Drive technology PMC

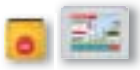
Operation, control and movement of highly dynamic drives

Drive technology from Pilz – Safe, open, complete.

the spirit of safety

Business activities

Excellent Components

Sensor technology	▸ Safe proximity switches ▸ Safe rope pull switches ▸ Safety switches ▸ Safety bolts ▸ Safe hinge switches ▸ Safety gate systems ▸ Safety light beams/curtains/grids ▸ Camera-based protection and measuring systems ▸ Safe camera systems	
Control technology	▸ Relays for electrical safety ▸ Relays for functional safety ▸ Configurable control systems ▸ Compact programmable control systems ▸ Modular programmable control systems ▸ Decentralised periphery	
Networks	▸ Network components ▸ Industrial communication	SafetyNET p
Drive technology	▸ Motion control systems ▸ Servo amplifiers ▸ Motors	
Operator and visualisation systems	▸ Control and signal devices ▸ Operator terminals	
Software	▸ System software and tools ▸ Application software	

Professional Services

Consulting and engineering	▸ Risk Assessment ▸ Safety Concept ▸ Safety Design ▸ System Implementation ▸ Safety Validation ▸ CE Marking ▸ International Compliance Services ▸ Plant Assessment ▸ Inspection of ESPE	
Training	▸ Seminars ▸ Courses	

Support

Technical help round the clock!

Technical support is available from Pilz round the clock. This service is provided free of charge beyond standard business hours.

Americas
- Brazil
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- Mexico
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  +1 877-PILZUSA (745-9872)

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- Korea
  +82 2 2263 9540

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  +32 9 3217575
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  +44 1536 462203
- France
  +33 3 88104000
- Germany
  +49 711 3409-444
- Ireland
  +353 21 4804983
- Italy
  +39 031 789511
- Scandinavia
  +45 74436332
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Pilz – Complete automation

Total customer proximity

Pilz has a tradition as a family-run company stretching back over 60 years. Real proximity to customers is visible in all areas, instilling confidence through individual consultation, total flexibility and reliable service. Worldwide, round the clock, in 24 subsidiaries and branch offices.

Benefit-oriented innovations

Our customer proximity is the basis for our innovative strength. We are always oriented towards current market requirements, which is why we can offer innovative automation solutions in every case. Market leadership in safe automation secures our leadership in research and technology. Customer proximity and innovation belong together and are mutually dependent.

Overall solutions

Pilz is your solution supplier for all automation functions. Including standard control functions. Pilz developments protect man, machine and the environment. Our automation solutions incorporate our knowledge and experience from the stringent demands of safety technology, as well as the sum of our knowledge gained from over 60 years' experience of general automation technology.

All our experience and knowledge go into individual products and sophisticated system solutions.

- Sensor technology
- Control technology
- Networks
- Drive technology
- Operator and visualisation systems
- Software
- Consulting and engineering
- Training

the spirit of safety

With their knowledge, enthusiasm, creativity and courage to take the unconventional route, our staff have made us what we are today: one of the leading brands in automation technology.

More than 1 300 staff, each one of them an ambassador for safety, make sure that your company's most valuable asset – your staff – can work safely and free from injury.

Individual solutions

As market and technology leader, Pilz offers solutions for both safety and standard control technology.

Part of these solutions is Pilz drive technology (PMC). PMC provides overall solutions for automating your machine. From control systems to servo amplifiers, right up to servo motors. At Pilz you can buy everything from one source.

Embedded within the respective system environment, including all safety aspects plus the relevant accessories.

The focus is always on your application. Whether it's individual components or the complete solution: With Pilz drive technology, there are no limits.

Contents

Solution suppliers for safety and standard

As market and technology leader, Pilz supplies excellent components and complete systems for safety and standard control technology.

Are you looking for a flexible solution for your automation functions? Then you've come to the right place!

- **PMCprimo:** Motion control systems for automation, including management of all the movements for a large number of physically separate servo axes.

- **PMCprotego D and PMCtendo DD:** Servo amplifiers as drive controllers for implementing the widest range of motor technologies. They can be used to operate all common types of motor.

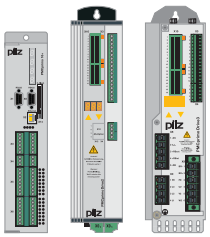
- **PMCprotego S:** Safety card for the safe drive solution, including safe stop functions, safe motion functions and safe brake functions.

- **PMCtendo AC:** Servo motors for every application. Whether the focus is on dimensions, dynamics, controllability, connection types or the feedback system.

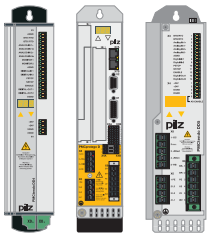
- **PMCtools:** Software to configure, program and monitor your machine.

Your requirements:

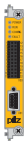
Our solution:



Control systems PMCprimo



Servo amplifiers PMCprotego D and PMCtendo DD

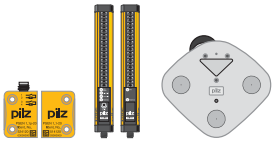


Safe motion with safety card PMCprotego S

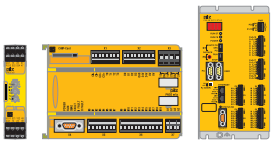
Servo motors PMCtendo AC

Software PMCtools

Supplementary product areas:



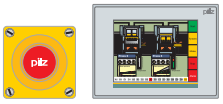
Sensor technology



Control technology

SafetyBUS p®
SafetyNET p®
induraNET p®

Networks



Operator and visualisation systems

Software

Services

Products for safety and standard

Besides the area of drive technology, other product areas also contain first-class components, which you can use individually or combine to form a system.

Sensor technology provides cost efficient personal security and industrial safety. Used in conjunction with Pilz safe control technology, PSEN sensors provide the highest level of cost effectiveness and process safety, for protection of man and machine in compliance with the standards.

Control technology provides compatible components and systems, from the monitoring of electrical safety right through to complete machine control. You can benefit from 60 years of experience in automation technology.

Networks provide compatible communication systems and network components. They can be used to transfer input/output signals and control data reliably and safely.

Operator and visualisation systems provide diagnostic and visualisation devices, plus control and signal devices as part of the Pilz solution. The focus is always on fast, simple configuration. Machine downtimes are clearly reduced thanks to the overall diagnostic concept PVIS.

Software provides system software, tools and application software. Here you'll find the right tool for every task. From product-related software to diagnostic software, through to the PAScal Safety Calculator.

Services are available from Pilz for all phases of the machine lifecycle: from identification of the danger zones through to implementation of safety concepts and holistic solutions. Pilz training courses cover all issues of machinery safety.

Automation system PSS4000 for standard and safety is the ideal system for automation solutions in all industries. Reduce engineering effort and costs, now!

Automation System PSS4000

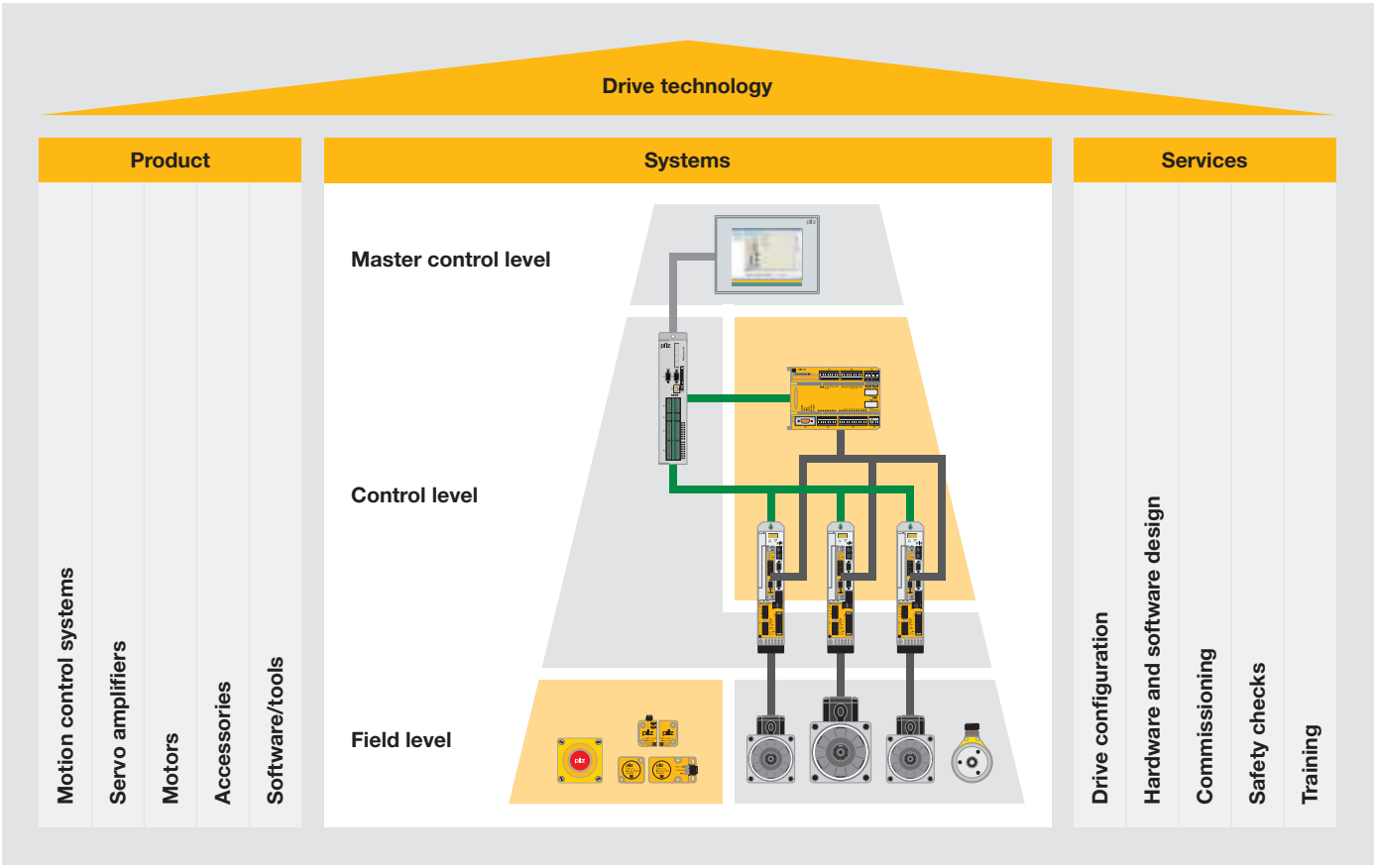
induraNET p®

The whole range of business activities at a glance:

Webcode 0326

Online information at www.pilz.com

Pilz drive technology – Safe, open, complete



Pilz drive technology: sophisticated products, stable systems, professional services.

Pilz drive technology

Part of the Pilz solution is drive technology PMC. PMC offers complete, safe, scalable drive technology as part of the Pilz solution. PMC provides overall solutions for automating your machine.

From control systems to servo amplifiers, right up to servo motors: At Pilz you can buy everything from one source, including all safety aspects and the relevant accessories. The focus is always on your application. Whether it's individual components or the complete solution: With Pilz drive technology, there are no limits.

Competent advice and customer care from the start

Pilz is your competent partner on all matters relating to drive technology. You'll receive individual advice and customer care. Make us part of your team – from planning to implementation. The Pilz range of services extends from risk assessment to drive configuration, hardware and software design through to commissioning. Regular safety checks and a comprehensive range of training measures complete our range.

