CC-Link IE TSN Compatible Product

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

The CC-Link Family is the first field network in Japan and Asia. It has acquired international standards such as ISO and IEC, and has grown as a global standard network in various fields of the manufacturing industry. Now, the CC-Link Partner Association has developed "CC-Link IE TSN", the world's first open industrial network using TSN (Time-Sensitive Networking), which is an extension of standard Ethernet, to accelerate the construction of smart factories utilizing IoT.

We globally offer a wide variety of development methods and truly open industrial networks in response to growing market demands for the use of a wide range of sensors at manufacturing sites, for high-performance drive devices, and for the implementation of protocols for various types of devices, applications, etc.
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Development flow for CC-Link Family compatible products.

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

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

**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.

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

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

**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.

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

**Development Tool Sales**
Please contact the manufacturer.

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

![Testing Laboratory](https://www.cc-link.org/en/support/testlab/index.html)

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

![CLPA Partner Product Search Tool](https://www.cc-link.org/en/downloads/index.html#section-A)

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

![CLPA Partner Product Search Tool](https://www.cc-link.org/en/downloads/index.html#section-A)

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

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**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.14 to P.17

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

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

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

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

Step 1: Select the station type

- Master station
- Local station
- Remote station

See P.8

Step 2: Select the certification class

- Class A
- Class B

Class B devices have higher function than Class A devices.

- **Class A**
  - Can be developed by changing the software of existing (Non-TSN) products.

- **Class B**
  - Guarantees synchronization accuracy of 1μs or less
  - Requires either designated LSI or general purpose Ethernet LSI that supports fast communication cycles.

See P.9

* Some of the items to be considered during development are different for recommended wiring components, such as switches, cables, and connectors.
Step 3 Select the development method

Decide which development method to use.

- PC board
- Embedded Module
- Dedicated Communication LSI
- Software Development Kit (SDK), etc.

Step 4 Select the development location

Decide where to conduct development.

- Develop in-house
- Use a contracted development manufacturer

See P.10

See P.11

Class A devices can be developed by changing the software of existing (Non-TSN) products.

Class B devices guarantee synchronization accuracy of 1/μs or less and require either dedicated LSI or general-purpose Ethernet LSI that supports fast communication cycles.
**Process flow for developing CC-Link IE TSN compatible products**

**Step 1** Select the station type

**Master station**
A station that manages a network. A station that contains control information (parameters) and controls slave stations* and other master stations through cyclic transmission and transient transmission.

**Compatible devices (example)**
- PLC
- IPC (controller)

* Slave stations: A general term other than master stations such as local stations and remote stations.

**Local station**
A station capable of n:n cyclic transmission with the master station and other local stations, 1:n cyclic transmission with other stations, and transient transmission with other stations. It has a server function and client function for transient transmission.

**Compatible devices (example)**
- PLC
- IPC (controller)
- PC

**Remote station**
A station capable of 1:n cyclic transmission, and transient transmission with other stations. It has a server function and client function for transient transmission.

**Compatible devices (example)**
- HMI
- Remote I/O
- Servo
- Vision Sensor
- Inverter
- Solenoid valve
- Robots
- NC
Select the certification class

- The CC-Link IE TSN network has different certification classes depending on the functions and performance of the device (node) and switch.
- Certification classes include A and B, with B being the higher function.

It is generally recommended to develop certification class B products that have a wide variety of applications. Develop certification class A products only when modifying the software of existing (non-TSN compatible) products.

Certification Classes for Devices

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Conditions</th>
<th>Certification Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reception/Relay</td>
<td>Full rate reception/relay ((^1), (^2))</td>
<td>---</td>
</tr>
<tr>
<td>2</td>
<td>Standards</td>
<td>IEEE1588 compliant</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEEE802.1AS compliant</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEEE802.1Qbv compliant</td>
<td>●</td>
</tr>
<tr>
<td>3</td>
<td>Time Synchronization Accuracy</td>
<td>1μs or less</td>
<td>---</td>
</tr>
<tr>
<td>4</td>
<td>Communication Mode</td>
<td>Unicast</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Broadcasting/Multicast</td>
<td>---</td>
</tr>
<tr>
<td>5</td>
<td>Transient Transmission</td>
<td>NRSV-Transient</td>
<td>●</td>
</tr>
</tbody>
</table>

\(^1\) 1 port: Reception, More than 2 ports: Reception and relay
\(^2\) Communication speed does not matter as long as it is 100 Mbps or more
\(^3\) Implementation is required for local stations
\(^4\) In the case of a system that guarantees time synchronization accuracy of 1 μs, it consists of only products of certification class B. In this case, products of certification class A (including switches) shall not be placed between products of certification class B.

Certification Classes for Switches

<table>
<thead>
<tr>
<th>No.</th>
<th>Standards</th>
<th>Certification Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1000BASE-T (IEEE802.3ab) compliant</td>
<td>((\oplus))</td>
</tr>
<tr>
<td></td>
<td>100BASE-TX (IEEE802.3u) compliant</td>
<td>((\oplus))</td>
</tr>
<tr>
<td></td>
<td>Auto MDI/MDI-X</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Auto Negotiation</td>
<td>●</td>
</tr>
<tr>
<td>2</td>
<td>Standards</td>
<td>●</td>
</tr>
<tr>
<td>3</td>
<td>Time Synchronization Accuracy</td>
<td>1μs or less</td>
</tr>
<tr>
<td>4</td>
<td>Time Aware Queuing</td>
<td>IEEE802.1Qbv compliant</td>
</tr>
</tbody>
</table>

\(*\) Supports either 1000BASE or 100BASE, or both
Select the development method

■ Extensive early lineup of supported products

Various types of product development are supported, from high-performance devices implemented on dedicated ASIC/FPGA to low-cost devices implemented on general-purpose Ethernet chips using software protocol stacks.

