Overview of the CC-Link Partner Association (CLPA)
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.
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.

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

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

Marketing Task Force

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

mayı 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

| CLPA membership categories (price excluding tax) |

<table>
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<th>License fee used</th>
<th>CC-Link Family technology</th>
<th>Specifications</th>
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<td>CC-Link IE TSN</td>
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<td>SLMP connectable products</td>
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*1. SLMP-Seamless Message Protocol

*2. 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.

Registered members: JPY 50,000
Executive members: JPY 100,000
Board members: JPY 200,000

*3. Contact your local CLPA office.
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 forward with CLPA Partners!

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 forward with CLPA Partners!

Board of directors

MITSUBISHI ELECTRIC ENGINEERING COMPANY LIMITED
Mitsubishi Electric FA Industrial Products Corporation
MITSUBISHI ELECTRIC INFORMATION NETWORK CORPORATION
MITSUBISHI ELECTRIC MECHATRONICS SOFTWARE CORPORATION
MITSUBISHI ELECTRIC MICRO-COMPUTER APPLICATION SOFTWARE COMPANY LIMITED
MITSUBISHI ELECTRIC SYSTEM & SERVICE CO., LTD.
Mitsubishi Electric TOKKI Systems Corporation
Mitsubishi Electric Turkey Elektrik Urunleri A.S.
Molex Inc.
MOXA Inc.
MITT Corporation
MYUNGO CABLE CO.,LTD.
NADA ELECTRONICS, LTD
NADEX Co., Ltd.
Nanjing DECOYEL Automation CO. Ltd.
Nanjing Solidot Electronic Technology Co., Ltd.
NEC Corporation
Nel One Systems Co., Ltd.
NICHIDEN SHOKO CO.,LTD.
Nichigoh communication electric wire co., Ltd.
NINGBO RONGHE WIRE & CABLE CO.,LTD.
Nippon Dampa Co., Ltd
NIPPON DENKI KENKYUSHO CO., LTD.
Nippon Seisen Cable, Ltd.
NITTA CORPORATION
NKE CORPORATION
Northwire,Inc.
NSD Corporation
NSK Ltd.
NTT Communications Corporation
O-DEAR INTERNATIONAL CORPORATION
OFS Fitel LLC
Okano Electric Wire Co.,Ltd.
Oki Electric Cable Co., Ltd.
OMRON Corporation
ONTEC CO.,LTD.
OPTEX FA CO.,LTD.
orientalmotor
ORing Industrial Networking Corp.
ORION ELECTRONICS
Palo Alto Networks k.k
panasonic Industrial Device SUNX Co
Panasonic Life Solutions Networks Co., Ltd.
Panduit, Corp.
