CC-Link Family Compatible Products

Development Method Guide

CC-Link **IE** *C**ontrol*
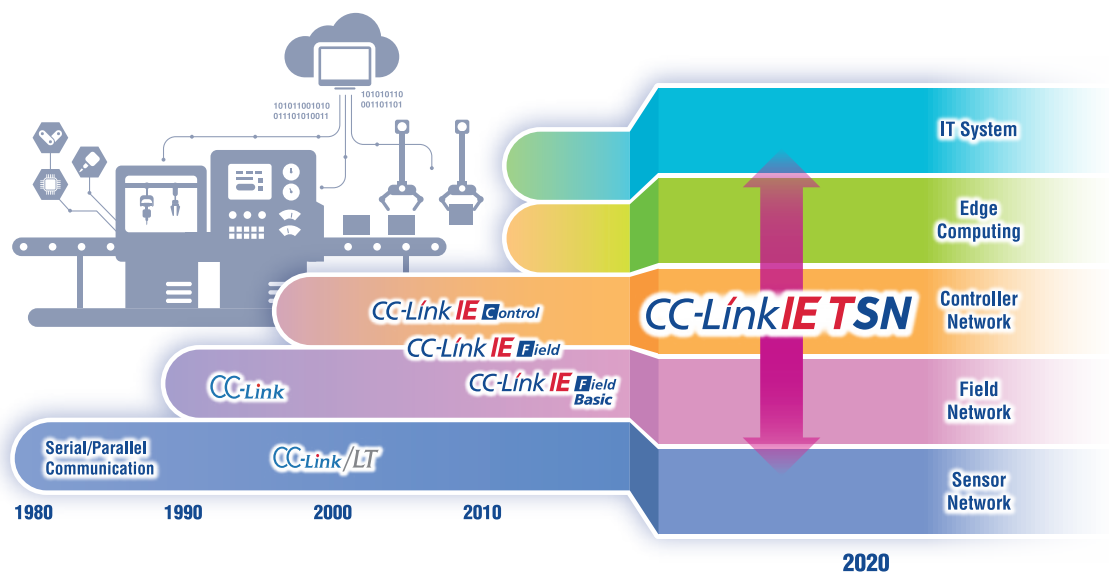
CC-Link **IE** *F**ield*

CC-Link **IE** *F**ield* *Basic*

CC-Link

SLMP
Seamless Message Protocol

The CC-Link Family realizes the seamless connection from the sensor level to the controller level and further to enable OT/IT convergence.

"The CC-Link Partner Association (CLPA) was established in 2000 to develop and promote the CC-Link open fieldbus. Since that time, the market demands for industrial open networks have changed continuously and both the CLPA and CC-Link technology have always been one step ahead. In 2007, CC-Link IE Controller Network was announced as the first open industrial network based on 1 Gbps Ethernet. This was followed by CC-Link IE Field Network in 2009. In 2018, CLPA released the specifications of CC-Link IE TSN, the first open industrial Ethernet to combine gigabit bandwidth with Time-Sensitive Networking (TSN). The CLPA is now focused on driving further adoption of CC-Link IE TSN worldwide."

INDEX

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.
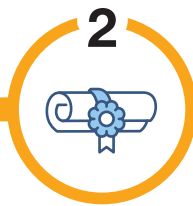
Flow from development to sales of partner manufacturers

1 Consider Development

For the details, see P.5

Select the station type, certification class, development method, etc. It is possible to use various development methods provided by the corresponding development tool partner manufacturer.

2 How to Become a Member

For the details, see P.34

In order to develop and sell CC-Link Family compatible products, you must first become a regular member or higher of the CC-Link Partner Association.

3 Development/ Evaluation

We provide detailed designs of hardware and software for products to be developed.

Full support from CLPA!

Development Support

For those who are developing CC-Link family products for the first time, we can introduce you to development tool partners and provide individual technical support on development methods. CLPA also offers seminars for developers.

Provision of technical specifications and conformance test specifications

Provided free of charge by CLPA
· Specifications for the Development of CC-Link Family Compatible Products
· "Conformance Test Specification" for conformance testing of developed products

Support at development tool partner manufacturers

■ 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/ Technical Support

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

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Do Conformance Tests

For the details, see P.15 to 17

The manufacturer's test and the association's test are taken for each model based on the "Conformance Test Specifications". 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.

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Sales

Products that have passed the conformance test can be sold as compatible products. If you wish to promote your product on the CLPA website, please register your product information on the Members website.

Conformance Test Application

Registering | Requested | CLPA Accepted | Testing in progress | Certified | Completed

You can apply for the conformance test and check your progress from the Members website.

Testing Laboratory

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.

Promotion

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

Product Development Steps

Conformance Test

Introduction to CC-Link Family compatible
Products Development Methodology

Main Specifications for
CC-Link Family of Networks

How to become a CLPA Member

Step 3 — Select the development method
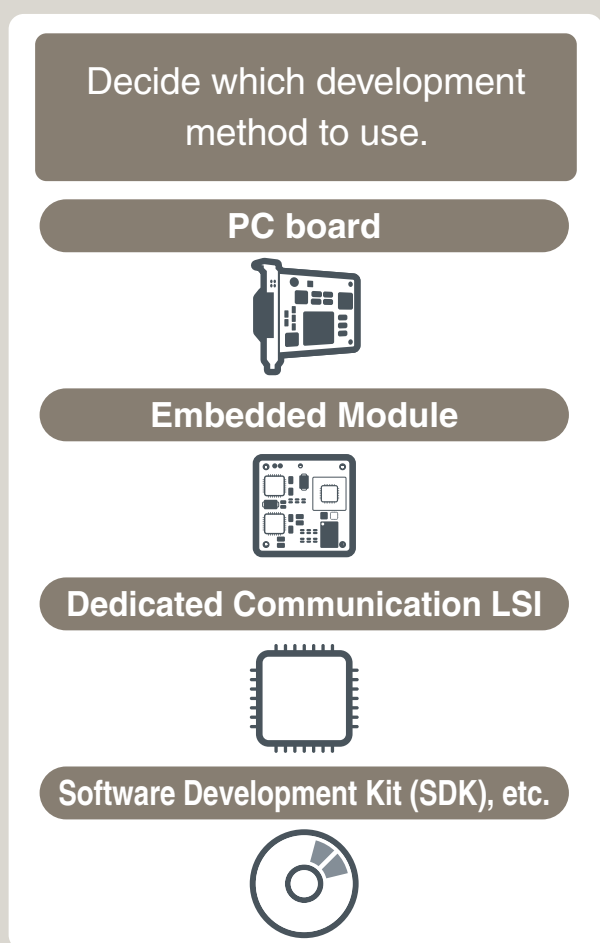
Step 4 — Select the development location

Decide which development method to use.

PC board

Embedded Module

Dedicated Communication LSI

Software Development Kit (SDK), etc.

Decide where to conduct development.

Develop in-house

Or...

Use a contracted development manufacturer

☞ P.11
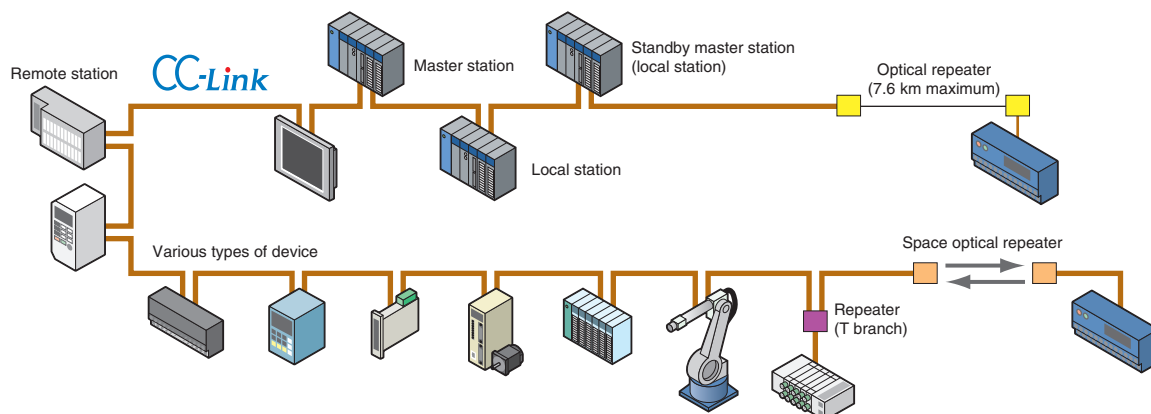
☞ P.12

Step 1

Selecting a network type

CC-Link

CC-Link is an RS485-based field network.
CC-Link offers a fast, stable input/output response and has a great potential for expansion with a high degree of flexibility. On the strength of this overwhelming performance, it has established a significant track record and gained user confidence as an open field network which originated in Japan and has grown into a world standard status. CC-Link is the most popular of the CC-Link Family of networks and continues to move along the path of evolution in the future.

Advantages

- Abundant relevant products, more than 1,000 varieties, available from the affiliated partners
- A network-compliant product can be developed with ease and at low cost.
- CC-Link Ver. 2 provides for cyclic transmission with higher-capacity.

Remote station　　CC-Link　　Master station　　Standby master station (local station)　　Optical repeater (7.6 km maximum)

Local station

Various types of device

Space optical repeater

Repeater (T branch)

CC-Link IE Control

CC-Link IE Controller Network is a gigabit Ethernet-based controller network.
It serves as a main-line network for use within factory premises that manages coordination between a large-scale distributed controller system and individual field networks.