■ Development using methods provided by various companies

<table>
<thead>
<tr>
<th>Application</th>
<th>① High Performance, High Function</th>
<th>② For IPC Systems</th>
<th>③ Use of Existing Ethernet Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>Hardware Master</td>
<td>Software Master</td>
<td>Hardware Master</td>
</tr>
<tr>
<td></td>
<td>1Gbps /100Mbps</td>
<td>1Gbps /100Mbps</td>
<td>(1Gbps/)100Mbps</td>
</tr>
<tr>
<td></td>
<td>Hardware Slave</td>
<td>Hardware Slave</td>
<td>Software Slave</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Software Slave</td>
</tr>
</tbody>
</table>

Communication Accuracy: High to Low

Hardware: Achieved with communication LSI / PC board / Built-in module
Software: Achieved with SDK

Shortened development time!
Select the development location

Develop in-house

Various development methods can be used to internally develop communication interfaces.

Use a contracted development manufacturer

As one of the methods of clearing the technical and personnel issues in internal development, it is possible to commission a manufacturer to develop communication interface hardware and software.
Development/Evaluation

■ Supports from the CC-Link Partner Association during the development and evaluation period

- CC-Link IE TSN specifications are provided free of charge by the CC-Link Partner Association to CLPA partners.
- The CC-Link Partner Association provides conformance test specifications free of charge for the conformance testing of developed products.
- The CC-Link Partner Association introduces tools and evaluation boards manufactured by the partners.

■ List of Public Tools

The following tools are available on the CC-Link Partner Association website.

<table>
<thead>
<tr>
<th>No.</th>
<th>Tool</th>
<th>Application</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CC-Link IE TSN Configuration Tool</td>
<td>Simple Configuration/Diagnostics</td>
<td>Can be downloaded by Registered members.</td>
</tr>
<tr>
<td>2</td>
<td>CC-Link IE TSN Utility</td>
<td>Pseudo Master Station, Pseudo Slave Station</td>
<td>Can be downloaded by Registered members.</td>
</tr>
<tr>
<td>3</td>
<td>Profile Creation Support Tool</td>
<td>CSP+ File Creation</td>
<td>Can downloaded by anyone.</td>
</tr>
</tbody>
</table>

■ Overview of Public Tools

The CC-Link IE TSN communication of developed products can be checked using a computer.

- Configuration example

  Basic CC-Link IE TSN communication can be confirmed during the product development of our partners.
Overview of 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.

Advantages of CSP+ Development

1. 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.

2. 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.

3. 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

1. 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.

2. 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.

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

■ Conformance Testing

Conformance tests are tests of the communication operation defined by the CC-Link Partner Association for CC-Link IE TSN compatible products to confirm that they meet the CC-Link IE TSN communication specifications and can be connected to the CC-Link IE TSN network.

■ Conformance testing means...

- The reliability of the CC-Link IE TSN communication unit can be guaranteed.
- Smooth system construction is possible with mutual connection among different manufacturers and models.

Caution

- The conformance test is intended to assure that the product meets CC-Link IE TSN communication specifications, and not intended for device-specific functions.
- Passing the conformance test does not mean that the performance or quality of the product itself are guaranteed.

Refer to the recommended wiring component specifications for switches, cables, connectors, etc.

■ Workflow for Conformance Testing

1. Read the regulations for the conformance test.
2. Ask CLPA for the test specification that applies to the developed product.
3. Perform the test in-house using the test specification or the test tool.
4. Apply for the conformance test, using the prescribed request form.
5. A test date is proposed by CLPA.
6. Send CLPA the product and a copy of the in-house test report by the date scheduled for the start of the test.
7. Test starts.
8. Test result is reported.
9. If the test is successful, a certificate of conformance and a test report are sent to the applicant.
CC-Link IE TSN conformance tests include required tests and optional tests. The test items differ for each certification class.

### Test Items

1. **Required Tests**
   The product must pass all of the required tests in order to be certified.

2. **Optional Tests**
   We recommend that you perform these tests when the corresponding functions are implemented.

#### Required Tests

<table>
<thead>
<tr>
<th>Classification</th>
<th>Test Items</th>
<th>Certification Class</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware test</td>
<td>Noise test</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Confirming the CE conformity declaration</td>
<td>—</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>2. Simulator noise (common mode) test</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>3. Cable (wire bundle) noise test</td>
<td>—</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>4. Electrical fast transient / burst test (EFT/B) (power supply application)</td>
<td>—</td>
<td>▲</td>
</tr>
<tr>
<td></td>
<td>5. Electrical fast transient / burst test (EFT/B) (cable application)</td>
<td>—</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>6. Conductive immunity test</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

### Functional Test

- Used Parts Check Test | — | ● |

### Software test

- Time Synchronization | |          |
- 1. IEEE 1588 | ● | ● |
- 2. IEEE 802.1AS | — | ● |
- Cyclic Transmission | ● | ● |
- Transient Transmission | ● | ● |
- Topology (line-star) | ▲ | ● |
- Diagnostics | ● | ● |
- Error Processing | ● | ● |
- Checking the profile description (CSP+) | | |
- 1. Description Contents Check | ● | ● |
- Aging test | ● | ● |

### Test items for both 1G/100 Mbps compatible devices

<table>
<thead>
<tr>
<th>Classification</th>
<th>Test Items</th>
<th>Implementation categories for both 1Gbps &amp; 100 Mbps compatible devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware test</td>
<td>Noise test</td>
<td>● 1Gbps</td>
</tr>
<tr>
<td></td>
<td>1. Confirming the CE conformity declaration</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>2. Simulator noise (common mode) test</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>3. Cable (wire bundle) noise test</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>4. Electrical fast transient / burst test (EFT/B) (power supply application)</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>5. Electrical fast transient / burst test (EFT/B) (cable application)</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>6. Conductive immunity test</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Functional Test</td>
<td>●</td>
</tr>
</tbody>
</table>

### Implementation categories for both 1Gbps & 100 Mbps compatible devices

- **1Gbps**
- **100 Mbps**
- **Optional**
## Process Flow for Developing CC-Link IE TSN Compatible Products

### How to Become a CLPA Member

### CC-Link IE TSN Recommended Network Wiring Parts

### CC-Link IE TSN Specification

## Flow of Executing the Noise Test

1. **Availability of CE Conformity Declaration**
   - **Available**
   - **None**

2. **Selecting the Action Items**
   - (a) CLPA-designated noise test
   - (b) EN61000-4-4/EN61000-4-6 Compliant EMC Test

3. **Test Configuration**
   - **Noise Voltage**: ±2,000 VAC, ±900 VDC
   - **Application Time**: 2 hours

