intelligent TwinSAFE safety functions

Technical data	AX5160	AX5172	AX5190	AX5191	AX5192	AX5193
Rated output current at 40 °C (3-phase connection)	60 A	72 A	90 A	110 A	143 A	170 A
Rated supply voltage	3 x 400...480 V AC ±10 %					
DC-Link voltage	max. 890 V DC					
Peak output current <sup>(1)</sup>	120 A	144 A	135 A	165 A	215 A	221 A
Rated apparent power for S1 operation 400 V (only 3-phase connection)	42.0 kVA	50.0 kVA	62.0 kVA	76.0 kVA	99.0 kVA	118.0 kVA
Braking power	external					
Power loss <sup>(2)</sup>	830 W	1010 W	1300 W	1600 W	2100 W	2500 W
System bus	EtherCAT					
Weight	13.0 kg	13.0 kg	28.0 kg	28.0 kg	32.0 kg	32.0 kg
Further information	www.beckhoff.com/AX5160					

<sup>(1)</sup>RMS for max. 3 seconds, <sup>(2)</sup>S1 operation, incl. power supply, without brake chopper

Dimensions	AX5160	AX5172	AX5190	AX5191	AX5192	AX5193
Height without connectors	345 mm	345 mm	540 mm	540 mm	540 mm	540 mm
Width	190 mm	190 mm	280 mm	280 mm	280 mm	280 mm
Depth without connectors	240 mm	240 mm	242 mm	242 mm	322 mm	322 mm

Ordering information	AX51xx
AX5160	Digital Compact Servo Drive, 1-axis module, 3 x 400...480 V AC, rated output current 60 A, EtherCAT interface
AX5172	Digital Compact Servo Drive, 1-axis module, 3 x 400...480 V AC, rated output current 72 A, EtherCAT interface
AX5190	Digital Compact Servo Drive, 1-axis module, 3 x 400...480 V AC, rated output current 90 A, EtherCAT interface
AX5191	Digital Compact Servo Drive, 1-axis module, 3 x 400...480 V AC, rated output current 110 A, EtherCAT interface
AX5192	Digital Compact Servo Drive, 1-axis module, 3 x 400...480 V AC, rated output current 143 A, EtherCAT interface
AX5193	Digital Compact Servo Drive, 1-axis module, 3 x 400...480 V AC, rated output current 170 A, EtherCAT interface

Mains filter, mains choke and brake resistor must be ordered separately.

**i** For availability status see Beckhoff website at: [www.beckhoff.com/AX5160](http://www.beckhoff.com/AX5160)





AX5901 |  
Power supply  
module



AX5911/AX5912 |  
Power distribution  
module

## Accessories for AX5xxx Servo Drives

### AX5000 | Options and accessories

#### Generative energy

In dynamic multi-axis applications, excessive DC-Link voltages may occur due to alternate acceleration and deceleration of the drive axes. This brake energy can either be dissipated or converted. For the AX5000, a number of optional modules are available for dealing with this task.

#### AX5001 | DC-Link expansion

Through expansion of the capacitor capacity of the DC-Link, brake energy can be stored and reused for the next acceleration process. Connection of the expansion module with the multi-axis system is straightforward via the AX-Bridge module. The integrated EtherCAT interface enables parameterisation and diagnosis via the TwinCAT System Manager.

#### AX5021 | Brake module

The brake module consists of an internal braking resistor with a continuous output of 250 W, forced cooling and a brake chopper. An external braking resistor with a continuous output of 6 kW can be connected to the brake chopper. Installation outside the control cabinet avoids additional heat generation within the cabinet. The cold plate design of the heat sink enables installation on water-cooled plates. Connection of the brake module with the multi-axis system is straightforward via the AX-Bridge module. The integrated EtherCAT interface enables parameterisation and diagnosis via the System Manager.

#### AX504x | Energy recovery modules

Through connection of an energy recovery module with integrated mains inverter, brake energy can be fed back directly into the supply network. The energy recovery module is connected to the DC-Link of the AX-Bridge. The integrated EtherCAT interface enables parameterisation and diagnosis via the TwinCAT System Manager. At the same time, the energy balance can be documented.

#### AX-Bridge quick connection system

The AX-Bridge quick connection system enables simple and fast connection of several AX5000 devices to form a multi-axis system. The plug-gable supply and connection module combines power supply, DC-Link and 24 V DC control and braking voltage.

#### AX5901 | Power supply module

- supply module with snap-on connection for the AX5000
- connection of supply or DC-Link voltage and 24 V DC for control and brake energy

#### AX5911/AX5912 | Power distribution module

- clip-on quick connection system for power supply, DC-Link and control voltage
- connection module for multi-axis system with integrated power rails
- current carrying capacity of the power rails up to 85 A according to UL
- simple, wireless connection of several Servo Drives
- fast installation and commissioning

## Options

Ordering information	AX5xxx   Options	Pict.
AX5001-0000	DC-Link expansion module and 24 V DC power management	
AX5021-0000	ballast unit with internal braking resistor and connection option for an external ballast resistor (up to 6 kW)	
AX504x-0000	energy recovery module	
AX5701-0000	encoder option card: one additional encoder input TTL/1 V <sub>PP</sub> /BiSS, Hiperface, EnDAT (only for AX51xx)	
AX5702-0000	encoder option card: one additional encoder input TTL/1 V <sub>PP</sub> /BiSS, Hiperface, EnDAT (only for AX52xx)	A
AX5801-0000	TwinSAFE drive option card: safe restart lock, STO, SS1	B
AX5805-0000	TwinSAFE drive option card: STO, SS1, SS2, SOS, SLS, SDI	
AX5901-000x	AX-Bridge power supply module for connection of supply or DC-Link voltage and 24 V DC for control and brake energy (pluggable) (AX5x01...AX5125)	C
AX5911-000x	AX-Bridge power distribution module, quick connection system for power supply, DC-Link and control voltage (pluggable), for AX5x01...AX5112	D
AX5912-000x	AX-Bridge power distribution module, quick connection system for power supply, DC-Link and control voltage (pluggable), for AX5118 and AX5125	E

Option x = 0: CE version, x = 1: UL version with additional fuses

**i** For availability status see Beckhoff website at: [www.beckhoff.com/AX5000](http://www.beckhoff.com/AX5000)



## Connectors for AX5000 Servo Drive

Ordering information	ZS4500-20xx   Connectors	Pict.
ZS4500-2001	X01 mains input connector, 4-pin socket, AX5101-AX5125 (included in the scope of the AX5000 supply), max. 6 mm <sup>2</sup>	A
ZS4500-2002	X02 DC-Link connector, 2-pin socket (included in the scope of the AX5000 supply), max. 6 mm <sup>2</sup>	B
ZS4500-2003	X03 24 V DC supply connector, 3-pin socket (included in the scope of the AX5000 supply), max. 6 mm <sup>2</sup>	C
ZS4500-2006	X06 BLIO connector, single row without LED (included in the scope of the AX5000 supply), max. 1.5 mm <sup>2</sup>	D
ZS4500-2007	X06 BLIO connector, single row with LED, max. 1.5 mm <sup>2</sup>	E
ZS4500-2008	X06 BLIO connector, triple-row with LED, max. 1.5 mm <sup>2</sup>	F
ZS4500-2010	plug kit: X01, X02, X03, X06 (included in the scope of the AX5000 supply)	
ZS4500-2011	encoder connector X11/X21, D-Sub, 15-pin with enclosure	G
ZS4500-2012	resolver socket X12/X22, D-Sub, 15-pin with enclosure	H
ZS4500-2013	motor connector plug X13/X23, 4-pin, 2.5 mm <sup>2</sup> , with shroud, up to 25 A, max. 6 mm <sup>2</sup>	I
ZS4500-2014	connector X14/X24, 5-pin, motor brake and thermal protection contact, max. 1.5 mm <sup>2</sup>	J



## Connectors for Servomotors AMxxxx, ALxxxx and cables

Ordering information	ZS4000-20yy   Connectors	Pict.
ZS4000-2010	EMC power connector for servo cable (counterpart for motor box), BG1, up to winding code P (18 A)	A
ZS4000-2011	EMC power connector for servo cable (counterpart for motor box), BG1.5, for winding code Q (25 A)	B
ZS4000-2020	EMC resolver connector for resolver cable (counterpart for motor box)	C
ZS4000-2021	EMC encoder connector for encoder cable (counterpart for motor box)	D
ZS4000-2030	EMC thermo-protective male connector for thermo-protective wire, D-sub, 9-pin, with housing, straight	E
ZS4000-2040	EMC power coupling, counterpart for motor cable, BG1	F
ZS4000-2041	EMC power coupling, counterpart for motor cable, BG1.5	G
ZS4000-2050	EMC resolver coupling, counterpart for resolver cable	H
ZS4000-2051	EMC encoder coupling for servomotors, counterpart for encoder cable	I
ZS4000-2060	resolver female socket, angled 90°, for AM2000	J
ZS4000-2061	encoder female socket, angled 90°, for AM2000	K
ZS4000-2062	resolver female encoder, rotatable, angled 90°, for AM3000	L
ZS4000-2063	encoder female encoder, rotatable, angled 90°, for AM3000	M
ZS4000-2070	power female socket, angled 90°, for AM2000	N
ZS4000-2071	power female socket, rotatable, angled 90°, for AM3000, BG1, up to winding code P (18 A)	N
ZS4000-2072	power female socket, rotatable, angled 90°, for AM3000, BG1.5, for winding code Q (25 A)	O
ZS4000-2080	resolver female socket, straight, for AM2000	P
ZS4000-2081	encoder female socket, straight, for AM2000	Q
ZS4000-2090	power female socket, straight, for AM2000	R
ZS4000-2100	metal flange for motor cable to adjust the connector, two parts with sealing	S
ZS4000-2101	metal flange for feedback cable to adjust the connector, two parts with sealing	T



## EtherCAT patch cable

Ordering information	ZK1090-9191-0xxx   EtherCAT patch cable
ZK1090-9191-0001	EtherCAT bridge AX5201 to AX5112, length 0.17 m
ZK1090-9191-0002	EtherCAT bridge AX5118-AX5140, length 0.26 m
ZK1090-9191-0005	EtherCAT patch cable, length 0.5 m
ZK1090-9191-0010	EtherCAT patch cable, length 1.0 m
ZK1090-9191-0020	EtherCAT patch cable, length 2.0 m
ZK1090-9191-0030	EtherCAT patch cable, length 3.0 m
ZK1090-9191-0050	EtherCAT patch cable, length 5.0 m
ZK1090-9191-0100	EtherCAT patch cable, length 10.0 m

## AX5000 mains filter

Ordering information	AX2090-NF50-0xxx   Mains filter
AX2090-NF50-0014	mains filter C2 for AX5000 Servo Drives up to 14.6 A
AX2090-NF50-0032	mains filter C2 for AX5000 Servo Drives up to 32.8 A
AX2090-NF50-0063	mains filter C2 for AX5160 Servo Drives up to 63 A
AX2090-NF50-0100	mains filter C2/C3 for AX5172/AX5190 Servo Drives up to 100 A
AX2090-NF50-0150	mains filter C2/C3 for AX5191/AX5192 Servo Drives up to 150 A
AX2090-NF50-0180	mains filter C2/C3 for AX5193 Servo Drives up to 180 A

## AX5000 mains chokes

Ordering information	AX2090-ND50-00xx   Mains choke
AX2090-ND50-0060	mains choke U <sub>k</sub> 2 % for AX5160 Servo Drive
AX2090-ND50-0072	mains choke U <sub>k</sub> 2 % for AX5172 Servo Drive
AX2090-ND50-0090	mains choke U <sub>k</sub> 2 % for AX5190 Servo Drive
AX2090-ND50-0110	mains choke U <sub>k</sub> 2 % for AX5191 Servo Drive
AX2090-ND50-0143	mains choke U <sub>k</sub> 2 % for AX5192 Servo Drive
AX2090-ND50-0170	mains choke U <sub>k</sub> 2 % for AX5193 Servo Drive

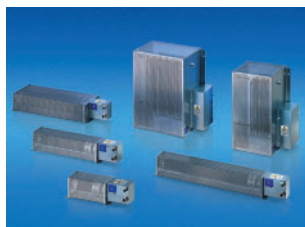
## AX5000 ballast resistors

Ordering information	AX2090-BW5x-xx00   Ballast resistors
AX2090-BW50-0300	external ballast resistor for AX5x01 to AX5112 (stand-alone), 300 W/47 Ω
AX2090-BW50-0600	external ballast resistor for AX5x01 to AX5112 (stand-alone), 600 W/47 Ω
AX2090-BW50-1600	external ballast resistor for AX5x01 to AX5112 (stand-alone), 1600 W/47 Ω
AX2090-BW51-1000	external ballast resistor for AX5118-AX5193 (stand-alone) and AX5021, 1000 W/23 Ω
AX2090-BW51-3000	external ballast resistor for AX5118-AX5193 (stand-alone) and AX5021, 3000 W/23 Ω
AX2090-BW51-6000	external ballast resistor for AX5118-AX5193 (stand-alone) and AX5021, 6000 W/23 Ω

Recommended interface cables:

for AX2090-BW50-xxxx = ZK4509-0003-xxxx

for AX2090-BW51-xxxx = ZK4509-0004-xxxx



## AX5000 motor chokes

Ordering information	AX2090-MD50-00xx   Motor chokes
AX2090-MD50-0012	motor choke for AX5000, motor cable > 25 m, up to 12 A rated current
AX2090-MD50-0025	motor choke for AX5000, motor cable > 25 m, up to 25 A rated current



## Motor cables 1.5 mm<sup>2</sup> for AL2000/AM2000/AM3000/AM3500 at AX5x01 to AX5112 (1.5 A to 12 A)

Ordering information	Motor cable with 1.5 mm <sup>2</sup> wire cross-section, fixed installation	Pict.
ZK4500-0003-xxxx	cables for fixed installation with 50,000 bending cycles, max. 180 m/min, max. 5 m/s <sup>2</sup> , min. bending radius = 200 mm (18 x OD), 4 x 1.5 + 2 x (2 x 0.75 mm <sup>2</sup> ), length < 25 m	A
ZK4500-0003-0050	example for 5 m length	
ZK4502-0003-xxxx	length ≥ 25 m	
ZK4509-0003-xxxx	not assembled	
ZK4501-0003-xxxx	cable extension	B
ZK4500-0211-xxxx	motor cable with yTec plug for AM301x-xxxx-0005, 4 x 0.75 mm <sup>2</sup> , dynamic, suitable as trailing cable (5 million bending cycles), max. 180 m/min, max. 5 m/s <sup>2</sup> , min. bending radius = 97 mm (10 x OD), max. chain length horizontal 20 m, vertical 5 m	



Ordering information	Motor cable with 1.5 mm <sup>2</sup> wire cross-section, highly flexible, suitable as trailing cable	Pict.
ZK4500-0023-xxxx	highly dynamic, suitable as trailing cable (10 million bending cycles), max. 240 m/min, max. 30 m/s <sup>2</sup> , min. bending radius = 85 mm (7 x OD), max. chain length horizontal 20 m, vertical 5 m, 4 x 1.5 + 2 x (2 x 0.75 mm <sup>2</sup> ), length < 25 m	C
ZK4500-0023-0050	example for 5 m length	
ZK4502-0023-xxxx	length ≥ 25 m	
ZK4509-0023-xxxx	not assembled	
ZK4501-0023-xxxx	cable extension	D



## Motor cables 2.5 mm<sup>2</sup> for AM2000/AM3000 (up to winding code "P")/AM3500 at AX5118 (18 A)

Ordering information	Motor cable with 2.5 mm <sup>2</sup> wire cross-section, fixed installation	Pict.
ZK4500-0004-xxxx	cables for fixed installation with 50,000 bending cycles, max. 180 m/min, max. 5 m/s <sup>2</sup> , min. bending radius = 240 mm (18 x OD), 4 x 2.5 + 2 x (2 x 1 mm <sup>2</sup> ), length < 25 m	E
ZK4500-0004-0050	example for 5 m length	
ZK4502-0004-xxxx	length ≥ 25 m	
ZK4509-0004-xxxx	not assembled	
ZK4501-0004-xxxx	cable extension	F



Ordering information	Motor cable with 2.5 mm <sup>2</sup> wire cross-section, highly flexible, suitable as trailing cable	Pict.
ZK4500-0024-xxxx	highly dynamic, suitable as trailing cable (10 million bending cycles), max. 240 m/min, max. 30 m/s <sup>2</sup> , bending radius = 100 mm (7 x OD), max. chain length horizontal 20 m, vertical 5 m, 4 x 2.5 + 2 x (2 x 1 mm <sup>2</sup> ), length < 25 m	G
ZK4500-0024-0050	example for 5 m length	
ZK4502-0024-xxxx	length ≥ 25 m	
ZK4509-0024-xxxx	not assembled	
ZK4501-0024-xxxx	cable extension	H



## Motor cables 4 mm<sup>2</sup> for AM3000 (winding code "Q") at AX5125 (25 A)

Ordering information	Motor cable with 4 mm <sup>2</sup> wire cross-section, flexible	Pict.
ZK4500-0015-xxxx	dynamic, suitable as trailing cable (10 million bending cycles), max. 180 m/min, max. 5 m/s <sup>2</sup> , bending radius = 150 mm (10 x OD), 4 x 4 + 2 x 1 + (2 x 1.5 mm <sup>2</sup> ), length < 25 m	I
ZK4500-0015-0050	example for 5 m length	
ZK4502-0015-xxxx	length ≥ 25 m	
ZK4509-0015-xxxx	not assembled	
ZK4501-0015-xxxx	cable extension	J



## Motor cables, not assembled, for higher performance

Ordering information	Motor cable for Servo Drives from AX5125
ZK4509-0016-0xxx	6 mm <sup>2</sup> , for AX5125, flexible, suitable as trailing cable with 10 million bending cycles
ZK4509-0017-0xxx	10 mm <sup>2</sup> , for AX5140, flexible, suitable as trailing cable with 10 million bending cycles
ZK4509-0018-0xxx	16 mm <sup>2</sup> , for AX5172, flexible, suitable as trailing cable with 10 million bending cycles
ZK4509-0019-0xxx	25 mm <sup>2</sup> , for AX5190, flexible, suitable as trailing cable with 10 million bending cycles
ZK4509-0019-1xxx	35 mm <sup>2</sup> , for AX5191, flexible, suitable as trailing cable with 10 million bending cycles
ZK4509-0019-2xxx	50 mm <sup>2</sup> , for AX5192, flexible, suitable as trailing cable with 10 million bending cycles

## Absolute encoder cables AL2xxx/AM3xxx to AX5000

Ordering information	Encoder cable with 7 x 2 x 0.14 + 2 x 0.5 mm <sup>2</sup> wire cross-section	Pict.
ZK4510-0000-xxxx	cables for fixed installation with 50,000 bending cycles, max. 180 m/min, max. 5 m/s <sup>2</sup> , min. bending radius = 140 mm (18 x OD)	A
ZK4510-0000-0050	example for 5 m length	
ZK4511-0000-xxxx	extension cable for fixed installation	B
ZK4519-0000-xxxx	not assembled	
ZK4510-0020-xxxx	highly flexible, suitable as trailing cable (10 million bending cycles), max. 240 m/min, max. 30 m/s <sup>2</sup> , min. bending radius = 55 mm (7 x OD), max. chain length: horizontal = 20 m, vertikal = 5 m	A
ZK4510-0020-0050	example for 5 m length	
ZK4511-0020-xxxx	extension cable, highly dynamic, suitable as trailing cable	B
ZK4519-0020-xxxx	not assembled	
ZK4510-0210-xxxx	dynamic encoder cable with yTec plug, 4 x 2 x 0.25 mm <sup>2</sup>	



## Resolver cable AM2000/AM3000/AM3500 to AX5000

Ordering information	Resolver cable with 4 x 2 x 0.25 mm <sup>2</sup> wire cross-section	Pict.
ZK4530-0010-xxxx	dynamic, suitable as trailing cable (10 million bending cycles), max. 120 m/min, max. 4 m/s <sup>2</sup> , bending radius = 75 mm (10 x OD)	C
ZK4530-0010-0050	example for 5 m length	
ZK5431-0010-xxxx	extension cable	D
ZK4539-0010-xxxx	not assembled	
ZK4530-0210-xxxx	resolver cable with yTec plug for AM301x-xxxx-0005	



## Connector box encoder cables AL2250 to AX5000

Ordering information	Encoder cable with 7 x 2 x 0.14 + 2 x 0.5 mm <sup>2</sup> wire cross-section
ZK4520-0020-xxxx	highly flexible, suitable as trailing cable (10 million bending cycles), max. 240 m/min, max. 30 m/s <sup>2</sup> , min. bending radius 55 mm (7 x OD), max. chain length: horizontal = 20 m, vertical = 5 m, for connection of the connector box AL2250-0001 to AX5000 for encoder with zero pulse

## Absolute encoder cables AM2xxx to AX5000

Ordering information	Encoder cable with 7 x 2 x 0.14 + 2 x 0.5 mm <sup>2</sup> wire cross-section
ZK4510-0120-xxxx	highly flexible, suitable as trailing cable (10 million bending cycles), max. 240 m/min, max. 30 m/s <sup>2</sup> , min. bending radius = 55 mm (7 x OD), max. chain length: horizontal = 20 m, vertical = 5 m
ZK4510-0120-0050	example for 5 m length
ZK4519-0120-xxxx	not assembled



## Thermal protection cables ALxxxx to AX5000

Ordering information	Thermal protection cables with 4 x 0.14 mm <sup>2</sup> wire cross-section
ZK4540-0020-xxxx	thermal protection cable, highly flexible, suitable as trailing cable, assembled at both ends, 4 x 0.14 mm <sup>2</sup> , 10 million bending cycles, max. 240 m/min, max. 30 m/s <sup>2</sup> , min. bending radius = 55 mm (7 x OD)



## Documentation

Ordering information	TDmlAX-5000-0000-0200   Documentation
TDmlAX-5000-0000-0200	AX5000 commissioning and installation manual

**i** For availability status see Beckhoff website at: [www.beckhoff.com/DriveTechnology](http://www.beckhoff.com/DriveTechnology)



# Servo Drives AX2000, AX2500

Digital Compact Servo Drives





### Fully digital Servo Drives as an intelligent backbone

Servo Drives from the AX2000/AX2500 series are integrated as components of drive systems in electrical equipment or machines. The devices drive the brushless Synchronous Servomotors AM2000 and Linear Servomotors AL2000 with regulation of torque, speed or position.

The digital Servo Drives are available in two versions. The AX2000 series is a powerful variant with Servo Drives designed for nominal current of up to 70/80 A. The AX2500 series Servo Drives are modularly expandable and optimised for applications where space is tight. The maximum nominal current is 6 A. Both series are fully software-compatible among each other and are integrated in the TwinCAT control software.

#### Servo Drive AX2000

The standard versions of the Servo Drives AX2000 are available in six current ratings. Interference suppression filters are integrated into the power feeds for operation directly from the mains up to AX2020, as are suppression filters for the 24 V auxiliary voltage supply. The digital Servo Drives offer a large number of convenient functions. These include adjustable setvalue ramps, two analog monitor outputs, four program-

mable digital inputs (two of which are defined, as standard, as limit switch inputs) and two digital outputs. The Servo Drive can optionally be fitted with a start-up lock for personnel safety. It prevents the drive from starting again even though the electrical power is present. The main circuit can therefore remain live. The start-up lock has been approved by the responsible professional association.

Integrated safety is also strongly emphasised. In the Servo Drives, the electrically secure isolation is in accordance with EN 50178 between the mains or motor connections. The electronics signal is achieved with appropriate "creepage" paths and complete potential separation. Further integrated functions offer soft starting, overvoltage detection, short-circuit protection and phase failure monitoring.

#### Servo Drive AX2500

The AX2500 series is integrated into the Beckhoff modular drive concept as an extension of the AX2000 Servo Drive series. The AX2500 Servo Drives are fully software compatible with the AX2000 and provide maximum output in the smallest space. In its maximum configuration the multi-axis system comprises eight axes, i.e. a master module with seven axis modules. The master

module contains power supply unit, mains filter for power and auxiliary voltage, ballast circuit and resistor as well as a power output stage and can also be operated stand-alone. The subsequent additional axis modules are simply plugged directly into the master module and are connected in the intermediate DC circuit via a socket strip.



## AX20xx | Digital Compact Servo Drives

The Digital Servo Drives combine the most modern power electronics with a compact practical size. The characteristics such as small dimensions, integrated EMC filters up to AX2020 and plug-in connectors allow simple and cheap installation into control cabinets.

An internal 32 bit micro-processor provides high quality

control, with sampling times down to 62  $\mu$ s. The variable fieldbus connection permits easy integration into a variety of control environments: EtherCAT, PROFIBUS, SERCOS interface, CANopen, DeviceNet, real-time Ethernet and Lightbus. Together with the Synchronous Servo-motors of the AM2xxx, AM3xxx and AL2xxx/AL3800 series,

the Compact Servo Drives offer an ideally matching digital drive system.

### Features

- The integrated encoder and resolver interfaces allow the connection of a resolver or a high-resolution single- or multi-turn sine cosine encoder as a feedback unit.

- compliance with all relevant standards: CE, UL, cUL
- direct to grounded 3-phase mains, 230 V<sup>-10 %</sup>...480 V<sup>+10 %</sup>, 50 Hz; 208 V<sup>-10 %</sup>...480 V<sup>+10 %</sup>, 60 Hz
- integrated mains filter up to 20 A
- all shielding connections directly on the amplifier

Technical data	AX2003	AX2006	AX2010	AX2020	AX2040	AX2070
Rated output current	3 A	6 A	10 A	20 A	40 A	70 A/80 A
Rated supply voltage	3 x (230...480) V AC $\pm$ 10 %, 50...60 Hz					
Rated intermediate circuit DC voltage	(310...675) V DC					
Rated output current (rms value $\pm$ 3 %)	3 A <sub>rms</sub>	6 A <sub>rms</sub>	10 A <sub>rms</sub>	20 A <sub>rms</sub>	40 A <sub>rms</sub>	70 A <sub>rms</sub> /80 A <sub>rms</sub>
Peak output current (max. approx. 5 s $\pm$ 3 %)	6 A <sub>rms</sub>	12 A <sub>rms</sub>	20 A <sub>rms</sub>	40 A <sub>rms</sub>	80 A <sub>rms</sub>	140 A <sub>rms</sub> /160 A <sub>rms</sub>
Rated connected load for S1 operation	2 kVA	4.2 kVA	7 kVA	14 kVA	30 kVA	50 kVA
Continuous output of regen circuit (RBint)	80 W	200 W	200 W	200 W	–	–
Continuous output of regen circuit (RBext) max.	500 W	1.5 kW	1.5 kW	1.5 kW	6 kW	6 kW
Weight	4.0 kg	4.0 kg	5.0 kg	7.5 kg	19.5 kg	21 kg
Further information	www.beckhoff.com/AX20xx					

Dimensions	AX2003	AX2006	AX2010	AX2020	AX2040	AX2070
Height without connectors	275 mm	275 mm	275 mm	275 mm	495 mm	495 mm
Width	70 mm	70 mm	70 mm	120 mm	250 mm	250 mm
Depth without connectors	265 mm	265 mm	265 mm	265 mm	300 mm	300 mm

- Intermediate circuits can be connected in parallel with ballast distribution.
- programmable via RS232 interface
- CANopen interface on board
- 2-key operation directly at the amplifier with status information on LED display
- optional: restart lock (AS)

## Servo Drives with fieldbus interface AX2000-Bxxx

Ordering information	AX20xx-xxxx-000z
AX2003-0000-000z	Digital Compact Servo Drive, rated output current 3 A (CANopen interface on-board)
AX2006-0000-000z	Digital Compact Servo Drive, rated output current 6 A (CANopen interface on-board)
AX2010-0000-000z	Digital Compact Servo Drive, rated output current 10 A (CANopen interface on-board)
AX2020-0000-000z	Digital Compact Servo Drive, rated output current 20 A (CANopen interface on-board)
AX2040-0000-0001	Digital Compact Servo Drive, rated output current 40 A (CANopen interface on-board)
AX2070-0000-0001	Digital Compact Servo Drive, rated output current 70 A/80 A (CANopen interface on-board)
AX2003-B110-000z	Digital Compact Servo Drive, rated output current 3 A, EtherCAT interface
AX2006-B110-000z	Digital Compact Servo Drive, rated output current 6 A, EtherCAT interface
AX2010-B110-000z	Digital Compact Servo Drive, rated output current 10 A, EtherCAT interface
AX2020-B110-000z	Digital Compact Servo Drive, rated output current 20 A, EtherCAT interface
AX2040-B110-0001	Digital Compact Servo Drive, rated output current 40 A, EtherCAT interface
AX2070-B110-0001	Digital Compact Servo Drive, rated output current 70 A/80 A, EtherCAT interface
AX2003-B200-000z	Digital Compact Servo Drive, rated output current 3 A, Lightbus interface
AX2006-B200-000z	Digital Compact Servo Drive, rated output current 6 A, Lightbus interface
AX2010-B200-000z	Digital Compact Servo Drive, rated output current 10 A, Lightbus interface
AX2020-B200-000z	Digital Compact Servo Drive, rated output current 20 A, Lightbus interface
AX2040-B200-0001	Digital Compact Servo Drive, rated output current 40 A, Lightbus interface
AX2070-B200-0001	Digital Compact Servo Drive, rated output current 70 A/80 A, Lightbus interface
AX2003-B310-000z	Digital Compact Servo Drive, rated output current 3 A, PROFIBUS DP interface
AX2006-B310-000z	Digital Compact Servo Drive, rated output current 6 A, PROFIBUS DP interface
AX2010-B310-000z	Digital Compact Servo Drive, rated output current 10 A, PROFIBUS DP interface
AX2020-B310-000z	Digital Compact Servo Drive, rated output current 20 A, PROFIBUS DP interface
AX2040-B310-0001	Digital Compact Servo Drive, rated output current 40 A, PROFIBUS DP interface
AX2070-B310-0001	Digital Compact Servo Drive, rated output current 70 A/80 A, PROFIBUS DP interface
AX2003-B520-000z	Digital Compact Servo Drive, rated output current 3 A, DeviceNet interface
AX2006-B520-000z	Digital Compact Servo Drive, rated output current 6 A, DeviceNet interface
AX2010-B520-000z	Digital Compact Servo Drive, rated output current 10 A, DeviceNet interface
AX2020-B520-000z	Digital Compact Servo Drive, rated output current 20 A, DeviceNet interface
AX2040-B520-0001	Digital Compact Servo Drive, rated output current 40 A, DeviceNet interface
AX2070-B520-0001	Digital Compact Servo Drive, rated output current 70 A/80 A, DeviceNet interface
AX2003-B750-000z	Digital Compact Servo Drive, rated output current 3 A, SERCOS interface
AX2006-B750-000z	Digital Compact Servo Drive, rated output current 6 A, SERCOS interface
AX2010-B750-000z	Digital Compact Servo Drive, rated output current 10 A, SERCOS interface
AX2020-B750-000z	Digital Compact Servo Drive, rated output current 20 A, SERCOS interface
AX2040-B750-0001	Digital Compact Servo Drive, rated output current 40 A, SERCOS interface
AX2070-B750-0001	Digital Compact Servo Drive, rated output current 70 A/80 A, SERCOS interface
AX2003-B900-000z	Digital Compact Servo Drive, rated output current 3 A, Ethernet interface
AX2006-B900-000z	Digital Compact Servo Drive, rated output current 6 A, Ethernet interface
AX2010-B900-000z	Digital Compact Servo Drive, rated output current 10 A, Ethernet interface
AX2020-B900-000z	Digital Compact Servo Drive, rated output current 20 A, Ethernet interface
AX2040-B900-0001	Digital Compact Servo Drive, rated output current 40 A, Ethernet interface
AX2070-B900-0001	Digital Compact Servo Drive, rated output current 70 A/80 A, Ethernet interface

Option z = 0: without restart lock, z = 1: with restart lock

Accessories see page 1129



## AX25xx | Digital Compact Servo Drives

The AX2500 series is a modular drive system. The AX2500 Servo Drives are fully software-compatible with the AX2000. In its maximum configuration, the multi-axis system comprises eight axes, i.e. a supply module with seven axis modules. The supply module comprises a

power supply, a mains filter for power and auxiliary voltage, a ballast circuit and resistor and a power output stage. The following axis modules are simply plugged directly onto the supply module and connected with each other in the intermediate DC circuit via a socket strip, which

is also used for looping through the 24 V DC auxiliary voltage. This provides the user with a very compact, cost-optimised servo system, which is flexibly adaptable to the respective requirements. Compared with single axes, the wiring and commissioning effort is reduced sig-

nificantly. The modular concept also minimises possible sources of error.

The variable fieldbus connection enables simple integration into various control worlds: PROFIBUS DP, SERCOS interface, CANopen, real-time Ethernet and Lightbus. The AX2500 Servo

Technical data	AX2503	AX2506	AX2513	AX2516	AX2523	AX2526
Function	master module	master module	master module	master module	axis module	axis module
Rated output current	3 A	6 A*	3 A	6 A*	3 A	6 A*
Rated supply voltage	1 x 115...1/3 x 230 V AC ±10 %, 50...60 Hz	1 x 115...1/3 x 230 V AC ±10 %, 50...60 Hz	3 x (230...400) V AC ±10 %, 50...60 Hz	3 x (230...400) V AC ±10 %, 50...60 Hz	–	–
Rated intermediate circuit DC voltage	(160...310) V DC	(160...310) V DC	(310...560) V DC	(310...560) V DC	(160...560) V DC	(160...560) V DC
Rated output current (rms value ±3 %)	3 A <sub>rms</sub>	6 A <sub>rms</sub> *	3 A <sub>rms</sub>	6 A <sub>rms</sub> *	3 A <sub>rms</sub>	6 A <sub>rms</sub> *
Peak output current (max. approx. 5 s ±3 %)	9 A <sub>rms</sub>	12 A <sub>rms</sub> *	9 A <sub>rms</sub>	12 A <sub>rms</sub> *	9 A <sub>rms</sub>	12 A <sub>rms</sub> *
Maximum installed power for S1 operation, multi-axis systems	7 kVA	7 kVA	12 kVA	12 kVA	–	–
Continuous output of regen circuit (RBint)	40 W	40 W	40 W	40 W	–	–
Further information	www.beckhoff.com/AX25xx					

Dimensions	AX2503	AX2506	AX2513	AX2516	AX2523	AX2526
Height without connectors	230 mm	267 mm*	230 mm	267 mm*	230 mm	267 mm*
Width	100 mm	100 mm	100 mm	100 mm	50 mm	50 mm
Depth without connectors	240 mm					

\*with attached fan

Drive can be used for motors with resolver or with single-turn/multi-turn absolute encoder. The operation of linear and asynchronous motors is also possible. Ready-made motor and feedback lines are offered as accessories.

#### Features

- mains connection
- mains filter included centrally in the supply module
- compliance with all relevant standards: CE, UL, cUL
- screened connections directly at the AX2500

- 24 V DC connection
- enable connection
- RS232 connection
- intermediate circuit coupling for all axes via socket strip
- BTB ("ready for operation") contact
- device-dependent supply voltage:  
1 x/3 x 115 V AC...230 V AC for supply module  
AX2503/AX2506,  
3 x 230 V AC...400 V AC for supply module  
AX2513/AX2516
- Earth-free operation is acceptable.
- simple mechanical mounting via DIN rails
- only two different housing widths for supply module/axis module 100 mm/50 mm
- mounting on DIN rail for 300 mm control cabinets

## Servo Drives with fieldbus interface AX2500-Bxxx

Ordering information	AX25xx-Bxxx-0000
AX2503-B200-0000	master module, 115 V...230 V, rated output current 3 A, Lightbus interface
AX2506-B200-0000	master module, 115 V...230 V, rated output current 6 A*, Lightbus interface
AX2513-B200-0000	master module, 230 V...400 V, rated output current 3 A, Lightbus interface
AX2516-B200-0000	master module, 230 V...400 V, rated output current 6 A*, Lightbus interface
AX2523-B200-0000	axis module, rated output current 3 A, Lightbus interface
AX2526-B200-0000	axis module, rated output current 6 A*, Lightbus interface
AX2503-B310-0000	master module, 115 V...230 V, rated output current 3 A, PROFIBUS DP interface
AX2506-B310-0000	master module, 115 V...230 V, rated output current 6 A*, PROFIBUS DP interface
AX2513-B310-0000	master module, 230 V...400 V, rated output current 3 A, PROFIBUS DP interface
AX2516-B310-0000	master module, 230 V...400 V, rated output current 6 A*, PROFIBUS DP interface
AX2523-B310-0000	axis module, rated output current 3 A, PROFIBUS DP interface
AX2526-B310-0000	axis module, rated output current 6 A*, PROFIBUS DP interface
AX2503-B510-0000	master module, 115 V...230 V, rated output current 3 A, CANopen interface
AX2506-B510-0000	master module, 115 V...230 V, rated output current 6 A*, CANopen interface
AX2513-B510-0000	master module, 230 V...400 V, rated output current 3 A, CANopen interface
AX2516-B510-0000	master module, 230 V...400 V, rated output current 6 A*, CANopen interface
AX2523-B510-0000	axis module, rated output current 3 A, CANopen interface
AX2526-B510-0000	axis module, rated output current 6 A*, CANopen interface
AX2503-B750-0000	master module, 115 V...230 V, rated output current 3 A, SERCOS interface
AX2506-B750-0000	master module, 115 V...230 V, rated output current 6 A*, SERCOS interface
AX2513-B750-0000	master module, 230 V...400 V, rated output current 3 A, SERCOS interface
AX2516-B750-0000	master module, 230 V...400 V, rated output current 6 A*, SERCOS interface
AX2523-B750-0000	axis module, rated output current 3 A, SERCOS interface
AX2526-B750-0000	axis module, rated output current 6 A*, SERCOS interface
AX2503-B900-0000	master module, 115 V...230 V, rated output current 3 A, Ethernet interface
AX2506-B900-0000	master module, 115 V...230 V, rated output current 6 A*, Ethernet interface
AX2513-B900-0000	master module, 230 V...400 V, rated output current 3 A, Ethernet interface
AX2516-B900-0000	master module, 230 V...400 V, rated output current 6 A*, Ethernet interface
AX2523-B900-0000	axis module, rated output current 3 A, Ethernet interface
AX2526-B900-0000	axis module, rated output current 6 A*, Ethernet interface

\*with attached fan

Servo Drives with DeviceNet interface on request

Accessories see page 1129

# AX2xxx accessories

## Motor cables ALxxxx/AMxxxx to AX2000

Ordering information	ZK4000-21y1-2zzz   Motor cable with 1.5 mm <sup>2</sup> cross-cut (up to AX2010)
ZK4000-2111-2050	motor cable, assembled at both ends for AX2000 Servo Drive, 4 x 1.5 mm <sup>2</sup> + 2 x 1 mm <sup>2</sup> , l= 5 m
ZK4000-2111-2100	motor cable, assembled at both ends for AX2000 Servo Drive, 4 x 1.5 mm <sup>2</sup> + 2 x 1 mm <sup>2</sup> , l= 10 m
ZK4000-2111-2150	motor cable, assembled at both ends for AX2000 Servo Drive, 4 x 1.5 mm <sup>2</sup> + 2 x 1 mm <sup>2</sup> , l= 15 m
ZK4000-2111-2200	motor cable, assembled at both ends for AX2000 Servo Drive, 4 x 1.5 mm <sup>2</sup> + 2 x 1 mm <sup>2</sup> , l= 20 m
ZK4000-2111-2250	motor cable, assembled at both ends for AX2000 Servo Drive, 4 x 1.5 mm <sup>2</sup> + 2 x 1 mm <sup>2</sup> , l= 25 m
ZK4000-2111-2300	motor cable, assembled at both ends for AX2000 Servo Drive, 4 x 1.5 mm <sup>2</sup> + 2 x 1 mm <sup>2</sup> , l= 30 m
ZK4000-2101-2zzz	motor cable, not assembled, 4 x 1.5 mm <sup>2</sup> + 2 x 1 mm <sup>2</sup> , zzz = ordering indication of the length of material in decimetres, e.g. ZK4000-2101-2100 = 10 metres

Ordering information	ZK4000-21y2-2zzz   Motor cable with 2.5 mm <sup>2</sup> cross-cut (as of servomotor AM297K) (for AX2020)
ZK4000-2112-2050	motor cable, assembled at both ends for AX2000 Servo Drive, 4 x 2.5 mm <sup>2</sup> + 2 x 1 mm <sup>2</sup> , l= 5 m
ZK4000-2112-2100	motor cable, assembled at both ends for AX2000 Servo Drive, 4 x 2.5 mm <sup>2</sup> + 2 x 1 mm <sup>2</sup> , l= 10 m
ZK4000-2112-2150	motor cable, assembled at both ends for AX2000 Servo Drive, 4 x 2.5 mm <sup>2</sup> + 2 x 1 mm <sup>2</sup> , l= 15 m
ZK4000-2112-2200	motor cable, assembled at both ends for AX2000 Servo Drive, 4 x 2.5 mm <sup>2</sup> + 2 x 1 mm <sup>2</sup> , l= 20 m
ZK4000-2112-2250	motor cable, assembled at both ends for AX2000 Servo Drive, 4 x 2.5 mm <sup>2</sup> + 2 x 1 mm <sup>2</sup> , l= 25 m
ZK4000-2112-2300	motor cable, assembled at both ends for AX2000 Servo Drive, 4 x 2.5 mm <sup>2</sup> + 2 x 1 mm <sup>2</sup> , l= 30 m
ZK4000-2102-2zzz	motor cable, not assembled, 4 x 2.5 + 2 x 1 mm <sup>2</sup> , zzz = ordering indication of the length of material in decimetres, e.g. ZK4000-2102-2100 = 10 metres

Note: with motor cables > 25 m the motor choke AX2090-MD20 is required! All cables are UL and CSA listed, and suitable as trailing cable (10 million bending cycles), special length on request, maximum length = 100 metres.

Ordering information	ZK4000-210x-2zzz   Motor cable for AX2040/AX2070
ZK4000-2104-2zzz	Motor cable AX2040, not assembled, 4 x 6 mm <sup>2</sup> + 2 x 1.5 mm <sup>2</sup> , zzz = ordering indication of the length of the material in decimetres, e.g. ZK4000-2104-2100 = 10 metres
ZK4000-2105-2zzz	Motor cable AX2070, not assembled, 4 x 10 mm <sup>2</sup> + 2 x 1.5 mm <sup>2</sup> , zzz = ordering indication of the length of the material in decimetres, e.g. ZK4000-2105-2100 = 10 metres

## Motor cables ALxxxx/AMxxxx to AX2500

Ordering information	ZK4000-27y1-2zzz   Motor cable with 1.0 mm <sup>2</sup> cross-cut
ZK4000-2711-2050	motor cable, assembled at both ends for AX2500 Servo Drive, 4 x 1.0 + 2 x 1 mm <sup>2</sup> , l= 5 m
ZK4000-2711-2100	motor cable, assembled at both ends for AX2500 Servo Drive, 4 x 1.0 + 2 x 1 mm <sup>2</sup> , l= 10 m
ZK4000-2711-2150	motor cable, assembled at both ends for AX2500 Servo Drive, 4 x 1.0 + 2 x 1 mm <sup>2</sup> , l= 15 m
ZK4000-2711-2200	motor cable, assembled at both ends for AX2500 Servo Drive, 4 x 1.0 + 2 x 1 mm <sup>2</sup> , l= 20 m
ZK4000-2711-2250	motor cable, assembled at both ends for AX2500 Servo Drive, 4 x 1.0 + 2 x 1 mm <sup>2</sup> , l= 25 m
ZK4000-2701-2zzz	motor cable, not assembled, 4 x 1.0 + 2 x 1 mm <sup>2</sup> , zzz = ordering indication of the length of material in decimetres, e.g. ZK4000-2701-2100 = 10 metres

Note: with motor cables > 25 m the motor choke AX2090-MD20 is required! All cables are UL and CSA listed, and suitable as trailing cable (10 million bending cycles), special length on request, maximum length = 100 metres.

## Resolver cables AMxxxx to AX2000/AX2500

Ordering information	ZK4000-22yy-2zzz   Resolver cables
ZK4000-2210-2050	resolver cable, assembled at both ends, 4 x 2 x 0.25 mm <sup>2</sup> , l= 5 m
ZK4000-2210-2100	resolver cable, assembled at both ends, 4 x 2 x 0.25 mm <sup>2</sup> , l= 10 m
ZK4000-2210-2150	resolver cable, assembled at both ends, 4 x 2 x 0.25 mm <sup>2</sup> , l= 15 m
ZK4000-2210-2200	resolver cable, assembled at both ends, 4 x 2 x 0.25 mm <sup>2</sup> , l= 20 m
ZK4000-2210-2250	resolver cable, assembled at both ends, 4 x 2 x 0.25 mm <sup>2</sup> , l= 25 m
ZK4000-2210-2300	resolver cable, assembled at both ends, 4 x 2 x 0.25 mm <sup>2</sup> , l= 30 m
ZK4000-2200-2zzz	resolver cable, not assembled, 4 x 2 x 0.25 mm <sup>2</sup> , zzz = ordering indication of the length of material in decimetres, e.g. ZK4000-2200-2100 = 10 metres

Note: all cables have UL and CSA approval, suitable for use in trailing cables with 10 million bending cycles, special lengths on request, the maximum cable length is 100 metres.

## Encoder cables AMxxxx/ALxxxx to AX2000/AX2500

Ordering information	ZK4000-26yy-2zzz   Feedback cable
ZK4000-2610-2050	encoder cable, assembled at controller end, 8 x 2 x 0.14 mm <sup>2</sup> , l= 5 m
ZK4000-2610-2100	encoder cable, assembled at controller end, 8 x 2 x 0.14 mm <sup>2</sup> , l= 10 m
ZK4000-2610-2150	encoder cable, assembled at controller end, 8 x 2 x 0.14 mm <sup>2</sup> , l= 15 m
ZK4000-2610-2200	encoder cable, assembled at controller end, 8 x 2 x 0.14 mm <sup>2</sup> , l= 20 m
ZK4000-2610-2250	encoder cable, assembled at controller end, 8 x 2 x 0.14 mm <sup>2</sup> , l= 25 m
ZK4000-2610-2300	encoder cable, assembled at controller end, 8 x 2 x 0.14 mm <sup>2</sup> , l= 30 m
ZK4000-2600-2zzz	encoder cable, not assembled, 8 x 2 x 0.14 mm <sup>2</sup> zzz = ordering indication of the length of material in decimetres, e.g. ZK4000-2400-2100 = 10 metres

Note: all cables have UL and CSA approval, suitable for use in trailing cables with 10 million bending cycles, special lengths on request, the maximum cable length is 50 metres.

