English version

CC-Link Family compatible Products

Development Method Guide

CC-Link **IE** **C**ontrol

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

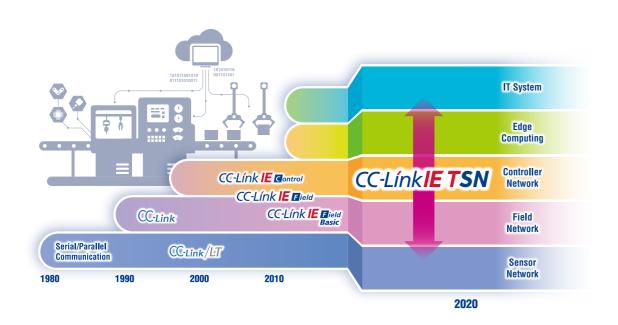CC-Link **IE** **F**ield **Basic**

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 Control was announced as the first open industrial network based on 1 Gbps Ethernet. This was followed by CC-Link IE Field 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

CLPA

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.

CLPA

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.

Provision of Technical Specifications

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

Provision of Conformance Test Specifications

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

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
https://www.cc-link.org/en/support/testlab/index.html

Promotion①

"Electronic Partner Product Catalog" 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.

Electronic Partner Product Catalog
https://www.cc-link.org/en/downloads/index.html#section-A

Promotion②

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

Partner Manufacturers

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.

See P.5 to P.12, P.19 to P.30

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.

CC-Link Link Partner Association
https://www.cc-link.org/en/clpa/members/index.html

See P.37

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.

For downloads
https://www.cc-link.org/en/downloads/index.html

See P.13

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.

See P.15 to P.17

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.
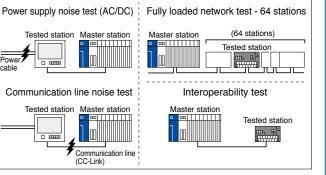
Development Tool Manufacturer

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.

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.

Test Cases

Power supply noise test (AC/DC)
Tested station Master station
Power cable

Fully loaded network test - 64 stations
Master station (64 stations)
Tested station

Communication line noise test
Tested station Master station
Communication line (CC-Link)

Interoperability test
Master station
Tested station

* 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.

Product Development Steps

Step 1 Selecting a network type

Step 2 Selecting a station type

Step 3 Select the development method

Step 4 Select the development location

First identify the type of a network with which your product will comply.

CC-Link
CC-Link IE Control
CC-Link IE Field
CC-Link IE Field Basic
SLMP
Seamless Message Protocol

Identify the type of a station with which your product will comply.

Remote I/O station

Remote Device station

Intelligent Device station

Master/Local station

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.07

☞ P.09

☞ P.11

☞ P.12

Step 1 — Selecting a network type

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
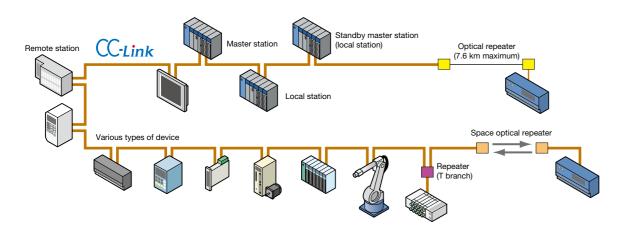
CC-Link

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
Master station
Standby master station (local station)
Optical repeater (7.6 km maximum)
Local station
Various types of device
Space optical repeater
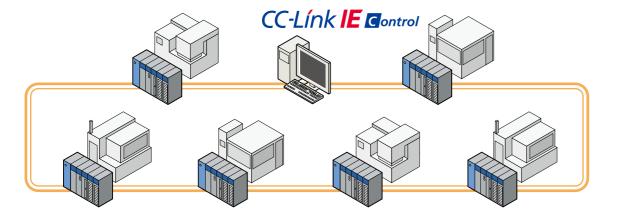Repeater (T branch)