Parker Hannifin
Pepperl + Fuchs GmbH
PEPPERL+FUCHS K.K.
Phoenix Contact GmbH & Co. KG
Phoenix Contact K.K
Pilz GmbH &Co
Pneumax S.P.A.
PROFICIENT (SHANGHAI) INTERNATIONAL CO.,LTD
Red Lion Controls
REJ Co., Ltd
RENESAS ELECTRONICS CORPORATION
RKI INSTRUMENT INC.
Robostar Co., Ltd
ROBOTEC Inc.
SAMWON ACT CO.,LTD.
SANSHA ELECTRIC MFG. CO.,LTD.
SANTEST CO., LTD
Sanwa Engineering Corp
Sanyo Machine Works. Ltd.
Sasaki Sekkei Co., Ltd.
Schneider Electric Japan Holdings Ltd.
SEIKO EPSON CORPORATION
Sekisui Jushi Cap-Ai System Co.,Ltd.
Servoland Corporation
Shanghai Ashiya Trading LTD.
Shanghai Automation Instrumentation Co., Ltd
Shanghai Golytec Automation CO.,LTD.
Shanghai Powerful Automation Technology Development Co., Ltd
Shanghai SUNCHU Electromechanical Device Co., Ltd
Shanghai Suntone Electronic Co., Ltd.
Sharp Corporation
SHIMADEN CO., LTD.
SHINKO TECHNOS CO., LTD
SHOEI ELECTRIC Co., Ltd.
SHOSHIN CORPORATION
Sichuan Odot Automation System Co., Ltd.
SICK AG
SILA Embedded Solutions GmbH
SINKA JAPAN CO., LTD.
SINSEONG IDOL
SMC CORPORATION
SN-TECH
Solartron Metrology Ltd
Spinner GmbH
SR Technology Co.,LTD.
STMicroelectronics K.K.
Sumitomo Heavy Industries,Ltd.
SUNHO AUTOMATION
Surpass Industry Co., Ltd.
 Suzhou Jia Zhan Science and Technology Co., Ltd.
SWCC SHOWA CABLE SYSTEMS CO., LTD.
TACHIBANA ELETECH CO., LTD.
TAIHAN ELECTRIC WIRE CO., LTD.
TAIYO CABLE (DONGGUAN) CO., LTD.
TAIYO CABLETEC CORPORATION
TAIYO ELECTRIC CO.,LTD.
TAIYO,LTD.
TAKIBISHI CORPORATION
Takikawa Engineering Co., Ltd.
TAMADIC Co., Ltd.
TAMAGAWA SEIKI CO., LTD.
TATSUTA ELECTRIC WIRE & CABLE CO.,LTD.
TEAC Corporation
Technical & Try Co., LTD
TESSERA TECHNOLOGY INC.
THK CO.,LTD.
Thomas Cable Co., Ltd.
Tianjin Geneuo Technology Co., Ltd.
Tianjin Sentinel Electronics Co., Ltd.
TOGAMI ELECTRIC MFG. CO., LTD
Toho Technology Corporation
TOSIBA MACHINE CO., LTD.
Toshiba Schneider Inverter Corporation
TOYO ELECTRO CORPORATION
TOYO ELECTRIC MFG. CO.,LTD.
TOYOGIKEN CO., LTD.
TPC Mechatronics Corp.
Tyco Electronics Japan G.K.
U.I. Lapp GmbH
UNION DENSHI WORKS CO., LTD.
Unipulse Corporation
UNITEC Corp.
UNITED ELECTRIC WIRE (KUNSHAN) CO., LTD.
Valcom Co.,LTD.
VAT Vacuumventile AG
Wago Company of Japan, Ltd.
Weidmuller Interface GmbH & Co. KG
WITTENSTEIN ternary Co.,Ltd.
YAMAHA MOTOR CO., LTD.
YAMATO SCALE CO., LTD.
YASKAWA ELECTRIC CORPORATION
 Yokogawa Electric Corporation
YOSHINOGAWA ELECTRIC &CABLE
YOSSIO ELECTRONIC COMPANY
Zhejiang Wanma Group Special Electronic Cable Co., Ltd.
Zhejiang Zhaolong Interconnect Technology Co., Ltd.

