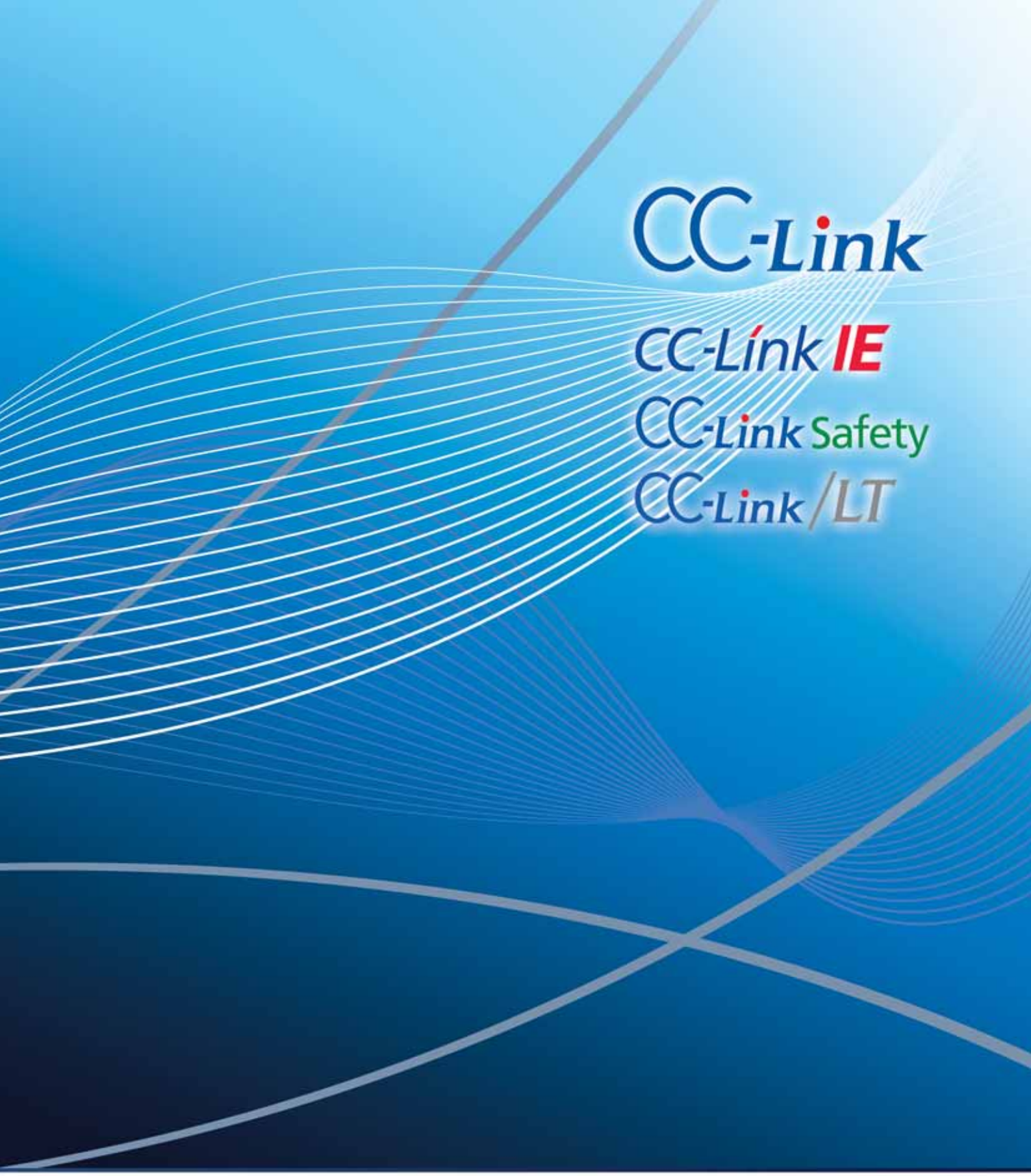


Global and open Field Network

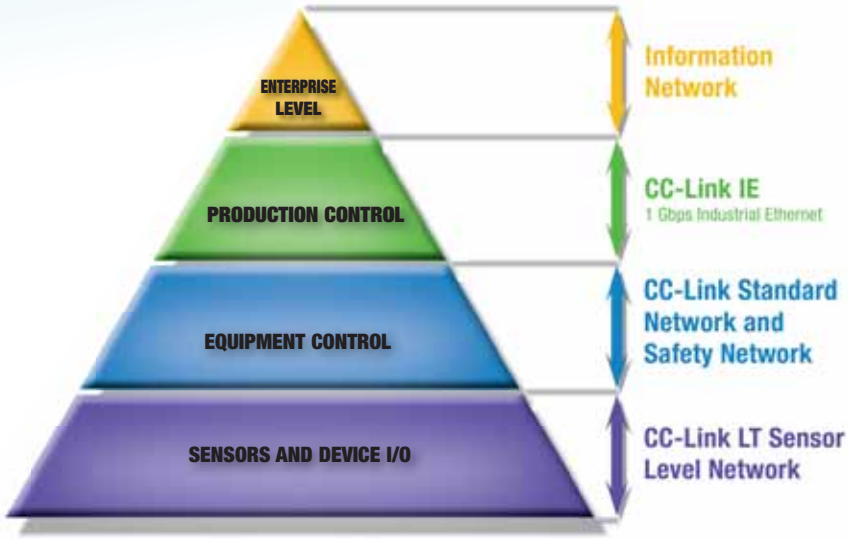
CC-Link CLPA PARTNER ASSOCIATION

www.clpa-europe.com

CC-Link-an integrated family of high speed deterministic automation networks

Welcome to the CC-link Vendor Partner brochure. This document has been designed primarily to provide information and guidance to equipment suppliers who are interested to interface their products with the CC-Link family of Open and Global Networks.

From consulting to the provision of dedicated communication LSIs, CLPA is ready to assist you in speedy development of CC-Link compatible products.



What is CC-Link?

CC-Link (Control & Communication Link) was originally developed by Mitsubishi Electric in Japan, one of the largest automation equipment manufacturers and the world's largest volume producer of PLCs. In the year 2000 CC-Link was released as an "Open" network so that independent automation equipment manufacturers could incorporate CC-Link compatibility into their products. This enabled end-users and OEMs to select the products they needed for their automation systems and be assured that these products could communicate with each other over a single CC-Link cable.

CC-Link is a family of industrial open source networks that process both control and information at high speed, to provide efficient, integrated factory-wide and process automation. It provides high speed, deterministic communication linking a wide range of multi-vendor automation devices over a single cable. CC-Link is ideally suited for machine, cell or process control in industries ranging from semiconductors to food & beverage, automotive to pharmaceuticals, material handling to building automation. It has also been widely adopted for plant control, building automation, and manufacturing sites.

CC-Link IE
The new high performance 1Gbps Industrial Ethernet using fibre optic cable

CC-Link
Standard field device level network with performance up to 10Mbps

CC-Link Safety
Open safety network for use with safety controllers to enable construction of a safety system in conformance with safety standards.

CC-Link/LT
Sensor level network (this is similar to ASi) and is currently available on request in Europe

Why choose CC-Link?