CC-Link IE Control

CC-Link IE Control 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
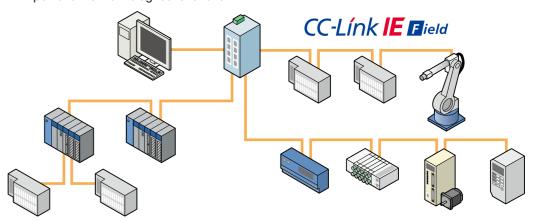
CC-Link IE Control

CC-Link IE Field

CC-Link IE Field 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

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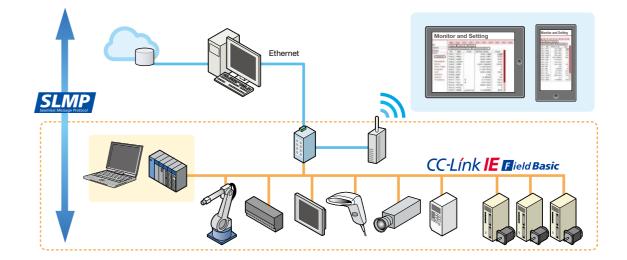
CC-Link IE Field Basic is the CC-Link IE communication that utilizes general-purpose Ethernet technology that can easily be applied to the small-scale devices that do not require high speed control, and easily be used and developed. It enables the cyclic transmission of CC-Link IE Field Network using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

SLMP Seamless Message Protocol

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.

SLMP
Seamless Message Protocol

Ethernet
Monitor and Setting

CC-Link IE Field Basic

Step 2 Selecting a station type

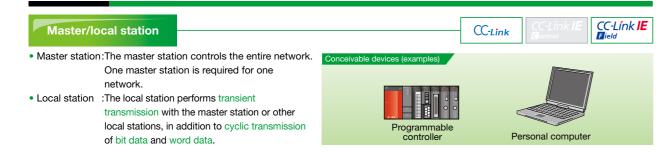Step 1 Selecting a network type → Step 2 Selecting a station type → Step 3 Examining a development methodology → Step 4 Selecting a location for development

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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.
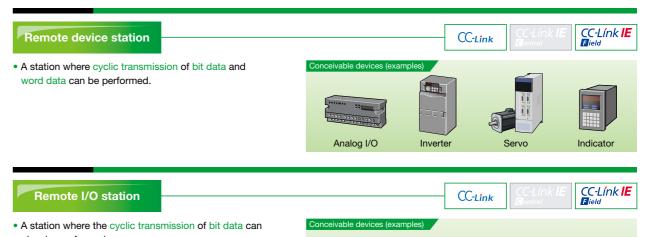
Conceivable devices (examples)

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

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 placebe performed.

Conceivable devices (examples)

Digital I/O | Solenoid valve

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.

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

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

•PC board

| Advantages | • This methodology can be used on various types of operating systems including the real-time operating system. |
| Disadvantages | • This methodology can be used only on personal computers. It is difficult to be applied on field equipment such as remote I/O. |

Network type considered: CC-Link, SLMP, CC-Link IE Control, CC-Link IE Field, CC-Link IE Field Basic

•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. |
| Disadvantages | • There are limits to downsizing.
• The increased production results in more costs. |

Network type considered: CC-Link, SLMP, CC-Link IE Control, CC-Link IE Field, CC-Link IE Field Basic

•Dedicated communication LSI

| Advantages | • A network-compatible product can be developed without concern for constraints from protocol.
• Communication circuits can be easily downsized. |
| Disadvantages | • Development requires a higher level of technical competence and a longer period of time compared with the built-in module approach. |

Network type considered: CC-Link, SLMP, CC-Link IE Control, CC-Link IE Field, CC-Link IE Field Basic

•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. |
| Disadvantages | • Cyclic transmission cannot be performed.
• Products directly connected to CC-Link IE have a higher performance ability, including communication speed. |

Network type considered: CC-Link, SLMP, CC-Link IE Control, CC-Link IE Field, CC-Link IE Field Basic

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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

■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

❶Integrated 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.

❷Reduced 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.

❸XML 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.

❶Partners 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.

❷Partners 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.

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+
	①Create	②Conformance	③Release	④Use
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

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

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.

Procedure for taking a conformance test

Read the regulations for the conformance test.

↓

Request CLPA for the test specification that applies to the developed product.

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

↓

Perform the test in-house using the test specification or the test tool.