Minimise downtimes

Thanks to the PVIS diagnostic concept, system messages from the PMC control systems and servo amplifiers can be displayed in plain text. Remedy messages are displayed for each event. PVIS significantly reduces downtimes in the case of a fault. Thanks to pre-defined messages, even project configuration is child's play.

Your benefits at a glance

- For simple through to high end applications
- Solution is always expandable thanks to the modular design
- Fast to commission and simple to service thanks to universal programming in accordance with IEC 61131-3
- Complete automation solution or individual components – depending on your requirement
- Customised solutions incorporating all safety aspects
- Individual advice and customer care

Keep up-to-date on drive technology PMC:

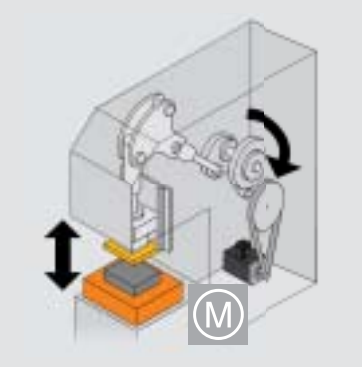
Webcode 2307

Online information at www.pilz.com

Overview of control systems and servo amplifiers

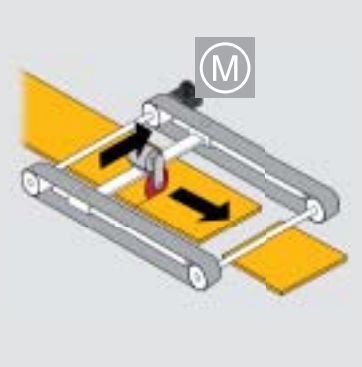
	Control system	Drive-integrated control systems		Servo amplifiers		
	 *PMCprimo 16+*	 *PMCprimo Drive2*	 *PMCprimo Drive3*	 *PMCtendo DD4*	 *PMCtendo DD5*	 *PMCprotego D + DS*
Soft SPS IEC 61131-3	◆	◆	◆			
Motion control	◆	◆	◆			
Servo amplifiers		◆	◆	◆	◆	◆
Safe torque off			◆		◆	◆
Additional safety functions						◆

For a wide range of applications



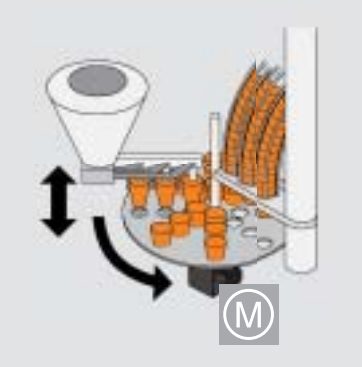
Application example
Servo presses

Presses with servo drive increase the output rate compared with conventional presses and provide maximum flexibility. The Pilz safe motion solution is suitable for implementation of the necessary safety level SIL 3, PL e, Category 4. Functions such as safely limited speed in setup mode, safe direction during the light grids' muting phase and safe control of the holding brakes enable operators to work safely within the danger zone.



Application example
Flying saw

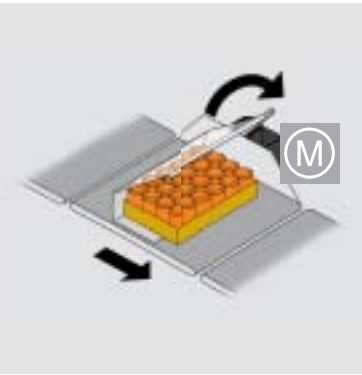
Classic flying saw applications include cutting endless materials such as wood or sheet metal, for example. The flying saw moves synchronously with the material to be cut, so that the machining process does not need to be stopped. Once machining is finished, the cycle is restarted. If you add a safety aspect to this classic motion control function, the flying saw can be set up without risk at safely reduced speed, for example.



Application example
Filling

When filling liquid or paste products, axis movements are precisely co-ordinated. Dosing plungers as well as lifters can be individually modified. Filling is so accurate that no material is spilt. The fill volume can be changed to suit the size of the packaging. Recipes can also be incorporated for different fillings or weights. With Pilz motion control, the challenges of filling operations are like child's play.

The respective risk analysis will determine exactly how the solutions are implemented.



Application example
Wraparound

The wraparound application places high demands on precision and on the synchronicity of axis movements. The position of the product to be wrapped is identified, the relevant film is unwound and the imprint is positioned precisely in the designated place. Plus the film is cut after wrapping. An intelligent motion control system is a prerequisite for synchronising the relevant axes.

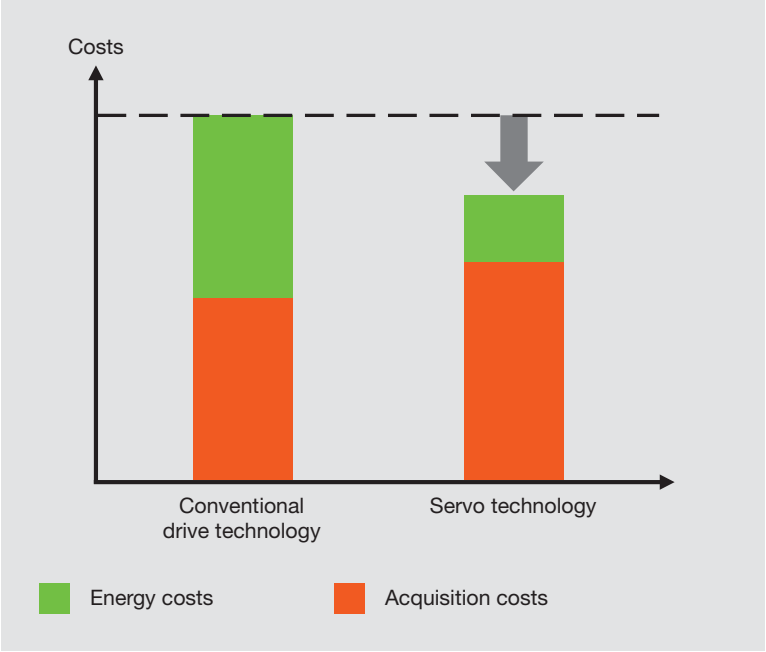
Green light for energy saver

Protect the environment, reduce costs

Over half the energy used in industrial companies is consumed by electrical drives. Energy costs make up a huge proportion of the operating costs, particularly when there's a high number of operating hours. Energy-efficient drive solutions can help to reduce operating costs and CO_2 emissions.

Precision control

Precision-controlled machinery and mechanically-friendly motion sequences in line with process requirements can reduce energy consumption. Using servo technology, format changes or variable cycle counts can be easily implemented within the production process and any irregularities can be compensated.



Optimum drive configuration

A precise drive configuration will mean that the drives are sized correctly. Not only will this reduce acquisition costs, it will also save energy – viewed across the whole of the machine's service life – thanks to optimum axis configuration. Pilz will take care of this for you. Pilz uses a powerful, graphical configuration tool for drive sizing. The fully graphical tool is based on a database containing the characteristic data for drive components such as servo motors, servo amplifiers, gears etc. It is also possible to specify the motion path and simulate the components involved.

Save energy with Pilz drive technology

Pilz drive solutions are tailored exactly to the requirements of your application. With modern control structures, which are suitable for highly dynamic applications, and a high overload capability, the servo amplifiers provide energy-saving solutions. A range of motors with different performance classes offers a wide selection of products, so that the optimum, energy-saving drive solution can be found for each application.

PMCtools – Professional tools

Motion control made simple

Professional tasks require professional tools. Use our comprehensive software to configure, program and monitor your machine.

Universal programming in accordance with IEC 61131-3 guides you through an application, from planning to production. All the key components for commissioning an automation system are integrated. From the rapid generation of motion curves through to simple drive parameterisation. Nothing presents a problem thanks to the integrated commissioning tools.

Programming environment under IEC 61131-3

The basis for the entire programming is a soft PLC under IEC 61131-3. Individual programming requirements are considered thanks to the six editors. The system is compatible on both Pilz control platforms PMCprimo 16+ and PMCprimo Drive. External devices are easy to integrate via various bus systems thanks to the resource manager.

Function libraries

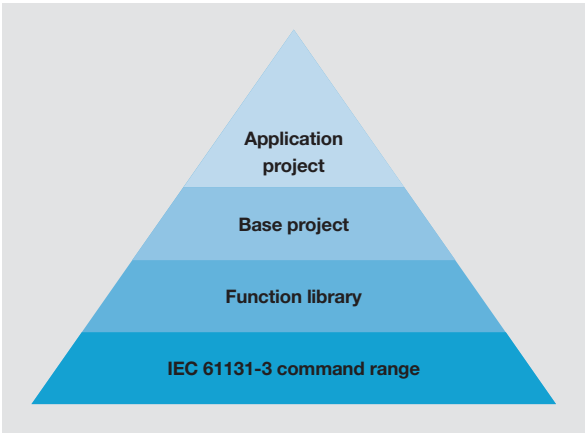
A large number of standard libraries provide all common PLC and motion control functions. The function libraries for curve and drive parameterisation are a particular feature. They form the interface to the graphical auxiliary programs and act as a memory cell for the calculated data.

Software with integrated motion control functions (base project)

The base project's ready-made program structures simplify the implementation of the application considerably, as the motion part is pre-programmed and fully functional. All that's left is to adapt the specific parameters and program the calls for the various operating states.

Parameterisation instead of programming (application project)

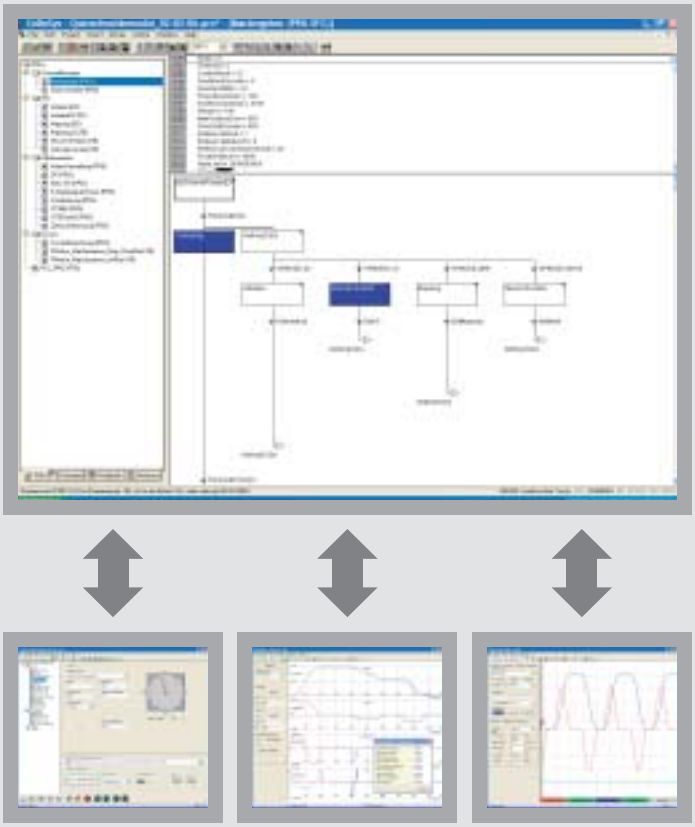
Ready-made application projects can be employed if common functions such as cross cutting, flying saw, synchronisation or similar are used on your machine, whether individually or in combination. You can dispense with time-consuming programming; all you need to do is adapt the application-specific parameters on the operator terminal.