In the world of Industrial Automation, there are three major global suppliers, each of whom also dominates their local markets: Siemens A&D/PNO with Profibus in Europe; Rockwell Automation/ODVA with DeviceNet in the Americas and Mitsubishi Electric/CLPA with CC-Link in Asia. For equipment producers selling into these markets, the dominant supplier is the obvious choice when selecting a network partner. Although CC-Link is the newest of these major globally accepted fieldbus networks, it is already the dominant open network in Asia and is growing strongly in North America and Europe. Many export orientated European manufacturers are now incorporating CC-Link because of its strength in Asia.

There are more than 4 million installed CC-Link nodes and over 850 CC-Link compatible products on the market as of 2006. These products include industrial PCs, PLCs, robots, servos, drives, valve manifolds, digital & analogue I/O modules, temperature controllers, mass flow controllers, bar code & RFID readers, and many others.

Why more customers are choosing CC-Link

CC-Link is a family of fast, powerful, automation networks designed specifically for robustness and flexibility. It is best known for its ease of use, simplicity of system design, fast installation and commissioning, and reliability in operation. Key features for end users include:

- Stand-by-master function: If a fault occurs on the master station, the stand-by will maintain network communications
- Detaching slave function: This automatically removes the faulty slave station and allows communication to continue with all other stations
- Automatic Return function: Allows network devices to be replaced while the network is operating, and automatically returns a disconnected station to the data link when the fault is corrected without the need to close or reset the network

In addition, various global standards organisations recognize CC-Link technology:

- CC-Link has been accepted for inclusion in IEC 61158 Standard for Fieldbus Networks.
- CC-Link has been approved by ISO (International Organization for Standardization) as 15745-5 International Automation Systems and Integration Standard
- CC-Link is a recognised international standard for sensor/actuator networks (SEMI E54.12) by the Semiconductor Equipment Manufacturers Institute
- CC-Link is approved as a China National Standard number GB/Z 19760-2005 Control and Information Communication Field Network CC-Link Standard and GB/T 20099.4-2006 Chinese Building Automation Standard

Getting started

Making your products compatible with CC-Link, the open field network originating from Japan, will not only ensure the level of system flexibility distinctively characteristic of multi-vendor products but also provide you with the opportunity to boost the competitiveness of your products to the global level once and for all.