> Your product needs to pass all of the in-house test items before taking a conformance test by CLPA.

Using the test specification | Using the test tool

↓

Apply for the conformance test, using the prescribed request form.

↓

A test date is informed by CLPA.

↓

Send CLPA the product and a copy of the in-house test report by the date scheduled for the start of the test.

> The test takes about 2 weeks.
> The partner company concerned does not need to attend the test in principle.
> If you wish to witness the test, contact the pertinent CPLA office in advance.

↓

Test starts.

↓

A test result is reported.

↓

A certificate of conformance and a test report are sent to the applicant.

Taking a conformance test

Memo

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.

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

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

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

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

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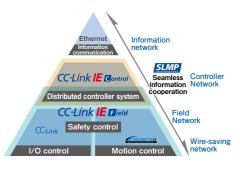
MITSUBISHI ELECTRIC CORPORATION

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 Control 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

Customer
MITSUBISHI ELECTRIC   CLPA

- **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

CC-Link IE Control

Driver Development

■ **Driver Development**

Drivers for various operating systems can be developed for use of the Mitsubishi Electric PC interface board (Q80BD-J71GP21-SX).
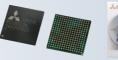
CC-Link IE Field

Master Station

■ **Source Code Development**

Develop a master station using source codes. A master station can be designed with higher flexibility by combining source codes and communication LSI. It is applicable also to the motion function.

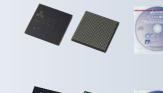#### Intelligent Device Station, Remote Device Station

■ **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.

CC-Link IE Field

Driver Development

■ **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).

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.

■ **Object development**

In this method, stations are developed using the object code and the device kit. By developing with object codes, a design with higher flexibility can be achieved compared to using the built-in interface board.

CC-Link

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.)

Driver Development

■ **Driver Development**

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

Hilscher Gesellschaft für Systemautomation mbH

Contact addresses

Hilscher Gesellschaft für Systemautomation mbH

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

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	**Application**
CPU	ARM966E-S/100MHz	ARM966E-S/100MHz	Cortex-M4 at 100 MHz with MPU	Cortex-M4 at 100 MHz with MPU and FPU
	xPIC/100MHz	xPIC/100MHz	xPIC/100MHz	xPIC/100MHz
SRAM	672K	672K	576 KB	64K
Flash	—	—	1024 KB	512 KB
Host interface	8/16/32bit DPM	8/16/32bit DPM	8/16bit DPM	Internal 32bit
	SPI/SQI 125M	SPI/SQI 125M	2x SPI/SQI 125M	—
	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 × 19mm	15 × 15mm	10 × 10mm	
	BGA 324 pins / 1mm pitch	BGA 244 pins / 0.8mm pitch	BGA 144 pins / 0.8mm 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

Embedded Module
COMX 51CA-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 Series

Contact addresses

HMS INDUSTRIAL NETWORKS

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URL: https://www.hms-networks.com/

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 **Anybus®** BY HMS NETWORKS

✔ **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.**
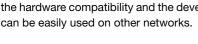
Anybus CompactCom 40 - CC-Link / CC-Link IE Field

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.

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

CC-Link IE TSN
(2021/Q3 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 (30ns access) - High-speed SPI, The baud rate can be set at up to 20MHz. - Shift register (For I/O devices, cyclic transmission time: 82µs) - UART (Backward compatibility with 30 series, up to 625kbps)		
Application connector or PKG	BGA VF400 0.8mm pitch	1.27mm pitch Pitch header	50 pin CompactFlash connector
Power supply	3.3 VDC, 2.5V, 1.2V	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)

CC-Link

CC-Link IE Field

Type	Chip	Brick	Module	Features

CC-Link	*	AB6672	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 156kbps to 10Mbps
				• 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 1Gbps

* 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 156kbps to 10Mbps • 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 1Gbps

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	24V
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 156kbps to 10Mbps • 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 1Gbps

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	EtherCAT 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.

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

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.

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.