PMC software

Software PMC

Type	Application	Order number
Motion control tools	Configuration software for motion control devices	1 802 959
CoDeSys Target	Software to enable CoDeSys functionality, incl. motion control tools	8175 974
PASconfig SDrive	Parameter software for safety cards PMCprotego S (Safe Motion)	850 035



PDrive *PMotion* *PScope*

Your benefits at a glance

- Parameterisation instead of programming thanks to base projects/application projects
- Safe handling of all automation data and programs, as everything is combined in one project
- Save time thanks to simple operation and ready-made function blocks
- Your drives can be commissioned quickly and easily thanks to graphic tools and a storage oscilloscope
- From planning to production: Everything in one project file thanks to universal programming in accordance with IEC 61131-3

Setting parameters for the servo amplifier with PDrive

No specialist knowledge is required to set the parameters for all the motor and servo amplifiers. A complete parameter database is available for all common servo amplifier/motor combinations.

Curve generation with PMotion

Master-slave relationships can be created quickly and easily using the sophisticated plotting program PMotion. It is possible to display the angle assignment, as well as speed, acceleration and shock for the motor and mechanical design.

Graphical diagnostics with PScope

PScope is a powerful diagnostic tool. All relevant analogue and digital processes in the control system and drives are displayed graphically on the PC. So all the necessary information is available at all times, in a clear, compact form.

Parameter software for safe motion

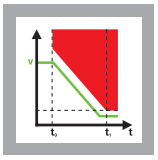
Thanks to the clear, graphical interface of the PASconfig SDrive tool, parameters for the safety cards PMCprotego S can be set simply and quickly (further information on safe motion from page 12).

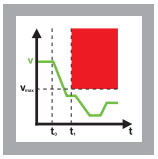
Keep up-to-date on PMC software:

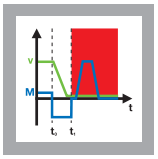
Webcode 3072

Online information at www.pilz.com

Safe motion – Safety cards PMCprotego S







Safe motion – From the safety technology professionals

As a supplier of safe automation, the focus at Pilz is on safety. Our expertise in the area of safety technology is transferred to drive technology. The combination of the safety card PMCprotego S and the servo amplifier PMCprotego D produces the safe drive solution – safe motion.

Protection of man and machine

Safe motion describes the implementation of safety functions for one or more drive axes. This is necessary to prevent uncontrollable movements. At the same time it guarantees the safety of personnel during operation, setup, format change or maintenance.

Open for individual requirements

The PMCprotego DS provides safe inputs and outputs to activate the safety functions. It also provides a variety of encoder interfaces plus a connection to all common bus systems.

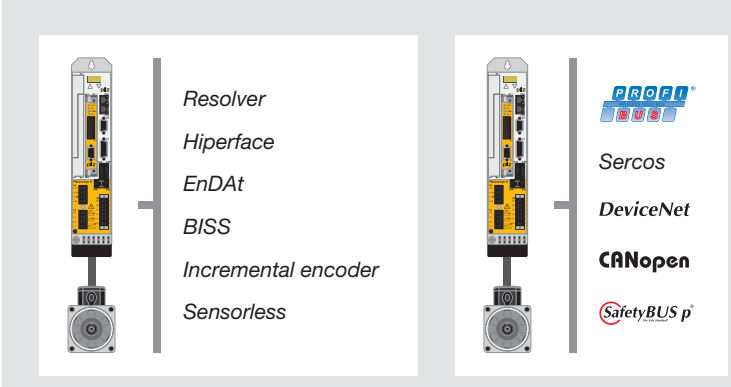
Economical operation

Safe motion opens up new possibilities for co-operation between man and machine. For example, it's possible to set up machinery at safely reduced speed. This reduces the setup time and increases the availability of the process.

Complete one-stop automation solution

With the safety card PMCprotego S, the automation solution from Pilz is complete. You benefit from a complete one-stop solution. Compatible products and tools reduce the work involved in training and documentation. Optimum integration of the safety card PMCprotego S brings significant cost savings.

Safety card PMCprotego S	+	Servo amplifier PMCprotego D	=	Safe motion PMCprotego DS



Openness thanks to a variety of encoder interfaces and bus systems.

Safety with a standard encoder

Safety on the servo amplifier PMCprotego DS is based on the evaluation of internal system variables. The servo motor's feedback system is all that's needed for implementation. A second encoder is not required in order to achieve SIL 2 (3), PL d (e), Category 3 (4), which reduces the overall costs.

Safe networking

Very soon it will be possible to connect the PMCprotego DS and control system using the real-time Ethernet SafetyNET p as the safe drive bus, and safe, sophisticated multi-axis applications will be the result.

Simple diagnostics

Thanks to the PVIS diagnostic concept, system messages from the safe servo amplifiers PMCprotego DS can be displayed in plain text. Remedy messages are displayed for each event. PVIS significantly reduces downtimes in the case of a fault. Thanks to pre-defined messages, even project configuration is child's play.

Reduced reaction times

The new servo amplifiers PMCprotego DS have integrated safety functions, opening up new possibilities for safe drive solutions. Motion is monitored precisely where it arises. This means that reaction times are reduced considerably. This is very significant for safety, particularly with highly dynamic drives. Costs are reduced at the same time, as there are fewer external safety components.

Your benefits at a glance

- Highly dynamic, short reaction times
- Safety is independent of the encoder system
- Simple, fast commissioning
- Easy-to-use software tool
- Devices are easy to exchange thanks to the MMC memory card (standard and safety configuration)
- Integrated PVIS diagnostics
- Reduced wiring
- Greater functionality and convenience, as internal system variables can be used
- Safety level simply requires a standard feedback system

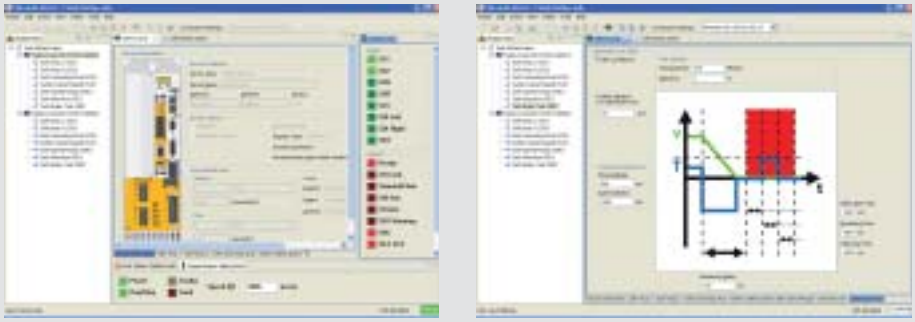
Keep up-to-date on the servo amplifier PMCprotego DS:

Webcode 2591

Online information at www.pilz.com

Centralised view of decentralised safety – One tool covers every axis

The parameters for several safety cards are set centrally via a software tool. The cards that are used are displayed in a tree structure. Thanks to the clear graphical interface, parameters can be set simply and quickly. The current status of the safety card can be displayed online. This means that the operating status, error stack and other data can be monitored continuously.



Clear user interface for simple parameter setting.

Drive-integrated safety

Stop functions

Safe motion functions

Safe brake functions

According to the Machinery Directive, the risks caused by the drive need to be considered when drive functions are designed, as well as the operating functions. IEC 61800-5-2 forms the basis. All the safety functions available on the PMCprotego DS meet the safety requirements stipulated by this standard.

Servo amplifiers PMCprotego D are also designed for SIL 3 of EN/IEC 62061, PL e of EN ISO 13849-1 and Category 4 of EN 954-1.

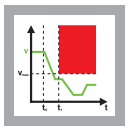
All the safety functions and standards' classifications are on the "Safe drive technology" poster:

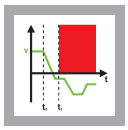
Webcode 4399

Online information at www.pilz.com

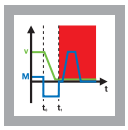
Risk | **Measures**

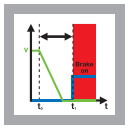
Setup



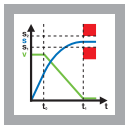


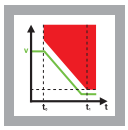
Suspended loads/vertical axes



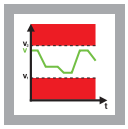


Intervention in the process





Additional possible measures for risk reduction

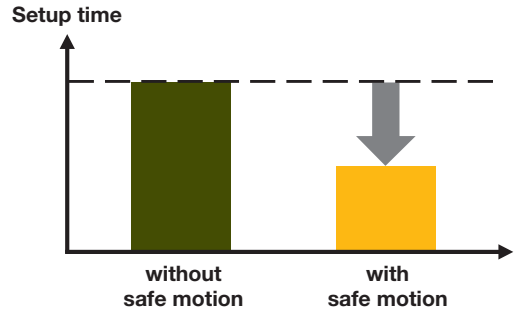


Safe speed range (SSR)
The "safe speed range" function adds minimum speed monitoring to the SLS function. In other words, the maximum speed must not exceed a certain value, and the minimum speed must not drop below a certain value. If either of these limits is violated, the drive is shut down.

Benefits

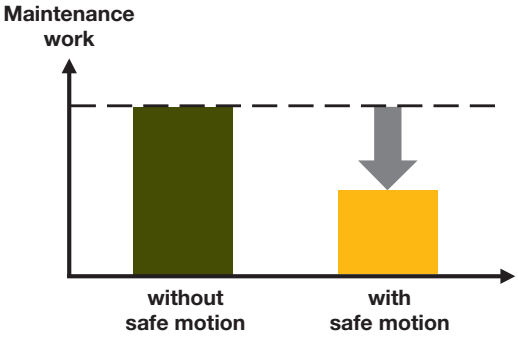
Safely limited speed (SLS)
The “safely limited speed” function monitors the drive to check that a defined maximum speed is not exceeded. If the speed limit value is exceeded, the drive is shut down safely.

Safe direction (SDI)
The “safe direction” function guarantees that a drive can only move in one (defined) direction. If the specified direction is violated, the drive is shut down safely.



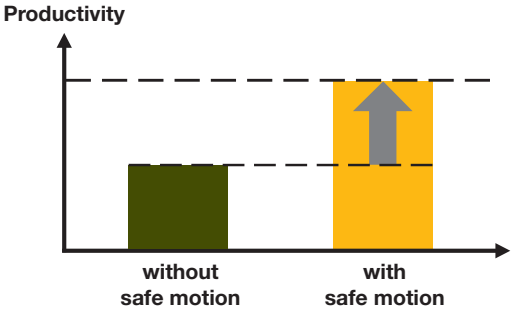
Safe brake test (SBT)
The “safe brake test” function checks the function of the brake. This test can be used to identify any faults in the brake’s control and mechanics. The brake test may be carried out in each production cycle or only every 24 hours, depending on the specific application and the requirement from the risk analysis.

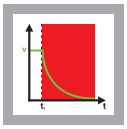
Safe brake control (SBC)
The “safe brake control” function enables brakes to be controlled safely, thereby preventing suspended loads from falling.



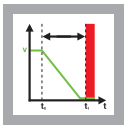
Safe operating stop (SOS)
The “safe operating stop” function monitors the stop position reached by the axis and prevents any deviation from the position window. The drive’s control functions are maintained in full. If the position strays outside of the monitored window, the drive is shut down safely.

Safe stop 2 (SS2)
With a “safe stop 2” function, the drive is brought to a controlled stop and then a “safe operating stop” is initiated. In a “safe operating stop”, the drive‘s control functions are maintained in full.





Safe torque off (STO)
With the “safe torque off” function, the power to the motor is safely removed directly within the servo amplifier. The drive cannot generate any hazardous movements. If the STO is activated when the drive is moving, the motor will run down in an uncontrolled manner.