CC-Link technology is based on the use of an (ASIC) which handles the complete data link layer and transport layer for reliable communications and assures interoperability between devices

What is CLPA?

The CC-Link Partner Association (CLPA) is an organization of manufacturers of CC-Link compatible products and users of CC-Link technology and was formed in 2000. The CLPA oversees and manages the CC-Link specifications and promotes the worldwide adoption of CC-Link technology for network communications in industrial automation.

The CLPA-Europe (CLPA-EU) was created to promote the CC-Link open network to the market place and to support European member companies by providing technical assistance in developing CC-Link compatible products; conducting conformance testing, and to promote these products to the marketplace. Engineers at CLPA-EU are available to assist members' product development teams with the implementation of CC-Link into their products.

The CC-Link Partner Association works with its members to promote their CC-Link compatible products throughout the world via its web sites, products catalogues, at trade fairs and will press activities. CLPA has offices in Germany, UK, North America, Japan, China, South Korea, Taiwan and Singapore.

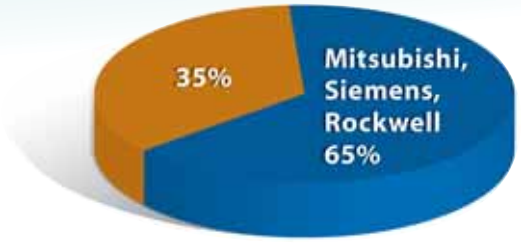
For more about CLPA and the benefits of membership, see page 11

CC-Link - Freedom from doubt

Supplier confidence

CC-Link networks are based on core technology developed by the Mitsubishi Electric Corporation in Japan. According to the latest research from ARC Advisory Group. Mitsubishi Electric is the World's third largest supplier of PLCs, and the dominant supplier in Asia.

Leading Suppliers of PLC Hardware



Both Mitsubishi Electric and CLPA are strongly represented in Europe and globally. In Europe, CC-Link compatible products are available or under development from over twenty European device manufacturers

Availability of Products

The success of an open network is determined by the availability of automation products that support the standard technology. As of April 2007, there were nearly 850 certified CC-Link compatible products available from hundreds of automation equipment manufacturers worldwide. Product listings can be obtained from the CLPA web sites.

Interoperability

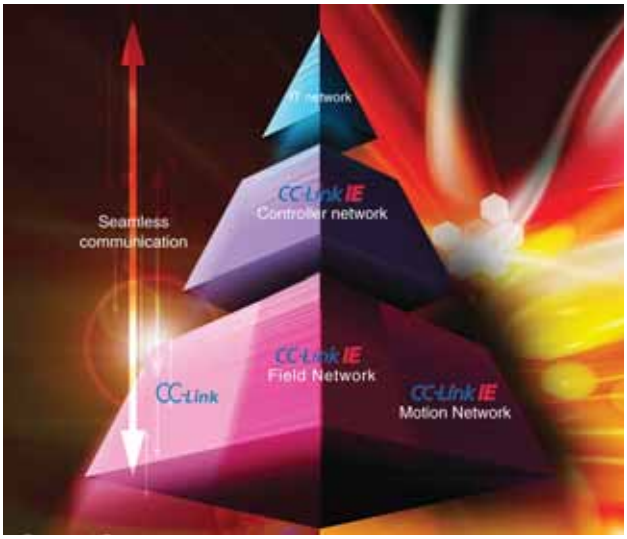
Interoperability is the ability of a network technology to assure that all of the devices/ components of a system operate together. CC-Link technology is based on the use of an ASIC which handles the complete data link layer and transport layer for reliable communications and assures interoperability between devices.

Specifications, freely available to members define all required networking parameters and device-level interface profiles, and electronic CC-Link System Profile (CSP) files assure interoperability at the application layer.

Seamless Communication

CC-Link is a family of industrial networks that processes both control and information data at high speed, to provide efficient, integrated factory and process automation. It provides high speed, deterministic communication seamlessly linking a wide range of multi-vendor automation devices over a single cable.

- CC-Link IE, is for the production control level and linking
- CC-Link for equipment control
- CC-Link Safety for data and personnel security
- CC-Link LT for sensor and devices.