4. **Test Conditions**
   - **Noise Voltage**: ±1,000 V
   - **Application Time**: 10 minutes

5. **Conductive Immunity Test**
   - **Sweep Frequency**: 0.15 to 80 MHz
   - **Electric Field Strength**: 10 Vrms
   - **Modulation**: 80% AM
   - **Frequency Step**: 1%

### Requests from CLPA
- Documents that show the test configuration need to be submitted in order to confirm that the configuration is correct.
- As all of the above test items have different noise waveforms, we recommend that you check all the test items.
## Optional Tests

<table>
<thead>
<tr>
<th>Classification</th>
<th>Test Items</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware test</td>
<td>1000BASE-T compliance test</td>
<td></td>
</tr>
<tr>
<td>Software test</td>
<td>Cyclic transmission (checking the transmitting station (local station) status register)</td>
<td>Optional tests are not confirmed by the CC-Link Partner Association.</td>
</tr>
<tr>
<td></td>
<td>Topology (ring connection, mesh connection, mixed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control (cyclic start/stop / reserved station)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Error processing (station number setting mismatch / network number setting mismatch / station type mismatch)</td>
<td></td>
</tr>
</tbody>
</table>

### Requests from CLPA

- These are optional tests, but they are test items related to the communication and functions of the product. The corresponding test items should be implemented when developing a product with applicable functions.
- Although we as an association do not confirm the results through testing, the test results should be submitted.

## Differences in conformance testing between CC-Link IE TSN and CC-Link IE Field

### CC-Link IE TSN Conformance Test Implementation Division

There are two conformance test types for CC-Link IE TSN; a "Manufacturer Test" and a "Conformance test conducted by the CC-Link Partner Association". You can use the test lab recommended by CLPA when the partner manufacturer conducts the test for the test item whose test category is "Manufacturer Test". The use of the test lab is chargeable. If conduct conformance test by CLPA in advance at the same test lab will waive the conformance testing and reduce the testing costs. Please see below for details.

<table>
<thead>
<tr>
<th>Test Implementation Division</th>
<th>Partner Manufacturers</th>
<th>Test Lab</th>
<th>Conformance Test</th>
<th>CC-Link Association</th>
<th>Cost (Regular Member)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>All tests implemented</td>
<td>Implemented</td>
<td>Implemented</td>
<td>100,000 yen</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Some tests implemented</td>
<td>Partial testing implemented (including conformance testing)</td>
<td>Implemented</td>
<td>50,000 yen</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>All tests implemented</td>
<td>(including conformance testing)</td>
<td>Implemented</td>
<td>Implemented</td>
<td></td>
</tr>
</tbody>
</table>
### CC-Link IE TSN Development Tool Partner

Choose a development method to suit your goals.

<table>
<thead>
<tr>
<th>Company</th>
<th>Development Method</th>
<th>Station Type</th>
<th>Certification Classes A or B</th>
<th>Dedicated Communication LSI</th>
<th>SDK</th>
<th>Publication page</th>
</tr>
</thead>
<tbody>
<tr>
<td>MITSUBISHI ELECTRIC</td>
<td></td>
<td>Master/Local station</td>
<td>B</td>
<td>●</td>
<td></td>
<td>P.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Master station</td>
<td>B</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remote station</td>
<td>B</td>
<td>●</td>
<td></td>
<td>P.21</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>port</td>
<td></td>
<td>Master station</td>
<td>A / B</td>
<td>Coming soon</td>
<td>P.22</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remote station</td>
<td>A</td>
<td>Coming soon</td>
<td>P.23</td>
<td></td>
</tr>
<tr>
<td>RENESAS</td>
<td></td>
<td>Remote station</td>
<td>B</td>
<td>●</td>
<td></td>
<td>P.24</td>
</tr>
<tr>
<td>SILA</td>
<td></td>
<td>Remote station</td>
<td>A / B</td>
<td>Coming soon</td>
<td>P.25</td>
<td></td>
</tr>
<tr>
<td>Elmic</td>
<td></td>
<td>Master station</td>
<td>B</td>
<td>●</td>
<td></td>
<td>P.26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remote station</td>
<td>A</td>
<td>●</td>
<td></td>
<td>P.27</td>
</tr>
</tbody>
</table>

Embedded module or PC board are under consideration by partners. For details, contact the CC-Link Partner Association.

* Support is also planned for Safety.

The partners that are considering development are as follows.
Memo
When products are made compatible with CC-Link IE TSN... This not only ensures the system flexibility unique to multi-vendor products, but also provides an opportunity for the competitive strength of the product to reach the global level.

In order to speedily and reliably develop CC-Link IE TSN compatible products, Mitsubishi Electric provides support in all aspects, including providing development tools.

### Developable Stations / Certification Classes

<table>
<thead>
<tr>
<th>Development Method</th>
<th>Station Type</th>
<th>Certification Class</th>
<th>Product Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication LSI</td>
<td>Master/Local station</td>
<td>Class B devices</td>
<td>Designated communication LSI for development of CC-Link IE TSN Master/Local Station (CP610)</td>
</tr>
<tr>
<td>Software Development Kit</td>
<td>Master station</td>
<td>Class B devices</td>
<td>CC-Link IE TSN Master Station Software Development Kit</td>
</tr>
</tbody>
</table>

### Development Method

#### Designated communication LSI for Master/Local station CP610

This is a communication LSI that allows to develop devices that perform cyclic transmission or transient transmission without being aware of the protocol. The CP610 is controlled by software.

#### CC-Link IE TSN Master Station Software Development Kit

**SW1DTD-GNSDK1M (the source code bundled version)**

**SW1DTD-GNSDK2M (the Library version)**

A method for developing a master station using a software protocol stack.

CC-Link IE TSN compatible devices can be developed without changing the hardware of devices compatible with general-purpose Ethernet.

### Features and benefits of development methods

- **Designated communication LSI for Master/Local stations** **CP610**

  1. You can develop a CC-Link IE TSN Master Station/Local Station without having to implement the protocol.
  2. Available sample code can be customized according to the customer’s hardware specifications and applications.
  3. Freely selectable MPU and OS.
  4. Can use the CC-Link IE TSN configuration tool included in the source code development kit to set parameters and diagnose the CC-Link IE TSN Master Station/Local Station.