Advantages

- Employs gigabit Ethernet technology to achieve super-high speed, large-capacity network-type shared-memory communications.
- A redundant transmission path (loop-back communication) enables highly-reliable communication.
- A powerful network diagnostic function

CC-Link IE Control

| Step 1 Selecting a network type	Step 2 Selecting a station type	Step 3 Examining a development methodology	Step 4 Selecting a location for development
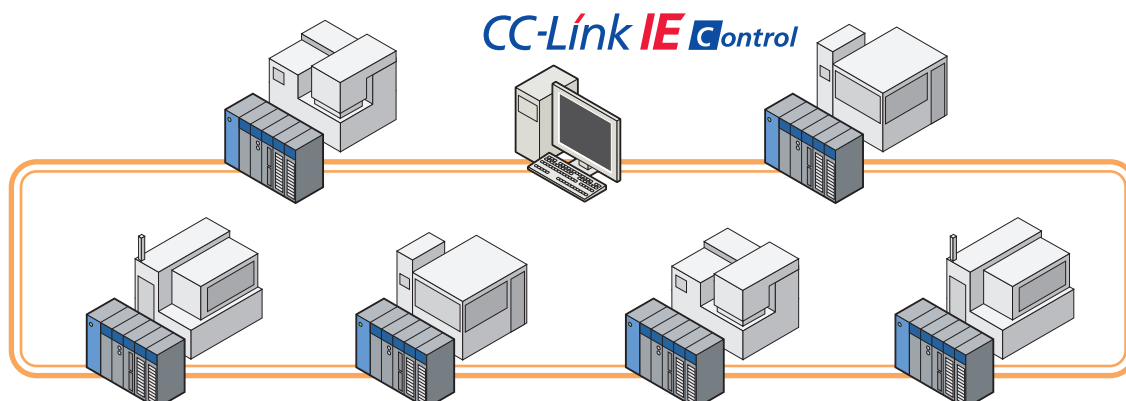
CC-Link IE Field

CC-Link IE Field Network is a gigabit Ethernet-based field network.
Under an open, seamless network environment, it accommodates multiple control requirements from high-speed I/O control to distributed controller system with a single network. Cables can be flexibly arranged along with the layout of the equipment.

Advantages
- A gigabit transmission capability and a real-time protocol enable communication between control data and administrative data without stress.
- A broad latitude in the choice of network topologies
- A powerful network diagnostic function

CC-Link IE Field Basic

SLMP
Seamless Message Protocol
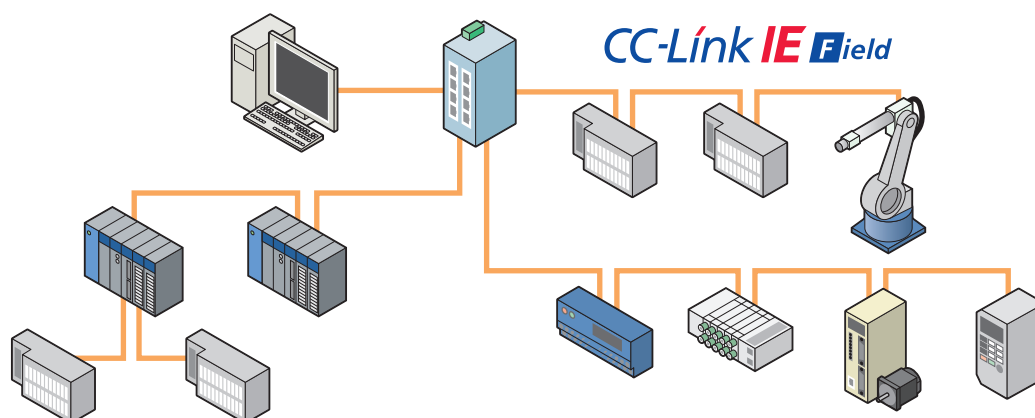
CC-Link IE Field Network Basic is the CC-Link IE communication that utilizes general-purpose Ethernet technology that can easily be applied to the small-scale devices that do not require high speed control, and easily be used and developed. It enables the cyclic transmission of CC-Link IE Field Network using software.

A common protocol which provides for a seamless connection between the CC-Link IE and Ethernet products. All you have to do to make your Ethernet product SLMP-compatible is develop a software program that is needed. It is very simple.
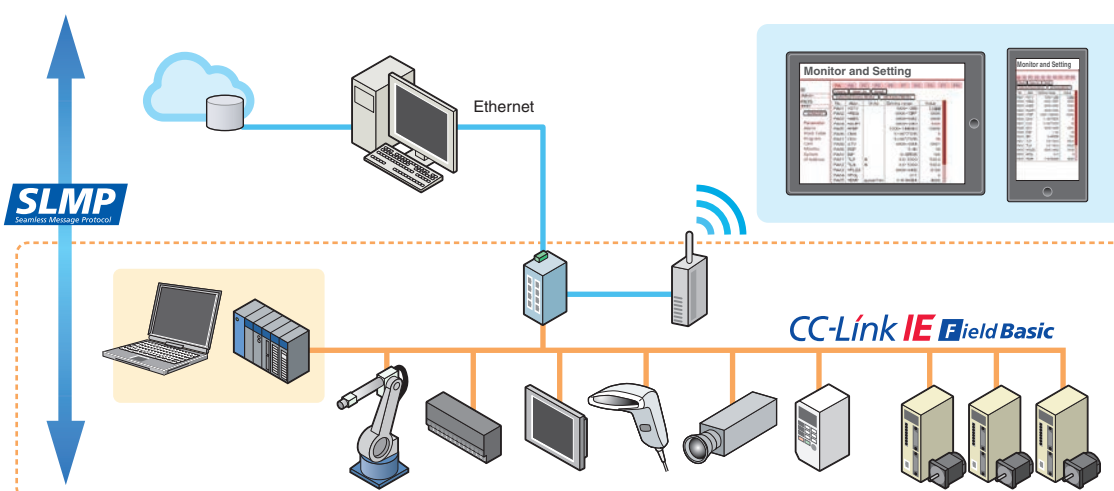
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Step
2 Selecting a station type

Master/local station

CC-Link | CC-Link IE Control | CC-Link IE Field

• Master station :The master station controls the entire network.
One master station is required for one network.
• Local station :The local station performs transient transmission
with the master station or other local stations, in
addition to cyclic transmission of bit data and
word data.

Conceivable devices (examples)

Programmable controller   Personal computer

Control station /normal station

CC-Link | CC-Link IE Control | CC-Link IE Field

• Control station :The control station controls the entire network.
One control station is required for one network.
The control station assigns a scope of cyclic
transmission to each station.
• Normal station :The normal station performs cyclic transmission
and transient transmission according to the
scope assigned by the control station.

Conceivable devices (examples)

Programmable controller   Personal computer   HMI

Intelligent device station

CC-Link | CC-Link IE Control | CC-Link IE Field

• The intelligent device station performs transient
transmission with the master station, in addition to
cyclic transmission of bit data and word data.

Conceivable devices (examples)

HMI

Cyclic transmission

CC-Link | CC-Link IE Control | CC-Link IE Field

Communication performed periodically within the same network is called "cyclic transmission".
The interval at which cyclic transmission takes place can be determined by calculations. This, coupled with small variances, makes cyclic transmission an ideal communication mode for the field network which is required to exhibit a good periodicity in its control functions.

Transient transmission

CC-Link | CC-Link IE Control | CC-Link IE Field

Communication performed only when a communication request is output within the same network is called "transient transmission".
Transient transmission is used to send or receive message(s), in an arbitrary timing independent of the cyclic transmission, as when reading or writing PLC data from an HMI.

Bit data and word data

CC-Link | CC-Link IE Control | CC-Link IE Field

Data handled in cyclic transmission is classified into two major types: bid data (remote input/output) which includes on/off information and word data (remote register) which includes analog information.
A remote I/O station can handle only work with bit data.

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| Step 1 | Selecting a network type | Step 2 | Selecting a station type | Step 3 | Examining a development methodology | Step 4 | Selecting a location for development |

Remote device station

CC-Link   CC-Link IE Control   CC-Link IE Field

• A station where cyclic transmission of bit data and word data can be performed.

Conceivable devices (examples)

Analog I/O   Inverter   Servo   Indicator

Remote I/O station

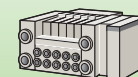CC-Link   CC-Link IE Control   CC-Link IE Field

• A station where the cyclic transmission of bit data can place be performed.

Conceivable devices (examples)

Digital I/O   Solenoid valve

Number of occupied stations

CC-Link   CC-Link IE Control   CC-Link IE Field

Because, in a CC-Link network, the amount of data assignable to a single station is predetermined, the number of occupied stations is set from 1 to 4 based on the amount of data handled by one piece of equipment.

Amount of data per station

Bit data (remote I/O): 32 bits each for input and output
Word data (remote register): 4 words each for input and output

The greater the number of occupied stations, the greater the amount of data that can be handled by one piece of equipment however, the number of equipment connectable within the entire network decreases accordingly.

Step 3 — Examining a development methodology

| Step 1 | Selecting a network type | Step 2 | Selecting a station type | Step 3 | Examining a development methodology | Step 4 | Selecting a location for development |

CC-Link Family Specifications

CC-Link Partner Association furnishes its members free of cost with documents containing protocol specifications for constituent networks of the CC-Link Family. These specifications will permit you to develop your own product that is connectable to CC-Link. For information about the documents issued by CC-Link Partner Association, see "Documents" on its website (https://www.cc-link.org/).

But we will have trouble starting from scratch on our own, loading the protocol onto our computers.

You will be able to make use of a proven development method that is presented by your fellow partner.