	CC-Link IE TSN	CC-Link IE Field	CC-Link
Station Type	Remote Station	Intelligent Device Station	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(100MHz) + Real-time OS accelerator + Ethernet accelerator	
Ethernet Controller	CC-Link IE TSN CC-Link IE Field		CC-Link IE Field	EtherCAT Slave controller
	10M/100M/1G EthernetMAC + 2port Switch			10M/100M EthernetMAC + 2port Switch
	Built-in Gbit EtherPHY		—	2port Ether PHY (10Base-T, 100Base-Tx/Fx)
Built-in RAM	Instruction RAM : 768KB Data RAM : 512KB Buffer RAM : 64KB			
External I/F	116/32bit CPU I/F, memory I/F, serial flash I/F, GPIO (max. 106)		16/32bit CPU I/F, memory I/F, serial flash I/F, GPIO (max. 96)	
Built-in peripheral functions	Timer (32bit:4ch,16bit:16ch), Watchdog-Timer (1ch), UART (2ch) I2C (2ch), CAN (2ch), CSI (2ch), CC-Link (1ch)		Timer (4ch), Watchdog- Timer (1ch), UART (2ch), I2C (2ch), CAN (2ch), CSI (2ch), CC-link (1ch)	
Package	484pin FBGA (23mm×23mm, 1mm pitch)	356pin FBGA (17mm×17mm, 0.8mm pitch)	324pin PBGA (19mm x 19mm, 1mm pitch)	

■R-IN32M4-CL3

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

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
UART 2-ch | Serial Flash I/F(Quad)
CSI 2-ch | SRAM I/F (Master/Slave)
I2C 2-ch | GPIO (108port)
| Timer 32bit 4ch 16bit:16ch

Built-in RAM with ECC
Instruction RAM 768KB
Data RAM 512KB
Buffer RAM 64KB

Ethernet Controller
CC-Link IE TSN Remote Station
CC-Link IE Field Intelligent Device
Ethernet MAC +2port Switch
10/100M /1G 2port EtherPHY

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

Evaluation tool

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

The kit contains:		Provided by Renesas Electronics
• Evaluation board	• EWARM	CC-Link Family sample software
• JTAG-ICE (I-jet Lite)	(evaluation version)	R-IN32M4-CL3 driver

IAR SYSTEMS

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

Functions in the evaluation board		Provided by Renesas Electronics
• 2-port RJ45	• UART (USB)	CC-Link Family sample software
Ethernet	• General purpose input (Switch)	R-IN32M4-CL3 driver
• CSI	• General purpose output (LED)	
• I2C		

SHIMAFUJI

MACNICA, Inc.

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 2,048bits, 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 : 37,000LEs
- Internal RAM : 1,400,000 bits
- DSP block : 4blocks
- PLL : 4 pcs
- Controlled by Nios® II connected to Avalon®-MM via Intel® Corporation's Qsys system-level integration tool

■ 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

High performance inter connect
NoC architecture based high speed inter connect

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

Qsys

Hierarchy design
System level hierarchy design

Real time debug support
Accelerate productivity

Memo

TEXAS INSTRUMENTS

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

Sitara™ ARM® Processors

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**

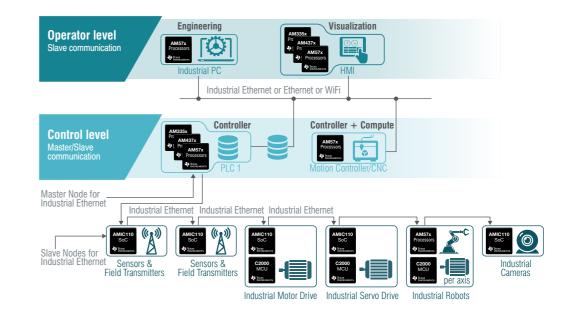### CC-Link IE Field Basic reference design for master and slave on TI Sitara processors

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 300MHz	Cortex®-A8 up to 1GHz	Cortex®-A9 up to 1GHz	Single or Dual Cortex®-A15 up to 1.5GHz + 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 200MHz, 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
• 512MB 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 32Mb
• SPI Flash
• Power management IC (TPS65910)
• RoHS compliant

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

Key features:
• AM5728 processor
• 2GB 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 Control Network Specifications