Safe stop 1 (SS1)
With a “safe stop 1” function, the drive is brought to a controlled stop and then the power to the motor is safely removed. Once at standstill the drive cannot generate any hazardous movements.

Technical details – PMCprotego S

Safety cards PMCprotego S

Common features

Electrical data
- External supply voltage U_B: 24 VDC
- Power consumption (with no load): ca. 3 W

Reaction times (maximum)
- Input recognition time: 1 ms
- Output response time: 1 ms

Inputs
- Galvanic isolation: Yes
- Signal level “0”. -3 … 5 V
- Signal level “1”. 15 … 30 V
- Inputs: LOW active

Outputs, single-pole
- Typical output current at 24 VDC: 0.5 A
- Galvanic isolation: Yes
- Electronic short circuit protection: Yes
- Signal level at “0”. 0 VDC
- Signal level at “1”. 24 VDC

Environmental data
- Protection type: IP20
- Ambient temperature: 0 … 40 °C
- Storage temperature: -25 … +55 °C

Mechanical data
- Dimensions in mm (H x W x D): 142 x 103 x 18.5
- Installation: in PMCprotego D, Slot 3
- Weight: 150 g

PMCprotego S

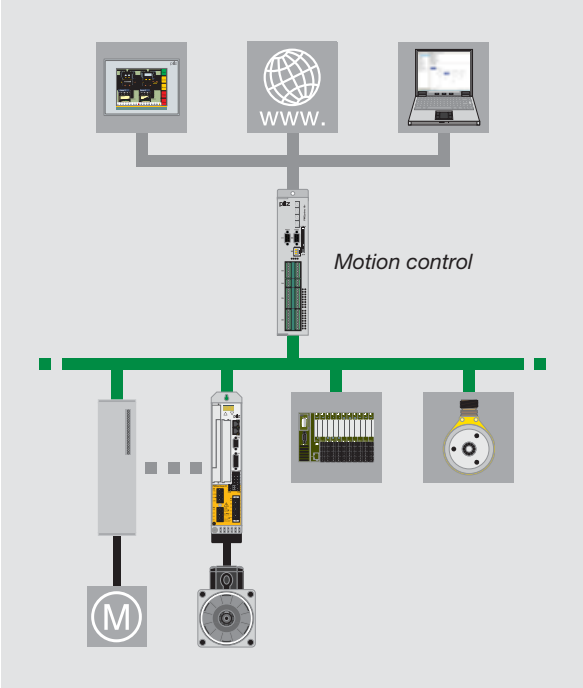
Type
Reaction times
Inputs/outputs, single-pole
Output, dual-pole
Output to control an external brake (dual-pole)
Brake
Encoder input
Standards
Safety functions
Order number

We reserve the right to change technical details

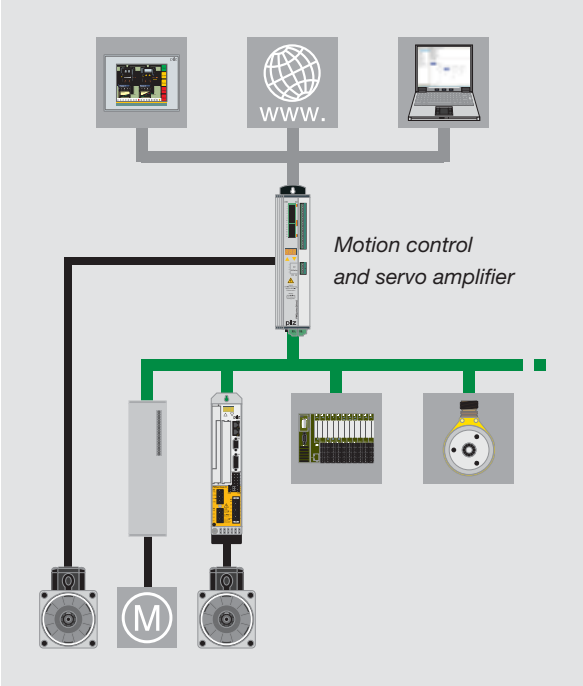
	Unit	PMCprotego S1	PMCprotego S2
Error reaction time	ms	1	2
Response time of the safety functions	ms	2	3
Number of single-pole inputs		9	8
Number of single-pole outputs		7	5
Number of dual-pole outputs		1	-
Typical output current at 24 VDC	A	2	-
Galvanic isolation		Yes	-
Electronic short circuit protection		Yes	-
Signal level at “0”	VDC	0	-
Signal level at “1”	VDC	24	-
Number		1	-
Max. output current at 24 VDC	A	2	-
Electronic short circuit protection		Yes	-
Control external brake < 2 A		via PMCprotego S1	-
Control external brake > 2 A		via external brake module	-
Encoder type		SSI and incremental encoder	-
Number of encoders required for safe solution		1 [1)]	-
Supply voltage for encoder		External	-
		Cat. 4 of EN 954-1 SIL 3 of EN/IEC 62061 PL e of EN ISO 13849-1	Cat. 3 of EN 954-1 SIL 2 of EN/IEC 62061 PL d of EN ISO 13849-1
Safe torque off (STO)		◆	◆
Safe stop 1 (SS1)		◆	◆
Safe stop 2 (SS2)		◆	◆
Safe operating stop (SOS)		◆	◆
Safely-limited speed (SLS)		◆	◆
Safe speed range (SSR)		◆	◆
Safe direction (SDI)		◆	◆
Safe brake control (SBC)		◆	
Safe brake test (SBT)		◆	
		680 000	680 002

[1)] The Pilz solution is safe with just one encoder. If the risk analysis requires a second encoder, a second, external encoder can be connected.

Motion control – Control systems PMCprimo



Open, controller-based control system PMCprimo 16+



Drive-integrated control system PMCprimo Drive

Control systems PMCprimo 16+ and PMCprimo Drive are used for all types of motion and control functions. They consist of PLC and motion technology. They perform the automation within a plant, including management of all the movements for a large number of physically separate servo axes.
Universal programming to IEC 61131-3 within one project, covering standard PLC to motion control functionality, provides the basis for simple, quick implementation of each task.

From simple to high end applications

With Pilz motion control, all your plant's functions are compatible with each other. This allows production processes to run smoothly with fewer failures, providing more economical production. Take advantage of the wide range of functions:

- IEC 61131-3
- (Shock-free) positioning
- Virtual main shaft
- Electrical gear
- Cam mechanism
- Integral "flexible cam"
- Register control
- Web tension control
- PLC functionality
- Linear and circular interpolation
- Electronic camshaft
- Fast inputs to detect printer's marks

Selection guide – Control systems PMCprimo Controller

Type	Number of axes	Hardware platform
PMCprimo 16+	1 to > 100 [1)]	Controller-based
PMCprimo Drive2	1 to 9	Drive-integrated
PMCprimo Drive3	1 to 9	Drive-integrated

High performance axis control for 1 to > 100 axes

The PMCprimo 16+ is a control system for complex motion and control functions. As a stand-alone system it can be used for applications with up to 20 axes. Networked it can be used for well over 100 axes. PMCprimo 16+ can be used as centralised or distributed intelligence. Thanks to its modularity, there are no limits when designing the system. Thanks to the openness of the PMCprimo 16+, house standards and customised requirements can be considered during planning. So you can be flexible when setting up your automation system.

Drive-integrated axis control for 1 to 9 axes

The control system PMCprimo Drive is used for motion and control functions from 1 to 9 axes. It combines intelligence and drive within one compact unit. Simply add additional servo amplifiers from the second axis onwards. This reduces the space requirement in your control cabinet, plus you have an economical solution for your application. Without having to compromise on performance.

Compatible

The control platforms PMCprimo 16+ and PMCprimo Drive are compatible in terms of performance and design. This means that application programs can be used on both platforms in an identical form.

Your benefits at a glance

- Solution is always expandable thanks to the modular design
- Two hardware platforms, providing the optimum hardware basis for each application
- Combination of PLC and power element (PMCprimo Drive) provides an economical solution
- Open for house standards and customer requirements thanks to a wide range of interfaces
- Fast to commission and simple to service thanks to universal programming in accordance with IEC 61131-3
- Suitable for simple to complex applications

Openness	Size	Safe torque off	Interfaces	
			Ethernet	Bus systems
▸ Possible to use third party drives ▸ CAN-based drives ▸ Frequency converter ▸ DC drives ▸ Special drives	Standard	-	◆	Modbus, PROFIBUS-DP Small, PROFIBUS-DP Master, PROFIBUS-DP Slave, Interbus, DeviceNet, Modbus Plus, CANopen [2]
▸ CAN-based drives ▸ Frequency converter ▸ DC drives ▸ Special drives	Standard	External	◆ (optional via expansion cards)	Modbus, PROFIBUS-DP Small, CANopen
▸ CAN-based drives ▸ Frequency converter ▸ DC drives ▸ Special drives	Compact	Integrated	◆ (optional via expansion cards)	Modbus, PROFIBUS-DP Small, CANopen

[1] Networking of several control systems PMCprimo 16+
[2] Additional bus systems on request

Keep up-to-date on control systems PMCprimo:

Webcode 2314

Online information at www.pilz.com

Technical details – PMCprimo 16+

Controller-based motion control systems PMCprimo 16+

PMCprimo 16+

Technical details

- 20 axes available
  - 18 real axes (+/-10 V)
  - and 2 virtual axes
- Each axis can be operated virtually
- 3 master encoder inputs
- Up to 20 virtual axes
- Modular, ability to network up to 60 PMCprimo 16+
- Cycle time in position control loop 1 ms
- 16 digital inputs and 16 digital outputs
- 2 analogue inputs and 2 analogue outputs
- Up to 16 electrical cams
- 128 KByte variable memory, battery-buffered
- 2 MByte Flash memory for user program
- Programming port RS 232
- 2 x CANopen
- Ethernet up to 100 MBit/s
- Serial interface RS 422 (Modbus)
- 2 x expansion slots for fieldbus systems
- Supply voltage: 24 VDC
- Protection type: IP20
- Mounting position: vertical

Options

- Fieldbuses:
  - PROFIBUS-DP (Master and Slave)
  - PROFIBUS-DP-S Small
  - Interbus-S
  - DeviceNet
  - CANopen (third CANopen)
- Internal cam editor
- Soft PLC IEC 61131-3
- CompactFlash, up to 1 GByte, plug-in

Order references

	0	1
None		
PROFIBUS-DP-S Small [1)]		

We reserve the right to change technical details

Designation		Unit	Performance data
Nominal data			
CPU supply voltage		VDC	24
I/O supply voltage		VDC	24
Rotary encoder supply voltage		VDC	5 … 24 (external feed)
CAN supply voltage			Internal
Power dissipation		W	Max. 16
Environmental conditions			
Ventilation			Natural convection
Ambient temperature		°C	0 … +45
Rel. humidity during operation		%	0 … 95, non-condensing
Storage temperature		°C	-25 … +70, max. 20 K/hour variation
Storage humidity		%	Max. 95 rel. humidity, non-condensing
Pollution degree			2 in accordance with VDE 0100
Overvoltage category			II
Max. installation height		m above sea level	3000
Mechanics			
Dimensions (excl. connector)	Height	mm	317
	Width	mm	64
	Depth	mm	185

Further technical details in the installation manual

Always state when ordering	Type	Mains voltage
Order number	PMCprimo 16+. 00/_ /_ /_ /_	24 VDC