Alphabetical listing by company name for Regular Members and above (as of May 29th, 2020)
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 CLPA was established, it is expected to reach more than 3793 member firms in financial year 2019 (as of the end of March 2019). 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 2000 models. Partner companies also receive the benefit of their products being promoted in various CC-Link Partner Association activities free of charge, including the CLPA Partner Product Search Tool.

As a sign of our global acceptance, the total number of shipped devices is approx. 30 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.

Growing CLPA members

Increase in number of CC-Link compatible products

Increase in number of shipped nodes (Unit: 10000 nodes)

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

IIFFES2019
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.

High-level Technology and Ease-of-Use
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, 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.

From a Japanese de facto standard to a Global Standard

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<td>IEC61158, IEC61784-2 : CC-Link IE Field published in August 2014</td>
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<td>IEC61784-3-8 : CC-Link Safety published in June 2016</td>
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<td>Taiwan Standards: CNS</td>
<td>CNS 52573 : CC-Link published in May 2009</td>
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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.

**Development Support**

As part of various support activities, in addition to CLPA-sponsored seminars, there are seminars hosted by our Board Members (such as Mitsubishi Electric Corporation). These are intended to provide useful information for all users of the CC-Link Family, from novices to experts.

**Consider Development**

Select the station type, certification class, development method, etc. It is possible to use various development methods (dedicated communication LSI, embedded module, software stack, etc.) provided by the corresponding development tool partner manufacturer.

**How to Become a Member**

In order to develop and sell CC-Link Family compatible products, you must first become a regular, executive or board member of the CC-Link Partner Association. Visit the CC-Link Partner Association website below to apply for membership.

**Inquiries/Consulting**

In addition to consultation on product development, seminars sponsored by development tool partner manufacturers are also held. Please contact the manufacturer.

**Technical Support**

Support for technical questions in the process of development. Please contact the manufacturers.

**Development Tool Sales**

Please contact the manufacturer.

**Development/Evaluation**

We provide detailed designs of hardware and software for products to be developed. Download the conformance test specifications, system profile (CSP+) specifications, CSP+ creation guidelines, and CSP+ support tools from the CLPA website.

**CLPA**

Provision of Technical Specifications

CLPA provides CC-Link Family Specifications for development methodologies free of charge. For details, please refer to "Development Method Guide".

**Partner Manufacturers**

Provision of Conformance Test Specifications

CLPA offers member firms the "CC-Link Conformance Test" specifications for free, applicable to developed products.

**Development Tool**

Consider Development

Select the station type, certification class, development method, etc. It is possible to use various development methods (dedicated communication LSI, embedded module, software stack, etc.) provided by the corresponding development tool partner manufacturer.

**Inquiries/Consulting**

In addition to consultation on product development, seminars sponsored by development tool partner manufacturers are also held. Please contact the manufacturer.

**Development Tool Sales**

Please contact the manufacturer.

**Technical Support**

Support for technical questions in the process of development. Please contact the manufacturers.
**Testing Laboratory**
CLPA conducts conformance tests. The member firms use the conformance test facilities to test CC-Link Family compatible products in various ways. The noise test, hardware test, software test and combined test among others enable verification of correct performance.

*Testing Laboratory*

**Promotion 1**
"CLPA Partner Product Search Tool" is available, fully covering all the CC-Link Family compatible products that the member manufacturers have developed and put on the market. CLPA provides users with diversified solutions.

*CLPA Partner Product Search Tool*
https://www.cc-link.org/en/downloads/index.html#section-A

**Promotion 2**
By registering compatible product information, products can be published on the CLPA website.

**Mass Production Planning-Evaluation**
Make a prototype based on the design and perform various evaluations.

**Do Conformance Tests**
Perform conformance tests for each model based on the "Conformance Test Specification". To facilitate the conformance testing process, the CC-Link Partner Association has test centers available in Japan and overseas.

* A certificate will be issued after a conformance test is passed.

**Sales**
Products that have passed the conformance test can be sold as compatible products. In order to promote products on the CLPA website, the product information must be added by the partner manufacturer.

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**What is a Conformance Test?**
- A conformance test is to be conducted on each model to ensure reliable communication between CC-Link Family compatible products.
- Your products need to be tested to ensure that your products meet the CC-Link Family communication specifications and can be connected to CC-Link networks.
- We offer test tools for CC-Link IE Field Basic, SLMP and open tools for CC-Link IE TSN.

By conducting the conformance test, you can:
- ensure the communication reliability of your product with the CC-Link Family, and
- easily design system configurations where products of different manufacturers and models are connected.

*The conformance test is to ensure that the product meets the common specification of CC-Link Family. The conformance test is not intended to ensure the performance and quality of the product itself.*
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*

With the adoption of TSN (Time-Sensitive Networking) Ethernet communication technology as a time sharing method to enable flexible IIoT system construction.