Source code development kit: A software package for developing a CC-Link IE TSN Master Station / Local Station. The source code kit can be downloaded from the Mitsubishi Electric FA site.

There is also a device kit which is a set of CP610 and a Flash ROM with the source code.

#### CC-Link IE TSN Master Station Software Development Kit

**SW1DTD-GNSDK1M/SW1DTD-GNSDK2M**

1. A software protocol that runs on a PC.
   - Regardless of high-performance PC or inexpensive PC, various systems can be constructed.
   - CANopen® compliant API.
   - Customers who develop CANopen® compatible products can easily develop CC-Link IE TSN compatible devices.
   - The source code bundled version can be customized by the customer. It can be expanded and ported to different development environments. In addition, the library version can build a system at a low cost.

List of communication specification

<table>
<thead>
<tr>
<th>Features</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data width</td>
<td>16bit (data bit)</td>
</tr>
<tr>
<td>Communication bandwidth</td>
<td>1066Mbps</td>
</tr>
<tr>
<td>Communication protocol</td>
<td>Ethernet (IEEE 802.3), Ethernet (IEEE 802.1Qbv), Ethernet (IEEE 1588)</td>
</tr>
<tr>
<td>Control communication</td>
<td>SLMP, UDP/IP, TCP/IP</td>
</tr>
</tbody>
</table>

Software configuration

**Software Development Kit**

<table>
<thead>
<tr>
<th>Master station Class B devices</th>
<th>CC-Link IE TSN Master Station Software Development Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW1DTD-GNSDK1M-MSW1DTD-GNSDK1M-M</td>
<td></td>
</tr>
<tr>
<td>SW1DTD-GNSDK2M-MSW1DTD-GNSDK2M-M</td>
<td></td>
</tr>
</tbody>
</table>

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Process flow for developing CC-Link IE TSN compatible products

CC-Link IE TSN recommended network wiring parts

CC-Link IE TSN specification

How to become a CLPA member

Development tool

Developable Stations / Certification Classes

<table>
<thead>
<tr>
<th>Development Method</th>
<th>Station Type</th>
<th>Certification Class</th>
<th>Product name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication LSI with Built-in GbE-PHY</td>
<td>Remote station</td>
<td>Class B devices.</td>
<td>Communication LSI with Built-in GbE-PHY for development of CC-Link IE TSN Remote Station (CP620)</td>
</tr>
<tr>
<td>Software Development Kit</td>
<td>Remote station</td>
<td>Class A devices.</td>
<td>CC-Link IE TSN Remote Station for Software Development Kit</td>
</tr>
</tbody>
</table>

Development Method

**Communication LSI with Built-in GbE-PHY for development of CC-Link IE TSN Remote Station (CP620)**

LSI that integrates an ASIC for CC-Link IE TSN communication, MPU and GbE-PHY. It allows devices that perform cyclic transmission and transient transmission to be developed without having to implement the protocol.

**CC-Link IE TSN Remote Station for Software Development Kit SW1DNC-GNSDK1S-M / SW1DNC-GNSDK2S-M**

(TCP/IP stack bundled version)

A method for developing remote stations using a software protocol stack. It enables the development of CC-Link IE TSN compatible devices without changing the hardware of devices compatible with general-purpose Ethernet.

Features and benefits of development methods

**Communication LSI CP620 with Built-in GbE-PHY for Remote Stations**

① GbE-PHY is integrated, making it easy to create pattern designs for communication circuits. In addition, there are only few parts and circuits around the CPU and GbE-PHY, allowing the developed substrate to be compact.

② Sample codes are available that can be customized according to the hardware specifications and applications.

③ As it is equipped with a H/W-RTOS, CPU load and power consumption of the developed device can be reduced.

**CC-Link IE TSN Remote Station for Software Development Kit SW1DNC-GNSDK1S-M**

① Requires few resources for the operation of the software protocol stack, allowing it to be operated even with a microcomputer for low-cost devices.

② Everything is provided as source code, and API and wrapper layers are included, making it easy to port to the customer’s development environment.

③ By using the log function, errors and processing status in the protocol stack can be traced during debugging.

Recommended development environment

<table>
<thead>
<tr>
<th>Name</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAR Embedded Workbench for Arm</td>
<td>IAR Systems K.K.</td>
</tr>
<tr>
<td>Atmel Studio</td>
<td>Atmel Corporation</td>
</tr>
<tr>
<td>KNUCLEO-F4292I</td>
<td>STMicroelectronics</td>
</tr>
</tbody>
</table>
PORT’s CC-Link IE TSN Stack products can be obtained in different versions. Whether master or remote station (software stack) - large quantities or small quantities - PORT offers the right solution for every user of CC-Link IE TSN technology.

### Developable Stations / Certification Classes

<table>
<thead>
<tr>
<th>Development Method</th>
<th>Station Type</th>
<th>Certification Class</th>
<th>Product name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software</td>
<td>Master Station</td>
<td>A or Class B*</td>
<td>CC-Link IE TSN Master SDK</td>
</tr>
<tr>
<td>Development Kit</td>
<td></td>
<td>*Class B available if Hardware supports TSN</td>
<td>Coming soon</td>
</tr>
</tbody>
</table>

### Development Method

- The application decides what you need - PORT offers the right CC-Link IE TSN Master solution for your need - Semiconductor independently.
  - SDK uses GOAL, port’s Industry 4.0 platform.
  - Platform is easily portable to customer’s hardware and operating system.
  - Master Station sample platform is the NXP LS1028ARDB.
  - Port’s Design Tool allows easy creation of application data objects (Link Devices or CANopen objects), Stack configurations and Device Description files.

### Features and benefits of development methods

- Allows implementation of Management Master station and Control Master station.
  - Management Master Station: Controls other slaves and manages the network (only one station per network).
  - Control Master Station: controls other slaves and masters (one or multiple CM stations per network).
- Supports time synchronization via IEEE 802.1AS and IEEE 1588v2 (both E2E and P2P delay mechanisms are supported).
- Supports both hardware and software implementation of TDMA-scheduling (IEEE 802.1Qbv). (Software implementation is less deterministic but allows support of standard MAC controllers)
- Supports control communication (cyclic communication) with Slave stations and other Master stations.
- Supports Transient Transmissions (acyclic communication) with other stations.
  - Reserved transient Transmission: acyclic communication within timeslot for cyclic communication.
  - Non-reserved Transient Transmission: acyclic communication within timeslot for standard Ethernet traffic.
- Supports SLMP (Seamless Message Protocol) for acyclic data transfer.
- Support of multiple cycle times.
  The Master can perform control communication with multiple slaves with different cycle times. All cycle times must be a multiple of the smallest cycle time.
- Cyclic Start/Stop: stop and restart cyclic transmission with other stations.
- Certification Class B is possible.

