

2021.Jun.



English version

# CLPA Guide Book Overview of the CC-Link Partner Association (CLPA)



**CC-Link I E T S N**  
Open the Future of Connected Industries



# The CC-Link Partner Association (CLPA) is a world leader in developing a truly open industrial network that accelerates the construction of smart factories.

CC-Link Family- the first field network from Japan and Asia.  
CLPA has acquired ISO and IEC international standards for its open network family and grown into a global standard in manufacturing.  
In order to accelerate the construction of smart factories utilizing IIoT, CLPA has launched the world's first open industrial network "CC-Link IE TSN" using TSN (Time-Sensitive Networking), an expansion of standard Ethernet.  
In response to the growing market demand for a wide range of devices in manufacturing sites, high-performance drive equipment, and protocol implementations for various types of equipment and applications, CLPA will provide a variety of development methods and develop truly open industrial networks on a global scale.



### Message

Information and communication technology has fundamentally changed our daily lives and industrial activities. Various activities, which used to be performed by human-to-human communication or document sharing, are now performed by digitalized methods and in an automated/autonomous manner. The production process now integrates many different lifecycle tasks. These include direct physical production activities, business processes, supply chains, after sales service and take back/recycling. Key to this integration is information and communication technologies. By flexibly combining complementary activity in related enterprises, new industrial sectors are emerging. With key words such as “Smart manufacturing” or “Cyber-physical production systems”, many projects from new industrial revolutions are being promoted in industrially advanced countries. Developing countries are also rapidly catching up on such trends.

One of the important factors for the drastic changes in production is the spread of information and communication infrastructure. This consists of industrial information networks connected to enterprise information networks. Hence the integration and utilization of comprehensive data about production assets is made possible. These assets may include equipment, materials, parts, products, manufacturing technology and environment. Such industrial information networks of production assets become indispensable infrastructure for advanced manufacturing.

To realize such an industrial information network in practical and meaningful scale and cost, it must be an open and standardized network which can be shared and utilized across the boundary of individual enterprises. Versatile functional requirements with respect to communication speed, data volume, network control methods and network complexity, etc. are also desirable. Finally, continuing development works should be performed to seek higher functionalities.

The CLPA has addressed these requirements for an open and standardized industrial network. This was begun with the CC-Link open fieldbus. Ethernet-based CC-Link IE followed, and high-performance CC-Link IE TSN was recently introduced. The CLPA will continue to respond to the ever expanding demands for advanced industrial networks. In this way, the CC-Link Family of open networks will contribute to the development of future advanced manufacturing systems.



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Doctor of Engineering

*F. Kimura*

# CLPA, the organization promoting open networks as well as your business partner.

## Support vendors and users in the global promotional activities of the CC-Link Family.

Under the motto “CC-Link, the open field network, will become world’s de facto standard”, CLPA was established in November 2000. Ever since, the Board of Directors, Marketing Task Force and Technical Task Force have joined forces to help vendors to develop compatible products and users to build open FA systems.

◎ The Board of Directors consisting of ten firms operates the CLPA and decides on major association issues.

◎ Increase partner membership and adoption of the CC-Link Family.

### Marketing Task Force

Oversees a wide variety of promotional activities world wide, including fairs, conferences, seminars, advertising programs, social media and other activities.

◎ Focuses on management of related technology and coordinates provision of information to members and outside standard-setting organizations.

### Technical Task Force

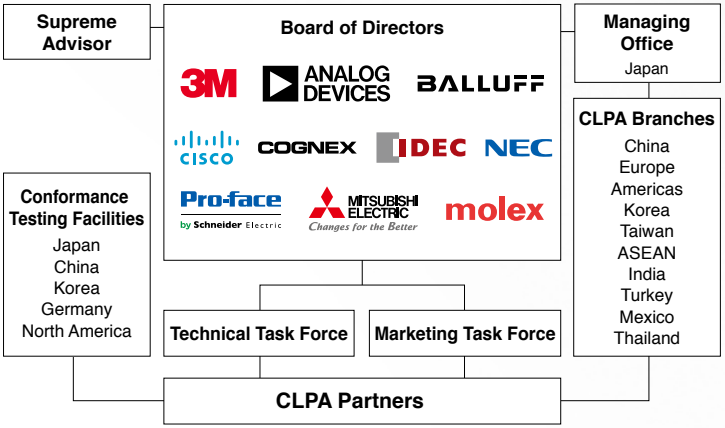
Develops new specifications for the CC-Link Family, including "CC-Link IE TSN", the first open industrial Ethernet to support TSN technology. Also develops technical materials such as installation manuals as well as conformance test specifications and addresses various technical issues.

## Get the membership of CLPA. The partners can develop business opportunities by receiving services such as support for developing compatible products.

The member firms are entitled to obtain the most up-to-date technical information and CC-Link Family specifications for free. In addition, support for conformance tests that are essential to establishing reliability is available at various stages of developing compatible products.

- Free distribution of CC-Link Family specifications
- Conducting conformance tests
- Technical support

### Organization Chart for the CC-Link Partner Association



### CLPA membership categories (price excluding tax)

Rights and Fees		Membership Categories				Remarks
		Registered Member	Regular Member	Executive Member	Board Member	
The right to obtain the CC-Link Family specifications free of charge		Yes				- Provided for free. - Conformance test specifications are available for Regular members and above.
The right to develop, manufacture and sell CC-Link Family products, development tools and recommended-wiring products		No	Yes			This is the right granted to developers and/or Member manufacturers. It does not regulate the resale of products by distributors.
The right to use the CC-Link Family technology		No	Yes			
The right to publish the information on the Member's own product in the Electronic Partner Product catalog and Internet website		No	Yes			Published for free
Annual Fees		Not charged (free)	100,000 yen (8,000 yen)	200,000 yen (18,000 yen)	1 million yen (84,000 yen)	According to the bill issued by CLPA
Initial Fee		Not charged (free)			1 million yen	According to the bill issued by CLPA
Conformance Test Fees (per product)	CC-Link	- Remote Device Station - Remote I/O Station - Cable - Development tool	N/A	200,000 yen	100,000 yen	Not charged (included in annual fees) According to the bill issued by CLPA
	CC-Link/LT	- Master Station - Remote I/O Station - Cable - Development tool	N/A	300,000 yen	200,000 yen	Not charged (included in annual fees) According to the bill issued by CLPA
	CC-Link IE Control Network	- Normal Station - Control Station - Development tool	N/A	300,000 yen	200,000 yen	Not charged (included in annual fees) According to the bill issued by CLPA
	CC-Link IE Field Network	- Master/Local Station - Intelligent Device Station - Development tool	N/A	300,000 yen	200,000 yen	Not charged (included in annual fees) According to the bill issued by CLPA
	CC-Link IE Field Network Basic	- Master/Slave Station - Development tool	N/A	Not charged (free)	Not charged (free)	Not charged (included in annual fees) Download the test tools and conduct test
	CC-Link IE Safety	- IESMAP (Master) - IESSLP (Slave) - Development tool	N/A	300,000 yen	200,000 yen	Not charged (included in annual fees) According to the bill issued by CLPA
	CC-Link IE TSN	- Master/Local Station - Remote Station - Development tool	N/A	100,000 yen <sup>1</sup>	50,000 yen <sup>1</sup>	Not charged (included in annual fees) According to the bill issued by CLPA
	CC-Link IE Control Network	- Cables - Connectors - Media converters etc.	N/A	100,000 yen	50,000 yen	Not charged (included in annual fees) According to the bill issued by CLPA
	CC-Link IE Field Network	- Cables - Connectors - Switches etc.	N/A	100,000 yen	50,000 yen	Not charged (included in annual fees) According to the bill issued by CLPA
	CC-Link IE TSN	- Cables - Connectors - Switches etc.	N/A	100,000 yen <sup>1</sup>	50,000 yen <sup>1</sup>	Not charged (included in annual fees) According to the bill issued by CLPA
Tool Test Fees (per product)	CC-Link IE TSN	- Software etc.	N/A	100,000 yen	50,000 yen	Not charged (included in annual fees) According to the bill issued by CLPA

<sup>1</sup> As long as it does not conflict with the rights of other partners, you may use the logo for promotional purposes only.  
<sup>2</sup> If you submit the result of a test conducted on behalf of the CC-Link Partner Association at a testing organization recognized by the CC-Link Partner Association, the cost will be as follows.  
- Regular: 50,000 JPY - Executive: 20,000 JPY

# Leveraging the forces of partner firms around the world, the CC-Link Family will take another giant step forward.

CC-Link Family…making the next leap foward with CLPA Partners!

Board of Directors					
A&D Co., Ltd.	ENDO KOGYO Co.,Ltd.	Japan Quality Assurance Organization (JQA)			
ABB K.K.	ESPEC TEST SYSTEM CORP	Japan Telegartner Ltd.			
Advanet Inc.	ESTIC CORPORATION	JCC Co., Ltd.			
Advantech Japan Co., Ltd.	FANUC LTD	JEL SYSTEM CO., LTD			
AGC Inc.	Fortinet Japan K.K.	JFE Plant Engineering Co., Ltd.			
Ailes Electronic Industry CO., LTD	Fortive ICG Japan Co., Ltd.	JMACS Japan Co., Ltd.			
Allied Telesis K.K.	FUJI CONTROLS COMPANY LIMITED	JTEKT CORPORATION			
ALPHA SYSTEMS CO.,LTD	FUJI ELECTRIC CABLE CO.,LTD.	K.C.C. SHOKAI LIMITED			
ALPSsystems Co.,Ltd	Fuji Electric Co., Ltd	Kawasaki Heavy Industries, LTD.			
Altima Corp.	Fuji Electric F-Tech Co., Ltd.	KEYENCE Corporation			
ANYWIRE CORPORATION	Fujikin Incorporated	KITAZAWA ELECTRIC WORKS CO., LTD.			
Asahi Enterprise Corporation	Fukushima SiC Applied Engineering Inc.	KK TFF Fluke Networks			
ASKA CORPORATION	GIKEN INDUSTRIAL CO., LTD.	KOGANEI CORPORATION			
ATEQ K.K.	HAKARU PLUS CORPORATION	KOYO ELECTRONICS INDUSTRIES CO.,LTD.			
Azbil Corporation	Hakko Electronics Co., Ltd	KURAMO ELECTRIC CO., LTD			
B&PLUS KK	Harmonic Drive Systems Inc.	KYOEI ELECTRIC CO.,LTD			
BL AUTOTEC, LTD.	HARTING JAPAN	KYOWA ELECTRONIC INSTRUMENTS CO., LTD.			
BROTHER INDUSTRIES LTD	HERUTU ELECTRONICS CORPORATION	M-System Co., Ltd.			
C.D.N CORPORATION	Hirata Corporation	M2M craft Co., Ltd.			
CANON ANELVA CORPORATION	Hirose Electric Co., Ltd.	Magnescale Co., Ltd.			
CHINO CORPORATION	Hirschmann Automation and Control KK.	MARS TOHKEN SOLUTION CO. LTD.			
Chiyoda Co., Ltd	Hitachi Industrial Equipment Systems Co., Ltd.	Matsusada Precision Inc.			
CHUO SEISAKUSHO, LTD.	Hitachi Metals, Ltd.	MEIDENSHA CORPORATION			
CITIZEN FINE DEVICE CO., LTD.	Hivertec,inc.	MEIRYO TECHNICA CORPORATION			
CKD Corporation	HMS INDUSTIRAL NETWORKS	MicroTechnica Co., Ltd.			
CKD NIKKI DENSO CO., LTD.	HOKUYO AUTOMATIC CO., LTD.	Minebea Intec GmbH			
CONTEC CO.,LTD	HORIBA STEC Co., Ltd.	Minebea Mitsumi Inc.			
Corning International K.K.	IAI Corporation	MISUMI Corporation			
CORRENS CORPORATION	IAR Systems AB	MITSUBISHI ELECTRIC CORPORATION			
Dai-ichi Dentsu Ltd.	IDEC Corporation	MITSUBISHI ELECTRIC ENGINEERING COMPANY LIMITED			
DAIICHI ELECTRONICS CO., LTD	igus k.k.	Mitsubishi Electric FA Industrial Products Corporation			
DENSO WAVE INCORPORATED	IHI Corporation	Mitsubishi Electric Information Network Corporation			
Diatrend Corporation	International Laboratory Corporation	MITSUBISHI ELECTRIC MECHATRONICS SOFTWARE CORPORATION			
Dyadic Systems Co.,Ltd.	ITOH DENKI CO., LTD.	MITSUBISHI ELECTRIC MICRO-COMPUTER APPLICATION SOFTWARE COMPANY LIMITED			
DYDEN CORPORATION	JANOME SEWING MACHINE CO., LTD.	MITSUBISHI ELECTRIC SYSTEM & SERVICE CO., LTD.			