Conformance Testing

Conformance testing through the CC-Link Partner Association (CLPA) ensures that devices meet the performance specifications in order to become CC-Link certified. To make it convenient for manufacturers from across the globe to have their products tested, six testing facilities have been established: one in Europe*; one in the USA; two in Japan; one in Korea, and one in China.
* from 2008

CC-Link in Action

CC-Link is used in a multitude of applications and environments worldwide and warmly regarded by users for its ease of use, reliability and simplicity. Applications include: automotive manufacturing; building automation; paper, pulp and printing industries; machine control, utilities; manufacturing and process control. For more application information visit our European website at www.cpla–europe.com.

Automotive

Speed of design and installation time was why the Ford Motor company selected CC-Link for their new Mustang production facility in Michigan where it controls the conveyors, paint shop, assembly and welding lines. In Korea at Hyundai Kia Motors it was selected "…because of high reliability ... and CC-Link is easier to use and maintain than other networks" and China at Beijing Hyundai it was chosen for its low maintenance, quick failure recovery and ease of use.

Building Automation

Bringing the benefits of industrial automation to buildings. At AGSY TEC in Germany CC-Link was selected due to its high EMC/noise immunity, ease of configuring, simple cabling and competitive installation cost making it a

natural choice for building control. Other applications include monitoring building services in apartments in China; office environmental control in Japan. Building energy management for integrator GB Innomech in UK

Machine Control

The open technology aspect of CC-Link allows a wide variety of automation equipment from numerous automation suppliers to be integrated for fast effective control. Running at speeds of up to 10Mbps, CC-Links fast deterministic update times facilitate quick machine response. Applications include high-speed bottling lines from Krones integrating PLCs, with over hundred and thirty inverter drives, and HMIs; accurate control of machines used in laying undersea fibre optic transmission cables worldwide; control and remote monitoring of printing press lines in Lancaster PA (USA)

Manufacturing

Many of CC-Link's standard features have been developed with manufacturing and continuous production in mind. These include: a Stand-by Master function that maintains network communications in the event of a Master station failure; detaching slave function allows for the hot swapping of modules without affecting or closing down the network; the automatic return function automatically returns a station to the network when a fault is corrected. These features are essential for continuous production required in the food and beverage industries, water utilities, materials handling and process markets.

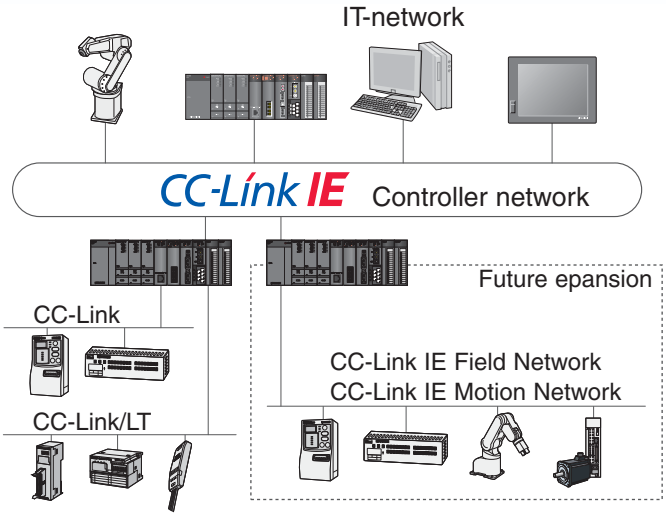
The CC-Link family

CC-Link IE

To meet the changing demands for optimised control, openness, and reliable handling of large volumes of data on communication networks CLPA has developed an open 1-Gigabit Ethernet based integrated optical network concept called CC-Link IE.

Recognising these demands, and coupled to the reducing costs of new generation compact optical networks, CC-Link IE realises the seamless data transmission from the information network layer to the production site layer.

High speed, deterministic Ethernet networking and the first open standard 1Gbps manufacturing network to be released globally - that's CC-Link IE. In addition to the control data transmission, it enables information processing data transmission such as equipment control, maintenance and device setting diagnostics for improved collaboration and productivity.



CC-Link

CC-Link is Asia's best selling Fieldbus, with over 4 million nodes installed worldwide that provides high speed, deterministic communication linking a wide range of automation devices over a single cable.

Today's automation systems require an effective, integrated control system. CC-Link provides this necessary multi-vendor communication backbone. CC-Link is ideally suited for machine, cell or process control in industries ranging from semi-conductors to food and beverage, automotive to pharmaceuticals,material handling to building automation.