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

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

CC-Link IE Field Network Specifications

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

CC-Link IE Field Basic Specifications

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

CC-Link Specification

Item			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 ← slave station)		
	Remote register (RWw)		256 words	2048 words (master station → slave station)		
	Extended cyclic settings		–	1X setting / 2X setting	4X setting	8X setting
Control specification — Maximum number of link points per station	1 station occupied	RX, RY	32 bits each	32 bits each	64 bits each	128 bits each
		RWr, RWw	4 words each	8 words each	16 words each	32 words each
	2 stations occupied	RX, RY	64 bits each	96 bits each	192 bits each	384 bits each
		RWr, RWw	8 words each	16 words each	32 words each	64 words each
	3 stations occupied	RX, RY	96 bits each	160 bits each	320 bits each	640 bits each
		RWr, RWw	12 words each	24 words each	48 words each	96 words each
	4 stations occupied	RX, RY	128 bits each	224 bits each	448 bits each	896 bits each
		RWr, RWw	16 words each	64 words each	64 words each	128 words each
Maximum number of occupied stations			4			
Communication specification — Transmission rate			10M/5M/2.5M/625k/156kbps			
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			
Slave station number			1 to 64			

Maximum total cable length and inter-station cable length

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

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

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.

CC-Link Recommended Part

Item name	Type designation	Manufacturer
Filter	MCT7050-A401	Sinka Japan Co., Ltd.
RS485 transceiver	SN75ALS181NS	Texas Instruments, Ltd.
Zener diode	STZU6.2NT146	ROHM Co., Ltd.
	RD6.2Z	Renesas Electronics Corporation
	PESD5V0U1UA	NXP Semiconductors Japan, Ltd.

\<With transmission line insulation provided\>

Item name		Type designation	Manufacturer
For communication signal	Photocoupler	HCPL-7720-500E	Broadcom Ltd.
		HCPL-0720-500E	
		ACPL-072L	
	Digital isolator	ISO721	Texas Instruments, Ltd.
		ISO7220	
		ISO7221C	
		ISO7231C	
For gate control	Photocoupler	HCPL-2611-500E	Broadcom Ltd.
		HCPL-M611-500E	
		HCPL061N	
		PS9117A	Renesas Electronics Corporation
	Digital isolator	ISO721	Texas Instruments, Ltd.
		ISO7221C	
		ISO7231C	

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: ①Total number of stations 　a + b x 2 + c x 3 + d x 4 ≦ 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 ②Number of modules connected 　16 x A + 54 x B + 88 x C ≦ 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: ①Total number of stations 　(a + a2 + a4 + a8) + (b + b2 + b4 + b8) x 2 + (c + c2 + c4 + c8) x 3 + (d + d2 + d4 + d8) x 4 ≦ 64 ②Total number of remote I/O points 　(a x 32 + a2 x 32 + a4 x 64 + a8 x 128) + (b x 64 + b2 x 96 + b4 x 192 + b8 x 384) 　+ (c x 96 + c2 x 160 + c4 x 320 + c8 x 640) + (d x 128 + d2 x 224 + d4 x 448 + d8 x 896) ≦ 8192 ③Total number of remote register words 　(a x 4 + a2 x 8 + a4 x 16 + a8 x 32) + (b x 8 + b2 x 16 + b4 x 32 + b8 x 64) 　+ (c x 12 + c2 x 24 + c4 x 48 + c8 x 96) + (d x 16 + d2 x 32 + d4 x 64 + d8 x 128) ≦ 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 ④Number of modules connected 　16 x A + 54 x B + 88 x C ≦ 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.

CC-Link Ver.1.00 specifications (differences from Ver.1.10)

Specifications for CC-Link Ver.1.00 and Ver.1.10 differ in the following two particulars:
• Maximum total cable length and inter-station cable length
• Connection cable

Item	Specifications
Maximum total cable length and inter-station cable length	 *1 Inter-station cable length between remote I/O stations or remote device stations *2 Inter-station cable length between master/local station or intelligent device station and preceding/following station Ver.1.00 compatible CC-Link dedicated cable (Characteristic Impedance: 100Ω type)
	(A): Cables longer than 1m are used in a system configuration comprised of only remote I/O and remote device stations. (B): Cables longer than 2m are used in a system configuration including local and intelligent device stations. *: If a cable has a length within this range in any one section between remote I/O stations or intelligent device stations, the maximum total cable length listed applies.
Connection cable	CC-Link Ver.1.00- or Ver.1.10-compliant cable (shielded 3-wire twisted-pair cable) *Only single vendor use in case of Ver.1.00 cable.