Mitsubishi Electric TOKKI Systems Corporation	ROBOTEC Inc.	TOGAMI ELECTRIC MFG. CO., LTD
Mitutoyo Corporation	SANSHA ELECTRIC MFG. CO.,LTD.	Toho Technology Corporation
MTT Corporation	SANTEST CO., LTD	Toshiba Schneider Inverter Corporation
Nabeya Bi-tech Kaisha	Sanyo Machine Works. Ltd.	TOYO ELECTRIC CORPORATION
NACHI-FUJIKOSHI CORP.	Sasaki Sekkei Co., Ltd.	TOYO ELECTRIC MFG. CO.,LTD.
NADA ELECTRONICS, LTD	Schneider Electric Japan Holdings Ltd.	TOYOGIKEN CO., LTD.
NADEX Co., Ltd.	Seidensha Electronics co., ltd.	Trend Micro Incorporated.
NEC Corporation	SEIKO EPSON CORPORATION	Tyco Electronics Japan G.K.
Net One Systems Co., Ltd.	Sekisui Jushi Cap-Ai System Co.,Ltd.	UNION DENSHI WORKS CO., LTD.
NICHIDEN SHOKO CO.,LTD.	Servoland Corporation	Unipulse Corporation
Nichigoh communication electric wire co., Ltd.	Sharp Corporation	UNITEC Corp.
Nippon Dempa Co., Ltd	SHIBAURA MACHINE CO., LTD.	Valcom Co.,LTD.
NIPPON DENKI KENKYUSHO CO., LTD.	SHIMADEN CO., LTD.	Wago Company of Japan, Ltd.
Nippon Seisen Cable, Ltd.	Shimafuji Electric Incorporated	Yamaha Corporation
NISSEI ELECTRIC CO.,LTD.	SHINKO TECHNOS CO.,LTD	YAMAHA MOTOR CO., LTD.
NITTA CORPORATION	SHOEI Electric Co., Ltd.	YAMATO SCALE CO., LTD.
NKE CORPORATION	SINKA JAPAN CO.,LTD.	YASKAWA ELECTRIC CORPORATION
NSD Corporation	SMC CORPORATION	Yokogawa Electric Corporation
NSK Ltd.	Soft Servo Systems, Inc.	YOSHINO GAWA ELECTRIC WIRE&CABLE
NTT Communications Corporation	STMicroelectronics K.K.	YOSIO ELECTRONIC COMPANY
NUSCO CO.,LTD.	Sumitomo Heavy Industries,Ltd.	ZUKEN ELMIC,INC.
OKANO CABLE Co.,Ltd.	Surpass Industry Co., Ltd.	
Oki Electric Cable Co., Ltd.	TACHIBANA ELETECH CO., LTD.	
OMRON Corporation	TAIYO CABLETEC CORPORATION	
ONTEC CO.,LTD.	TAIYO ELECTRIC CO.,LTD.	
OPTEX FA CO.,LTD.	TAIYO,LTD.	
orientalmotor	TAKEBISHI CORPORATION	
Palo Alto Networks k.k	Takikawa Engineering Co., Ltd.	
panasonic Industrial Device SUNX Co	TAMADIC Co., Ltd.	
PEPPERL+FUCHS K.K.	TAMAGAWA SEIKI CO., LTD.	
Phoenix Contact K.K	TEAC Corporation	
PRE-TECH CO., LTD.	Technical & Try CO., LTD	
REJ Co., Ltd	TECHNO Co., Ltd.	
Renesas Electronics Corporation	TESSERA TECHNOLOGY INC.	
RKC INSTRUMENT INC.	THK CO.,LTD.	

Alphabetical listing by company name for  
Regular Members and above (as of April 2021)

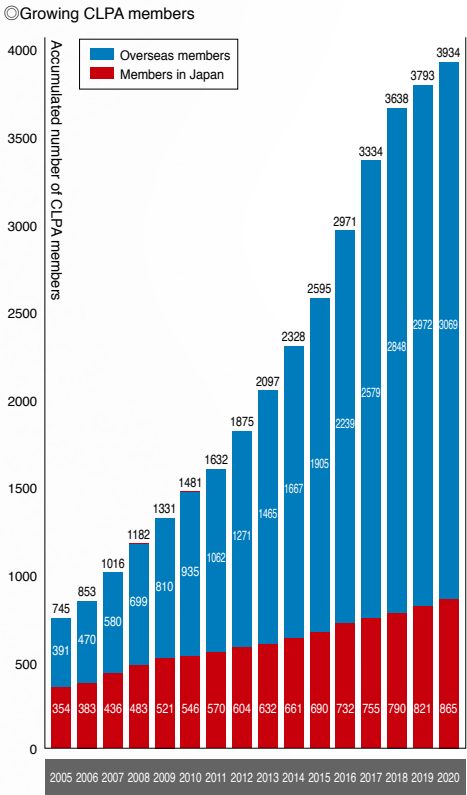


# The CLPA's commitment to advancing the CC-Link Family betters manufacturing sites around the world.

These figures are self-explanatory about the development and growth on the global level.

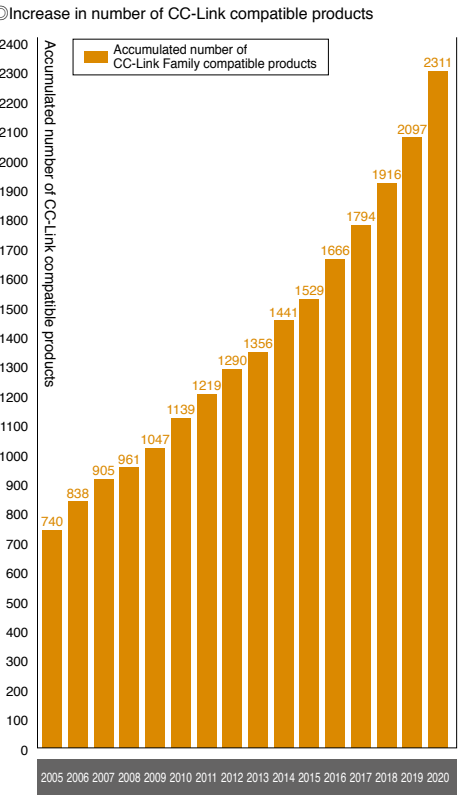
## Many member firms come crossing the borders to join the CC-Link Partner Association.

Though starting with only 134 member firms when established, currently CLPA has over 3,900 corporate members worldwide in financial year 2020 (as of the end of March 2021). The overseas firms account for as much as 80 % of the memberships, providing solid evidence that the world has recognized that the CC-Link Family have become true global standards.



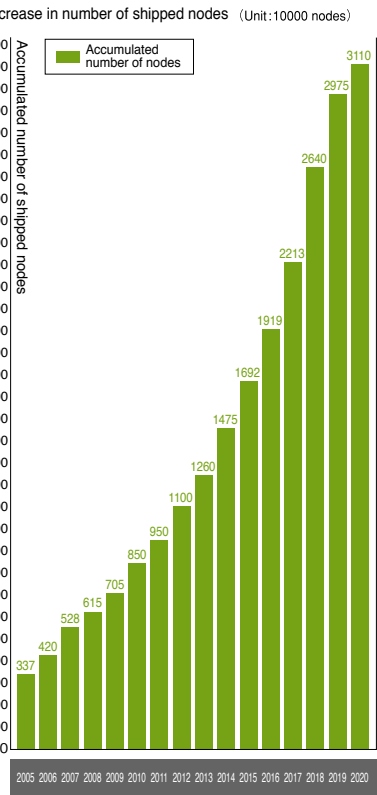
## A line of diversified CC-Link Family compatible products, as many as the number of user voices.

With the increasing number of vendor firms joining the CC-Link Partner Association, the accumulated number of CC-Link Family compatible products is now over 2311 models. Partner companies also receive the benefit of their products being promoted in various CC-Link Partner Association activities free of charge, including the Electronic Partner Product Catalog.



## As a sign of our global acceptance, the total number of shipped devices is approx. 31 million.

The growth of the installed base is being driven by the automotive, semiconductor and LCD panel industries. We expect that this growth will continue to accelerate.



## CC-Link, CC-Link Safety and CC-Link IE, ... The global acceptance of the first open industrial network from Japan continues.

As a key feature of our promotion and the best opportunities to exchange information with more vendors and users, CLPA participates in exhibitions in Japan and overseas. We will continue to actively participate in more trade shows and exhibitions of diversified industries to promote technical understanding of the future of manufacturing, CC-Link IE TSN.



Smart Manufacturing Forum 2019 (Guangzhou)



Smart Factory + Automation World 2019



SPS2019



IIFES2019

# CLPA is a global operation with local offices in 11 regions worldwide. Each office works to increase the adoption of CLPA networks by device makers, machine builders and end-users operating in these regions.

CLPA's 11 global offices are located in Japan, China, Europe, North America, Korea, Taiwan, ASEAN, India, Turkey, Mexico and Thailand. These offices promote CC-Link Family technology and provide a wide range of services for CLPA members.