1. **Accurate time stamp information and advanced analysis**
   - Collection of field data with accurate time stamp information
   - Improvement of analysis accuracy by application of AI

2. **Network integration**
   - Coexistence of multi-protocols on a single trunk
   - Realize simultaneous FA real time control and IT layer seamless communication
   - Handle general, motion 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 networks and 5G**
   - Construct production lines free of wiring constraints
   - Wiring-free system construction

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**IT System**
- Big data analysis
- Production management
- Productivity improvement

**Edge Computing**
- Process
- Analysis
- Feedback of field data

**OT (Operational Technology)**
- Acquisition of Production Equipment data

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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 IE TSN” - a new industrial open network that combines traditional open networks (CC-Link IE Control/CC-Link IE Field) with motion control. By adopting TSN technology, the network is made more open with enhanced performance and functions.

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Integration of networks:

![Diagram showing integration of networks](image)

Dramatic reduction of communication cycles:

![Diagram showing time sharing method](image)

Roadmap:

- “CC-Link IE TSN” - a new industrial open network that combines traditional open networks (CC-Link IE Control/CC-Link IE Field) with motion control. By adopting TSN technology, the network is made more open with enhanced performance and functions.
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

Use cases

Coating data is processed at high speed by inter-controller communication

Ring connection

Line-Star connection

Provides robot and equipment status via IP communication

IPC

Cloud

ERP System

MES System

Controller

Computer

Controller

Controller

Robot

Robot

Robot

Inverter

Remote I/O

Safety remote I/O

Remote I/O

Robot

Safety Input/Output

General Input/Output

Standard Ethernet
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

- Ring connection
- Line
- Star connection

- Safety Input/Output
- General Input/Output

- Coating data is processed at high speed by inter-controller communication

- Cloud
- ERP System
- MES System
- IPC

- Robot
- Robot Inverter
- Remote I/O

- Controller
- Computer

- Standard Ethernet

---

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

Image data (traceability data) can be sent directly to upper system

CC-LinkIE TSN

Import data of mark sensor/acceleration sensor

Shutter output
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).

CC-LinkIE TSN

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

**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.

**CC-Link, CC-Link/LT, CC-Link Safety**

CC-Link is the existing fieldbus network for typical field control applications. CC-Link/LT is a cost saving network for small I/O applications. CC-Link Safety is specialized for use to meet demanding safety network requirements.

**SLMP**

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.
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.

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

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)


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

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.

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.
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.


- 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 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.

**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 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, detachment of slave stations, automatic return, testing and monitoring provide a high reliability network system and allow the system down time to be minimized.

### Stand-by Master Function
Using CC-Link, a Stand-by Master station can assume control of network communications in the event that the Primary Master station becomes inoperable.

### Slave Station Detachment Function
In the event that a slave station stops communicating, CC-Link allows communication to continue with all other stations.

### Automatic Return Function
CC-Link automatically returns a detached station to full network operation when the fault is corrected.

### Testing and Monitoring Function
This function monitors data link status, and conducts a series of hardware and circuit tests.
### CC-Link IE TSN Specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication speed</td>
<td>1Gbps/100Mbps</td>
</tr>
<tr>
<td>Maximum cyclic size per station</td>
<td>Max. 4G (4,294,967,296) octet in total per station</td>
</tr>
<tr>
<td>Transient transmission</td>
<td>With the server function and client function for each station, the transmission capacity is the same as SLMP.</td>
</tr>
<tr>
<td>Communication method</td>
<td>Time sharing method</td>
</tr>
<tr>
<td>Synchronization function</td>
<td>Compliant with IEEE802.1AS and IEEE1588v2</td>
</tr>
<tr>
<td>Number of nodes connected to a single network</td>
<td>64,770 devices (total of master/slave stations) Up to 65535 devices for IP address class A.</td>
</tr>
</tbody>
</table>
| 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

<table>
<thead>
<tr>
<th>Twisted pair cable specifications</th>
</tr>
</thead>
</table>
| **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.  
• M12 connector (1 Gbps): The X-Coding 8-pin connector compliant with IEC 61076-2-109 is recommended.  
• M12 connector (100 Mbps): The D-Coding 4-pin connector compliant with IEC 61076-2-101 or X-Coding 8-pin connector compliant with IEC 61076-2-109 is recommended. |