It is possible to develop a product in-house according to the specifications issued by CC-Link Partner Association, but any of development methods disclosed by its members for varying types of network (dedicated communication LSI, built-in module, or driver for a PC board) could be utilized to achieve that goal with ease and in a short period of time.
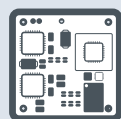
Development methodology
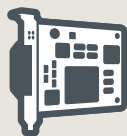
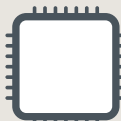| Methodology		Network type considered
•PC board	**Advantages** • This methodology can be used on various types of operating systems including the real-time operating system.	CC-Link, SLMP, CC-Link IE Control, CC-Link IE Field, CC-Link IE Field Basic
	Disadvantages • This methodology can be used only on personal computers. It is difficult to be applied on field equipment such as remote I/O.	
•Embedded Module	**Advantages** • Communication functions can be provided merely by installing the module into an end-user's board. • This methodology can be used on several types of network easily.	CC-Link, CC-Link IE Field
	Disadvantages • There are limits to downsizing. • The increased production results in more costs.	
•Dedicated communication LSI	**Advantages** • A network-compatible product can be developed without concern for constraints from protocol. • Communication circuits can be easily downsized.	CC-Link, CC-Link IE Field
	Disadvantages • Development requires a higher level of technical competence and a longer period of time compared with the built-in module approach.	
•Software Development Kit (SDK), etc.	**Advantages** • Just developing a software program enables a new SLMP-compatible product to be created. • Conformance test is only checking the functions of software.	SLMP, CC-Link IE Field Basic
	Disadvantages • Cyclic transmission cannot be performed. • Products directly connected to CC-Link IE have a higher performance ability, including communication speed.	

Step 4 — Selecting a location for development

Step 1 Selecting a network type

Step 2 Selecting a station type

Step 3 Examining a development methodology

Step 4 Selecting a location for development

Developing a product in-house

You can develop a proprietary communication interface in-house by employing various development methods described in this document.

But we will have trouble developing one all on our own.

You will be able to make use of contract development services.

As a way to get around problems with the availability of technical expertise and manpower which are associated with the in-house development option, you may commission the building of hardware and/or software needed for the communication interface to a contract developer.
For more details, see the relevant page.

Selecting a network/station type

Examples in CC-Link

The following table provides a summary of differences among station types, taking the CC-Link network as an example.
Duration of time required for development may differ depending on conditions that are involved. Refer to the table as a guide only.

	Amount of data per station		Number of occupied stations	Communication method		Object to be developed		Estimated duration of time required	Conceivable devices (examples)	Development methodology		
Remote I/O station	Bit data I/O **32** bits each	Word data I/O **4** words each	**1** station	Cyclic transmission	Transient transmission	Hardware	Software	**1** to **2** months	•Digital I/O •Solenoid valve	Dedicated communication LSI	Built-in module	Driver for a PC board
Remote device station	Bit data I/O **32** bits each	Word data I/O **4** words each	**1** to **4** station	Cyclic transmission	Transient transmission	Hardware	Software	**3** to **4** months	•Analog I/O •Inverter •Servo •Indicator	Dedicated communication LSI	Built-in module	Driver for a PC board
Intelligent device station	Bit data I/O **32** bits each	Word data I/O **4** words each	**1** to **4** station	Cyclic transmission	Transient transmission	Hardware	Software	**6** to **12** months	•HMI	Dedicated communication LSI	Built-in module	Driver for a PC board
Master/local station	Bit data I/O **32** bits each	Word data I/O **4** words each	**1** to **4** station	Cyclic transmission	Transient transmission	Hardware	Software	**6** to **12** months	•Programmable controller •Personal computer	Dedicated communication LSI	Built-in module	Driver for a PC board

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■ Control & Communication System Profile Plus

CSP+

CSP+

CSP+ is an abbreviation for Control & Communication System Profile Plus. It is a profile that describes information (network parameter information, memory map, etc.) required for the startup, operation and maintenance of CC-Link Family compatible devices. As CSP+ has integrated profile specifications, all CC-Link Family protocols can be described in the same format. By using CSP+, CC-Link Family users can easily set parameters for each model with the same engineering tool.

Advantages of CSP+ Development

❶ Integrated engineering tool environment

Development vendors of CC-Link Family compatible products do not need to create separate engineering tools as long as CSP+ files for the developed products are created. Furthermore, the profile notation according to applications such as diagnostics and energy management makes it possible to display dedicated screens with layouts specialized for each application in the engineering tool.

❷ Reduced support operations

Since the network parameter information and memory map are described in the CSP+ file, CC-Link Family users can set network parameters and create comments without needing a manual. Also, since device parameters can be set and monitored without a program, user support operations for development vendors will be reduced.

❸ XML format adopted

As CSP+ compatible files are in XML format, a general-purpose XML processing library can be used. Therefore, development vendors can reduce the time required for profile development.

CSP+ conformance testing

With the addition of CSP+ test items, conformance tests will be operated as follows.

❶ Partners developing new CC-Link Family compatible products

As of April 2013, it is necessary to take the CSP+ test in addition to the conventional device tests based on the new conformance test specifications.

❷ Partners who already have certified products

Development of CSP+ is optional for products that have already been certified.
In addition, conformance testing will be conducted free of charge for CSP+.

Flow of CSP+ operations

(1) Using the CSP+ creation support tool (can be downloaded from the CC-Link Partner Association website), development vendors create profiles for the CC-Link Family compatible devices.

(2) After the above file is created, a conformance test is conducted at the CC-Link Partner Association, and the certified file will be posted on the CC-Link Partner Association website.

(3) CC-Link Family users can download the CSP+ files describing the profiles of the CC-Link Protocol Family connected devices created by development vendors of CC-Link Family compatible products from the website of CC-Link Partner Association or the development vendor.

(4) The CC-Link Family user will use an engineering tool that can use CSP+, import the CSP+ file of the device downloaded in (3), and implement engineering for the device.

	①Create	②Conformance	③Release	④Use
Operation Method	Create a profile using the CSP+ creation support tool		Product packaged — Available online (CC-Link Partner Association Partner / CC-Link Partner Association)	Engineering Tools (Monitoring, Diagnosis, Parameter Setting, etc.) — CSP+
Target Users	• CC-Link Family product development vendor	• CC-Link Partner Association	• CC-Link Family product development vendor • CC-Link Partner Association	• CC-Link users

Refer to the following URL. https://www.cc-link.org/en/cclink/cspplus/index.html

Memo

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Taking a conformance test

When your product has been developed, a conformance test conducted by CC-Link Partner Association is performed on the product. Once the product passes the test, it can be marketed as a CC-Link-compatible product.

What is the conformance test?

A product to be certified as a CC-Link Family compatible is subjected to testing on communication operations, the procedure of which is defined by CLPA. The test is conducted to verify whether the product satisfies the prescribed CC-Link communication specification and thus can be connected to CC-Link networks.

By taking the conformance test

- Reliability can be assured for your product in terms of CC-Link communications.
- A system can be smoothly configured between products manufactured by different manufacturers or between different models upon interconnection.

Conformance test items

1 Noise test
2 Hardware test
3 Software test
4 Combination test
5 Interoperability test
6 Aging test
7 CSP+ verification test

⚠ **Caution**
- The conformance test is intended to verify whether the product concerned satisfies the prescribed CC-Link communication specification. Inherent functions of the product are beyond the scope of this test.
- A satisfactory completion of the conformance test does not constitute or imply CLPA's guarantee or endorsement of the product's performance or quality.

The test for CC-Link IE Field Network Basic and SLMP is basically performed by developers using a test tool.

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Procedure for taking a conformance test

1	Read the regulations for the conformance test.		Regulation Confirmation
2	Obtain test specifications applicable to the developed product from CLPA.		Obtain specifications
3	Perform the test in-house as specified in the test specification or test tools.		In-house test
4	Apply for testing through the Members website. * In case of test tools, proceed to 8.		Test Application
5	A test date is informed by CLPA.		Test Schedule Issued
6	Send CLPA the product and a copy of the in-house test report by the date scheduled for the start of the test.		Sending of documents and equipment
7	Test starts.		Test
8	A test result is reported.		Result
9	A certificate of conformance and a test report are sent to the applicant.		Sending of certification documents

Taking a conformance test

Test items and implementation division

Conformance test items are classified into two groups: those performed beforehand by the partner or member of CC-Link Partner Association and those performed by CLPA. Some of the test items are conducted by both the partner and the association.
The partner has to ensure that the product concerned passes all the test items before a test starts at CLPA.

Examples of CC-Link test items to be implemented beforehand by the partner

• Power supply noise test (common mode)
• Cable (bundled cable) noise test
• Measurement of stray capacitance across communication terminals
• Cable limit length test

Recommended parts

For CC-Link and CC-Link/LT, the test contains test items intended to check some of the parts making up the "physical layer" to identify their manufacturer and type name.
In regard to CC-link, additional test items are imposed if anything other than CLPA-recommended parts are used.

Document/material and devices required for preliminary testing by the partner

Documents

• **CC-Link conformance test specification**

For information about the type of the conformance test specification, see "Documents" on the CLPA's website (https://www.cc-link.org/).

Equipment and material

• **Programmable controller** (master station)
Use a programmable controller certified.

• **Impulse noise simulator** (for power supply noise test and cable (bundled cable) noise test)

• **Engineering tool for a programmable controller**
Use an engineering tool certified.

• **LCR meter** (for measurement of stray capacitance across communication terminals)
A meter that allows for a measurement frequency requirement of 10 MHz.

• **CC-Link cable**
Use a cable certified.
Required cable length
(number of pieces): 5 m (1), 200 m (1)

Memo

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MITSUBISHI ELECTRIC CORPORATION

For technical support

MITSUBISHI ELECTRIC CORPORATION Open System Center
E-mail: OSC@rj.MitsubishiElectric.co.jp

For a speedy development of a CC-Link Family compatible product.