**1 Headquarters (Japan)**  
6F Ozone-front Building, 3-15-58, Ozone, Kita-ku, Nagoya 462-0825, Japan  
TEL : +81-52-919-1588 FAX : +81-52-916-8655  
E-mail : [info@cc-link.org](mailto:info@cc-link.org)  
URL : <https://www.cc-link.org/>

**2 China**  
Headquarters (Tongji University) : School of Electronics and Information Engineering, Jiading Campus, Tongji University, Shanghai, P.R.China  
Head Office : 19F No.1386 Hong Qiao Road, Shanghai, P.R.China  
TEL : +86-21-64940523 FAX : +86-21-64940525  
E-mail : [support@cn.cc-link.org](mailto:support@cn.cc-link.org)  
URL : <https://www.cc-linkchina.org.cn/>

**3 Europe**  
Postfach 10 12 17, 40832 Ratingen, Germany  
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E-mail : [partners@eu.cc-link.org](mailto:partners@eu.cc-link.org)  
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500 Corporate Woods Parkway, Vernon Hills, IL60061, USA  
TEL : +1-847-478-2647 FAX : +1-847-876-6611  
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**5 Korea**  
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E-mail : [clpakor@meak.co.kr](mailto:clpakor@meak.co.kr)  
URL : <http://kr.cc-link.org/ko/>

**6 Taiwan**  
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E-mail : [cclink01@ms63.hinet.net](mailto:cclink01@ms63.hinet.net)  
URL : <https://tw.cc-link.org/zh/>

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E-mail : [Clpa\\_India@asia.meap.com](mailto:Clpa_India@asia.meap.com)  
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E-mail : [partners@tr.cc-link.org](mailto:partners@tr.cc-link.org)  
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**11 Thailand**  
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Fax : +66(2) 043-1231-33  
E-mail : [info@cclinkthailand.com](mailto:info@cclinkthailand.com)  
URL : <http://th.cc-link.org/th/>

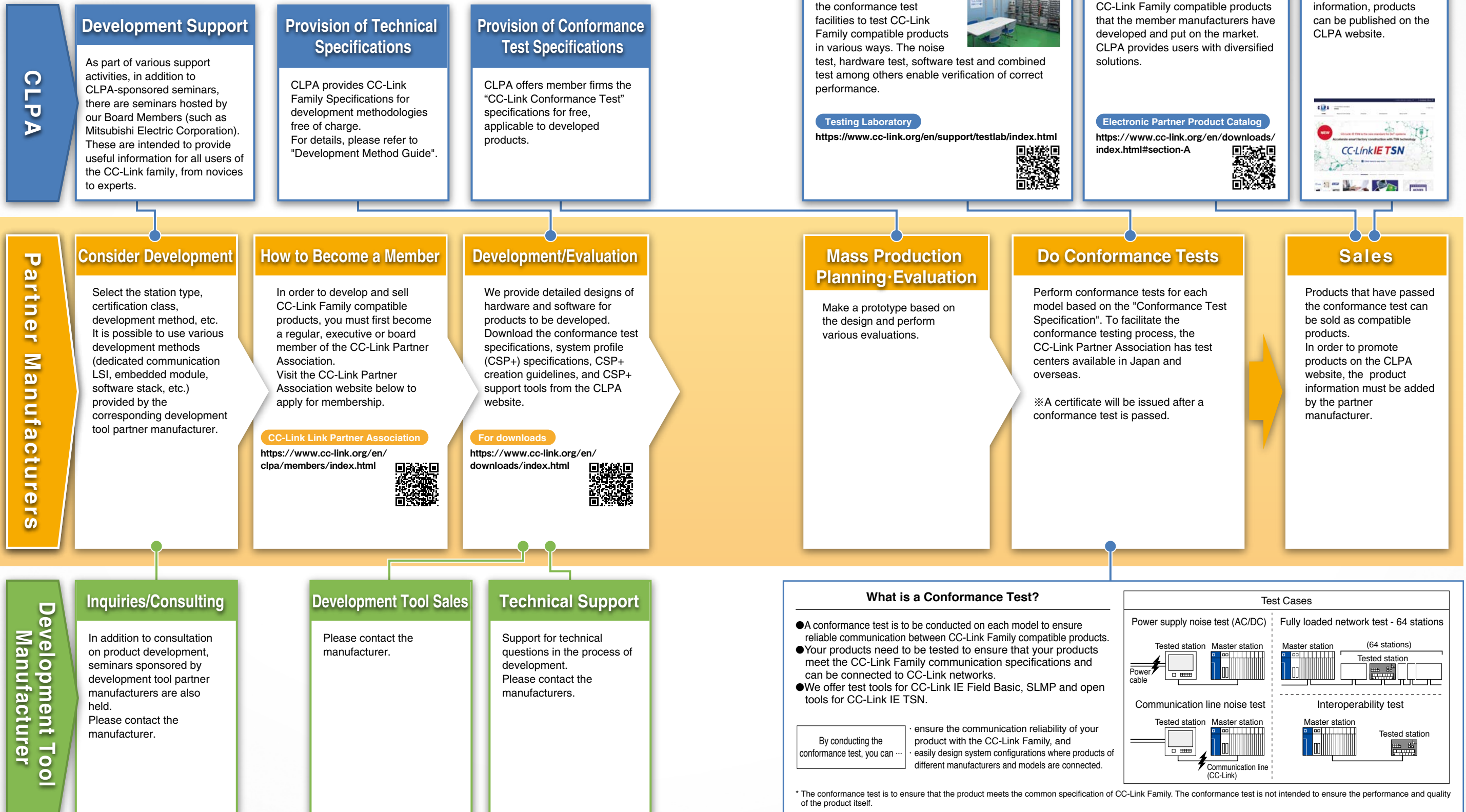
## High-level Technology and Ease-of-Use From a Japanese defacto standard to a Global Standard

The CC-Link Family has been certified to conform to international standards, IEC Standards and SEMI Standards for the semiconductor and FPD industries, in addition to Japanese Industrial Standards, Chinese National Standards, ISO Standards, Korean National Standards and Taiwanese Standards. An established de facto standard in Japan, now it is now also recognized as a global standard. It meets the conventional requirements for open networks, communication compatibility and a diverse lineup of compatible products. In addition, it can drastically improve the production efficiency of manufacturing systems and applications. Its high technological level and ease of use are internationally appreciated.

International Standard: ISO	ISO15745-5 : CC-Link published in January 2007
International Standard: IEC	IEC61158, IEC61784-1 : CC-Link published in December 2007 IEC61158, IEC61784-2 : CC-Link IE Control, CC-Link IE Field published in August 2014 IEC61784-3-8 : CC-Link Safety published in June 2010 IEC61784-3-8 : CC-Link IE Safety published in August 2016
SEMI Standard	SEMI E54.12 : CC-Link published in July 2001 SEMI E54.23 : CC-Link IE Field published in May 2013 SEMI E54.23 : CC-Link IE TSN published in May 2020
The National Standards of the People's Republic of China: GB	GB/Z 19760-2005 : CC-Link published in December 2005 GB/T 20299.4-6 Chinese BA (Building Automation) standard : CC-Link published in December 2006 GB/T 19760-2008 : CC-Link published in June 2009 GB/Z 29496.1.2.3-2013 : CC-Link Safety published in June 2013 GB/T 33537.1.2.3-2017 : CC-Link IE published in April 2017 GB/Z 37085-2018 : CC-Link IE Safety published in December 2018
Japanese Industrial Standards: JIS	JIS TR B0031 : CC-Link published in May 2013
Korean National Standards: KS	KSB ISO 15745-5 : CC-Link published in March 2008 KSC IEC 61158/61784 : CC-Link published in December 2011 KSC IEC 61784-5-8 : CC-Link, CC-Link IE Control, CC-Link IE Field published in December 2014 KSC IEC 61784-3-8 : CC-Link IE Safety published in July 2018
Taiwan Standards: CNS	CNS 15252X6068 : CC-Link published in May 2009

# Development flow for CC-Link Family compatible products.

The CC-Link Partner Association will support you from development to sales of CC-Link Family compatible products.



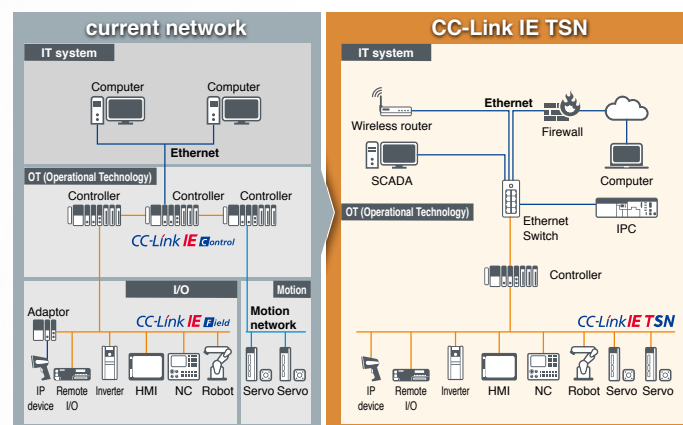


Adopts TSN technology, significantly increasing the performance and functions of CC-Link IE

By adopting TSN (Time-Sensitive Networking), which achieves real time communication by time sharing, different networks can coexist on a single cable. Also, this efficient protocol will achieve high speed, accurate control.

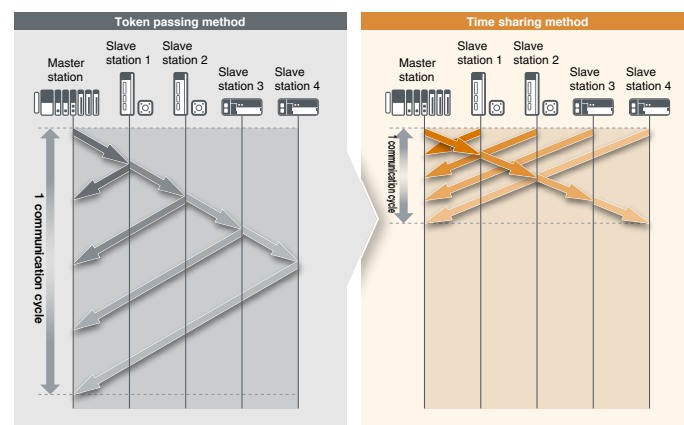
### Integration of networks

◎Integrate multiple OT and IT networks. Increase system structure flexibility and reduce wiring cost.



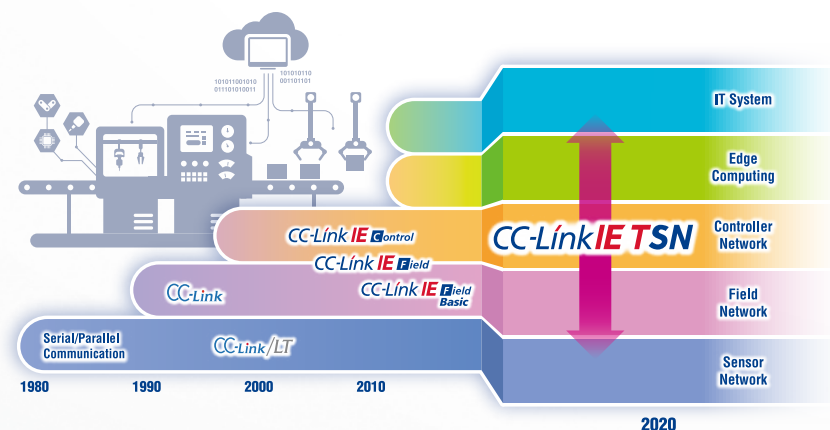
### Dramatic reduction of communication cycles

◎Shorten cyclic data update time with time sharing. This simultaneously transmits and receives input and output communication frames in both directions by using network time synchronization.