---

## PORT´s CC-Link IE TSN Stack products

*port industrial automation GmbH*

PORT’s CC-Link IE TSN Stack products can be obtained in different versions. Whether master or remote station (software stack) - large quantities or small quantities - PORT offers the right solution for every user of CC-Link IE TSN technology.

### Developable Stations / Certification Classes

<table>
<thead>
<tr>
<th>Development Method</th>
<th>Station Type</th>
<th>Certification Class</th>
<th>Product name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software</td>
<td>Master Station</td>
<td>A or Class B*</td>
<td>CC-Link IE TSN Master SDK</td>
</tr>
<tr>
<td>Development Kit</td>
<td></td>
<td>*Class B available if Hardware supports TSN</td>
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</tr>
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- Supports SLMP (Seamless Message Protocol) for acyclic data transfer.
- Support of multiple cycle times.
  The Master can perform control communication with multiple slaves with different cycle times. All cycle times must be a multiple of the smallest cycle time.
- Cyclic Start/Stop: stop and restart cyclic transmission with other stations.
- Certification Class B is possible.
Developable Stations / Certification Classes

<table>
<thead>
<tr>
<th>Development Method</th>
<th>Station Type</th>
<th>Certification Class</th>
<th>Product name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software Development Kit</td>
<td>Remote Station</td>
<td>Class A</td>
<td>CC-Link IE TSN Remote SDK</td>
</tr>
</tbody>
</table>

Development Method

- The application decides what you need - PORT offers the right CC-Link IE TSN Remote solution for your need - Semiconductor independently.
  - SDK uses GO AL, port's Industry 4.0 platform.
  - Platform is easily portable to customer’s hardware and operating system.
  - Remote Station sample platform is the STMicroelectronics NUCLEO-F429ZI.
  - Port’s Design Tool allows easy creation of Application data objects (Link Devices or CANopen objects), Stack configurations and Device Description files.

Features and benefits of development methods

- Allows implementation of Remote Slave Station.
- Supports time synchronization via IEEE 802.1AS and IEEE 1588v2 (both E2E and P2P delay mechanisms are supported).
- Supports both hardware and software implementation of TDMA-scheduling (IEEE 802.1Qbv).
  (software implementation is less deterministic but allows support of standard MAC controllers)
- Supports control communication (cyclic communication) with Master stations.
- Supports Transient Transmissions (acyclic communication) with other stations.
  - Reserved transient Transmission: acyclic communication within timeslot for cyclic communication.
  - Non-reserved Transient Transmission: acyclic communication within timeslot for standard Ethernet traffic.
- Supports SLMP (Seamless Message Protocol) for acyclic data transfer.

*Please refer to the diagram on the left.*
"R-IN32M4-CL3" is a communication LSI for CC-Link IE TSN Class B remote station. CC-Link IE TSN is realized on a single chip by installing 2 port Gigabit Ether PHY, CPU, and large-capacity memory. In addition, OS and software necessary for development are included to realize smooth product development.

### Develable Stations / Certification Classes

<table>
<thead>
<tr>
<th>Development Method</th>
<th>Station Type</th>
<th>Certification Class</th>
<th>Product name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication LSI</td>
<td>Remote station</td>
<td>Class B</td>
<td>R-IN32M4-CL3</td>
</tr>
</tbody>
</table>

#### Development Method

Provides all hardware, software and development environment necessary for CC-Link IE TSN communication. Evaluation can be started immediately according to the procedures in the startup manual.

**Communication LSI**
- CPU Cortex-M4 large capacity memory
- CC-Link IE TSN dedicated hardware
- 2 port Gigabit Ethernet PHY

**Software**
- CC-Link IE TSN remote station
- CC-Link IE Field intelligent device station
- TCP/IP stack, peripheral driver
- Project file for master station

**Manual**
- Hardware manual
- Users manual
- Startup manual etc.

**Evaluation board**
- Evaluation board with R-IN32M4-CL3

#### Features and benefits of development methods

1. Built-in hardware for CC-Link IE TSN
   - High precision time synchronization and time sharing communication
2. Built-in Gigabit Ethernet PHY
   - Reduction of mounting area and development cost
3. Equipped with R-IN engine
   - Fast real-time response
   - Low power consumption
4. Full software
   - Complete with OS, communication protocol and peripheral drivers to shorten development period

**Feature of R-IN32M4-CL3**

- 24V Regulator

- CAN 2-ch
- Timer 1-ch
- UART 2-ch
- SPI (Master/Slave)
- I2C 2-ch
- GPIO (108port)
- Timer 32bit 4ch 16bit 1ch
- Built-in RAM 64KB
- Instruction RAM 768KB
- Data RAM 512KB
- Ethernet MAC + 2 port Switch
- CC-Link IE TSN Slave Station
- CC-Link IE Field Intelligent Device
- Ethernet MAC + 2 port EtherPHY
- Ethernet Accelerator
- Check Sum
- Header ENDEC
- Buffer Manager
Process flow for developing CC-Link IE TSN compatible products

CC-Link IE TSN software development kit for remote station provided as portable C source code with sample applications for LINUX and STM32. A unified porting layer allows easy adaption of the stack to customer specific hardware. The SDK is self-contained and no further costs are involved for development of a CC-Link IE TSN remote station.