In addition to those stated earlier, its many features include:

- Communication speeds of up to 10Mbps
- Deterministic response for reliable, real-time control
- Simple communication programming eliminates the need for device personality files, configuration software is available but not required
- Allows automation controllers to be programmed and monitored over the network
- Provides network diagnostic information to identify any problem areas

CC-Link/LT

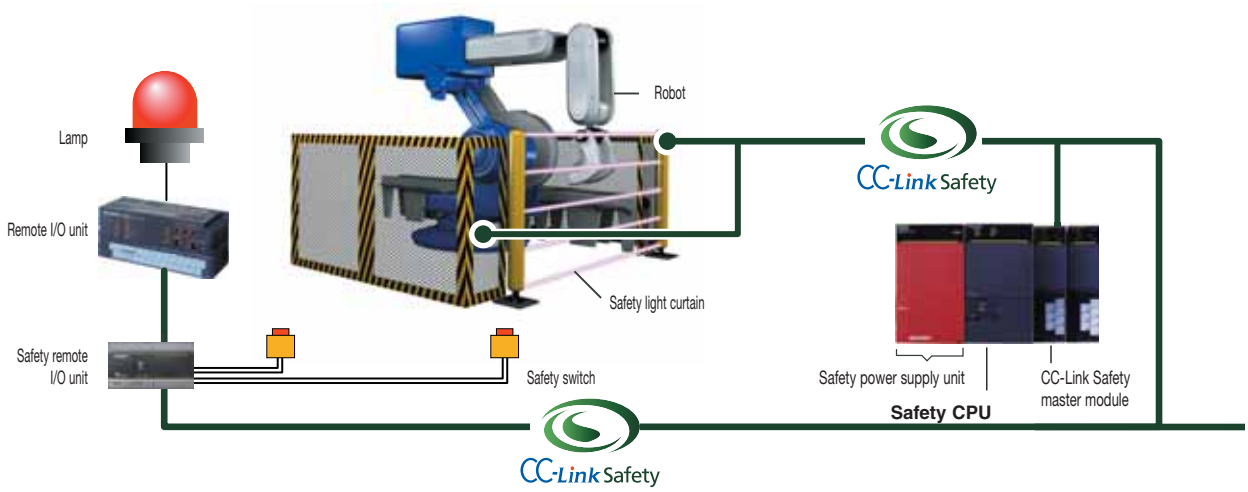
CC-Link/LT is a bit-oriented network designed for implementation in sensors and actuators, and for widespread I/O applications involving numerous locations of smaller increments of I/O points. CC-Link/LT utilizes the same open technology as CC-Link and can seamlessly integrate and communicate with CC-Link through a network bridge. CC-Link/LT can operate as a stand-alone network, or it can be connected to a CC-Link network as shown above.

A specially-designed flat network cable carrying both communication and power wiring is available, and the popular CC-Link/LT "one-touch" connector enables a fast, reliable connection to the communication cable for easy changes or to expansion of your network application.

CC-Link Safety

CC-Link Safety is a network with high reliability in data transmission suitable for use in safety applications that require compliance with IEC61508 SIL3, or EN854-1, or EN ISO 13849-1 Cat 4. CC-Link Safety is compatible with standard CC-Link. It allows the use of existing investments in network cable, other compatible products, and existing engineering effort. Safety devices and non-safety devices can reside on the same network.

CC-Link Safety will detect communication failures such as unexpected delay of communication or erroneous data that may cause malfunction of the emergency stop operation. This fail-safe function will bring machinery into a safe condition quickly if a communication failure is detected. Safety master station maintains error and failure histories of the safety remote stations.