### Roadmap

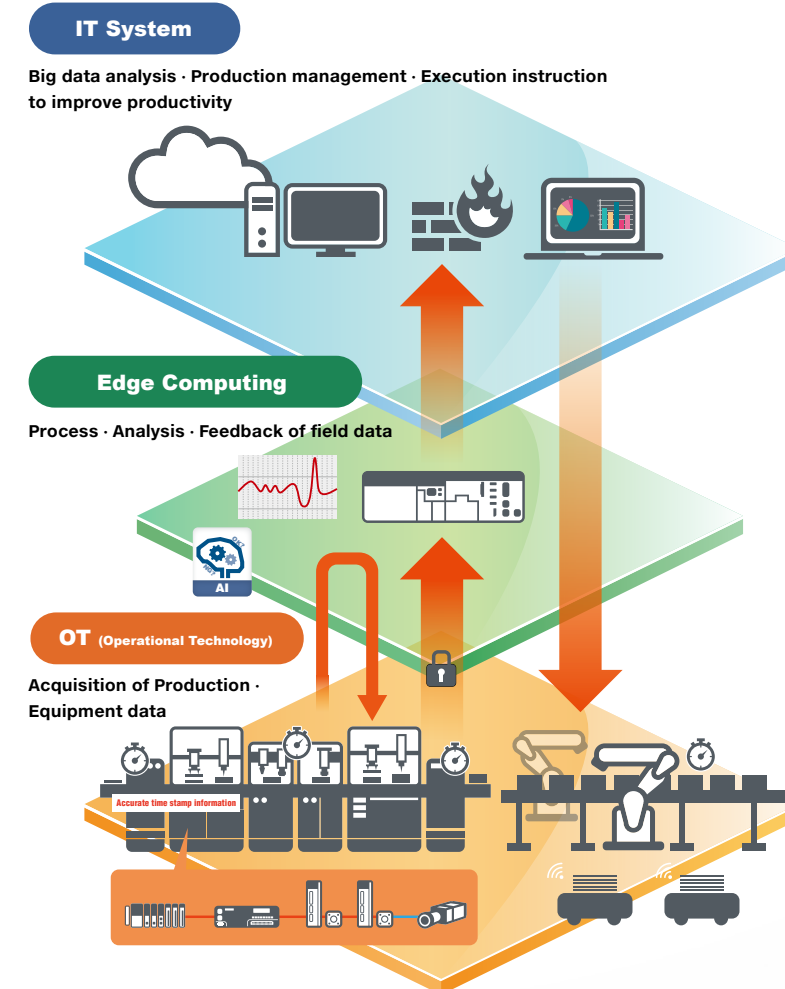
◎"CC-Link"- the open fieldbus originally developed by global automation leader Mitsubishi Electric.  
 "CC-Link IE"- the first gigabit Ethernet based industrial open network, enabling seamless data transmission from IT to OT.  
 "CC-Link IE TSN"- the first to combine open gigabit Ethernet bandwidth with Time-Sensitive Networking (TSN).  
 For more than 20 years since the CLPA was established in 2000, the CC-Link Family has evolved into networks that seamlessly connect from the sensor level to the controller level and further to enable OT/IT convergence.



Accelerate smart factory construction with TSN technology. The first in the world applying TSN technology to open industrial Ethernet.

## CC-Link IE TSN

### Open the Future of Connected Industries



#### 1 Accurate time stamp information and advanced analysis

- Collection of field data with accurate time stamp information
- Improvement of analysis accuracy by application using AI

#### 2 Network integration

- Coexistence of multi-protocol on a single trunk
- Realize FA layer real time control and IT layer seamless communication at the same time
- Construct general communication, motion communication and safety communication on a single network

#### 3 Realization of advanced motion control

- Fast and high accuracy synchronization control
- Optimize device performance by combining different communication cycles

#### 4 Utilization of wireless network and 5G

Future concept

- Layout-free production line construction
- Wiring-free system construction

#### 5 Compatibility of FA(OT)-IT integration and security

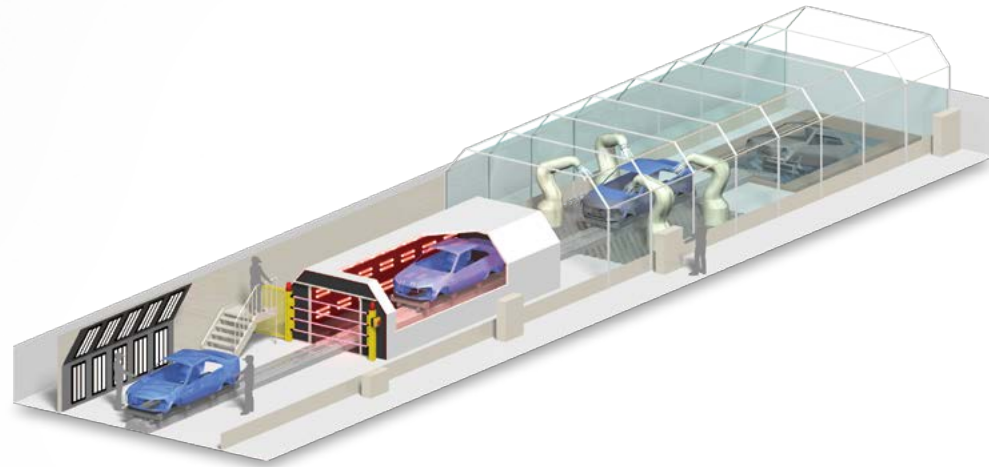
Future concept

- Build a stable security environment
- Expansion of devices and services compatible with security

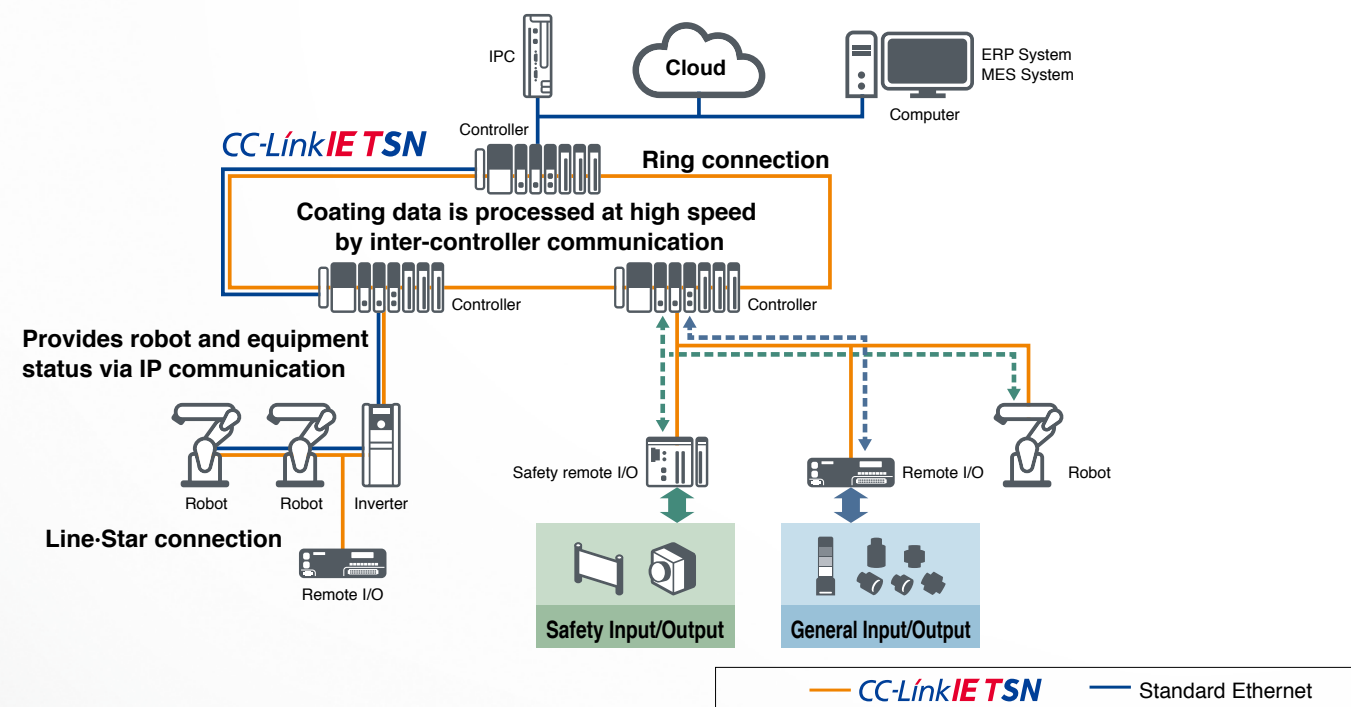


## Use cases

### CASE 1 Automotive (Paint shop)



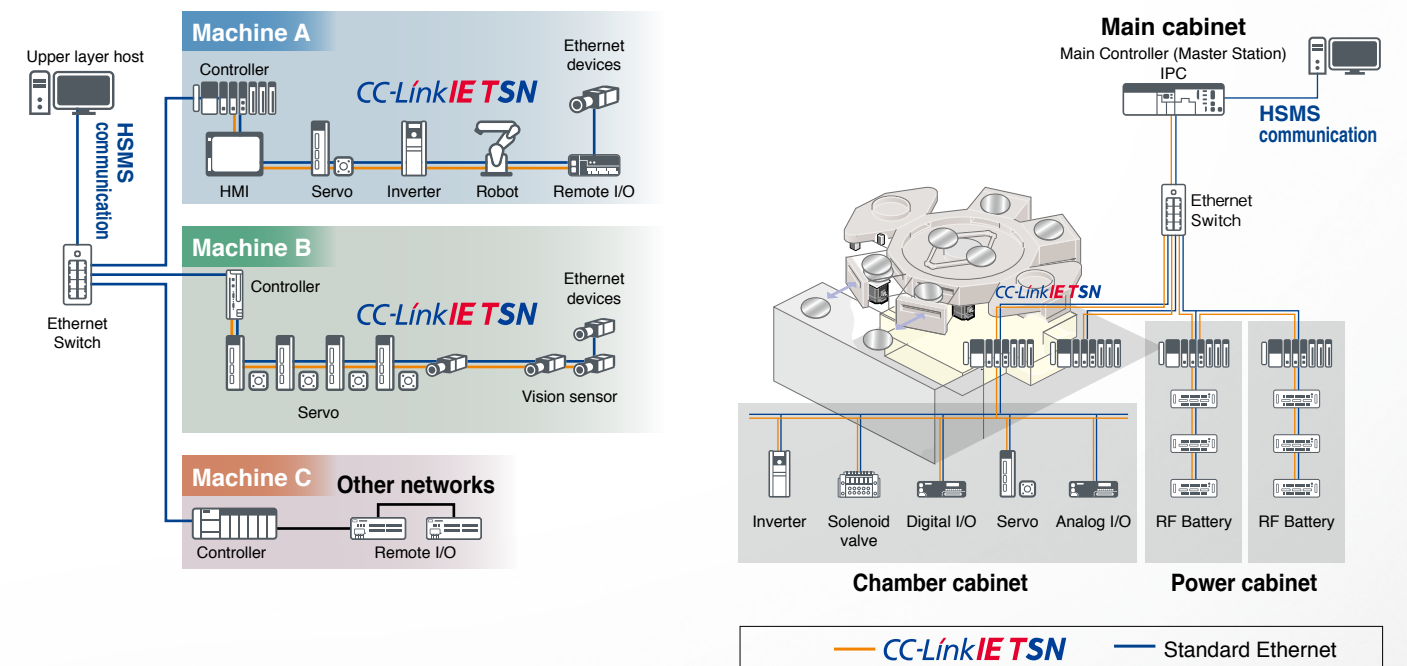
- Communicates both safety and non-safety communication on a single network
- Flexible cabling supports line/star/ring topology
- Supports from controller level downwards, handling large amounts of data for plant monitoring on the same line



