OPEN AUTOMATION NETWORKS

# CC-Link IE TSN

## FOR END USERS

# ENABLING DIGITALISATION OF MANUFACTURING

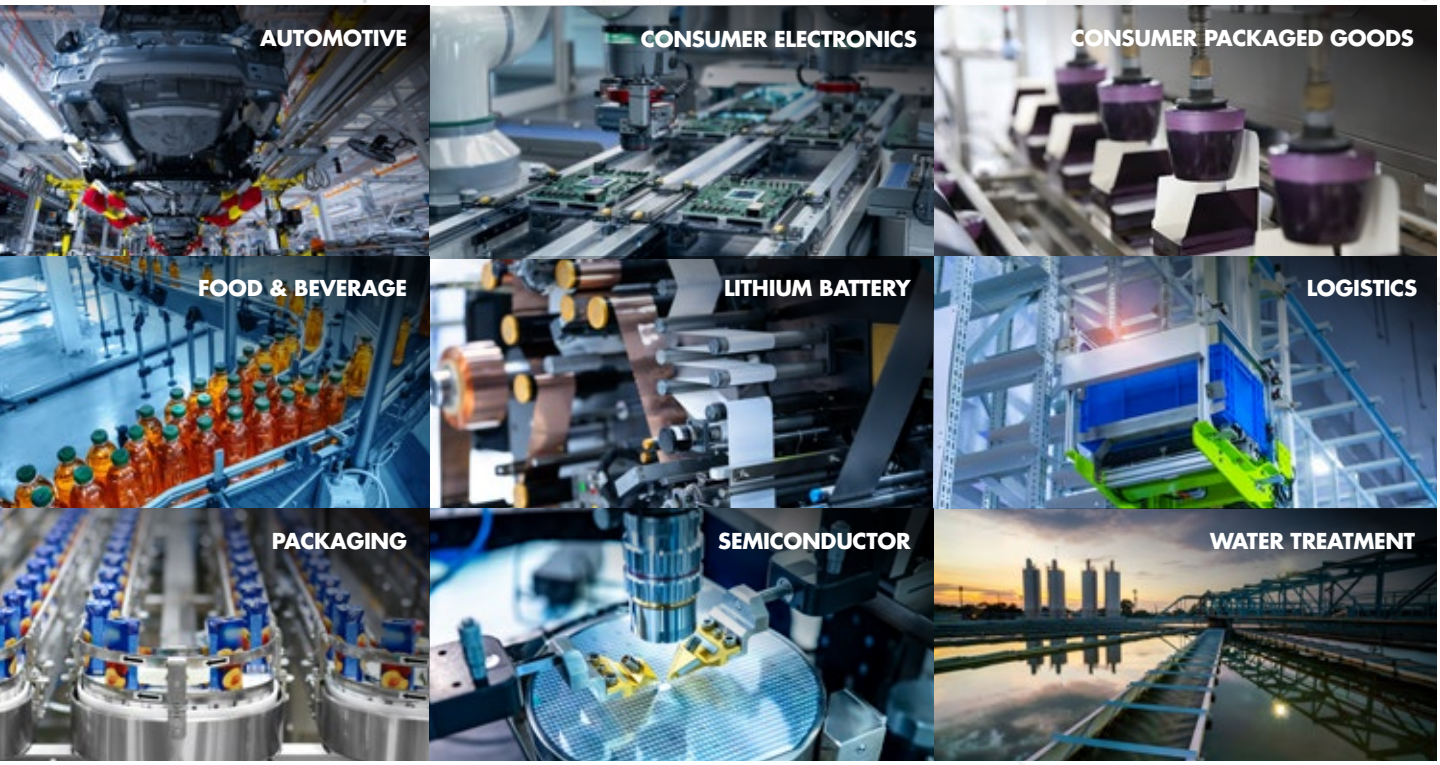
**CC-LINK IE TSN:**
**ONE NETWORK. ONE SOLUTION.**

# Empowering industries with Time-Sensitive Networking

The global economy consists of many different industries that enable our modern world. No matter where you look, from automotive, to food and beverage, to semiconductors and beyond, one thing is clear. The world depends on industrial automation. And this is facing many challenges as we go forward. The common theme through these is digitalisation. Data has become the new fuel that drives manufacturing. For industries to be successful today and in the future, they need technologies that allows data to flow from all parts of the enterprise to everything and everyone who needs it.