## Encoder cables for Linear Servomotors ALxxxx\*

Ordering information	ZK4000-24yy-2zzz   Feedback cable
ZK4000-2410-2050	encoder cable, assembled at controller end, 8 x 2 x 0.14 mm <sup>2</sup> , l= 5 m
ZK4000-2410-2100	encoder cable, assembled at controller end, 8 x 2 x 0.14 mm <sup>2</sup> , l= 10 m
ZK4000-2410-2150	encoder cable, assembled at controller end, 8 x 2 x 0.14 mm <sup>2</sup> , l= 15 m
ZK4000-2410-2200	encoder cable, assembled at controller end, 8 x 2 x 0.14 mm <sup>2</sup> , l= 20 m
ZK4000-2410-2250	encoder cable, assembled at controller end, 8 x 2 x 0.14 mm <sup>2</sup> , l= 25 m
ZK4000-2410-2300	encoder cable, assembled at controller end, 8 x 2 x 0.14 mm <sup>2</sup> , l= 30 m
ZK4000-2400-2zzz	encoder cable, not assembled, 8 x 2 x 0.14 mm <sup>2</sup> , zzz = ordering indication of the length of material in decimetres, e.g. ZK4000-2400-2100 = 10 metres

\*Only necessary if no connector box is used and encoders from other manufacturers are used.

Note: all cables have UL and CSA approval, suitable for use in trailing cables with 10 million bending cycles, special lengths on request, the maximum cable length is 50 metres.



## Thermal protection cables ALxxxx\* to AX2000/AX2500

Ordering information	ZK4000-25yy-2zzz   Thermal protection cables
ZK4000-2510-2050	thermal protection cable, assembled at both ends, 4 x 0.14 mm <sup>2</sup> , l = 5 m
ZK4000-2510-2100	thermal protection cable, assembled at both ends, 4 x 0.14 mm <sup>2</sup> , l = 10 m
ZK4000-2510-2150	thermal protection cable, assembled at both ends, 4 x 0.14 mm <sup>2</sup> , l = 15 m
ZK4000-2510-2200	thermal protection cable, assembled at both ends, 4 x 0.14 mm <sup>2</sup> , l = 20 m
ZK4000-2510-2250	thermal protection cable, assembled at both ends, 4 x 0.14 mm <sup>2</sup> , l = 25 m
ZK4000-2510-2300	thermal protection cable, assembled at both ends, 4 x 0.14 mm <sup>2</sup> , l = 30 m
ZK4000-2500-2zzz	thermal protection cable, not assembled, 4 x 2 x 0.14 mm <sup>2</sup> , zzz = ordering indication of the length of material in decimetres, e.g. ZK4000-2500-2100 = 10 metres

\*Only necessary if no connector box is used.

Note: all cables have UL and CSA approval, suitable for use in trailing cables with 10 million bending cycles, special lengths on request, the maximum cable length is 50 metres.

## Interface cables for AX2000/AX2500

Ordering information	ZK4000-230y-zzzz   Interface cables
ZK4000-2300-0030	interface cable PC/Servo Drive AX2000/AX2500 with 9-pin PC connector, including adapter D-sub 25-pin on D-sub 9-pin, length 3 metres
ZK4000-2300-0050	interface cable PC/Servo Drive AX2000/AX2500 with 9-pin PC connector, including adapter D-sub 25-pin on D-sub 9-pin, length 5 metres

## Connectors for Servo Drive AX2000

Ordering information	ZS4000-200y   Connectors
ZS4000-2000	mating connector, mains (X0-A), part of the delivery
ZS4000-2001	mating connector, mains (X0-B), part of the delivery
ZS4000-2002	connector (male), resolver (X2) D-sub, 9-pin, with housing
ZS4000-2003	mating connector, I/O (X3), part of the delivery
ZS4000-2004	mating connector, 24 V (X4), part of the delivery
ZS4000-2005	EMC-connector (female), ROD/SSI (X5), PC/CAN (X6), D-Sub, 9-pin, with housing
ZS4000-2006	EMC-connector (male), encoder (X1), 15-pin, with housing
ZS4000-2007	mating connector, DC-Link (X7), part of the delivery
ZS4000-2008	mating connector, ballast resistor (X8), part of the delivery
ZS4000-2009	mating connector, motor (X9), kit

## Connectors for Servo Drive AX2500

Ordering information	ZS4000-25yy   Connectors
ZS4000-2504	mating connector, power supply (X0)
ZS4000-2501	mating connector, BTB (X1)
ZS4000-2503	mating connector, I/O (X3)
ZS4000-2500	mating connector, motor (X6)

## Ballast resistors for Servo Drive AX2000

Ordering information	AX2090-BWyy-zzzz   Ballast resistors
AX2090-BW01-0250	external ballast resistor for Servo Drive AX2003–AX2020 250 W/33 Ω
AX2090-BW02-0500	external ballast resistor for Servo Drive AX2003–AX2020 500 W/33 Ω
AX2090-BW03-1500	external ballast resistor for Servo Drive AX2003–AX2020 1500 W/33 Ω
AX2090-BW05-2000	external ballast resistor for Servo Drive AX2040 2000 W/15 Ω
AX2090-BW05-3000	external ballast resistor for Servo Drive AX2040 3000 W/15 Ω
AX2090-BW05-6000	external ballast resistor for Servo Drive AX2040 6000 W/15 Ω
AX2090-BW06-2000	external ballast resistor for Servo Drive AX2040 2000 W/10 Ω
AX2090-BW06-3000	external ballast resistor for Servo Drive AX2040 3000 W/10 Ω
AX2090-BW06-6000	external ballast resistor for Servo Drive AX2040 6000 W/10 Ω

## Motor choke for Servo Drive AX2000/AX2500

Ordering information	AX2090-MD20   Motor choke
AX2090-MD20	motor choke for Servo Drive AX2003-AX2020 and AX25xx with motor cable > 25 m

## Mains chokes for Servo Drive AX2000

Ordering information	AX2090-NDxx   Mains chokes
AX2090-ND60-0000	mains choke for Servo Drive AX2040, 60 A, without UL approval
AX2090-ND60-0001	mains choke for Servo Drive AX2040, 60 A, with UL approval
AX2090-ND75-0000	mains choke for Servo Drive AX2070, 75 A, without UL approval
AX2090-ND130-000z	mains choke for Servo Drive AX2040/AX2070, 130 A, without UL approval

## Mains filter for Servo Drive AX2000

Ordering information	AX2090-NF0x   Mains filter
AX2090-NF05-0042	mains filter for Servo Drive AX2040, 42 A, without UL approval
AX2090-NF06-0075	mains filter for Servo Drive AX2070, 75 A, without UL approval
AX2090-NF06-0130	mains filter for Servo Drive AX2040/AX2070, 130 A, without UL approval

## I/O interface card for AX2000

Ordering information	AX2090-IO01   I/O interface card
AX2090-IO01	I/O interface card (14 inputs, 8 outputs) to start motion tasks

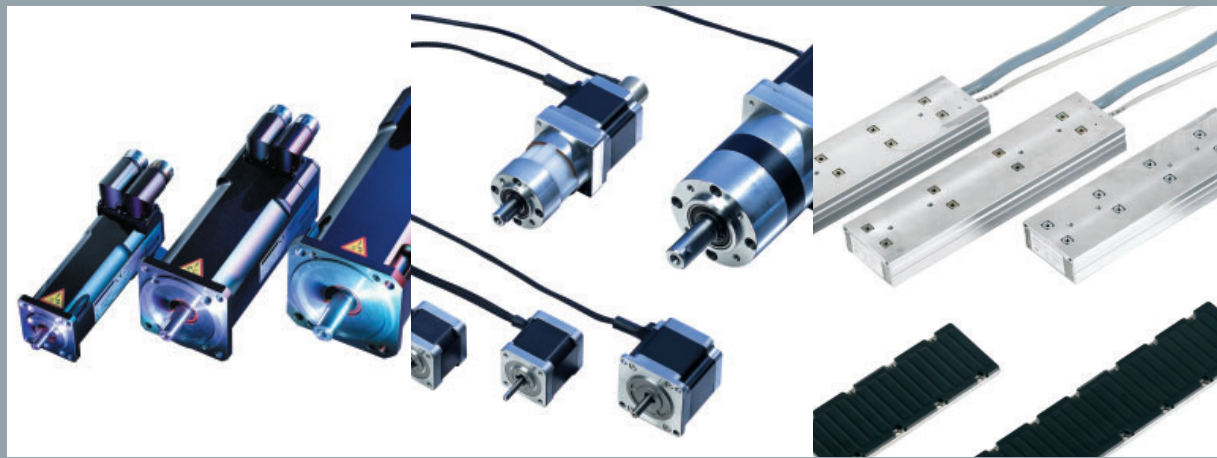
Note: in the case of using the I/O-interface card the installation of a fieldbus interface is not possible.

## Software for Servo Drive AX2000/AX2500

Ordering information	AX2090-S003   Software
AX2090-S003	operator software for AX2000/AX2500, online documentation

# Motor Series AM2000, AM3000, AM3500, AL2000, AL3800, AS1000

Synchronous Servomotors, Linear Servomotors, Stepper Motors



### **Highly dynamic, brushless Synchronous Servomotors AM2000, AM3000, AM3500**

The Synchronous Servomotors are brushless, three-phase motors meeting DIN 42950 and have permanent magnets in the rotor. This high quality neodymium magnetic material makes a significant contribution to the motors' exceptional dynamic properties. A three-phase winding is housed in the stator, and is electrically powered by the Servo Drive. The motor commutation is implemented electronically in the Servo Drive.

Temperature sensors in the stator windings and corresponding signal output via a zero-potential (break) contact monitor the coil temperature. The motors normally have an integrated resolver to provide feedback (optional single-turn or multi-turn absolute encoder). The Servo Drives evaluate the feedback signals and feed sine-wave currents to the motors.

Power transmission is implemented in accordance with DIN 748 via the cylindrical shaft end with a retaining thread, optional with a feather key groove. The motors accord with insulation material class F according to DIN 57530, and are manufactured to balance quality N according to DIN ISO 2373. The protection class of the motors is IP 65/64. This can be raised to IP 65/65 if a shaft sealing ring is employed.

The low-inertia servomotors from the Beckhoff AM3000 series, which are based on new material and manufacturing technologies, are predominantly used in highly dynamic motion applications. The aim of most motor development efforts is to generate more torque with a design that is as compact as possible. The challenge is that loads to be moved do not decrease accordingly – on the contrary, with each machine generation, the trend is toward ever higher loads. The aggravation of the inertia ratio between load and motor has a negative impact on control quality – in extreme cases, the mechanical system can become unstable. The inertia ratio can be optimised through suitable gearing. However, this reduces the maximum possible speed, which means that in many applications, the required velocity can no longer be reached so a larger motor and controller have to be used. In order to avoid the costs result-

ing from this, motors from the AM3500 series are used.

The servomotors AM2000 have angled connectors for the power supply and the feedback signals. The AM3000 and AM3500 features continuously rotatable connectors. Beckhoff offers the resolver, encoder and power leads as a ready-assembled accessory.

Type AG2xxx planetary gear units are offered as accessories for the AM2xxx and AM3xxx servomotors.

### **Compact power packages: Linear Servomotors AL2xxx, AL3xxx**

The AL2000, AL2400 and AL2800 Linear Servomotors complement the AM2000 servomotors and can be used wherever rotary design reaches mechanical limits during installation, or where special drive characteristics, in terms of dynamics, synchronism or acceleration, are required. Linear Servomotors are easy to set up and are not subject to mechanical wear. Several motors can be used simultaneously on the same path, which offers a distinct advantage for designers. Moreover, there are virtually no limits on travel options. With their high acceleration characteristics, Linear Servomotors can achieve positioning velocities of up to 10 m/s – with a high force constant and a very good force/weight ratio.

All three series of motors have the same pole spacing. This has the advantage that the procedure for adjusting the drive amplifiers and the adaptation to a linear encoder or the MES system is always the same, which saves time during commissioning. In principle, it is possible to operate several primary sections on one magnetic track. This significantly reduces the installation and component costs and opens up application options that would not normally be considered for linear motors.

In contrast to the AL2000 series, the linear motors from the AL3000 series have no iron core. This has the advantage that the coil part is not attracted by the permanent magnets and that cogging, i.e. the occurrence of cogging thrust due to magnetic forces between the permanent magnets and the iron core, is avoided. The benefits of ironless linear motors are particularly significant in semiconductor and plasma/LCD panel production, where highly synchronous operation and positioning quality are required.

### **Scaleless feedback system for AL2xxx Linear Servomotors**

The operation of linear motors requires a feedback system for the commutation and for monitoring of the speed and position. Normally, this measuring system consists of a reader head and a scale, mounted parallel to the travel path. The additional expenditure for the complete system increases with the length of the travel path. For this reason, Beckhoff has developed a measuring system that monitors the magnetic field of the permanent magnets of the magnetic plate and provides the AX2000/AX2500 series Servo Drive with incremental transducer signals for commutation, speed and position control. The measuring system provides one sinusoidal oscillation per logical motor revolution. A logical motor revolution corresponds to the distance between two homopolar magnets, i.e. for example between two north poles. With 24 mm, this distance is very short for the AL2xxx series linear motors, resulting in very high resolution. This leads to particularly synchronous operation and low running noise. A maximum resolution of 24 µm is adequate for simple positioning tasks. The achievable precision ranges between ±0.1 mm and largely depends on the mechanical precision and position of the travel path magnets. The influence of temperature fluctuations and external interference fields is compensated.

### **Stepper Motors AS1000**

The Stepper Motors of the AS1xxx series are a cost-effective alternative to Synchronous Servomotors for the small and medium capacity range. Different Stepper Motor types with torques ranging between 0.38 Nm and 5 Nm can be used as actuators or auxiliary axes for machine construction and automation applications.



## AM30xx | Synchronous Servomotors

### Pole-wound motor series

For the AM3000 servomotors, the stator is not wound outside the housing but inside through a needle winder. With conventional technology, the winding is pressed into the grooved laminated core. This only achieves a copper filling ratio (which determines the maximum torque) of approx. 40 %. Furthermore, the insulation layer has to be significantly thicker in order to protect the wire from mechanical stress and prevent damage.

With pole winding, the copper wire is in close contact with the iron core. The wire insulation can be much thinner, since no pressing of the winding head is required. These measures lead to a significant increase in the proportion of "active" copper, which determines the torque value, so that the performance of the AM3000 series is approx. 25–35 % higher. An additional benefit is that the motors are significantly shorter than conventional models.

### Sealed winding

The AM3000 servomotors are characterised by an extremely low moment of inertia, robust design and high overload capacity. The winding is sealed in order to eliminate air between the individual wires, since the thermal resistance of air is higher than that of epoxy resin. This further increases mechanical resilience, e.g. in case of vibrations.

### Single-piece motor housing

Servomotors dissipate a large proportion of the heat generated via the mounting flange. It is therefore important to keep the heat transfer resistance as small as possible. For this reason, the housings of the AM3000 motor series are made from a single piece, since material transitions increase the thermal resistance and have a negative influence on the stability of the motor.

The AM3000 Synchronous Servomotors are available with seven different flange sizes. For each size, once the flange size

has been defined, there is scope for variation in the length. The motors are offered with torques between 0.18 and 53 Nm and with a wide range of nominal speeds, so that for each application and gear ratio the motor with the optimum dimensions can be selected.

### Features

- Rotable plug connectors: The plug connectors for power and feedback are freely rotatable, making wiring of the whole machine easier.
- pressed bearings: preventing axial motion of the shaft
- tight tolerances: resulting in a highly symmetric structure inside the motor reducing cogging to an absolute minimum
- feedback option (similar to the AM2000 series): resolver, single-turn and multi-turn absolute encoders
- The motors are available with smooth shaft or with groove and feather key.

- protection class IP 65, shaft bush IP 54
- UL/CSA

### Option

- planetary gear units in different variants

AM30uv-wxyz-000a	Stand-still torque	Stand-still current	Rated speed at rated supply voltage			Rotor moment of inertia		Weight (without brake)	Weight (with brake)
			230 V AC	400 V AC	480 V AC	(without brake)	(with brake)		
AM3011-wB00-000a	0.18 Nm	1.16 A	8000 min <sup>-1</sup>	–	–	0.017 kg cm <sup>2</sup>	–	0.35 kg	–
AM3012-wC00-000a	0.31 Nm	1.51 A	8000 min <sup>-1</sup>	–	–	0.031 kg cm <sup>2</sup>	–	0.49 kg	–
AM3013-wC00-000a	0.41 Nm	1.48 A	8000 min <sup>-1</sup>	–	–	0.045 kg cm <sup>2</sup>	–	0.63 kg	–
AM3021-wCyz-000a	0.48 Nm	1.58 A	8000 min <sup>-1</sup>	–	–	0.107 kg cm <sup>2</sup>	0.118 kg cm <sup>2</sup>	0.82 kg	1.09 kg
AM3022-wCyz-000a	0.84 Nm	1.39 A	3500 min <sup>-1</sup>	8000 min <sup>-1</sup>	8000 min <sup>-1</sup>	0.161 kg cm <sup>2</sup>	0.172 kg cm <sup>2</sup>	1.10 kg	1.37 kg
AM3023-wCyz-000a	1.13 Nm	1.41 A	2500 min <sup>-1</sup>	5500 min <sup>-1</sup>	7000 min <sup>-1</sup>	0.216 kg cm <sup>2</sup>	0.227 kg cm <sup>2</sup>	1.38 kg	1.65 kg
AM3023-wDyz-000a	1.16 Nm	2.19 A	5000 min <sup>-1</sup>	8000 min <sup>-1</sup>	8000 min <sup>-1</sup>	0.216 kg cm <sup>2</sup>	0.227 kg cm <sup>2</sup>	1.38 kg	1.65 kg
AM3024-wCyz-000a	1.38 Nm	1.42 A	2000 min <sup>-1</sup>	4500 min <sup>-1</sup>	5500 min <sup>-1</sup>	0.270 kg cm <sup>2</sup>	0.281 kg cm <sup>2</sup>	1.66 kg	1.93 kg
AM3024-wDyz-000a	1.41 Nm	2.21 A	4000 min <sup>-1</sup>	8000 min <sup>-1</sup>	8000 min <sup>-1</sup>	0.270 kg cm <sup>2</sup>	0.281 kg cm <sup>2</sup>	1.66 kg	1.93 kg
AM3031-wCyz-0000	1.15 Nm	1.37 A	2500 min <sup>-1</sup>	5000 min <sup>-1</sup>	6000 min <sup>-1</sup>	0.330 kg cm <sup>2</sup>	0.341 kg cm <sup>2</sup>	1.55 kg	1.90 kg
AM3031-wEyz-0000	1.20 Nm	2.99 A	6000 min <sup>-1</sup>	–	–	0.330 kg cm <sup>2</sup>	0.341 kg cm <sup>2</sup>	1.55 kg	1.90 kg
AM3032-wCyz-0000	2.00 Nm	1.44 A	1500 min <sup>-1</sup>	3000 min <sup>-1</sup>	3500 min <sup>-1</sup>	0.590 kg cm <sup>2</sup>	0.601 kg cm <sup>2</sup>	2.23 kg	2.58 kg
AM3032-wDyz-0000	2.04 Nm	2.23 A	2500 min <sup>-1</sup>	5500 min <sup>-1</sup>	6000 min <sup>-1</sup>	0.590 kg cm <sup>2</sup>	0.601 kg cm <sup>2</sup>	2.23 kg	2.58 kg
AM3033-wCyz-0000	2.71 Nm	1.47 A	1000 min <sup>-1</sup>	2000 min <sup>-1</sup>	2500 min <sup>-1</sup>	0.850 kg cm <sup>2</sup>	0.861 kg cm <sup>2</sup>	2.90 kg	3.25 kg
AM3033-wEyz-0000	2.79 Nm	2.58 A	2000 min <sup>-1</sup>	4500 min <sup>-1</sup>	5000 min <sup>-1</sup>	0.850 kg cm <sup>2</sup>	0.861 kg cm <sup>2</sup>	2.90 kg	3.25 kg
AM3041-wCyz-0000	1.95 Nm	1.46 A	1200 min <sup>-1</sup>	3000 min <sup>-1</sup>	3500 min <sup>-1</sup>	0.810 kg cm <sup>2</sup>	0.878 kg cm <sup>2</sup>	2.44 kg	3.07 kg
AM3041-wEyz-0000	2.02 Nm	2.85 A	3000 min <sup>-1</sup>	6000 min <sup>-1</sup>	6000 min <sup>-1</sup>	0.810 kg cm <sup>2</sup>	0.878 kg cm <sup>2</sup>	2.44 kg	3.07 kg
AM3041-wHyz-0000	2.06 Nm	5.60 A	6000 min <sup>-1</sup>	6000 min <sup>-1</sup>	6000 min <sup>-1</sup>	0.810 kg cm <sup>2</sup>	0.878 kg cm <sup>2</sup>	2.44 kg	3.07 kg
AM3042-wEyz-0000	3.42 Nm	2.74 A	1800 min <sup>-1</sup>	3500 min <sup>-1</sup>	4000 min <sup>-1</sup>	1.450 kg cm <sup>2</sup>	1.518 kg cm <sup>2</sup>	3.39 kg	4.02 kg
AM3042-wGyz-0000	3.53 Nm	4.80 A	3500 min <sup>-1</sup>	6000 min <sup>-1</sup>	6000 min <sup>-1</sup>	1.450 kg cm <sup>2</sup>	1.518 kg cm <sup>2</sup>	3.39 kg	4.02 kg
AM3043-wEyz-0000	4.70 Nm	2.76 A	1500 min <sup>-1</sup>	2500 min <sup>-1</sup>	3000 min <sup>-1</sup>	2.090 kg cm <sup>2</sup>	2.158 kg cm <sup>2</sup>	4.35 kg	4.98 kg
AM3043-wGyz-0000	4.80 Nm	4.87 A	2500 min <sup>-1</sup>	5000 min <sup>-1</sup>	6000 min <sup>-1</sup>	2.090 kg cm <sup>2</sup>	2.158 kg cm <sup>2</sup>	4.35 kg	4.98 kg
AM3043-wHyz-0000	4.82 Nm	5.40 A	3000 min <sup>-1</sup>	6000 min <sup>-1</sup>	–	2.090 kg cm <sup>2</sup>	2.158 kg cm <sup>2</sup>	4.35 kg	4.98 kg
AM3044-wEyz-0000	5.76 Nm	2.90 A	1200 min <sup>-1</sup>	2000 min <sup>-1</sup>	2500 min <sup>-1</sup>	2.730 kg cm <sup>2</sup>	2.798 kg cm <sup>2</sup>	5.30 kg	5.93 kg
AM3044-wGyz-0000	5.88 Nm	5.00 A	2000 min <sup>-1</sup>	4000 min <sup>-1</sup>	5000 min <sup>-1</sup>	2.730 kg cm <sup>2</sup>	2.798 kg cm <sup>2</sup>	5.30 kg	5.93 kg
AM3044-wHyz-0000	5.89 Nm	5.60 A	2500 min <sup>-1</sup>	5000 min <sup>-1</sup>	6000 min <sup>-1</sup>	2.730 kg cm <sup>2</sup>	2.798 kg cm <sup>2</sup>	5.30 kg	5.93 kg
AM3044-wJyz-0000	6.00 Nm	8.80 A	4000 min <sup>-1</sup>	6000 min <sup>-1</sup>	6000 min <sup>-1</sup>	2.730 kg cm <sup>2</sup>	2.798 kg cm <sup>2</sup>	5.30 kg	5.93 kg
AM3051-wEyz-0000	4.70 Nm	2.75 A	1200 min <sup>-1</sup>	2500 min <sup>-1</sup>	3000 min <sup>-1</sup>	3.420 kg cm <sup>2</sup>	3.593 kg cm <sup>2</sup>	4.20 kg	5.30 kg
AM3051-wGyz-0000	4.75 Nm	4.84 A	2500 min <sup>-1</sup>	5000 min <sup>-1</sup>	6000 min <sup>-1</sup>	3.420 kg cm <sup>2</sup>	3.593 kg cm <sup>2</sup>	4.20 kg	5.30 kg
AM3051-wHyz-0000	4.79 Nm	6.00 A	3000 min <sup>-1</sup>	6000 min <sup>-1</sup>	6000 min <sup>-1</sup>	3.420 kg cm <sup>2</sup>	3.593 kg cm <sup>2</sup>	4.20 kg	5.30 kg
AM3052-wGyz-0000	8.43 Nm	4.72 A	1500 min <sup>-1</sup>	2500 min <sup>-1</sup>	3000 min <sup>-1</sup>	6.220 kg cm <sup>2</sup>	6.393 kg cm <sup>2</sup>	5.80 kg	6.90 kg
AM3052-wHyz-0000	8.48 Nm	5.90 A	1800 min <sup>-1</sup>	3500 min <sup>-1</sup>	4000 min <sup>-1</sup>	6.220 kg cm <sup>2</sup>	6.393 kg cm <sup>2</sup>	5.80 kg	6.90 kg
AM3052-wKyz-0000	8.60 Nm	9.30 A	3000 min <sup>-1</sup>	5500 min <sup>-1</sup>	6000 min <sup>-1</sup>	6.220 kg cm <sup>2</sup>	6.393 kg cm <sup>2</sup>	5.80 kg	6.90 kg
AM3053-wGyz-0000	11.37 Nm	4.77 A	1000 min <sup>-1</sup>	2000 min <sup>-1</sup>	2400 min <sup>-1</sup>	9.120 kg cm <sup>2</sup>	9.293 kg cm <sup>2</sup>	7.40 kg	8.50 kg
AM3053-wHyz-0000	11.51 Nm	6.60 A	–	3000 min <sup>-1</sup>	3500 min <sup>-1</sup>	9.120 kg cm <sup>2</sup>	9.293 kg cm <sup>2</sup>	7.40 kg	8.50 kg
AM3053-wKyz-0000	11.60 Nm	9.40 A	2000 min <sup>-1</sup>	4000 min <sup>-1</sup>	4500 min <sup>-1</sup>	9.120 kg cm <sup>2</sup>	9.293 kg cm <sup>2</sup>	7.40 kg	8.50 kg
AM3054-wHyz-0000	14.90 Nm	5.50 A	1000 min <sup>-1</sup>	1800 min <sup>-1</sup>	2000 min <sup>-1</sup>	11.92 kg cm <sup>2</sup>	12.093 kg cm <sup>2</sup>	9.00 kg	10.1 kg
AM3054-wKyz-0000	14.40 Nm	9.70 A	1800 min <sup>-1</sup>	3500 min <sup>-1</sup>	4000 min <sup>-1</sup>	11.92 kg cm <sup>2</sup>	12.093 kg cm <sup>2</sup>	9.00 kg	10.1 kg
AM3062-wHyz-0000	11.90 Nm	5.40 A	1000 min <sup>-1</sup>	2000 min <sup>-1</sup>	2400 min <sup>-1</sup>	16.90 kg cm <sup>2</sup>	17.51 kg cm <sup>2</sup>	8.90 kg	10.9 kg
AM3062-wKyz-0000	12.20 Nm	9.60 A	2000 min <sup>-1</sup>	3500 min <sup>-1</sup>	4500 min <sup>-1</sup>	16.90 kg cm <sup>2</sup>	17.51 kg cm <sup>2</sup>	8.90 kg	10.9 kg
AM3062-wMyz-0000	12.20 Nm	13.40 A	3000 min <sup>-1</sup>	6000 min <sup>-1</sup>	6000 min <sup>-1</sup>	16.90 kg cm <sup>2</sup>	17.51 kg cm <sup>2</sup>	8.90 kg	10.9 kg
AM3063-wKyz-0000	16.80 Nm	9.90 A	1500 min <sup>-1</sup>	3000 min <sup>-1</sup>	3500 min <sup>-1</sup>	24.20 kg cm <sup>2</sup>	24.81 kg cm <sup>2</sup>	11.1 kg	13.1 kg
AM3063-wMyz-0000	17.00 Nm	13.80 A	2000 min <sup>-1</sup>	4000 min <sup>-1</sup>	4500 min <sup>-1</sup>	24.20 kg cm <sup>2</sup>	24.81 kg cm <sup>2</sup>	11.1 kg	13.1 kg
AM3063-wNyz-0000	17.00 Nm	17.40 A	3000 min <sup>-1</sup>	5000 min <sup>-1</sup>	6000 min <sup>-1</sup>	24.20 kg cm <sup>2</sup>	24.81 kg cm <sup>2</sup>	11.1 kg	13.1 kg
AM3064-wHyz-0000	16.60 Nm	5.60 A	–	1500 min <sup>-1</sup>	1800 min <sup>-1</sup>	31.60 kg cm <sup>2</sup>	32.21 kg cm <sup>2</sup>	13.3 kg	15.3 kg
AM3064-wKyz-0000	20.80 Nm	9.20 A	1200 min <sup>-1</sup>	2000 min <sup>-1</sup>	2500 min <sup>-1</sup>	31.60 kg cm <sup>2</sup>	32.21 kg cm <sup>2</sup>	13.3 kg	15.3 kg
AM3064-wLyz-0000	21.00 Nm	12.80 A	1500 min <sup>-1</sup>	3000 min <sup>-1</sup>	3500 min <sup>-1</sup>	31.60 kg cm <sup>2</sup>	32.21 kg cm <sup>2</sup>	13.3 kg	15.3 kg
AM3064-wPyz-0000	20.40 Nm	18.60 A	2500 min <sup>-1</sup>	4500 min <sup>-1</sup>	5500 min <sup>-1</sup>	31.60 kg cm <sup>2</sup>	32.21 kg cm <sup>2</sup>	13.3 kg	15.3 kg
AM3065-wKyz-0000	24.80 Nm	9.80 A	1000 min <sup>-1</sup>	2000 min <sup>-1</sup>	2200 min <sup>-1</sup>	40.00 kg cm <sup>2</sup>	40.61 kg cm <sup>2</sup>	15.4 kg	17.4 kg
AM3065-wMyz-0000	25.00 Nm	13.60 A	1500 min <sup>-1</sup>	2500 min <sup>-1</sup>	3000 min <sup>-1</sup>	40.00 kg cm <sup>2</sup>	40.61 kg cm <sup>2</sup>	15.4 kg	17.4 kg
AM3065-wNyz-0000	24.30 Nm	17.80 A	2000 min <sup>-1</sup>	3500 min <sup>-1</sup>	4000 min <sup>-1</sup>	40.00 kg cm <sup>2</sup>	40.61 kg cm <sup>2</sup>	15.4 kg	17.4 kg

The table is continued on the next page.

AM30uv-wxyz-000a	Stand-still torque	Stand-still current	Rated speed at rated supply voltage			Rotor moment of inertia		Weight (without brake)	Weight (with brake)
			230 V AC	400 V AC	480 V AC	(without brake)	(with brake)		
AM3072-wKyZ-0000	29.70 Nm	9.30 A	–	1500 min <sup>-1</sup>	1800 min <sup>-1</sup>	64.50 kg cm <sup>2</sup>	66.14 kg cm <sup>2</sup>	19.7 kg	21.8 kg
AM3072-wMyZ-0000	30.00 Nm	13.00 A	–	2000 min <sup>-1</sup>	2500 min <sup>-1</sup>	64.50 kg cm <sup>2</sup>	66.14 kg cm <sup>2</sup>	19.7 kg	21.8 kg
AM3072-wPyZ-0000	29.40 Nm	18.70 A	1800 min <sup>-1</sup>	3000 min <sup>-1</sup>	3500 min <sup>-1</sup>	64.50 kg cm <sup>2</sup>	66.14 kg cm <sup>2</sup>	19.7 kg	21.8 kg
AM3072-wQyZ-0000	29.70 Nm	20.90 A	–	3500 min <sup>-1</sup>	4000 min <sup>-1</sup>	64.50 kg cm <sup>2</sup>	66.14 kg cm <sup>2</sup>	19.7 kg	21.8 kg
AM3073-wMyZ-0000	42.00 Nm	13.60 A	–	1500 min <sup>-1</sup>	1800 min <sup>-1</sup>	92.10 kg cm <sup>2</sup>	93.74 kg cm <sup>2</sup>	26.7 kg	28.8 kg
AM3073-wPyZ-0000	41.60 Nm	19.50 A	1300 min <sup>-1</sup>	2400 min <sup>-1</sup>	2800 min <sup>-1</sup>	92.10 kg cm <sup>2</sup>	93.74 kg cm <sup>2</sup>	26.7 kg	28.8 kg
AM3073-wQyZ-0000	41.60 Nm	24.60 A	–	3000 min <sup>-1</sup>	3500 min <sup>-1</sup>	92.10 kg cm <sup>2</sup>	93.74 kg cm <sup>2</sup>	26.7 kg	28.8 kg
AM3074-wLyZ-0000	53.00 Nm	12.90 A	–	1200 min <sup>-1</sup>	1400 min <sup>-1</sup>	119.7 kg cm <sup>2</sup>	121.34 kg cm <sup>2</sup>	33.6 kg	35.7 kg
AM3074-wPyZ-0000	52.50 Nm	18.50 A	–	1800 min <sup>-1</sup>	2000 min <sup>-1</sup>	119.7 kg cm <sup>2</sup>	121.34 kg cm <sup>2</sup>	33.6 kg	35.7 kg
AM3074-wQyZ-0000	51.90 Nm	26.20 A	–	2500 min <sup>-1</sup>	3000 min <sup>-1</sup>	119.7 kg cm <sup>2</sup>	121.34 kg cm <sup>2</sup>	33.0 kg	35.7 kg
AM3082-wTyZ-0006	80.00 Nm	50.00 A	–	2500 min <sup>-1</sup>	2800 min <sup>-1</sup>	173.0 kg cm <sup>2</sup>	175.00 kg cm <sup>2</sup>	55.0 kg	65.0 kg
AM3083-wTyZ-0006	110.0 Nm	72.00 A	–	2200 min <sup>-1</sup>	2500 min <sup>-1</sup>	343.0 kg cm <sup>2</sup>	345.00 kg cm <sup>2</sup>	71.3 kg	81.3 kg
AM3084-wTyZ-0006	150.0 Nm	90.00 A	–	2000 min <sup>-1</sup>	2200 min <sup>-1</sup>	511.0 kg cm <sup>2</sup>	513.00 kg cm <sup>2</sup>	89.3 kg	99.3 kg

Further information [www.beckhoff.com/AM30xx](http://www.beckhoff.com/AM30xx)

u: flange code

v: motor length

- Option w = 0: smooth shaft (preferred type)  
 w = 1: shaft with groove and feather key according to DIN 6885  
 w = 2: shaft with IP 65 sealing ring and smooth shaft  
 w = 3: shaft with IP 65 sealing ring and shaft with groove and feather key

Option x = winding code A...T

- Option y = 0: resolver, 2-pole  
 y = 1: single-turn absolute encoder, Heidenhain EnDAT  
 absolute position within one revolution, electronic identification plate  
 AM302x...AM304x: 512 sine periods per revolution  
 AM305x...AM308x: 2,048 sine periods per revolution  
 y = 2: multi-turn absolute encoder, Heidenhain EnDAT  
 absolute position within 4,096 revolutions, electronic identification plate  
 AM302x...AM304x: 512 sine periods per revolution  
 AM305x...AM308x: 2,048 sine periods per revolution  
 y = 3: single-turn absolute encoder, Hengstler BiSS  
 absolute position within one revolution, electronic identification plate  
 AM302x...AM308x: 2,048 sine periods per revolution  
 y = 4: multi-turn absolute encoder, Hengstler BiSS  
 absolute position within 4,096 revolutions, electronic identification plate  
 AM302x...AM308x: 2,048 sine periods per revolution

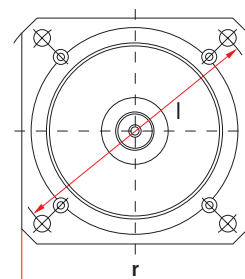
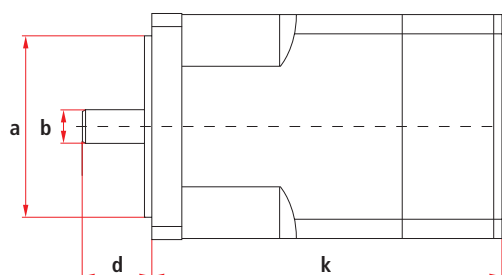
- Option z = 0: without holding brake  
 z = 1: with holding brake for AM302x...AM308x

- Option a = 0: connection boxes for motor and feedback cable  
 (only for AM302x/AM303x/AM304x/AM305x/AM306x/AM307x)  
 a = 1: connection cable 0.5 m (only for AM301x/AM302x)  
 a = 5: yTec plug (only for AM301x)  
 a = 6: motor connection via terminal box (only for AM308x)

Special flange, special shaft and other accessories on request

With the exception of the shaft seal, the options cannot be installed in the field. Options such as shaft seal, holding brake, EnDAT or BiSS can lead to a reduction of the nominal rating.

## Dimensions



Dimensions	a	b	d	k (resolver) (without brake)	k (resolver) (with brake)	k (encoder) (without brake)	k (encoder) (with brake)	l	r
AM3011	30 mm	8 mm	25 mm	69.6 mm	–	–	–	46 mm	40 mm
AM3012	30 mm	8 mm	25 mm	88.6 mm	–	–	–	46 mm	40 mm
AM3013	30 mm	8 mm	25 mm	107.6 mm	–	–	–	46 mm	40 mm
AM3021	40 mm	9 mm	20 mm	95.4 mm	129.5 mm	95.4 mm	129.5 mm	63 mm	58 mm
AM3022	40 mm	9 mm	20 mm	114.4 mm	148.5 mm	114.4 mm	148.5 mm	63 mm	58 mm
AM3023	40 mm	9 mm	20 mm	133.4 mm	167.5 mm	133.4 mm	167.5 mm	63 mm	58 mm
AM3024	40 mm	9 mm	20 mm	152.4 mm	186.5 mm	152.4 mm	186.5 mm	63 mm	58 mm
AM3031	60 mm	14 mm	30 mm	109.8 mm	141.3 mm	109.8 mm	141.3 mm	75 mm	70 mm
AM3032	60 mm	14 mm	30 mm	140.8 mm	172.3 mm	140.8 mm	172.3 mm	75 mm	70 mm
AM3033	60 mm	14 mm	30 mm	171.8 mm	203.3 mm	171.8 mm	203.3 mm	75 mm	70 mm
AM3041	80 mm	19 mm	40 mm	118.8 mm	152.3 mm	118.8 mm	152.3 mm	100 mm	84 mm
AM3042	80 mm	19 mm	40 mm	147.8 mm	181.3 mm	147.8 mm	181.3 mm	100 mm	84 mm
AM3043	80 mm	19 mm	40 mm	176.8 mm	210.3 mm	176.8 mm	210.3 mm	100 mm	84 mm
AM3044	80 mm	19 mm	40 mm	205.8 mm	239.3 mm	205.8 mm	239.3 mm	100 mm	84 mm
AM3051	110 mm	24 mm	50 mm	127.5 mm	172.5 mm	146.0 mm	189.0 mm	130 mm	108 mm
AM3052	110 mm	24 mm	50 mm	158.5 mm	203.5 mm	177.0 mm	220.0 mm	130 mm	108 mm
AM3053	110 mm	24 mm	50 mm	189.5 mm	234.5 mm	208.0 mm	251.0 mm	130 mm	108 mm
AM3054	110 mm	24 mm	50 mm	220.5 mm	265.5 mm	239.0 mm	282.0 mm	130 mm	108 mm
AM3062	130 mm	32 mm	58 mm	153.7 mm	200.7 mm	172.2 mm	219.7 mm	165 mm	138 mm
AM3063	130 mm	32 mm	58 mm	178.7 mm	225.7 mm	197.2 mm	244.7 mm	165 mm	138 mm
AM3064	130 mm	32 mm	58 mm	203.7 mm	250.7 mm	222.2 mm	269.7 mm	165 mm	138 mm
AM3065	130 mm	32 mm	58 mm	228.7 mm	275.7 mm	247.2 mm	294.7 mm	165 mm	138 mm
AM3072	180 mm	38 mm	80 mm	192.5 mm	234.5 mm	201.7 mm	253.7 mm	215 mm	188 mm
AM3073	180 mm	38 mm	80 mm	226.5 mm	268.5 mm	235.7 mm	287.3 mm	215 mm	188 mm
AM3074	180 mm	38 mm	80 mm	260.5 mm	302.5 mm	269.7 mm	321.3 mm	215 mm	188 mm
AM3082	250 mm	48 mm	110 mm	263.4 mm	329.4 mm	263.4 mm	329.4 mm	300 mm	260 mm
AM3083	250 mm	48 mm	110 mm	343.9 mm	410.0 mm	343.9 mm	410.0 mm	300 mm	260 mm
AM3084	250 mm	48 mm	110 mm	424.4 mm	490.4 mm	424.4 mm	490.4 mm	300 mm	260 mm

Technical drawings at [www.beckhoff.com/DriveTechnology](http://www.beckhoff.com/DriveTechnology)

Accessories see page 1129





## AM35xx | Synchronous Servomotors

New motor technologies enable more and more dynamic motors with lower inertia. The aim of most motor development efforts is to generate more torque with a design that should be as compact as possible. The challenge is that loads to be moved do not reduce proportionally – on the contrary, with each machine generation the trend is towards higher loads. Motor design initially involves calculation of the torque, which means that the mass inertia ratio has to be determined. The mass inertia ratio can be calculated from the quotient of reduced load moment of inertia and rotor moment of inertia of the motor.

For highly dynamic applications this ratio should not exceed 5:1; for ratios exceeding 10:1 the motor design should be reconsidered. The CYMEX design software makes calculation of the external inertia particularly easy. The mass inertia ratio is automatically considered as soon as a motor is selected.

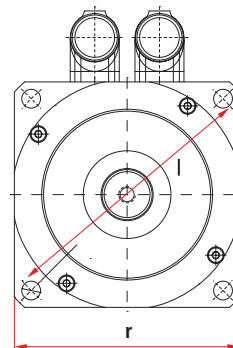
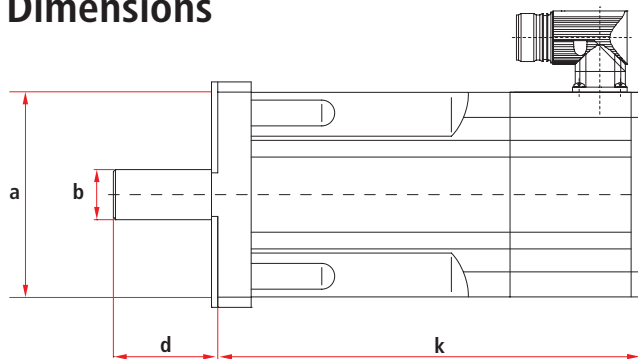
For improving the inertia ratio, it may be advisable to introduce gearing or to increase the gear ratio for existing gearing, since the reduction in load moment of inertia is proportional to the square of the gear ratio. However, the resulting lower speed/velocity is often unsuitable, leaving selection of a larger motor as the only solution. Beckhoff presents the new AM3500 motor series in order to avoid the associated higher costs for the motor and servo controller. These motors are particularly suitable for highly dynamic applications with high loads. In conjunction with higher rotor inertia, they offer the same benefits as the AM3xxx motor series in the form of the pole-wound stator winding, which significantly reduces the overall size. The flanges, connectors and shafts of the new range are compatible with the tried and tested AM3000 motors. The new models are available with flange sizes 3 to 6 and torques between 1.9–15 Nm.

The rated speed range is 3,000–6,000 rpm. Resolvers or absolute encoders (single or multi-turn) are available as feedback system. The standard protection class is IP 64; IP 65 is available as an option.