### CASE 2 Semiconductor process tool



- Provides rapid communications to handle large amounts of recipe and traceability data
- Does not affect operational communication determinism while co-existing with HSMS communication
- Ethernet devices communicate directly with the host on the upper layer
- Use current design assets by implementing a software protocol stack on top of the main controller (Master Station) IPC

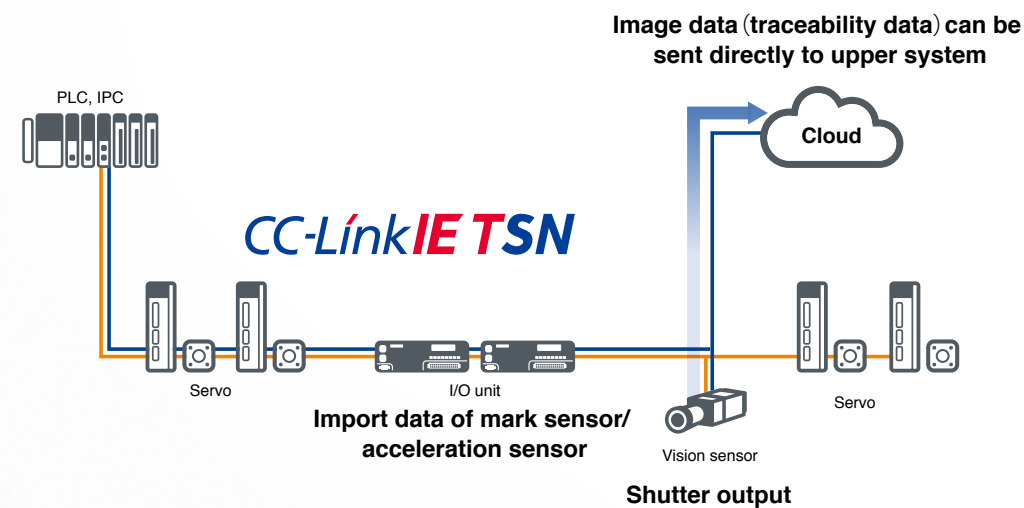


## Use cases

### CASE 3 Printing machine

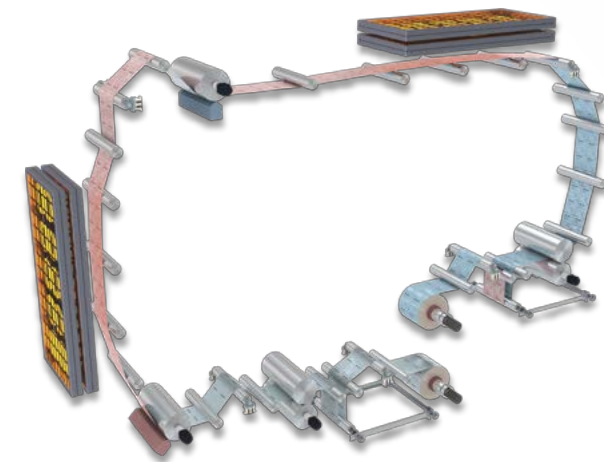


- ◎ Vision system integration. Combine vision system IP traffic on the same network as motion control data while communicating with upper systems.
- ◎ High speed, accurate servo system

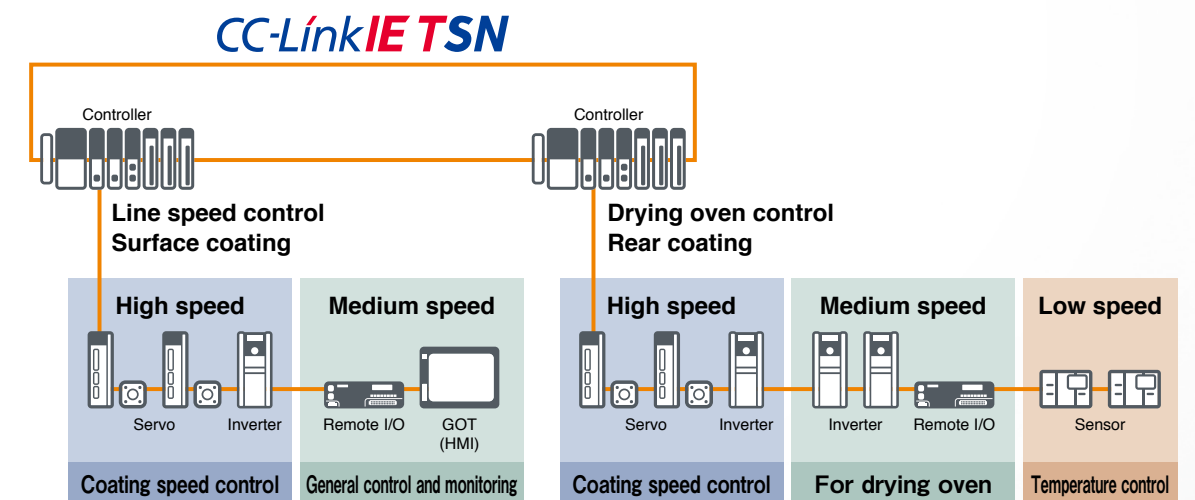


— CC-Link IETSN — Standard Ethernet

### CASE 4 Lithium ion battery manufacturing machine



- ◎ High accuracy control synchronization for multiple combined servo and inverter axes.
- ◎ Increase machine performance by combining fast communication cycle devices (e.g. servo) with slower devices (e.g. inverter).



Cyclic communication is enabled by suppressing the effect of each slave station's performance response.

— CC-Link IETSN —



# Network List

CC-Link IE Field Basic

## Ethernet Based Network

CC-Link IE TSN

TSN technology makes it possible to mix different networks on the same trunk line and provide real-time communication through time synchronization. Thus the motion control capabilities have been significantly enhanced.

CC-Link IE Field Basic

CC-Link IE communication using general-purpose Ethernet technology can be easily applied to small-scale equipment not requiring high-speed control. This is easy to use and develop. Cyclic communication on the CC-Link IE Field network can be realized by software implementation alone.

CC-Link IE Control

The industrial Ethernet network that realizes high reliability by duplexing the transmission path. The core network that bundles each field or motion network and provides controller-level distributed control with gigabit speed high data capacity. With the newly added safety communication function, safety data can be shared between controllers.

CC-Link IE Field

The new industrial Ethernet field network for intelligent manufacturing systems. Provides real-time integrated distributed control of I/O while also linking numerous networks at gigabit speed. The safety communication function and motion communication function have been recently added, allowing systems to be configured easily.

## Serial Based Network

CC-Link CC-Link Safety

CC-Link is the existing fieldbus network for typical field control applications. CC-Link Safety is specialized for use to meet demanding safety network requirements.

## Common Protocol

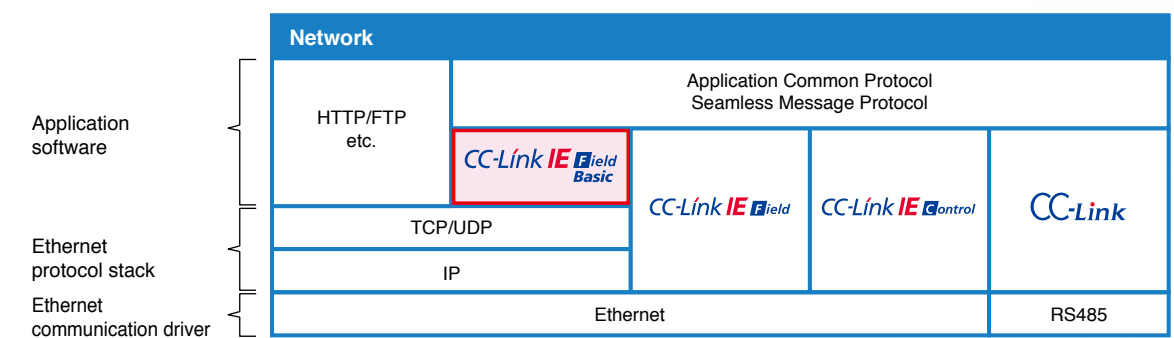
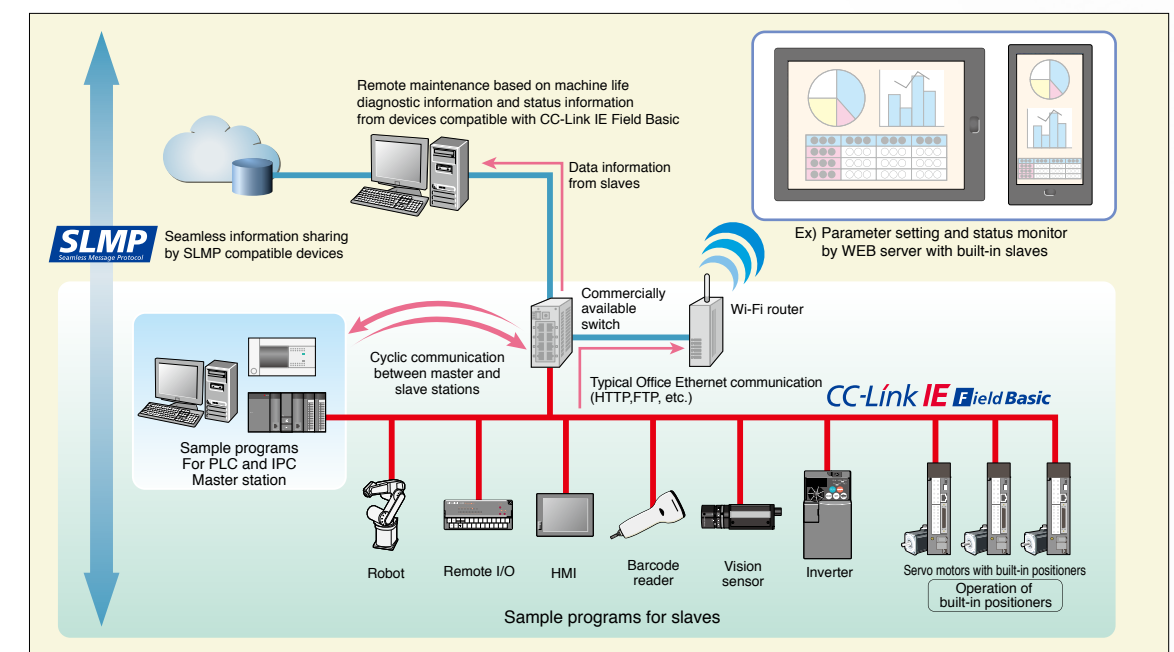
SLMP  
Seamless Message Protocol

The SLMP (Seamless Message Protocol) is a common protocol for realizing system management and operation regardless of the differences between networks. SLMP ensures direct transmission of information between production site and IT systems and facilitates extensive information sharing.

CC-Link IE Field Basic

Realizing CC-Link IE communication using general-purpose Ethernet on field networks applicable to small-scale equipment

CC-Link IE communication using general-purpose Ethernet technology. This can easily be applied to small-scale equipment not requiring high-speed control and is easy to use and develop. Cyclic communication on the CC-Link IE Field network is realized by software.



\*SLMP: Seamless Message Protocol

Cyclic communication on CC-Link IE Field network is realized by software.

◎The system can be developed quickly, and a wide lineup of applicable devices can be developed easily.

The communication can be done simultaneously with standard Ethernet TCP/IP communication (HTTP, FTP, etc.).

◎Wiring for control is not required, and the Ethernet network can be unified.

The master station can be easily realized on an IPC or personal computer.