MITSUBISHI ELECTRIC
Changes for the Better

Mitsubishi Electric is ready to assist you from consulting to the provision of product development tools.
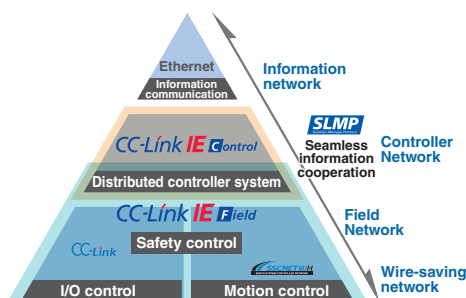
Making your products compatible with CC-Link Family, an open field network originating from Japan ———
That will not only ensure the level of system flexibility distinctively characteristic of multi-vendor products but also provide you with the opportunity to boost the competitiveness of your products to the global level once and for all.
With various certifications, including International Organization for Standardization ISO 15745-5[1], IEC 61158 and 61784[2], SEMI[3], Chinese National Standards GB[4], Korean Industrial Standards KS[5], and Japanese Industrial Standards JIS[6], CC-Link has lived up to its name as a global standard. To ensure quick and certain development of CC-Link Family compatible products, such as new generation CC-Link IE Controller Network and CC-Link IE Field Network, Mitsubishi Electric will support you in every phase of development, including the provision of development tools.

[1] Application Integration Framework   [2] Industrial Field bus protocol standard   [3] SEMI E54.12 E54.23-0513
[4] GB/T 19760 20299.4   [5] KSB ISO 15745-5   [6] JIS TR B0031
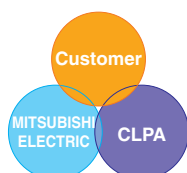
Technical support for development of CC-Link Family compatible products

- **Backup and support** ······ A variety of CC-Link Family-related technical documents are available, for a fee, and technical support is provided via member-only e-mail.
- **Open System Center** ······ Your inquiries are accepted 9:00 to 12:00 and 13:00 to 17:00 (every day of the week - except for Saturdays, Sundays and our company holidays) E-mail: OSC@rj.MitsubishiElectric.co.jp

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CC-Link IE Control

Control Station, Nomal Station

■ Driver Development
Drivers for various operating systems can be developed for use of the Mitsubishi Electric PC interface board (Q80BD-J71GP21-SX).

CC-Link IE Field

### Master Station, Local Station

■ Driver Development
Drivers for various operating systems can be developed for use of the Mitsubishi Electric PC interface board (Q80BD-J71GF11-T2/Q81BD-J71GF11-T2).

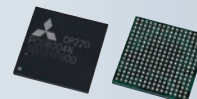### Intelligent Device Station, Remote Device Station

■ Communication LSI CP520 with GbE-PHY
This LSI integrates the CC-Link IE Field Network communication ASIC, MPU and GbE-PHY. CP520 allows you to develop devices that perform cyclic transmission and transient transmission without concern about protocol. It is applicable also to the motion function. CP520 is controlled with software.
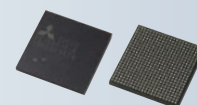
■ Dedicated communication LSI CP220*
CP220 is a communication LSI that allows you to develop devices that perform cyclic transmission and transient transmission without concern about protocol. It is applicable also to the motion function. CP220 is controlled with software.
* CP220 is designed for development of intelligent device stations.

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Master, Local and Intelligent Device Station

■ Built-in interface board Q50BD-CCV2

In this method, stations are developed using a built-in interface board. The CCLink master station, local station and intelligent device station functions are realized by mounting the interface board on a user circuit board.

Master Station, Local Station

■ Driver Development

Drivers for various operating systems can be developed for use of the Mitsubishi Electric PC interface board (Q80BD-J61BT11N).

Remote Device Station

### ■ Dedicated communication LSI MFP3N

MFP3N is a communication LSI that allows you to develop devices that handle bit data and word data without concern about protocol. MFP3N is controlled with software.
Support of both CC-Link Ver. 1 and Ver. 2 is possible by changing the software.

Remote I/O Station

■ Dedicated communication LSI MFP2N/MFP2AN

MFP2N and MFP2AN are communication LSIs that allow you to develop devices that handle bit data without concern about protocol. The two types are provided for different package sizes (number of pins) and I/O point quantity.
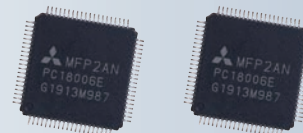
■ Embedded I/O Adapter

This small-sized Embedded adapter allows you to develop devices that handle bit data without concern about protocol. The adapter can be mounted directly on the circuit board you developed, and allows expansion of the number of I/O points through cascade connection. (A maximum of two adapters can be mounted on a single circuit.)

Hilscher Gesellschaft für Systemautomation mbH

Contact addresses

Hilscher Gesellschaft für Systemautomation mbH

Rheinstraße 15
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Germany
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Fax: +49 (0) 6190-9907-50
URL: https://www.hilscher.com
E-Mail: info@hilscher.com

Hilscher serves as your dependable partner in the development of CC-Link Family equipment.

hilscher

empowering communication

Hilscher offers the entire spectrum of CC-Link Family solutions you need - from the supply of various interface products to the development and production, on a contract basis, of such products to the organization of relevant workshops.

One for all

Industrial communication solutions with a common platform

One Partner ›› One Chip ›› All Systems

One Partner – One Chip – All Systems. From the standard product on to an **OEM module PC card**, **Gateway** and up to the **chip** – we offer a suitable solution for all requirements. When it comes to a solution for your industrial communications, place your trust in the technological market leader, **netX**, a solution for all fieldbuses and Real-time Ethernet: Made in Germany.

Features of the Hilscher CC-Link product technology

- Certified to CC-Link Family V2.0.
- Supports all profiles for a remote device (MFP3 equivalent).
- Dual port memory-based or serial host interfacing facilitates control operations.
- ARM core with built-in netX allows user applications to be installed.
- An application interface common to all the Hilscher products and protocols.
- Ensures a significant reduction in overall product development cost and a timely introduction into market.
- Easy-to-use configuration tool SYCON.net that is common to all.

■CC-Link·CC-Link IE Field Basic Communication Interfaces

■ASIC (communication controller)

The netX family of products comprises several multi-protocol network controllers which Hilscher developed to provide for an integration into automation equipment of every description (such as a drive, I/O, PLC, and barcode reader). The netX chip, is equipped with an ARM core CPU and contains a comprehensive set of peripheral functions. It also supports a variety of major protocols like field bus and industrial real-time Ethernet with one piece of hardware. Utilizing firmware supplied by Hilscher allows you to design your

original CC-Link interface.

Using a special NXHX software development boards also enables you to easily evaluate and develop CC-Link interfaces and user applications. Besides general-purpose hardware, NXHX has a built-in JTAG-USB interface as well as a JTAG interface that is the most common as a debugging interface so that netX Studio CDT, the Eclipse-based integrated development environment from Hilscher, can be used.

Best for the development of IIoT-enabled devices

	netX 51	netX 52	netX 90 Communication	netX 90 Application
CPU	ARM966E-S/100 MHz	ARM966E-S/100 MHz	Cortex-M4 at 100 MHz with MPU	Cortex-M4 at 100 MHz with MPU and FPU
	xPIC/100 MHz	xPIC/100 MHz	xPIC/100 MHz	xPIC/100 MHz
SRAM	672 K	672 K	576 KB	64 K
Flash	—	—	1024 KB	512 KB
Host interface	8/16/32 bit DPM	8/16/32 bit DPM	8/16 bit DPM	Internal 32 bit
	SPI/SQI 125 M	SPI/SQI 125 M	2x SPI/SQI 125 M	—
	MII (10/100 Mbps)	MII (10/100 Mbps)		MII (10/100 Mbps)
Communication channel	2 ch	2 ch	2 ch	—
	PHY/switch/hub	PHY/switch/hub	PHY/switch/hub	—
	IEEE 1588	IEEE 1588	IEEE 1588	IEEE 1588
Peripherals	UART/I2C/QSPI/CAN	UART/I2C/QSPI/CAN	UART/I2C	UART/I2C/QSPI/CAN
	IO-Link / USB 1.1 / MAC	IO-Link / USB 1.1 / MAC	MAC / MLED	IO-Link / MAC / MLED
	PIO / GPIO / MMIO	PIO / GPIO / MMIO	GPIO	PIO / GPIO / MMIO
		No SDRAM controller		
Mixed signal	Timer	Timer	Timer/ADC SAR	Timer/ADC SAR EnDat 2.2/BiSS / SSI
Security	—	—	Secure boot supporting various algorithms by the built-in crypto core / Monitoring by AHB firewall	
Housing	19 × 19 mm	15 × 15 mm	10 × 10 mm	
	BGA 324 pins / 1 mm pitch	BGA 244 pins / 0.8 mm pitch	BGA 144 pins / 0.8 mm pitch	

■CC-Link Compatible Communication Interfaces

■PC Card

The cifX communication interface provides, at a low cost, all elements including optimum performance capability, functionality, and flexibility. PCI, PCI Express and MiniPCI Express, all of which can be used on standard personal computers (each for use with a slave station only), are now available. Other form factors can be also developed for your projects. Drivers for major RTOSs are also available and come with a full package of software programs necessary for product development, such as configuration tool, driver, example, and manual.
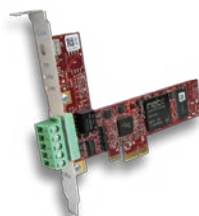
PC Card
cifX
- Low cost and Powerful for your system
- PCI / PCI Express / Mini PCI Express
- Driver for major OS (Windows / INtime / RTX / VxWorks / Linux / Windows CE / QNX) and OPC server

■Built-in Module

Hilscher's built-in modules represent a single-chip solution in the form of an integrated package of software and hardware suitable for CC-Link slave interface which is directly installed into various automation equipment such as controllers, PLCs, and drives. The high-end network controller "netX" permits all communication tasks to be executed using a microprocessor mounted. Because API is common to all the protocols, compatibility with other field buses or real-time Ethernet networks can be secured with great ease, simply by replacing existing Hilscher built-in modules such as comX and netIC.