### Features

- high overload capacity
- maximum power density through stator pole winding
- increased moment of inertia for highly dynamic applications at higher loads
- compact design
- very low torque ripple
- flexible feedback systems such as resolver or absolute encoder
- rotatable plug connectors facilitate assembly
- simple commissioning through predefined default values or electronic identification plate
- protection class IP 64, optionally IP 65

## Dimensions



Dimensions	a	b	d	k (resolver) (without brake)	k (resolver) (with brake)	k (encoder) (without brake)	k (encoder) (with brake)	l	r
AM3541	80 mm	19 mm	40 mm	159 mm	181 mm	189 mm	211 mm	100 mm	84 mm
AM3542	80 mm	19 mm	40 mm	195 mm	233 mm	225 mm	263 mm	100 mm	84 mm
AM3543	80 mm	19 mm	40 mm	231 mm	309 mm	261 mm	339 mm	100 mm	84 mm
AM3551	110 mm	24 mm	50 mm	172 mm	223 mm	202 mm	253 mm	130 mm	108 mm
AM3552	110 mm	24 mm	50 mm	202 mm	262 mm	232 mm	292 mm	130 mm	108 mm
AM3553	110 mm	24 mm	50 mm	232 mm	292 mm	262 mm	322 mm	130 mm	108 mm
AM3562	130 mm	32 mm	58 mm	223 mm	262 mm	233 mm	272 mm	165 mm	138 mm
AM3563	130 mm	32 mm	58 mm	251 mm	304 mm	261 mm	314 mm	165 mm	138 mm

AM35uv-wxyz	Standstill torque	Standstill current	Rated torque	Rated current	Rotor moment of inertia (without brake)	Rotor moment of inertia (with brake)
AM3541-w0yz	1.9 Nm	1.7 A	1.6 Nm	1.5 A	2.0 kg cm <sup>2</sup>	2.2 kg cm <sup>2</sup>
AM3541-w1yz	1.9 Nm	2.8 A	1.2 Nm	1.9 A	2.0 kg cm <sup>2</sup>	2.2 kg cm <sup>2</sup>
AM3542-w0yz	3.3 Nm	2.4 A	2.9 Nm	2.3 A	4.0 kg cm <sup>2</sup>	4.2 kg cm <sup>2</sup>
AM3542-w1yz	3.3 Nm	4.5 A	2.1 Nm	3.1 A	4.0 kg cm <sup>2</sup>	4.2 kg cm <sup>2</sup>
AM3543-w0yz	6.1 Nm	3.0 A	3.0 Nm	2.3 A	8.0 kg cm <sup>2</sup>	8.2 kg cm <sup>2</sup>
AM3543-w1yz	6.1 Nm	5.2 A	1.9 Nm	2.7 A	8.0 kg cm <sup>2</sup>	8.2 kg cm <sup>2</sup>
AM3551-w0yz	4.1 Nm	3.4 A	3.2 Nm	2.8 A	15.0 kg cm <sup>2</sup>	15.6 kg cm <sup>2</sup>
AM3551-w1yz	4.1 Nm	6.1 A	1.7 Nm	2.9 A	15.0 kg cm <sup>2</sup>	15.6 kg cm <sup>2</sup>
AM3552-w0yz	6.3 Nm	4.8 A	4.6 Nm	3.6 A	19.0 kg cm <sup>2</sup>	19.6 kg cm <sup>2</sup>
AM3553-w0yz	8.6 Nm	6.4 A	6.1 Nm	4.8 A	20.0 kg cm <sup>2</sup>	20.6 kg cm <sup>2</sup>
AM3562-w0yz	11.6 Nm	10.3 A	8.4 Nm	7.9 A	40.0 kg cm <sup>2</sup>	42.0 kg cm <sup>2</sup>
AM3563-w0yz	14.9 Nm	12.5 A	10.9 Nm	9.6 A	60.0 kg cm <sup>2</sup>	62.0 kg cm <sup>2</sup>

Flange- and shaft-compatible with the corresponding size of the AM3000 series

Further information [www.beckhoff.com/AM35xx](http://www.beckhoff.com/AM35xx)

u: flange code, v: motor length

Option w = 0: smooth shaft

w = 1: shaft with groove and feather key according to DIN 6885

Option x = 0: rated speed 3,000 min<sup>-1</sup>

x = 1: rated speed 6,000 min<sup>-1</sup> (only till AM3551)

Option y = 0: resolver, 2-pole

y = 3: single-turn absolute encoder, Hengstler BiSS, absolute position within one revolution, electronic identification plate, 2,048 sine periods per revolution

y = 4: multi-turn absolute encoder, Hengstler BiSS, absolute position within 4,096 revolutions, electronic identification plate, 2,048 sine periods per revolution

Option z = 0: without holding brake

z = 1: with holding brake

Special flange, special shaft and other accessories on request



## AM2xxx | Synchronous Servomotors

The AM2000 series of brushless Synchronous Servomotors are of outstanding quality; they are highly dynamic, the rotors have low moments of inertia, they have excellent rotational characteristics and impressive overload capacity. The Synchronous Servomotors, in connection with digital Servo Drives from the AX2000/AX2500 series, are excellently suited for positioning tasks that make high demands on dynamics and stability. The servomotor rotors are fitted with neodymium permanent magnets. This magnetic material is an important factor in making it possible to drive these motors in a highly dynamic fashion. The motors are fitted with two-pole hollow shaft resolvers and as an option may be obtained with a holding brake.

Temperature sensors in the stator windings and cor-

responding signal output via a zero-potential (break) contact monitor the coil temperature. The motors normally have an integrated resolver to provide feedback (optional single-turn or multi-turn absolute encoder). The Servo Drives evaluate the feedback signals and feed sine-wave currents to the motors.

The motors have angled connectors for the power supply and the feedback signals. Beckhoff offers the resolver, encoder and power leads as a ready-assembled accessory.

The motors are optionally available with an integrated stop brake. This holding brake (24 V DC) locks the rotor when power is removed. When the brake is released, the rotor can turn without residual torque. Operation is free from backlash. The stop brake can be driven directly by the Servo Drive.

### Features

- high dynamic performance caused by neodymium magnets
- flange dimensions meet IEC standard, fit j6, accuracy according to DIN 42955, tolerance class R
- vibration class N according to DIN ISO 2373
- insulation material class F according to DIN 57530
- style IM B5 according to DIN 42950
- shaft end without keyway to DIN 748
- protection class IP 65
- shaft bush in IP 64, optionally with shaft sealing ring in IP 65
- nominal mains voltage 400/460 V
- long service life through brushless technology
- integrated resolver
- optional single-turn or multi-turn absolute encoder

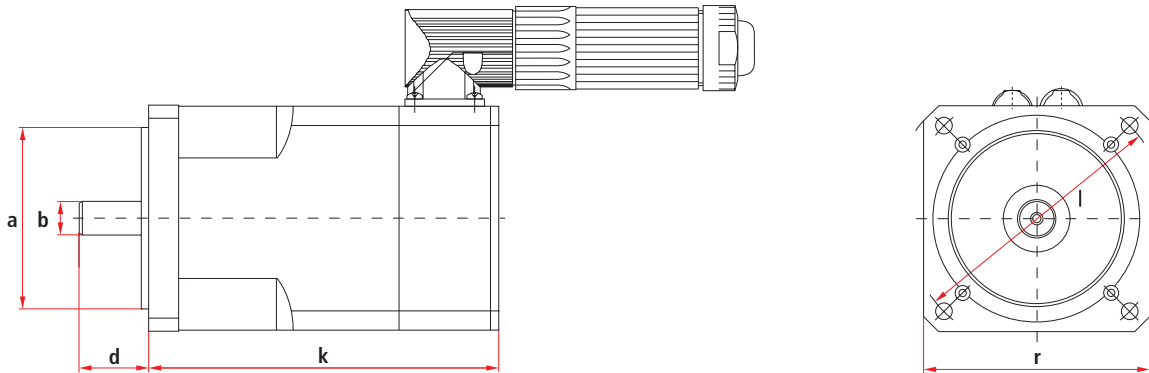
AM2000-wxyz	Standstill torque	Standstill current	Rated speed at rated supply voltage		Rotor moment of inertia	Weight
			230 V AC	400/480 V AC		
AM217S-0000	0.1 Nm	0.6 A	6000 min <sup>-1</sup>	–	0.06 kg cm <sup>2</sup>	0.7 kg
AM217M-0000	0.2 Nm	0.93 A	6000 min <sup>-1</sup>	–	0.12 kg cm <sup>2</sup>	0.8 kg
AM217S-2000	0.1 Nm	0.6 A	6000 min <sup>-1</sup>	–	0.06 kg cm <sup>2</sup>	0.7 kg
AM217M-2000	0.2 Nm	0.93 A	6000 min <sup>-1</sup>	–	0.12 kg cm <sup>2</sup>	0.8 kg
AM227M-wxy0	0.32 Nm	0.8 A	–	4000 min <sup>-1</sup>	0.08 kg cm <sup>2</sup>	1.1 kg
AM227M-wxy1	0.32 Nm	0.8 A	–	4000 min <sup>-1</sup>	0.15 kg cm <sup>2</sup>	1.4 kg
AM227L-wxy0	0.8 Nm	0.82 A	–	4500 min <sup>-1</sup>	0.14 kg cm <sup>2</sup>	1.5 kg
AM227L-wxy1	0.8 Nm	0.82 A	–	4500 min <sup>-1</sup>	0.21 kg cm <sup>2</sup>	1.8 kg
AM237S-wxy0	0.5 Nm	1 A	–	6000 min <sup>-1</sup>	0.45 kg cm <sup>2</sup>	1.9 kg
AM237S-wxy1	0.5 Nm	1 A	–	6000 min <sup>-1</sup>	0.83 kg cm <sup>2</sup>	2.3 kg
AM237M-wxy0	1 Nm	1.6 A	–	6000 min <sup>-1</sup>	0.7 kg cm <sup>2</sup>	2.3 kg
AM237M-wxy1	1 Nm	1.6 A	–	6000 min <sup>-1</sup>	1.08 kg cm <sup>2</sup>	2.7 kg
AM237L-wxy0	1.5 Nm	1.6 A	–	4000 min <sup>-1</sup>	1 kg cm <sup>2</sup>	2.9 kg
AM237L-wxy1	1.5 Nm	1.6 A	–	4000 min <sup>-1</sup>	1.38 kg cm <sup>2</sup>	3.3 kg
AM247M-wxy0	2.5 Nm	1.78 A	–	3000 min <sup>-1</sup>	1.4 kg cm <sup>2</sup>	3.3 kg
AM247M-wxy1	2.5 Nm	1.78 A	–	3000 min <sup>-1</sup>	1.78 kg cm <sup>2</sup>	3.7 kg
AM247L-wxy0	3 Nm	2.3 A	–	3000 min <sup>-1</sup>	1.6 kg cm <sup>2</sup>	3.5 kg
AM247L-wxy1	3 Nm	2.3 A	–	3000 min <sup>-1</sup>	1.98 kg cm <sup>2</sup>	3.9 kg
AM257K-wxy0	2.6 Nm	1.9 A	–	3000 min <sup>-1</sup>	2.1 kg cm <sup>2</sup>	4.5 kg
AM257K-wxy1	2.6 Nm	1.9 A	–	3000 min <sup>-1</sup>	3.16 kg cm <sup>2</sup>	5.25 kg
AM257S-wxy0	4.6 Nm	2.8 A	–	3000 min <sup>-1</sup>	3.1 kg cm <sup>2</sup>	5.7 kg
AM257S-wxy1	4.6 Nm	2.8 A	–	3000 min <sup>-1</sup>	4.16 kg cm <sup>2</sup>	6.3 kg
AM257M-wxy0	8 Nm	4.3 A	–	3000 min <sup>-1</sup>	4.5 kg cm <sup>2</sup>	7.6 kg
AM257M-wxy1	8 Nm	4.3 A	–	3000 min <sup>-1</sup>	5.56 kg cm <sup>2</sup>	8.2 kg
AM257L-wxy0	9.5 Nm	6.1 A	–	3000 min <sup>-1</sup>	6.5 kg cm <sup>2</sup>	8.7 kg
AM257L-wxy1	9.5 Nm	6.1 A	–	3000 min <sup>-1</sup>	7.56 kg cm <sup>2</sup>	9.45 kg
AM277K-wxy0	11 Nm	6 A	–	3000 min <sup>-1</sup>	12 kg cm <sup>2</sup>	9.8 kg
AM277K-wxy1	11 Nm	6 A	–	3000 min <sup>-1</sup>	15.6 kg cm <sup>2</sup>	11.3 kg
AM277S-wxy0	17 Nm	10 A	–	3000 min <sup>-1</sup>	18 kg cm <sup>2</sup>	14 kg
AM277S-wxy1	17 Nm	10 A	–	3000 min <sup>-1</sup>	21.6 kg cm <sup>2</sup>	15.5 kg
AM277M-wxy0	22 Nm	13.7 A	–	3000 min <sup>-1</sup>	13.1 kg cm <sup>2</sup>	17 kg
AM277M-wxy1	22 Nm	13.7 A	–	3000 min <sup>-1</sup>	16.7 kg cm <sup>2</sup>	18.5 kg
AM297K-wxy0	26 Nm	16 A	–	3000 min <sup>-1</sup>	82 kg cm <sup>2</sup>	28 kg
AM297K-wxy1	26 Nm	16 A	–	3000 min <sup>-1</sup>	91.5 kg cm <sup>2</sup>	31.3 kg
AM297S-wxy0	32 Nm	20 A	–	3000 min <sup>-1</sup>	104 kg cm <sup>2</sup>	32.5 kg
AM297S-wxy1	32 Nm	20 A	–	3000 min <sup>-1</sup>	113.5 kg cm <sup>2</sup>	35.8 kg
AM297M-wxy0	40 Nm	23.4 A	–	3000 min <sup>-1</sup>	139.4 kg cm <sup>2</sup>	40 kg
AM297M-wxy1	40 Nm	23.4 A	–	3000 min <sup>-1</sup>	148.9 kg cm <sup>2</sup>	43.3 kg

Further information [www.beckhoff.com/AM2xxx](http://www.beckhoff.com/AM2xxx)

- Option w = 0: smooth shaft  
w = 1: shaft with groove and feather key according to DIN 6885, w = 2: connection cable with plug
- Option x = 0: standard winding  
x = 1: special winding
- Option y = 0: resolver, 2-pole  
y = 1: single-turn absolute encoder, Heidenhain EnDAT  
absolute position within one revolution, electronic identification plate  
AM227x: 512 sine periods per revolution  
AM237x...AM297x: 2,048 sine periods per revolution  
y = 2: multi-turn absolute encoder, Heidenhain EnDAT  
absolute position within 4,096 revolutions, electronic identification plate  
AM227x: 512 sine periods per revolution  
AM237x...AM297x: 2,048 sine periods per revolution
- Option z = 0: without holding brake  
z = 1: with holding brake

Special flange, special shaft and other accessories on request, accessories see page 1129

## Dimensions



Dimensions	a	b	d	k (without brake)	k (with brake)	l	r
AM217S	25 mm	6 mm	16 mm	83 mm	–	32 mm	37 mm
AM217M	25 mm	6 mm	16 mm	99 mm	–	32 mm	37 mm
AM227M	40 mm	9 mm	20 mm	122 mm	155 mm	63 mm	55 mm
AM227L	40 mm	9 mm	20 mm	152 mm	185 mm	63 mm	55 mm
AM237S	60 mm	11 mm	23 mm	116 mm	149 mm	90 mm	75 mm
AM237M	60 mm	11 mm	23 mm	134 mm	167 mm	90 mm	75 mm
AM237L	60 mm	11 mm	23 mm	152 mm	185 mm	90 mm	75 mm
AM247M	80 mm	14 mm	30 mm	169 mm	173 mm	100 mm	88 mm
AM247L	80 mm	14 mm	30 mm	188 mm	221 mm	100 mm	88 mm
AM257K	95 mm	19 mm	40 mm	155 mm	190 mm	115 mm	105 mm
AM257S	95 mm	19 mm	40 mm	185 mm	220 mm	115 mm	105 mm
AM257M	95 mm	19 mm	40 mm	230 mm	265 mm	115 mm	105 mm
AM257L	95 mm	19 mm	40 mm	285.5 mm	318 mm	115 mm	105 mm
AM277K	130 mm	24 mm	50 mm	216 mm	259 mm	165 mm	142 mm
AM277S	130 mm	24 mm	50 mm	271 mm	314 mm	165 mm	142 mm
AM277M	130 mm	24 mm	50 mm	305 mm	348 mm	165 mm	142 mm
AM297K	180 mm	32 mm	58 mm	240 mm	284 mm	215 mm	190 mm
AM297S	180 mm	32 mm	58 mm	263 mm	307 mm	215 mm	190 mm
AM297M	180 mm	32 mm	58 mm	298 mm	342 mm	215 mm	190 mm

k: for feedback resolver, technical drawings at [www.beckhoff.com/DriveTechnology](http://www.beckhoff.com/DriveTechnology)

Accessories see page [1129](#)



## AG2200 | Planetary gear units for AM2000/AM3000/AM3500 Synchronous Servomotors

The compact, high-precision planetary gear units for the AM2000/AM3000/AM3500 Synchronous Servomotor range are used mainly in applications where large mass inertia has to be overcome, or where the inertia ratio between load and motor prevents dynamic motion. The inertia ratios, i.e. the required torques and motors can be calculated conveniently via the CYMEX calculation tool, which also offers an option for check-

ing whether the selected motor can be adapted to the gear unit.

The planetary gear units are fitted to the respective motor in the factory and delivered as a complete motor/gear unit.

### Features

- maximum economic efficiency
  - low price
  - absolutely maintenance-free, thanks to unique lubrication concept
- short delivery time
- long service life (> 20,000 h)
- high efficiency (> 95 % at full load)
- maximum power density
- low running noise and smooth operation through maximum production quality
- suitable for cyclic or continuous operation
- flexible mounting position
- protection class IP 64
- output shaft with feather key

- 5 sizes 050...155
- 12 gear ratios  $i = 3, 4, 5, 7, 10$  (single-stage),  $i = 15, 16, 25, 30, 50, 70, 100$  (two-stage)
- acceleration torque between 11 and 450 Nm
- maximum speed up to 8,000 rpm
- low torsional backlash ( $\leq 8 \dots 15$  arcmin)

Ordering information	Rated torque	Acceleration torque	Torsional backlash standard/reduced	Typ. combination with AM2000	Typ. combination with AM3xxx
AG2200-+LP050-M01-x-11y	max. 5 Nm	max. 11 Nm	$\leq 12/10$ arcmin	AM227x/AM237x	AM301x/AM302x
AG2200-+LP050-M02-x-11y	max. 5 Nm	max. 11 Nm	$\leq 15/13$ arcmin	AM227x/AM237x	AM301x/AM302x
AG2200-+LP070-M01-x-11y	max. 16 Nm	max. 32 Nm	$\leq 12/8$ arcmin	AM237x/AM247x	AM302x/AM303x/AM3x4x
AG2200-+LP070-M02-x-11y	max. 16 Nm	max. 32 Nm	$\leq 15/10$ arcmin	AM237x/AM247x	AM302x/AM303x/AM3x4x
AG2200-+LP090-M01-x-11y	max. 40 Nm	max. 80 Nm	$\leq 12/8$ arcmin	AM247x/AM257x	AM3x4x/AM3x5x
AG2200-+LP090-M02-x-11y	max. 40 Nm	max. 80 Nm	$\leq 15/10$ arcmin	AM247x/AM257x	AM3x4x/AM3x5x
AG2200-+LP120-M01-x-11y	max. 100 Nm	max. 200 Nm	$\leq 12/8$ arcmin	AM257x/AM277x	AM3x5x/AM3x6x
AG2200-+LP120-M02-x-11y	max. 100 Nm	max. 200 Nm	$\leq 15/10$ arcmin	AM257x/AM277x	AM3x5x/AM3x6x
AG2200-+LP155-M01-x-11y	max. 190 Nm	max. 350 Nm	$\leq 12/8$ arcmin	AM277x/AM297x	AM3x6x/AM307x
AG2200-+LP155-M02-x-11y	max. 190 Nm	max. 350 Nm	$\leq 15/10$ arcmin	AM277x/AM297x	AM3x6x

Further information [www.beckhoff.com/AG2200](http://www.beckhoff.com/AG2200)

M01: single-stage x = gear ratio 3\*, 4\*, 5, 7\* or 10 (\*LP50/70/90/120 only)

M02: two-stage x = gear ratio 15\*, 16\*, 25, 30\*, 50, 70\* or 100 (\*LP50/70/90/120 only)

y = 0: reduced torsional backlash, y = 1: standard torsional backlash



## AL20xx | Linear Servomotors

The 3-phase synchronous Linear Servomotors from the AL2000 range have both a coil unit and a magnet plate. The coil unit contains a grooved, laminated core with inlaid copper windings. It is generally used as the moving part. The magnet plate contains the steel plate to which the permanent magnets are fixed.

The AL2000 series consists of eight different motors, all having exactly the same width of 80 mm (incl. magnetic assembly). This means that all the motors can be operated using the same magnet plates. They can be combined in any desired way. The magnet plates are fully sealed and therefore have an almost perfectly level and robust surface.

The coil units are also potted, satisfy protection class IP 64, and are therefore suitable

for use in aggressive environments. Coil units are fitted with a 0.5 m cable bundle and optionally with pre-assembled connectors, so that they can be quickly connected to the connector box or the servo drive via plugged connections. This greatly reduces the difficulty of implementing the cabling and makes a significant contribution to avoiding errors.

In combination with the Servo Drives AX2xxx or AX5000, the AL2xxx series linear motors are particularly suitable for dynamic movements where high acceleration is required over short distances.

### Features

- speeds of 4 m/s or 10 m/s
- accelerations up to 30 g
- peak forces of 200 N to 2000 N

- no mechanical wear
- complete absence of backlash, giving stiff control response
- extremely precise positioning, high repeatability
- direct force, little latching force
- very low thermal resistance, allowing high capacity utilisation
- operation alternatively with or without water cooling possible
- protection from thermal overload through integrated temperature sensors
- Operation with the AX2xxx/AX5000 is made extremely simple through default values.
- connection to the AX2xxx/AX5000 through pre-assembled cables
- UL/CSA

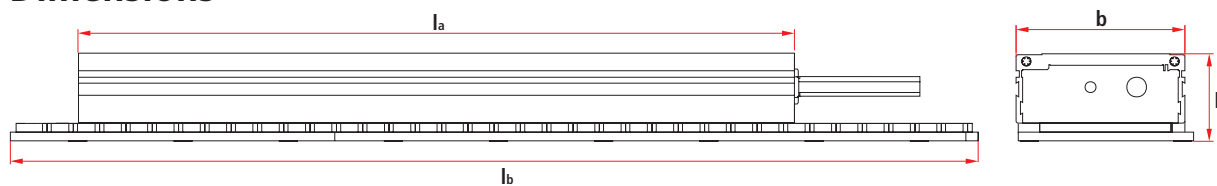
### Scaleless feedback system for Linear Servomotors

The MES system registers the magnetic field of the permanent magnets of the magnet plate. It sends, with the aid of built-in electronics, encoder signals for commutation as well as speed and position control to the AX2xxx/AX5000 series Servo Drive. The MES provides one sine wave per 24 mm pole pitch and a precision of 1/10 mm.

### Connector box

As a further accessory, Beckhoff offers an adapter box with motor, feedback and thermal protection line connected on one side. The pre-assembled motor and encoder lines can be attached on the other side.

## Dimensions



Dimensions	b	l <sub>a</sub>	h
AL2003	77 mm	98 mm	40 mm
AL2006	77 mm	146 mm	40 mm
AL2009	77 mm	195 mm	40 mm
AL2012	77 mm	244 mm	40 mm
AL2015	77 mm	290 mm	40 mm
AL2018	77 mm	336 mm	40 mm
AL2024	77 mm	468 mm	40 mm
AL2030	77 mm	562 mm	40 mm

Technical drawings at [www.beckhoff.com/DriveTechnology](http://www.beckhoff.com/DriveTechnology)

Technical data	AL2003	AL2006	AL2009	AL2012	AL2015	AL2018	AL2024	AL2030
Winding type	S	N   S	N   S	N   S	N   S	N   S	N   S	N   S
Motor configuration	3-phase synchronous Linear Servomotors (400...480 V AC)							
Peak force 3 sec. (F <sub>P</sub> )	225 N	450 N	675 N	900 N	1125 N	1350 N	1800 N	2250 N
Peak current (I <sub>P</sub> )	5 A	6.5   13 A	8   15 A	13   26 A	13   33 A	20   41 A	26   52 A	20   50 A
Contin. force w. water cool. (F <sub>cw</sub> )	105 N	210 N	315 N	420 N	525 N	630 N	840 N	1050 N
Contin. force w. air cooling (F <sub>ca</sub> )	75 N	150 N	225 N	300 N	375 N	450 N	600 N	750 N
Continuous current (I <sub>c</sub> )	1.6 A	1.6   3.3 A	3.6   6.8 A	3.3   6.5 A	3.3   8.2 A	4.8   10 A	6.5   13 A	6.7   16.3 A
Continuous power loss (P <sub>c</sub> )	80 W	155 W	226 W	310 W	370 W	453 W	620 W	740 W
Force constant (K <sub>f</sub> )	46 N/A	93   46 N/A	87   46 N/A	93   46 N/A	112   46 N/A	93   44.9 N/A	93   46 N/A	112   46 N/A
Motor constant (K <sub>m</sub> )	185 N <sup>2</sup> /W	370 N <sup>2</sup> /W	570 N <sup>2</sup> /W	740 N <sup>2</sup> /W	970 N <sup>2</sup> /W	1140 N <sup>2</sup> /W	1480 N <sup>2</sup> /W	1940 N <sup>2</sup> /W
Magnet pitch	24 mm							
Winding resistance per phase (R <sub>f</sub> )	3.9 Ω	7.8   2 Ω	4.4   1.2 Ω	3.9   1 Ω	4.3   0.75 Ω	2.5   0.59 Ω	1.9   0.48 Ω	2.2   0.37 Ω
Winding inductance per phase (L <sub>f</sub> )	30 mH	60   15 mH	33   9 mH	30   7.5 mH	35   6.5 mH	19   4 mH	15   3.7 mH	17.5   3.2 mH
Thermal resistance (R <sub>th</sub> )	0.96 °C/W	0.48 °C/W	0.32 °C/W	0.24 °C/W	0.20 °C/W	0.16 °C/W	0.12 °C/W	0.10 °C/W
Magnetic attraction force (F <sub>a</sub> )	500 N	900 N	1325 N	1700 N	2000 N	2850 N	3400 N	4000 N
Weight of the coil (M <sub>P</sub> )	0.9 kg	1.5 kg	2.0 kg	2.6 kg	3.2 kg	3.8 kg	5.1 kg	6.3 kg
Air gap with cover	0.4 mm							
Temperature sensor	PTC 1 kΩ							
Corresponding Servo Drive	AX2003 AX5x03	AX2003   AX2006 AX5x03   AX5x06	AX2006   AX2010 AX5x06   AX5112	AX2006   AX2010 AX5x06   AX5112	AX2006   AX2010 AX5x06   AX5112	AX2006   AX2010 AX5x06   AX5112	AX2010   AX2020 AX5112   AX5118	AX2010   AX2040 AX5112   AX5125
Further information	<a href="http://www.beckhoff.com/AL20xx">www.beckhoff.com/AL20xx</a>							

Ordering information	AL20xx-000x-000y coil unit
AL2003-0001-000y	Linear Servomotor, 400...480 V, F <sub>P</sub> = 225 N, F <sub>C</sub> = 75 N
AL2006-000x-000y	Linear Servomotor, 400...480 V, F <sub>P</sub> = 450 N, F <sub>C</sub> = 150 N
AL2009-000x-000y	Linear Servomotor, 400...480 V, F <sub>P</sub> = 675 N, F <sub>C</sub> = 225 N
AL2012-000x-000y	Linear Servomotor, 400...480 V, F <sub>P</sub> = 900 N, F <sub>C</sub> = 300 N
AL2015-000x-000y	Linear Servomotor, 400...480 V, F <sub>P</sub> = 1125 N, F <sub>C</sub> = 375 N
AL2018-000x-000y	Linear Servomotor, 400...480 V, F <sub>P</sub> = 1350 N, F <sub>C</sub> = 450 N
AL2024-000x-000y	Linear Servomotor, 400...480 V, F <sub>P</sub> = 1800 N, F <sub>C</sub> = 600 N
AL2030-000x-000y	Linear Servomotor, 400...480 V, F <sub>P</sub> = 2250 N, F <sub>C</sub> = 750 N

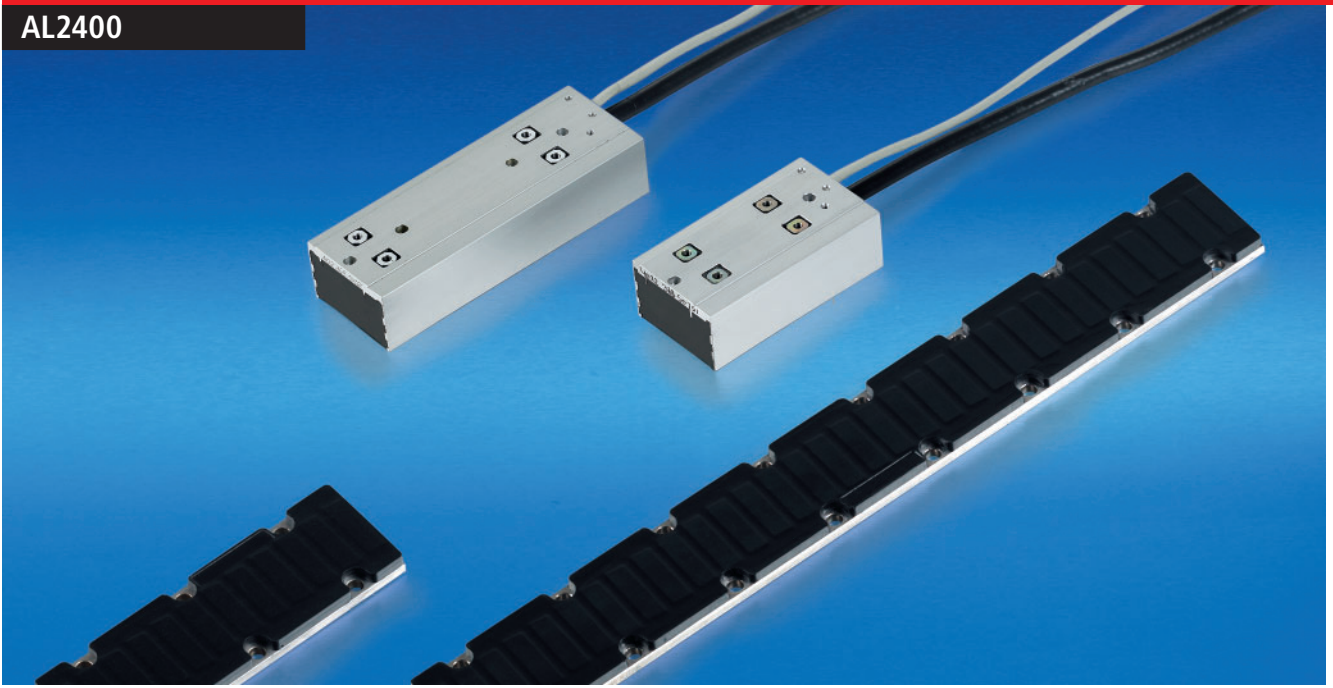
Option x = 0: N type, max. 4 m/s, x = 1: S type, max. 10 m/s

Option y = 0: without connector plug, y = 1: with connector plugs (motor and temperature)

Ordering information	AL21xx-0000 magnet plate
AL2110-0000	magnetic assembly (l <sub>b</sub> = 192 mm, weight 3.8 kg/m), for AL20xx motors
AL2120-0000	magnetic assembly (l <sub>b</sub> = 288 mm, weight 3.8 kg/m), for AL20xx motors

Accessories see page 1129





## AL24xx | Linear Servomotors

The 3-phase synchronous Linear Servomotors AL2400 expand the smaller performance product range. These Linear Servomotors are particularly suitable for tight installation situations. The coil unit contains a grooved, laminated core with inlaid copper windings. It is generally used as the moving part. The magnet plate contains the steel plate to which the permanent magnets are fixed.

The AL2400 series consists of two different motors, both having exactly the same width of 51 mm. This means that all the motors can be operated using the same magnet plates. There are three different lengths of magnet plates that can be combined in any desired way. The magnet plates are fully sealed and therefore have an almost perfectly level and robust surface.

The coil units are also potted, satisfy protection class IP 64, and are therefore suitable for use in aggressive environments. Coil units are fitted with a 0.5 m cable bundle and option-

ally with pre-assembled connectors, so that they can be quickly connected to the connector box or the Servo Drive via plugged connections. This greatly reduces the difficulty of implementing the cabling, and makes a significant contribution to avoiding errors.

In combination with the Servo Drives AX2xxx or AX5000, the AL2xxx series linear motors are particularly suitable for dynamic movements where high acceleration is required over short distances.

All linear motors of the series AL2xxx have the same magnet pitch (24 mm).

The motor connection is compatible with the other types of the AL2xxx series.

### Features

- speeds of 8 m/s
- accelerations up to 30 g
- peak forces of 120 N to 240 N
- no mechanical wear
- complete absence of backlash, giving stiff control response

- extremely precise positioning, high repeatability
- direct force, little latching force
- very low thermal resistance, allowing high capacity utilisation
- protection from thermal overload through integrated temperature sensors
- Operation with the AX2xxx/AX5000 is made extremely simple through default values.
- connection to the AX2xxx/AX5000 through pre-assembled cables
- UL/CSA

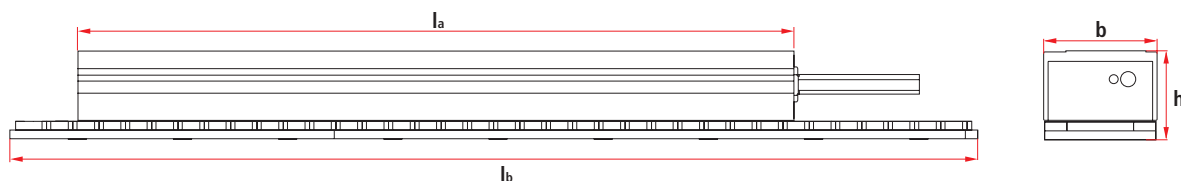
### Scaleless feedback system for Linear Servomotors

The MES system registers the magnetic field of the permanent magnets of the magnet plate. It sends, with the aid of built-in electronics, encoder signals for commutation as well as speed and position control to the AX2xxx/AX5000 series Servo Drive. The MES provides one sine wave per 24 mm pole pitch and a precision of 1/10 mm.

### Connector box

As a further accessory, Beckhoff offers an adapter box with motor, feedback and thermal protection line connected on one side. The pre-assembled motor and encoder lines can be attached on the other side.

## Dimensions



Dimensions	b	l <sub>a</sub>	h
AL2403	51 mm	93 mm	40 mm
AL2406	51 mm	143 mm	40 mm

Technical drawings at [www.beckhoff.com/DriveTechnology](http://www.beckhoff.com/DriveTechnology)

Technical data	AL2403	AL2406
Motor configuration	3-phase synchronous Linear Servomotors (400...480 V AC)	
Peak force 3 sec. (F <sub>P</sub> )	120 N	240 N
Peak current (I <sub>P</sub> )	3.9 A	7.9 A
Contin. force w. air cooling (F <sub>ca</sub> )	45 N	90 N
Continuous current (I <sub>c</sub> )	1.6 A	3.1 A
Continuous power loss (P <sub>c</sub> )	55 W	110 W
Force constant (K <sub>f</sub> )	39 N/A	
Motor constant (K <sub>m</sub> )	90 N <sup>2</sup> /W	180 N <sup>2</sup> /W
Magnet pitch	24 mm	
Winding resistance per phase (R <sub>f</sub> )	5.6 Ω	2.8 Ω
Winding inductance per phase (L <sub>f</sub> )	35 mH	18 mH
Thermal resistance (R <sub>th</sub> )	1.4 °C/W	0.7 °C/W
Magnetic attraction force (F <sub>a</sub> )	270 N	490 N
Weight of the coil (M <sub>p</sub> )	0.55 kg	0.9 kg
Air gap with cover	0.4 mm	
Temperature sensor	PTC 1 kΩ	
Corresponding Servo Drive	AX25x3   AX2003 AX5x03	AX25x3/AX25x6   AX2003/AX2006 AX5x03/AX5x06
Further information	<a href="http://www.beckhoff.com/AL24xx">www.beckhoff.com/AL24xx</a>	

Ordering information	AL240x-000x-000y coil unit
AL2403-0001-000y	Linear Servomotor, 230 V, F <sub>P</sub> = 120 N, I <sub>P</sub> = 3.9 A <sub>rms</sub>
AL2406-0001-000y	Linear Servomotor, 230 V, F <sub>P</sub> = 240 N, I <sub>P</sub> = 7.9 A <sub>rms</sub>

S type, max. 8 m/s

Option y=0: without connector plug, y=1: with connector plugs (motor and temperature)

Ordering information	AL25xx-0000 magnet plate
AL2510-0000	magnetic assembly (l <sub>b</sub> = 96 mm, weight 2.1 kg/m), for AL24xx motors
AL2520-0000	magnetic assembly (l <sub>b</sub> = 144 mm, weight 2.1 kg/m), for AL24xx motors
AL2530-0000	magnetic assembly (l <sub>b</sub> = 384 mm, weight 2.1 kg/m), for AL24xx motors

Accessories see page [1129](#)



## AL28xx | Linear Servomotors

The 3-phase synchronous Linear Servomotors AL2800 expand the high-performance product range. The coil unit contains a grooved, laminated core with inlaid copper windings. It is generally used as the moving part. The magnet plate contains the steel plate to which the permanent magnets are fixed.

The AL2800 series consists of four different motors, all having exactly the same width of 130 mm. This means that all the motors can be operated using the same magnet plates. There are two different lengths of magnet plates that can be combined in any desired way. The magnet plates are fully sealed and therefore have an almost perfectly level and robust surface.

The coil units are also potted, satisfy protection class IP 64, and are therefore suitable for use in aggressive environments. Coil units are fitted with a 0.5 m cable bundle and optionally with pre-assembled connectors, so that they can be connected to the connector box

or the Servo Drive via plugged connections. This greatly reduces the difficulty of implementing the cabling and makes a significant contribution to avoiding errors.

In combination with the Servo Drives AX2xxx or AX5000, the AL2xxx series linear motors are particularly suitable for dynamic movements where high acceleration is required over short distances.

All linear motors of the series AL2xxx have the same magnet pitch (24 mm).

The motor connection is compatible with the other types of the AL2xxx series.

### Features

- speeds of 2.5 m/s or 6 m/s
- accelerations up to 30 g
- peak forces of 2250 N to 9000 N
- no mechanical wear
- complete absence of backlash, giving stiff control response
- extremely precise positioning, high repeatability
- direct force, little latching force

- very low thermal resistance, allowing high capacity utilisation
- protection from thermal overload through integrated temperature sensors
- Operation with the AX2xxx/AX5000 is made extremely simple through default values.
- connection to the AX2xxx/AX5000 through pre-assembled cables
- UL/CSA

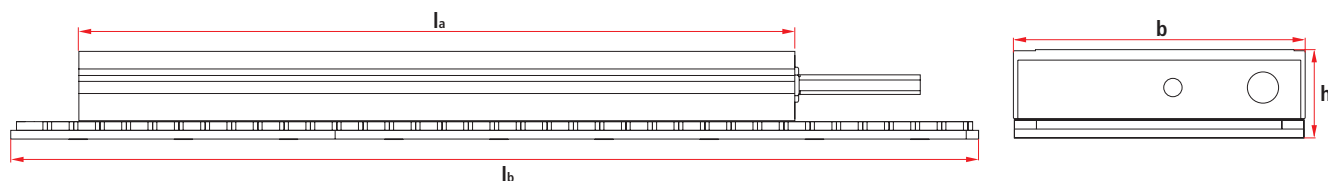
### Scaleless feedback system for Linear Servomotors

The MES system registers the magnetic field of the permanent magnets of the magnet plate. It sends, with the aid of built-in electronics, encoder signals for commutation as well as speed and position control to the AX2xxx/AX5000 series Servo Drive. The MES provides one sine wave per 24 mm pole pitch and a precision of 1/10 mm.

### Connector box

As a further accessory, Beckhoff offers an adapter box with motor, feedback and thermal protection line connected on one side. The pre-assembled motor and encoder lines can be attached on the other side.

## Dimensions



Dimensions	b	l <sub>a</sub>	h
AL2812	130 mm	244 mm	45 mm
AL2815	130 mm	290 mm	45 mm
AL2830	130 mm	562 mm	45 mm
AL2845	130 mm	834 mm	45 mm

Technical drawings at [www.beckhoff.com/DriveTechnology](http://www.beckhoff.com/DriveTechnology)

Technical data	AL2812	AL2815	AL2830	AL2845
Winding type	N   S	N   S	N   S	N   S
Motor configuration	3-phase synchronous Linear Servomotors (400...480 V AC)			
Peak force 3 sec. (F <sub>P</sub> )	1800 N	2250 N	4500 N	6750 N
Peak current (I <sub>P</sub> )	13 A   26 A	13.5 A   33 A	26 A   66 A	39 A   99 A
Contin. force w. air cooling (F <sub>ca</sub> )	580 N	725 N	1450 N	2175 N
Continuous current (I <sub>c</sub> )	4.1 A   8.2 A	4.2 A   10.2 A	8.5 A   20 A	12.5 A   31 A
Continuous power loss (P <sub>c</sub> )	430 W	550 W	1100 W	1650 W
Force constant (K <sub>f</sub> )	186 N/A   93 N/A	225 N/A   93 N/A	225 N/A   93 N/A	225 N/A   93 N/A
Motor constant (K <sub>m</sub> )	1750 N <sup>2</sup> /W	2150 N <sup>2</sup> /W	4300 N <sup>2</sup> /W	6450 N <sup>2</sup> /W
Magnet pitch	24 mm			
Winding resistance per phase (R <sub>f</sub> )	6.6 Ω   1.6 Ω	7.8 Ω   1.3 Ω	3.9 Ω   0.66 Ω	2.6 Ω   0.44 Ω
Winding inductance per phase (L <sub>f</sub> )	52 mH   13 mH	63 mH   10.5 mH	32 mH   5.3 mH	21 mH   3.5 mH
Thermal resistance (R <sub>th</sub> )	0.16 °C/W	0.13 °C/W	0.065 °C/W	0.043 °C/W
Magnetic attraction force (F <sub>a</sub> )	3400 N	4000 N	8000 N	12000 N
Weight of the coil (M <sub>p</sub> )	5 kg	6 kg	12 kg	18 kg
Air gap with cover	0.4 mm			
Temperature sensor	PTC 1 kΩ			
Corresponding Servo Drive	AX2006   AX2010 AX5x06   AX5112	AX2006   AX2020 AX5x06   AX5118	AX2020   AX2040 AX5112   AX5125	AX2020   AX2070 AX5118
Further information	<a href="http://www.beckhoff.com/AL28xx">www.beckhoff.com/AL28xx</a>			

Ordering information	AL28xx-000x-000y coil unit
AL2812-000x-000y	Linear Servomotor, 400...480 V, F <sub>P</sub> = 1800 N, F <sub>c</sub> = 580 N
AL2815-000x-000y	Linear Servomotor, 400...480 V, F <sub>P</sub> = 2250 N, F <sub>c</sub> = 725 N
AL2830-000x-0000	Linear Servomotor, 400...480 V, F <sub>P</sub> = 4500 N, F <sub>c</sub> = 1450 N
AL2845-000x-0000	Linear Servomotor, 400...480 V, F <sub>P</sub> = 6750 N, F <sub>c</sub> = 2175 N

Option x=0: N type, max. 2.5 m/s, x=1: S type, max. 6 m/s

Option y=0: without connector plug, y=1: with connector plugs (only possible with AL2812 and AL2815!)

Ordering information	AL29xx-0000 magnet plate
AL2910-0000	magnetic assembly (l <sub>b</sub> = 192 mm, weight 10.5 kg/m), for AL28xx motors
AL2920-0000	magnetic assembly (l <sub>b</sub> = 288 mm, weight 10.5 kg/m), for AL28xx motors

Accessories see page [1129](#)



## AL38xx | Ironless Linear Servomotors

In contrast to the AL2000 series, the linear motors from the AL3000 series have no iron core. This has the advantage that the coil part is not attracted by the permanent magnets and that cogging, i.e. the occurrence of cogging thrust due to magnetic forces between the permanent magnets and the iron core, is avoided. The benefits of ironless linear motors are particularly significant in semiconductor and plasma/LCD panel production, where highly synchronous operation and positioning quality are required. The lack of an iron core has the additional benefit of reduced weight and inductance of the coil part, leading to

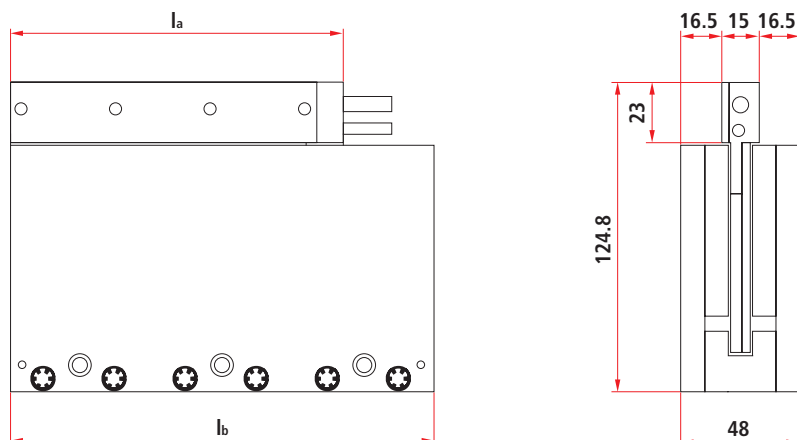
improved dynamics. Overall, an ironless linear motor is therefore the ideal drive, because it generates no interfering side effects in addition to the direct, backlash-free connection with the load. This enables the control loop gain to be set significantly higher in order to achieve the required positioning accuracy.