That's where the CC-Link Partner Association steps in. We are an established, global organisation with a track record of getting data to where it's needed in the most innovative ways. We have done this with a range of industry leading, open technologies supported by hundreds of partner companies worldwide. This has resulted in thousands of product choices and a global installed base in the tens of millions.

**Come with us on a journey that shows how our technologies can benefit your manufacturing operations.**



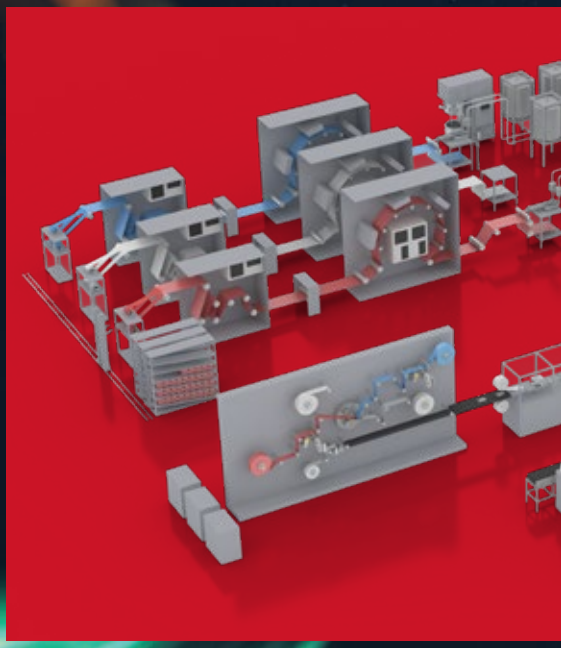

**Benefits of CC-Link IE TSN at a glance:**

- Open, converged and deterministic industrial Ethernet architecture
- Gigabit or 100Mbit bandwidth
- Simpler network architectures/machine designs
- Greater process transparency and better management
- Better integration of OT and IT systems
- High productivity

# How does CC-Link IE TSN benefit manufacturing?

Digitalisation's transformative potential in manufacturing is widely recognised. But this "explosion" of data has created a double-edged sword. On one hand, it can provide valuable actionable insights for optimising processes. Poorly managed, it becomes a tidal wave that overwhelms companies.

Key to its management is a converged, high bandwidth network infrastructure to support digital transformation strategies. Convergence allows everything to communicate on the same network architecture, avoiding multiple networks' cost and complexity. It's the foundation of high-speed, real-time deterministic communications between disparate devices and systems, sharing data across the entire enterprise, regardless of source or destination. This provides the transparency required for fully optimised operations by allowing the data to flow from its source to be processed for actionable insights, then fed back. This does not just apply to supervisory systems. Having real-time control and coordination of multiple different shop floor or operational technology (OT) systems is also critical.