Embedded Communication Module
comX
- Same host board for different protocol
- Dual Port Memory or Serial for host I/F
- Compact and Robust mechanical mount
- Reduce development time and cost

DIL-32 Communication IC Module
netIC
- Compact module for low cost device
- UART / SPI Serial I/F (Modbus RTU)
- CPU less design by SSIO

■CC-Link IE Field Compatible Communication Interfaces

- Intelligent Device Station in the CC-Link IE Field network
- Fixed Baud rate of 1 Gbit/s
- CSP+ configuration file
- Acyclic communication via SLMP
- Available as PC Card, Embedded module and netX technology

PCI Express Card
CIFX 50E-CCIES

Low Profile PCI Express Card
CIFX 70E-CCIES

■CC-Link IE Field Basic Compatible Communication Interfaces

- CC-Link IE Field Basic as Slave
- Baud rate of 100 Mbit/s
- Acyclic communication via SLMP
- Enable existing netX-based products with CC-Link IE Field Basic per software update
- Fits seamless in the Hilscher product portfolio and uses the same application interface, driver and tools

PCI Express Card
cifX Series

Built-in Module
netJACK Series

Built-in Module
comX Series

Built-in Module
netRAPID 90

HMS INDUSTRIAL NETWORKS

Anybus solutions offer you a sure way to easily succeed in the development of CC-Link/CC-Link IE Field equipment in a short period of time.

- **HMS has a host of solutions to offer for creating products which are compliant with CC-Link/CC-Link IE field networks.**
- **Chances are that you'll find the right solution for your needs.**
- **Anybus solutions enable you to put your CC-Link-compatible product to market in a short time.**

Anybus CompactCom 40 - CC-Link / CC-Link IE Field

Communication module provided in three built-in forms selectable according to hardware or specifications
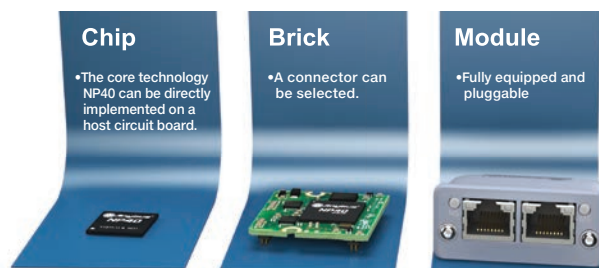
With Anybus CompactCom's three built-in forms of chip, brick, or module, choosing the optimum form to introduce is easy.
No matter which form is adopted, development man-hour and investment allow for the development of CC-Link / CC-Link IE Field* (slave) compatible devices, at a minimum, in order to ensure software compatibility. Development using the Anybus CompactCom provides the hardware compatibility and the developed hardware can be easily used on other networks.

Chip
- The core technology NP40 can be directly implemented on a host circuit board.

Brick
- A connector can be selected.

Module
- Fully equipped and pluggable

* No chip is available for C40 CC-Link IE Field/TSN.

A circuit board of a host device has an Anybus slot and 50 pin CompactFlash connector.

CC-Link IE TSN
(2022 December scheduled to be released)

Specifications	Chip	Brick	Module
Size (L x W x H)	17 x 17 mm	36 x 36 x 8 mm	52 x 50 x 22 mm 52 x 37 x 16 mm (without housing)
Application interface	- 8/16-bit parallel (30 ns access) - High-speed SPI, The baud rate can be set at up to 20 MHz. - Shift register (For I/O devices, cyclic transmission time: 82 µs) - UART (Backward compatibility with 30 series, up to 625 kbps)		
Application connector or PKG	BGA VF400 0.8 mm pitch	1.27 mm pitch Pitch header	50 pin CompactFlash connector
Power supply	3.3 VDC, 2.5 V, 1.2 V	3.3 VDC	3.3 VDC
Operating temperature	-40 to 100 °C	-40 to 85 °C	-40 to 70 °C -40 to 85 °C (without housing)

Type	Chip	Brick	Module	Features
CC-Link	*	AB6672	AB6602 AB6702 (without housing)	• CC-Link remote device station • Number of I/O points for CC-Link v.1.1 (default): Up to 128 points of bit data, 16 points of word data • Number of I/O points for CC-Link v.2.0: Up to 896 points of bit data, 128 points of word data • Supports baud rates in the range of 156 kbps to 10 Mbps • One to four stations can be occupied. 1X to 4X extended cyclic settings (v.2.0) only
CC-Link IE Field	–	AB6679	AB6609 AB6709 (without housing)	• Intelligent device station • Number of I/O points: Supports up to 1536 bytes of I/O data • Supports SLMP servers • Supports 1 Gbps

* For types, please contact HMS Industrial Networks.

Anybus Communicator RS232/422/485, CAN - CC-Link, CC-Link IE Field

Protocol converter that connects serial devices or CAN devices to CC-Link / CC-Link IE Field

Anybus Communicator RS232/422/485 and Anybus Communicator CAN are high-performance externally mounted serial converters that allow CC-Link / CC-Link IE Field support using the existing RS232/422/485 or CAN serial interface of your equipment.

Without taking up any space inside the control cabinet, this extremely compact product requires no program changes on the equipment side and can be easily mounted on a DIN standard rail.

Specifications	
Size (L x W x H)	120 x 75 x 27 mm
Mounting method	Mounting onto a DIN rail
Baud rate (serial side)	9.6kbps to 57.6kbps
CAN	1.0, 2.0A, 2.0B, 20kbit/s-1Mbit/s
Power supply	24V
Operating temperature	0 to 55°C
Connector (Serial) CAN	D-Sub 9 pin Female D-Sub 9 pin Male

Type	Communicator RS232/422/485	Communicator CAN	Features
CC-Link	AB7008	AB7321	• CC-Link remote device station • Number of I/O points for CC-Link v.2.0: Up to 896 points of bit data, 128 points of word data • Supports baud rates in the range of 156 kbps to 10 Mbps • One to four stations can be occupied. 1X to 4X extended cyclic settings (v.2.0) only
CC-Link IE Field	AB7077	n.a.	• Intelligent device station • Number of I/O points: Up to 832 points of bit data, 204 points of word data • Supports 1 Gbps

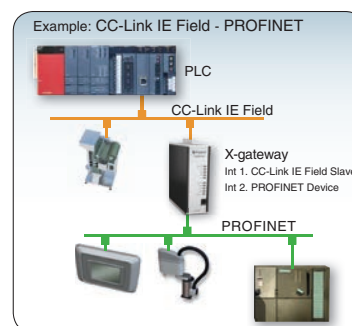## Anybus X-gateway - CC-Link / CC-Link IE Field

Network converter that connects CC-Link / CC-Link IE Field to other industrial networks and IIoT protocol

Anybus Communicator X-gateway facilitates I/O data transfers between varying types of networks and PLC systems, allowing for consistent communication of information throughout the entire plant. Connecting CC-Link and CC-Link IE Field to various types of industrial networks is also possible.

Specifications	
Size (L x W x H)	114 x 44 x 127 mm
Mounting method	Mounting onto a DIN rail
Power supply	24 V
Operating temperature	0 to 70°C

Features
• CC-Link remote device station • Number of I/O points for CC-Link v.2.0:   Up to 896 points of bit data, 128 points of word data • Supports baud rates in the range of 156 kbps to 10 Mbps • One to four stations can be occupied. 1X to 4X extended cyclic settings (v.2.0) only
• Intelligent device station • Number of I/O points: Up to 832 points of bit data, 204 points of word data • Supports 1 Gbps

Example: CC-Link IE Field - PROFINET

PLC

CC-Link IE Field

X-gateway
Int 1. CC-Link IE Field Slave
Int 2. PROFINET Device

PROFINET

Type/Network	PROFIBUS Master	DeviceNet Master	ASI Master	EtherNet/IP Master	CANopen Master**	Modbus-TCP Master**	EtherNet/IP Slave	Modbus-TCP Slave	PROFINET IO Slave	EtherCAT Slave	CC-Link IE Field Slave	PROFIBUS Slave	IIoT OPC UA/ MQTT
CC-Link	AB7810	AB7819	AB7830	AB7680	n.a.	AB9009	AB7841	AB7643	AB7661	AB7694	n.a.	AB7852	AB7562
CC-Link IE Field	AB7953	AB7955	n.a.	AB7957	n.a.	n.a.	AB7956	AB7958	AB7954	AB7961	n.a.	AB7959	AB7557

Type/Network	DeviceNet Slave	CANopen Slave	Modbus RTU Slave	CC-Link Slave	J1939**	LONWorks	ControlNet Slave	FIP Slave	Interbus Slave Cu	Interbus Slave Fo	Modbus Plus	PROFINET IRT Slave Cu	PROFINET IRT Slave Fo
CC-Link	AB7862	AB7897	AB7621	AB7626	n.a.	AB7627	AB7871	AB7879	AB7886	AB7892	AB7624	n.a.	n.a.
CC-Link IE Field	AB7960	AB7963	AB7964	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

* Products which support X-gateway CANopen Master, Modbus-TCP Master, and J1939 differ in shape.
** Standard Anybus products do not support the combinations marked with "n.a.". For details, please contact HMS Industrial Networks.