Slot 1 Expansion cards

	0	1	2	3	4	5	6
None	■						
CAN-2		■					
DeviceNet			■				
Interbus-S				■			
Modbus Plus					■		
PROFIBUS-DP-S						■	
PROFIBUS-DP-M							■

Slot 2 Expansion cards

	0	2	3	4	5	6
None	■					
DeviceNet		■				
Interbus-S			■			
Modbus Plus				■		
PROFIBUS-DP-S					■	
PROFIBUS-DP-M						■

	2	3	4	5	6	7
None	■					
Motion		■		■		■
PLC software			■	■	■	■
Interpolation					■	■

[1)] *Modbus has no function when PROFIBUS-DP-IC is activated*

Standard bus systems
Ethernet, 2 x CANopen, Modbus

Standard hardware
CompactFlash slot

Technical details – PMCprimo Drive2

Drive-integrated motion control systems PMCprimo Drive2

PMCprimo Drive2

Technical details

- 10 axes available
- 9 real axes
- Intermediate circuits can be connected in parallel
- 1 master encoder input
- Up to 10 virtual axes
- Cycle time in position control loop 1 ms
- 12 digital inputs and 8 digital outputs
- 2 analogue inputs and 2 analogue outputs
- Up to 8 electrical cams
- 8 KByte variable memory, battery-buffered
- 2 MByte Flash memory for user program
- Programming port RS 232
- CANopen
- Integrated mains filter
- Internal ballast resistance
- Serial interface RS 422 (Modbus)
- Auxiliary voltage: 24 VDC
- Protection type: IP20
- Mounting position: vertical
- CE and UL approval

Options

- Fieldbuses:
  - PROFIBUS-DP Small
  - CANopen (second CANopen)
- Internal cam editor
- Soft PLC in accordance with IEC 61131
- Expansion card with:
  - CANopen interface
  - CompactFlash, up to 1 GByte, plug-in
  - 8 KByte variable memory, battery-buffered
  - Ethernet up to 100 MBit/s

We reserve the right to change technical details

Designation		Unit	Size					
			01	03	06	10	14	20
Nominal data								
Supply voltage (power)		VAC	3 x 208 … 3 x 480 V ±10 %					
Frequency range		Hz	50 … 60					
Residual voltage at I_{rms}		VAC	Supply voltage less 5 V					
Continuous output current		A_{eff}	1.5	3	6	10	14	20
Peak output current (max. 5 s)		A_{eff}	3	6	12	20	28	40
Rated power		kVA	1	2	4	7	10	14
Output stage clock frequency at I_{rms}		kHz	8					
Control loop band width		Hz	> 1 200					
Supply voltage (electronics/with brake)		VDC	24 0 … +15 % (1.3 A/max. 3.3 A)					
Power dissipation at I_{rms}		W	30	40	60	90	160	200
Ballast circuit								
Internal brake resistor:								
Continuous output		W	80		200			
Max. peak output for max. 1 s		kW	8		16			
External brake resistor:								
Max. continuous output		kW	0.4		1.2			
Max. peak output for max. 5 s		kW	16		16			
Environmental conditions								
Ventilation			Forced ventilation through built-in fans					
Ambient temperature		°C	0 … +45 at rated power, +45 … +55 with power derating 2.5 %/K					
Rel. humidity during operation		%	85, non-condensing					
Storage temperature		°C	-25 … +55					
Installation height		m above sea level	Up to 1 000 at rated power, 1 000 … 2 500 with current reduction of around 1.5 %/100 m					
Mechanics								
Weight		kg	4				5	7.5
Dimensions (excl. connector)	Height	mm	325					
	Width	mm	70				100	120
	Depth	mm	265					

Further technical details in the installation manual

Order references

Always state when ordering	Type	Mains voltage
Order number	PMCprimo Drive2. _ _ / _ _ / _	230 … 480 VAC

Current	Size
1.5 A	01
3 A	03
6 A	06
10 A	10
14 A	14
20 A	20

	11	16	21	22	23	24	25	26
None	■							
AS relay		■		■		■		■
Expansion card [1]			■	■			■	■
PROFIBUS-DP-S Small [2]					■	■	■	■

	2	3	4	5	6	7
None	■					
Motion		■		■		■
PLC software			■	■	■	■
Interpolation					■	■

Standard bus systems
CANopen, Modbus

[1] *Expansion card with:*
- *CompactFlash slot*
- *Ethernet*
- *Second CANopen*
- *Real-time clock*
- *Battery-buffered RAM*

[2] *Modbus has no function when PROFIBUS-DP-IC is activated*

Technical details – PMCprimo Drive3

Drive-integrated motion control systems PMCprimo Drive3

PMCprimo Drive3

Technical details

- 10 axes available
- 9 real axes
- Intermediate circuits can be connected in parallel
- 1 master encoder input
- Up to 10 virtual axes
- Cycle time in position control loop 1 ms
- 12 digital inputs and 8 digital outputs
- 2 analogue inputs
- Up to 8 electrical cams
- 8 KByte variable memory, battery-buffered
- 2 MByte Flash memory for user program
- Programming port RS 232
- CANopen
- Start interlock with safety relay up to Category 3 of EN 954-1, SIL 2 of EN IEC 62061, PL d of EN ISO 13849-1
- Integrated mains filter
- Internal ballast resistance
- Serial interface RS 422 (Modbus)
- Auxiliary voltage: 24 VDC
- Protection type: IP20
- Mounting position: vertical
- CE and UL approval

Options

- Fieldbuses:
  - PROFIBUS-DP Small
  - CANopen (second CANopen)
- Internal cam editor
- Soft PLC in accordance with IEC 61131-3
- Expansion card with:
  - CANopen interface
  - CompactFlash, up to 1 GByte, plug-in
  - 8 KByte variable memory, battery-buffered
  - Ethernet up to 100 MBit/s

We reserve the right to change technical details

Designation		Unit	Size					
			03	06	10	01	03	06
Nominal data								
Supply voltage (power)		VAC	1 x 110 … 1 x 230 V ±10 %, 3 x 110 … 3 x 230 V ±10 %			3 x 208 … 3 x 480 V ±10 %		
Frequency range		Hz	50 … 60					
Max. motor voltage		VAC	Supply voltage less 5 V					
Continuous output current (at 3 x 230 V)		A_{eff}	3	6	10	-		
Peak output current (max. 5 s at 3 x 230 V)		A_{eff}	9	15	20	-		
Continuous output current (at 3 x 400 V)		A_{eff}	-			1.5	4	6
Peak output current (max. 5 s at 3 x 400 V)		A_{eff}	-			4.5	7.5	12
Power consumption in S1 mode		kVA	1.1	2.4	4	1.2	2.5	5
Output stage clock frequency at I_{rms}		kHz	8					
Control loop band width		Hz	> 1 200					
Supply voltage (electronics/with brake)		VDC	24 0 … +15 % (1.3 A/max. 2.8 A)					
Power dissipation at I_{rms}		W	35	60	90	40	60	90
Ballast circuit								
Internal brake resistor:								
Continuous output		W	20	50		20	50	
Max. peak output for max. 1 s		kW	3 [1]			7 [2]		
External brake resistor:								
Max. continuous output		kW	0.3	1		0.3	1	
Max. peak output for max. 5 s		kW	3 [1]			7 [2]		
Environmental conditions								
Ventilation			Forced ventilation through built-in fans					
Ambient temperature		°C	0 … +40 at rated power, +40 … +55 with power derating 2.5 %/K					
Rel. humidity during operation		%	85, non-condensing					
Storage temperature		°C	-25 … +55					
Installation height		m above sea level	Up to 1 000 at rated power, 1 000 … 2 500 with current reduction of around 1.5 %/100 m					
Mechanics								
Weight		kg	2.6			2.7		
Dimensions (excl. connector)	Height	mm	279					
	Width	mm	70				100	120
	Depth	mm	171					

Further technical details in the installation manual

[1] *at 230 V*

[2] *at 400 V*

Order references

Always state when ordering	Type	Mains voltage
Order number	PMCprimo Drive3. _ _ /_ _ /_	_ _ _ _ _ VAC

	Current	Size
230 V series	3 A	03
	6 A	06
	10 A	10
480 V series	1.5 A	01
	3 A	03
	6 A	06

	11	21	23	25
None	■			
Expansion card [3]		■		
PROFIBUS-DP-S Small [4]			■	■

	2	3	4	5	6	7
None	■					
Motion		■		■		■
PLC software			■	■	■	■
Interpolation					■	■

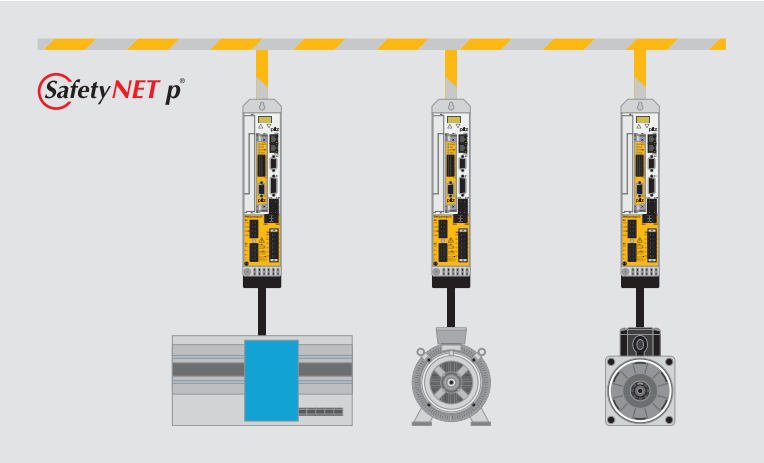
115 … 230 VAC	230 V series
208 … 480 VAC	480 V series

Standard bus systems
CANopen, Modbus

[3] *Expansion card with:*
- *CompactFlash slot*
- *Ethernet*
- *Second CANopen*
- *Real-time clock*
- *Battery-buffered RAM*

[4] *Modbus has no function when PROFIBUS-DP-IC is activated*

Servo amplifiers PMCprotego D and PMCte



Servo amplifiers PMCprotego D and PMCtendo DD can be used with the widest range of motor technologies.

Intelligent servo amplifiers from Pilz are used as drive controllers for the widest range of motor technologies.
You can use it to operate all common types of motor, from servo motors to asynchronous and linear motors. Plus rotary direct drives, linear servo motors and applications with special motors.
Take advantage of the benefits of these servo amplifiers: During design, control, application and operation.

These modern servo amplifiers do much more than drive the motor:

- Positioning (driven via bus or inputs)
- Ability to store up to 200 motion tasks
- Ability to run small motion sequences
- Speed control
- Torque control
- Electric gear function

Universal application

The servo amplifiers PMCprotego D and PMCtendo DD are designed for stand alone operation. Even the basic version provides all the functions necessary to operate a brushless motor in asynchronous or synchronous technology.

More than 20 different feedback systems can be connected directly for operating the widest range of motor technologies.
The servo amplifiers are compatible with a wide range of control systems thanks to the optional bus cards.

Open, enabling the appropriate equipment to be used in almost every application

The option slot on the servo amplifier is used for direct access to all amplifier functions. Expansion cards for almost all relevant fieldbus systems or PLC can simply be plugged in. The intermediate circuit connection with intelligent ballast circuit enables an optimum energy balance.
So frequently there is no need for external ballast circuits, even on critical axes.

Selection guide – Servo amplifiers PMCprotego D and PMC

Type	Rated current	Peak current (5 s)
PMCprotego D	1.5 … 72 A (larger power ratings in development)	4.5 … 140 A (up to max. 3 x rated current)
PMCtendo DD4	1.5 … 70 A	3.0 … 140 A
PMCtendo DD5	3.0 … 10 A 1.5 … 6 A	9.0 … 20 A 4.5 … 12 A

ndo DD

Safe Motion

All servo amplifiers have the safe torque off function, even in their basic configuration. The PMCprotego D is used for additional safety functions.

