



*Changes for the Better*

for a greener tomorrow



FA-IT Integrated Solution  
e-F@ctory

**e-F@ctory**

Connect everything

# GLOBAL IMPACT OF MITSUBISHI ELECTRIC



Through Mitsubishi Electric's vision, "Changes for the Better" are possible for a brighter future.

## ***Changes for the Better***

We bring together the best minds to create the best technologies. At Mitsubishi Electric, we understand that technology is the driving force of change in our lives. By bringing greater comfort to daily life, maximizing the efficiency of businesses and keeping things running across society, we integrate technology and innovation to bring changes for the better.

Mitsubishi Electric is involved in many areas including the following:

### **Energy and Electric Systems**

A wide range of power and electrical products from generators to large-scale displays.

### **Electronic Devices**

A wide portfolio of cutting-edge semiconductor devices for systems and products.

### **Home Appliance**

Dependable consumer products like air conditioners and home entertainment systems.

### **Information and Communication Systems**

Commercial and consumer-centric equipment, products and systems.

### **Industrial Automation Systems**

Maximizing productivity and efficiency with cutting-edge automation technology.

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## Connect everything

The industrial world has come to a major turning point with the introduction of the Internet of Things (IoT).

The key to surviving today's severe market competition is the prompt and timely implementation of IoT/optimization; not only on the production shop floor, but also throughout the monozukuri field.

In response to this need, we developed the "e-F@ctory" FA-IT integration solution. At its core is "edge computing," advanced technologies that utilize AI to collect data from the production shop floor and analyze it in real-time, thereby improving monozukuri. Utilizing wide-ranging knowledge and technologies, as a comprehensive FA manufacturer cooperating with more than 700 partner companies,\* we are disseminating e-F@ctory around the world. With us, you can implement "one-stop" operations using optimum IoT proposals for the shop floor, and realize the digital shift throughout monozukuri.

In Japan, and around the world, e-F@ctory innovation connecting all things and optimizing all areas of monozukuri has already started.