Transmission rate	Inter-station cable length		Maximum total cable length
	*1	*2	
156kbps	More than 30cm	More than 1m(A) / more than 2m(B)	1200m
625kbps			600m
2.5Mbps			200m
5Mbps	30cm to 59cm*		110m
	More than 60cm*		150m
10Mbps	30cm to 59cm*		50m
	60cm to 99cm*		80m
	More than 1m*		100m
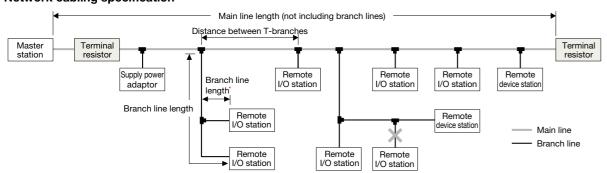
Specifications of CC-Link/LT

Item				4-point mode	8-point mode	16-point mode
Control specification	Maximum number of link points			256 bits (512 bits)	512 bits (1024bits)	1024 bits (2048bits)
	Number of link points per station			4 bits (8bits)	8 bits (16bits)	16 bits (32bits)
	Link scan time (ms)	With 32 stations connected	Number of points	128 bits	256 bits	512 bits
			2.5Mbps	0.7	0.8	1.0
			625kbps	2.2	2.7	3.8
			156kbps	8.0	10.0	14.1
		With 64 stations connected	Number of points	256 bits	512 bits	1024 bits
			2.5Mbps	1.2	1.5	2.0
			625kbps	4.3	5.4	7.4
			156kbps	15.6	20.0	27.8
Communication specification	Transmission rate			2.5M / 625k / 156kbps		
	Communication method			BITR (Broadcast-polling + Interval-Timed Response)		
	Type of transmission path			T-branch		
	Error control method			CRC		
	Maximum number of modules connected			64		
	Number of slave stations			1 to 64		
	Maximum number of modules connectable to branch line (per branch line)			8		
	Distance between stations			No limit		
	Distance between T-branches			No limit		
	Location for master station connection			At the end of a main line		
	RAS functions			Network diagnosis, internal loopback diagnosis, slave station disconnection, and automatic return		
	Connection cable			Dedicated flat cable (0.75mm^2 x 4), Dedicated cable for moving components (0.75mm^2 x 4), VCTF cable (JIS C 3306-compliant, 0.75mm^2 x 4)		

• **Network cabling specification**

Item	Description			Remark
Transmission rate	2.5Mbps	625kbps	156kbps	
Inter-station distance	No limit			
Maximum number of modules connectable to a branch line (per branch line)	8			
Maximum main line length	35m	100m	500m	Cable length between terminal resistors (not including branch lines)
Distance between T-branches	No limit			
Maximum branch line length	4m	16m	60m	Cable length per branch line (including cable run from a connector to equipment)
Total branch line length	15m	50m	200m	Aggregated total of branch line lengths

- Dedicated flat cables, VCTF cables, and dedicated cables for moving components can be used together for branch lines.
- Different cables cannot be used on a main line.
- Different cables cannot be used together on the same branch line.
- Set a master station at the end of a main line.
- Set terminal resistors within 20cm from a master station.
- A branch line cannot be extended from another branch line.

*: For Ver.1-compliant equipment, calculations are made on the basis of 1X setting being used.