RENESAS ELECTRONICS CORPORATION

Contact addresses

Renesas Electronics Corporation
5-20-1, Josuihon-cho, Kodaira-shi, Tokyo, 187-8588, Japan
Phone: +81-42-320-7300
Fax: +81-42-327-8656
URL: http://www.renesas.com

The R-IN32 series supports development of CC-Link Family compatible products.

RENESAS

Providing total solutions to support customer product development, including LSI, development tools, and sample software and drivers.

LSI

Development tools

Software drivers

The "R-IN32 series" developed by Renesas Electronics for industrial communication is a product that can be used for slave device development for CC-Link Family products.

As a total solution including development tools such as an Arm development environment and development kit as well as sample software and drivers, and of course LSI, speedy and easy product development is possible.

In addition, various communication protocols including CC-Link Family are supported, allowing development as a platform.

The R-IN32 series is compatible with various CC-Link Family communication.

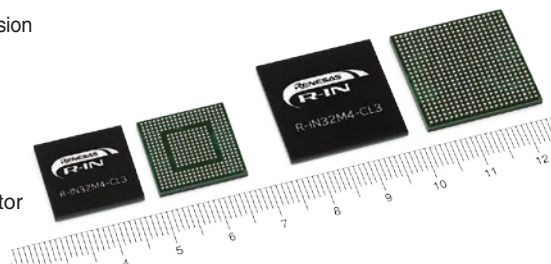| Station Type	CC-Link IE TSN Remote Station	CC-Link IE Field Intelligent Device Station	CC-Link Remote Device Station
R-IN32M4-CL3	○	○	—
R-IN32M3-CL	—	○	○
R-IN32M3-EC	—	—	○

R-IN32M4-CL3

• Supports Intelligent device station of CC-Link IE Field.
• Supports CC-Link IE TSN class B. Achieves highly accurate time synchronization and time-division communication.

The R-IN32M4-CL3 can realize "high-speed real-time response" and "high-precision communication control" that are important for Industrial ethernet communication.

Feature
- Time synchronization accuracy between devices ± 1us or less
- Integrate 2port GbE PHY, CPU, RAM(1.3MB) into One chip
- Inheriting multi-protocol support by R-IN engine
- Reduced mounting area due to small package and built-in PHY regulator
- Low power consumption (35% reduction with R-IN32M3-CL2)

* Please refer to the catalog "CC-Link IE TSN Compatible Product Development Method Guide" for more details.
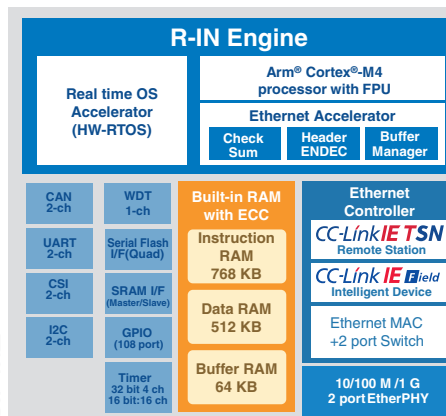
R-IN Series Lineup

	R-IN32M4-CL3		R-IN32M3-CL	R-IN32M3-EC
Product	R9A06G064MGBG	R9A06G064SGBG	UPD60510BF1-HN4-A	MC-10287BF1-HN4-A
R-IN32 engine	Arm® Cortex®-M4 Processor with FPU + Real-time OS accelerator + Ethernet accelerator		Arm® Cortex®-M3 32-bit RISC CPU(100 MHz) + Real-time OS accelerator + Ethernet accelerator	
Ethernet Controller	CC-Link IE TSN CC-Link IE Field		CC-Link IE Field	EtherCAT Slave controller
	10 M/100 M/1 G EthernetMAC + 2 port Switch			10 M/100 M EthernetMAC + 2 port Switch
	Built-in Gbit EtherPHY		—	2 port Ether PHY (10Base-T, 100Base-Tx/Fx)
Built-in RAM	Instruction RAM : 768 KB Data RAM : 512 KB Buffer RAM : 64 KB			
External I/F	116/32 bit CPU I/F, memory I/F, serial flash I/F, GPIO (max. 106)		16/32 bit CPU I/F, memory I/F, serial flash I/F, GPIO (max. 96)	
Built-in peripheral functions	Timer (32 bit:4 ch, 16 bit:16 ch), Watchdog-Timer (1 ch), UART (2 ch) I2C (2 ch), CAN (2 ch), CSI (2 ch), CC-Link (1 ch)		Timer (4 ch), Watchdog- Timer (1 ch), UART (2 ch), I2C (2 ch), CAN (2 ch), CSI (2 ch), CC-link (1 ch)	
Package	484 pin FBGA (23 mm×23 mm, 1 mm pitch)	356 pin FBGA (17 mm×17 mm, 0.8 mm pitch)	324 pin PBGA (19 mm x 19 mm, 1 mm pitch)	

■R-IN32M4-CL3

Product Specification

- CPU   Cortex-M4(100 MHz)
- RAM   1.3 MB with ECC
- Power 3.3 V±5%
         1.15 V±5%
- I/O   106 port(Max)
- 2 Port Ether PHY(10/100/1000)
- Peripherals
  - 32 bit external microcomputer I/F
  - UART
  - I2C
  - CSI
  - Timer
- Operating temperature range
  - Tj = -40 to +125°C
  - Ta = -40 to +85°C

Read the QR code for the details of R-IN32M4-CL3

Block Diagram

R-IN Engine

Real time OS Accelerator (HW-RTOS)

Arm® Cortex®-M4 processor with FPU

Ethernet Accelerator
| Check Sum | Header ENDEC | Buffer Manager |

CAN 2-ch	WDT 1-ch	Built-in RAM with ECC	Ethernet Controller
UART 2-ch	Serial Flash I/F(Quad)	Instruction RAM 768 KB	CC-Link IE TSN Remote Station
CSI 2-ch	SRAM I/F (Master/Slave)		CC-Link IE Field Intelligent Device
I2C 2-ch	GPIO (108 port)	Data RAM 512 KB	Ethernet MAC +2 port Switch
	Timer 32 bit 4 ch 16 bit:16 ch	Buffer RAM 64 KB	10/100 M /1 G 2 port EtherPHY

Evaluation tool

This kit simplifies development and evaluation of a product. Start software development for CC-Link Family now!

The kit contains:
- Evaluation board
- JTAG-ICE (I-jet Lite)
- EWARM (evaluation version)

Provided by Renesas Electronics
CC-Link Family sample software
R-IN32M4-CL3 driver

The evaluation board equipped with various peripheral functions enables you to evaluate R-IN32M4-CL3 comprehensively.

Functions in the evaluation board
- 2-port RJ45 Ethernet
- CSI
- I2C
- UART (USB)
- General purpose input (Switch)
- General purpose output (LED)

Provided by Renesas Electronics
CC-Link Family sample software
R-IN32M4-CL3 driver
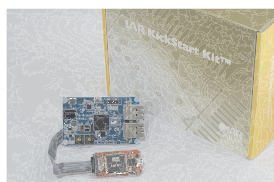
MACNICA, Inc.

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URL: https://www.alt.macnica.co.jp

<Contact Us>
https://f.msgs.jp/webapp/form/16344_qey_26/index.do

Indusrial 1st certified CC-Link IE Field IP Core for FPGA

Developed for Intel® FPGA and equivalent to the CP220 CC-Link IE Field intelligent device ASIC, it supports both cyclic & transient data exchange. Enabling CPU load off by specified & optimized to CC-Link IE Filed transmission.

■ Integrated CP220 equivalent function

- Integrated equivalent function to MITSUBISHI ELECTRIC's specified ASIC(CP220)
- For Intelligent device use
- Support both cyclic & transient data exchange
- RX/RY=each 2,048 bits, RWr/RWw=each 1,024 words
- Enabling CPU load off by using Intel® Corporation's soft core CPU Nios® II

■ IP Core Resouce(ALT-CLIEFA-USOC)

- Support low cost FPGA Cyclone® V E
- Logic Element : 37,000 LEs
- Internal RAM : 1,400,000 bits
- DSP block :   4 blocks
- PLL :   4 pcs
- Controlled by Nios®II connected to Avalon®-MM via Intel® Corporation's Platform Designer system-level integration tool

Industrial standard interface
Flexisble interface support not only AXI & Avalon but standard interface

High performance inter connect
NoC architecture based high speed inter connect

Platform Designer

Hierarchy design
System level hierarchy design

Real time debug support
Accelerate productivity

■ Utilize FPGA's merit

- It's poissble to integrate this IP & user's own design into ALTERA FPGA which is widely used in the industrial equipment market.
- Same to typical FPGA design flow & method by using Quartus® Prime
- Protect IP core by using external CPLD as of security chip

Quartus® Prime
Design Software

■ Development environment

- Industrial network kit (INK) as evaluation platform (should be prepared in addition to IP Core)
- Anctypted IP Core
- IP Core user's manual
- User's manual
- Sample design
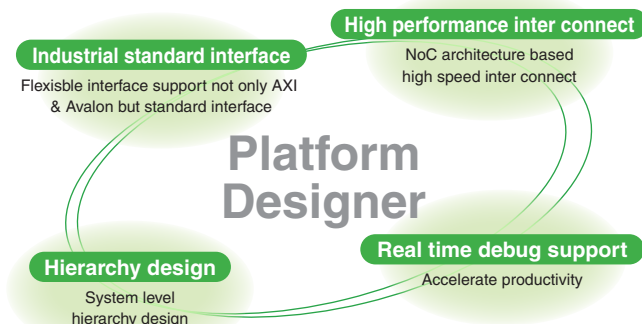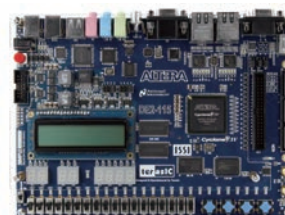
MACNICA, Inc.