◎The master station can be realized without a dedicated interface board.

\*Cyclic communication is implemented as application software with Ethernet based sample source code.

A field network system compatible with standard Ethernet communication can be constructed at low cost.

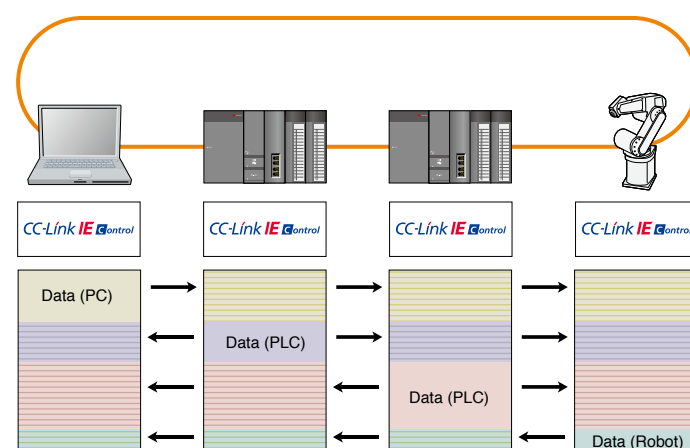


## A wide factory backbone network utilizing gigabit Ethernet technology.

CC-Link IE Control is designed to ensure a highly reliable network through the use of full duplex fiber optic transmission paths, delivering high-speed, high-capacity distributed control. It's the backbone network that provides assured control of each field network.

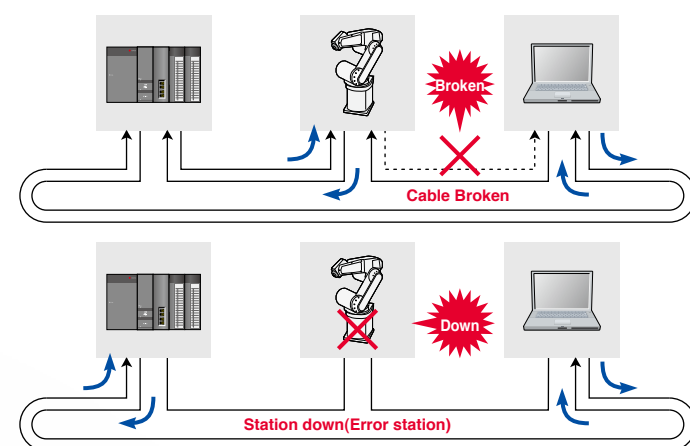
### Network shared memory for cyclic communication with ultra high speed & ultra large capacity

- ◎To achieve stable communication independent of transmission delay, CC-Link IE Control adopts a token passing protocol for data transmission control.
- ◎Each controller passes data to the network shared memory only when it has the token, ensuring fully deterministic and high speed real-time communication.



### High speed & reliability by redundant fiber optic loop technology

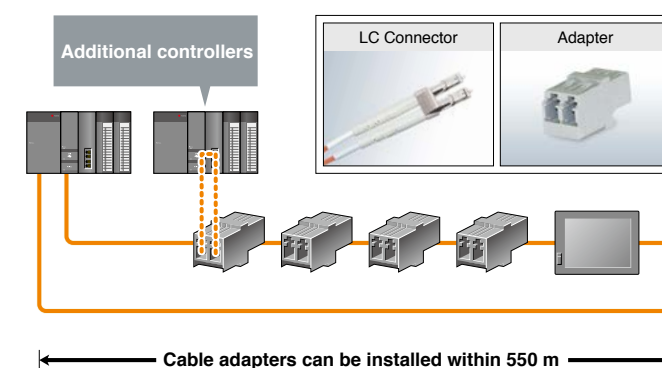
- ◎By adoption of redundant loop topology, each station continues communication by looping back upon detection of a broken cable or station error.
- ◎This integrated redundancy is provided without additional equipment and without increasing network cost.



### Adoption of standard Ethernet cables, connectors and adapters

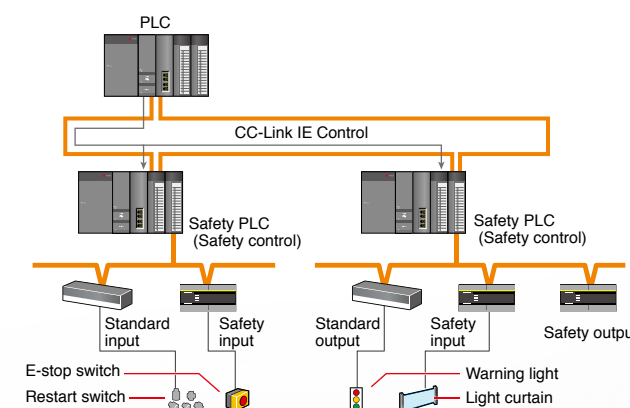
- ◎Worldwide availability of standard Ethernet cabling and parts by using standard Ethernet technology.
- ◎By using cable adapters, wiring debugging and installation can be started even if all the equipment in the line has not been fully installed.

- IEEE802.3z (1000BASE-SX)
- LC connector (IEC61754-20)



### IEC61508 SIL3 IEC61784-3 (2010) Compliant Safety Communication Function

- ◎The safety communication function has been added to the CC-Link IE Control network allowing safe communication to be shared between controllers.



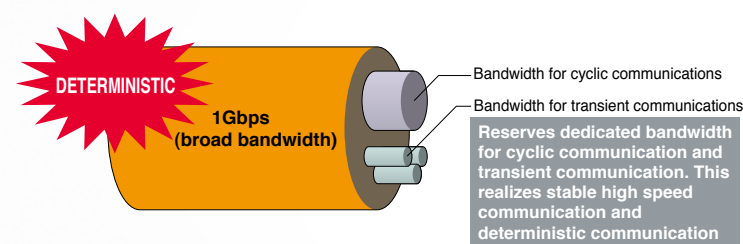


Ultra-high-speed ... supremely useable ... seamless ...  
and fully compatible with the Ethernet standards  
We've brought the benefits of "Gigabit & Ethernet"  
to the field level!

CC-Link IE Field is an ultra high speed & ultra large capacity network, which provides both synchronous deterministic (cyclic) and asynchronous on-demand messaging (transient) communication. I/O control, motion control and safety functions can be combined seamlessly.

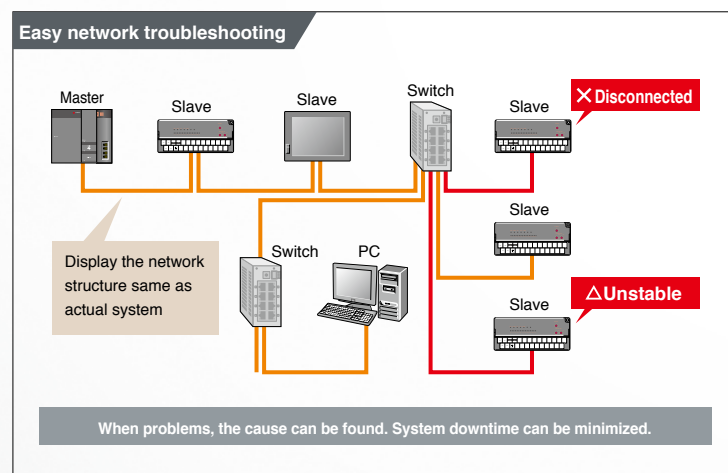
### Ultra High Speed

- ◎ Gigabit transmission and real-time protocol enables easy and reliable data communication and remote I/O communication independent of transmission delay.
- ◎ High-speed communication for management information of devices and trace information as well as the transmission of control data.



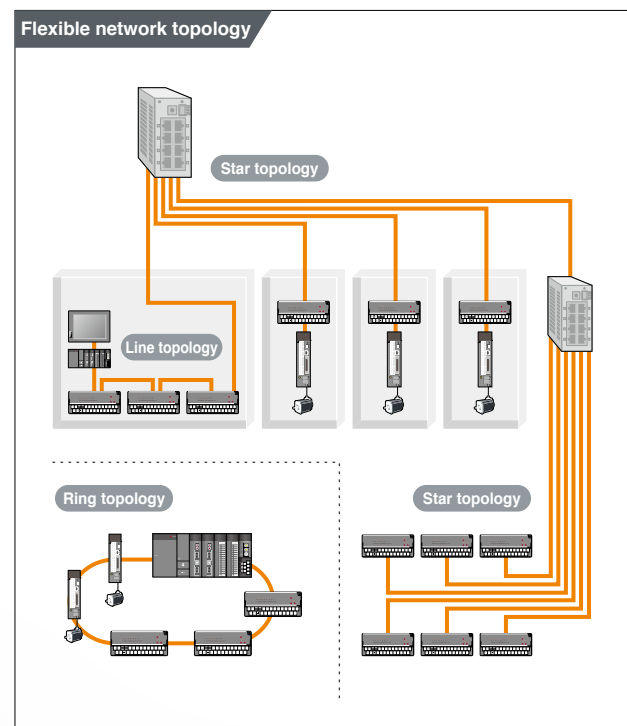
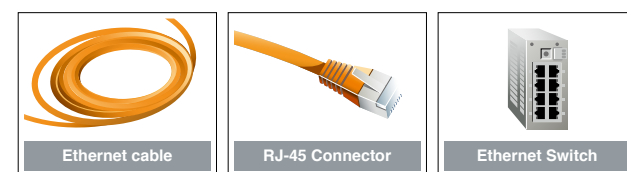
### Easy Networking

- ◎ Flexible network topology (ring, line and star are all possible)
- ◎ The network shared memory allows communication among controllers and field devices.
- ◎ Easy configuration and network diagnostics enable a total engineering cost reduction from system start-up to maintenance.



### Ethernet Cable and Connector

- ◎ Since the physical and data link layers of the CC-Link IE Field network use standard Ethernet technology, conventional cables, switches and hubs can be used.
- ◎ The availability of materials and selection of equipment for the network installation and maintenance are enhanced.



### Seamless Networking

- ◎ CC-Link IE Field can access field devices directly with remote engineering tools across the network hierarchy.
- ◎ Devices can be monitored or configured from anywhere in the network, which increases engineering efficiency with remote management.

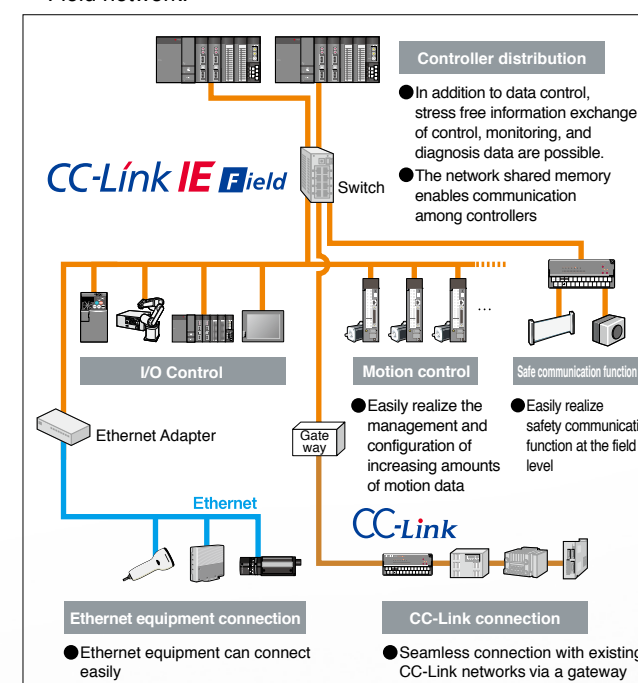
### IEC61508 SIL3 IEC61784-3 (2010)

#### Compliant Safety Communication Function

- ◎ The safety communication function has been added to the CC-Link IE Field network allowing safety communication at the field level.
- ◎ Allows flexible configurations of safety and general PLCs on a single network.