### Features

- absolutely stiff, backlash-free coupling of load and motor
- no cogging, highly synchronous operation
- high dynamics through low inductance
- high dynamics through lower weight of the coil part

- high force density
- direct, fast force generation, thereby no position overshoot
- significantly higher positioning accuracy through high control loop gain possible
- maintenance-free drive, no abrasion, no wear, ideal for cleanroom applications
- maximum velocity 2.7 m/s (N type) or 6.6 m/s (S type)

## Dimensions



Dimensions	$l_a$
AL3803	134 mm
AL3806	248 mm
AL3809	362 mm
AL3812	476 mm
AL3818	704 mm

Technical drawings at [www.beckhoff.com/DriveTechnology](http://www.beckhoff.com/DriveTechnology)

Technical data	AL3803	AL3806	AL3809	AL3812	AL3818
Winding type	N   S	N   S	N   S	N   S	N
Motor configuration	3-phase synchronous Linear Motors 230 V AC				
Peak force 3 sec. ( $F_P$ )		1400 N	2100 N	2800 N	4200 N
Peak current ( $I_P$ )	5.6 A   13.9 A	11.3 A   28 A	16.9 A   42 A	22.6 A   56 A	34 A
Contin. force w. air cooling ( $F_{ca}$ )	104 N	208 N	312 N	416 N	624 N
Continuous current ( $I_c$ )	1.14 A   2.8 A	2.27 A   5.6 A	3.4 A   8.4 A	4.5 A   11.2 A	6.8 A
Continuous power loss ( $P_c$ )	82 W	165 W	247 W	330 W	494 W
Force constant ( $K_f$ )	124 N/A   50.3 N/A	124 N/A   50.3 N/A	124 N/A   50.3 N/A	124 N/A   50.3 N/A	124 N/A
Motor constant ( $K_m$ )	323 N <sup>2</sup> /W	647 N <sup>2</sup> /W	970 N <sup>2</sup> /W	1293 N <sup>2</sup> /W	1940 N <sup>2</sup> /W
Speed max.	2.7 m/s   6.6 m/s	2.7 m/s   6.6 m/s	2.7 m/s   6.6 m/s	2.7 m/s   6.6 m/s	2.7 m/s
Magnet pitch	57 mm				
Winding resistance per phase ( $R_f$ )	15.8 $\Omega$   2.6 $\Omega$	7.9 $\Omega$   1.29 $\Omega$	5.3 $\Omega$   0.86 $\Omega$	4 $\Omega$   0.65 $\Omega$	2.6 $\Omega$
Winding inductance per phase ( $L_f$ )	28 mH   4.6 mH	14 mH   2.3 mH	9 mH   1.5 mH	7 mH   1.2 mH	4.7 mH
Thermal resistance ( $R_{th}$ )	1.04 $^{\circ}$ C/W	0.52 $^{\circ}$ C/W	0.35 $^{\circ}$ C/W	0.26 $^{\circ}$ C/W	0.17 $^{\circ}$ C/W
Magnetic attraction force ( $F_a$ )	0 N				
Weight of the coil ( $M_P$ )	0.55 kg	0.95 kg	1.35 kg	1.75 kg	2.55 kg
Temperature sensor	PTC 1 k $\Omega$				
Corresponding Servo Drive	AX2003   AX2006*	AX2006   AX2020	AX2010   AX2020*	AX2010*   AX2040	AX2020
	AX5x03   AX5x06*	AX5x06   AX5112	AX5112   AX5125	AX5112   AX5125*	AX5118
Further information	<a href="http://www.beckhoff.com/AL38xx">www.beckhoff.com/AL38xx</a>				

\*Peak force slightly reduced

Ordering information	AL38xx-000x-0000 coil unit
AL3803-000x-0000	Linear Servomotor, 230 V AC, $F_P = 700$ N, $F_C = 104$ N
AL3806-000x-0000	Linear Servomotor, 230 V AC, $F_P = 1400$ N, $F_C = 208$ N
AL3809-000x-0000	Linear Servomotor, 230 V AC, $F_P = 2100$ N, $F_C = 312$ N
AL3812-000x-0000	Linear Servomotor, 230 V AC, $F_P = 2800$ N, $F_C = 416$ N
AL3818-0000-0000	Linear Servomotor, 230 V AC, $F_P = 4200$ N, $F_C = 624$ N

Option x = 0: N type, max. 2.7 m/s, x = 1: S type, max. 6.6 m/s; motors only available without connector plug

Ordering information	AL39xx-0000 magnet yoke
AL3910-0000	magnetic assembly ( $l_b = 114$ mm, weight 25.5 kg/m), for AL38xx motors
AL3920-0000	magnetic assembly ( $l_b = 171$ mm, weight 25.5 kg/m), for AL38xx motors
AL3930-0000	magnetic assembly ( $l_b = 456$ mm, weight 25.5 kg/m), for AL38xx motors



## AS1xxx | Stepper Motors

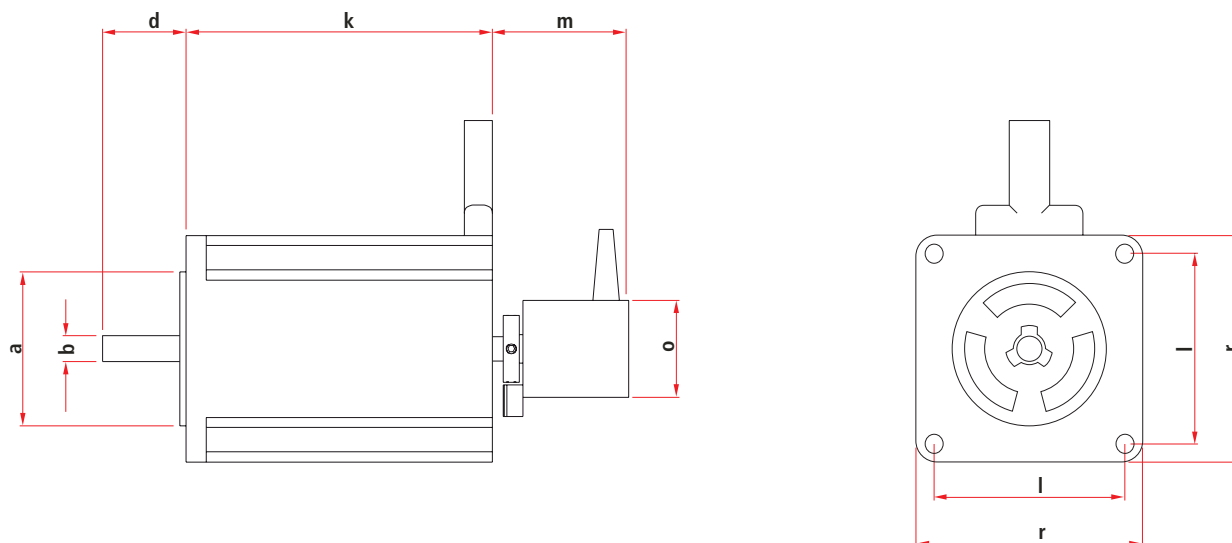
Stepper Motors are synchronous motors with a high number of poles, which can therefore be regarded as direct drives. Advantages include high holding torque and very good positioning capability. Individual steps or partial steps can be approached directly (i.e. without return system) through intelligent control of the stator windings in full step or microstep mode. This distinguishes Stepper Motors from servomotors and makes them a cost-effective alternative. Excessive acceleration and fast load cycles can result in the Stepper Motors no longer being able to follow the rotary field and "losing steps". The encoder option can improve matters in this situation.

Stepper Motors have their maximum torque in the lower speed range and an overriding holding torque at standstill. In many applications this makes a holding brake unnecessary. The stepper motor terminals from the Beckhoff I/O system can store suitable current curves for any speed or load profile, for optimum adjustment of the thermal motor load.

Beckhoff Stepper Motors are used as actuators or auxiliary axes in machine construction and automation applications. In conjunction with the KL2531 and KL2541 stepper motor terminals and the TwinCAT automation software, cost-effective axes can easily be integrated into the overall application.

In order to simplify the electrical connection, the Stepper Motors are equipped with pre-assembled plug connectors. Planetary gear units, incremental encoders and pre-assembled connection cables are available as accessories.

## Dimensions



Dimensions	a	b	d	k	l	m	o	r
AS1010	22 mm	5 mm	24 mm	39 mm	31 mm	–	–	42 mm
AS1020	22 mm	5 mm	24 mm	48 mm	31 mm	33 mm	24 mm	42 mm
AS1030	38.1 mm	6.35 mm	20.6 mm	54 mm	47.14 mm	–	–	56 mm
AS1050	38.1 mm	6.35 mm	20.6 mm	75.8 mm	47.14 mm	33 mm	24 mm	56 mm
AS1060	73 mm	14 mm	30 mm	96.5 mm	69.6 mm	33 mm	24 mm	85.5 mm

Technical data	AS1010-0000	AS1020-0xyz	AS1030-0000	AS1050-0xyz	AS1060-wxyz
Rated supply voltage	24...50 V DC				
Rated current (per phase)	1.0 A	1.0 A	1.5 A	5.0 A	5.0 A
Standstill torque	0.38 Nm	0.5 Nm	0.6 Nm	1.2 Nm	5.0 Nm
Winding resistance (per phase)	4.10 Ω	4.80 Ω	0.80 Ω	0.28 Ω	0.36 Ω
Winding inductance (per phase)	9.50 mH	9.50 mH	3.80 mH	0.86 mH	2.80 mH
Rotor moment of inertia	0.056 kg cm <sup>2</sup>	0.074 kg cm <sup>2</sup>	0.21 kg cm <sup>2</sup>	0.36 kg cm <sup>2</sup>	3.0 kg cm <sup>2</sup>
Resolution	1.8°/200 full steps				
Dimensions (r x length)	42 mm x 39 mm	42 mm x 48 mm	56 mm x 53 mm	56 mm x 75 mm	86 mm x 97 mm
Weight	0.31 kg	0.39 kg	0.68 kg	1.00 kg	2.85 kg
Bus Terminal	KL2531	KL2531/KL2541	KL2531	KL2541	KL2541
Further information	<a href="http://www.beckhoff.com/AS1010">www.beckhoff.com/AS1010</a>				

Option w = 0: smooth shaft with 2 flats (AS1030 only smooth shaft); w = 1: shaft with groove and feather key according to DIN 6885 (only AS1060)

Option x = 0: single shaft, x = 1; second shaft (only AS1020/AS1050/AS1060)

Option y = 0: no incremental encoder; y = 1: incremental encoder 24 V DC, 200 inc/rev; y = 2: 1,024 inc/rev

Option z = 0: standard; z = 1: customer-specific

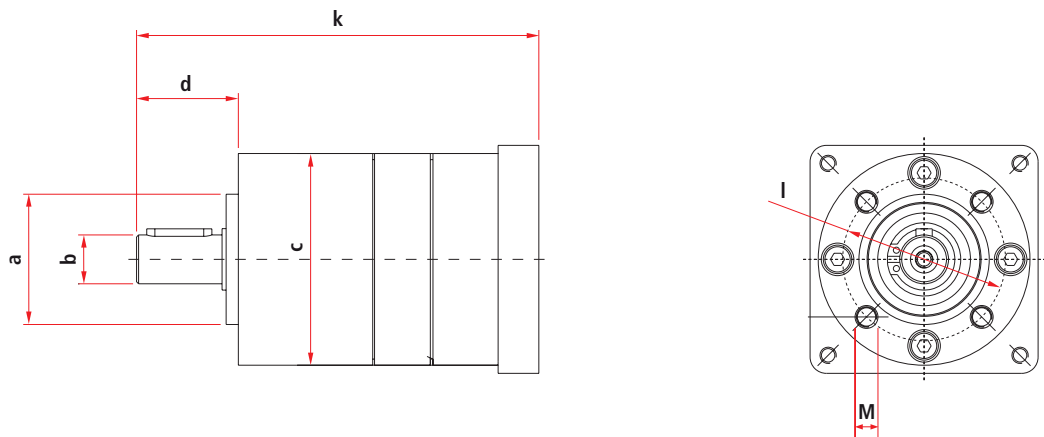




## AG1000 | Planetary gear unit for stepper motors

Beckhoff offers special planetary gears for Stepper Motors in order to increase the torque or to improve the inertia ratio. Stepper Motors whose flanges have dimensions of 56 mm or above can be fitted with low-backlash planetary gears. If the planetary gear is ordered along with the Stepper Motor, the combination of motor and gear is delivered fully assembled.

### Dimensions



Dimensions	a	b	c	d	k	l	M
AG1000-+PM52.x to AS1030/AS1050	32 mm	12 mm	52 mm	25 mm	99.8 mm	40 mm	M5
AG1000-+PM81.x to AS1060	50 mm	19 mm	81 mm	49 mm	151.2 mm	65 mm	M6

Ordering information	AG1000-+PM52.x to AS1030/AS1050	AG1000-+PM81.x to AS1060
Rated torque	4 Nm	20 Nm
Acceleration torque	6 Nm	30 Nm
Gear backlash	$\leq 0.7^\circ$	$\leq 0.5^\circ$
Max. radial load	200 N	400 N
Max. axial load	60 N	80 N

Further information [www.beckhoff.com/AG1000](http://www.beckhoff.com/AG1000)

x = 4: gear ratio 1:4 (more precisely 3.7 or 63/17 as a fraction), x = 7: gear ratio 1:7 (more precisely 6.75 or 27/4 as a fraction)

# Accessories for motors AMxxxx/ALxxxx/ASxxxx

## Connectors for Servomotors AMxxxx, ALxxxx and cables

Ordering information	ZS4000-20yy   Connectors	Pict.
ZS4000-2010	EMC power connector for servo cable (counterpart for motor box), BG1, up to winding code P (18 A)	A
ZS4000-2011	EMC power connector for servo cable (counterpart for motor box), BG1.5, for winding code Q (18 A)	B
ZS4000-2020	EMC resolver connector for resolver cable (counterpart for motor box)	C
ZS4000-2021	EMC encoder connector for encoder cable (counterpart for motor box)	D
ZS4000-2030	EMC thermo-protective male connector for thermo-protective wire, D-sub, 9-pin, with housing, straight	E
ZS4000-2040	EMC power coupling, counterpart for motor cable, BG1	F
ZS4000-2041	EMC power coupling, counterpart for motor cable, BG1.5	G
ZS4000-2050	EMC resolver coupling, counterpart for resolver cable	H
ZS4000-2051	EMC encoder coupling for servomotors, counterpart for encoder cable	I
ZS4000-2060	resolver female socket, angled 90°, for AM2000	J
ZS4000-2061	encoder female socket, angled 90°, for AM2000	K
ZS4000-2062	resolver female encoder, rotatable, angled 90°, for AM3000	L
ZS4000-2063	encoder female encoder, rotatable, angled 90°, for AM3000	M
ZS4000-2070	power female socket, angled 90°, for AM2000	N
ZS4000-2071	power female socket, rotatable, angled 90°, for AM3000, BG1, up to winding code P (18 A)	N
ZS4000-2072	power female socket, rotatable, angled 90°, for AM3000, BG1.5, for winding code Q (18 A)	O
ZS4000-2080	resolver female socket, straight, for AM2000	P
ZS4000-2081	encoder female socket, straight, for AM2000	Q
ZS4000-2090	power female socket, straight, for AM2000	R
ZS4000-2100	metal flange for motor cable to adjust the connector, two parts with sealing	S
ZS4000-2101	metal flange for feedback cable to adjust the connector, two parts with sealing	T



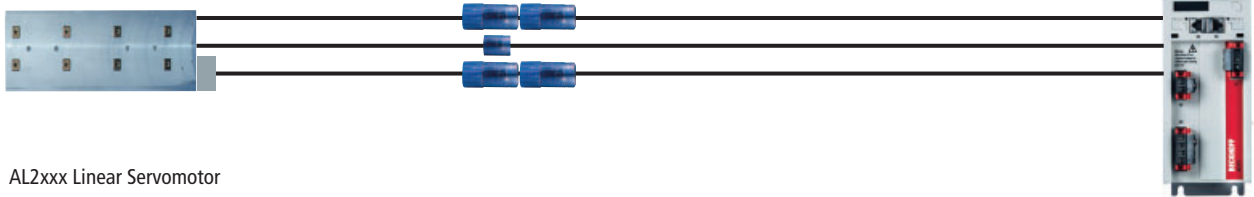
## Connector box for ALxxxx

The AL2250 connector box facilitates wiring between linear motor and the Servo Drive. It is mounted on the linear slide and moves with the motor. The motor cable, the thermal protection contact cable and the encoder cable are inserted into the box through cable glands and connected to the terminal strip. The temperature contact is linked to the motor and encoder cable, so that no thermal protection contact cable is required. The standard motor and encoder cables are connected on the other side of the box.

Ordering information	AL2250-000x   Connector box
AL2250-000x	connector box for motor, encoder and thermal protection cable (AX2x00/AX5000) (x = 0: AX2x00/x = 1: AX5000)



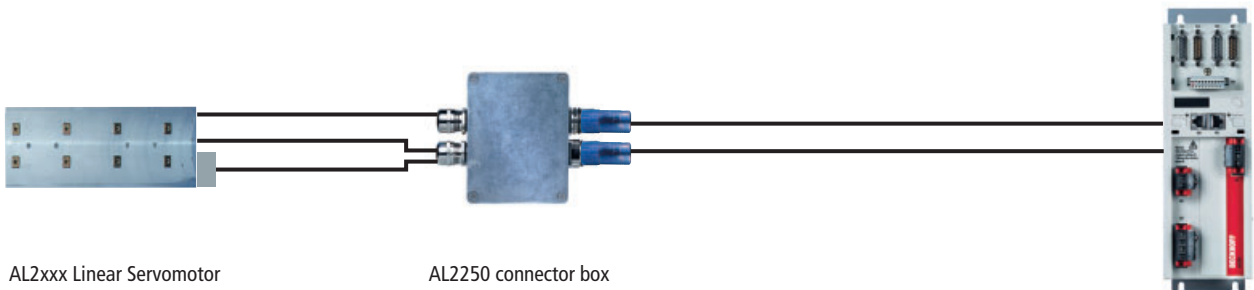
### AL2xxx with Beckhoff encoder (MES) without connector box



AL2xxx Linear Servomotor

Cable	AX2000	AX2500	AX5000
Motor cable	ZK4000-2111	ZK4000-2711	ZK4500-0023
Thermal protection contact cable	ZK4000-2510	ZK4000-2510	ZK4540-0020
Encoder cable for MES	ZK4000-2610	ZK4000-2610	ZK4510-0020

### AL2xxx with Beckhoff encoder (MES) and AL2250 connector box



AL2xxx Linear Servomotor

AL2250 connector box

Cable	AX2000	AX2500	AX5000
Motor cable	ZK4000-2111	ZK4000-2711	ZK4500-0023
Encoder cable for MES or absolute encoder	ZK4000-2610	ZK4000-2610	ZK4510-0020
Encoder cable for encoder with zero pulse	ZK4000-2610	ZK4000-2610	ZK4520-0020

## Feedback system for ALxxxx

Ordering information	AL2200-000z   Feedback system
AL2200-000z	magnetic encoder system for AL2xxx series Linear Servomotors (MES)

Option z = 0: without connector plug, z = 1: with connector plug

## Motor cables for AS1000 Stepper Motors to KL2531/41 or EL70x1

Ordering information	ZK4000-6200-xxxx   Motor cables
ZK4000-6200-2010	motor cable, assembled at both ends for AS1000 Stepper Motors, 4 x 0.5 mm <sup>2</sup> , l = 1 m
ZK4000-6200-2030	motor cable, assembled at both ends for AS1000 Stepper Motors, 4 x 0.5 mm <sup>2</sup> , l = 3 m
ZK4000-6200-2050	motor cable, assembled at both ends for AS1000 Stepper Motors, 4 x 0.5 mm <sup>2</sup> , l = 5 m
ZK4000-6200-2100	motor cable, assembled at both ends for AS1000 Stepper Motors, 4 x 0.5 mm <sup>2</sup> , l = 10 m

The maximum motor cable length is 10 m.

## Encoder cables for AS1000 Stepper Motors to KL2531/41 or EL70x1

Ordering information	ZK4000-5100-xxxx   Encoder cables
ZK4000-5100-2010	encoder cable, assembled on both sides for AS1000 Stepper Motors, 5 x 0.35 mm <sup>2</sup> , l = 1 m, screened
ZK4000-5100-2030	encoder cable, assembled on both sides for AS1000 Stepper Motors, 5 x 0.35 mm <sup>2</sup> , l = 3 m, screened
ZK4000-5100-2050	encoder cable, assembled on both sides for AS1000 Stepper Motors, 5 x 0.35 mm <sup>2</sup> , l = 5 m, screened
ZK4000-5100-2100	encoder cable, assembled on both sides for AS1000 Stepper Motors, 5 x 0.35 mm <sup>2</sup> , l = 10 m, screened

## Motor cables for AS1000 Stepper Motors to EP7041 EtherCAT Box

Ordering information	ZK4000-6261-xxxx   Motor cables
ZK4000-6261-0005	motor cable, assembled at both ends for AS1000 Stepper Motors, 4 x 0.5 mm <sup>2</sup> , l = 0.5 m
ZK4000-6261-0010	motor cable, assembled at both ends for AS1000 Stepper Motors, 4 x 0.5 mm <sup>2</sup> , l = 1 m
ZK4000-6261-0020	motor cable, assembled at both ends for AS1000 Stepper Motors, 4 x 0.5 mm <sup>2</sup> , l = 2 m

## Encoder cables for AS1000 Stepper Motors to EP7041 EtherCAT Box

Ordering information	ZK4000-5151-xxxx   Encoder cables
ZK4000-5151-0005	encoder cable, assembled on both sides for AS1000 Stepper Motors, 5 x 0.35 mm <sup>2</sup> , l = 0.5 m, screened
ZK4000-5151-0010	encoder cable, assembled on both sides for AS1000 Stepper Motors, 5 x 0.35 mm <sup>2</sup> , l = 1 m, screened
ZK4000-5151-0020	encoder cable, assembled on both sides for AS1000 Stepper Motors, 5 x 0.35 mm <sup>2</sup> , l = 2 m, screened

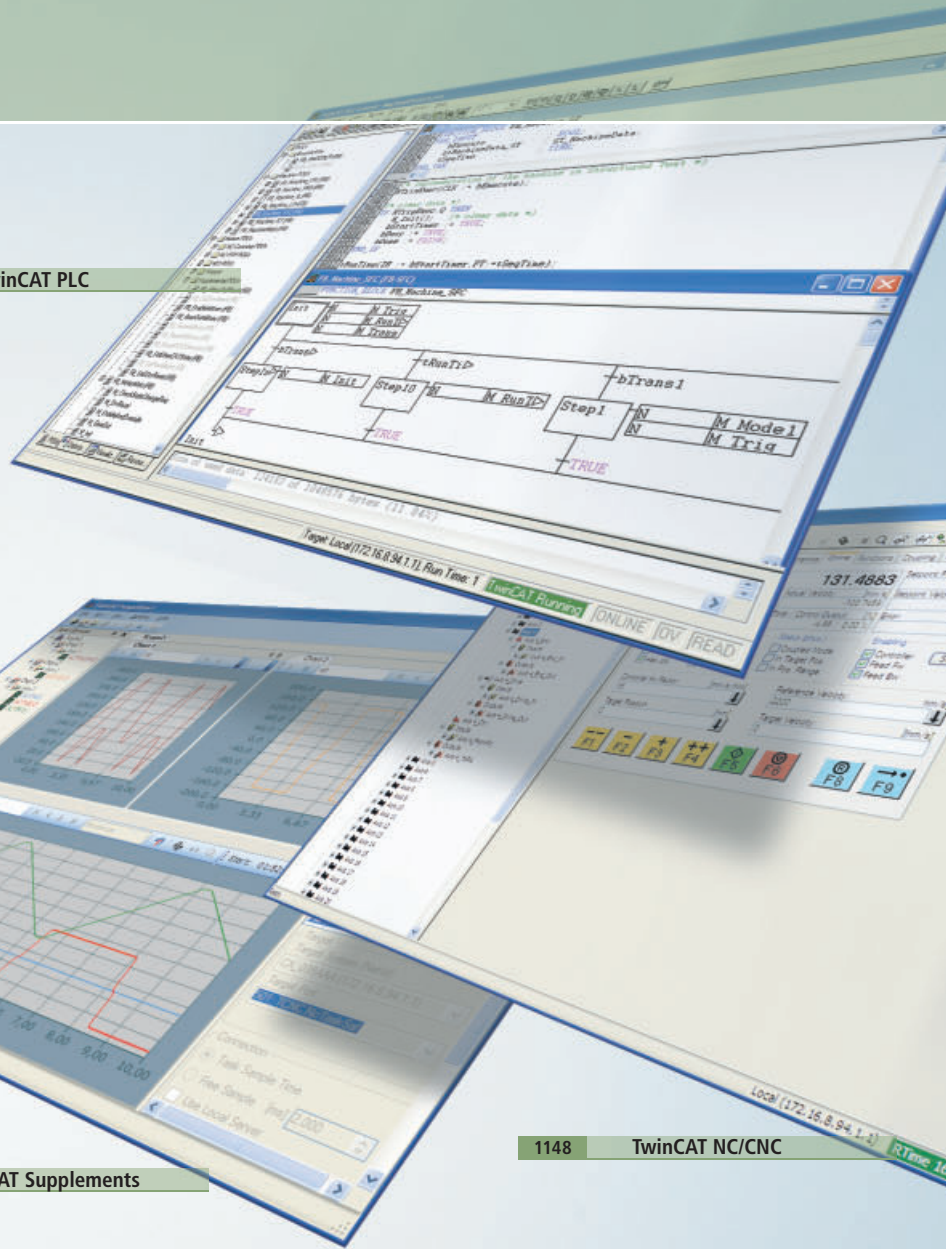


# TwinCAT®

PLC and Motion Control on the PC



1146 TwinCAT PLC



1148 TwinCAT NC/CNC

1157 TwinCAT Supplements



# TwinCAT®

The Windows Control and Automation Technology

- 1136** Product overview
- 1140** PC-based control technology
- 1143** PLC and Motion Control on the PC

**1146** TwinCAT PLC

**1148** TwinCAT NC PTP

**1150** TwinCAT NC I

**1152** TwinCAT CNC

**1154** TwinCAT I/O

**1156** TwinCAT CP

**1157** TwinCAT Supplements  
System

**1166** TwinCAT Supplements  
Motion

**1170** TwinCAT Supplements  
Communication

**1179** TwinCAT Supplements  
Controller

**1180** TwinCAT Supplements  
Building Automation



# Product overview TwinCAT

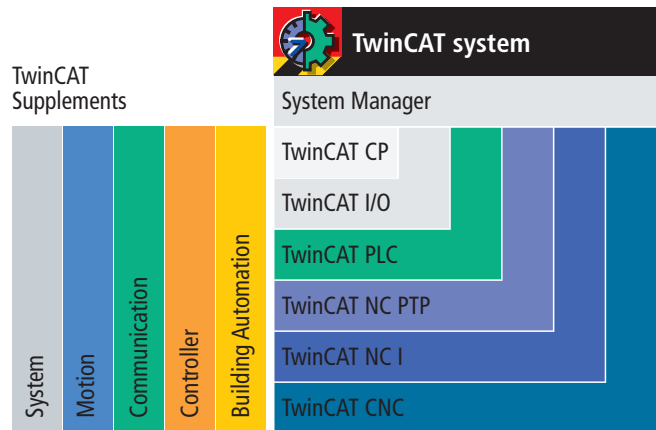
Software PLC	
TwinCAT PLC <span style="float: right;">1146</span>	
<b>PC hardware</b>	standard PC/IPC hardware, no extras
<b>Operating systems</b>	Windows NT/2000/XP/Vista, Windows 7, NT/XP Embedded, CE*
<b>Real-time</b>	Beckhoff real-time kernel
<b>I/O system</b>	EtherCAT, Lightbus, PROFIBUS DP/MC, Interbus, CANopen, DeviceNet, SERCOS, Ethernet and PC hardware
<b>Run-time system</b>	4 multi-tasking PLCs each with 4 tasks in each PLC run-time system, development and run-time systems on one PC or separately (CE: only run-time)
<b>Memory</b>	process image size, flags area, program size, POU size, number of variables only limited by the size of the user memory (max. 2 GB with NT/2000/XP/Vista)
<b>Cycle time</b>	adjustable from 50 µs
<b>Link-time</b>	1 µs (Intel® Core™2 Duo) for 1,000 PLC commands
<b>Programming</b>	IEC 61131-3: IL, FBD, LD, SFC, ST, powerful library management, convenient debugging




Software NC PTP	
TwinCAT NC PTP <span style="float: right;">1148</span>	
<b>TwinCAT PLC</b>	inclusive <span style="float: right;">1146</span>
<b>PC hardware</b>	standard PC/IPC hardware, no extras
<b>Operating systems</b>	Windows NT/2000/XP/Vista, Windows 7, NT/XP Embedded, CE*
<b>Real-time</b>	Beckhoff real-time kernel
<b>I/O system</b>	EtherCAT, Lightbus, PROFIBUS DP/MC, Interbus, CANopen, DeviceNet, SERCOS, Ethernet and PC hardware
<b>Programming</b>	performed using function blocks for TwinCAT PLC according to IEC 61131-3 (standardised PLCopen Motion Control libraries), convenient axis commissioning menus in the System Manager
<b>Run-time system</b>	NC point-to-point including TwinCAT PLC
<b>Number of axes</b>	up to 255
<b>Axis types</b>	electrical and hydraulic servo drives, frequency converter drives, stepper motor drives, switched drives (fast/crawl axes)
<b>Cycle time</b>	50 µs upwards, typically 1 ms (selectable)
<b>Axis functions</b>	standard axis functions: start/stop/ reset/reference, speed override, special functions: master/slave cascading, cam plates, electronic gearings, online distance compensation of segments, "flying saw"





TwinCAT Level	
TwinCAT I/O <span style="float: right;">1154</span>	
<b>PC hardware</b>	standard PC/IPC hardware, no extras
<b>Operating systems</b>	Windows NT/2000/XP/Vista, Windows 7, NT/XP Embedded, CE (only run-time)*
<b>Real-time</b>	Beckhoff real-time kernel
Multi-purpose I/O interface for all common fieldbus systems, PC Fieldbus Cards and interfaces with integrated real-time driver	

TwinCAT Level	
TwinCAT CP <span style="float: right;">1156</span>	
<b>PC hardware</b>	standard PC/IPC hardware, no extras
<b>Operating systems</b>	Windows NT/2000/XP/Vista, Windows 7, NT/XP Embedded*
<b>Real-time</b>	Beckhoff real-time kernel
Windows driver for Beckhoff Control Panel	

\* version-dependent



Software NC I	
	<b>TwinCAT NC I</b> 1150
	TwinCAT PLC inclusive 1146
	TwinCAT NC PTP inclusive 1148
<b>PC hardware</b>	standard PC/IPC hardware, no extras
<b>Operating systems</b>	Windows NT/2000/XP/Vista, Windows 7, NT/XP Embedded, CE*
<b>Real-time</b>	Beckhoff real-time kernel
<b>I/O system</b>	EtherCAT, Lightbus, PROFIBUS DP/MC, Interbus, CANopen, DeviceNet, SERCOS, Ethernet and PC hardware
<b>Programming</b>	DIN 66025 programs for NC interpolation, access via function blocks from TwinCAT PLC according to IEC 61131-3
<b>Run-time system</b>	NC interpolation, including TwinCAT NC PTP and PLC
<b>Number of axes</b>	max. 3 axes and up to 5 auxiliary axes per group, 1 group per channel, max. 31 channels
<b>Axis types</b>	electrical servo axes, stepper motor drives
<b>Interpreter functions</b>	subroutines and jumps, programmable loops, zeroshifts, tool compensations, M and H functions
<b>Geometries</b>	straight lines and circular paths in 3-D space, circular paths in all main planes, helices with base circles in all main planes linear, circular, helical interpolation in the main lanes and freely definable planes, Bezier splines, look-ahead function
<b>Axis functions</b>	online reconfiguration of axes in groups, path override, slave coupling to path axes, auxiliary axes, axis error and sag compensation, measuring functions
<b>Operation</b>	automatic operation, manual operation (jog/inching), single block operation, referencing, handwheel operation (motion/superposition)

Software CNC	
	<b>TwinCAT CNC</b> 1152
	TwinCAT PLC inclusive 1146
	TwinCAT NC PTP inclusive 1148
	TwinCAT NC I inclusive 1150
<b>PC hardware</b>	standard PC/IPC hardware, no extras
<b>Operating systems</b>	Windows NT/2000/XP/Vista, Windows 7, Windows NT/XP Embedded*
<b>Real-time</b>	Beckhoff real-time kernel
<b>I/O system</b>	EtherCAT, Lightbus, PROFIBUS DP/MC, Interbus, CANopen, DeviceNet, SERCOS, Ethernet and PC hardware
<b>Programming</b>	DIN 66025 programming language with high-level language extensions, mathematical functions, programming of parameters/variables, user macros, subroutine techniques, spindle and help functions, tool functions, zero offset shifts
<b>Run-time system</b>	CNC, including TwinCAT NC I, NC PTP, PLC
<b>Number of axes/spindles</b>	8 path axes/6 controlled spindles, max. of 64 axes/12 controlled spindles (optional)
<b>Axis types</b>	electrical servo-axes, analog/encoder interface via fieldbus, digital interface via fieldbus (EtherCAT, Lightbus, PROFIBUS MC, SERCOS)
<b>Geometries</b>	linear, circular, helical interpolation in the main planes and freely definable planes, 8 interpolating path axes per channel, look-ahead function
<b>Axis functions</b>	coupling and gantry axis function, override, axis error and sag compensation, measuring functions
<b>Operation</b>	automatic operation, manual operation (jog/inching), single block operation, referencing, block search, handwheel operation (motion/superposition)
<b>TwinCAT CNC Options</b>	
<b>Options</b>	TwinCAT CNC Axes Pack 1153
	TwinCAT CNC Channel Pack 1153
	TwinCAT CNC Transformation 1153
	TwinCAT CNC HSC Pack 1153

\* version-dependent

# Product overview TwinCAT

Supplements   System	
<b>TwinCAT ECAD Import</b>	1158
tool for importing XML files from ECAD systems	
<b>TwinCAT Engineering Interface Server</b>	1158
for coordination of programming tasks via a source code management system	
<b>TwinCAT XML Data Server</b>	1159
PLC data can be written directly into an XML file or read from an XML file.	
<b>TwinCAT Backup</b>	1160
tool for backing up and restoring of files, operating system and TwinCAT settings	
<b>TwinCAT Simulation Manager</b>	1160
simplifies preparation and configuration of a simulation environment	
<b>TwinCAT Database Server</b>	1161
for bi-directional access: PLC and database	
<b>TwinCAT PLC HMI</b>	1161
displays only the visualisation created with TwinCAT PLC control in full screen under XP when starting up	
<b>TwinCAT PLC HMI Web</b>	1162
Displays a visualisation created with TwinCAT PLC control in Internet Explorer. A Java VM is required.	
<b>TwinCAT PLC HMI CE</b>	1162
licence for using the system software TwinCAT PLC HMI CE under Windows	
<b>TwinCAT Management Server</b>	1162
licence for using the TwinCAT Management Server for central administration of Beckhoff CE controls	
<b>TwinCAT Scope 2</b>	1163
licence for using the TwinCAT Scope	
<b>TwinCAT EtherCAT Redundancy</b>	1163
licence for extending the TwinCAT EtherCAT master with cable redundancy capability	
<b>TwinCAT PROFINET IO Controller</b>	1164
licence for using the PROFINET IO Controller	
<b>TwinCAT PROFINET IO Device</b>	1164
licence for using the PROFINET IO Device	
<b>TwinCAT EtherNet/IP Slave</b>	1165
licence for using the EtherNet/IP Slave	

Supplements   Motion	
<b>TwinCAT PLC Hydraulic Positioning</b>	1166
software library for TwinCAT PLC for the control of the position and pressure of hydraulic axes	
<b>TwinCAT NC FIFO Axes</b>	1166
software library that enables a target value specified by the user to be generated for an NC axis	
<b>TwinCAT NC Flying Saw</b>	1167
software library for TwinCAT PLC to enable implementation of the "flying saw" function	
<b>TwinCAT PLC Remote Synchronisation</b>	1167
software library for general synchronisation of time in distributed systems	
<b>TwinCAT NC Camming</b>	1167
software library that enables the use of the cam function of TwinCAT NC	
<b>TwinCAT Cam Design Tool</b>	1168
tool for designing electronic cam plates, fully integrated in the TwinCAT System Manager	
<b>TwinCAT Digital Cam Server</b>	1168
fast camshaft controller as software implementation in TwinCAT, freely configurable via the TwinCAT System Manager	
<b>TwinCAT Valve Diagram Editor</b>	1169
graphics-oriented editor for designing the characteristic curves of a hydraulic valve	
<b>TwinCAT Kinematic Transformation</b>	1169
realises different kinematic transformations for TwinCAT PTP or TwinCAT NC I	

## Supplements | Communication

### TwinCAT PLC Serial Communication 1170

software library for communication via serial Bus Terminals or PC COM ports

### TwinCAT PLC Serial Communication 3964R/RK512 1170

software library for communication via serial Bus Terminals or PC COM ports with the 3964R/RK512 protocol

### TwinCAT PLC Serial Communication EnOcean 1171

software library for the processing of signals from sensors without batteries with EnOcean technology

### TwinCAT PLC Modbus RTU 1171

software library for communication with the Modbus protocol via serial Bus Terminals or PC COM ports

### TwinCAT PLC IEC 60870-5-101/-102/-103/-104 Master 1172

software library for communication via the telecontrol protocol according to IEC 60870-5-10x (master)

### TwinCAT PLC IEC 60870-5-101/-104 Slave 1172

software library for communication via the telecontrol protocol according to IEC 60870-5-101/104 (slave)

### TwinCAT DriveTop Server 1173

communication server for connecting the Indramat DriveTop tool with TwinCAT

### TwinCAT DriveCOM OPC Server 1173

for communication of drive setup tools right into DriveCom-compatible drives

### TwinCAT OPC Server 1175

for access to TwinCAT variables in accordance with the OPC DA/XML DA specification

### TwinCAT OPC UA Server 1176

for access to TwinCAT variables in accordance with the OPC UA specification

### TwinCAT SMS/SMTP Server 1176

enables sending of SMS or e-mail messages from the TwinCAT PLC

### TwinCAT TCP/IP Server 1177

server and PLC library for communication via generic TCP server (client functionalities included)

### TwinCAT Modbus TCP Server 1177

for communication with Modbus TCP devices (server and client functionality)

### TwinCAT Virtual Serial COM Driver 1177

driver for the automatic generation of virtual Windows COM interfaces for EL60xx terminals

### TwinCAT FTP Client 1178

enables the TwinCAT PLC to access several FTP servers

### TwinCAT PLC RFID Reader Communication 1178

for the connection of RFID readers to the TwinCAT PLC

## Supplements | Controller

### TwinCAT PLC Controller Toolbox 1179

software library with function blocks for control technology

### TwinCAT PLC Temperature Controller 1179

software library with temperature control function block

## Supplements | Building Automation

### TwinCAT PLC Building Automation 1180

software library for executing basic building automation functions

### TwinCAT PLC Building Automation DALI 1180

software library for the processing of signals for the digital interfaces of ballasts

### TwinCAT Building Automation Framework 1181

for easy configuration of building automation applications

### TwinCAT PLC HVAC 1182

software library for the automation of heating, ventilation, air-conditioning and sanitary installations

### TwinCAT PLC M-Bus 1183

licence for using the PLC library TwinCAT PLC M-Bus

### TwinCAT Crestron Server 1183

for communication between a TwinCAT PLC and a Crestron control centre



## TwinCAT – PC-based control technology

### The Windows Control and Automation Technology

The TwinCAT Software System turns almost any compatible PC into a real-time controller with a multi-PLC system and NC/CNC axis control. At the same time, TwinCAT integrates the programming environment for all Beckhoff controllers: from high-end Industrial PC Control to embedded controller.

### TwinCAT architecture

TwinCAT consists of run-time systems that execute control programs in real-time and the development environments for programming, diagnostics and configuration. Any Windows programs, for instance visualisation programs or Office programs, can access TwinCAT data via Microsoft interfaces, or can execute commands.

### A practically oriented software solution

TwinCAT offers a precise time-base in which programs are executed with the highest deter-

ministic features, independently of other processor tasks. The real-time load on a PC is set with TwinCAT; defined operating behaviour is achieved in this way. TwinCAT indicates the system load for programs that are running. A load threshold can be set in order to assure a defined computing capacity for the operating programs as well as for Windows NT/2000/XP/Vista or Windows 7. If this threshold is exceeded, a system message is generated.

### TwinCAT supports system diagnosis

The general use of hardware and software from the open PC world requires some checking: unsuitable components can upset the PC system. Beckhoff has integrated a practical indicator of the real-time jitter, giving administrators an easy way to evaluate the hardware and software. A system message during operation can draw attention to incorrect states.

### Start/stop behaviour

Depending on the setting, TwinCAT is started and stopped manually or automatically. Since TwinCAT is integrated into Windows NT/2000/XP/Vista and Windows 7 as a service, an operator is not needed to start the system: switching on is enough.

### Restarting and data backup

When a program is started or restarted, TwinCAT loads programs and remanent data. To back up data and to shut down Windows NT/2000/XP/Vista or Windows 7 correctly, a UPS (uninterruptible power supply) is of great value.

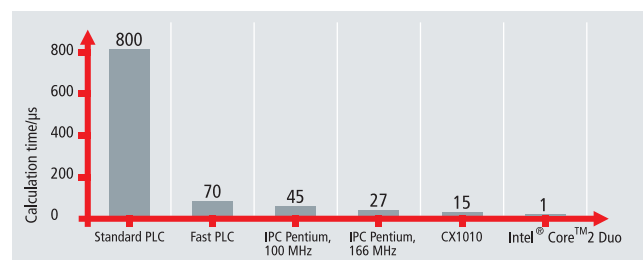
### TwinCAT and "Blue Screen"

The TwinCAT system can be configured such that real-time capability is maintained in the event of a BSOD (Blue Screen of Death) operating system crash. Real-time tasks such as PLC and NC can therefore continue to run and bring the controlled process into a safe state. Ultimately, it is



Load threshold and jitter online

Comparison: execution times for 1,000 PLC commands by a hardware PLC and by TwinCAT PLC





the decision of the programmer whether or not to utilise this feature, bearing in mind that data or programs may already have been destroyed by the BSOD.

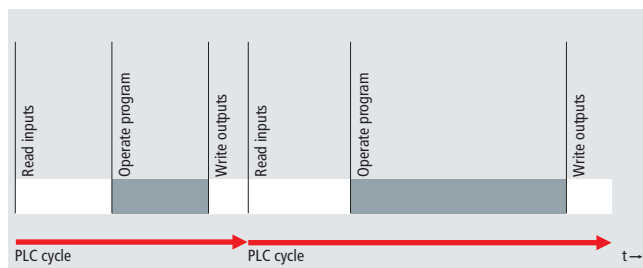
**Worldwide connection through message routing – “remote” connection is inherent to the system**

According to the requirement for operating resources, the TwinCAT software devices can be distributed: TwinCAT PLC programs can run on the PCs or on Beckhoff Bus Terminal Controllers. A “message router” manages and distributes all the messages, both in the system and via TCP/IP connections.

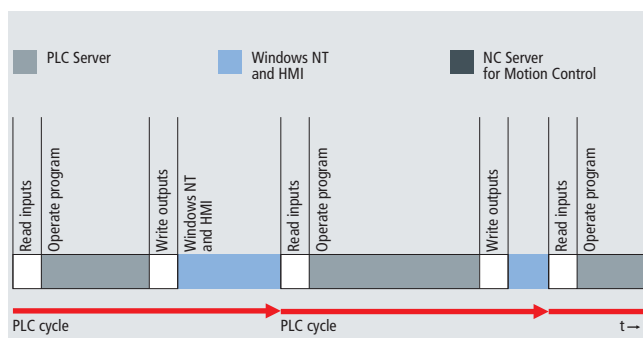
PC systems can be connected with each other via TCP/IP; Bus Terminal Controllers are integrated via serial interfaces and fieldbuses (EtherCAT, Lightbus, PROFIBUS DP, CANopen, RS232, RS485, Ethernet TCP/IP).

**Worldwide access**

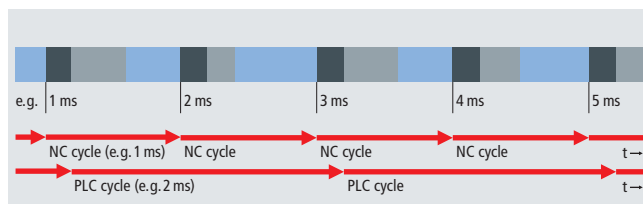
Since standard TCP/IP services of NT/2000/XP/Vista/CE and Windows 7 can be used, this data can be exchanged across the world. The system offers scalable communication capacity and timeout periods for the supervision of communications. OPC provides a standardised means for accessing many different SCADA/MES/ERP packets.