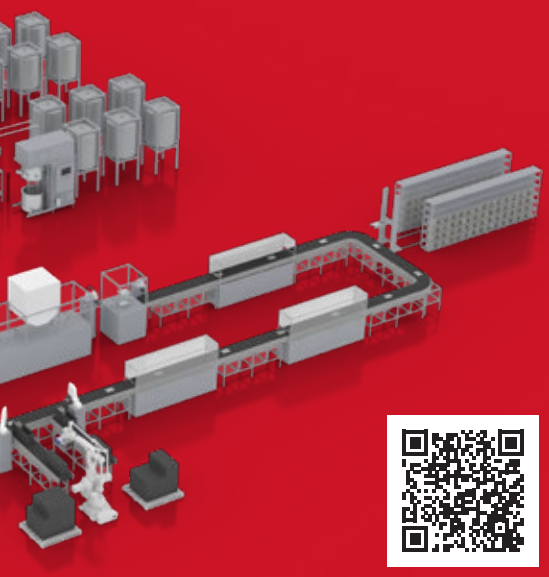


## CC-Link IE TSN and gigabit bandwidth delivers a series of benefits to manufacturing in general:

- Reduce costs, shorten project timelines and increase uptime by simplifying network architectures and hence system designs. Convergence avoids multiple network types to handle different process traffic.
- Deliver greater process transparency and optimised operations. Converged network architectures allow data to flow to where it's needed. This is the key to managing processes in the best way.
- Greater productivity, as optimised processes will run in the most productive way.
- Better integration of OT and information technology (IT) systems, as a converged stream of data can be shared between the factory floor and supervisory systems more easily.

## What industries use CC-Link IE TSN?

Today, over 100 leading global manufacturers are reaping the benefits of CC-Link IE TSN in their operations worldwide. These cover industries as diverse as automotive, consumer electronics, consumer packaged goods, food & beverage, lithium batteries, logistics, semiconductors and many more.



**CASE STUDY | Lithium-ion battery manufacturing, China.**

## Setting tomorrow's battery industry in motion

**Challenges:**

Combine highly critical electrolyte coating and film winding processes with general machine control, safety and IT system integration without compromising cell quality or machine productivity.

**Benefits delivered by TSN:**

OT convergence - Precise motion control of winding and lamination is combined with I/O and safety on same network with no process compromises. TSN & gigabit bandwidth enables microsecond synchronisation of motion axes along with general machine functions. IT convergence - connect with AI based maintenance systems for further process optimisation.

# What do we offer?

We were established in 2000 to develop and promote the CC-Link family of open industrial automation network technologies. Since then, we have grown into a global organisation with a track record of innovation. In a series of firsts, the CLPA introduced open industrial Ethernet technology with gigabit bandwidth in 2007. Building on this success we were the first to combine gigabit bandwidth with Time-Sensitive Networking in 2018.

To learn more about the CLPA and our technologies, please watch "**20 Years of Innovation**"

Beginning with what is now one of the world's most widely used fieldbus technologies, CC-Link, and then became recognised as an innovator in industrial Ethernet. Today, our offering is based on CC-Link IE TSN, the world's first and so far only open industrial Ethernet technology that combines gigabit bandwidth with Time-Sensitive Networking.

This makes CC-Link IE TSN the leading choice for machine builders looking to save cost, improve efficiency and improve connectivity between the OT and IT worlds.

## Key features and benefits are:

**Use TSN's converged network technology to implement simpler deterministic network architectures that combine multiple network traffic types into one.**

**Improve productivity with combined data streams that simplify maintenance and increase uptime.**

**Increase process transparency by simpler extraction of process data to gain optimisation insights.**

This is why we believe that CC-Link IE TSN can be summarised as "**One Network. One Solution.**"

For less demanding applications, we also offer CC-Link IE Field Basic. This suits the needs of low cost applications where a higher degree of functionality is less important.

Our legacy technologies are still widely used globally. These include our earlier industrial Ethernet technologies, CC-Link IE Field and CC-Link IE Control. And despite being over 20 years old, our original fieldbus CC-Link is still powering millions of devices across the world even today.

For an in-depth overview of TSN and its importance to modern manufacturing, please watch our video series "**What is Time-Sensitive Networking?**"

## Our organisation

The CLPA has broad industry support. This is reflected in our board members who include some of the world's leading technology companies as shown here:

**President**

**Board of directors**

3M, Analog Devices, Balluff, Cisco, Cognex, IDEC, NEC, Pro-face by Schneider Electric, Mitsubishi Electric – Changes for the Better, molex