#### Motion communication function capable of highly accurate synchronous communication

- ◎ Highly accurate synchronization is possible by compensating for the delay time in propagating data from the master station to the slave station.
- ◎ Able to combine not only required device synchronization, but also the information of I/O and sensors for which synchronization is not required, on the same CC-Link IE Field network.







## CC-Link obtains SEMI certification. The open field network as a global standard

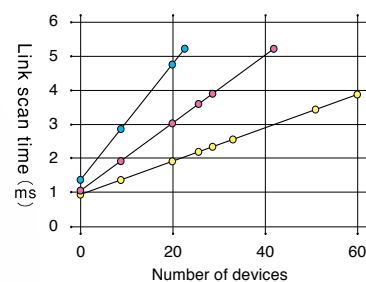
CC-Link is the high-speed field network able to simultaneously handle both control and information data. With a high communication speed of 10 Mbps, CC-Link can achieve a maximum transmission distance of 100 meters and connect to 64 stations.

### High-speed and Highly Deterministic Input-Output Response

In addition to high speed 10 Mbps operation, CC-Link is extremely deterministic. Being able to rely on a predictable, unvarying I/O response allows system designers to provide reliable, real-time control.

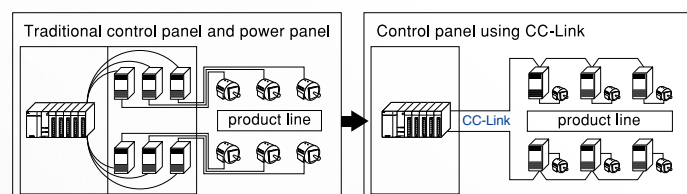
#### ■ Link scan time (at communication speed of 10 Mbps)

- Only remote I/O connected
- Only remote Device connected  
(Each occupy one station)
- Only Local/  
Intelligent Device connected  
(Each occupy one station)



### Efficiency through Reduced Wiring

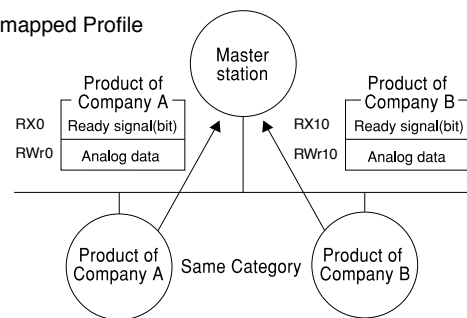
CC-Link significantly reduces the amount of control and power wiring needed in today's complex production lines. It reduces wiring and installation costs, minimizes the work needed to accomplish the wiring and drastically improves maintenance operations.



### CC-Link Provides Compatibility between Multiple Vendor Products

CLPA provides a "memory mapped profile" that defines data for each product type. This definition includes the control signal and data layout (addressing). Multiple vendors can develop CC-Link compatible products to match this "profile". Users are then able to easily change from one product brand to another without needing to change connections or control programs.

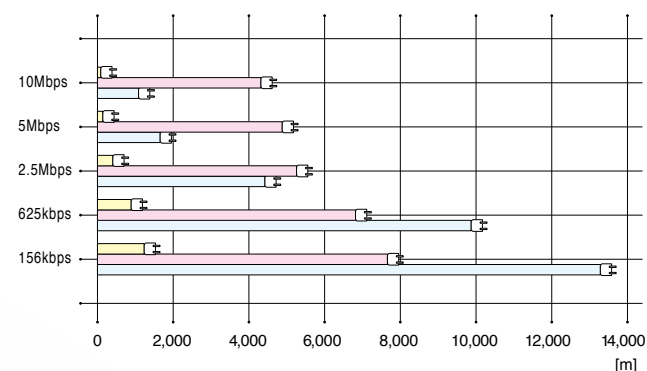
#### ■ Memory mapped Profile



### Easy to Extend Transmission Distance

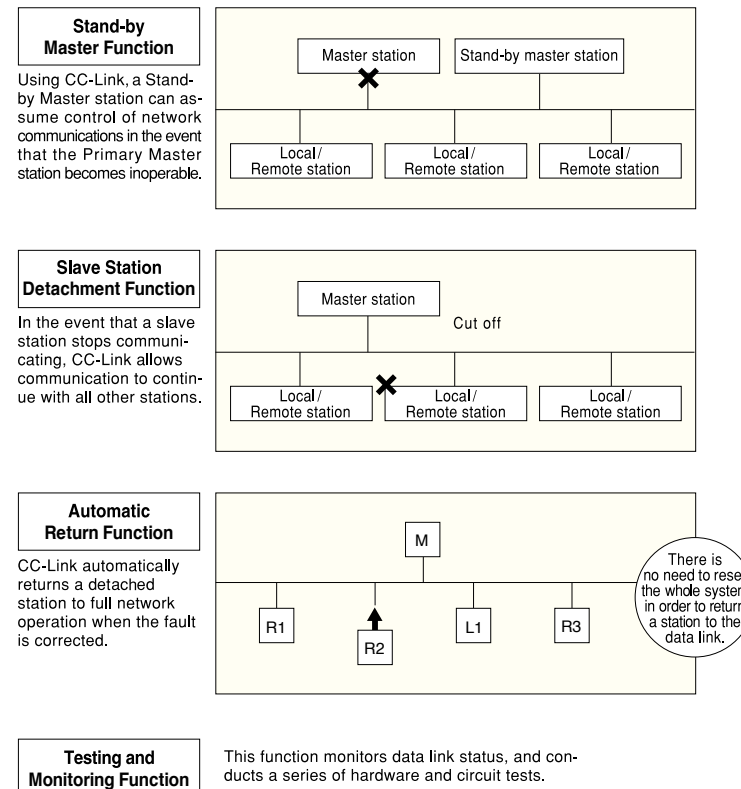
The maximum overall cable length is 100 meters when 10 Mbps is selected. This length can be extended to 1.2 km when the network speed is 156 Kbps. The use of cable repeaters and optical repeaters allows even greater distances to be covered. CC-Link supports large-scale applications and reduces the work needed for wiring and device installation.

#### ■ CC-Link transmission distance



### CC-Link Realizes High Reliability with an RAS Function.

The RAS (Reliability, Availability, Serviceability) function is another of CC-Link's features. Functions including stand-by master, detach ment of slave stations, automatic return, testing and monitoring provide a high reliability network system and allow the system down time to be minimized.





CC-Link IE TSN Specification

Item			Specifications
Communication speed			1Gbps/100Mbps
Maximum cyclic size per station			Max. 4G (4,294,967,296) octet in total per station
Transient transmission			With the server function and client function for each station, The transmission capacity is the same as SLMP.
Communication method			Time sharing method
Synchronization function			Compliant with IEEE802.1AS and IEEE1588v2
Number of nodes connected to a single network			64,770 devices (total of master/slave stations) Up to 65535 devices for IP address class A.
Maximum distance between nodes			• Twisted pair cable (compliant with IEEE 802.3): 100 m • Optical fiber (IEEE 802.3 compliant multimode fiber): 550 m • Optical fiber (SI-POF): 20m • Optical fiber (SI-HPCF):100m
Maximum no. of branches			No upper limit
Topology			Line, star, line/star mixed, ring, ring/star mixed, mesh
Connection specifications	Twisted pair cable specifications	Cable specifications	• 1 Gbps: IEEE 802.3 1000BASE-T compliant cable ANSI/TIA/EIA-568-B (Category 5e or higher) compliant shielded or double shielded type is recommended.
			• 100 Mbps: IEEE 802.3 100BASE-TX compliant cable ANSI/TIA/EIA-568-B (Category 5 or higher) shielded or double shielded type is recommended. Under noise environment, double shielding is recommended.
		Connector specifications	• RJ45 connector(1 Gbps): The shielded RJ45 compliant with ANSI/TIA/EIA-568-B 8-pin connectors is recommended.
			• RJ45 connector (100 Mbps): The shielded RJ45 compliant with the ANSI/TIA/EIA-568-B 4-pin or 8-pin connector is recommended.
	Optical fiber cable specifications (1Gbps)	Optical fiber specification	Optical fiber cable compliant with IEEE 802.3 1000BASE-SX (MMF)
			Standard IEC 60793-2-10 Types A1a.1 (50/125 μm multimode)
			Transmission loss (max) 3.5 (dB/km) or less (λ = 850 nm)
			Transmission band (min) 500 (MHz/km) or higher (λ = 850 nm)
		Optical fiber specification	GI type plastic optical fiber cable (GI -POF)
			Standard Proposing IEC 60793-2-40 (core 55 μm, external diameter 490 μm multimode)
			Transmission loss (max) 100 (dB/km) or less (λ = 850 nm)
			Transmission band (min) 350 (MHz/km) or higher (λ = 850 nm)
		Connector specifications	Duplex LC type connector
			Standard IEC 61754-20: Type LC connector
			Connection loss 0.3 (dB) or less
			Polished surface PC polishing
		Optical fiber specification	SI type plastic optical fiber cable (SI-POF)
			Standard —
			Transmission loss (max) 170 (dB/km) or less (λ = 650 nm)
			Transmission band (min) 10 (MHz/km) or higher (λ = 650 nm)
		Optical fiber specification	SI type plastic clad fiber cable (SI-PCF)
			Standard —
			Transmission loss (max) 19 (dB/km) or less (λ = 650 nm)
			Transmission band (min) 14 (MHz/km) or higher (λ = 850 nm)
	Optical fiber cable specifications (100Mbps)	Connector specifications	F07 type connector
			Standard IEC 61754-16: Type PN connector
			Connection loss 0.8 (dB) or less (for master fiber)
			Polished surface Not defined

\*1. For the ring/star mixed and mesh wiring, use switches that can configure each topology.

CC-Link IE Control Network Specifications

Item		Specifications
Communication speed/data link control		1Gbps / Standard Ethernet
Communication control method		Token passing method
Communication control method		Ring
Redundant system function		Redundant data transfer as standard
Number of connected stations per network		Up to 120 stations
Max. number of networks		239
Max. number of groups		32
Optical fiber cable	Optical fiber specification	Optical fiber cable for 1000BASE-SX (MMF)
	Standard	IEC60793-2-10 Types A1a.1 (50/125μm multimode)
	Transmission loss (max)	3.5(dB/km) or less (λ=850nm)
	Transmission band (min)	500(MHz-km) or more (λ=850nm)
	Total length (total length of optical cable)	66 km (when 120 stations connected)
	Maximum distance between nodes	550 m (core/clad=50/125(μm))
	Connector specifications	Duplex LC connector
	Standard	IEC61754-20:Type LC connector
	Connection loss	0.3(dB) or less
	Polished surface	PC polishing
Twisted pair cable	Transmission line type	Dual loop
	Communication medium	Shielded twisted pair cable (category 5e)
	Connector	RJ45 connector, M12 X-Code connector
	Total length	12,000m
	Distance between stations (max.)	100m
Cyclic communication (Max. number of link points per network)		Control data (Max. number of link points)
		LB : 32768 bits
		LW : 131072 words
		LX : 8192 bits
		LY : 8192 bits
Maximum number of link points per station	LB	16384 bits
	LW	16384 words
	LX	8192 bits
	LY	8192 bits

The CC-Link IE Control network achieves a communication speed of 1 Gbps. It uses token passing as the data transfer control method. This prevents frame collisions, improving the throughput of communication. Therefore, it is optimal for networks where regularly scheduled communication is required.