CC-Link Networks Technical specification				
	CC-Link LT	**CC-Link**	**CC-Link Safety**	**CC-Link IE**
Network type	Sensor and Device I/O	Equipment control	Equipment control	Production / Information Control
Network Topology	T Branch	Bus, Multi-drop, T branch, Star	Bus, Multi-drop, T branch, Star	Ring
Maximum network speed	156kps > 2.5Mbps	156 Kps > 10Mbps	157 Kps > 10Mbps	1 Gbps
Total network distance	500m trunk + 200m branch	1.2Km (13.2Km with repeaters)	1.2Km (13.2Km with repeaters)	66,000m
Maximum distance between stations	500m	1.2Km (13.2Km with repeaters)	1.2Km (13.2Km with repeaters)	550m
Minimum distance between stations	none	20cm	20cm	none
Maximum number of stations	65	65	42 Safety	120 (up to 239 networks)
Maximum number of Master stations	1	16	16	N/A
Maximum number of Slave stations	64 (8 per branch)	64	64	N/A
Error detection method	CRC	CRC, RAS	CRC, RAS, CRC32	FCS
Maximum number of network I/O	2048	8192 In / 8192 Out	2048 In / 2048 Out	32Kbits
Maximum number of network Data	tex-	2048 in / 2048 Out	128 In / 128 Out	256Kbytes
Cable type	Dedicated 4 x 0.75mm^2 flat	3 wire twisted	3 wire twisted	GI Fibre optic
Communication Method	BITR Broadcast Polling + Internal timed response	Broadcast Polling	Broadcast Polling	Token Passing, Cyclic data transmission
Link Scan time	0.7 > 27.8 ms	3.9ms	3.9ms	5mS maximum
Deterministic	Yes	Yes	Yes	Yes
Physical Layer	Dedicated	RS485	RS486	Ethernet based on IEEE802.3Z (1000 Base-SX)
RAS functions	Station removal detection, Internal loop, Automatic return	Hot standby Master, Hot swap I/O, Station removal detection, Internal loop, Automatic return	Hot standby Master, Hot swap I/O, Station removal detection, Internal loop, Automatic return	Dual redundant, Station Bypass, Station removal detection, Cable break detection, Automatic return

Options for the OEM product manufacturer to incorporate CC-Link compatibility into the products they sell.

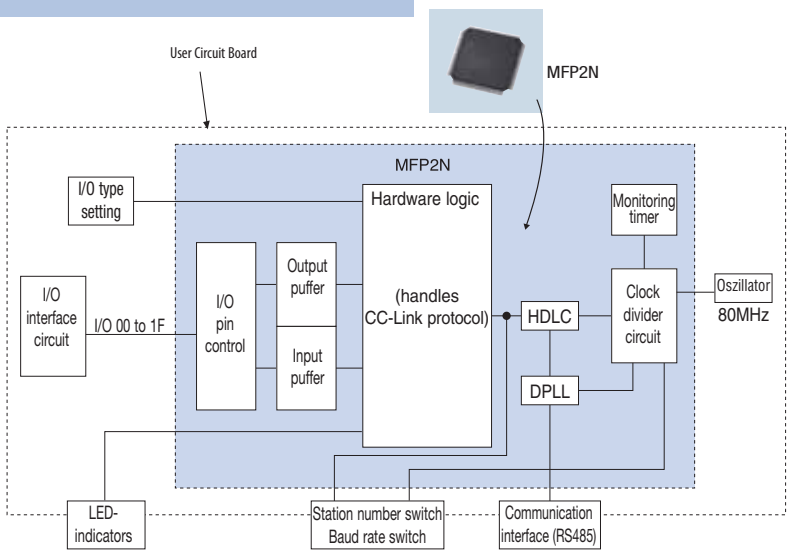
Development of a CC-Link compatible device is primarily a simple hardware exercise requiring no sophisticated tools. The engineering task involves integrating the CC-Link ASIC into your product. CLPA will provide your design engineer with a hardware development kit and technical assistance during your development stage. From consulting to the provision of dedicated communication LSIs, CLPA is ready to assist you in speedy development of CC-Link compatible products. The Mitsubishi Electric CC-Link Compatible Product Development Guidebook L(NA)08052E-A is available for download from the CLPA-Europe and Mitsubishi websites.

Options for developing CC-Link Remote I/O Station products

OPTION 1

1

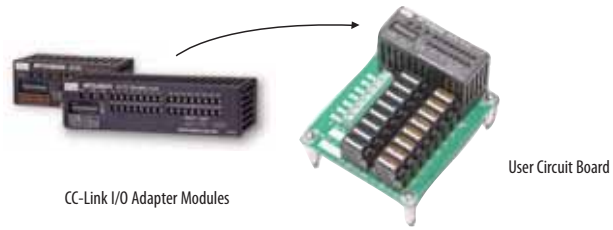
Incorporate the CC-Link ASIC (MFP2N) onto the product circuit board along with required specified components, switches and LED indicators.



OR OPTION 2

OR 2

Incorporate the CC-Link I/O Adapter Module onto the product circuit board. The I/O Adapter Module contains the CC-Link ASIC, specified components, switches and LED indicators.



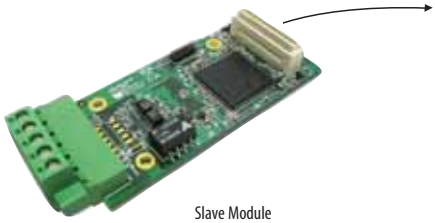
CC-Link I/O Adapter Modules

User Circuit Board

OR OPTION 3

OR 3

Incorporate an OEM CC-Link Slave Module onto the product circuit board. These slave modules are available from companies such as HMS, Hilscher, and Woodhead. These modules contain the CC-Link ASIC, cable terminal block, specified components, and in some modules - switches and LED indicators.