**Managing office**
CLPA Headquarters

**Conformance testing facilities**
Japan
China
Korea
Germany

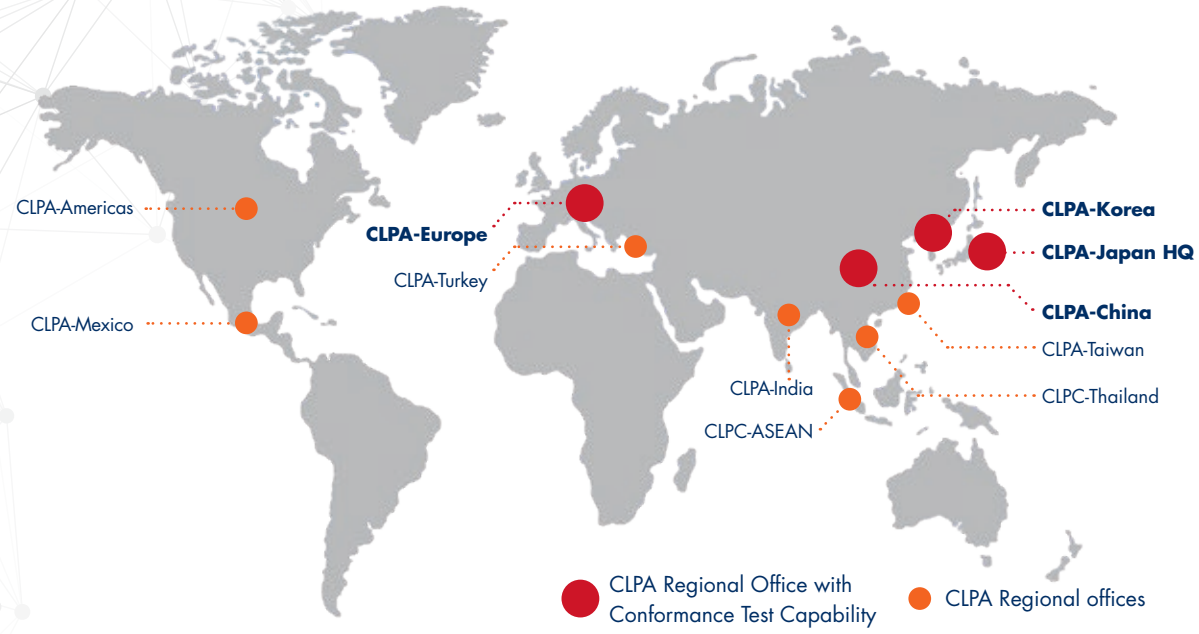
**CLPA branches**
China
Europe
America
Korea
Taiwan
ASEAN
India
Turkey
Americas
Mexico