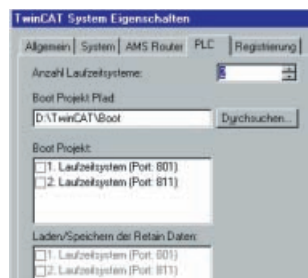
Real-time operation of PLC software in a classic PLC

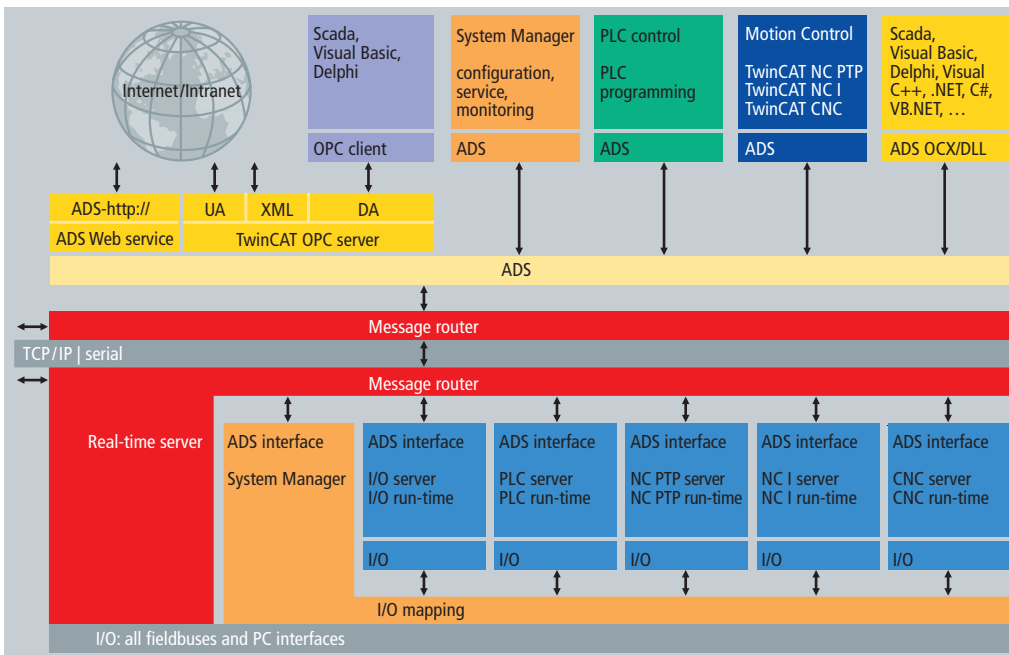
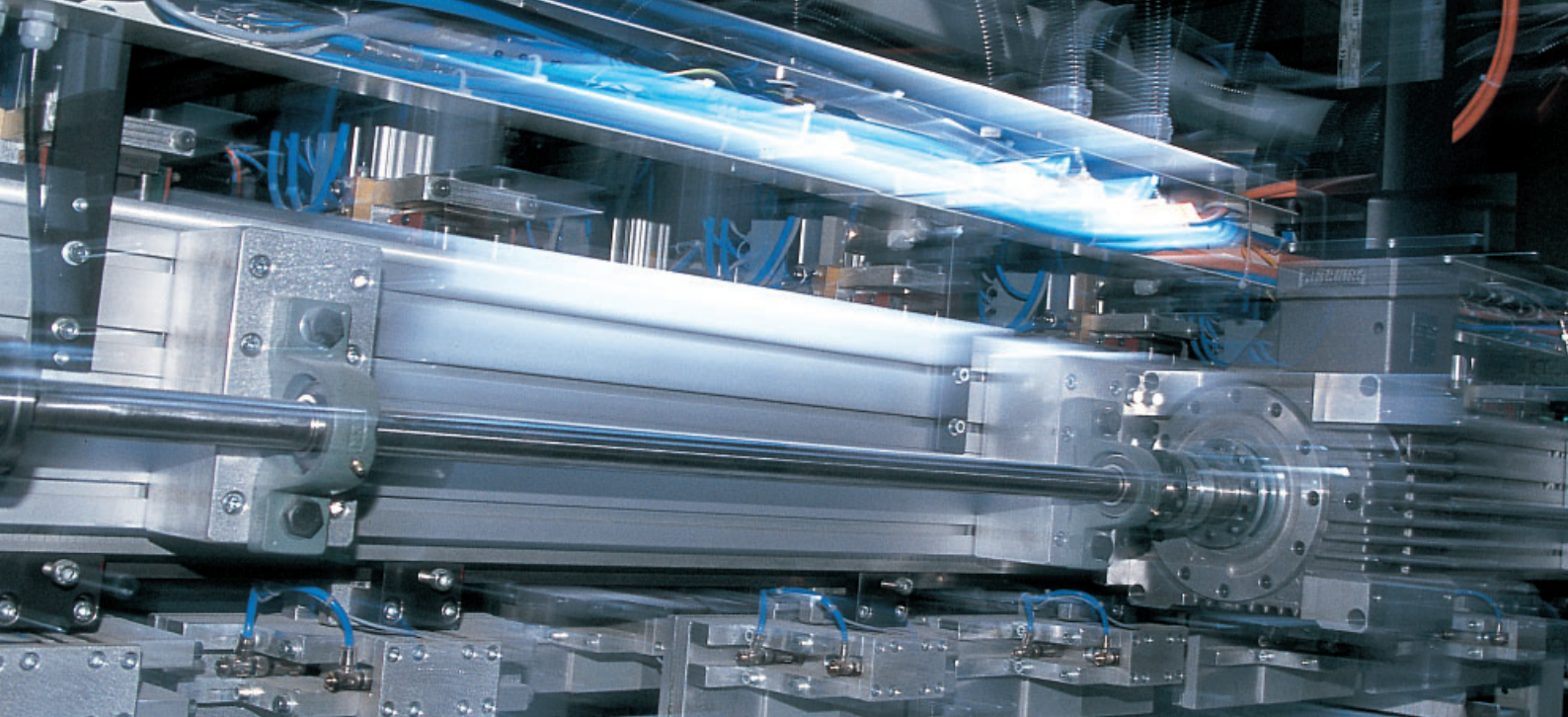


Real-time operation of PLC software on a PC



Real-time operation of software for a PLC and NC (Motion Control) on a PC

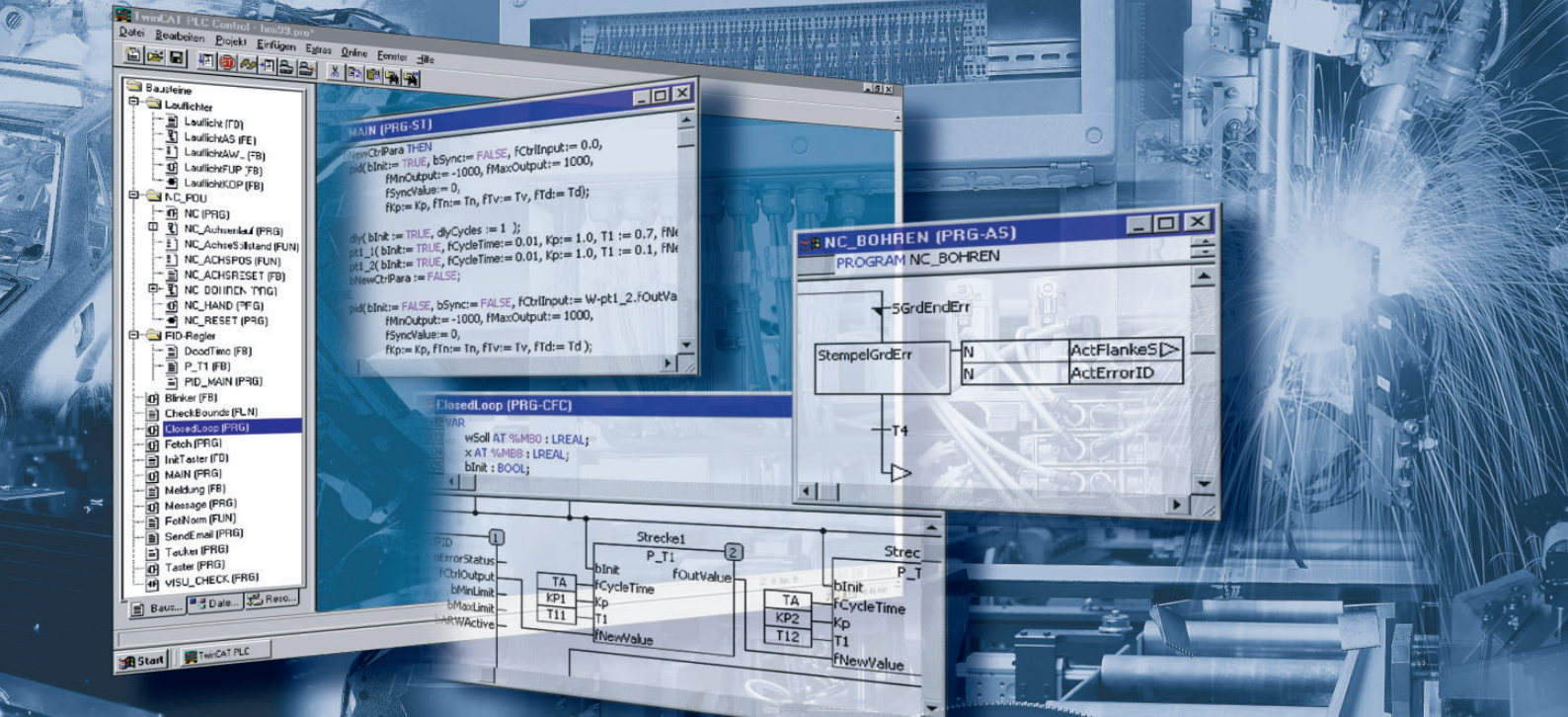




## The Windows Control and Automation Technology

The Beckhoff TwinCAT software system turns almost any compatible PC into a real-time controller with a multi-PLC system, NC axis control, programming environment and operating station. TwinCAT replaces conventional PLC and NC/CNC controllers as well as operating devices with:

- open, compatible PC hardware
- embedded IEC 61131-3 software PLC, software NC and software CNC in Windows NT/2000/XP/Vista, Windows 7, NT/XP Embedded, CE
- programming and run-time systems optionally together on one PC or separated
- connection to all common fieldbuses
- PC interfaces support
- data communication with user interfaces and other programs by means of open Microsoft standards (OPC, OCX, DLL, etc.)



# PLC and Motion Control on the PC

## TwinCAT I/O – universal I/O interface for all common fieldbuses

Many PC fieldbus cards from various manufacturers are supported. It is possible to operate more than one fieldbus card per PC. Master and slave functionality is supported, depending on the selected fieldbus card. The fieldbus cards can be configured and diagnosed conveniently via the TwinCAT System Manager. TwinCAT I/O includes the TwinCAT real-time system for operating the fieldbuses and a DLL interface to application programs.

## TwinCAT PLC – the central pillar of automation software

Conceived as a pure software PLC, TwinCAT PLC allows up to four virtual “PLC CPUs”, each running up to four user tasks, on one PC. The PLC program can be written in one or more of the languages provided for in the IEC 61131-3 standard:

- IL (Instruction List),
- LD (Ladder Diagram),
- FBD/CFB (Function Block Diagram),

- SFC (Sequential Function Chart) and
  - ST (Structured Text).
- TwinCAT PLC running under the Windows NT/2000/XP/Vista operating systems includes both the programming environment and the run-time system, so that an additional programming device is not required. Under the CE operating system and the embedded operating systems for the series BX and BC controllers, only TwinCAT run-time is available. Program modifications are implemented via network-capable powerful communication with the run-time system. Programming can be done
- locally,
  - via TCP/IP or
  - via the fieldbus (BXxxxx and BCxxxx).

## IEC 61131-3 – advanced programming standard for all Beckhoff controllers

The TwinCAT PLC is programmed in accordance with IEC 61131-3 independently of the manufacturer. TwinCAT supports all the IEC 61131-3 programming languages with convenient editors and a fast, effective compiler,

so that the development cycle for the creation even of large PLC programs of several megabytes can be short. Incremental compilation prevents long turnaround times. Only genuinely new sections are compiled. Powerful editor features, such as “autoformat”, “autodeclare” or “find” and “replace” enable fast programming. For all programming languages, the project comparison function facilitates differences to be identified and accepted if appropriate. If a project (comments, directories, etc.) is to be translated into a language other than the original language, all terms can be exported into a table, translated and re-imported. If a team is dealing with the development, all objects (blocks, data types, lists) can be managed within a source code management tool via the TwinCAT Engineering Interface. This enables changes to be traced back and differences between individual versions to be displayed.

The concept of the “instantiation” of function blocks, in which each instance is associated with its own data, leads

naturally to object-oriented and structured programming styles. All common data types specified in IEC 61131-3 are supported. Multi-dimensional fields and structures are possible, as are enumeration and subrange types.

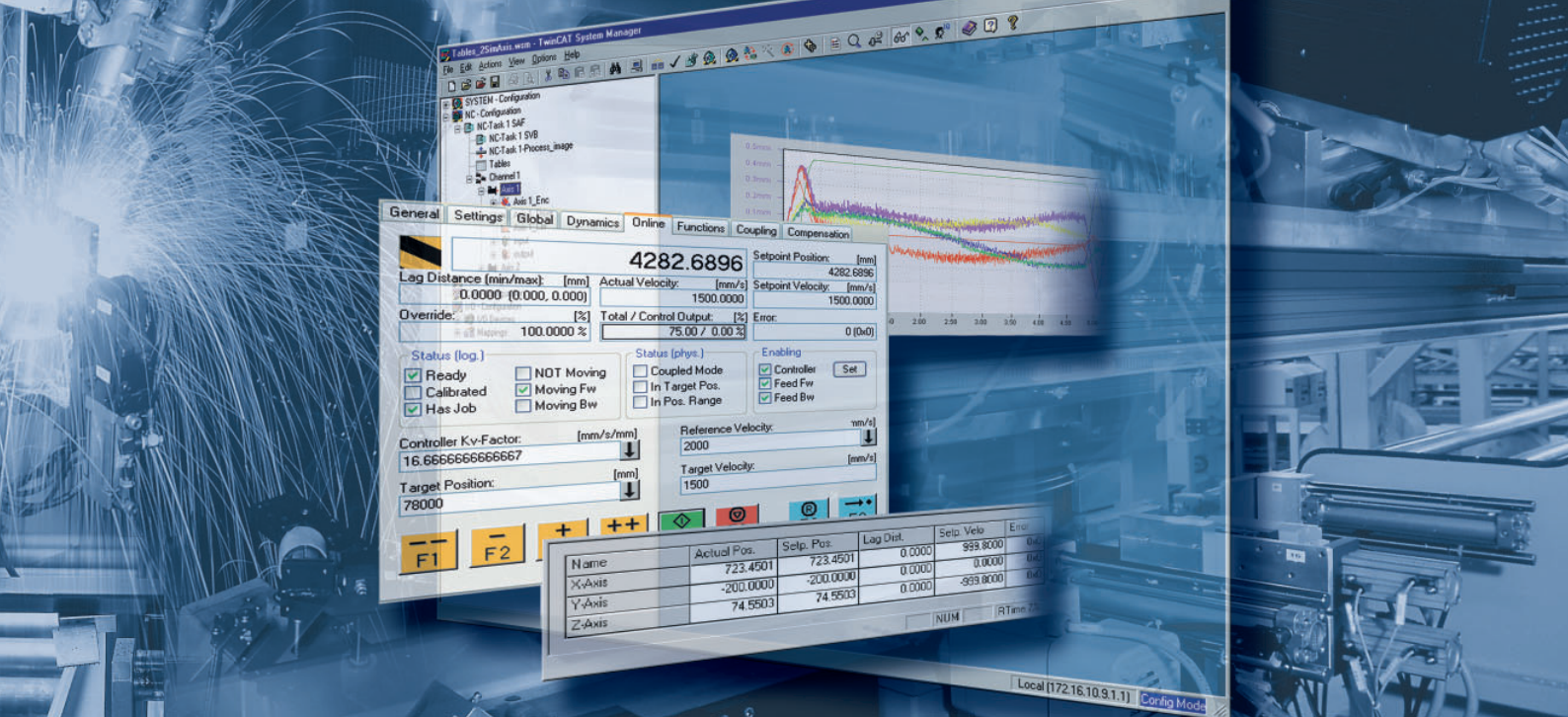
TwinCAT PLC is certified for the languages IL and ST (base level). The online change function can be used for code and/or data modifications while the PLC is running, providing maximum data retention. Source code can be stored in the target system (except for BCxxxx series controllers). The criteria analysis function is very helpful for the detection of process errors.

Code can very easily be reused via the convenient library manager. For know-how protection, multi-stage password protection can be applied to programs and libraries.

## Many target platforms – one tool

The PLC programs created with TwinCAT PLC can be executed on a number of target platforms. Apart from Industrial PCs and the Embedded PCs, the PLC project can also be loaded into





the BC and BX series fieldbus controllers from Beckhoff. Program development and debugging proceed in the same working environment, regardless of which unit is executing the program.

### Extensive supplementary libraries

As an extension to the blocks defined by the IEC language standard, Beckhoff offers a wide range of supplementary libraries for the execution of tasks typical in automation technology: e.g. libraries for controlling electrical and hydraulic axes via TwinCAT NC, serial communication libraries, system libraries for message outputs, write/read files, control technology blocks, etc.

### Helpful practice tools

Extensive faultfinding functions in TwinCAT PLC facilitate the solution of problems either on site or via remote maintenance. For this purpose, the PLC programming environment in TwinCAT offers:

- monitoring,
- powerflow (flow control),
- break point,

- sampling trace of PLC variables,
- single step,
- watchlist,
- call hierarchy and
- forcing of variables.

In addition, the TwinCAT ScopeView (a software oscilloscope) can be used to record one or several variables simultaneously.

### TwinCAT NC – Motion Control on the PC

A software NC consists of:

- positioning (set value generation and position control)
- integrated PLC with NC interface
- operating programs for commissioning purposes
- I/O connection for axes via fieldbus

With TwinCAT NC, the position controller is calculated on the PC processor as standard. It exchanges data cyclically with drives and measurement systems via the fieldbus.

### Central NC positioning on the PC

The computing capacity of a PC enables axis motion simultaneously with the PLC, whereby the position controller is usually calculated on the PC: the computing capacity of a PC enables many axes to be positioned simultaneously.

TwinCAT enables a PC to process the operating programs, the PLC and the NC at the same time. The division of the system load is supported by TwinCAT with appropriate functions.

### Analytical path calculation

The algorithms that TwinCAT NC/NC I/CNC uses to control axes take account of the dynamic parameters of the axis: speed, acceleration and jerk. In this way, the axes are moved at any time within the limits of what is dynamically possible, and are precisely analytically coordinated. A range of different regulation algorithms are available in order to reduce the deviations from the ideal trajectory that will occur in practice.

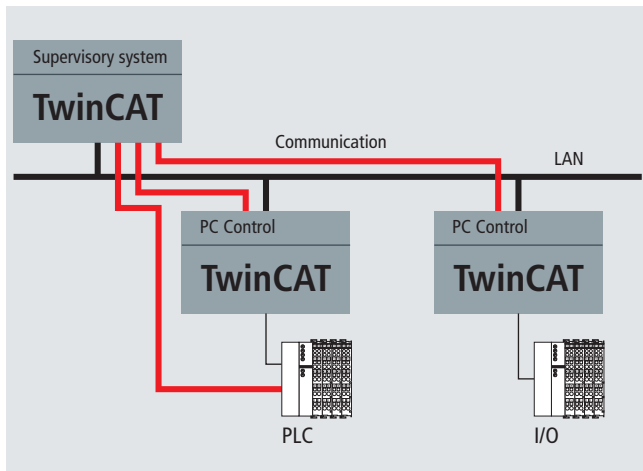
### Individual or joint

Based on the normal methods for positioning an individual electrical axis, moving from its starting point to its destination (point-to-point positioning), TwinCAT NC also allows the coordinated movement of a number of axes in multi-stage master-slave operation (e.g. gearing functions or cam plates) to be executed. TwinCAT NC I further allows the interpolated path sequencing described in accordance with DIN 66025 to be carried out involving up to three axes.

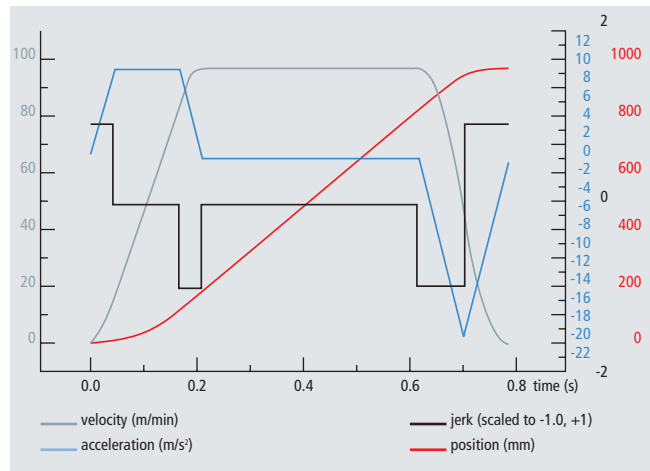
### Software PLC included

TwinCAT combines software NC and software PLC to form a powerful controller. The communication between the two packages is a pure software/software channel with minimum delay times. The NC functionalities are called from the PLC program via standardised, PLCopen-certified function blocks.

Axis movements can be simulated without hardware; the actual value is instructed to ideally track the set value, and



Hierarchical controller architecture: central or distributed



PTP positioning procedure

the complete machine flow is checked. TwinCAT ScopeView is helpful for commissioning and maintenance. It records all axis variables such as position, speed and acceleration.

### Convenient commissioning

Commissioning is simplified significantly by the configuration and diagnostic dialogs offered in the TwinCAT System Manager. For each axis, all main data are displayed at a glance. The axes can be moved via function keys. Special functions such as couplings, cam plates or distance compensation can be triggered and observed via the System Manager. A convenient dialog enables the dynamic parameters of an axis to be determined.

### TwinCAT NC I – axis interpolation in three dimensions

TwinCAT NC I (interpolation) is the NC system for linear and circular interpolated path movements of axis groups with up to eight drives. The system includes interpreter, set value generation and position control.

PLC functionality is integrated, as is the connection of the axes with the fieldbus.

The interpreter interprets the code described in DIN 66025. Comprehensive PLC libraries enable interaction between NC and PLC. NC programs, for example, can be loaded directly from the PLC program into the interpreter. As an alternative to DIN 66025, the path interpolation via the TcPLCInterpolation library can take place directly from the PLC. In this case, the geometry and help functions (e.g. M functions) are written to a table in the PLC and transferred to the NC core. This procedure is particularly suitable for flexible movements, e.g. in pick-and-place applications.

### TwinCAT CNC – the software CNC for toughest requirements

TwinCAT CNC expands TwinCAT NC I with classic CNC features: up to 32 interpolating axes and comprehensive coordinate and kinematic transformations are possible. Parts programming is carried out according

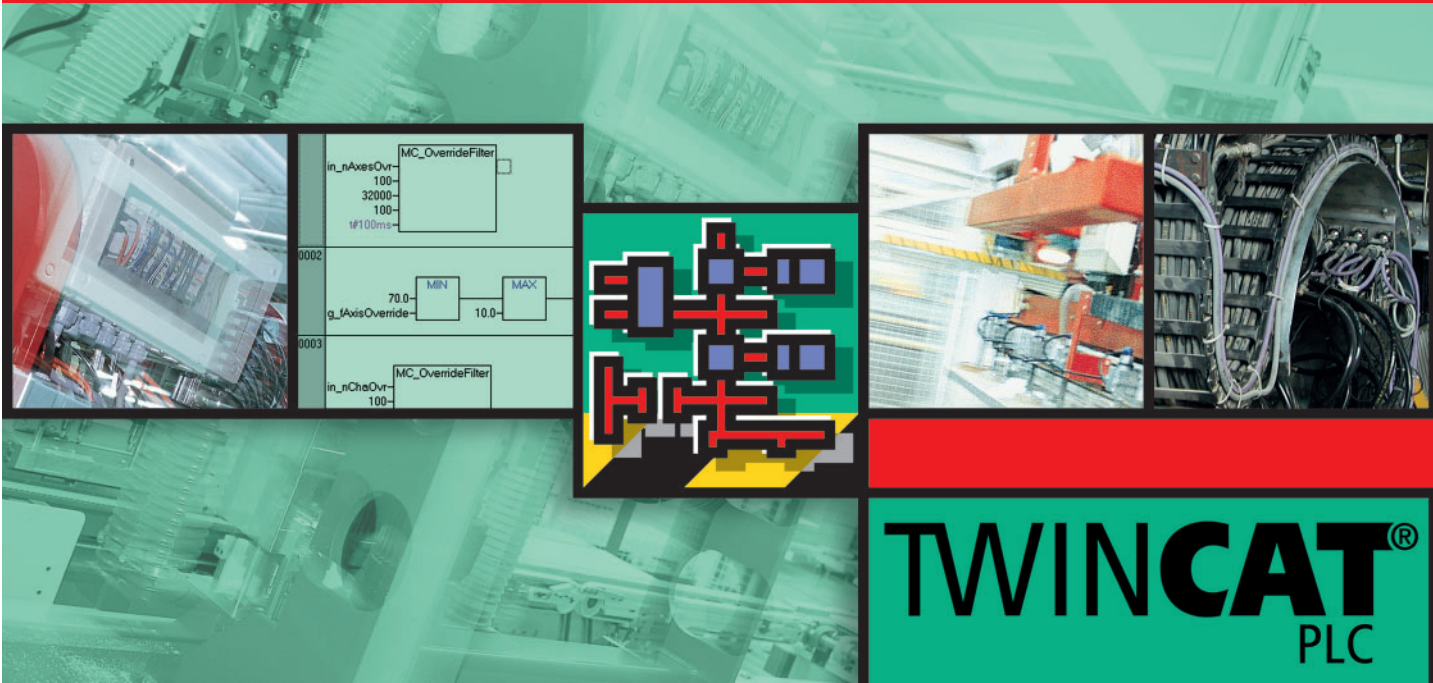
to DIN 66025 using high-level language extensions. TwinCAT CNC can operate with up to 64 axes or 32 path axes and controlled spindles that can be distributed across up to twelve CNC channels. In a CNC channel, up to 32 axes can be interpolated simultaneously, enabling even the most difficult motion tasks to be solved. Apart from the classic linear, circular and helical interpolations, TwinCAT CNC offers convenient spline interpolation, optionally based on Akima or B-splines. Real-time transformations enable complex machine kinematics to be realised without problem.

### HSC technology (high-speed cutting)

Advanced HSC cutting technology requires CNC control technology with optimised solutions for Motion Control in order to achieve optimum results in terms of processing time while at the same time offering maximum accuracy and workpiece surface quality.

The TwinCAT CNC HSC pack offers the following options:

- velocity and acceleration control across blocks for optimum utilisation of axis dynamics and therefore higher achievable path velocities
- high surface quality through smoothed dynamics and associated reduction of vibrational excitation of the machine
- effective control of specified contour tolerances
- path programming via splines with programmable spline type (Akima spline, B-spline) for reduction of NC blocks for free-form surfaces



# TWINCAT<sup>®</sup>

## PLC

## TwinCAT PLC – IEC 61131-3 Multi-PLC on the PC

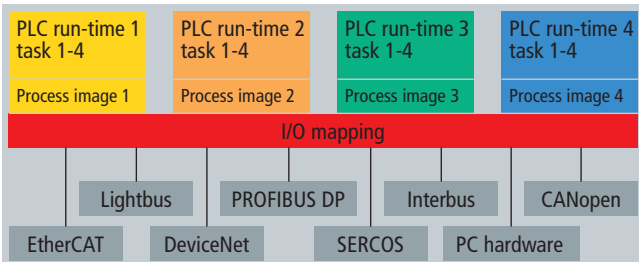
### Software PLC for Windows NT/2000/XP/Vista or Windows 7

The TwinCAT PLC is programmed in accordance with IEC 61131-3 independently of the manufacturer. Online connections with PLC run-time systems around the world can be implemented with TCP/IP or via fieldbuses on the IPC.

### TwinCAT PLC programming system

TwinCAT PLC offers all the languages in the IEC 61131-3 standard and has a powerful development environment for programs whose code size and data regions far exceed the capacities of conventional PLC systems.

### TwinCAT multi PLC



### Online connection via networks

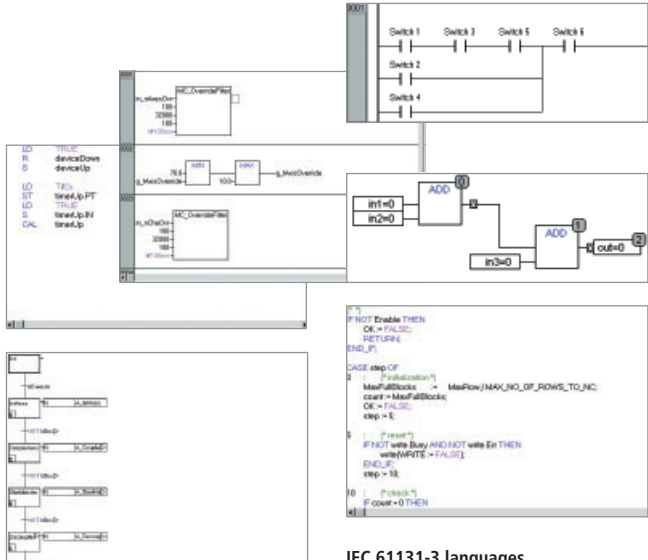
Changes to programs or data are supported by a very powerful link to the run-time systems, which can also operate over a network. All the usual facilities of a PLC are available.

Any Windows programs, for instance visualisation programs or Office programs, can access TwinCAT data via Microsoft interfaces or control the PLC.

### Practically oriented properties

- all defined programming languages: IL, FBD, LD, SFC, ST and CFC

- certified in accordance with base level (IL/ST)
- structured programming with modular program management
- recompilation while PLC runs with maximum data retention (online change)
- convenient library management
- source code storage in target system
- criterion analysis
- conversion between languages
- incremental compilation
- all common data types, structures, arrays, including multi-dimensional arrays
- programming support: auto-format, auto-declare, cross reference, search/replace
- project compare
- program converting in different languages
- connection with source code management tools



IEC 61131-3 languages

### Diagnosis using standard PC techniques

Changes of any size to program and data can be carried out "online". Error location and correction (debugging) is supported by aid of a very powerful link to the run-time system. This can also be used over a network. All the usual features of a PLC are available.

### Debugging features

- Online connections with PLC run-time systems around the world can be implemented with TCP/IP or via fieldbuses.
- online change of new variables, instances or programs at run-time with maximum data retention
- online monitoring of variables in variable lists, watch windows, editors
- online status and powerflow (accumulator contents) of programs and instances
- triggering, forcing and setting variables
- single step, breakpoints
- step into, step over
- display of the current call stack
- Watch list shows a selection of variables.
- Trace function records variable values for every cycle.
- online management of all variable names and structures across the whole system
- TwinCAT ScopeView as a graphical diagnostic and analysis tool for the display of values



Powerful debugging

Technical data	TwinCAT PLC
PC hardware	standard PC/IPC hardware, no extras
Operating systems	version-dependent: Windows NT/2000/XP/Vista, Windows 7, Windows NT/XP Embedded, Windows CE (only run-time)
Target systems	PC (x86), Windows CE devices, Beckhoff Fieldbus Controllers (BCxxxx, BXxxxx, IL230x-Cxxx)
Real-time	Beckhoff real-time kernel as a component of TwinCAT
Run-time system	max. 4 multi-tasking PLCs each with 4 tasks in each PLC run-time system, development and run-time systems on one PC or remote programming via TCP/IP
Memory	process image size, flags area, program size, POU size, number of variables only limited by the size of the user memory (max. 2 GB under NT/2000/XP/Vista)
Cycle time	50 µs upwards selectable (typically 1 ms)
Link time	1 µs (Intel® Core™2 Duo)
Programming	IEC 61131-3: IL, FBD, LD, SFC, ST, CFC, powerful library management
Debugging	online changes in programs and variables, online monitor, execution control, breakpoints, write, force, step, data trace, remote debugging via TCP/IP
Remanence	remanent and persistent data, UPS supported storage on hard disk, storage in NOVRAM as option
I/O system	free choice of fieldbus: EtherCAT, PROFIBUS DP/MC, CANopen, DeviceNet, Interbus, SERCOS, Lightbus, Ethernet, PC hardware (printer port, COM port, USB), PC cards: generic memory DPRAM support
Connectivity	variable access via OPC, Beckhoff ADS OXC/DLL, .NET
Further information	www.beckhoff.com/TwinCAT_PLC

Ordering information	
TwinCAT PLC	licence for using the IEC 61131-3 PLC automation software, including programming software and run-time system

Options		
TwinCAT PLC Controller Toolbox	The TwinCAT Controller Toolbox library contains blocks for basic controllers (P, I, D), complex controllers (PI, PID), pulse width modulation, ramps, signal generators, filters.	1179
TwinCAT PLC Temperature Controller	IEC 61131-3 software library for TwinCAT PLC for temperature control	1179
TwinCAT PLC Hydraulic Positioning	IEC 61131-3 software library for TwinCAT PLC for controlling hydraulic axes	1166
TwinCAT PLC Modbus RTU	IEC 61131-3 software library for TwinCAT PLC with Modbus RTU function blocks for serial communication with Modbus devices	1171
TwinCAT PLC Serial Communication	IEC 61131-3 software library for TwinCAT PLC for communication via serial Bus Terminals or PC COM ports	1170
TwinCAT PLC Building Automation	IEC 61131-3 software library for TwinCAT PLC for execution of basic functions in the building automation area (basic library)	1180
TwinCAT Engineering Interface Server	The TwinCAT Engineering Interface Server integrates drivers for interfacing with Microsoft Visual Source Safe or Subversion.	1158



## TwinCAT NC PTP – Point-to-point axis positioning

### Position control with the PC

TwinCAT NC PTP includes axis positioning software (set value generation, position control), an integrated software PLC with NC interface, operating program for commissioning and an I/O connection to the axes through various fieldbuses. TwinCAT NC PTP replaces conventional positioning modules and NC controllers.

### NC PTP software on the PC

The position controller is normally calculated on the PC processor and cyclically exchanges data via the fieldbus with drives and measurement systems.

The capacity of a PC allows axes to be moved in parallel with the PLC functionality. PC power means that some tens of axes can easily be positioned simultaneously.

### System structure

Axes are structured into channels for PTP movement and for interpolated movements.

### Axis structure

TwinCAT NC PTP uses variables to operate axes. Each axis has variables for encoder, drive and controller. The axis can be linked to I/O interfaces, and parameters can be set.

### Axis functions

- Axis functions such as
- start (various modes)
- stop
- new target position and velocity
- constant drive output
- set/call actual position

### Axis types

- servo axes
- high/low speed axes
- stepper motor axes
- “low-cost” stepper motor axes
- encoder axes
- simulation axes
- DC drives

### Position measurement systems

The position controller acquires the actual position through:

- incremental encoders
- absolute encoders
- digital interfaces to the drives

### Drive interfaces

- analog
- EtherCAT
- SERCOS
- SSI
- Lightbus
- PROFIBUS DP/MC
- pulse train

### Interfaces

- interfacing to all popular fieldbuses, in particular EtherCAT, Lightbus, SERCOS, PROFIBUS MC, synchron CAN

- Axis functions can be embedded into the IEC 61131-3 PLC system by means of function block libraries; the function blocks comply with the PLCopen standard.
- data interface to Windows NT/2000/XP/Vista/CE or Windows 7 programs by means of open standards (OPC, Beckhoff ADS)

### System operation

### Positioning

Positioning is executed with a powerful, modern positioning algorithm in which profiles are generated with jerk limitation and with pre-control of speed and acceleration to minimise the following error.

Positioning facilities:

- Controller structures can be adjusted.
  - P controller
  - PID controller
  - PID with speed pre-control
  - PID with speed and acceleration pre-control
- override functions

### Commissioning/servicing

The online menu allows important axis parameters such as

- target position,
  - set speed,
  - acceleration, jerk,
  - reference speed,
  - controller Kv factor,
- to be set, and general axis functions such as

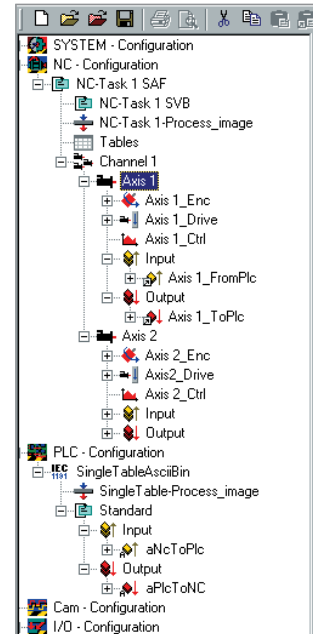
- start,
  - stop/emergency stop,
  - new target position with new speed,
- to be called.

### Special functions

- linear coupling (electrical gears)
- distance compensation
- online master/slave and slave/master conversion
- "flying saw" (diagonal saw)

- camming (support through TwinCAT Cam Design Tool)
- FIFO axes
- change over encoders/controllers
- external axis set value generator
- multi-master coupling

Programming IEC 61131-3 function blocks or standard PLCopen Motion Control libraries



Connection between NC software and drive using drag and drop

Technical data	TwinCAT NC PTP
PC hardware	standard PC/IPC hardware, no extras
Operating systems	version-dependent: Windows NT/2000/XP/Vista, Windows 7, Windows NT/XP Embedded, Windows CE (only run-time)
Real-time	Beckhoff real-time kernel as a component of TwinCAT
Run-time system	NC point-to-point (NC PTP) including TwinCAT PLC
Number of axes	up to 255 axes
Axis types	electrical and hydraulic servo drives, frequency converter drives, stepper motor drives, DC drives, switched drives
Cycle time	50 µs upwards selectable (typically 1 ms)
Axis functions	standard axis functions: start/stop/reset/reference, speed override, destination override; special functions: master-slave cascading, electronic gearing, online distance compensation
Programming	performed using IEC 61131-3 function blocks in the TwinCAT PLC, convenient methods for axis commissioning
Debugging	online monitoring of all axis state variables such as actual/set value, enable, controller values, online axis tuning, forcing axis variables
Configuration	all axis parameters such as the measuring system, drive parameters and position controller can be conveniently configured
Remanence	remanent data, UPS-supported storage on hard disk
I/O system	free choice of fieldbus: EtherCAT, PROFIBUS DP/MC, CANopen, DeviceNet, Interbus, SERCOS, Lightbus, Ethernet
Connectivity	variable access via OPC, Beckhoff ADS OXC/DLL
Further information	www.beckhoff.com/TwinCAT_NC_PTP

Ordering information	
TwinCAT NC PTP	licence for using the PTP positioning software with integrated IEC 61131-3 TwinCAT PLC, contains programming software and run-time system

Options		
TwinCAT NC Camming	IEC 61131-3 software library for TwinCAT, implemented camshaft functionality (table coupling)	1167
TwinCAT NC FIFO Axes	IEC 61131-3 software library for TwinCAT, permits specified FIFO set value generation	1166
TwinCAT NC Flying Saw	IEC 61131-3 software library for TwinCAT, implements a "flying saw"	1167
TwinCAT Cam Design Tool	graphical development tool for programming cams	1168
TwinCAT Valve Diagram Editor	graphics-oriented editor for designing the characteristic curve of a hydraulic valve	1169

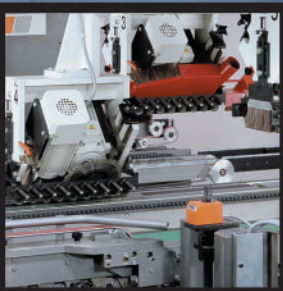
```

NC-Pfad
g:\s3000\v3\NcSetups\DXd

N405 #set param GroupDyna
N410 CIP X100 Y200 I-120,
N420 CIP X200 Y300 I-20,
N430 CIP X300 Y200 I120,
N440 CIP X200 Y100 I20,
N490 @100 K99990

(5. Die ccw CIP-Rosette 2
N500 @121 R1 K5 K600
N510 CIP X100 Y200 I20,

```



# TWINCAT<sup>®</sup> NC I

## TwinCAT NC I – Axis interpolation in three dimensions

### Follow the path with the PC

The TwinCAT NC Interpolation (NC I) is the NC system for interpolated path movements. TwinCAT NC I offers 3-D interpolation (interpreter, set point generation, position controller), an integrated PLC with an NC interface and an I/O connection for axes via the fieldbus. All well known Fieldbus systems and programming standards in the CNC world, such as DIN 66025, are supported. TwinCAT NC I delivers open PC solutions for standard axial components and CNC controls. TwinCAT NC I uses the power of the PC and allows axis regulation under Windows

NT/2000/XP/Vista/CE or Windows 7. Hardware modules are simulated in the software, and are thus superfluous.

### TwinCAT NC I – interpreter

The syntax which is laid down in DIN 66025 is a reliable descriptive language for machine sequences. There is also an additional extension to the DIN syntax with a number of useful functions:

- techniques for sub-routines and jumps
- programmed loops
- zero offset shifts
- tool compensations
- tools
- M and H functions

### 3-D interpolation

The following geometries are supported by the interpreter:

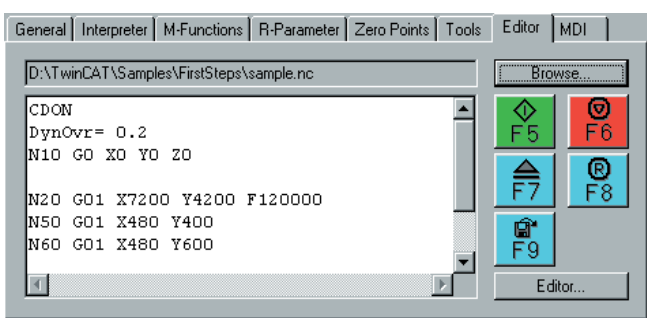
- straight lines in space
- circles in all main planes
- circles in space
- helices with base circles in the main planes
- Bezier splines

### TwinCAT NC I – operating interface

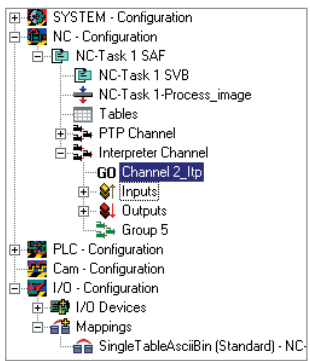
An operating interface integrated into the TwinCAT System Manager provides information on all set and actual values and on the physical and logical state of the interpolation channels and interpolation axes.

The NC structure and many NC parameters are also set using the System Manager.

The NC program editor



The structure of an axis group



### Online changes of configuration of the axes

Individual PTP axes can be collected flexibly, when the axes are stationary, into new interpolation groups, after which they can be reconfigured as PTP axes. In this way all PTP characteristics such as reference run, tool change, etc. can be used.

### PLC blocks for interpolation

In order to create a simple interface for axis interpolation, PLC blocks which can create positioning commands for the interpolation channel, using easily understood descriptions organised as tables are available.

### TwinCAT NC I – pathway dynamics

A rate-of-change limited profile, which at any moment describes the acceleration, speed and position on the path as well as the associated transformed Cartesian axis values. The maximum allowed dynamic limiting values can be changed at any time in the NC program.

### TwinCAT NC I – path override

TwinCAT NC I possesses a speed override function which can synchronously work on all of the axes.

### Speed reduction at curves

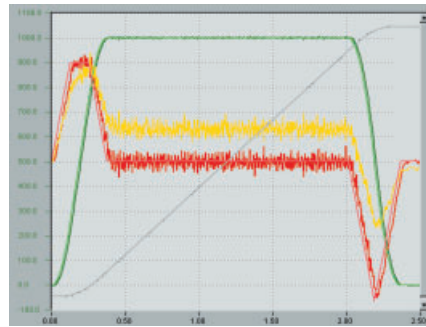
TwinCAT NC I offers different reduction methods for reducing the speed on neighbouring geometrical cross-over points. The parameter for this speed reduction can be changed in the NC program.

### TwinCAT NC I axes

For each channel three path axes (X, Y, Z) can be used. In addition, five further auxiliary axes can be integrated into the channel. These are interpolated with the path, i.e. they start with the path segment and arrive in the target position with the path segment.

### „Look Ahead“

The „Look Ahead“ function calculates the maximum possible path velocity at segment transitions. It can take into account all entries in the NC core and connects neighbouring geometries so far as this is possible.



TwinCAT Scope

### Slave coupling on the path axes

A master/slave coupling on a path axis is possible, independently of which slave type is involved.

### Geometric-dynamic smoothing

Various options are available in order to achieve optimum geometrical and dynamic smoothing at segment transitions (e.g. Bezier smoothing). In this way, the path velocity can be kept constant at segment transitions if the boundary conditions are suitable. This is particularly important for pick-and-place tasks and manipulations (e.g. laser welding).

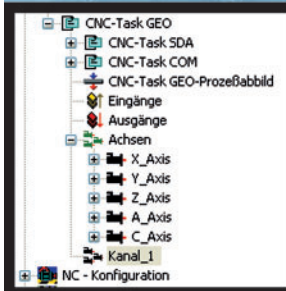
### Diagnostic and optimisation possibilities

All machine state variables can be extracted and displayed for diagnostic and analysis purposes. An ideal tool in this respect is TwinCAT ScopeView, which allows all internal and external variables to be recorded. These variables include path values (set and actual values) such as path speed, path acceleration, tangential and orthogonal path error as well as Cartesian values such as position, speed, following error, etc.

Technical data	TwinCAT NC I
PC hardware	standard PC/IPC hardware, no extras
Operating systems	version-dependent: Windows NT/2000/XP/Vista, Windows 7, Windows NT/XP Embedded, Windows CE (only run-time)
Real-time	Beckhoff real-time kernel as a component of TwinCAT
Run-time system	NC interpolation, including TwinCAT NC PTP and PLC
Number of axes	3 axes per group, 1 group per channel, max. 31 channels, auxiliary axes
Axis types	electrical servo-axes, stepper motor drives
Interpreter functions	subroutines and jumps, programmed loops, zero shifts, tool compensations, M and H functions, "delete distance to go"
Geometry functions	straight lines and circular paths in 3-D space, circular paths in all main planes, helices with base circles in all main planes, Bezier splines
Axis functions	online reconfiguration of axes in groups, path override, slave coupling to path axes
Programming	DIN 66025 programs for NC interpolation, access via function blocks for TwinCAT PLC according to IEC 61131-3
Debugging	online monitoring in the TwinCAT System Manager with the following displays: present set/actual positions (following errors of all axes), NC program line presently being executed, NC program line presently being interpreted, channel status
I/O system	free choice of fieldbus: EtherCAT, PROFIBUS DP/MC, CANopen, DeviceNet, SERCOS, Lightbus, Ethernet
Connectivity	variable access via OPC, Beckhoff ADS OCX/DLL (Automation Device Specification)
Further information	<a href="http://www.beckhoff.com/TwinCAT_NC_I">www.beckhoff.com/TwinCAT_NC_I</a>

Ordering information	
TwinCAT NC I	licence for using the interpolation and PTP positioning software with integrated IEC 61131-3 TwinCAT PLC, contains programming software and run-time system





# TwinCAT CNC – High-performance CNC solution for complex applications

## Complex tasks – new solutions

TwinCAT CNC offers complete CNC functionality as a pure PC-based software solution. TwinCAT CNC covers the complete range of classic CNC path control, including high-end systems for complex motion and kinematics requirements. The powerful, continuously evolving PC platform and the hard real-time base of the TwinCAT real-time kernel provide the foundation for the CNC software.

## TwinCAT continuity

TwinCAT CNC is based on TwinCAT PLC, the IEC 61131-3 software PLC. If TwinCAT NC PTP is used as the basis; powerful motion functionality for positioning tasks is also available. Parts programming is carried out according to DIN 66025 using high-level language extensions. TwinCAT CNC expanded TwinCAT NC I with classic CNC features. Up to 64 interpolating axes and comprehensive coordinate and kinematic transformations are possible.

## Open for I/O and drive systems

In the CNC world, TwinCAT CNC offers unique openness towards the I/O periphery and the drive system through the consistent utilisation of Fieldbus technology. A variety of I/O modules can be connected via all common fieldbus systems. The drive systems can be connected with the CNC via an analog/encoder interface or directly via a digital drive interface (e.g. EtherCAT, PROFIBUS MC, SERCOS or Lightbus). This offers maximum openness and independence in the choice of I/O and drive systems for the user.

## Versatile machining

The required axis and spindle functions, interpolation and feed functions, tool and help functions according to DIN 66025 with specific expansions are available for a variety of machining technologies (e.g. milling, drilling, handling, special machines).

## Interpolation with 64 axes

Complex machining tasks often require path movements involving a large number of axes and spindles. TwinCAT CNC can operate with 64 axes and controlled spindles that can be distributed across up to 12 CNC channels. In a CNC channel, up to 32 axes can be interpolated simultaneously, enabling even the most difficult motion tasks to be solved.

## HSC technology (high-speed cutting)

Advanced HSC cutting technology requires CNC control technology with optimised solutions for Motion Control in order to achieve optimum results in terms of processing time while at the same time offering maximum accuracy and workpiece surface quality.

The TwinCAT CNC HSC pack offers the following options:

- velocity and acceleration control across blocks for optimum utilisation of axis dynamics and therefore higher achievable path velocities

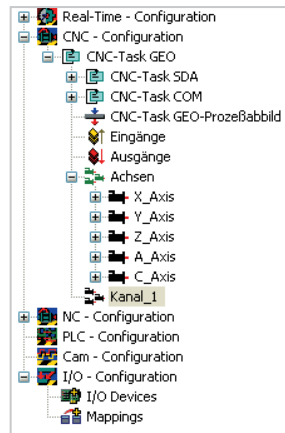
- high surface quality through smoothed dynamics and associated reduction of vibrational excitation of the machine
- effective control of specified contour tolerances
- path programming via splines with programmable spline type (Akima spline, B-spline) for reduction of NC blocks for free-form surfaces

## Real-time transformations

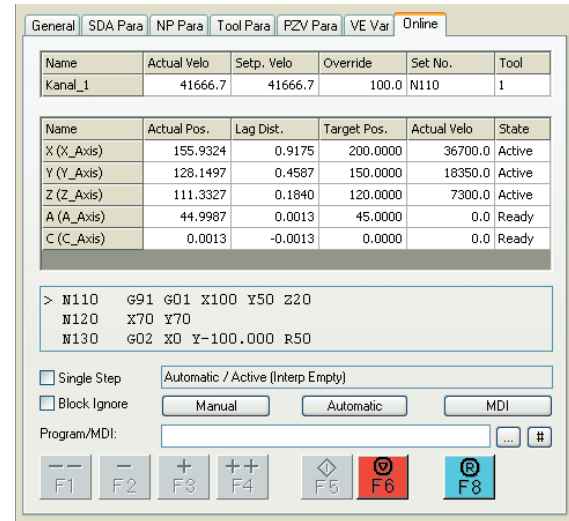
Complex machine kinematics with difficult machining tasks require real-time transformations within the CNC for simple and flexible operation and programming. They are used, for example, for defining different coordinate systems within the machining process or for generating automatic compensating movements of rotary axes. A classic application is 5-axis machining.