<table>
<thead>
<tr>
<th>Optical fiber specifications</th>
<th>Optical fiber cable compliant with IEEE 802.3 1000BASE-SX (MMF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>IEC 60793-2-10 Types A1a.1 (50/125 μm multimode)</td>
</tr>
<tr>
<td>Transmission loss (max)</td>
<td>3.5 (dB/km) or less (λ = 850 nm)</td>
</tr>
<tr>
<td>Transmission band (min)</td>
<td>500 (MHz/km) or higher (λ = 850 nm)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Optical fiber specifications</th>
<th>GI type plastic optical fiber cable (GI-POF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Proposing IEC 60793-2-40 (core 55 μm, external diameter 490 μm multimode)</td>
</tr>
<tr>
<td>Transmission loss (max)</td>
<td>100 (dB/km) or less (λ = 850 nm)</td>
</tr>
<tr>
<td>Transmission band (min)</td>
<td>350 (MHz/km) or higher (λ = 850 nm)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connector specifications</th>
<th>Duplex LC type connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>IEC 61754-20: Type LC connector</td>
</tr>
<tr>
<td>Connection loss</td>
<td>0.3 (dB) or less</td>
</tr>
<tr>
<td>Polished surface</td>
<td>PC polishing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Optical fiber specifications</th>
<th>SI type plastic optical fiber cable (SI-POF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>—</td>
</tr>
<tr>
<td>Transmission loss (max)</td>
<td>170 (dB/km) or less (λ = 650 nm)</td>
</tr>
<tr>
<td>Transmission band (min)</td>
<td>10 (MHz/km) or higher (λ = 650 nm)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Optical fiber specifications</th>
<th>SI type plastic clad fiber cable (SI-PCF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>—</td>
</tr>
<tr>
<td>Transmission loss (max)</td>
<td>19 (dB/km) or less (λ = 650 nm)</td>
</tr>
<tr>
<td>Transmission band (min)</td>
<td>14 (MHz/km) or higher (λ = 850 nm)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connector specifications</th>
<th>F07 type connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>IEC 61754-16: Type PN connector</td>
</tr>
<tr>
<td>Connection loss</td>
<td>0.8 (dB) or less (for master fiber)</td>
</tr>
<tr>
<td>Polished surface</td>
<td>Not defined</td>
</tr>
</tbody>
</table>

*1. For the ring/star mixed and mesh wiring, use switches that can configure each topology.*
### CC-Link IE Control Network Specifications

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

### CC-Link IE Field Network Specifications

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

### CC-Link IE Field Basic Specifications

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum number of link points</strong></td>
<td><strong>Ver. 1.10</strong></td>
</tr>
<tr>
<td>Remote I/O (RX, RY)</td>
<td>2048 points each</td>
</tr>
<tr>
<td>Remote register (RWr)</td>
<td>256 words</td>
</tr>
<tr>
<td>Remote register (RWw)</td>
<td>256 words</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of link points per unit</th>
<th>1 station occupied</th>
<th>2 stations occupied</th>
<th>3 stations occupied</th>
<th>4 stations occupied</th>
</tr>
</thead>
<tbody>
<tr>
<td>RX, RY</td>
<td>32 points each</td>
<td>64 points each</td>
<td>96 points each</td>
<td>128 points each</td>
</tr>
<tr>
<td>RX, RW</td>
<td>4 points each</td>
<td>8 words each</td>
<td>16 words each</td>
<td>32 points each</td>
</tr>
<tr>
<td>RX, RY</td>
<td>12 points each</td>
<td>24 points each</td>
<td>32 points each</td>
<td>48 points each</td>
</tr>
<tr>
<td>RX, RW</td>
<td>16 points each</td>
<td>4 words each</td>
<td>32 points each</td>
<td>64 points each</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control specification</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Extended cyclic setting</td>
<td>–</td>
<td>1 time setting</td>
<td>2 time setting</td>
</tr>
</tbody>
</table>

| 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 \( (X^8 + X^2 + X + 1) \)