Further information on Pilz safe motion is available from page 12.

PMCprotego D

The servo amplifiers PMCprotego D are used as drive controllers when the demand is for safety. Applications can be implemented economically thanks to drive-integrated safety. The slot for the safety card is already integrated, so that additional safety functions such as safely reduced speed, safe operational stop or safe standstill can be implemented. Networking with the real-time Ethernet SafetyNET p is in development.

PMCtendo DD

The servo amplifiers PMCtendo DD are available in two sizes. Choose the appropriate product for your application:

- Standard series PMCtendo DD4 – with a large performance range
- Compact series PMCtendo DD5 – with safe torque off

Your benefits at a glance

- Extensive application area for the most diverse functions
- Open hardware and software architecture
- Quick and easy to learn how to use, clear project documentation thanks to user-friendly, understandable user software
- Wide range of drive and status enquiry options makes it easier to incorporate into the machine concept

tendo DD

Power supply	Current cycle time	Size	Safe torque off	Additional safe drive functions	
				External solution	Drive-integrated solution
208 … 480 VAC	62.5 µs (31.25 µs [1])	Standard	◆	◆	◆
208 … 480 VAC	62.5 µs	Standard		◆	
110 … 230 VAC 208 … 480 VAC	31.25 µs	Compact	◆	◆	

[1] *On request*

Keep up-to-date on:

- *SafetyNET p*

Webcode 2541

- *Servo amplifiers PMCprotego D and PMCtendo DD*

Webcode 2584

Online information at www.pilz.com

Technical details – PMCprotego D

Servo amplifiers PMCprotego D

PMCprotego D

Technical details

- Position controller with max. 200 motion tasks
- Universal voltage range
- Intermediate circuits can be connected in parallel
- Auxiliary voltage 20 … 30 VDC
- 1 master encoder input
- 1 rotary encoder output
- CANopen
- Ethernet-based bus communication
- Start interlock with safety relay up to Category 3 of EN 954-1, SIL 2 of EN/IEC 62061, PL d of EN ISO 13849-1, in conjunction with the safety card PMCprotego S1 Category 4 of EN 954-1, SIL 3 of EN/IEC 62061, PL e of EN ISO 13849-1
- Slot for safety card
- Integrated mains filter
- Internal ballast resistance (size 01-24)
- 4 digital inputs and 2 digital outputs
- 2 analogue inputs
- Multimedia card
- Protection type: IP20
- Mounting position: vertical
- CE and UL approval

Options

- D1 I/O expansion card with 14 inputs and 8 outputs
- Fieldbuses:
  - PROFIBUS-DP-S
  - Sercos
  - DeviceNet

Order references

Current	Size
1.5 A	01
3 A	03
6 A	06
12 A	12 [1)]
24 A	24 [1)]
48 A	48
72 A	72

Hardware option			000	100	200	
Slot 1	0	None	■			
	1	I/O expansion		■		
	2	PROFIBUS			■	
	3	Sercos II				
	4	DeviceNet				
Slot 2	0	None	■	■	■	
	1	Pos I/O [2)]				
	2	Pos I/O AO [3)]				
Slot 3	0	None	■	■	■	
	1	Pos I/O [2)]				
	2	Pos I/O AO [3)]				
	A	PMCprotego S1				
	B	PMCprotego S2				

Standard bus systems
CANopen, Ethernet-based bus communication on request

We reserve the right to change technical details

Designation	Unit	01	03	06	12	12P	24	24P	48	72
		Size (other sizes in development)								
Nominal data										
Supply voltage (power)	VAC	3 x 208 … 3 x 480V ±10 %								
Frequency range	Hz	50 … 60								
Max. motor voltage	VAC	Supply voltage less 4 V					Supply voltage less 6 V			
Continuous output current (at 400 VAC)	A_{eff}	1.5	3	6	12		24		48	72
Peak output current (max. 2 s)	A_{eff}	4.5	9	18	24	30	48	78	96	140
Power consumption in S1 mode	kVA	1.1	2.2	4.5	9		18		35	50
Output stage clock frequency at I_{rms}	kHz	8/16 (60 % I_{rms})								
Control loop band width	Hz	> 1 200								
Supply voltage (electronics/with brake)	VDC	24 0 … +15 % (ca. 1 A/max. 3 A)							(ca. 2 A/max. 5 A)	
Power dissipation at I_{rms}	W	40	70	100	160		330		635	1 005
Ballast circuit										
Internal brake resistor:										
Continuous output	W	20	50		100		200		-	
Max. peak output for max. 1 s	kW	15					23		-	
External brake resistor:										
Max. continuous output	kW	0.3	1		1.5		4		6	6
Max. peak output for max. 5 s	kW	4 … 21					6 … 30		16 … 70	16 … 70
Environmental conditions										
Ventilation		Forced ventilation through built-in fans								
Ambient temperature	°C	0 … +40 at rated power, +40 … +55 with power derating 2.5 %/K								
Rel. humidity during operation	%	85, non-condensing								
Storage temperature	°C	-25 … +55								
Installation height	m above sea level	Up to 1 000 at rated power, 1 000 … 2 500 with current reduction of around 1.5 %/100 m								
Mechanics										
Weight	kg	4.4					5.5			
Dimensions (excl. connector) Height	mm	345					348		385	
Width	mm	70					100		190	
Depth	mm	243								

Further technical details in the installation manual

Always state when ordering	Type	Mains voltage
Order number	PMCprotego D . _ _ _ / _ _ _ / 0 / _	208 … 480 VAC

300	400	101	201	301	401	102	202	302	402	10A	20A	30A	40A	10B	20B	30B	40B	001	00A	00B	010	01A	01B	020	02A	02B

Options	Value
I_{peak} = 3x [1]	P

[1] Devices with increased peak output current; see additional type information

[2] Expansion card without analogue outputs

[3] Expansion card with analogue outputs

Technical details – PMCtendo DD4

Servo amplifier PMCtendo DD4

PMCtendo DD4

Technical details

- Position controller with max. 180 motion tasks
- Universal voltage range from 230 … 480 VAC
- Intermediate circuits can be connected in parallel
- Auxiliary voltage 24 VDC
- 1 master encoder input
- 1 rotary encoder output
- CANopen
- Integrated mains filter
- Internal ballast resistance
- 4 digital inputs and 2 digital outputs
- 2 analogue inputs and 2 analogue outputs
- Protection type: IP20
- Mounting position: vertical
- CE and UL approval

Options

- D1 I/O expansion card with 14 inputs and 8 outputs
- DA1 I/O expansion card with 2 analogue outputs, 8 inputs and 8 outputs
- AS restart interlock
- Fieldbuses:
  - PROFIBUS-DP-S
  - Sercos

We reserve the right to change technical details

Designation		Unit	Size							
			01	03	06	10	14	20	40	70
Nominal data										
Supply voltage (power)		VAC	3 x 208 … 3 x 480 V ±10 %							
Frequency range		Hz	50 … 60							
Max. motor voltage		VAC	Supply voltage less 5 V							
Continuous output current (at 400 VAC)		A_{eff}	1.5	3	6	10	14	20	40	70 [1]
Peak output current (max. 2 s)		A_{eff}	3	6	12	20	28	40	80	140 [1]
Power consumption in S1 mode		kVA	1	2	4	7	10	14	30	50
Output stage clock frequency at I_{rms}		kHz	8							
Control loop band width		Hz	> 1200							
Supply voltage (electronics/with brake)		VDC	24 0 … +15 % (1 A/max. 3 A)						(2 A/max. 5 A)	
Power dissipation at I_{rms}		W	30	40	60	90	160	200	400	700
Ballast circuit										
Internal brake resistor:										
Continuous output		W	80		200				-	
Max. peak output for max. 1 s		kW	8		16				-	
External brake resistor:										
Max. continuous output		kW	0.4		1.2				6	
Max. peak output for max. 5 s		kW	16		16				35	50
Environmental conditions										
Ventilation			Forced ventilation through built-in fans							
Ambient temperature		°C	0 … +45 at rated power, +45 … +55 with power derating 2.5 %/K							
Rel. humidity during operation		%	85, non-condensing							
Storage temperature		°C	-25 … +55							
Installation height		m above sea level	Up to 1000 at rated power, 1000 … 2500 with current reduction of around 1.5 %/100 m							
Mechanics										
Weight		kg	4				5	7.5	19.5	21
Dimensions (excl. connector)	Height	mm	325						375/495 [2]	
	Width	mm	70				100	120	250	
	Depth	mm	265						300	

Further technical details in the installation manual

[1] at 480 V

[2] with shielding plate

Order references

Always state when ordering	Type	Mains voltage
Order number	PMCtendo DD4. _ _ / _ _ _	230 … 480 VAC

Current	Size
1.5 A	01
3 A	03
6 A	06
10 A	10
14 A	14
20 A	20
40 A	40
70 A	70

			112	116	117	122	132	162	166	167	172	182
Version of base unit	Standard		■	■	■	■	■					
	AS relay							■	■	■	■	■
Expansion slot	I/O expansion	D1 [3]				■					■	
		D/A [4]					■					■
	Bus interface	Sercos		■					■			
		PROFIBUS-DP			■					■		

Standard bus systems
CANopen

[3] D1: 14 digital inputs, 8 digital outputs

[4] D/A: Analogue outputs, 8 digital inputs, 8 digital outputs

Technical details – PMCtendo DD5

Servo amplifier PMCtendo DD5

PMCtendo DD5

Technical details

- Position controller
  with max. 180 motion tasks
- Universal voltage range
- Intermediate circuits can be
  connected in parallel
- Auxiliary voltage 24 VDC
- 1 master encoder input
- 1 rotary encoder output
- CANopen
- Start interlock with safety relay
  up to Category 3 of EN 954-1,
  SIL 2 of EN IEC 62061,
  PL d of EN ISO 13849-1
- Integrated mains filter
- Internal ballast resistance
- 4 digital inputs
  and 2 digital outputs
- 2 analogue inputs
- Protection type: IP20
- Mounting position: vertical
- CE and UL approval

Options

- D1 I/O expansion card
  with 14 inputs and 8 outputs
- Fieldbuses:
  - PROFIBUS-DP-S
  - Sercos

We reserve the right to change technical details

Designation		Unit	Size					
			03	06	10	01	03	06
Nominal data								
Supply voltage (power)		VAC	1 x 110 … 1 x 230 V ±10 %, 3 x 110 … 3 x 230 V ±10 %			3 x 208 … 3 x 480 V ±10 %		
Frequency range		Hz	50 … 60					
Max. motor voltage		VAC	Supply voltage less 5 V					
Continuous output current (at 3 x 230 V)		A_{eff}	3	6	10	-		
Peak output current (max. 5 s at 3 x 230 V)		A_{eff}	9	15	20	-		
Continuous output current (at 3 x 400 V)		A_{eff}	-			1.5	4	6
Peak output current (max. 5 s at 3 x 400 V)		A_{eff}	-			4.5	7.5	12
Power consumption in S1 mode		kVA	1.1	2.4	4	1.2	2.5	5
Output stage clock frequency at I_{rms}		kHz	8					
Control loop band width		Hz	> 1 200					
Supply voltage (electronics/with brake)		VDC	24 0 … +15 % (ca. 1 A/max. 2.5 A)					
Power dissipation at I_{rms}		W	35	60	90	40	60	90
Ballast circuit								
Internal brake resistor:								
Continuous output		W	20	50		20	50	
Max. peak output for max. 1 s		kW	3 [1]			7 [2]		
External brake resistor:								
Max. continuous output		kW	0.3	1		0.3	1	
Max. peak output for max. 5 s		kW	3 [1]			7 [2]		
Environmental conditions								
Ventilation			Forced ventilation through built-in fans					
Ambient temperature		°C	0 … +40 at rated power, +40 … +55 with power derating 2.5 %/K					
Rel. humidity during operation		%	85, non-condensing					
Storage temperature		°C	-25 … +55					
Installation height		m above sea level	Up to 1 000 at rated power, 1 000 … 2 500 with current reduction of around 1.5 %/100 m					
Mechanics								
Weight		kg	2.6			2.7		
Dimensions (excl. connector)	Height	mm	279					
	Width	mm	70				100	120
	Depth	mm	171					