As an option, TwinCAT CNC provides special CNC functions:

- RTCP function (rotation tool center point)
- TLC function (tool length compensation)
- kinematics selection from the kinematics library
- definition of different coordinate systems
- tool alignment in the chosen coordinate system
- linking/transition of coordinate systems



CNC configuration and diagnostics with TwinCAT System Manager

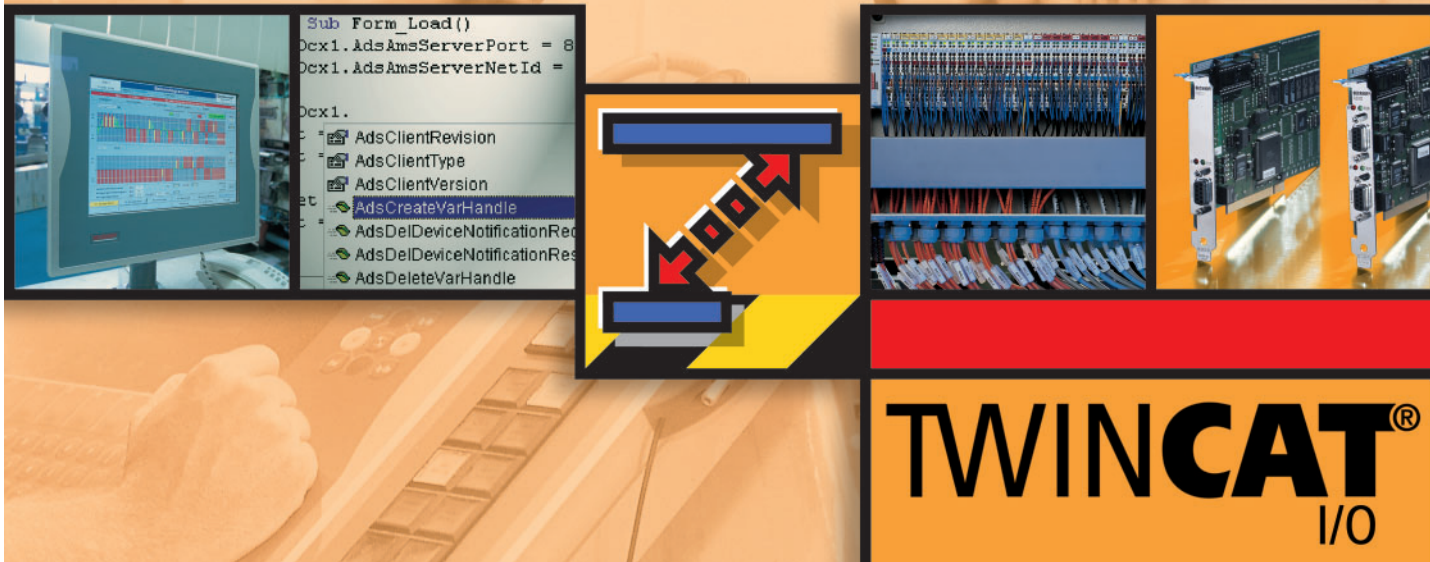


System operation for commissioning

Technical data	TwinCAT CNC
PC hardware	standard PC/IPC hardware, no extras
Operating systems	version-dependent: Windows NT/2000/XP/Vista, Windows 7, Windows NT/XP Embedded
Real-time	Beckhoff real-time kernel as a component of TwinCAT
Run-time system	CNC, including TwinCAT NC I, NC PTP and PLC
Number of axes/spindles	8 path axes/6 controlled spindles, with a maximum of 64 axes/12 controlled spindles (optional), 1 CNC channel, with a maximum of 12 CNC channels (optional)
Axis types	electrical servo-axes, analog/encoder interface via fieldbus (e.g. EtherCAT, Lightbus, PROFIBUS, CANopen), digital interface via fieldbus (EtherCAT, Lightbus, SERCOS interface, PROFIBUS MC)
Geometry functions	linear, circular, helical interpolation in the main planes and freely definable planes, 8 interpolating path axes per channel, a maximum of 32 interpolating path axes (optional), look-ahead function
Axis functions	coupling and gantry axis function, override, axis error and sag compensation, measuring functions
Programming	DIN 66025 programming language with high-level language extensions, mathematical functions, programming of parameters/variables, user macros, subroutine techniques, spindle and help functions, tool functions, zero offset shifts
Operation	automatic operation, manual operation (jog/inching), single block operation, referencing, block search, handwheel operation (motion/superposition)
Debugging	online monitoring in the TwinCAT System Manager
I/O system	decentralised I/Os via freely selectable open fieldbuses (EtherCAT, Lightbus, SERCOS, PROFIBUS DP/MC, CANopen, DeviceNet)
Connectivity	variable access via OPC, Beckhoff ADS OCX/DLL
Further information	<a href="http://www.beckhoff.com/TwinCAT_CNC">www.beckhoff.com/TwinCAT_CNC</a>

Ordering information	
TwinCAT CNC	licence for using the CNC path control software based on TwinCAT PLC or TwinCAT NC PTP

Options	
TwinCAT CNC Axes Pack	expansion to a total of 64 axes/controlled spindles, of which a maximum of 32 can be path axes and a maximum of 12 can be controlled spindles
TwinCAT CNC Channel Pack	1 further CNC channel, expandable to a maximum of 12 channels, channel synchronisation, axis transfer between channels
TwinCAT CNC Transformation	transformation functionality (5-axis functionality), kinematics selection from kinematics library, RTCP function, TLC function, definition of various coordinate systems, linking/transition of coordinate systems
TwinCAT CNC HSC Pack	velocity and acceleration control across blocks for optimum utilisation of axis dynamics for higher path velocities, maximum surface quality through smoothed dynamics, control of specified contour tolerances, path programming via splines



# TWINCAT® I/O

## TwinCAT I/O – I/O connection to Windows programs

### TwinCAT I/O

TwinCAT I/O is a real-time driver for Windows programs running under Windows NT/2000/XP/Vista/CE or Windows 7. Program variables, the I/O devices present in the system and the connected I/O channels are brought into the proper relationship with one another.

### TwinCAT I/O

- provides variable-oriented linkage of I/O devices and tasks
- provides variable-oriented linkage of tasks to other tasks
- The smallest unit is one bit.
- supports both synchronous and asynchronous relationships

- Data regions and process images are exchanged consistently.

### Openness: all standards

TwinCAT I/O supports all established fieldbuses – even simultaneously.

- EtherCAT
- Lightbus
- PROFIBUS DP (master and slave)
- PROFIBUS MC (Motion Control)

- Interbus
- CANopen
- SERCOS interface
- DeviceNet
- Ethernet
- PC printer port
- USB
- serial Bus Coupler BK8100 to COM
- memory interface (DPRAM) for PC cards
- SMB (System Management Bus)



LIGHTBUS

DeviceNet



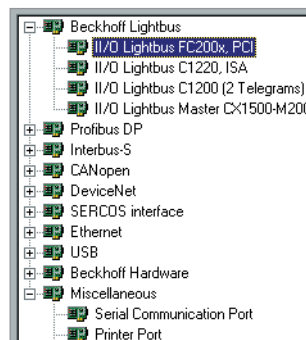
CANopen

SERCOS  
interface

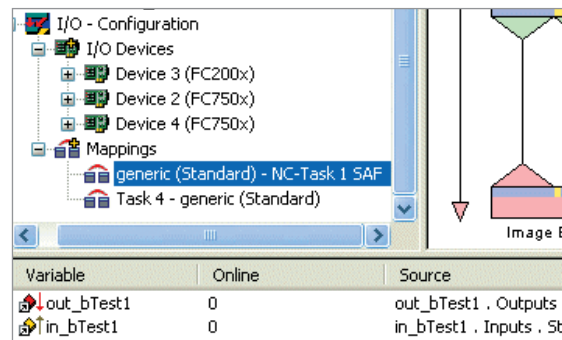
Ethernet TCP/IP



Open I/O interface



Online display



### TwinCAT I/O – properties

TwinCAT I/O provides the connected I/O channels as a structure and organises the mapping of the data transfer.

TwinCAT I/O permits server process images to be linked bit-wise to I/O channels and provides tools which can, for instance, link a lot of channels continuously with a single command. The connections can be moved by drag and drop.

### Software wiring

With the aid of the TwinCAT I/O system, the inputs and outputs of a task can be cyclically exchanged with the outputs and inputs of another task – the data consistency remains intact. The TwinCAT I/O system is variable-oriented, which means that

the smallest unit which can be addressed and linked is a variable, and the smallest size of a variable is one bit.

### Online analysis

At the server's fieldbus level and the level of the process image, commissioning and servicing are assisted by online display. TwinCAT I/O generates address relationships (mappings) between tasks and I/O devices, and provides powerful online tools:

- online display in a directory tree
- online watch window
- force and write to commission and test task variables and I/O devices

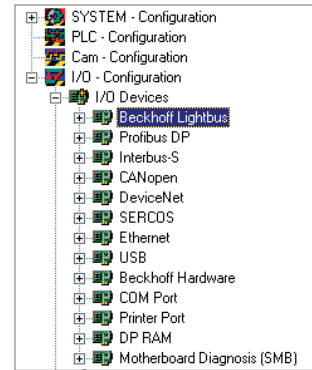
Diagnostic data is displayed in a consistent form for all I/O devices.

### Import/export functions

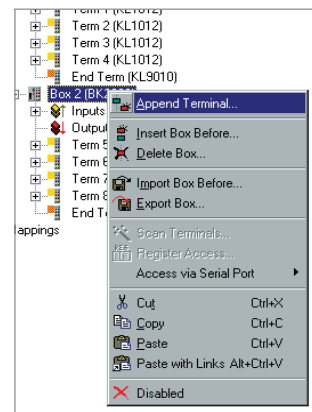
TwinCAT I/O manages variables, making import and export functions available at all levels.

### TcTimer API under CE

On Beckhoff CE devices TwinCAT I/O is available with the TcTimer extension. The TcTimer API offers a real-time timer (scalable from 100  $\mu$ s) and access to the logical process image. Data exchange with the fieldbus is triggered with a method call. The TcTimer API enables external applications to create deterministic applications that are synchronised up to the IO fieldbus level.

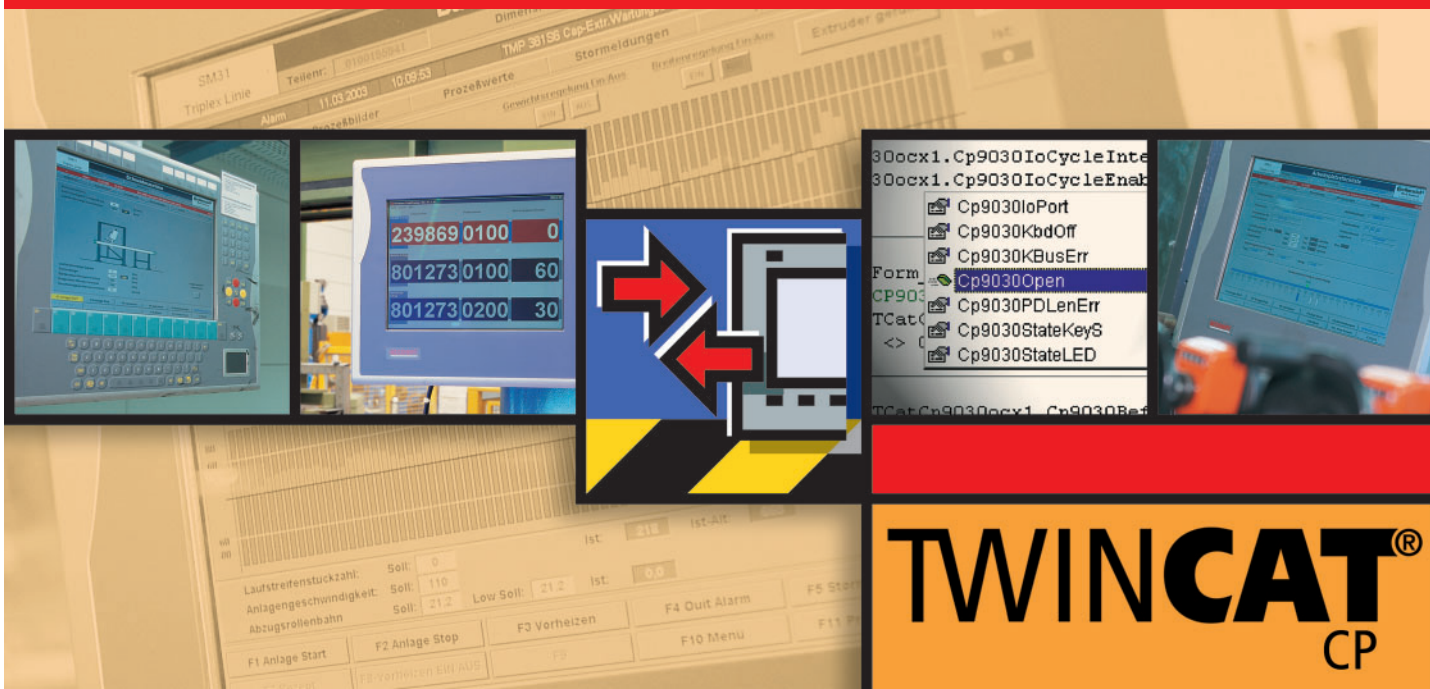


I/O configuration



Import/export functions

Technical data	TwinCAT I/O
PC hardware	standard PC/IPC hardware, no extras
Operating systems	version-dependent: Windows NT/2000/XP/Vista, Windows 7, Windows NT/XP Embedded, Windows CE (only run-time)
Real-time	Beckhoff real-time kernel as a component of TwinCAT
User program	User program running in user mode which can, for instance, run cyclically as a multimedia task ("soft" real-time). Access to the I/O process image is provided via cyclical calls of DLL functions. Under CE: hard real-time with synchronised access to process image
Memory	only limited by the size of the computer's RAM (max. 2 GB under NT/2000/XP/Vista)
Cycle time	50 $\mu$ s upwards selectable
Programming	application program in any high-level language, e.g. C++, Delphi
Debugging	via the standard debugging tools of the high-level language used
I/O system	free choice of fieldbus: EtherCAT, PROFIBUS DP/MC, CANopen, DeviceNet, Interbus, SERCOS, Lightbus, Ethernet, PC hardware (printer port, COM port, USB), PC cards: generic memory DPRAM support
Connectivity	variable access via OPC, Beckhoff ADS OXC/DLL (Automation Device Specification) (under CE: in addition TcTimer API)
Further information	<a href="http://www.beckhoff.com/TwinCAT_IO">www.beckhoff.com/TwinCAT_IO</a>
Ordering information	
TwinCAT I/O	licence for using the I/O DLL for data exchange with Windows programs



# TwinCAT CP – Driver for Beckhoff Control Panels

TwinCAT CP is a driver for the Beckhoff Control Panels C6xxx and C7xxx, the industrial operating and display devices.

Control Panels are optimised for use as a human-machine interface. Operating and display elements create an independent unit, separated from the PC by a simple cable link.

TwinCAT CP creates the driver connection between general Windows programs and the

operating and display elements on the Beckhoff Control Panel:

- direct switches for fast machine functions
- switch feedback by LEDs
- UPS support

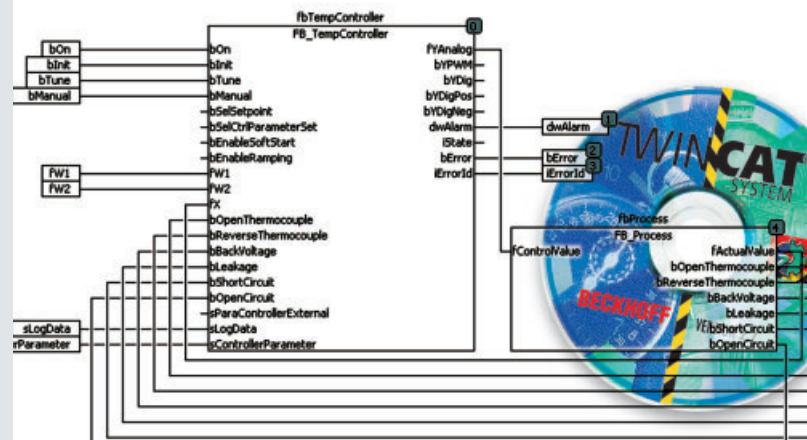
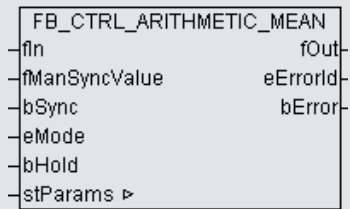
The driver permits variable-oriented operation of the Control Panel's functions by the Windows programs.



Technical data	TwinCAT CP
PC hardware	standard PC/IPC hardware, no extras
Operating systems	version-dependent: Windows NT/2000/XP/Vista, Windows 7, Windows NT/XP Embedded
Real-time	Beckhoff real-time kernel as a component of TwinCAT
User program	User program running in user mode which can, for instance, run cyclically as a multimedia task ("soft" real-time). Access to the I/O process image is provided via cyclical calls of DLL functions.
Memory	only limited by the size of the computer's RAM (max. 2 GB under NT/2000/XP/Vista)
Programming	application program in any high-level language, e.g. C++, Delphi
Debugging	via the standard debugging tools of the high-level language used
I/O system	keys, LEDs and UPS functionality of the Beckhoff CP6xxx, CP7xxx Control Panels together with the Beckhoff CP9030/CP9035 plug-in card
Connectivity	OPC, Beckhoff ADS OCX/DLL (Automation Device Specification)
Further information	<a href="http://www.beckhoff.com/TwinCAT_CP">www.beckhoff.com/TwinCAT_CP</a>

Ordering information	
TwinCAT CP	licence for using the driver for the Beckhoff Control Panel, providing communication with general Windows programs

# TwinCAT Supplements





## TwinCAT ECAD Import

The TwinCAT ECAD Import Tool completes the engineering chain: everything happens automatically without user intervention, from electrical design to PLC projects. The achievable reduction in input and transmission errors ultimately also reduces costs. From an ECAD program, the required information about

the structure of the I/Os and the linkage to PLC variables is exported via XML. Beckhoff uses an XML schema for specifying the structure of the XML file. The TwinCAT ECAD Import Tool reads the XML file and generates a TwinCAT System Manager configuration with all I/O devices, Bus Terminals and Fieldbus Box

modules, and a basic PLC program with the I/O variables used. A software device hierarchy can be created by importing a further XML file. An NC device with tasks, axes and, obviously, I/O variables can be created automatically. For this too, links with PLC variables can be generated automatically. Corrections in the

ECAD construction drawings can be implemented at any time. Any changes that may be required in the System Manager or the PLC program are carried out automatically, as far as possible.

### Ordering information

#### TwinCAT ECAD Import

Licence for using the TwinCAT ECAD Import for importing XML files from the ECAD systems. A TwinCAT System Manager configuration and a PLC program are created automatically.

## TwinCAT Engineering Interface Server

In cases where several programmers work on a PLC project, in the past the question kept recurring of how to integrate the work of the different programmers in a single project. Up to now, this was only possible by comparing, importing and copying. The TwinCAT Engineer-

ing Interface (ENI) enables tasks to be coordinated via a source code management system. To this end, the TwinCAT Engineering Interface Server is installed on a central server within the network. It provides a shell for a variety of source code management systems. Microsoft Visual

Source Safe and drivers for Subversion source code management can be operated under this shell.

The TwinCAT Engineering Interface Server contains configuration, management and diagnostic programs. Once the appropriate database has been

selected, the connected users have to be configured with passwords and individual rights. A diagnostic tool offers the option of displaying which user is carrying out what tasks in what objects, independent of the database used.

### Ordering information

#### TwinCAT Engineering Interface Server

licence for using the TwinCAT Engineering Interface Server with integrated drivers for Microsoft Visual Source Safe and Subversion

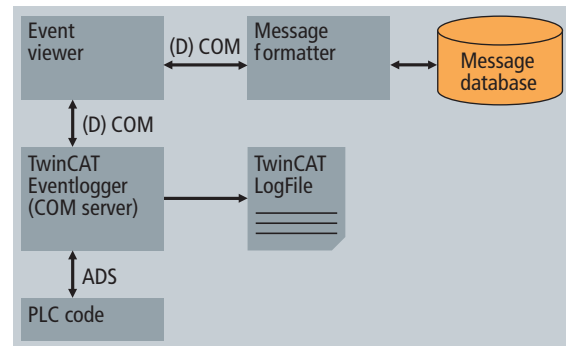
## TwinCAT Eventlogger

With the TwinCAT Eventlogger an alarm and diagnostics system is available that can be installed in all TwinCAT-based controllers with very little programming effort. The TwinCAT Eventlogger has the task of managing all messages (events) appearing in the TwinCAT system; to forward them and, where necessary, to write them into the TwinCAT log file. In this context 'events' are understood to comprise alarms, warnings, notes or instructions. Messages can be acknowledged. The Eventlogger has COM/DCOM interfaces. The Message Formatter produces the connection between the actual event and its message text. It fetches the appropriate message string from an external data bank

(usually XML-based) containing the message texts, and returns the complete message, including all its parameters, to the visualisation system.

The Event Viewer implements the visualisation of the resulting messages. In this manner the automatic display of all important information concerning an event is possible. It is also possible to create a customised message display by linking the TcEventViewer Type Library. The message texts are comfortably configured with the TcEvent configurator.

**The TwinCAT Eventlogger is included in the TwinCAT system.**



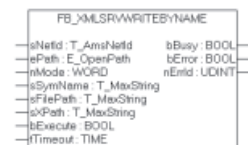
## TwinCAT XML Data Server

The TwinCAT XML Data Server enables reading of data from an XML file directly into the PLC and writing of variable values from the PLC into an XML file. The structure of the variables in the XML document matches the structure of the variables in the PLC. Individual subelements of a variable can be accessed separately.

A PLC library contains:

- two function blocks for reading of variables from the XML file
  - FB\_XmlSrvRead
  - FB\_XmlSrvReadByName
- two function blocks for writing PLC variables to an XML file
  - FB\_XmlSrvWrite
  - FB\_XmlSrvWriteByName

Variables can be addressed via names or addresses.



Ordering information	
<b>TwinCAT XML Data Server</b>	licence for using the TwinCAT XML Data Server for data exchange between an XML file and the TwinCAT PLC
<b>TwinCAT XML Data Server CE</b>	licence for using the TwinCAT XML Data Server for data exchange between an XML file and the TwinCAT PLC on Windows CE platforms



## TwinCAT Backup

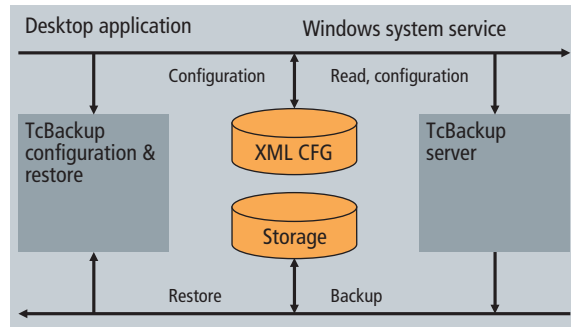
In addition to files, directories and settings, TwinCAT configurations are also backed up. Users can specify additional components they wish to back up. Furthermore, essential operating system-specific information is backed up. These include user settings, profiles, network settings and much more. Any of the media connected to the PC can be used for the backup, for example a hard disk, a floppy disk, a CD writer or a network drive.

In the event of a restore, all files and settings are copied to a new computer on which an operating system is already installed. In addition, TwinCAT is installed and configured. This also includes the automatic preparation of a System Manager configuration and creation of a boot project. Installations can be customised.

If fieldbus cards differ (e.g. if the cards are plugged into different PCI slots), the backup tool will attempt an automatic adaptation.

Between certain fieldbus cards, it is even possible to carry

out an automatic update. The backup is configured in XML.



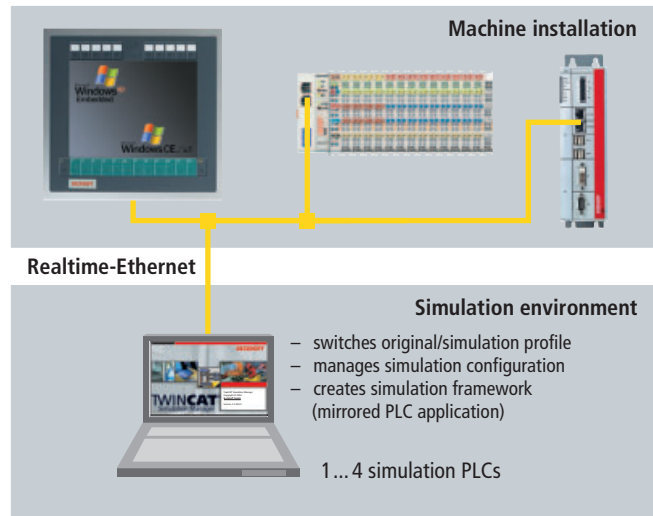
Ordering information	
TwinCAT Backup	licence for using the TwinCAT Backup tool for the backing up and restoring of files, operating system settings and TwinCAT settings

## TwinCAT Simulation Manager

The TwinCAT Simulation Manager is a tool for the configuration of a simulation environment, which integrates itself perfectly into the TwinCAT system environment. It supports creation of a "virtual machine" the temporal behaviour of which corresponds to the real machine.

Remote capability has been integrated in order to ensure separation of the actual PLC/NC and the simulation process. The actual control system can thus run on the control computer and the simulation process on

another PC. The link between control system and simulation process is realised via real-time Ethernet and the TwinCAT network variables.



Ordering information	
TwinCAT Simulation Manager	licence for using the TwinCAT Simulation Manager

## TwinCAT Database Server

Many applications require backup of current variables from the PLC in databases. Conversely, recipe values often have to be loaded from a database during operation and processed directly in the PLC. The TwinCAT Database Server is used for logging PLC data in a database. Different database variants are available:

- SQL/SQL Compact (previously "SQL Mobile")
- Access
- ASCII
- ODBC
  - Oracle/DB2/MySQL
  - PostgreSQL/Firebird/Interbase

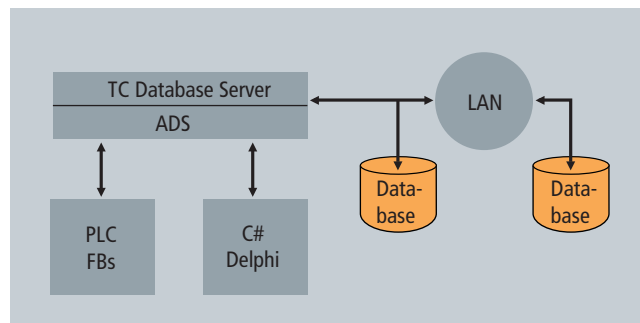
The TwinCAT Database Server enables:

- cyclical logging of PLC values,
- cyclical checking of PLC values and logging of modified values only, and
- logging of event-driven data from the PLC cycle via a function block.

Individual PLC variables and also structures can be exchanged with the database.

The database server supports authenticated access to the database. PLC function blocks for creating a database, a table and logging of data (appending or overwriting of data sets in the database or in ring buffer

mode) are available. The system can optionally be configured with a user-friendly configurator. A corresponding XML file with databases, ADS devices (e.g. PLC run-time) and transactions is described.

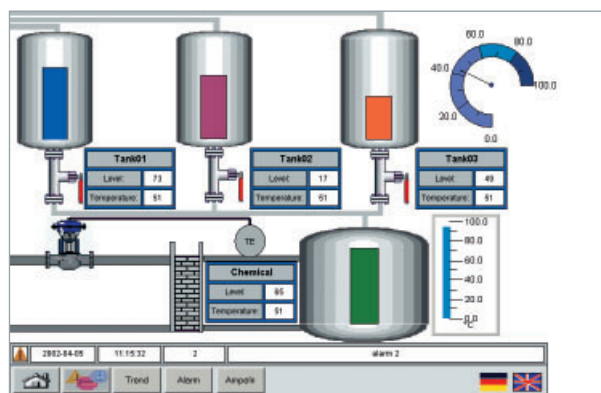


Ordering information	
TwinCAT Database Server	licence for using the TwinCAT Database Server for logging of PLC data in a database
TwinCAT Database Server CE	licence for using the TwinCAT Database Server CE for logging of PLC data in a database for Windows CE platforms

## TwinCAT PLC HMI

The popular TwinCAT PLC Control option of simple visualisation development is now also available as a stand-alone option. On start-up, the TwinCAT PLC HMI tool offers a full-screen display of the visualisation created with TwinCAT PLC Control. To this end, the tool only requires access to the PLC project. All

visualisation features such as placeholder concept, Keypad, NumPad, password protection, etc. can be used.



Ordering information	
TwinCAT PLC HMI	licence for using the TwinCAT PLC HMI tool for developing visualisations under Windows NT/2000/XP/Vista

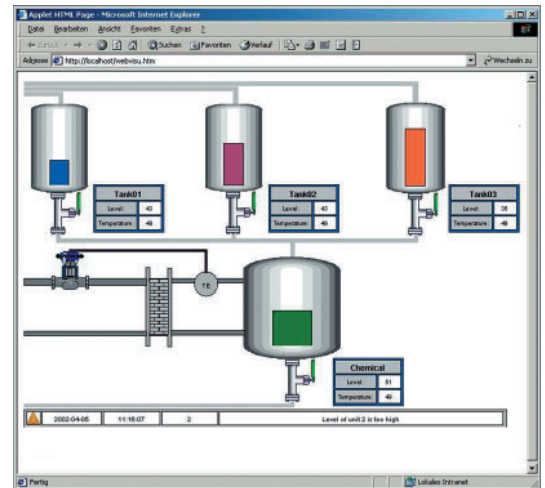
## TwinCAT PLC HMI Web

The TwinCAT PLC visualisation options have been extended: A web-based solution is now available in addition to the well-known TwinCAT PLC HMI for the PC and TwinCAT PLC HMI CE.

TwinCAT PLC Control serves as an editor for creating the dialogues for all three visualisation variants. Buttons, sliders, geometric elements (circles, polygons, ...), tables, display instruments, graphics and edit boxes are available as web page elements.

The new web-based display is loaded together with the IEC 61131 PLC code to the run-time system simply by activating an option in TwinCAT PLC Control. The web pages created are available on the Internet Information Server (IIS) under TwinCAT on Windows XP or CE systems as a target platform.

The web page is based on Java Applet technology; a Java VM is required to display the web page.



Web-based diagnostics and configuration

### Ordering information

#### TwinCAT PLC HMI Web

licence for using the system software TwinCAT PLC HMI Web under Windows XP or CE

## TwinCAT PLC HMI CE

TwinCAT PLC HMI CE enables the visualisation integrated in TwinCAT PLC Control to be run

as a stand-alone application under Windows CE. On start-up the TwinCAT PLC HMI CE tool

offers a full-screen display of the visualisation created with TwinCAT PLC Control.

### Ordering information

#### TwinCAT PLC HMI CE

licence for using the system software TwinCAT PLC HMI CE under Windows CE

## TwinCAT Management Server

The TwinCAT Management Server enables the central administration of Beckhoff controllers. Software updates, for example, can thus be loaded conveniently from a central place to controllers in the network. Besides the general updating of operating systems, device-specific components (PLC boot project) can also be loaded.

In the first step, Beckhoff controllers in the network are detected automatically via "Device Discovery"; subsequently there is a possibility

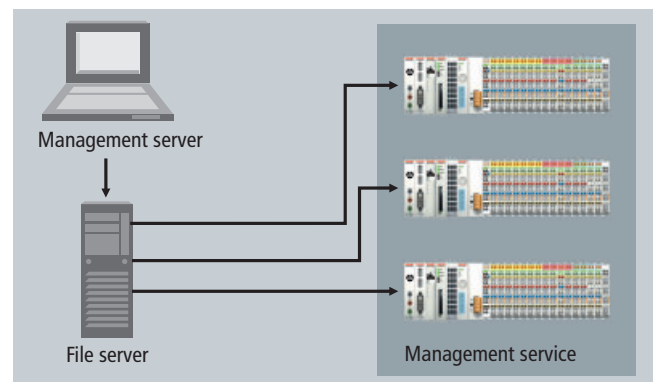
to assign the detected devices to logical groups. For each group, actions can be defined that can be processed individually by the respective devices.

The following basic actions are available: copying, deleting, renaming of files or folders, carrying out of registry entries, running of applications and restarting of the system.

Building on these basic script-based actions, powerful custom scripts for complex update scenarios can hence be executed. The Management

Server offers the possibility to monitor the ongoing processing

of the actions and to display the status.



### Ordering information

#### TwinCAT Management Server

licence for using the TwinCAT Management Server for central administration of Beckhoff CE controllers

## TwinCAT Scope 2

For some time now, TwinCAT contains a software scope: TwinCAT ScopeView. TwinCAT Scope 2 enables the graphics features of the new PC generation to be fully utilised.

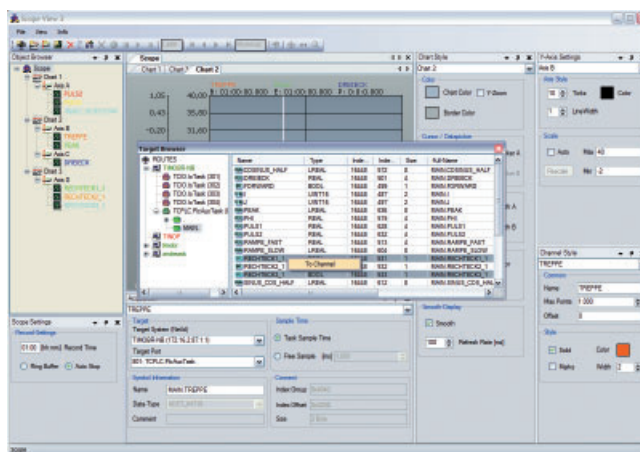
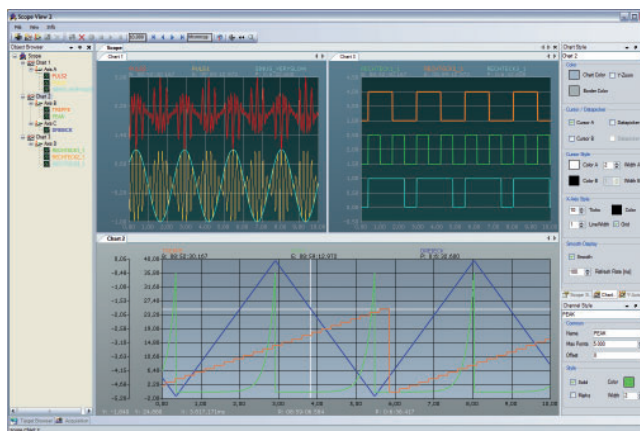
Logger and Viewer are separate. The Logger records the data from different channels with a time stamp and saves the data intermediately. It can also be installed on a CE target. The data can come from different ADS devices.

The viewer fetches the data from the Logger by means of ADS and displays it. The configuration of the Scope is also carried out in the viewer. An assistant supports the search for variables to be recorded. Following selection of the controller, it is possible to browse inside the corresponding PLC. Individual variables can simply be selected.

The scope is the top level of a configuration. Charts are the actual display area of the ScopeView. They provide the X-axis as the time-defined basis of the scope.

The Y-axes offer the option to group the channels within one chart. By means of automatic or free scaling, each axis provides the range of values that covers the connected channels. Channels represent the system variables to be analysed.

The Viewer optionally uses DirectX for displaying. DirectX provides COM-based programming interfaces for multimedia-intensive applications on the Windows platform.



### Ordering information

#### TwinCAT Scope 2

licence for using the TwinCAT Scope under Windows NT, 2000, XP, Vista

## TwinCAT EtherCAT Redundancy

TwinCAT EtherCAT Redundancy is an extension option for the TwinCAT EtherCAT master offering cable redundancy. From the last logical device a cable

is returned back to the master. The TwinCAT System Manager is used for configuration and diagnostics.

### Ordering information

#### TwinCAT EtherCAT Redundancy

licence for extending the TwinCAT EtherCAT master with cable redundancy capability

## TwinCAT PROFINET IO Controller



The PROFINET IO Controller (master) is a TwinCAT supplement that turns every Beckhoff PC-based control system into a PROFINET IO controller. By installing the supplement, a standard Ethernet interface

becomes a PROFINET master. This supplement can be used on PCs and Embedded PCs.

PROFINET can also be tunnelled via EtherCAT in conjunction with the EL6631 PROFINET terminal for the

EtherCAT I/O system. In this way, any EtherCAT network can exchange data with PROFINET IO devices.

Technical data	PROFINET via RT Ethernet	PROFINET via EtherCAT (EL6631)
Ethernet hardware	real-time Ethernet hardware	PROFINET terminal EL6631
Operating system	Windows XP, XP Embedded, CE	
Software	TwinCAT I/O, PLC, NC, NC I, CNC	
Target systems	PC (x86), Windows CE devices	PC (x86), Windows CE devices with EtherCAT interface
Cycle time	min. 1 ms	
Number of possible IO devices	limited by CPU power and memory	up to 15 devices
Ordering information		
TwinCAT PROFINET IO Controller	licence for using the TwinCAT PROFINET IO Controller for Windows XP, XP Embedded	
TwinCAT PROFINET IO Controller CE	licence for using the TwinCAT PROFINET IO Controller for Windows CE	

## TwinCAT PROFINET IO Device



The PROFINET IO Device (slave) is a TwinCAT supplement that turns every Beckhoff PC-based control system into a PROFINET IO device. By installing the supplement, a standard Ethernet interface becomes a PROFINET

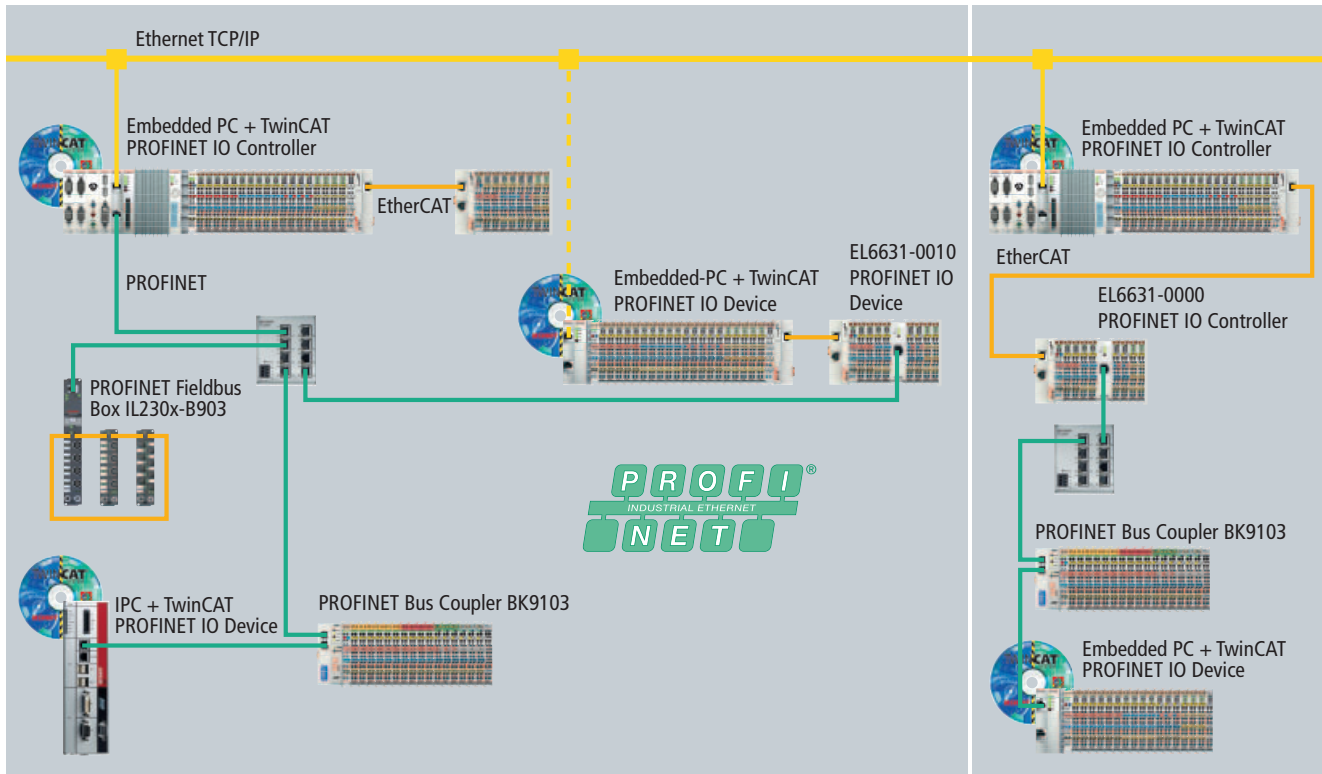
slave. This supplement can be used on PCs and Embedded PCs.

PROFINET can also be tunnelled via EtherCAT in conjunction with the EL6631 PROFINET terminal for the EtherCAT I/O system. In this

way, any EtherCAT network can exchange data with PROFINET IO controllers.

Technical data	PROFINET via RT Ethernet	PROFINET via EtherCAT (EL6631)
Ethernet hardware	real-time Ethernet hardware	PROFINET terminal EL6631
Operating system	Windows XP, XP Embedded, CE	
Software	TwinCAT I/O, PLC, NC, NC I, CNC	
Target systems	PC (x86), Windows CE devices	PC (x86), Windows CE devices with EtherCAT interface
Cycle time	min. 1 ms	
Number of possible IO devices	limited by CPU power and memory	1
Ordering information		
TwinCAT PROFINET IO Device	licence for using the TwinCAT PROFINET IO Device for Windows XP, XP Embedded	
TwinCAT PROFINET IO Device CE	licence for using the TwinCAT PROFINET IO Device for Windows CE	

PROFINET system structure



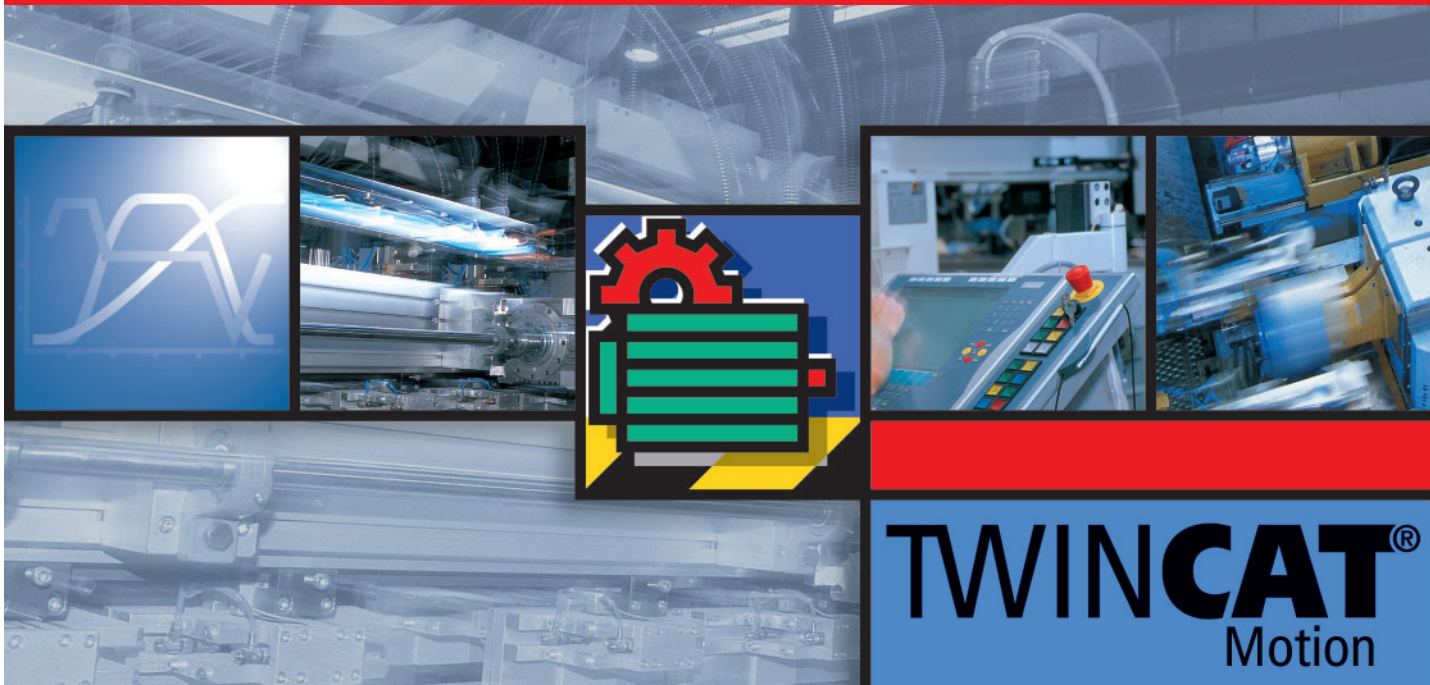
## TwinCAT EtherNet/IP Slave



The TwinCAT EtherNet/IP Slave is a supplement that turns every Beckhoff PC-based control system into an EtherNet IO device. By installing the supplement, any

Ethernet interface becomes an EtherNet/IP slave. This product can be used on all PC controllers and Embedded PC controllers running XP and CE.