### 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

<table>
<thead>
<tr>
<th>Communication speed</th>
<th>Inter-station cable length</th>
<th>Max. overall cable extension length</th>
</tr>
</thead>
<tbody>
<tr>
<td>156kbaus</td>
<td>1300m</td>
<td></td>
</tr>
<tr>
<td>625kbaus</td>
<td>900m</td>
<td></td>
</tr>
<tr>
<td>25Mbaus</td>
<td>400m</td>
<td></td>
</tr>
<tr>
<td>5Mbaus</td>
<td>160m</td>
<td></td>
</tr>
<tr>
<td>10Mbaus</td>
<td>100m</td>
<td></td>
</tr>
</tbody>
</table>

#### 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

<table>
<thead>
<tr>
<th>Number of units connected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. 64 stations. It should satisfy the conditions below.</td>
</tr>
<tr>
<td>1. Number of all stations</td>
</tr>
<tr>
<td>a: Number of links that occupies 1 station, b: Number of links that occupies 2 stations, c: Number of links that occupies 3 stations, d: Number of links that occupies 4 stations</td>
</tr>
<tr>
<td>2. Number of units connected</td>
</tr>
<tr>
<td>16x1A+5x4B+8B+2x304</td>
</tr>
<tr>
<td>A: Number of remote I/O station units ——— Max. 64 units</td>
</tr>
<tr>
<td>B: Number of remote device station units ——— Max. 42 units</td>
</tr>
<tr>
<td>C: Number of local station, stand by master station and intelligent device station units ——— Max. 26 units</td>
</tr>
</tbody>
</table>

Ver.1.10

Max. 64 stations. It should satisfy the conditions below.

1. Number of all stations
\[ (a+b^2+c^3+d^4+e^6) = 64 \]
2. Total number of remote I/O points
\[ (a^2+b^2+c^4+d^6+e^8) = 26 \]
3. Total number of remote register points
\[ (a^2+b^2+c^4+d^6+e^8) = 2048 \]

4. Number of units connected
\[ 16x1A+5x4B+8B+2x304 \]
| 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**

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master station</td>
<td>Remote I/O station or Remote device station</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td><strong>3</strong></td>
</tr>
<tr>
<td>Max. overall cable extension length</td>
<td></td>
</tr>
<tr>
<td>&quot;1&quot;: Inter-station cable length between remote I/O or remote device stations</td>
<td></td>
</tr>
<tr>
<td>&quot;2&quot;: Inter-station cable length between the master station and a local station or between an intelligent device station and the preceding following station</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Communication speed</th>
<th>Inter-stationable length</th>
<th>Max. overall cable extension length</th>
</tr>
</thead>
<tbody>
<tr>
<td>10kbits</td>
<td>1000 m</td>
<td></td>
</tr>
<tr>
<td>6Mbps</td>
<td>500 m</td>
<td></td>
</tr>
<tr>
<td>10kbits</td>
<td>500 m</td>
<td></td>
</tr>
<tr>
<td>20 cm or over</td>
<td>500 m</td>
<td></td>
</tr>
<tr>
<td>5Mmps</td>
<td>450 m</td>
<td></td>
</tr>
<tr>
<td>20 cm or over</td>
<td>450 m</td>
<td></td>
</tr>
<tr>
<td>5MHz</td>
<td>350 m</td>
<td></td>
</tr>
<tr>
<td>60 cm or over</td>
<td>350 m</td>
<td></td>
</tr>
<tr>
<td>10MHz</td>
<td>250 m</td>
<td></td>
</tr>
<tr>
<td>80 cm or over</td>
<td>250 m</td>
<td></td>
</tr>
<tr>
<td>1 m or over</td>
<td>250 m</td>
<td></td>
</tr>
<tr>
<td>2 m or over</td>
<td>250 m</td>
<td></td>
</tr>
<tr>
<td>3 m or over</td>
<td>250 m</td>
<td></td>
</tr>
</tbody>
</table>

(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)

* Cables of different manufacturers cannot be used together.*
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.

How to become a member

https://www.cc-link.org

CC-Link Partner Association
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