To User Circuit Board

Slave Module

Options for developing CC-Link Remote Device Station products

OPTION 1

1

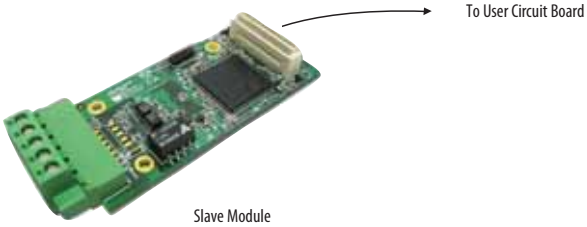
Incorporate the CC-Link ASIC (MFP3N) onto the product circuit board along with specified components, switches and LED indicators. The OEM product requires a microprocessor to manipulate the address and data lines.

MFPN3

OR OPTION 2

OR 2

Incorporate an OEM CC-Link Slave Module onto the product circuit board. These slave modules are available from companies such as HMS, Hilscher, and Woodhead. These modules contain the CC-Link ASIC, cable terminal block, specified components, and in some modules - switches and LED indicators.



Slave Module

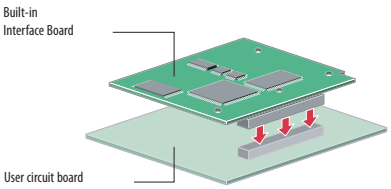
Options for developing CC-Link Master Station, Local Station, and Intelligent Device Station products

OPTION 1

1

Incorporate the CC-Link Built-in Interface Board onto the product circuit board. This interface board contains the CC-Link Master ASIC (MFP1N), microprocessor, flash ROM, switches, LED indicators, dual-port memory, and general purpose bus connector for easy interfacing.

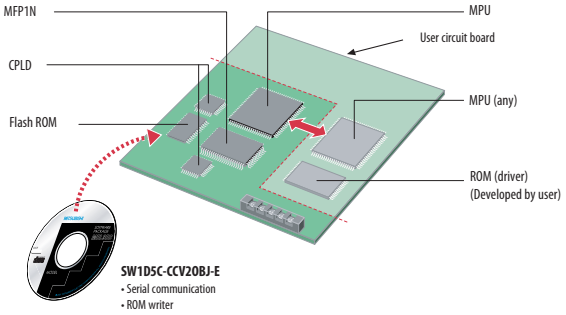
CC-Link Built-in Interface Board



OR OPTION 2

OR 2

Incorporate the CC-Link Master ASIC (MFP1N), specified components, and object code onto the product circuit board.



SW1D5C-CCV2OBJ-E
- Serial communication
- ROM writer

Typical CC-Link Compatible Products

- Analogue I/O
- Barcode/ID
- Cables
- CNC
- Connectors
- Digital I/O
- Drives & Positioning
- Embedded Products
- Gateways
- HMIs
- Indicators
- Industrial PC
- Measuring devices
- PLC
- Power Devices
- Process Devices
- Repeaters
- Robots
- Routers & Hubs
- Safety devices
- Sensors
- Slip Ring
- Tools
- Valves
- Weigh Scales