Further technical details in the installation manual

[1] *at 230 V*
[2] *at 400 V*

Order references

Always state when ordering	Type	Mains voltage
Order number	PMCtendo DD5. _ _ /_ _ _	_ _ _ _ _ VAC

	Current	Size
230 V series	3 A	03
	6 A	06
	10 A	10
480 V series	1.5 A	01
	3 A	03
	6 A	06

			112	117	122
Version of base unit	Standard with AS option				
Expansion slot	I/O expansion	D1 [3]			
	Bus interface	PROFIBUS-DP			

115 … 230 VAC	230 V series
208 … 480 VAC	480 V series

[3] *D1: 14 digital inputs, 8 digital outputs*

Standard bus systems
CANopen

Servo motors PMCtendo AC

The right motor for every application

PMCtendo AC servo motors represent a modern range of servo motor. Here you'll find the right motor for each specific application. Whether the focus is on dimensions, dynamics, controllability, connection types or feedback systems.

Good controllability

The excellent controllability of the PMCtendo AC motors is achieved using the high resolution absolute encoder as a feedback system. Through this you can read out the absolute position of the motors during operation. Even when the machine has been switched off or there is a power failure, the absolute position will still be available.

High dynamics

The PMCtendo AC3 and PMCtendo AC4 series have an extremely low mass moment of rotor inertia at optimised energy density. Extremely fast acceleration can be achieved as a result. That is the basis for increasing the machine speed and subsequently increasing productivity.

More than just motors

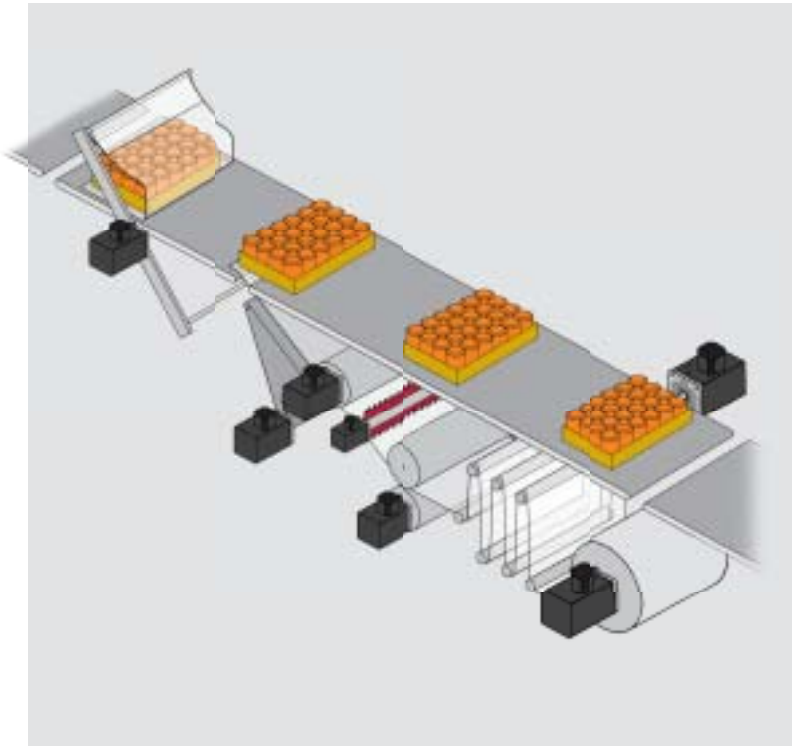
All motors are available with a range of gear units. Special versions, various connector types, ATEX versions etc. are also available.

Support with your motor design

The standard range contains four different series and the widest range of motor sizes. On request we can also supply customised solutions. And of course, Pilz application engineers will provide support with the motor design and definition of the power transmission.

Selection guide – Servo motors PMCtendo AC

Type	Application
PMCtendo AC1	For universal use with large power ratings
PMCtendo AC2	For universal use
PMCtendo AC3	Low moment of inertia, dynamic version
PMCtendo AC4	Compact, highly dynamic version



The appropriate, decentralised drive for every detail

Your benefits at a glance

- High dynamics and torque stability
- Excellent ratio between torque/moment of inertia
- Extremely quiet operation in all speed ranges
- Smooth operation at low speed
- High reliability even in extreme working conditions
- High resolution absolute value encoder for highest performance and absolute positioning
- Support with your motor design

Standstill torque M_0 in Nm	Rated speed n_N in rpm	Flange in mm
24 … 115	1200 … 3000	190/240
0.2 … 28	3000 … 6000	58 … 142
0.6 … 23	3000 … 6000	70 … 142
4 … 10	3000 … 6000	100

Keep up-to-date on servo motors PMCtendo AC:

Webcode 2597

Online information at www.pilz.com

Technical details – PMCtendo AC

Servo motors PMCtendo AC

PMCtendo AC3

General technical details

The performance data in the tables below refers to the following boundary conditions:

- Operating mode: S1
- Current form: sinusoidal
- Cooling: self-cooling IC410 (free convection)
- Ambient temperature: +5 … +40 °C (you must consult technical support if the temperature is outside this range or the installation is encapsulated)
- Installation height: 1 000 m above sea level
- Insulation material class: H, performance measurement, F
- Temperature switch

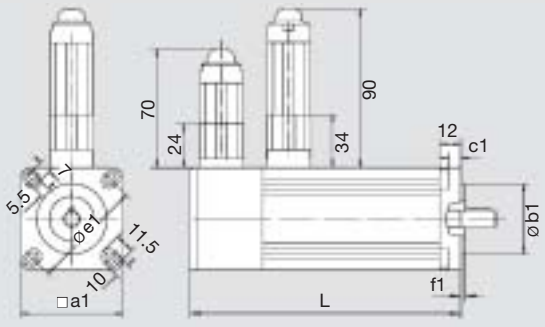
Technical details, Hiperface® encoder system

- Single-turn: resolution of 32 768 steps per revolution
- Multi-turn: resolution of 4 096 revolutions, each with 32 768 steps
- Absolute measuring system
- Programmable position value
- Process data channel in real-time
- Safe data transfer

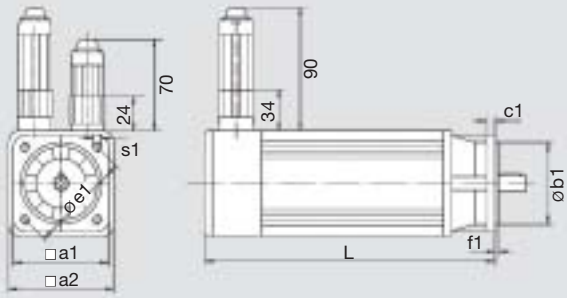
Options

- Holding brake 24 VDC
- Plug for power connection (size 51–AB): In the terminal box, on the housing or on the B-side of the connection cover
- Smooth shaft
- Other feedback systems
- Mounting prepared for external encoders
- 230 V winding (no surcharge)
- Tropical insulation
- External fan

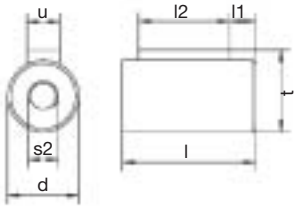
Dimensions *PMCtendo AC2, size: 2X*

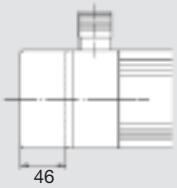


PMCtendo AC3, size: 3X



Shaft dimensions General





PMCtendo AC3, size: 3X, with Hiperface rotary encoder (additional length)

We reserve the right to change technical details

Dimension list PMCtendo AC1–AC3

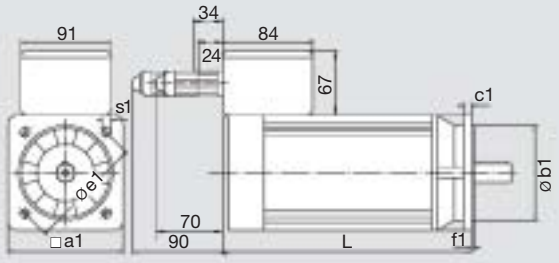
Size	□a1	□a2	b1	c1	d	e1	f1	L	l	l1	l2	s1	s2	t	u
21-25	58	-	40	12	9	63	2.5	See technical details page 38-40	20	2.5	15	5.5	-	10.5	3
31-35	70	77	60	6	11	75	2.5		23	4	14	5.8	M4 x 9	12.5	4
51-55	92	-	80	11	14	100	3		30	5	20	6.6	M5 x 10	16	5
61-65	115	-	95	8	19	115	3		40	5	30	9	M6 x 20	21.5	6
72-77	142	-	130	12	24	165	3.5		50	5	40	12	M8 x 20	27	8
A2-AB	190	-	180	16	32	215	4		58	6.5	45	13	M12 x 20	35	10
B1/2	240	-	230	18	38	265	4		80	8	63	14.5	M12 x 20	41	10
B3/4	240	-	230	18	42	265	4		110	8	63	14.5	M12 x 20	45	10

All the stated data applies to motors with a rated voltage of 400 V

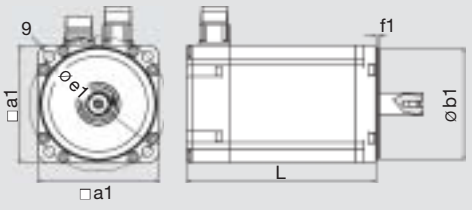
Dimension list PMCtendo AC4

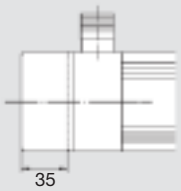
Size	□a1	□a2	b1	c1	d	e1	f1	L	l	l1	l2	s1	s2	t	u
62-65	100	-	95	18	19	115	3	See technical details page 40	40	5	30	9	M6 x 16	21.5	6

PMCtendo AC1–AC3, size: 5X–AB



PMCtendo AC4, size: 6X





PMCtendo AC4, size: 6X, with Hiperface rotary encoder (additional length)

Technical details – PMCtendo AC

For universal use with large power ratings

Performance data. servo motors PMCtendo AC1

Motor size	Length L without/ with brake[1)] mm	Weight without/ with brake kg	Rated speed n_N rpm	Continuous standstill torque M_0 Nm	Rated torque M_N Nm	Peak torque M_{max} Nm	Therm. time constant τ th min	Moment of inertia without/ with brake 10^{-4} kgm²	Torque constant K_T Nm/A	Continuous standstill current (eff.) I_0 A	Peak current (eff.) I_{max} A
A4	301/365	26/32.6	2 000 3 000	24	21.8 20.9	89	55	136/168	2.45 1.63	9.8 14.7	36.3 54.5
A5	326/390	29.8/36.4	2 000 3 000	30	27.3 26.2	99	60	170/202	2.45 1.63	12.2 18.4	40.5 61
A7	376/440	38/44.6	1 200	43	41.2	139	65	238/270	4.08	10.5	34
A9	426/490	46/52.6	1 200	54	50.4	163	70	300/332	4.08	13.2	40
AB	476/540	54/60.6	1 200	66	61.6	199	70	370/402	4.08	16.2	49