Technical data	EtherNet/IP via RT Ethernet
Ethernet hardware	real-time Ethernet hardware
Operating system	Windows XP, XP Embedded, CE
Software	TwinCAT I/O, PLC, NC, NC I, CNC
Target systems	PC (x86), Windows CE devices
Cycle time	min. 1 ms
Number of possible slave devices	1
Ordering information	
TwinCAT EtherNet/IP Slave	licence for using the TwinCAT EtherNet/IP Slave for Windows XP, XP Embedded
TwinCAT EtherNet/IP Slave CE	licence for using the TwinCAT EtherNet/IP Slave for Windows CE



## TwinCAT PLC Hydraulic Positioning

The function blocks and functions of this library can be used for positioning and controlling hydraulic axes. Various functions are available for the conversion of sensor signals into actual positions and of control outputs into output data.

Blocks for point-to-point movements are supplied. These blocks operate with time or path-controlled ramps. Optionally,

constant or cosine acceleration can be used. In two variants, breaking is optimised by a root calculator or by an adaptive time control. Dead path and dead time compensation are available for the transition to the target position. The behaviour at the target can be selected through parameterisation: position control, pressure output with the correct sign, automatic repositioning.

The motion can be influenced through monitoring functions and aborted prematurely if a limit value is reached. Alternatively, a motion can be slowed down, for example, through a pressure controller.

Apart from the remanence and persistence options of the TwinCAT PLC run-time, axis parameters can also be stored and loaded as files via supplied

blocks. The modular configuration of the axis within the PLC application enables the flexible combination of library blocks with customer- and application-specific special functions.

Ordering information	
TwinCAT PLC Hydraulic Positioning	licence for using the IEC 61131-3 software library for TwinCAT for controlling hydraulic axes

## TwinCAT NC FIFO Axes

The purpose of the FIFO is to send externally generated set position values to the axes in the form of a speed pre-control.

The set value generation is designed in such a way that both the set position and the set speed are determined as the

FIFO inputs are worked through in sequence. It is also possible, if necessary, to interpolate between two neighbouring FIFO inputs.

Ordering information	
TwinCAT NC FIFO Axes	licence for using the IEC 61131-3 software library for TwinCAT PLC to permit set value generation specified by the user for an NC axis

## TwinCAT NC Flying Saw

“Flying saw” generally represents synchronisation of a slave axis with a master axis in motion. The master axis can be a real axis, a virtual axis, or some other external source of actual values. A simple example for a “flying saw” is a tool that processes a workpiece in continuous operation. To this end, the tool travels with the workpiece over a limited

distance, synchronised in terms of velocity and position. After the task is complete, the tool returns to the starting position and is ready for the next task.

The PLC library contains blocks for programming this function under TwinCAT NC.

- synchronisation of the slave axis from any motion situation (stop, forward or reverse

travel) with the master in motion

- simple synchronisation with the master velocity
- precise position synchronisation with the master axis (velocity and position)
- synchronous velocity can be set via a coupling factor
- optional return prevention as additional safety function

- superimposed section compensation during the synchronous phase for dynamic position correction

Typical applications for this functionality result can be found in transfer lines, printing and packing machines.

### Ordering information

#### TwinCAT NC Flying Saw

licence for using the IEC 61131-3 software library for TwinCAT PLC to permit implementation of the “flying saw” functions

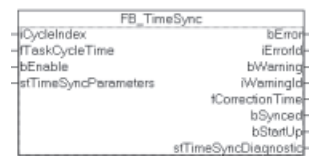
## TwinCAT PLC Remote Synchronisation

Due to the increasing use of decentralised controllers, time synchronisation of different systems is becoming an increasingly important issue. In systems without identical time base, cyclic transfer of information can lead to beat effects, which can mani-

fest themselves as periodic malfunction in the synchronisation of drives for which axis information is transferred via a network. The TcRemoteSync.lib library offers options for general time synchronisation of information in distributed systems and special

techniques for synchronising NC axes (“distributed axes”). For synchronising distributed

systems, the functionality implemented in the TcRemoteSync.lib library can be used.



### Ordering information

#### TwinCAT PLC Remote Synchronisation

licence for using the IEC 61131-3 software library for TwinCAT PLC Remote Synchronisation

## TwinCAT NC Camming

TwinCAT NC offers the option of coupling a slave axis with a master axis via a cam plate. Traditionally, cam plates are described as two-column position tables with master positions and corresponding slave positions. In addition to this simple cam plate type, TwinCAT NC also supports so-called motion functions, which very accurately describe a cam plate via a few

interpolation points and a selection of motion laws.

Application examples for TwinCAT cam plates are available from a wide range of industry sectors: press controllers, machining centres, transfer lines, product handling or packaging machines.

The TwinCAT NC Camming PLC library contains all the function blocks required for dealing with these cam plates.

- table types:
  - Position tables with master interpolation points and associated slave positions; linear or spline interpolation is used between the interpolation points.
  - motion function table describing a cam plate via motion laws according to VDI guideline 2143

- cyclic or linear processing
- Cam plate described through offset and scaling, can be modified both on the master and the slave side.
- Motion functions can be modified online.

### Ordering information

#### TwinCAT NC Camming

licence for using the IEC 61131-3 software library for TwinCAT PLC for implementation of the camshaft functions (table coupling) of TwinCAT NC



## TwinCAT Cam Design Tool

The TwinCAT Cam Design Tool is available for the development of electronic cam plates. It is fully integrated into the System Manager. Cam plates represent the relationship between the positions of different axes. The independent axis is referred to as the master axis, while the dependent axis is called slave axis. The position of the slave axis is uniquely functional dependent on the position of the master axis.

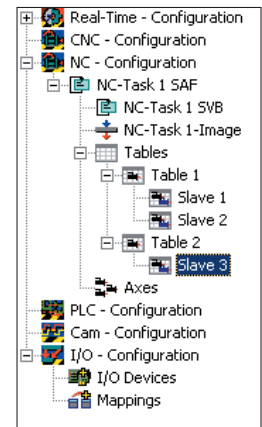
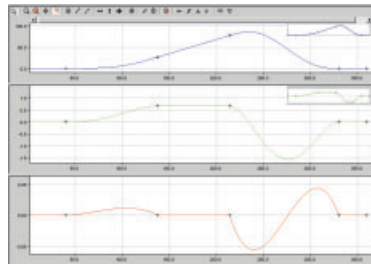
The Cam Design Tool can be used to develop or modify cam plates interactively on the basis of VDI guideline 2143. The cam plates are composed of sections of laws of motion such as modified sine waves, harmonic combinations, or of various polynomial functions. Speed, acceleration and jerk are also represented in addition to the slave position. The starting and finishing values

may be entered graphically and interactively, or in the form of a table. The same applies to boundary values (derivative values) which can also be graphically and interactively modified for the appropriate functions.

In order to synchronise to the movement of another slave that has already been defined, it is possible to attach the starting or finishing point of a movement section to that other movement, and to shift it. In this way jerk-restricted, smooth movements are created.

For synchronising several cam plate, all slaves of a master can be displayed simultaneously. Data that already exists in table form can be read into TwinCAT Cam Design Tool, and its derivatives can also be displayed. The generated cam plates can be transferred to the NC as tables with specified step size

or as so-called motion functions. Advantages of motion functions include accurate calculation in the NC and the option of online manipulation. The cam plates are saved in the System Manager project and automatically transferred to the NC on system start-up.



### Ordering information

#### TwinCAT Cam Design Tool

licence for using the TwinCAT Cam Design Tool for the graphical development of programming cams

## TwinCAT Digital Cam Server

Fast camshaft controller implemented in software in TwinCAT. The camshaft controller can be freely configured by the TwinCAT System Manager. Communication with the TwinCAT PLC takes place both via the process image and via ADS (Automation Device Specification).

- up to 320 outputs
- up to 180 cams per output
- path-path cams,
- path-time cams
- brake cams
- (special function)
- dynamic speed correction
- minimum cycle time with the Beckhoff Lightbus: 66 µs
- independent of fieldbus (all the fieldbuses supported by TwinCAT)
- measurement and monitoring of rotary speed
- complete integration into the TwinCAT System Manager

### Ordering information

#### TwinCAT Digital Cam Server

licence for using the TwinCAT Digital Cam Server

## TwinCAT Valve Diagram Editor

In order to linearise non-linear characteristic curves of hydraulic valves, a velocity curve that has been measured for the output voltages has to be read in and approximated by a characteristic curve. The measured characteristic

curve is displayed in the TwinCAT Valve Diagram Editor and can easily be linearised graphically. Only a few reference points are required. A straight line or a 5<sup>th</sup> degree polynomial is placed between these reference points.

The determined characteristic linearisation is then loaded into the TwinCAT NC real-time and taken into account when the voltages are output in the drive. Online monitoring is possible at any time.

### Ordering information

#### TwinCAT Valve Diagram Editor

licence for using the TwinCAT Valve Diagram Editor for designing the characteristic curve of a hydraulic valve

## TwinCAT Kinematic Transformation

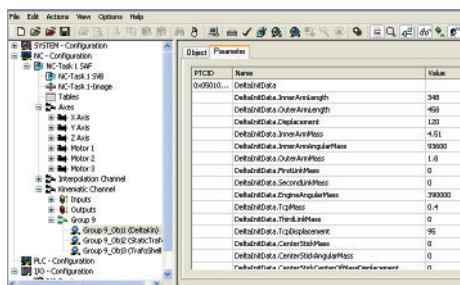
The kinematics package integrates itself transparently into the existing Motion Control world of TwinCAT: simple insertion of an additional Kinematic channel is sufficient. The complete parameterisation is done in the TwinCAT System Manager.

The package supports different parallel and serial kinematic systems, as used for e.g. pick-and-place tasks. The supplement is based on TwinCAT NC I for interpolating movements and G-Code (DIN 66025). In addition, standard PTP and cam plate applications can be realised.

Programming is usually based on the Cartesian coordinate system, with the control system calculating the inverse kinematics for the relevant motor positions.

The kinematic system can be selected in the TwinCAT System Manager. The kinematic channel is used to parameterise the type (e.g. delta) and the bar lengths and offsets. Mass and mass inertia values can be specified for dynamic pre-control. The "flying saw" and "cam plate" functions enable synchronisation with conveyor belts for picking or placing workpieces, for example.

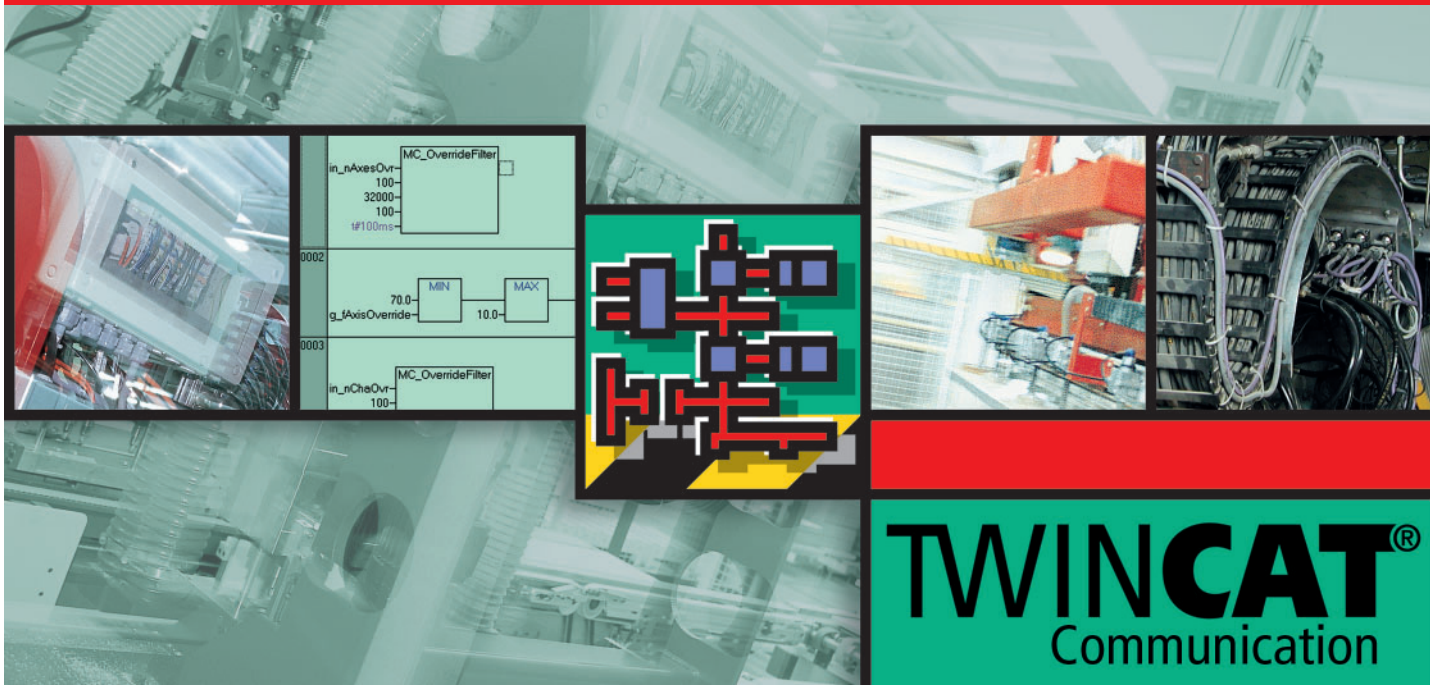
TwinCAT Kinematic Transformation is optimised for the Beckhoff AX5000 drive series.



### Ordering information

#### TwinCAT Kinematic Transformation

realises different kinematic transformations for TwinCAT PTP or TwinCAT NC I



**TWINCAT®**  
Communication

## TwinCAT PLC Serial Communication

Communication library for connection of serial devices such as printers, barcode scanners, peripheral controllers or distributed display systems to the TwinCAT PLC.

The PC's serial interface and the Beckhoff KL6xxx serial Bus Terminals are supported.

- sending and receiving byte by byte
- sending and receiving strings

- automatic detection of start/stop sequences
- configuration of serial Bus Terminals at run-time

Ordering information	
TwinCAT PLC Serial Communication	licence for using the IEC 61131-3 software library for TwinCAT PLC for communication via serial Bus Terminals or PC COM ports

## TwinCAT PLC Serial Communication 3964R/RK512

In addition to serial communication, this library permits connection of serial devices to the TwinCAT PLC by means of the 3964R protocol. The PC's serial interface and the Beckhoff KL6xxx serial Bus Terminals are supported. The full range of functions in the "Serial Communication" library is included.

The RK512 protocol implements data exchange between serial Bus Terminals and other devices via a serial interface. The COMlibRK512 library for TwinCAT PLC supports transmission and reception of PLC variables of any type. Data up to 128 bytes long is transferred transparently in the form of data blocks. To ensure

secure data transmission, the 3964R protocol is used underneath the RK512 protocol. The COMlib, COMlib3964R and COMlibRK512 libraries are included in the package.

Ordering information	
TwinCAT PLC Serial Communication 3964R/RK512	licence for using the IEC 61131-3 software library for TwinCAT PLC for communication via serial Bus Terminals or the PC COM ports using the protocol 3964R/RK512

## TwinCAT PLC Serial Communication EnOcean

The transmitter or sender modules from the company EnOcean enable wireless sending of key signals and climate control signals without battery. These signals are received by a receiver module and can then

be processed in a controller. The KL6023 wireless adapter receives these signals and TwinCAT PLC Serial Communication EnOcean converts them to an RS485 signal, which is processed directly by the KL6021-0023 serial Bus

Terminal. Using the EnOcean TwinCAT Serial Communication library, the data can be read by the KL6023 wireless adapter and prepared for further software utilisation.

### Ordering information

<b>TwinCAT PLC Serial Communication EnOcean</b>	free licence for using the PLC library for processing of data from the KL6023 wireless adapter or the KL6021-0023 serial Bus Terminal
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## TwinCAT PLC Modbus RTU

In addition to Modbus TCP, TwinCAT devices can also communicate with Modbus RTU devices. Communication takes place via a serial RS232, RS422 or RS485 interface and is therefore suitable both for the PC/CX interfaces and for operation with the serial KL6xxx Bus Terminals. Many manufacturers

of operating terminals support Modbus RTU. The Modbus RTU library offers blocks for master and slave operation. The operating devices serve as master, the TwinCAT control as slave. The configuration effort is very small.

### Ordering information

<b>TwinCAT PLC Modbus RTU</b>	Licence for using the IEC 61131-3 software library for TwinCAT PLC. The Modbus RTU TwinCAT PLC library offers function blocks for serial communication with Modbus end devices.
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## TwinCAT PLC IEC 60870-5-101, -102, -103, -104 Master

Four telecontrol libraries are available that comply with the globally accepted IEC 60870 standard.

The -101 specification standardises a protocol for serial coupling. A master can be realised via a comprehensive function block library for TwinCAT PLC.

The -102 protocol serves for the transmission of counter states of electrical energy quantities. These values are usually transmitted at longer periodic intervals. Special safety measures ensure that the values cannot be falsified. The TwinCAT PLC library implements a serial interface, via which the individual ASDUs (application-layer service data units) can be sent or received.

The serial -103 version is the communication standard for substation control. The protocol is used for serial communication with digital protective equipment protecting the electric energy transmission network from the effects of faults (short circuit, earth leakage) in individual power supply units. For the purpose of monitoring these protective devices, all states are transferred to the control master station via a serial IEC 60870-5-103 protocol.

Like the -101 version, the -104 protocol defines a general communication standard. In contrast to the -101 standard, the communication is realised via TCP/IP.

Interoperability between devices from different manufacturers is ensured through the “interoperability list”, the structure of which is defined in the standard. For the TwinCAT libraries interoperability lists are available for each product in the Beckhoff Information System.



Ordering information	
TwinCAT PLC IEC 60870-5-101 Master	licence for using the IEC 61131-3 software library for TwinCAT PLC for communication via the telecontrol protocol according to IEC 60870-5-101 (serial transmission), master
TwinCAT PLC IEC 60870-5-102 Master	licence for using the IEC 61131-3 software library for TwinCAT PLC for communication via the telecontrol protocol according to IEC 60870-5-102 (serial transmission), master
TwinCAT PLC IEC 60870-5-103 Master	licence for using the IEC 61131-3 software library for TwinCAT PLC for communication via the telecontrol protocol according to IEC 60870-5-103 (serial transmission), master
TwinCAT PLC IEC 60870-5-104 Master	licence for using the IEC 61131-3 software library for TwinCAT PLC for communication via the telecontrol protocol according to IEC 60870-5-104 (TCP/IP-based transmission), master
TwinCAT PLC IEC 60870-5-104 Master CE	licence for using the IEC 61131-3 software library for TwinCAT PLC for communication via the telecontrol protocol according to IEC 60870-5-104 (TCP/IP-based transmission) for Windows CE platforms, master

## TwinCAT PLC IEC 60870-5-101, -104 Slave

In telecontrol applications, devices from different manufacturers have to communicate with each other. Standardised data exchange can easily be realised via the internationally

standardised telecontrol protocols IEC 60870-5-101 for serial transfer and IEC 60870-5-104 for the TCP/IP-based transfer.

The two comprehensive TwinCAT libraries implement

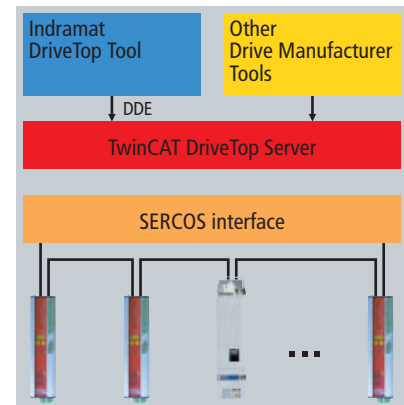
the IEC 60870 slaves for -101 and -104. They run on a wide range of control platforms, including CX Embedded PCs and standard PCs.

Ordering information	
TwinCAT PLC IEC 60870-5-101 Slave	licence for using the IEC 61131-3 software library for TwinCAT PLC for communication via the telecontrol protocol according to IEC 60870-5-101 (serial transmission), slave
TwinCAT PLC IEC 60870-5-104 Slave	licence for using the IEC 61131-3 software library for TwinCAT PLC for communication via the telecontrol protocol according to IEC 60870-5-104 (TCP/IP-based transmission), slave
TwinCAT PLC IEC 60870-5-104 Slave CE	licence for using the IEC 61131-3 software library for TwinCAT PLC for communication via the telecontrol protocol according to IEC 60870-5-104 (TCP/IP-based transmission) for Windows CE platforms, slave

## TwinCAT DriveTop Server

The TwinCAT DriveTop Server is a communication server for linking the Indramat DriveTop tools to TwinCAT. This means that the familiar tool for configuration and commissioning of Indramat drives can continue to be used. Configuration with a number of SERCOS rings is also supported. The TwinCAT DriveTop Server and the Indramat DriveTop software offer a further method for initialising and visualising the parameter data of Indramat drives in a SERCOS system, as an alternative to the TwinCAT System

Manager. From the point of view of the SERCOS interface, the DriveTop Server uses TwinCAT ADS communication. As an interface to the DriveTop software, data exchange is represented to DDE services in accordance with the DriveTop convention. Other programs can continue to use the ADS service channel in parallel. The TwinCAT DriveTop Server makes the full range of Indramat DriveTop software functionalities available.



### Ordering information

#### TwinCAT DriveTop Server

licence for using the TwinCAT DriveTop Server for the configuration of Indramat SERCOS drives with DriveTop software on TwinCAT systems

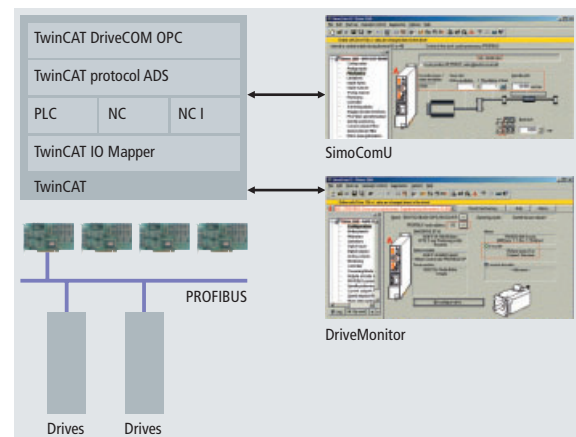
## TwinCAT DriveCOM OPC Server

The DriveCOM user organisation has set itself the aim of facilitating uniform, standardised communication between configuration, commissioning and diagnostic tools from different drive manufacturers, independent of the fieldbus.

The TwinCAT DriveCOM OPC Server offers this type of communication connection: TwinCAT enables the data flow from the engineering tool to the drive, independent of the fieldbus. Due to the network-capable ADS TwinCAT communication system, distributed drives can be configured and diagnosed

from a central point. Siemens supports this standard with the SimoComU and DriveMonitor tools in the 611U, Posmo and master drives under the name PROFIBUS DP-V1 OPC.

The TwinCAT DriveCOM OPC Server requires a subordinate TwinCAT system with a FCxxx-type Beckhoff Fieldbus Card. The TwinCAT DriveCOM configurator finds supported drives in the TwinCAT configuration and makes this information available for the engineering tool. The configurator features an automation interface and can therefore be operated remotely by other tools.



### Ordering information

#### TwinCAT DriveCOM OPC Server

licence for using the TwinCAT DriveCOM OPC Server

## TwinCAT ADS Communication Library

### TwinCAT ADS organises the data exchange

TwinCAT ADS organises the exchange of data between TwinCAT and Windows programs and includes:

- searching for variables
- access by variable name
- synchronisation of timing with the operating system
- adaptation of the differing data types
- creation of data blocks and list generation to improve system effectiveness
- ensuring that accessed data is consistent

### Access methods

- synchronous/asynchronous
- cyclical/notify on change

### Interface for program applications

The TwinCAT interface for programming languages (Visual Basic, Visual C, Delphi, Java, ...) does not just offer links to I/O

data, but also full access to the methods of the PLC/NC run-time server (start, stop, etc.).

### TwinCAT ADS operates through the message router

The data link to TwinCAT servers always takes place via the message system. In this way it is possible for the Windows programs not only to work with the local server but also to exchange data with all registered TwinCAT servers worldwide. The message router also ensures that the data exchange to remote servers on other PCs or field equipment can occur.

ADS components are available for the following applications: DLL, OCX, VB Script, J Script, .NET assembly, Java, web service.

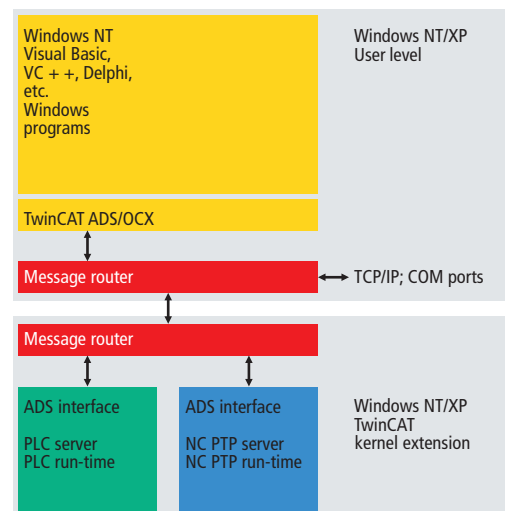
ADS data exchange can be managed transparently via different physical transport routes: TCP, UDP, fieldbus, EtherCAT, serial, SOAP.

### TwinCAT ADS monitor

The TwinCAT ADS monitor is an important debugging and diagnostics tool for the development of ADS-based communication and is split into two applications, i.e. the logger for recording the telegrams and the viewer for displaying the telegrams offline. The telegrams can be conveniently filtered in the viewer.

All ADS components are available free of charge as "TwinCAT ADS Communication Library". Detailed descriptions and examples can be found in the Information System:

<http://infosys.beckhoff.com>



### Ordering information

TwinCAT ADS  
Communication Library

free licence for using the ADS communication components

## TwinCAT OPC Server

### The standard interface for automation

OPC stands for "Openness, Productivity & Collaboration" and describes an initiative for standardisation of data exchange in automation. Formerly, applications such as operating and monitoring software were forced to use the differing access procedures of each controller manufacturer. OPC is the specification for a uniform software interface, and permits access to the process data from any manufacturer.

### OPC specifications

The TwinCAT OPC Server supports the following specifications: DataAccess (DA) and XML-DA. DataAccess (DA) is based on the established Microsoft COM technology and provides data for the client.

The OPC XML-DA specification enables data exchange through XML via HTTP. The TwinCAT OPC Server XML-DA is implemented as plug-in for the Microsoft IIS (Internet Information Server) and provides TwinCAT variables for web-based visualisations or implementation under C++, .NET, and JavaScript. Data can be transmitted HTTP-compliant through firewalls.

The TwinCAT OPC Servers can be configured in the configurator or via XML. In addition to the namespace and the event space, other features of the Beckhoff OPC server can be defined with the configuration tool, or via XML: simulation signals allow the OPC client/server communication to be tested without accessing physical I/O.

The simulation algorithm allows sinusoidal, ramp and random signals, e.g. to configure in amplitude, slope and offset, etc. Also interesting is the facility for the online conversion of process values: configurable linear conversions allow process values in units of "degrees Celsius" to appear in the OPC client as "degrees Fahrenheit", or "inch" as "centimetre".

### Features

- open concept, access to all the TwinCAT ADS devices:
  - TwinCAT I/O
  - TwinCAT CP
  - TwinCAT CAM
  - TwinCAT NC
  - TwinCAT PLC run-time systems
  - Bus Terminal Controller
  - Fieldbus PLC Box

- Embedded PC
- access to TwinCAT variables
- project planning
- supports browsing of namespace
- automatic configuration via XML
- The server supports browsing of variables.

### Further features

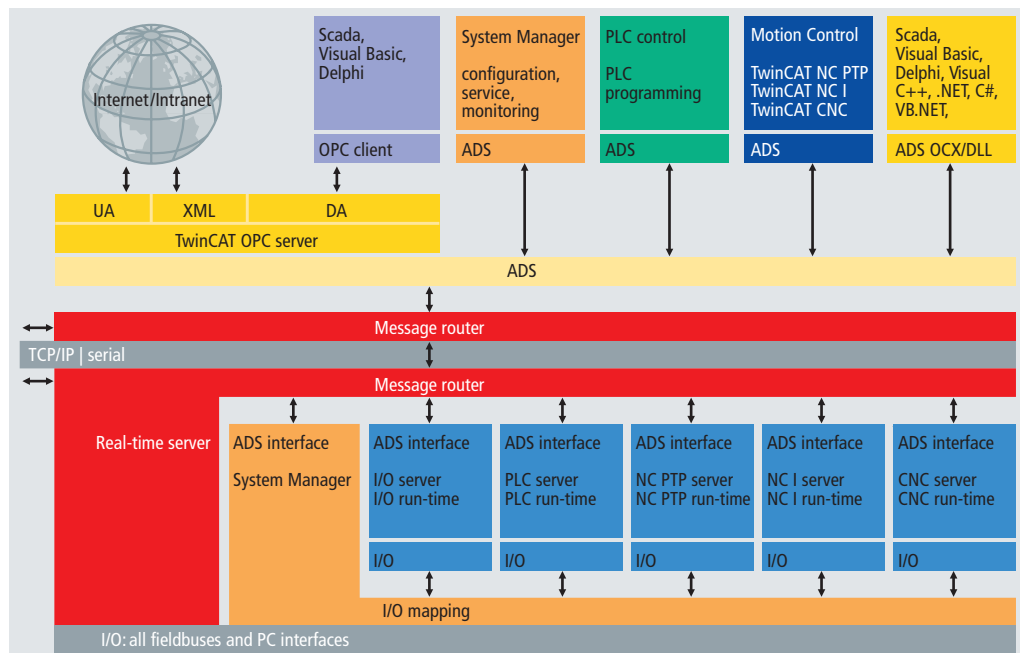
- Configurable simulation signals such as sine, ramp, random or none can be set for each variable in order to test OPC client/server communication without access to physical I/O by the OPC server.
- online conversion of process values, configurable conversion algorithm



Since 1998 Beckhoff is member of the OPC foundation.



TwinCAT OPC is tested as "OPC compliant" product by the OPC Compliance certification.



### Ordering information

TwinCAT OPC Server	Licence for using the OPC server for accessing TwinCAT. DataAccess and XML-DA are supported.
TwinCAT OPC Server CE	Licence for using the OPC server for accessing TwinCAT on Windows CE platforms. DataAccess and XML-DA are supported.



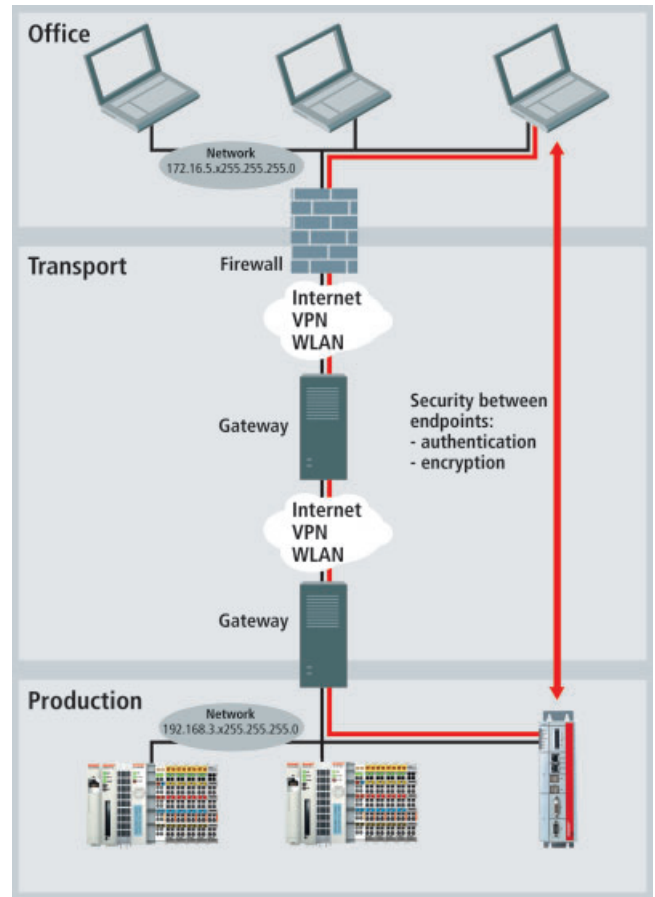
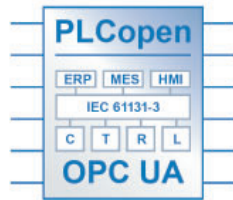
## TwinCAT OPC UA Server

The TwinCAT OPC UA Server makes the options of the new Unified Architecture specification available. In addition to data access techniques, the UA also specifies the data coding and the transport protocols. This enables platform-independence and therefore integration of the UA interface in smaller embedded devices. XML-based web services or an efficient TCP-based binary protocol according to the specification are available as communication types. In addition to exchange of complex data, security mechanisms for authentication and data encryption are integrated. The system enables protected data communication between two end points (e.g. visualisation and control) in a heterogeneous network.

The product includes an OPC UA server and an OPC UA client. The UA server offers data exchange of variables and calling of ADS methods. The UA client enables communication with other UA servers and facilitates integration of third-party products.



Since 1998 Beckhoff is member of the OPC foundation.



### Ordering information

TwinCAT OPC UA Server	licence for using the OPC UA Server for accessing TwinCAT
TwinCAT OPC UA Server CE	licence for using the OPC UA Server for accessing TwinCAT on Windows CE platforms

## TwinCAT SMS/SMTP Server

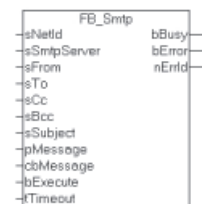
The TwinCAT SMS Server allows an SMS to be sent to a mobile telephone from the TwinCAT PLC. A server with a COM interface is offered for this purpose.

### PLC block

The TwinCAT PLC SMS library (TcPlcSMS) contains a block for sending SMS messages directly from the PLC. The library is available for the PC and for the Bus Terminal Controller BCxxxx. It is possible to communicate with

the PC's serial interface and with the serial Bus Terminal (KL6xxx) in the same way.

This product has been expanded with an SMTP server. A PLC block enables convenient sending of e-mails via the Simple Mail Transfer Protocol.



### Ordering information

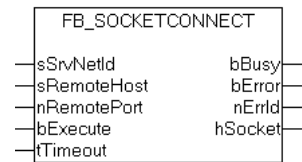
TwinCAT SMS/SMTP Server	licence for using the TwinCAT SMS/SMTP server
TwinCAT SMS/SMTP Server CE	licence for using the TwinCAT SMS/SMTP server for Windows CE platforms

## TwinCAT TCP/IP Server

The TwinCAT TCP/IP Server enables the implementation and realisation of one or several TCP/IP server/clients within the TwinCAT PLC. A server compo-

nent serves the TCP/IP sockets of the operating system and also acts as an ADS device. The blocks of the PLC library for establishing and closing the communication

and for the actual data exchange (sending and receiving) enable simple interaction with the server.



Ordering information	
TwinCAT TCP/IP Server	licence for using the TwinCAT TCP Server for realising generic TCP/IP servers and clients for Windows NT/2000/XP/Vista
TwinCAT TCP/IP Server CE	licence for using the TwinCAT TCP Server CE for realising generic TCP/IP servers and clients for Windows CE

## TwinCAT Modbus TCP Server

The TwinCAT Modbus TCP Server represents a connection of TwinCAT controls to the Modbus TCP world. Modbus TCP is a simple, manufacturer-neutral and open protocol. It is the

“de facto” standard for control systems. The TwinCAT Modbus TCP Server represents a simple gateway between Modbus TCP and TwinCAT ADS devices. It can operate as a server or as a client.

In server mode, TwinCAT memory areas are mapped directly to Modbus memory areas. In client mode, a number of PLC blocks are available that can be used to read inputs and input registers

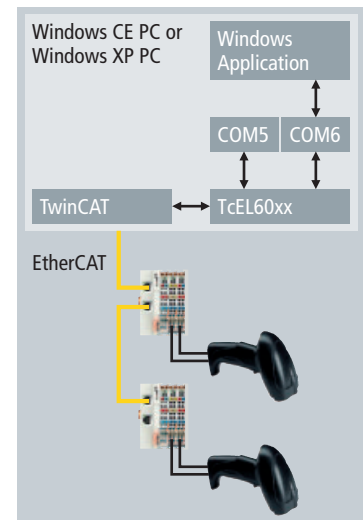
and to write coils and registers. The server is started directly with the start of TwinCAT. It is configured via an XML file.

Ordering information	
TwinCAT Modbus TCP Server	licence for using the TwinCAT Modbus TCP Server for communication with Modbus TCP devices (server and client functionality)
TwinCAT Modbus TCP Server CE	licence for using the TwinCAT Modbus TCP Server for Windows CE platforms

## TwinCAT Virtual Serial COM Driver

The driver inserts one or more EL60xx EtherCAT Terminals as normal serial interfaces ('COMx') in Windows CE or XP. Configuration takes place in the TwinCAT System Manager, wherein it is defined for each EL60xx whether or not and on which computer a serial interface should be created for it. Access to the device connected to the terminal then

takes place via Windows API for serial interfaces. In this way, even existing Windows applications can be used to read data via an EL60xx from devices with serial interfaces, such as bar code scanners.

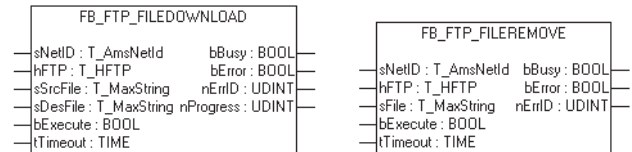


Ordering information	
TwinCAT Virtual Serial COM Driver	licence for using a driver for Windows XP, Vista and Windows CE platforms

## TwinCAT FTP Client

The TwinCAT FTP client enables the TwinCAT PLC to access several FTP servers in a simple manner. There are various function blocks available for the PLC: following the establishment of a connection (optionally with

authentication), files can be loaded to/from the server. Additional function blocks allow files or directories to be searched for, created, deleted and renamed.



### Ordering information

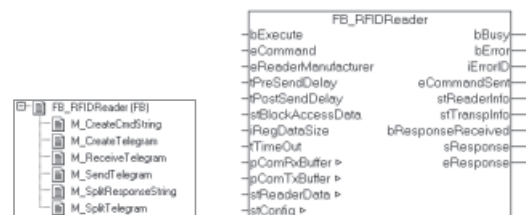
#### TwinCAT FTP Client

licence for using the TwinCAT FTP Client for Windows XP, Vista and Windows CE platforms

## TwinCAT PLC RFID Reader Communication

In the past, connection of RFID readers to the TwinCAT PLC required adaptation of the drivers for the different readers based on existing libraries for serial interfaces. The TwinCAT RFID reader library offers a general, abstract interface

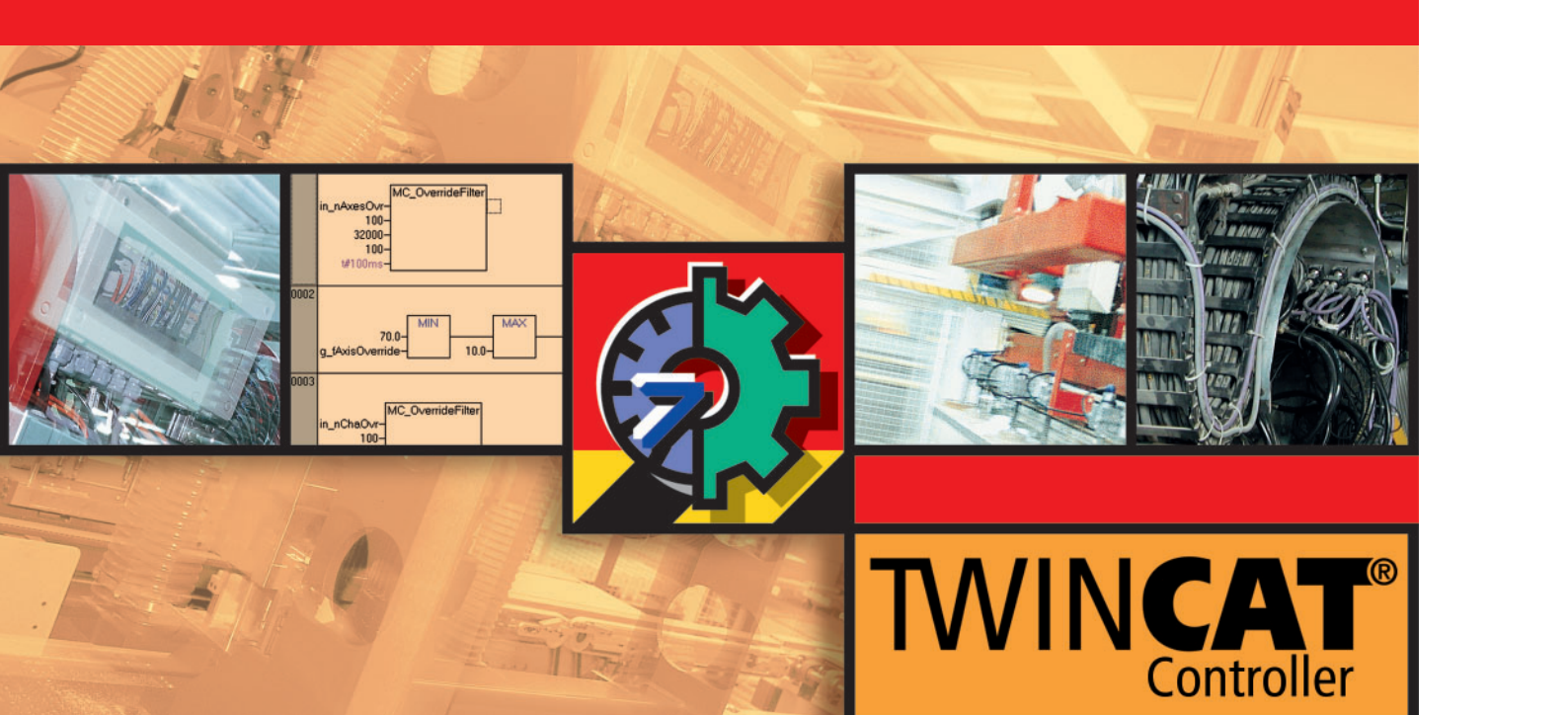
that can be used for all readers. Suitable drivers for different readers have already been created. The user sees a single block for all readers. The configuration can easily be adapted to a specific reader.



### Ordering information

#### TwinCAT PLC RFID Reader Communication

for the connection of RFID readers to the TwinCAT PLC



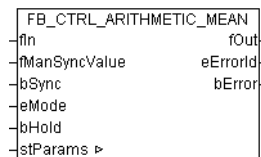
## TwinCAT PLC Controller Toolbox

A large number of control problems cannot be solved with standard controllers. The Controller Toolbox now offers all customers the option to create their own complex controller from basic components.

The Controller Toolbox comprises:

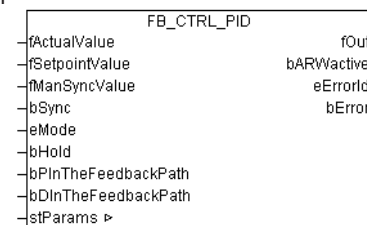
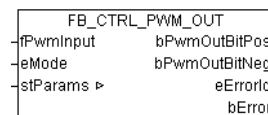
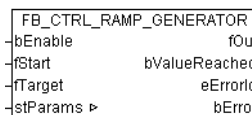
- simple basic controllers (P, I, D),

- complex controllers (PI, PID, switching controllers),
- filter blocks,
- control value generators (limiters, PWM),



- ramp and signal generator blocks.

All blocks share the same look & feel and simple parameterisation.



TwinCAT blocks for control tasks

### Ordering information

**TwinCAT PLC  
Controller Toolbox**

Licence for using the IEC 61131-3 software library for TwinCAT PLC. The TwinCAT Controller Toolbox library contains blocks for basic controllers (P, I, D), complex controllers (PI, PID), pulse width modulation, ramps, signal generators, filters.

## TwinCAT PLC Temperature Controller

Library with temperature controller function block (multiple instances possible) for monitoring and control of temperature regulated areas with these features:

- easy commissioning through automatic adjustment of the controller (self-tuning)
- automatic and manual operation with smooth transition
- control values provided as direct analog or as pulse width modulated signal
- tolerance monitoring, absolute value monitoring
- scalable reaction to sensor error and heating power faults
- limitation of set and control values
- optional ramping of the setpoint values
- soft starting for the setpoint curve
- An industrial PID controller is at the heart of the temperature controller.

### Ordering information

**TwinCAT PLC  
Temperature Controller**

licence for using the IEC 61131-3 temperature controller software library for TwinCAT PLC



**TWINCAT®**  
Building Automation

## TwinCAT PLC Building Automation

Library for execution of basic functions in the Building Automation area comprising modules for: lighting control, staircase illumination, light dimmer using one or two switches, peak load

limiter for energy optimisation, control of blinds, signalling contact, differentiation between single/double as well as short/long button presses, threshold switch, scaling functions for converting

unprocessed values to measured values, functions for converting temperatures (Kelvin, Celsius, Reaumur, Fahrenheit).

Ordering information	
TwinCAT PLC Building Automation	licence for using the IEC 61131-3 software library for TwinCAT PLC for execution of basic functions in the building automation (basic library)

## TwinCAT PLC Building Automation DALI

DALI (Digital Addressable Lighting Interface) is a definition whose purpose is to standardise digital interfaces to lamp ballasts. The standard allows the manufacturers of lighting components to implement complex lighting tasks easily and conveniently. The TwinCAT PLC

Building Automation DALI library offers configuration and programming blocks for the KL6811 DALI master Bus Terminal. The library can be used with the BC or BX series Bus Terminal Controllers, or on the PC/CX. The library includes the following blocks:

- blocks for changing the lamp power
- blocks for changing and querying various parameters of a DALI slave
- blocks for assigning addresses to individual DALI slaves
- blocks for configuring DALI groups and DALI scenes

Ordering information	
TwinCAT PLC Building Automation DALI	free licence for using an IEC 61131-3 software library for TwinCAT PLC for communication with the KL6811 DALI master Bus Terminal

## TwinCAT Building Automation Framework

Medium-sized or large building automation projects require a clear structure and administration of a large quantity of data points, which in most cases are distributed over several Beckhoff controllers. The TwinCAT Building Automation Framework offers support for system integrators during the development and commissioning of such applications.

To this end, all Beckhoff controllers (Industrial PC and/or Embedded PC) and the Bus Terminals and data points are entered in the TwinCAT Building Automation Manager. The links of the Bus Terminals are configured with the standard functions of the PLC program. From this information the configuration program generates and activates the I/O links for all controllers entered in the system.