Developable Stations / Certification Classes

<table>
<thead>
<tr>
<th>Development Method</th>
<th>Station Type</th>
<th>Certification Class</th>
<th>Product name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software Development Kit</td>
<td>Remote Station</td>
<td>Class A, Class B</td>
<td>CC-LINK IE TSN STM32 Coming soon</td>
</tr>
<tr>
<td>Software Development Kit</td>
<td>Remote Station</td>
<td>Class A</td>
<td>CC-LINK IE TSN LINUX Coming soon</td>
</tr>
</tbody>
</table>

Development Method

- The SDK is self-contained and evaluation can easily be performed on the STM32 NUCLEO or iMX6 evaluation boards as provided by numerous 3rd party vendors.
  - Remote device application development can be started on the evaluation boards using the provided CSP+ files and examples for GX Works3. Other masters will be supported in future demos.
  - If hardware and software environment is similar to the demos, they can be used for your own software development. Otherwise, the demos can serve as a starting point to adapt the port to new RTOS and/or hardware platforms.
  - Embedded Experts GmbH, a SILA subsidiary, also provides porting services to existing or new customer hardware.

To further support development, the SDK includes a combined getting started and porting manual.

Features and benefits of development methods

- Delivered as C source code
- Supports iMX6 and STM32
- TSN ready
  - Use hardware MAC support for IEEE 802.1AS and IEEE 1588v2 if available.
  - Software 802.1Qbv implementation
- Complete with OS, TCP/IP stack, documentation and samples to reduce development time.

<table>
<thead>
<tr>
<th>IMX6 UL/ULL</th>
<th>STM32</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS</td>
<td>Linux (Kernel &gt; 4.6)</td>
</tr>
<tr>
<td>IDE</td>
<td>GCC + CMAKE</td>
</tr>
<tr>
<td>TCP/IP stack</td>
<td>Linux</td>
</tr>
<tr>
<td>Devices</td>
<td>NXP-Freescale IMX6</td>
</tr>
<tr>
<td></td>
<td>Ultralite Cortex A7</td>
</tr>
<tr>
<td>TSN</td>
<td>IEEE 802.1AS + IEEE 1588v2</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethernet ports</td>
<td>1 (Star)</td>
</tr>
<tr>
<td>Speed</td>
<td>100Mbit/s</td>
</tr>
</tbody>
</table>
Development tool

Commercialized software development kit (SDK) for product developers of CC-Link IE TSN remote station and master station. SDK based on the know-how cultivated by a long-established communication middleware manufacturer, µTRON for remote station and Windows reference environment operation sample for master station are packaged for quick evaluation and development. We support smooth evaluation and development.

Development Method

- Software development kit (SDK or Lib for INTtime) for a CC-Link IE TSN master station.
- Develop the user application for the master station by returning the application interface that operates the stack for the CC-Link IE TSN master station.
- Develop a user application for a master station by utilizing the packaged sample application that uses an application interface to operate the stack.

Example of packaged sample applications:
1. Sample application for cyclic transmission.
2. Sample application of CC-Link IE TSN and CANopen® compatible devices.
3. Sample SLMP server and SLMP client functions.

Features and benefits of development methods

- CC-Link IE TSN Standards Compliant
  Can connect to CC-Link IE TSN compatible remote station (Class A / Class B) devices.
- High Versatility
  - Windows-based industrial PC environment
  - Supports Visual Studio
  - Supports API with C Language
  - Supports API compatible with CANopen®
- High Performance
  - Operates on RTOS (INTime) coexisting with Windows
  - High precision clock with Intel®
- Continuous Function Expansion
  - Quickly respond to standard version upgrades
- Product lineup according to application
  - SDK version by providing source code that can support OS changes and function expansion.
  - A library version that binarizes the core part of the protocol stack for application developers.

*Both products are equipped with sample application in C language.

Contact Information
3-11-1 Shin-Yokohama, Kōhoku-ku, Yokohama, Kanagawa, Japan
TEL 045-624-8002
FAX 045-624-8005
WEB https://www.elwsc.co.jp/
E-mail info@elwsc.co.jp
*Or contact your local CLPA office (P27)

Development Stations / Certification Classes

<table>
<thead>
<tr>
<th>Development Method</th>
<th>Station Type</th>
<th>Certification Class</th>
<th>Product name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software</td>
<td>Master Station</td>
<td>Class B</td>
<td>Ze-PRO CC-Link IE TSN(Master) SDK</td>
</tr>
<tr>
<td>Software</td>
<td>Master Station</td>
<td>Class B</td>
<td>Ze-PRO CC-Link IE TSN(Master) Lib for INTime</td>
</tr>
</tbody>
</table>

CC-Link IE TSN Master Station Communication Specification

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Communication Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CC-Link IE TSN Certification Class</td>
<td>Certification Class B</td>
</tr>
<tr>
<td>2</td>
<td>Maximum cyclic size per network</td>
<td>Input data Total 36Kbytes</td>
</tr>
<tr>
<td>3</td>
<td>Maximum cyclic size per station</td>
<td>Input data Total 36Kbytes</td>
</tr>
<tr>
<td>4</td>
<td>Transient transmission</td>
<td>Total 102KBytes</td>
</tr>
<tr>
<td>5</td>
<td>Communication speed</td>
<td>1Gbps, 10Gbps</td>
</tr>
</tbody>
</table>
| 6   | Connectable device type                   | CC-Link IE TSN compatible Slave Station (Certification Class A or certification Class B) is connected to the local node.
| 7   | Shortest communication cycle              | 250μs                      |
| 8   | Maximum number of connected stations      | 129 stations (total of Master station + Remote station) |
| 9   | Connection cable                          | Category 5e or higher double shielded, straight |
| 10  | Total network length                      | Line, Star, Link, Star    |
| 11  | Maximum distance between nodes            | 100m (compliant with ANSI/IEEE-SA-584-B Category 5) |
| 12  | Number of possible switch cascade layers  | 1 layer                    |
| 13  | Duplex                                    | Full, Half                |
| 14  | Communication bandwidth guaranteed         | 1000Mbps                   |
| 15  | Time synchronization protocol             | IEEE802.1AS and IEEE1588   |

1 * When configuring a network with only certification Class B, only one CC-Link IE TSN compatible switch certified by the CC-Link Partner Association can be connected. Also, when using a general-purpose switch, you can connect only to the end of the network. Please contact us for details regarding the use of the switch.
2 When using time synchronization protocol IEEE802.1AS. When the time synchronization protocol is set to IEEE1588, up to 30 slave stations can be connected. However, the number of slave stations of certification class B must be 8 or less. For details on setting the time synchronization protocol to IEEE1588, please contact us.