[1)] Entry for resolver as feedback Hiperface + 0 mm

B1	293/343	41.5/46.85	1 500 2 000 3 000	40	35.5 32.5 27.5	120	50	65/118	3.26 2.44 1.63	12.3 16.4 24.5	36.8 49.2 73.6
B2	373/423	55/60.35	1 500 2 000 3 000	69	58.5 53.5 48.9	204	65	114/167	3.26 2.44 1.63	21.2 28.2 42.3	62.6 83.6 125.2
B3	433/483	74/79.35	1 500 2 000	94	77.5 72.5	280	80	150/203	3.46 2.44	21.1 38.5	80.9 114.8
B4	493/543	92/97.35	1 500 2 000	115	94 85.5	345	90	192/245	3.13 2.44	36.8 47.1	110.2 141

[1)] Entry for resolver as feedback Hiperface + 28 mm

We reserve the right to change technical details

Performance data. servo motors PMCtendo AC2

For universal use

Motor size	Length L without/ with brake[1)] mm	Weight without/ with brake kg	Rated speed n_N rpm	Continuous standstill torque M_0 Nm	Rated torque M_N Nm	Peak torque M_{max} Nm	Therm. time constant τ th min	Moment of inertia without/ with brake 10^{-4} kgm²	Torque constant K_T Nm/A	Continuous standstill current (eff.) I_0 A	Peak current (eff.) I_{max} A
53	235/263	5.4/6	3000 4000 6000	3.2	2.6 2.3 1.7	10	38	1.84/2.22	1.48 1.11 0.74	2.17 2.89 4.33	6.77 9.02 13.54
54	260/288	6.4/7	3000 4000 6000	4.2	3.4 3 2.3	14	40	2.28/2.66	1.48 1.11 0.74	2.84 3.79 5.69	9.48 12.63 18.95
55	285/312	7.4/8	3000 4000 6000	5.3	4.3 3.8 2.8	18	40	2.72/3.1	1.48 1.11 0.74	3.59 4.78 7.17	12.18 16.24 24.36
62	224/255	7.1/8	3000 4000 6000	4	3.6 3.2 3.2	20	25	6.2/9.8	1.63 1.22 0.82	2.5 3.3 4.9	12.3 16.4 24.4
63	249/280	9/10.1	3000 4000 6000	6	5.4 4.8 4.8	30	30	8.01/11.61	1.63 1.22 0.82	3.7 4.9 7.4	18.5 24.5 36.6
64	274/305	10.1/12	3000 4000 6000	8	7.2 6.4 6.4	40	30	10/13.6	1.63 1.22 0.82	4.9 6.5 9.8	24.5 32.7 48.7
65	299/330	12/13.9	3000 4000 6000	10	9 8 8	50	30	11.9/15.5	1.63 1.22 0.82	6.1 8.2 12.3	30.5 40.9 60.9
72	234/264	12/13.9	3000 4000 6000	8	7 6 6	40	40	12.7/22.2	1.63 1.22 0.82	4.9 6.5 9.8	24.5 32.7 49
73	259/289	14.2/16.1	3000 4000 6000	12	10.5 9 9	60	45	17.4/26.9	1.63 1.22 0.82	7.4 9.8 14.7	36.8 49.1 73.6
74	284/314	16.4/18.3	3000 4000 6000	16	14 12 12	80	45	22.1/31.6	1.63 1.22 0.82	9.8 13.1 19.6	49.1 65.4 98
75	309/339	18.6/20.5	3000 4000 6000	20	17.5 15 15	100	50	26.8/36.3	1.63 1.22 0.82	12.3 16.4 24.5	61.3 81.8 123
76	334/364	20.3/22.7	3000 4000	24	21 19.5	120	50	31.5/41	1.63 1.22	14.7 19.6	73.6 86
77	359/389	23/24.9	3000 4000	28	24.5 21	140	55	36.2/45.7	1.63 1.22	17.2 22.9	85.9 114.5

[1)] Entry for resolver as feedback Hiperface + 0 mm

Technical details – PMCtendo AC

Performance data. servo motors PMCtendo AC3

Motor size	Length L without/ with brake[1)] mm	Weight without/ with brake kg	Rated speed n_N rpm	Continuous standstill torque M_0 Nm	Rated torque M_N Nm	Peak torque M_{max} Nm	Therm. time constant τ th min	Moment of inertia without/ with brake 10^{-4} kgm²	Torque constant K_T Nm/A	Continuous standstill current (eff.) I_0 A	Peak current (eff.) I_{max} A
21	106/130	1/1.25	6000	0.2	0.16	0.7	32	0.07/0.19	0.73	0.28	0.96
22	121/145	1.3/1.55	6000	0.4	0.32	1.4	35	0.13/0.25	0.73	0.55	1.92
23	136/160	1.6/1.85	6000	0.6	0.48	2.1	38	0.18/0.3	0.73	0.83	2.88
24	151/175	1.9/2.15	6000	0.8	0.64	2.8	40	0.23/0.35	0.73	1.1	3.84
31	126/173	1.4/2	3000 4000 6000	0.6	0.55 0.52 0.5	2.1	32	0.42/0.8	1.45 1.09 0.73	0.41 0.55 0.82	1.44 1.92 2.89
32	151/198	2.2/2.8	3000 4000 6000	1.2	1.1 1.06 1	4.2	35	0.77/1.15	1.45 1.09 0.73	0.82 1.1 1.65	2.89 3.85 5.77
33	176/223	3.1/3.7	3000 4000 6000	1.8	1.65 1.6 1.5	6.3	38	1.1/1.48	1.45 1.09 0.73	1.24 1.65 2.47	4.33 5.77 8.66
34	201/248	4/4.6	3000 4000 6000	2.5	2.2 2.1 2	8.75	40	1.42/1.8	1.45 1.09 0.73	1.72 2.29 3.44	6.01 8.02 12.03
35	226/273	4.9/5.5	3000 4000 6000	3	2.75 2.6 2.5	10.5	43	1.74/2.12	1.45 1.09 0.73	2.06 2.75 4.12	7.22 9.62 14.43

Performance data. servo motors PMCtendo AC4

62	160/192	3.9/4.74	3000 4500	4	3 2.4	10	25	1.75/2.82	1.63 1.09	2.5 3.7	6.1 9.2
63	180/212	5.3/6.14	3000 4500	6	4.5 3.6	15	30	2.51/3.58	1.63 1.09	3.7 5.5	9.2 13.8
64	204/236	6.7/7.54	3000 4500	8	6 4.8	20	30	3.29/4.36	1.63 1.09	4.9 7.4	12.3 18.4
65	224/256	8.1/8.94	3000 4500	10	7.5 6	25	35	4.07/5.14	1.63 1.09	6.1 9.2	15.3 23
71	148/183	10/11.5	2000 3000 4500	4.5	4.2 4 3.9	13.8	32	3.62/5.28	2.44 1.63 1.09	1.8 2.8 4.1	5.66 8.47 12.66
72	173/208	11.5/13	2000 3000 4500	9	8.1 7.7 7.3	27.6	35	6.04/7.7	2.44 1.63 1.09	3.7 5.5 8.3	11.3 16.9 25.3
73	198/228	13/14.5	2000 3000 4500	12.5	11.8 11.6 9.5	41.4	38	8.2/9.86	2.44 1.63 1.09	5.1 7.7 11.5	17 25.4 37.9
74	223/253	14.5/16	2000 3000 4500	16	15.1 13.9 12.7	55.2	40	10.7/12.36	2.44 1.63 1.09	6.5 9.8 14.7	22.6 33.9 50.6
75	248/283	16/17.5	2000 3000 4500	20	18.5 17.5 15	69	40	13.1/14.76	2.44 1.63 1.09	8.2 12.3 18.4	28.3 42.3 63.3

[1)] *Entry for resolver as feedback*

Motor size XX: Hiperface + XX mm

21-24: + 20 mm
Single-turn: resolution of 4096 steps per revolution
Multi-turn: resolution of 4096 revolutions, each with 4096 steps

31-35: + 46 mm
62-65: + 35 mm
71-75: + 30 mm

Technical details. holding brake PMCtendo AC1–AC3

Motor size	Braking torque M_B Nm	Rated voltage U_N VDC	Rated current I_N A	Rated power P W
2X	2.1	24	0.34	8.2
3X/5X	3.2	24	0.45	10.8
6X	9.5	24	0.8	19.2
7X	27	24	1.03	24.6
AX	48	24	0.94	22.7
BX	145	24	2.08	50

Technical details. holding brake PMCtendo AC4

Motor size	Braking torque M_B Nm	Rated voltage U_N VDC	Rated current I_N A	Rated power P W
6X	7.5	24	0.75	18
7X	15	24	1	24

We reserve the right to change technical details

Order references

Always state when ordering	Type	Size	Brake	Feedback	Type	Connection	Connection direction	Voltage	Rotational speed
Order number	PMCtendo AC _ .								

Series	
PMCtendo AC1	1
PMCtendo AC2	2
PMCtendo AC3	3
PMCtendo AC4	4

21 … AB	

Without brake[2]	0
With brake	1

Resolver 2-pole[2]	5
Resolver 4-pole	A
Hiperface single-turn	L
Hiperface multi-turn	M

B5, shaft with feather key[2]	1
B5, shaft without feather key	2

1	1 200 min^{-1}
A	1 500 min^{-1}
2	2 000 min^{-1}
3	3 000 min^{-1}
4	4 000 min^{-1}
D	4 500 min^{-1}
6	6 000 min^{-1}

M	230 V
H	400 V[2]

1	To right[3]
2	To left[3]
4	Upwards
5	To B-side[2]
6	To A-side

1	Connector for motor and feedback on housing
2	Terminal box with connector for feedback
6	Angled connector for motor and feedback
7	Angled swivel connector for motor and feedback[2]

[2] *Preferred types*

[3] *Right/left looking towards the shaft extension*

Technical details – Accessories for drive tech

Suitability guaranteed

Pilz offers a wide range of accessories. From gear units to individually customised cable and connection types, through to appropriate feedback systems for the application.

The accessories described here represent just a selection. Individually customised types are available to suit your application. Just contact us!

Accessories

Ballast resistor

Mains filter

Motor throttle

Cable

CAN adapter

Type
Ballast resistor
Mains filter
Motor throttle
Cable
CAN adapter

We reserve the right to change technical details

nology PMC

Application	Technical details
Ballast resistors are used to remove excess energy from the system. Due to the compact design, the various sizes are suitable for wall mounting or for assembly on or in the control cabinet.	Ballast resistors in the range 180 … 1 600 W
Mains filter for advanced environmental protection against mains-bound interference.	Mains voltage: up to 3 x 480 VAC Rated current: 7 … 180 A
The motor throttle is built into the output on the servo amplifier, particularly where there are long cable connections. This increases smoothness, reduces noise and extends the service life of the motor.	Rated voltage: up to 3 x 400 VAC Rated current: n stages up to 3 x 25 A
Power cable, motor feedback cable, programming cable, network cable, rotary encoder cable and other cable	Also available in variable lengths
Networking aid in the amplifier PMCtendo DD and PMCprotego D	-

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