**Technical task force**

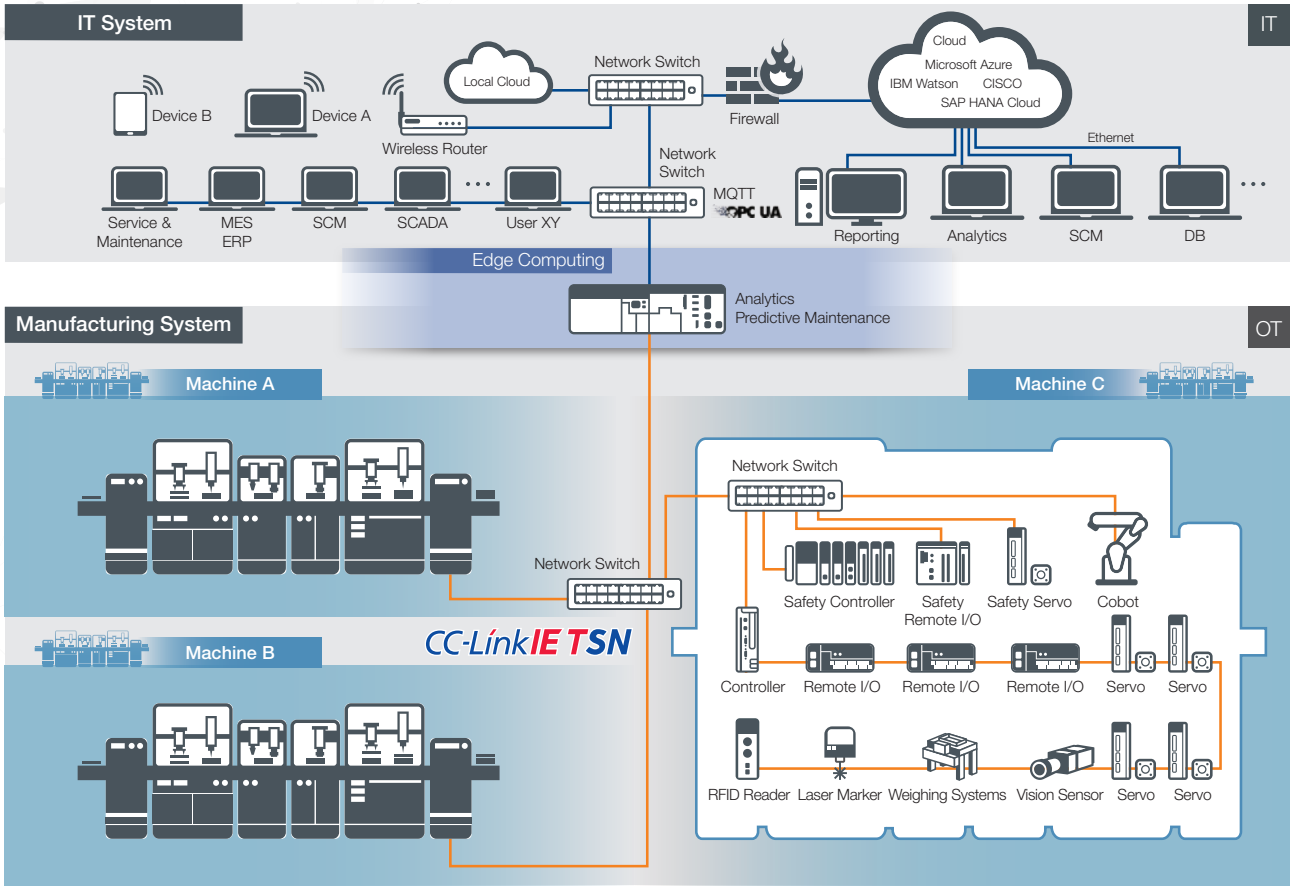
**Marketing task force**

**CLPA Partners**

## World-wide support



## CC-Link IE TSN IT/OT Architecture




## Technical specifications

| No. | Items | CC-Link IE TSN | CC-Link IE Field Basic |
|---|---|---|---|
| 1 | Baud rate | 1Gbps/100Mbps | 100Mbps |
| 2 | Maximum input/output size per master | 4G Octet(Byte) | 9K Octet(Byte) |
| 3 | Transient transmission | Supported | Supported |
| 4 | Communication method | Time sharing | Broadcast polling |
| 5 | Synchronisation method | Time synchronisation | – |
| 6 | Maximum station No. per network | 64,770 stations<br>(Master: m stations,<br>Slave: 64,770-m stations) | 65 stations<br>(Master: 1 station,<br>Slave: 64 stations) |
| 7 | Topology | Line, Star, Ring,<br>Line + Star,<br>Line + Ring, Ring + Star,<br>Mesh | Line, Star |
| 8 | Cable specification | IEEE 802.3 1000BASE-T (Category 5e or above)/100BASE-TX (Category 5 or above) compatible cable.<br>Shielded or double shielded cable recommended. | |
| 9 | Connector specification | RJ-45 connector (1Gbps/100Mbps) ANSI/TIA/EIA-568-B compliant. 8 pin shielded connector recommended.<br>M12 connector (1Gbps/100Mbps) IEC61076-2-109 compliant. 8 pin connector recommended.<br>M12 connector (100Mbps) IEC61076-2-101 compliant. 4 pin connector recommended. | |