CC-Link IE TSN specification

How to become a CLPA member

CC-Link IE TSN recommended

Network wiring parts
Developable Stations / Certification Classes

<table>
<thead>
<tr>
<th>Development Method</th>
<th>Station Type</th>
<th>Certification Class</th>
<th>Product name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software</td>
<td>Remote station</td>
<td>Class A</td>
<td>Ze-PRO CC-Link IE TSN (Remote) SDK</td>
</tr>
</tbody>
</table>

**Development Method**

- **Software development kit (SDK) for TSN remote station.**
- **Wrap blocks with high transplant dependency with API.**
- **Can be easily implemented by combining the OS, TCP/IP stack and Ethernet driver according to the customer environment.**
- **Operation confirmation after porting can be easily confirmed by using it as a CC-Link IE TSN utility * simple master station.**

* CC-Link IE TSN utility can be obtained from the CLPA Members Site.

**Features and benefits of development methods**

- **Development method details**
  - Ze-PRO CC-Link IE TSN (Remote) SDK

**SDK Specification**

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supported OS</td>
<td>μITRON® 4.0 specification</td>
</tr>
<tr>
<td>2</td>
<td>Supported devices</td>
<td>STMicroelectronics Inc. STM32F4 series</td>
</tr>
<tr>
<td>3</td>
<td>Recommended Phy devices</td>
<td>Texas Instruments Inc. DRE8346CVV</td>
</tr>
<tr>
<td>4</td>
<td>Recommended TCP/IP stack</td>
<td>Zuken Elmic KASAGO IPv4 Lite</td>
</tr>
<tr>
<td>5</td>
<td>Minimum required memory (ROM/RAM)</td>
<td>ROM:512KB RAM:200KB</td>
</tr>
</tbody>
</table>

**Confirmed operation environment**

<table>
<thead>
<tr>
<th>No.</th>
<th>Operation check environment</th>
<th>Product name</th>
<th>Manufacture name</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Evaluation Board &amp; Integrated Development Environment (STM32F4)</td>
<td>NUCLEO-F429ZI</td>
<td>STMicroelectronics</td>
<td>Cortex-M4 (180MHz)</td>
</tr>
<tr>
<td></td>
<td>API</td>
<td>IAR Embedded Workbench for ARM</td>
<td>IAR Systems</td>
<td>Version: 8.3</td>
</tr>
<tr>
<td>2</td>
<td>Evaluation Board &amp; Integrated Development Environment (RTX2M)</td>
<td>TS-RX72M-COM</td>
<td>TESSERA TECHNOLOGY INC.</td>
<td>Renesas Electronics Corporation RXv3(240MHz)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E2studio+CCRX Compiler</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Renesas Electronics Corporation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E2studio(V7.5.0) CCRX(V3.01)</td>
</tr>
<tr>
<td>3</td>
<td>OS</td>
<td>μITRON® 4.0 specification OS</td>
<td>μForce Co.,Ltd.</td>
<td>Package version: 2.2.8 Kernel version: 2.11.00</td>
</tr>
<tr>
<td>4</td>
<td>TCP/IP stack</td>
<td>KASAGO IPv4 Lite</td>
<td>ZUKEN ELMIC Inc.</td>
<td>Version: 6.0.1.33</td>
</tr>
<tr>
<td>5</td>
<td>SNMP</td>
<td>KASAGO SNMP</td>
<td>ZUKEN ELMIC Inc.</td>
<td>Version: 6.0.1.33</td>
</tr>
<tr>
<td>6</td>
<td>IP diagnose detection</td>
<td>KASAGO AutoIP</td>
<td>ZUKEN ELMIC Inc.</td>
<td>Version: 6.0.1.33</td>
</tr>
</tbody>
</table>

**Contract development service**

- **MITSUBISHI ELECTRIC ENGINEERING COMPANY LIMITED.**
  - From product development to conformance testing, prototyping and mass production, we support users from both software and hardware.

**Kit contents**

- TSN stack SDK (source code)
- Sample application
- CC-Link IE TSN (Remote) SDK Reference Manual
- CC-Link IE TSN (Remote) SDK porting manual
CC-Link IE TSN Specifications

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Transmission Speed</td>
<td>1 Gbps, 100 Mbps</td>
</tr>
<tr>
<td>2</td>
<td>Maximum I/O Size Per Station</td>
<td>Up to 4G (4,294,967,296) octets in I/O total for each station</td>
</tr>
<tr>
<td>3</td>
<td>Transient Transmission</td>
<td>Each station has server function and client function. Transmission capacity is the same as SLMP.</td>
</tr>
<tr>
<td>4</td>
<td>Communication Method</td>
<td>Time Sharing Method</td>
</tr>
<tr>
<td>5</td>
<td>Synchronization Function</td>
<td>Complies with IEEE 802.1AS and IEEE 1588v2</td>
</tr>
<tr>
<td>6</td>
<td>Number of Nodes Connected to One Network</td>
<td>64,770 units (total number of master and slave stations)</td>
</tr>
</tbody>
</table>
| 7   | Maximum Distance Between Nodes | • For twisted pair cable (IEEE 802.3 compliant): 100 m  
• For optical fiber (IEEE 802.3 compliant multi-mode fiber): 550 m  
• For optical fiber (SI-POF): 20 m  
• For optical fiber (SI-HPCF): 100 m |
| 8   | Maximum Number of Branches | No upper limit |
| 9   | Topology | Line, star, line/star mixed, ring, ring/star mixed, mesh |

CC-Link IE TSN specification
CC-Link IE TSN recommended network wiring parts

Recommended network wiring parts
CC-Link IE TSN wiring components such as cables, connectors and switches can be used as long as they comply with applicable standards such as ANSI/TIA/EIA-568-B (Category 5 or Category 5e).
However, unlike general office (OA) use, they are often used in industrial applications with devices that generate electromagnetic noise, requiring functions that are different from that for office use, such as grounding the noise induced in the cable without affecting the communication.
Therefore, the CC-Link Partner Association has conducted tests to ensure that our customers can use them safely for industrial purposes, and provides information on products that passed these tests as the recommended products.