A further navigation tree contains the structure of the building. A building complex is subdivided into buildings, floors and zones. Each zone may contain different functional units

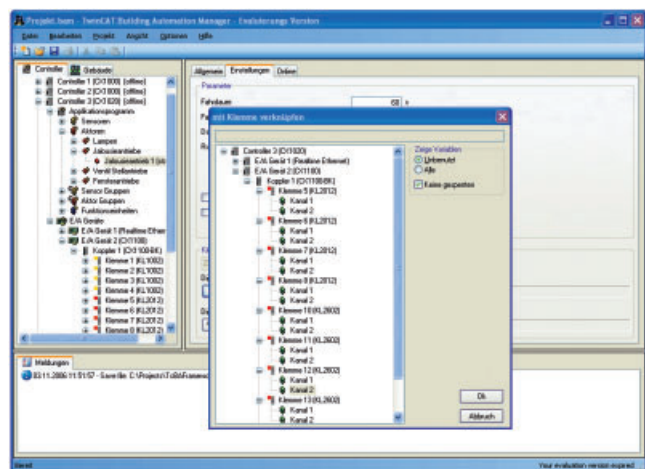
such as lighting, shading, heating, air conditioning, etc. The operator therefore automatically has documentation available that may be helpful for maintenance purposes.

An application program is created based on a PLC library supplied with the TwinCAT Building Automation Framework. The PLC library is structured in such a way that the parameters loaded from the Building Automation Manager into the controller are stored persistently. Specified and documented PLC variables provide an integrated interface that simplifies the connection with higher-level systems. The TwinCAT OPC Server can be used to enable a connection to the control master station, or the TwinCAT web service can be used for access from HTML pages.

The PLC program using this PLC library as a basis can be customised via TwinCAT PLC Control. The standard framework functions can be expanded with special function blocks.

The state of all sensors and actuators can be monitored in the TwinCAT Building Automation Manager. Actuators can also be switched manually.

All Embedded PCs with Windows CE are supported as target systems. The Bus Couplers (BK9000, BK9100 and BK9050) are linked via real-time Ethernet.



### Ordering information

#### TwinCAT Building Automation Framework

Licence for using the TwinCAT Building Automation Framework for development and commissioning of building automation applications. The building automation PLC libraries are included. The Framework requires TwinCAT PLC 2.10 or higher.

## TwinCAT PLC HVAC

The HVAC library is a comprehensive PLC library for TwinCAT automation software with more than 70 functions that simplifies engineering significantly for applications in the area of building technology.

Function blocks are available for handling the sensor/actuator level, for example:

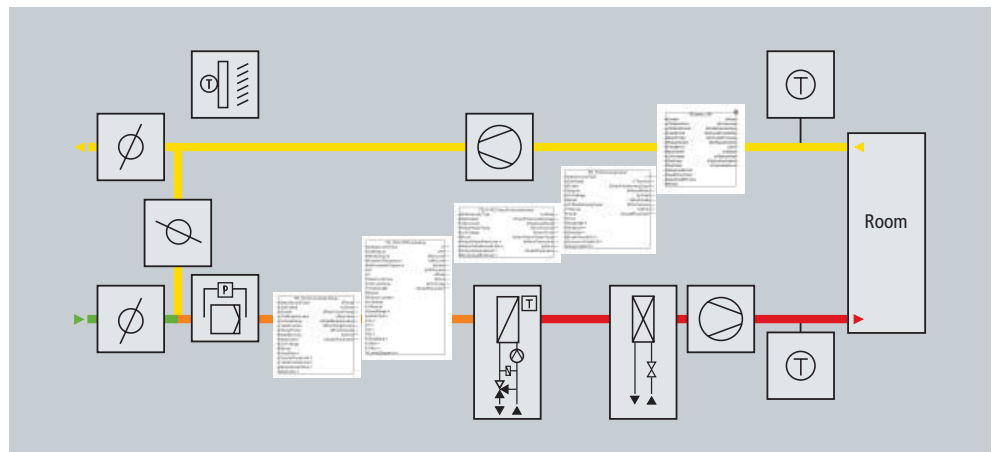
- temperature sensor
- analog valve
- 3-point valve
- single-stage fan

Complex control or regulating tasks can be realised using these blocks, for example:

- time schedulers
- start-up programs
- sequence controller
- operating hours counter
- summer night cooling
- setpoint generators

The functional blocks all have the same uniform look and feel in common. All blocks have a standardised interface and react to errors in the same way.

The functional block can be adapted individually to its task in the automated system by means of a large number of parameters. For example, a general pump block can be parameterised with ease to meet the requirements of a cooling, heating, heating circulation, circulating or charge pump. Management of the internal parameters is standardised for all blocks.



### Ordering information

TwinCAT PLC HVAC

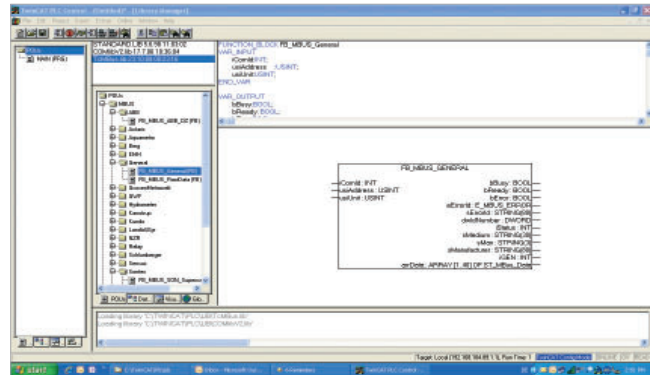
licence for using the IEC 61131-3 software library for automation of heating, ventilation, air-conditioning and sanitary installations

## TwinCAT PLC M-Bus

The M-Bus (metering bus) is a fieldbus for logging consumption data (e.g. in water meters, electricity meters, gas meters, heat/cold meters, etc.). Devices from different manufacturers support this common protocol.

Up to 250 slaves can be connected with any topology (star or line). Devices from different manufacturers can be operated on the same bus. The M-Bus is a European standard and is described in EN 1434. The data are sent serially from a slave (measuring device) to a master (TwinCAT PLC with level con-

verter). The master controls the communication on the bus by requesting data from the slaves. The slaves can respond with a fixed or variable data structure. The M-Bus library evaluates data with variable data structure (low byte first). It supports the serial interfaces KL6001, KL6021 or PC-COM port. They are connected with an M-Bus level converter via RS232 or RS485. From there, the individual slaves are connected via a two-wire line that is protected against polarity reversal.



Ordering information	
TwinCAT PLC M-Bus	licence for using the PLC Library TwinCAT PLC M-Bus

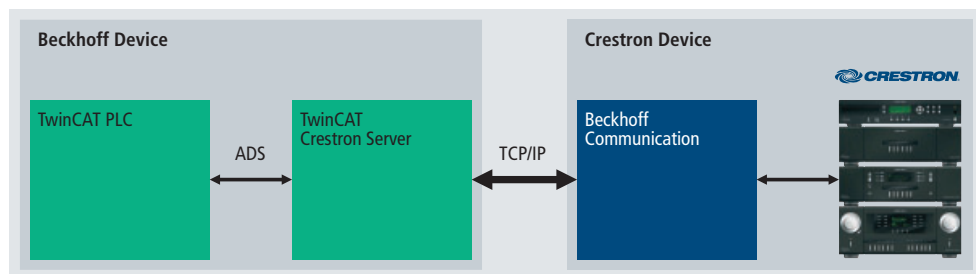
## TwinCAT Crestron Server

Crestron is one of the leading manufacturers of AV control systems. The TwinCAT Crestron Server enables communication between a TwinCAT PLC and a Crestron control centre. The two systems are linked via Ethernet, based on the TCP/IP protocol. User macros for SIMPL are available for programming the Crestron controller. The required function blocks are included in the TwinCAT PLC library. Read and write access

to the other device is available from the Crestron controller and the TwinCAT PLC. The TwinCAT

Crestron Server supports all PC-based controllers under Windows CE, Windows XP

Embedded and Industrial PCs running Windows XP.



Ordering information	
TwinCAT Crestron Server	licence for using the TwinCAT Crestron Server for communication between a TwinCAT PLC and a Crestron control centre



BECKHOFF

FUNCTION F\_GetVersionTcPlcLibHydraulics - UINT  
VAR\_INPUT  
nVersionElement INT;  
END\_VAR  
VAR  
END\_VAR  
(\* Version history  
Date midly |Version| created under| Author | Remark  
-----  
02.03.05 |3.0.0 |TC2.9-> 2.8 |WOs |Spawned from 2\_1\_24  
-----  
| | | |WOs |Added; pre-release versio  
| | | | |Bug fix (BU) MC\_SetPos  
| | | | |Extended (THB) MC\_Cal  
| | | | |dwTcHydNsDwMo  
| | | | |Bug fix (THB) MC\_CamT

F\_GETVERSIONTCPLCLIBHYDRAULICS  
nVersionElement: INT F\_GetVersionTcPlcLibHydraulics - UINT

Loading library 'C:\TWINCAT\PLC\LIB\TcBase.lib'  
Loading library 'C:\TWINCAT\PLC\LIB\TcSystem.lib'  
Loading library 'C:\TWINCAT\PLC\LIB\TcUtilities.lib'

Target: Local [5.1.18.249.1.1] Run Time: 1 **TwinCAT Running** ONLINE IOW READY  
12:09

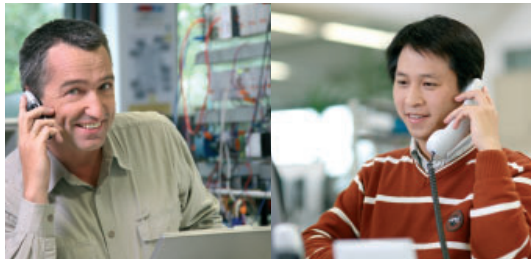
# Support, Service, Training



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Beckhoff and its partners around the world offer comprehensive support and service, guaranteeing fast and competent assistance with all questions related to Beckhoff products and system solutions.

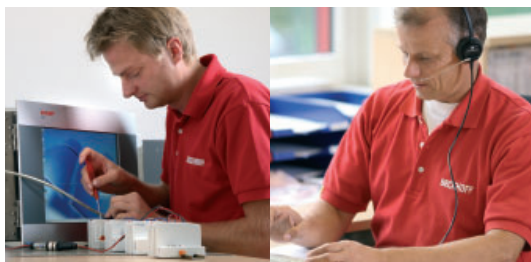
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Beckhoff offers you comprehensive technical assistance, helping you not only with the application of individual Beckhoff products, but also with wide-ranging services:

- worldwide support
- design, programming and commissioning of complex automation systems
- training program for Beckhoff system components

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### Germany

Beckhoff Automation GmbH  
Eiserstraße 5  
33415 Verl  
Germany

### Support

Hotline: +49 (0) 52 46 / 963-157  
support@beckhoff.com

### Service

Hotline: +49 (0) 52 46 / 963-460  
service@beckhoff.com  
www.beckhoff.com

### Austria

Beckhoff Automation GmbH  
Hauptstraße 4  
6706 Bürs  
Austria  
Phone: +43 (0) 55 52 / 6 88 13 - 0  
support@beckhoff.at  
www.beckhoff.at

### Belgium, Luxembourg

Beckhoff Automation BVBA  
Kempische Steenweg 305 bus 202  
3500 Hasselt  
Belgium  
Phone: +32 (0) 11 / 24 08 00  
info@beckhoff.be  
www.beckhoff.be

### Multiprox N.V.

Lion d'Orweg 12  
P.b. 71  
9300 Aalst  
Belgium  
Phone: +32 (0) 53 / 76 65 66  
info@multiprox.be  
www.multiprox.be

### Bulgaria

Kastiva GmbH  
68-72 Ami Bue Str., 4. Floor  
1612 Sofia  
Bulgaria  
Phone: +3 59 (2) 9 50 44 31  
office@kastiva.com  
www.kastiva.com

### Croatia

Krovel d.o.o.  
Barutanski jarak 114  
10000 Zagreb  
Croatia  
Phone: +3 85 / 16 11 77 20  
beckhoff@krovel.hr  
www.krovel.hr

### Czech Republic, Slovak Republic

Dyger s.r.o.  
Vystaviste 1  
648 59 Brno  
Czech Republic  
Phone: +420 5 / 41 32 10 04  
info@dyger.cz  
www.dyger.cz

### Denmark

Beckhoff Automation ApS  
Naverland 2  
2600 Glostrup  
Denmark  
Phone: +45 43 / 46 76 20  
support@beckhoff.dk  
www.beckhoff.dk

### Finland, Estonia

Beckhoff Automation Oy  
P.O. Box 23  
Kankurinkatu 4-6  
05801 Hyvinkää  
Finland  
Phone: +358 (0) 20 / 7 42 38 00  
support@beckhoff.fi  
www.beckhoff.fi

### France

Beckhoff Automation Sarl  
Immeuble "Le Montréal"  
ZA de Courtaboeuf  
19 bis, avenue du Québec  
91951 Courtaboeuf Cedex  
France  
Phone: +33 (0) 1 69 29 83 70  
support@beckhoff.fr  
www.beckhoff.fr

### Great Britain, Ireland

Hayes Control Systems  
The Boathouse  
Station Road  
Henley-on-Thames  
Oxon RG9 1AZ  
Great Britain  
Phone: +44 14 91 / 41 05 39  
sales@hayescontrols.co.uk  
www.hayescontrols.co.uk

### Greece, Cyprus

L. J. Skourgialos  
Industrial Automation Systems  
241 EL. Venizelou  
176 73 Kallithea/Athens  
Greece  
Phone: +30 / 21 09 51 02 60  
ias@otenet.gr

### Hungary

Controrg Kft.  
Pajta u. 14  
8200 Veszprem  
Hungary  
Phone: +36 / 88 42 40 75  
info@controrg.hu  
www.controrg.hu

### Italy

Beckhoff Automation S.r.l.  
Via E. Majorana, 1  
20054 Nova Milanese (MI)  
Italy  
Phone: +39 03 62 / 36 51 64  
support@beckhoff.it  
www.beckhoff.it

### Lithuania, Latvia, Belarus

Santavilte UAB  
Taikos 149  
52119 Kaunas  
Lithuania  
Phone: +3 70 37 / 35 01 66  
info@santavilte.lt  
www.santavilte.lt

### Netherlands

Industrial Automation Link  
Küppersweg 71  
2031 EB Haarlem  
Netherlands  
Phone: +31 23 / 5 18 51 40  
sales@ial.nl  
www.ial.nl

### Norway

Beckhoff Automation AS  
Træleborgodden 6  
3112 Tønsberg  
Norway  
Phone: +47 33 50 46 93  
support@beckhoff.no  
www.beckhoff.no

### Poland

Beckhoff Automation Sp. z o.o.  
Stara Iwiczna,  
ul. Sloneczna 116A  
05-500 Piaseczno  
Poland  
Phone: +48 22 / 7 57 26 10  
support@beckhoff.pl  
www.beckhoff.pl

### Portugal

Bresimar Automação, S.A.  
Quinta do Simão –  
EN109 – Esgueira  
Apartado 3080  
3801-101 Aveiro  
Portugal  
Phone: +351 234 / 30 33 20  
bresimar@bresimar.pt  
www.bresimar.pt

### Romania

Kreatron Automation S.R.L.  
Str. Octavian Fodor nr. 113, ap. 13  
400434, Cluj-Napoca  
jud. Cluj  
Romania  
Phone: +40 264 / 48 47 08  
office@kreatron.ro  
www.kreatron.ro

### Russia

Beckhoff Automation OOO  
Ul. Bakuninskaya 14, Building 9  
105005 Moscow  
Russia  
Phone: +7 495 / 9 81 64 54  
support@beckhoff.com  
www.beckhoff.ru

### Slovenia

Beckhoff Automatizacija d.o.o.  
Zbiljska cesta 4  
1215 Medvode  
Slovenia  
Phone: +3 86 / 13 61 30 80  
info@beckhoff.si  
www.beckhoff.si

### Spain

Beckhoff Automation S.A.  
Edificio Testa Sant Cugat  
Avda. Alcalde Barnils, 64-68  
08174 Sant Cugat (Barcelona)  
Spain  
Phone: +34 93 / 5 84 49 97  
info@beckhoff.es  
www.beckhoff.es

### Sweden

Beckhoff Automation AB  
Stenåldersgatan 2A  
21376 Malmö  
Sweden  
Phone: +46 (0) 40 / 6 80 81 60  
support@beckhoff.se  
www.beckhoff.se

### Switzerland

Beckhoff Automation AG  
Rheinweg 9  
8200 Schaffhausen  
Switzerland  
Phone: +41 (0) 52 / 6 33 40 40  
info@beckhoff.ch  
www.beckhoff.ch

### Turkey

Beckhoff Otomasyon Ltd. şti.  
Gardenya-3 Plaza No: 18-19  
34758 Ataşehir Istanbul  
Turkey  
Phone: +90 216 580 9830  
info@beckhoff.com.tr  
www.beckhoff.com.tr

## Support, Service worldwide

### USA

Beckhoff Automation LLC  
12150 Nicollet Avenue South  
Burnsville, MN 55337  
USA  
Phone: +1 952 / 890 0000  
support.usa@beckhoff.com  
www.beckhoffautomation.com

### Canada

Beckhoff Automation Canada Ltd.  
130 Research Lane  
Guelph, ON N1G 5G3  
Canada  
Phone: +1 905 / 852 1534  
canada@beckhoff.com

### Mexico

Integra Automation, SA de CV  
Av. Industrias 325-A  
78399 Fracc. Talleres  
San Luis Potosí, S.L.P.  
México  
Phone: +52 444 / 822 2615 al 17  
mexico@beckhoff.com

### Argentina

eFALCOM  
Alcorta 2411  
CPA B1744HFM  
Moreno / Buenos Aires  
Argentina  
Phone: +54 237 / 463 1151  
info@efalcom.com  
www.efalcom.com

### Brazil

Beckhoff Automação Industrial Ltda.  
Rua Continental, 146 – Jd. do Mar  
São Bernardo do Campo  
São Paulo 09750-060  
Brazil  
Phone: +55 (11) 4126-3232  
support@beckhoff.com.br  
www.beckhoff.com.br

### Chile

Tecmel Chile S.A.  
Padre Orellana 1486  
Santiago  
Chile  
Phone: +562 / 596 2541  
mberrios@tecmelchile.cl  
www.tecmelchile.cl

### Costa Rica, Nicaragua, Honduras, El Salvador, Guatemala, Belize, Panama

TAAC S.A.  
50 Sur Hotel Grano de Oro  
Calle 30, Avenidas 4-6  
San José 10103  
Costa Rica  
Phone: +506 / 2222-6450  
info@taac-sa.com  
www.taac-sa.com

### Uruguay

Comando Ltda.  
Dr. J. de Salterain 1142  
Montevideo 11200  
Uruguay  
Phone: +598 (2) / 400-7923  
comando@comandonet.com  
www.comandonet.com

### Egypt

Industrial Control Systems ICS  
29 Dr. Mohamed El Harouny Street  
Nasr City, Cairo 11371  
Egypt  
Phone: +202 / 2 75 50 31  
info@ics-me.com  
www.ics-me.com

### South Africa

Beckhoff Automation (Pty) Ltd  
Unit 8, Boskruin Business Park,  
Randpark Ridge  
Randburg 2188  
South Africa  
Phone: +27 (0) 11 792 3374  
support@beckhoff.co.za  
www.beckhoff.co.za

### China

Beckhoff Automation (Shanghai)  
Co. Ltd.  
5<sup>th</sup> Floor,  
No. 163 JiangChang San Road  
Shanghai Shibei Industrial Zone  
Shanghai, 200436  
P. R. China  
Phone: +86 21 / 66 31 26 66  
support@beckhoff.com.cn  
www.beckhoff.com.cn

### India

Beckhoff Automation Pvt. Ltd.  
Suite 4, Level 6, Muttha Towers  
Don Bosco Marg  
Pune – 411 006  
India  
Phone: +91 20 / 40 00 48 00  
support@beckhoff.co.in  
www.beckhoff.co.in

### Japan

K.MECS Co., Ltd.  
Yusen Iwamotocho Bldg. 3F  
2-3-3 Iwamotocho, Chiyoda-City,  
Tokyo 101-0032  
Japan  
Phone: +81 3 5825 5333  
info@kmeecs.co.jp  
www.kmeecs.com

### Lebanon, Jordan, Syria

Industrial Technologies (itec) S.A.L.  
1st Floor, Farah Bldg,  
Gouraud street  
Jemmayzeh, Beirut  
Lebanon  
Phone: +9 61 (1) 44 88 26  
info@iteclb.com  
www.iteclb.com

### Singapore, Malaysia, Philippines, Vietnam, Indonesia

TDS Technology (S) Pte Ltd.  
64 Sungei Kadut Loop  
(Hocen Building)  
Singapore 729493  
Singapore  
Phone: +65 / 63 66 16 61  
sales\_sg@tdstech.com  
www.tdstech.com

### Thailand

TDS Technology (Thailand) Co., Ltd.  
50/962 Moo 2  
Bengyeetos Thanyaburi  
Pratumthane  
12130 Bangkok  
Thailand  
Phone: +66 (0) 2569 5511  
sales\_th@tdstech.com  
www.tdstech.com

### T & R Electronic (Thailand) Co., Ltd.

120/62 Moo 8 Bang Sare  
Sattahip  
Chonburi 20250  
Thailand  
Phone: +66 (0) 3873 7487  
trthailand@trelectronic.co.th  
www.trelectronic.co.th

### South Korea

Tri-TEK Corp.  
717 DaeRyung TechnoTown III  
448 KasanDong Kumcheongu  
Seoul 153-803  
Korea  
Phone: +82 2 / 2107-32 42  
tritek@tritek.co.kr  
www.tritek.co.kr

### Taiwan

Ji-DIEN Co., Ltd.  
9F., No. 22, Sec. 1, Zhongshan Rd.  
Xingzhuang City  
Xingzhuang County 242  
Taiwan (R.O.C.)  
Phone: +886 (2) 8522 3237  
jidienn@chgroup.com.tw  
www.chgroup.com.tw

### United Arab Emirates, Oman, Qatar, Bahrain, Kuwait, Saudi Arabia

Beckhoff Automation FZE  
C# 608, Dubai Silicon Oasis  
P.O. Box No. 341007  
Dubai  
United Arab Emirates  
Phone: +971 4 5015480  
support@beckhoff.ae  
www.beckhoff.ae

### Australia

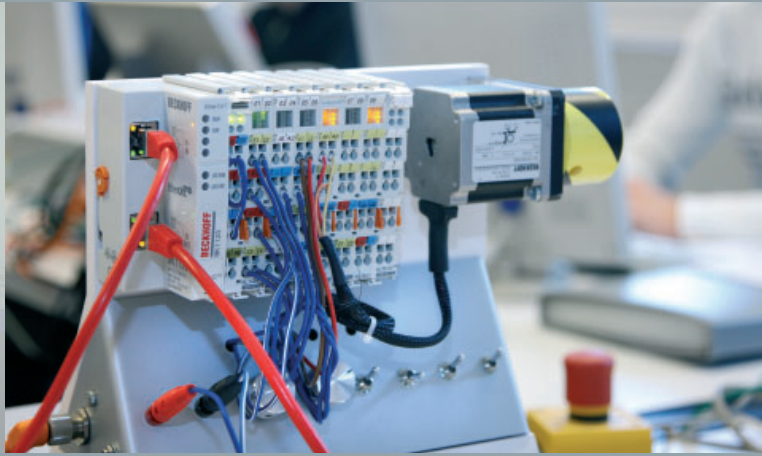
Beckhoff Automation Pty. Ltd.  
Level 16, 10 Queens Road  
Melbourne, Victoria, 3004  
Australia  
Phone: +61 (3) 99 12 54 30  
info@beckhoff.com.au  
www.beckhoff.com.au

### New Zealand

W. Arthur Fisher  
P.O. Box 12747  
Penrose  
Auckland  
New Zealand  
Phone: +64 9 / 2 70 01 00  
waf@waf.co.nz  
www.waf.co.nz

For further addresses  
see page 10

# Training



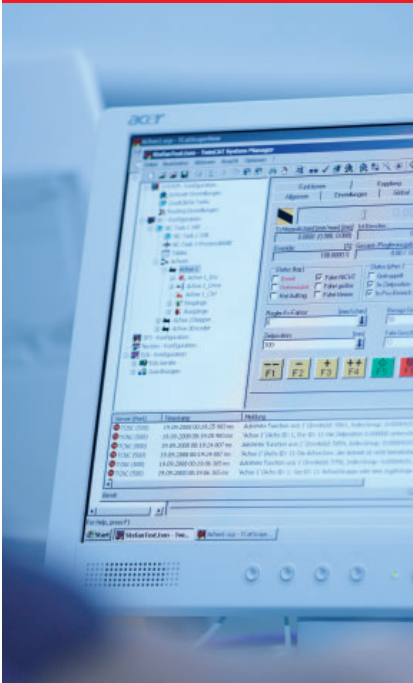
# Training offers

Beckhoff offers a comprehensive training program worldwide for Beckhoff system components. The training takes place at the headquarters in Germany or at the Beckhoff subsidiaries. Please contact the appropriate companies in your country with regard to training with the partner firms around the world. For addresses see page [10](#)

TwinCAT Training		
Basics		
TR1000	TwinCAT Training: Compact programming	1190
TR1020	TwinCAT Training: Programming for those converting from PLCs	1190
TR1010, TR1012	TwinCAT Training: Commissioning, maintenance and service	1191
Individual		
TR1900	TwinCAT Training: Individual	1191
Motion Control		
TR2020	TwinCAT Training: NC Point-to-Point	1191
TR2030	TwinCAT Training: NC Point-to-Point and NC Interpolation	1192
Industrial Ethernet		
TR3090	TwinCAT Training: Small controllers of the BC9xxx and the BX9xxx series	1192
Safety		
TR8010	TwinCAT Training: TwinSAFE	1192
EtherCAT		
TR8020	TwinCAT Training: EtherCAT	1192
Building Automation		
TR5000, TR5002	TwinCAT Training: Building automation for system integrators	1193
TR5010, TR5012	TwinCAT Training: Basic course in building automation for electricians	1193

Embedded PC Training		
TR4000	Embedded PC Training: Introduction for PLC programmers	1194
TR4010, TR4012	Embedded PC Training: Commissioning and maintenance	1194
TR4032	Embedded PC Training: Focus on HMI	1194

EtherCAT Developer Training		
TR8110	EtherCAT technology basics for developers	1195
TR8100, TR8200	EtherCAT workshops for developers	1195



## TwinCAT Training

### TR1000 | Basics: Compact programming

The principal training objectives are IEC 61131-3 programming, addressing of axes from the PLC, and communications options under TwinCAT. The training is aimed at PLC programmers who are transferring to the TwinCAT system but who are familiar with high level language concepts such as declaration of variables, variable classes and structures.

- TwinCAT handling, IEC 61131-3 programming
- TwinCAT NC PTP: basis of axis commissioning
- TwinCAT ADS: communication interface, high-level language communication

- Requirements** | Participants should be familiar with the following:
- sound knowledge of Windows operating systems
  - experience with PLC or high-level language programming

<b>TR1000</b>	<b>Compact programming</b>
<b>Ordering information</b>	duration: 5 days
<b>Further information</b>	<a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>

### TR1020 | Basics: Programming for those converting from PLCs

The focus of this training is IEC 61131-3 programming and the methods of communication under TwinCAT. The training is aimed at PLC programmers who have worked in the past with classical PLC systems and who are now converting to PC controllers and IEC 61131-3 programming.

- The focus is on issues relating to job switching, such as:
- Purpose of variable declarations?
  - Are conventional data blocks replaced?
  - What are the benefits of data block instantiation?
  - benefits of the ST language compared with IL

- Requirements** | Participants should be familiar with the following:
- sound knowledge of Windows operating systems
  - experience of PLC programming

<b>TR1020</b>	<b>Programming for those converting from PLCs</b>
<b>Ordering information</b>	duration: 5 days
<b>Further information</b>	<a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>

## TR1010, TR1012 | Basics: Commissioning, maintenance and service

The focus of this training is the operation and diagnostic possibilities of the TwinCAT system and to a lesser extent PLC programming.

The first block contains information on TwinCAT handling, commissioning and an overview of IEC 61131-3.

The NC part provides information about axis positioning with TwinCAT NC PTP and an introduction to TwinCAT ScopeView for diagnostic purposes.

**TR1012 includes, in addition, an overview of Structured Text programming (1 day).**

**Requirements** | Participants should be familiar with the following:

- sound knowledge of Windows basic functionalities
- handling of PLC systems, such as logging in and out, saving PLC programmes, etc.

<b>TR1010</b>	<b>Commissioning, maintenance and service</b>
Ordering information	duration: 4 days
Further information	<a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>

<b>TR1012</b>	<b>Commissioning, maintenance, service and an overview of Structured Text programming</b>
Ordering information	duration: 5 days
Further information	<a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>

## TR1900 | Individual

The course contents are specified in consultation with the customer. The following target groups are particularly addressed:

- controller programmers who are planning to convert from their former programming system to TwinCAT
- TwinCAT programmers who have completed some projects with TwinCAT and who would like to learn "tips and tricks" for further applications
- "construction" and "service" personnel who would like to specify the procedures for commissioning and the diagnostic facilities when using the TwinCAT system
- "Commissioning", "maintenance" and "service" staff: in this case it would, for example, be possible to train specifically for an existing PLC project. Participation, for some of the time, of a programmer who can provide information about the sequence of events within the machine would be valuable.

<b>TR1900</b>	<b>Individual</b>
Ordering information	duration: by arrangement
Further information	<a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>

## TR2020 | Motion Control: NC Point-to-Point

This training focuses particularly on the topic of TwinCAT NC PTP positioning. The target group consists of users who are familiar with programming with TwinCAT PLC and who now wish to familiarise themselves with the extension to TwinCAT NC.

<b>TR2020</b>	<b>NC Point-to-Point</b>
Ordering information	duration: 2 days
Further information	course contents and requirements see <a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>



## TR2030 | Motion Control: NC Point-to-Point and NC Interpolation

The training focuses on TwinCAT NC PTP positioning and NC interpolation. It is aimed at users who are familiar with TwinCAT PLC programming and want to learn about the TwinCAT NC/NC I extension.

<b>TR2030</b>	<b>NC Point-to-Point and NC Interpolation</b>
<b>Ordering information</b>	duration: 3 days
<b>Further information</b>	course contents and requirements see <a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>

## TR3090 | Industrial Ethernet: Small controllers of the BC9xxx and the BX9xxx series

This course focuses on the small controllers of the BC9xxx and BX9xxx series, Ethernet and associated protocols. It is aimed at users of these small controllers.

<b>TR3090</b>	<b>Small controllers of the BC9xxx and the BX9xxx series</b>
<b>Ordering information</b>	duration: 3 days
<b>Further information</b>	course contents and requirements see <a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>

## TR8010 | Safety: TwinSAFE

The principle training objectives, concerning the knowledge about the integration of the TwinSAFE terminals into the TwinCAT system and use of the TwinSAFE configurator, are the main focus.

<b>TR8010</b>	<b>TwinSAFE</b>
<b>Ordering information</b>	duration: 1 day
<b>Further information</b>	course contents and requirements see <a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>

## TR8020 | EtherCAT

This course focuses on the EtherCAT bus system. It is aimed at programmers wishing to learn about EtherCAT and its application options.

<b>TR8020</b>	<b>EtherCAT</b>
<b>Ordering information</b>	duration: 1 day
<b>Further information</b>	course contents and requirements see <a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>

## TR5000, TR5002 | Building Automation: Building automation for system integrators

The focus of this training is IEC 61131-3 programming and the methods of communication under TwinCAT. The focus is on programming of the Embedded PC system and on DALI, EnOcean and OPC communication. The training is aimed at programmers who wish to switch to TwinCAT and get to know the software and hardware for building automation.

<b>TR5000</b>	<b>Building automation for system integrators</b>
<b>Ordering information</b>	duration: 4 days
<b>Further information</b>	course contents and requirements see <a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>

<b>TR5002</b>	<b>Building automation for system integrators and an overview of Structured Text programming</b>
<b>Ordering information</b>	duration: 5 days
<b>Further information</b>	course contents and requirements see <a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>

## TR5010, TR5012 | Building Automation: Basic course in building automation for electricians

The course focuses on handling and diagnosis of the TwinCAT system and on programming with the FBD (function block diagram) building automation library.

<b>TR5010</b>	<b>Basic course in building automation for electricians</b>
<b>Ordering information</b>	duration: 4 days
<b>Further information</b>	course contents and requirements see <a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>

<b>TR5012</b>	<b>Basic course in building automation for electricians and an overview of Structured Text programming</b>
<b>Ordering information</b>	duration: 5 days
<b>Further information</b>	course contents and requirements see <a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>





## Embedded PC Training

### TR4000 | Introduction for PLC programmers

The focus is on PLC programming of the CX Embedded PC. This course is aimed at PLC programmers wishing to migrate from a hardware PLC to the CX. All basic steps – from first switching on of the CX to the creation of a PLC project – are explained. An overview of further application options for the CX, such as connectivity, TwinCAT NC PTP and HMI, is provided.

<b>TR4000</b>	<b>Introduction for PLC programmers</b>
<b>Ordering information</b>	duration: 5 days
<b>Further information</b>	course contents and requirements see <a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>

### TR4010, TR4012 | Commissioning and maintenance

The course aims are handling and diagnostics of the CX Embedded PC during commissioning and maintenance. An optional additional day is available for further programming information. The course is aimed at commissioning and maintenance personnel.

<b>TR4010</b>	<b>Commissioning and maintenance</b>
<b>Ordering information</b>	duration: 4 days
<b>Further information</b>	course contents and requirements see <a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>

<b>TR4012</b>	<b>Commissioning and maintenance and an overview of Structured Text programming</b>
<b>Ordering information</b>	duration: 5 days
<b>Further information</b>	course contents and requirements see <a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>

### TR4032 | Focus on HMI

This course focuses on HMI with Microsoft Visual Studio.Net on CX controllers with the Windows CE operating system.

<b>TR4032</b>	<b>Focus on HMI</b>
<b>Ordering information</b>	duration: 2 days
<b>Further information</b>	course contents and requirements see <a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>



# EtherCAT Developer Training

## TR8xxx | EtherCAT seminar and workshops for developers

The workshops are aimed at developers of EtherCAT masters (TR8200) or EtherCAT slaves (TR8100). In addition to theoretical content they also include practical exercises. It is assumed that workshop participants have access to an evaluation kit (EL98xx) (slave workshop) or the Master Sample Code (ET9200) (master workshop). Basic EtherCAT knowledge is assumed. The workshops are led by developers and held in manageable groups so that individual interests can be addressed.

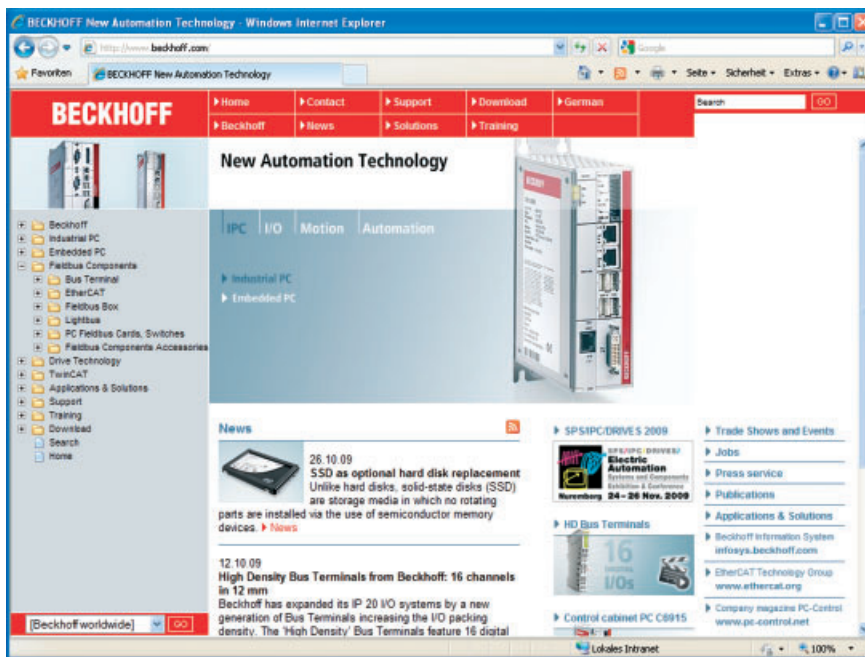
<b>TR8110</b>	<b>EtherCAT technology basics for developers</b>
<b>Ordering information</b>	training location: Verl, Germany duration: 1 day
<b>Further information</b>	course contents and requirements see <a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>
<b>TR8100</b>	<b>EtherCAT evaluation workshop for slave developers</b>
<b>Ordering information</b>	training location: Verl, Germany duration: 1 day
<b>Further information</b>	course contents and requirements see <a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>
<b>TR8200</b>	<b>EtherCAT Master Sample Code workshop for master developers</b>
<b>Ordering information</b>	training location: Verl, Germany duration: 1 day
<b>Further information</b>	course contents and requirements see <a href="http://www.beckhoff.com/training">www.beckhoff.com/training</a>

## The online manual

The Beckhoff Information System contains a wide range of useful information about the Beckhoff products, including not only an overview of the products and relevant documentation, but also technical information, manuals, TwinCAT example codes, a knowledge base and much more.



<http://infosys.beckhoff.com>



[www.beckhoff.com](http://www.beckhoff.com)

## Products online

At [www.beckhoff.com](http://www.beckhoff.com) you can get detailed information on the range of products from Beckhoff. Animations, videos and interactive online presentations supplement the large variety of information.



[www.beckhoff.com/news](http://www.beckhoff.com/news)



## Print media online

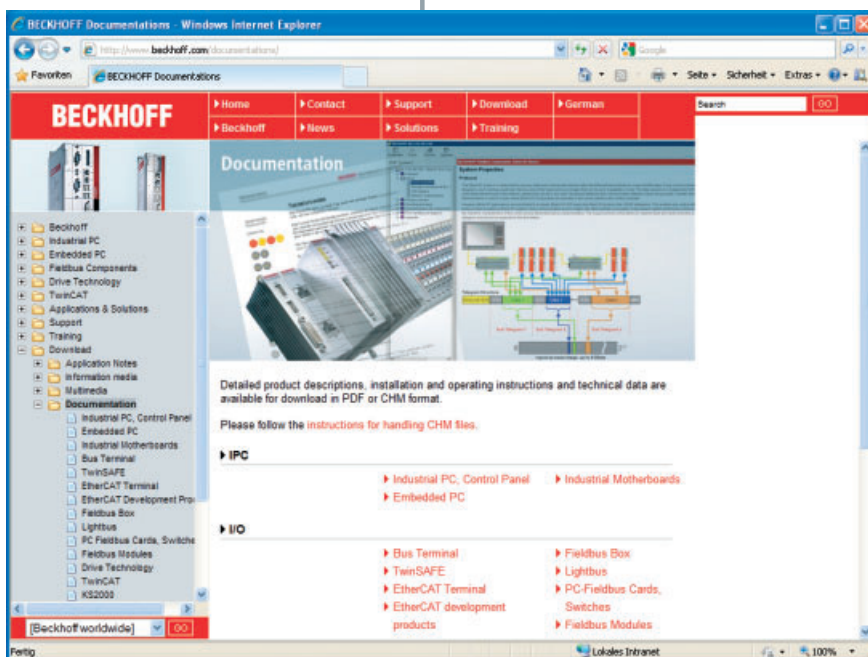
The Beckhoff catalogs and flyers are available for download on the Internet. Printed copies are available on request. Please use our online order form to specify your requirements.

### Beckhoff Newsletter

Beckhoff offers a further information service with the "New Automation Technology Newsletter". Alongside printed and online media, customers and prospective customers can keep up to date quickly and simply via electronic mail. Beckhoff RSS feeds deliver the latest news directly to PCs or Smartphones.



[www.beckhoff.com/newsletter](http://www.beckhoff.com/newsletter)



[www.beckhoff.com/documentations](http://www.beckhoff.com/documentations)

[www.beckhoff.com/TwinCAT](http://www.beckhoff.com/TwinCAT)



### Online documentation

In addition to all the information contained in the printed catalog, the online service offers additional information, available in the universal PDF or in CHM (Compiled HTML) file format: detailed documentation and manuals for the Beckhoff products and software updates, technical drawings and configuration files for the fieldbus components.

The full version of the powerful TwinCAT automation software can be downloaded and tested free of charge for 30 days.

# Information Media | Print



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**Main catalog**



Order no. DK130x

**News catalog**



Order no. DK140x

**Product overview**



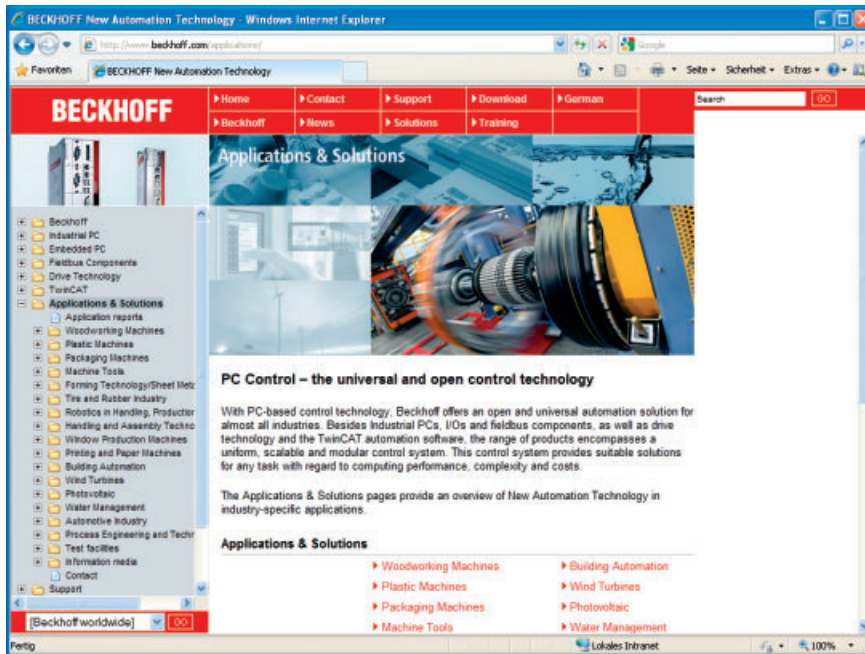
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**Product DVD**

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Ordering information	Description
DK1101	Main catalog, German
DK1102	Main catalog, English
DK1301	News catalog, German
DK1302	News catalog, English
DK1401	Product overview, German
DK1402	Product overview, English
DK1405	Product overview, French
DK1406	Product overview, Italian
DK1407	Product overview, Russian
DK1409	Product overview, Turkish
DK4000	Main catalog and software products on DVD, German, English, Italian

# Information Media | Applications & Solutions



[www.beckhoff.com/applications](http://www.beckhoff.com/applications)

[www.beckhoff.com/media](http://www.beckhoff.com/media)

Ordering information	Description
DK3501	Flyer Building Automation, German
DK3502	Flyer Building Automation, English
DK3511	Flyer Wood Industry, German
DK3512	Flyer Wood Industry, English
DK3531	Flyer Water Treatment, German
DK3532	Flyer Water Treatment, English
DK3541	Flyer Packaging Industry, German
DK3542	Flyer Packaging Industry, English
DK3551	Flyer Tire and Rubber Industry, German
DK3552	Flyer Tire and Rubber Industry, English
DK3561	Flyer Plastic Industry, German
DK3562	Flyer Plastic Industry, English
DK3571	Flyer Wind Turbines, German
DK3572	Flyer Wind Turbines, English
DK3591	Flyer Robotics, German
DK3592	Flyer Robotics, English
DK3631	Flyer Photovoltaic Production, German
DK3632	Flyer Photovoltaic Production, English



# Information Media | PC Control Magazine

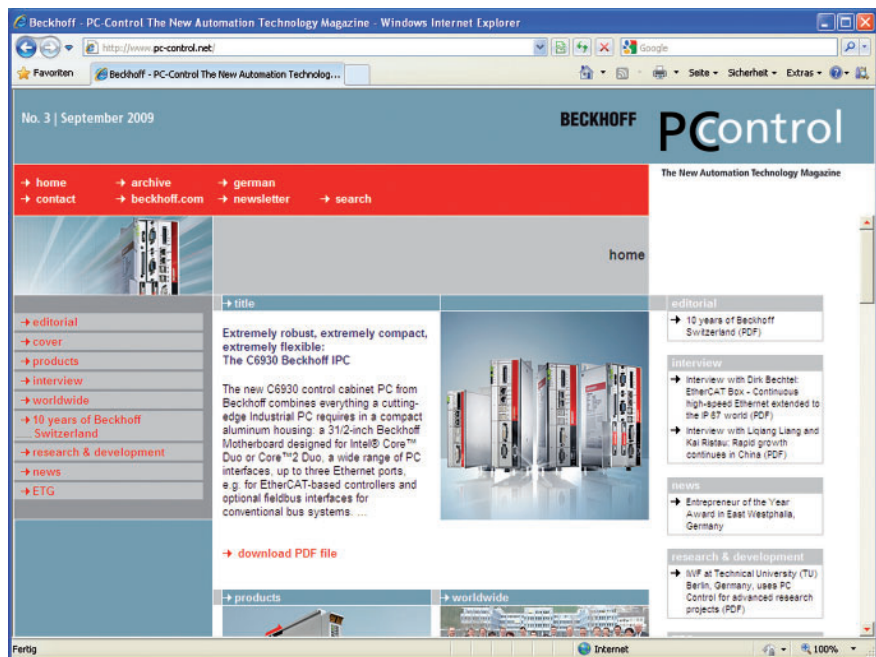


Order no. DK600x

PC Control Magazine

## PC Control “The New Automation Technology Magazine”

A further source of information is PC Control, the Beckhoff company magazine. PC Control is issued four times per year and includes general automation technology reports, particularly from the areas of IPC, I/O, motion and automation, and PC-based control technology. The online version of the Beckhoff company magazine can be found at [www.pc-control.net](http://www.pc-control.net). All contributions are available both in German and in English as web pages or as PDF files. The reports are supplemented with links to background or other additional information. The previous issues of PC Control are available in the archive for online viewing or for downloading.



[www.pc-control.net](http://www.pc-control.net)

Ordering information	Description
DK6001	Company magazine PC Control, German
DK6002	Company magazine PC Control, English