◎ Foundation: 1991
◎ Headquarters: Yokohama city, Kanagawa
◎ Sites: Osaka, Nagoya, Utsunomiya
◎ Mission: Leading Edge Solution Provider

Top class distributor of both Intel® Corporation and so many leading edge foreign semiconductor suppliers, holding technical workshop, PLD design service, developing original board

Memo

Process Flow for Developing
CC-Link Family Compatible Products

Conformance Test

Introduction to CC-Link Family compatible
Products Development Methodology

Main Specifications for
CC-Link Family of Networks

How to become a CLPA Member

TEXAS INSTRUMENTS

Contact addresses

Texas Instruments Incorporated
12500 TI Blvd. Dallas, TX 75243
Phone: +1-972-995-2011
URL: www.ti.com

TI Sitara™ processors support CC-Link IE Field Basic and provide industrial grade solutions

Texas Instruments offers industrial grade devices to support 10+ year solutions with features like 100,000 power-on-hours at 105°C, high temperature availability up to 125°C, scalability through a combination of portfolio and unified Processor Software Development Kit (SDK), and excellent support through the E2E forums.

## TI's Sitara processors: designed for multiprotocol communications

Single to multicore Arm® processors with application-specific accelerators

1. CC-Link IEF Basic slave and master support on RTOS and Linux

2. Support for 10+ industrial communication protocols on each device

3. Tools, software and training resources available on TI.com

Sitara™
ARM® Processors

CC-Link IE Field Basic reference design for master and slave on TI Sitara processors
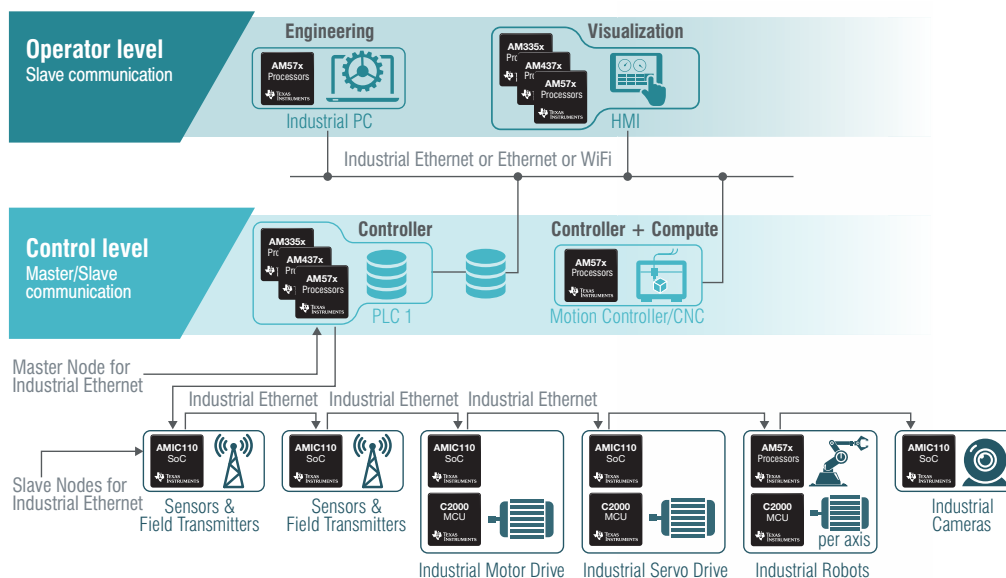
CC-Link IE Field Basic
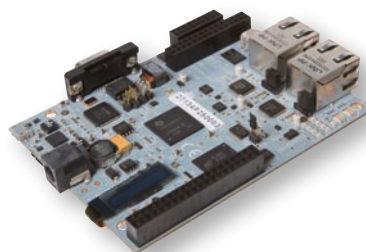
Supported by Processor SDK Linux and RTOS across Sitara processors including AMIC110, AM335x, AM437x, AM57x

Demonstrates that the implementation of CC-Link IE Field Basic on Sitara processors can meet CLPA certification critera

Key features include:
• SLMP supported on slave station
• Up to 64 slave stations supported by master
• Fully customizable with source code available

Find more information on TI's CC-Link IE Field Basic reference design at **www.ti.com/tool/TIDEP-0089**.

For more information on TI's Arm-based Sitara processors, visit **www.ti.com/sitara**.

Sitara processors that support CC-Link IE Field Basic

	AMIC110	AM335x	AM437x	AM57x
Core (s)	Cortex®-A8 up to 300 MHz	Cortex®-A8 up to 1 GHz	Cortex®-A9 up to 1 GHz	Single or Dual Cortex®-A15 up to 1.5 GHz + DSP
Co-Processor	PRU-ICSS[1]		2x PRU-ICSS	2x PRU-ICSS + up to 2x Cortex®-M4
Ethernet[2]	2x 10/100 MAC	2x 10/100 MAC + 2-port Gb switch		4x 10/100 MAC + 2-port Gb switch
Serial I/O	CAN, I2C, SPI, UART, USB2.0, GPIO		CAN, I2C, SPI, QSPI, UART, USB2.0, GPIO	PCIe, CAN, I2C, SPI, QSPI, UART, USB2.0, GPIO
Additional features	—	Display subsystem	Display subsystem	Display subsystem, video acceleration
	—	3D graphics acceleration		2D/3D graphics acceleration
	—	Crypto acceleration		
Evaluation Module	TMDXICE110	TMDSICE3359	TMDSIDK437x	TMDXIDK5728 TMDXIDK5718
Operating Temp (°C)	-40 to 105 °C			

(1) PRU-ICSS is an acronym for Programmable Real-time Unit Industrial Communications Subsystem.
    Each instance of PRU-ICSS contains two programmable real-time cores with a max performance of 200 MHz, among other peripherals.
(2) The 10/100 MACs are located in the PRU-ICSS and can be used for general-purpose Ethernet or industrial Ethernet.

Development Kits

TI's Industrial Development Kits (IDK) and Industrial Communications Engines (ICE) are standalone test, development, and evaluation modules that enable developers to write software and develop hardware for industrial control and industrial communications applications. Order one to start your CC-Link IEF Basic design now!

TMDXICE110	TMDSICE3359	TMDSIDK437x	TMDXIDK5728

Key features:
- AMIC110 processor
- Two 10/100 industrial Ethernet connectors with external magnetics
- 5-V input supply, single-chip power management IC (TPS650250) to power the entire board
- 512 MB of DDR3Texas Instruments™ LaunchPad™ compatible BoosterPack™ format
- 3.3-V SPI interface to C2000 F28069M LaunchPad

Key features:
- AM3359 processor
- On-board OLED display
- 1GB DDR3 memory
- Support for NOR Flash up to 32 Mb
- SPI Flash
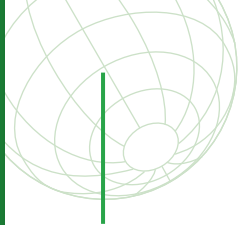- Power management IC (TPS65910)
- RoHS compliant

Key features:
- AM4379 processor
- 1 GB DDR3
- QSPI-NOR Flash
- Discrete power solution
- On-board 2 Mp camera
- EnDat2.2 connectivity for motor control

Key features:
- AM5728 processor
- 2 GB DDR3
- 4 Ethernet ports with concurrent operation (including 2 from PRU-ICSS)
- On-board eMMC
- Mini PCIe, USB3.0, and HDMI connectors

CC-Link IE Controller Network Specifications

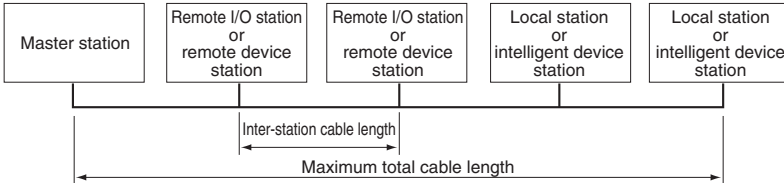| Item		Specifications	
		Transmission point extended mode	Normal mode
Communication speed		1 Gbps	
No. of nodes connected to a single network		120 units (1 management node and 119 normal nodes)	
Max. number of networks		239	
Max. number of groups		32 (may be registered to multiple groups)	
Maximum distance between nodes		• Optical fiber cable (IEEE802.3 compliant multimode fiber): 550 m • Twisted pair cable (IEEE802.3 compliant): 100 m	
Max. number of link points per network	LB	32 K points (32768 points, 4 K octets)	
	LW	128 K points (131072 points, 256 K octets)	
	LX	8 K points (8192 points, 1024 octets)	
	LY	8 K points (8192 points, 1024 octets)	
Maximum number of link points per station	LB	32 K points (32768 points, 4 K octets)	16 K points (16384 points, 2 K octets)
	LW	128 K points (131072 points, 256 K octets)	16 K points (16384 points, 2 K octets)
	LX	8 K points (8192 points, 1024 octets)	
	LY	8 K points (8192 points, 1024 octets)	
Transient transmission capacity		UP to 960 octets (data section)	
Topology		• Optical fiber cable: Ring • Twisted pair cable: Line, star, line/star mixed, ring	

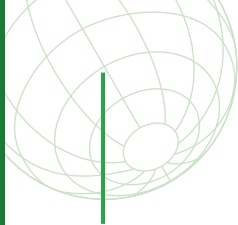## CC-Link IE Field Network Specifications