Mutual Certification System
- Cables and connectors that can be used in CC-Link IE Field can also be used in CC-Link IE TSN, enabling mutual certification.
The following recommended components that have passed the CC-Link IE Field network recommended wiring component test can be similarly recommended for CC-Link IE TSN. Testing is not required at this time.
  - Cable
  - RJ45 plug/jack
  - RJ45 relay connector
  - M12 plug/jack

Switches that have passed the CC-Link IE Field network recommended wiring component test can be classified as recommended products that have passed certification class A in CC-Link IE TSN without further testing.
How to become a CLPA member

In order to develop CC-Link IE TSN compatible products...

You need to join the CC-Link Partner Association.

Sign up for a new membership.

CC-Link Partner Association Membership Category

- Regular 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

- Executive Members

- Board Members

- Registered Members
  - Only provides access to CC-Link Family specifications

CC-Link Partner Association Membership Category

<table>
<thead>
<tr>
<th>Category</th>
<th>Regular Member</th>
<th>Executive Member</th>
<th>Board Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual fees (JPY)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) shows fees for intermediate enrollment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JPY 100,000*3</td>
<td>JPY 50,000*3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initiation fee (JPY)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JPY 1,000,000*3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquisition of product specifications</td>
<td>Provided for free upon membership registration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>License to use CC-Link Family technology</td>
<td>SLMP*1 Included</td>
<td>Included</td>
<td></td>
</tr>
<tr>
<td>CC-Link Family Specifications (Other than SLMP)</td>
<td>Included</td>
<td>Included</td>
<td></td>
</tr>
<tr>
<td>Conformance test fee (per device)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC-Link IE TSN</td>
<td>JPY 100,000*3</td>
<td>JPY 50,000*3</td>
<td>Included</td>
</tr>
<tr>
<td>Master, local and intelligent device stations for CC-Link and normal stations of CC-Link IE Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Master and local stations, intelligent device stations, remote device stations of CC-Link IE Field</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC-Link IE Safety</td>
<td>JPY 300,000</td>
<td>JPY 200,000</td>
<td></td>
</tr>
<tr>
<td>IESMAP(master)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IESSLP(slave)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC-Link remote device and I/O stations, cables and miscellaneous products</td>
<td>JPY 200,000</td>
<td>JPY 100,000</td>
<td>Included in the annual membership fee</td>
</tr>
<tr>
<td>CC-Link IE Field Basic*2</td>
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<tr>
<td>SLMP*1 connectable products</td>
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</tr>
<tr>
<td>Recommended product test fees (per model)</td>
<td>JPY 100,000</td>
<td>JPY 50,000</td>
<td></td>
</tr>
<tr>
<td>Recommended network wiring parts for CC-Link IE TSN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC-Link IE TSN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC-Link IE Control and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC-Link IE Field</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of CC-Link Family logo</td>
<td></td>
<td></td>
<td>Included</td>
</tr>
<tr>
<td>Technical support</td>
<td></td>
<td></td>
<td>Included</td>
</tr>
<tr>
<td>Publishing products in home page CLPA Partner</td>
<td></td>
<td></td>
<td>Included</td>
</tr>
<tr>
<td>Product Search Tool (No charge)</td>
<td></td>
<td></td>
<td>Included</td>
</tr>
<tr>
<td>Promotion at fairs</td>
<td></td>
<td></td>
<td>Included</td>
</tr>
<tr>
<td>Information about events</td>
<td></td>
<td></td>
<td>Included</td>
</tr>
<tr>
<td>Posting of company name on CLPA website</td>
<td></td>
<td></td>
<td>Included</td>
</tr>
</tbody>
</table>

*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: 50,000 yen  
  - Executive: 20,000 yen
Global support system

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

- **Headquarters (Japan)**
  6F Ozone-front Building, 3-15-58, Ozone, Kita-ku, Nagoya 462-0825, Japan
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  E-mail : info@cc-link.org
  URL : https://www.cc-link.org/

- **China**
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  Head Office - 19F No. 1386 Hong Qiao Road, Shanghai, P.R.China
  TEL : +86-21-64940523  FAX : +86-21-64940525
  E-mail : support@cn.cc-link.org
  URL : https://www.cc-linkchina.org.cn/

- **Europe**
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  TEL : +49-2102-486-7988  FAX : +49-2102-532-9740
  E-mail : partners@eu.cc-link.org
  URL : https://eu.cc-link.org/en/

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  500 Corporate Woods Parkway, Vernon Hills, IL 60061, USA
  E-mail : info@cclinkamerica.org
  URL : http://am.cc-link.org/en/

- **Korea**
  RM. 711, 7F GANGSEO HANGANG XI-TOWER A, 401 Yangcheon-ro, Gangseo-gu, Seoul 07528 Korea
  TEL : +82-2-3860-6178  FAX : +82-2-6224-0158
  E-mail : cplpaor@mea.co.kr
  URL : http://kr.cc-link.org/ko/

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  TEL : +886-2-8990-1573  FAX : +886-2-8990-1572
  E-mail : cc-link@ms163.hinet.net
  URL : https://tw.cc-link.org/tw/

- **ASEAN**
  307 Alexandra Road #05-01/02Mitsubishi Electric Building Singapore 159943
  E-mail : cc-link@asia.meaap.com
  URL : http://as.cc-link.org/en/

- **India**
  3, E-3, J Block, M.I.D.C. Bhosari, Pune - 411 026, Maharashtra, INDIA
  TEL : +91-20-4624 2100  FAX : +91-20-4624 2200
  E-mail : Cipa_India@asia.meaap.com
  URL : https://in.cc-link.org/en/

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  E-mail : partners@tr.cc-link.org
  URL : https://eu.cc-link.org/en/

- **Mexico**
  Mariano Escobedo 69, Zona Industrial - Tlalnepantla, 54030, Estado de Mexico, Mexico
  TEL : +52-55-3067-7517
  E-mail : info@cclinkamerica.org
  URL : http://am.cc-link.org/en/

- **Thailand**
  CC-Link Promotion Center - Thailand
  101, True Digital Park Office, 5th Floor, Sukhumvit Road, Bangjak, Phra Khanong, Bangkok 10260
  Phone : +66(2) 092-8600 Ext. 5506
  Fax : +66(2) 043-1231-33
  URL : http://th.cc-link.org/th/
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.


https://www.cc-link.org

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