Selection of CC-Link compatible product suppliers

ABB Robotics
A & D Co Ltd
Ailes Electronics
Anywire Corporation
Baluff (Nihon Balluff)
Beckhoff Industrie Elektronik
Belden Electronics Division
Bits Co. Ltd
Chiyoda Co., Ltd.
CKD Corporation
Canon ANELVA Technix Corp
Contec Co Ltd
Correns Corporation
Daiden Co Ltd
Dai-Ichi Densu
Denso Wave inc
Depro Co Ltd
Digital Electronics
FANUC Ltd
Festo
Fuji Electric
GTS Genel Teknik
Hakko Electronics Co Ltd
Hengstler GmbH
Hilscher GmbH
Hirata Corp
HMS Industrial Networks
Hokuyo Automatic Co Ltd
IAI Corp.
Idec Izumi Corp
Itoh Denki Co Ltd
Jel System Co Ltd
Kawasaki Heavy Industries
Keyence Corp
Kitazawa Electric Works Co
Koganei Corp
Kuramo Electric Co Ltd
Kuroda Precision
Kyoei Denki
Leoni Special Cables GmbH
Minebea
Mitsubishi Electric
M-System
ND Meters
NEC
New Cosmos
Nidec-Shimpo
Nihon Electric
Nikki Denso
Nishimu
NSD Corporation
Oriental Motor
Patlite
Pepperl & Fuchs
Phoenix Connector
Pilz
RKC Instrument
Robostar
Samwon FA Co., Ltd.
Santest
Seiko Epson
Shanghai R&R
SHI
Shimaden Co Ltd
Shinko Technos Co LLtd
Shizuki Electric Co Ltd
Shoei Electric Co Ltd
Sick
SMC Pneumatics
Sumitomo 3M
SUNX Limited
Tachibana Eletech Co Ltd.
Taikisha LTD.
Taiyo Electric
Takebishi Electric
Takemoto Denki
Tamagawa Seiki Co Ltd
Tamagawa Seiki Co., LTD.
Technikon
Tohken Co Ltd
Toshiba Schneider
Toyo Electric Corp
Toyo Giken
Turck Inc
U.I.Lapp GmbH
Unipulse Corporation
United Equip. Acc.
Uticor Div. AVG
Wago Kontaktecnik GmbH
Woodhead Japan Corp
Yamaha Motor Co
Yamatake Corp
Yamato Scale
Yaskawa Electric Corp
Yokogawa Electric Corp
Yoshinogawa Electric Wire
Yosio Electronic Co

CC-Link Partner Association

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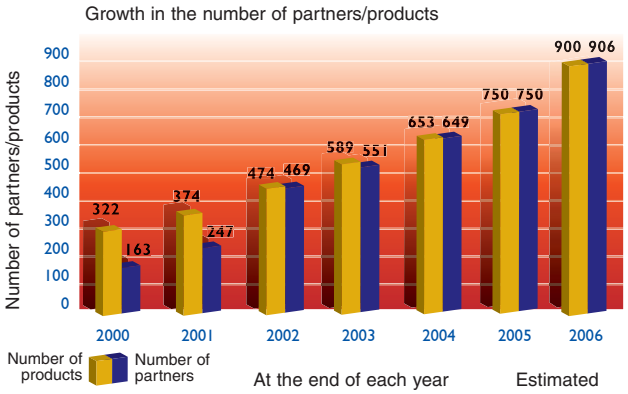
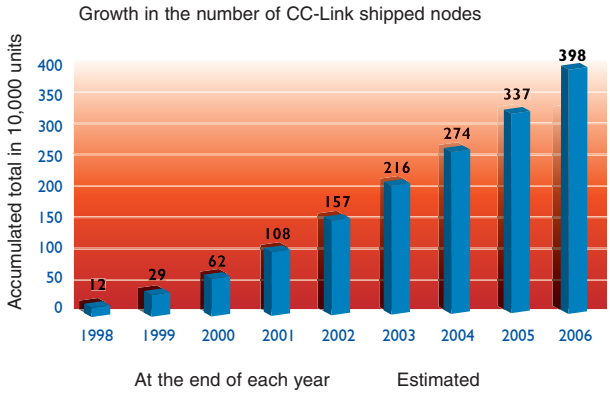
The CLPA has branches in North America, Europe, Japan, China, South Korea, Taiwan and Singapore. CLPA-Europe has applications engineering personnel on staff to assist members in applying CC-Link technology.

There were more than 4 million installed CC-Link nodes and nearly 850 CC-Link compatible products on the market as of April, 2007.

CLPA-Europe has also appointed local promotion partners in Netherlands, Poland, Turkey and Ukraine (see back cover for details)





Benefits of CLPA membership

CC-Link support branches provide CLPA members with a range of services that include:

- Distributing the CC-Link protocol specifications
- Providing technical support during the design phase to members who incorporate CC-Link compatibility in their products
- Conducting CC-Link educational seminars
- Providing CC-Link conformance-testing of member products
- Issuing conformance certificates for successfully-tested products
- Listing and promoting CC-Link compatible products on the CLPA web site, in the product catalogue and other publications
- Organising task forces to improve the functionality and acceptance
- Of CC-Link technology – Task forces include:
- Technical Task Force
- Marketing Task Force
- Promoting CC-Link and CLPA partners
- Products via trade shows
- Include partner products in the CLPA catalogues, CD-ROMs, web sites,
- Publications, seminars and the worldwide web
- Assisting potential members in the CLPA admission process

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To join the CC-Link Partner Association:

If you simply wish to receive information regarding CLPA and CC-Link compatible products from members then join as a Registered Member (no annual fee). If you are considering, or have decided to develop CC-Link compatible products then join as a Regular Member. Please visit www.clpa-europe.com to download all the forms needed.