Item	Specifications
Communication speed	1Gbps
Ethernet Standards	IEEE802.3ab (1000BASE-T) compliant
Communication media	Shielded twisted pair cable (Category 5e), RJ-45 connector, M12
Communication control method	Token passing method
No. of nodes connected to a single network	254 modules (total of master and device stations)
Maximum station-to-station distance	100 m
Cyclic communication	Control signal (bit data): max. 32768 bits (4096 bytes) RX (device station → master station): 16384 bits RY (master station → device station): 16384 bits Control data (word data): Max. 16384 words (32768 bytes) RWr (device station → master station): 8192 words RWw (master station → device station): 8192 words
Transient transmission (message communication)	Message size: Max. 2048 bytes
Topology	Line, star, line/star mixed, ring

CC-Link IE Field Network Basic Specifications

Item		Specifications
Communication speed		100 Mbps * Must support 100 Mbps (1 Gbps support is optional.)
Implementation method		Software
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 (4 K points)
	RWr, RWw	4 K octets each (2 K points)
Max. number of link points/station (More than one station can be occupied.)	RX, RY	8 octets each (64 points) (fixed)
	RWr, RWw	64 octets each (32 points) (fixed)
Link scan time (16 stations connected)		10 ms
Transient transmission		Possible (max. 2 K octets)
Mix of communication protocols, TCP and IP		Supported
Topology		Line, star

CC-Link Specifications

Item			Specifications				
			Ver.1.10	Ver.2.00			
Control specification	Maximum number of link points	Remote I/O (RX, RY)	2048 bits each	8192 bits each			
		Remote register (RWr)	256 words	2048 words (master station ← device station)			
		Remote register (RWw)	256 words	2048 words (master station → device station)			
	Extended cyclic settings		–	1X setting	2X setting	4X setting	8X setting
	Maximum number of link points per station	1 station occupied — RX, RY	32 bits each	32 bits each	32 bits each	64 bits each	128 bits each
		1 station occupied — RWr, RWw	4 words each	4 words each	8 words each	16 words each	32 words each
		2 stations occupied — RX, RY	64 bits each	64 bits each	96 bits each	192 bits each	384 bits each
		2 stations occupied — RWr, RWw	8 words each	8 words each	16 words each	32 words each	64 words each
		3 stations occupied — RX, RY	96 bits each	96 bits each	160 bits each	320 bits each	640 bits each
		3 stations occupied — RWr, RWw	12 words each	12 words each	24 words each	48 words each	96 words each
		4 stations occupied — RX, RY	128 bits each	128 bits each	224 bits each	448 bits each	896 bits each
		4 stations occupied — RWr, RWw	16 words each	16 words each	64 words each	64 words each	128 words each
	Maximum number of occupied stations		4				
Communication specification	Transmission rate		10 M/5 M/2.5 M/625 k/156 kbps				
	Communication method		Broadcast-polling				
	Synchronization method		Frame synchronization				
	Encoding method		NRZI				
	Type of transmission path		Bus transmission (EIA RS485-compliant)				
	Transmission format		HDLC-compliant				
	Error control method		CRC ($X^{16}+X^{12}+X^5+1$)				
	Maximum number of modules connected		64				
	Device station number		1 to 64				

Maximum total cable length and inter-station cable length

CC-Link Ver.1.10-compliant cable (terminal resistance used: 110 Ω)

Transmission rate	Inter-station cable length	Maximum total cable length
156 kbps	More than 20 cm	1200 m
625 kbps		900 m
2.5 Mbps		400 m
5 Mbps		160 m
10 Mbps		100 m

When Ver.1.10- and Ver.1.00-compliant cables are used together, the maximum total cable length and inter-station cable length for the Ver.1.00-compliant cable apply.

Connection cable: CC-Link Ver.1.10-compliant cable (shielded 3-wire twisted-pair cable)
• Cables manufactured by different manufacturers can be used together if the cables are Ver.1.10-compliant.

Differences between CC-Link Ver.1.10 and Ver.2.00

	Number of modules connected
Ver.1.10	Up to 64, provided, however, that the following conditions are met: ① Total number of stations $a + b \times 2 + c \times 3 + d \times 4 \leq 64$ a: Number of modules occupying 1 station b: Number of modules occupying 2 stations c: Number of modules occupying 3 stations d: Number of modules occupying 4 stations ② Number of modules connected $16 \times A + 54 \times B + 88 \times C \leq 2304$ A: Remote I/O station ·· up to 64 B: Remote Device station ··· up to 42 C: Local and Intelligent Device stations ························ up to 26
Ver.2.00	Up to 64, provided, however, that the following conditions are met: ① Total number of stations $(a + a2 + a4 + a8) + (b + b2 + b4 + b8) \times 2 + (c + c2 + c4 + c8) \times 3 + (d + d2 + d4 + d8) \times 4 \leq 64$ ② Total number of remote I/O points $(a \times 32 + a2 \times 32 + a4 \times 64 + a8 \times 128) + (b \times 64 + b2 \times 96 + b4 \times 192 + b8 \times 384)$ $+ (c \times 96 + c2 \times 160 + c4 \times 320 + c8 \times 640) + (d \times 128 + d2 \times 224 + d4 \times 448 + d8 \times 896) \leq 8192$ ③ Total number of remote register words $(a \times 4 + a2 \times 8 + a4 \times 16 + a8 \times 32) + (b \times 8 + b2 \times 16 + b4 \times 32 + b8 \times 64)$ $+ (c \times 12 + c2 \times 24 + c4 \times 48 + c8 \times 96) + (d \times 16 + d2 \times 32 + d4 \times 64 + d8 \times 128) \leq 2048$ a: Number of modules, 1X setting, occupying 1 station b: Number of modules, 1X setting, occupying 2 stations c: Number of modules, 1X setting, occupying 3 stations d: Number of modules, 1X setting, occupying 4 stations a2: Number of modules, 2X setting, occupying 1 station b2: Number of modules, 2X setting, occupying 2 stations c2: Number of modules, 2X setting, occupying 3 stations d2: Number of modules, 2X setting, occupying 4 stations a4: Number of modules, 4X setting, occupying 1 station b4: Number of modules, 4X setting, occupying 2 stations c4: Number of modules, 4X setting, occupying 3 stations d4: Number of modules, 4X setting, occupying 4 stations a8: Number of modules, 8X setting, occupying 1 station b8: Number of modules, 8X setting, occupying 2 stations c8: Number of modules, 8X setting, occupying 3 stations d8: Number of modules, 8X setting, occupying 4 stations ④ Number of modules connected $16 \times A + 54 \times B + 88 \times C \leq 2304$ A: Remote I/O station ·· up to 64 B: Remote device station ··· up to 42 C: Local and intelligent device stations ························ up to 26 *: For Ver.1-compliant equipment, calculations are made on the basis of 1X setting being used.

Specification Downloads

https://www.cc-link.org/en/downloads/index.html#section-D

How to become a CLPA Member

■ In order to develop CC-Link Family compatible products...

You need to join the CC-Link Partner Association.

Sign up for a new membership.
https://www.cc-link.org/en/clpa/members/index.html

■ CC-Link Partner Association Membership Category

Regular Members Executive Members Board Members	• Development of CC-Link Family compatible products • Sales of CC-Link Family compatible products • Use of CC-Link logo • Technical support from the CC-Link Partner Association • Product promotion (website, exhibition, etc.) by the CC-Link Partner Association
Registered Members	• Only provides access to CC-Link Family specifications

■ Rights and Fees by Membership Category

Rights & Fees/Membership			Registered Member	Regular Member	Executive Member	Board Member
Annual Fees Amount of money in ( ) shows monthly fees for intermediate enrollment.			Not charged (free)	100,000 yen (9,000 yen)	200,000 yen (18,000 yen)	1 million yen (84,000 yen)
Initial Fee			Not charged (free)			1 million yen
The right to obtain the CC-Link Family specifications free of charge			Yes			
The right to use SLMP technology			Yes			
The right to use the CC-Link Family technology			No	Yes		
Conformance Test Fees (per product)	CC-Link IE TSN	- Master/Local Station - Remote Station - Development tool	N/A	100,000 yen	50,000 yen	Not charged (included in annual fees)
	CC-Link IE Safety	- IESMAP - IESSLP - Development tool		300,000 yen	200,000 yen	
	CC-Link IE Field Network Basic	- Master/Remote Station - Development tool		Not Charged (free)	Not Charged (free)	
	CC-Link IE Field Network	- Master/Local Station - Intelligent Device Station - Development tool		400,000 yen	300,000 yen	
	CC-Link IE Controller Network	- Normal Station - Control Station - Development tool		400,000 yen	300,000 yen	
	CC-Link/LT	- Master Station - Remote I/O Station - Cable - Development tool		300,000 yen	200,000 yen	
	CC-Link	- Remote Device Station - Remote I/O Station - Cable - Development tool		300,000 yen	200,000 yen	
		- Master/Local Station - Intelligent Device Station - Development tool		400,000 yen	300,000 yen	
Recommended - wiring Product Test Fees (per product)	CC-Link IE TSN	- Cables - Connectors - Switches, etc.		100,000 yen	50,000 yen	
	CC-Link IE Field Network	- Cables - Connectors - Switches, etc.		150,000 yen	100,000 yen	
	CC-Link IE Controller Network	- Cables - Media converters, etc.		150,000 yen	100,000 yen	
Tool Test Fees (per product)	CC-Link IE TSN	- Software etc.		100,000 yen	50,000 yen	
The right to use the CC-Link Family logo			No[1]	Yes		
Technical support			No	Yes		
Publishing products in home page/Electronic Partner Product Catalog (No charge)			No	Yes		
Promotion at fairs			No	Yes		
Information about events Posting of company name on CLPA web site			Yes			

＊1 As long as it does not conflict with the rights of other partners, you may use the logo for promotional purposes only.

● 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

New publication, effective Feb. 2023
Specifications subject to change without notice

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