Recommended CC-Link/LT Components

Equipment type	Item name	Type designation	Manufacturer
Master station	Filter	CM04RC04T	TAIYO YUDEN Co., Ltd.
	RS485 driver/receiver	MAX1487CSA	Maxim Integrated Products, Inc.
	Zener diode* (1)	PESD5V0U1UA	NXP Semiconductors Japan, Ltd.
	Zener diode* (2)	UDZU5.6B	ROHM Co., Ltd.
	(With transmission line insulation provided)		
	Photocoupler	PS9117A	Renesas Electronics Corporation
	Connector (board side) right angle	38204-52S3-MOM PL	Sumitomo 3M Limited
Slave station	Connector (board side) straight type	38204-62S3-MOM PL	Sumitomo 3M Limited
	Filter	DLW31SN102SQ2	Murata Manufacturing Company, Ltd.
	RS485 driver/receiver	MAX1487CSA	Maxim Integrated Products, Inc.
	Zener diode* (1)	PESD5V0U1UA	NXP Semiconductors Japan, Ltd.
	Zener diode* (2)	UDZU5.6B	ROHM Co., Ltd.
	Connector (board side) right angle	38204-52S3-MOM PL	Sumitomo 3M Limited
	Connector (board side) straight type	38204-62S3-MOM PL	Sumitomo 3M Limited

*: Both products (1) and (2) (two each) are used in combination.

Specification Downloads

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

■Please visit the CLPA website for CC-Link/LT features.
https://www.cc-link.org/en/cclink/cclinklt/index.html

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

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

■ CC-Link Partner Association Member Categories

(Tax excluded)

			Registered member	Regular member	Executive member	Board member
Annual fees ( ) shows monthly fees for intermediate enrollment			—	JPY 100,000 (JPY 9,000)	JPY 200,000 (JPY 18,000)	JPY 1,000,000 (JPY 84,000)
Initiation fee			—	—	—	JPY 1,000,000
Acquisition of product specifications			Provided for free upon membership registration			
License to use CC-Link Family technology	SLMP*¹		Included			
	CC-Link Family Specifications (Other than SLMP)		—	Included		
Conformance Test Fees (per product)	CC-Link	- Remote Device Station - Remote I/O Station - Cable	N/A	JPY 200,000	JPY 100,000	Not charged (included in annual fees)
		- Master/Local Station - Intelligent Device Station	N/A	JPY 300,000	JPY 200,000	Not charged (included in annual fees)
	CC-Link/LT	- Master Station - Remote I/O Station - Cable	N/A	JPY 200,000	JPY 100,000	Not charged (included in annual fees)
	CC-Link IE Control Network	- Normal Station - Control Station	N/A	JPY 300,000	JPY 200,000	Not charged (included in annual fees)
	CC-Link IE Field Network	- Master/Local Station - Intelligent Device Station	N/A	JPY 300,000	JPY 200,000	Not charged (included in annual fees)
	CC-Link IE Field Network Basic	- Master/Slave Station	N/A	Not Charged (free)	Not Charged (free)	Not charged (included in annual fees)
	CC-Link IE Safety	- IESMAP (Master) - IESSLP (Slave)	N/A	JPY 300,000	JPY 200,000	Not charged (included in annual fees)
	CC-Link IE TSN	- Master/Local Station - Remote Station	N/A	JPY 100,000	JPY 50,000	Not charged (included in annual fees)
Recommended- wiring Product Test Fees (per product)	CC-Link IE Control Network	- Recommended Network Wiring Components	N/A	JPY 100,000	JPY 50,000	Not charged (included in annual fees)
	CC-Link IE Field Network	- Recommended Network Wiring Components	N/A	JPY 100,000	JPY 50,000	Not charged (included in annual fees)
Use of CC-Link Family logo			—	Included		
Technical support			—	Included		
Publishing products in home page-Electronic Partner Product Catalog (No charge)			—	Included		
Promotion at fairs			—	Included		
Information about events Posting of company name on CLPA web site			Included			

*1 SLMP: Seamless Message Protocol
*2 Download the test tools and conduct a self-test.
*3 If you submit the result of a test conducted on behalf of the CC-Link Partner Association at a testing organization recognized by the CC-Link Partner Association, the cost will be as follows.
　　· Regular : JPY 50,000　· Executive: JPY 20,000

Global support system

The CC-Link Partner Association has branches not only in Japan but also in overseas countries to provide global support

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●How to become a member

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

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

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

https://www.cc-link.org

〔 **Japan・China・Europe・Americas・Korea・Taiwan・ASEAN・India・Turkey・Mexico・Thailand** 〕

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