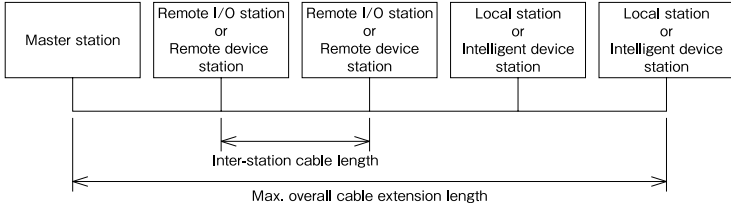
CC-Link IE Field Network Specifications

Item		Specifications
Ethernet Standards		IEEE802.3ab (1000BASE-T) compliant
Communication speed		1Gbps
Communication media		Shielded twisted pair cable (Category 5e), RJ-45 connector
Communication control method		Token passing method
Topology		Line, star, ring
Maximum number of connected units		254 modules (total of master and slave stations)
Maximum station-to-station distance		100m
Cyclic communication (Master slave method)		Control signal (bit data): max. 32768 bits (4096 octets) RX (slave → master): 16384 bits RY (master → slave): 16384 bits Control data (word data): Max. 16384 words (32768 octets) RW <sub>r</sub> (slave → master): 8192 words RW <sub>w</sub> (master → slave): 8192 words
Transient communication (message communication)		Message size: Max. 2048 octets

CC-Link IE Field Basic Specifications

Item		Specifications
Communication speed		100Mbps
Implementation method		Software
Connection form		Star (connection with switching hub)
Cable		Ethernet category 5e or higher
Max. number of connected stations per network (open specification)		64
Cyclic communication		Supported
Max. number of link points/network	RX,RY	512 octets each (4K points)
	RW <sub>r</sub> ,RW <sub>w</sub>	4K octets each (2K points)
Max. number of link points/station (More than one station can be occupied.)	RX,RY	8 octets each (64 points) (fixed)
	RW <sub>r</sub> ,RW <sub>w</sub>	64 octets each (32 points) (fixed)
Link scan time (16 stations connected)		10ms
Transient transmission		Possible (max. 2K octets)
Mix of communication protocols, TCP and IP		Supported

CC-Link Specification

Item			Specification					
			Ver. 1.10	Ver. 2.00				
Control specification	Maximum number of link points	Remote I/O(RX, RY)	2048 points each	8192 points each				
		Remote register (RWr)	256 words	2048 words (Slave station to Master station)				
		Remote register(RWw)	256 words	2048 words (Master station to Slave station)				
	Extended cyclic setting		—	1 time setting	2 time setting	4 time setting	8 time setting	
	Number of link points per unit	1 station occupied	RX, RY	32 points each		32 points each	64 points each	128 points each
			RWr, RWw	4 words each		8 words each	16 words each	32 words each
		2 stations occupied	RX, RY	64 points each		96 points each	192 points each	384 points each
			RWr, RWw	8 words each		16 words each	32 words each	64 words each
		3 stations occupied	RX, RY	96 points each		160 points each	320 points each	640 points each
			RWr, RWw	12 words each		24 words each	48 words each	96 words each
4 stations occupied		RX, RY	128 points each		224 points each	448 points each	896 points each	
		RWr, RWw	16 words each		32 words each	64 words each	128 words each	
Maximum number of occupied stations		4 stations						
Communication speed		10M / 5M / 2.5M / 625k / 156kbps						
Communication system		Broadcast polling system						
Synchronization system		Frame synchronization system						
Encoding system		NRZI						
Transmission path format		Bus format (EIA RS485 conformance)						
Transmission format		HDLC conformance						
Error control system		CRC (X <sup>16</sup> +X <sup>12</sup> +X <sup>5</sup> +1)						
Max. number of units connected		64 units						
The number of slave station		1-64						
Communication specification	Max. overall cable extension length and inter-station cable length							
			CC-Link Ver. 1.10 compatible cable (Using 110Ω terminators)					
			Communication speed	inter-station cable length	Max. overall cable extension length			
			156Kbps	20 cm or longer	1200m			
			625Kbps		900m			
			2.5Mbps		400m			
			5Mbps		160m			
			10Mbps		100m			
			If a system uses modules compatible with Ver. 1.00, 1.10 and Ver. 2.00, and cables compatible with Ver. 1.00 and 1.10, then follow the Ver. 1.00 specification for maximum overall cable extension length and inter-station cable length.					
			Connection cable		CC-Link Ver. 1.10 compatible cable (Shielded, 3-core twisted pair cable) * Mixture of different brand cables is possible only when they are all Ver. 1.10 compatible cables.			

Difference between CC-Link Ver.1.10 and Ver.2.00 in the number of connected units

	Number of units connected
Ver.1.10	Max. 64 stations. It should satisfy the conditions below.  1. Number of all stations a+b×2+c×3+d×4≤64 a : Number of units that occupies 1 station,    b : Number of units that occupies 2 stations c : Number of units that occupies 3 stations,    d : Number of units that occupies 4 stations  2. Number of units connected 16×A+54×B+88 C≤2304 A : Number of remote I/O station units ..... Max. 64 units B : Number of remote device station units ..... Max. 42 units C : Number of local station, stand by master station and intelligent device station units .... Max. 26 units
Ver.2.00	Max. 64 stations. It should satisfy the conditions below.  1. Number of all stations (a+a2+a4+a8)+(b+b2+b4+b8)×2+(c+c2+c4+c8)×3+(d+d2+d4+d8)×4≤ 64  2. Total number of remote I/O points (a×32+a2×32+a4×64+a8×128)+(b×64+b2×96+b4×192+b8×384) +(c×96+c2×160+c4×320+c8×640)+(d×128+d2×224+d4×448+d8×896)≤ 8192  3. Total number of remote register points (a×4+a2×8+a4×16+a8×32)+(b×8+b2×16+b4×32+b8×64) +(c×12+c2×24+c4×48+c8×96)+(d×16+d2×32+d4×64+d8×128)≤ 2048 a : The number of units with 1 station occupied and 1 time setting b : The number of units with 2 stations occupied and 1 time setting c : The number of units with 3 stations occupied and 1 time setting d : The number of units with 4 stations occupied and 1 time setting a2: The number of units with 1 station occupied and 2 times setting b2: The number of units with 2 stations occupied and 2 times setting c2: The number of units with 3 stations occupied and 2 times setting d2: The number of units with 4 stations occupied and 2 times setting a4: The number of units with 1 station occupied and 4 times setting b4: The number of units with 2 stations occupied and 4 times setting c4: The number of units with 3 stations occupied and 4 times setting d4: The number of units with 4 stations occupied and 4 times setting a8: The number of units with 1 station occupied and 8 times setting b8: The number of units with 2 stations occupied and 8 times setting c8: The number of units with 3 stations occupied and 8 times setting d8: The number of units with 4 stations occupied and 8 times setting  4. Number of units connected 16×A+54×B+88×C≤ 2304 A : Number of remote I/O station units ..... Max. 64 units B : Number of remote device station units ..... Max. 42 units C : Number of local station, stand by master station and intelligent device station units ..... Max. 26 units *In the case of units compatible with Ver. 1, the number is calculated with one time setting.

CC-Link Ver. 1.00 model (Differences from Ver. 1.10)

There are two differences in specifications between CC-Link Ver. 1.10 and Ver. 1.00 as shown below.

- Max. overall cable extension length and inter-station cable length
- Connection cable

Item	Specification																									
Max. overall cable extension length and inter-station cable length	<div><div><div>Master station</div><div>Remote I/O station or Remote device station</div><div>Remote I/O station or Remote device station</div><div>Local station or Intelligent device station</div><div>Local station or Intelligent device station</div></div><div><div><div>*2</div><div>*1</div><div>*2</div><div>*2</div></div><div>Max. overall cable extension length</div></div></div>																									
	*1: Inter-station cable length between remote I/O or remote device stations																									
	*2: Inter-station cable length between the master station and a local station or between an intelligent device station and the preceding or following station																									
	Ver.1.00 compatible CC-Link dedicated cable(Characteristic Impedance: 100Ω type)																									
	<table><tr><th rowspan="2">Communication speed</th><th colspan="2">inter-station cable length</th><th rowspan="2">Max. overall cable extension length</th></tr><tr><th>*1</th><th>*2</th></tr><tr><td>156Kbps</td><td rowspan="3">30 cm or over</td><td rowspan="8">1 m or over <sup>(A)</sup> / 2 m or over <sup>(B)</sup></td><td>1200 m</td></tr><tr><td>625Kbps</td><td>600 m</td></tr><tr><td>2.5Mbps</td><td>200 m</td></tr><tr><td rowspan="2">5Mbps</td><td>30 cm to 59 cm*</td><td>110 m</td></tr><tr><td>60 cm or over</td><td>150 m</td></tr><tr><td rowspan="3">10Mbps</td><td>30 cm to 59 cm*</td><td>50 m</td></tr><tr><td>60 cm to 99 cm*</td><td>80 m</td></tr><tr><td>1 m or over</td><td>100 m</td></tr></table>	Communication speed	inter-station cable length		Max. overall cable extension length	*1	*2	156Kbps	30 cm or over	1 m or over <sup>(A)</sup> / 2 m or over <sup>(B)</sup>	1200 m	625Kbps	600 m	2.5Mbps	200 m	5Mbps	30 cm to 59 cm*	110 m	60 cm or over	150 m	10Mbps	30 cm to 59 cm*	50 m	60 cm to 99 cm*	80 m	1 m or over
Communication speed	inter-station cable length		Max. overall cable extension length																							
	*1	*2																								
156Kbps	30 cm or over	1 m or over <sup>(A)</sup> / 2 m or over <sup>(B)</sup>	1200 m																							
625Kbps			600 m																							
2.5Mbps			200 m																							
5Mbps	30 cm to 59 cm*		110 m																							
	60 cm or over		150 m																							
10Mbps	30 cm to 59 cm*		50 m																							
	60 cm to 99 cm*		80 m																							
	1 m or over		100 m																							
	(A): 1 m or longer: In the case of a system comprising only remote I/O or remote device stations (B): 2 m or longer: In the case of a system comprising local and intelligent device stations *: If even a cable between remote I/O or remote device stations is to be wired within this range, the maximum overall cable length shown above applies.																									
Connection cable	CC-Link Ver. 1.10 compatible cable (Shielded, 3-core twisted pair cable) *Only single vendor use in case of Ver.1.00 cable.																									



### ●How to become a member

Would you like to improve your FA, BA, and PA devices by making them compatible with the CC-Link Family? Are you interested in open FA devices that satisfy international standards? CLPA will support you by promoting related technologies and holding exhibitions and seminars in Japan and overseas.

◎ How to apply for a membership: Please access from our website.

※FA:Factory Automation / BA:Building Automation / PA:Process Automation



<https://www.cc-link.org>



( Japan · China · Europe · Americas · Korea · Taiwan · ASEAN · India · Turkey · Mexico · Thailand )

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