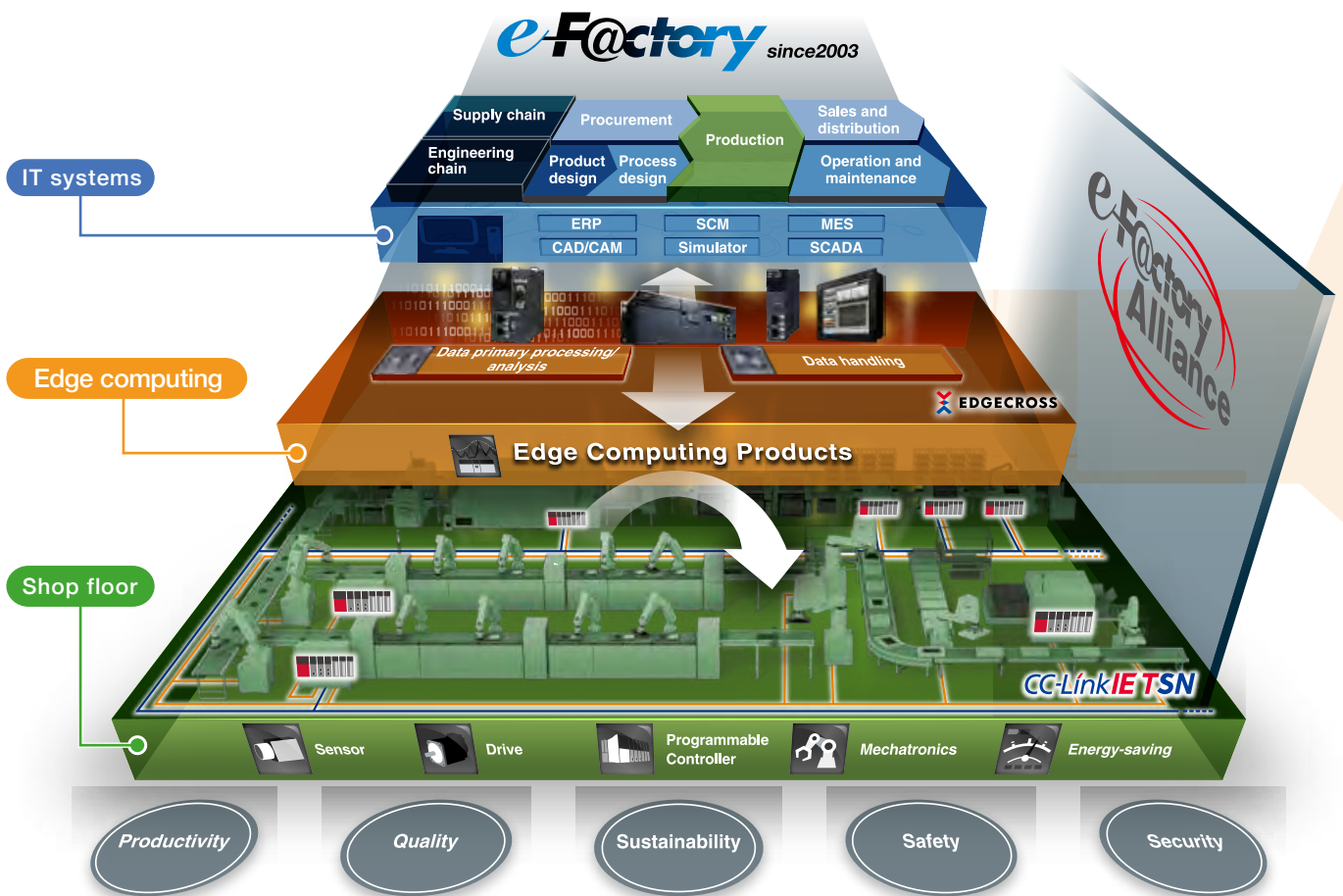


# The key to creating a smart factory is edge computing.

For a smart factory to be achievable, the real-time utilization of production shop floor data and efficient connectivity with IT systems are essential.

With e-F@ctory, by utilizing “edge computing,”

a technological concept for information processing between the shop floor and IT systems, it is possible to achieve data connectivity with optimal efficiency.

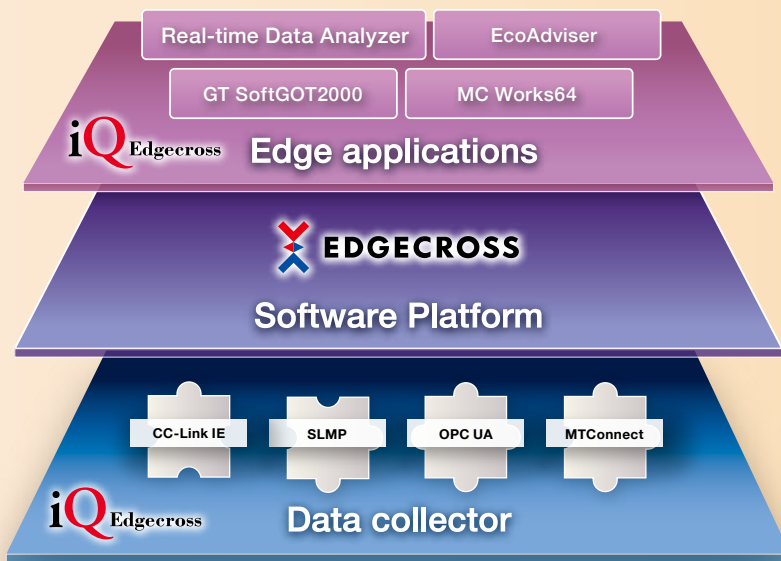




# An Environment Where Manufacturers Participate Freely



Edgecross is an open software platform operating in edge computing environments built in collaboration with members of the Edgecross Consortium\* to enable FA and IT collaboration. It is possible to build a free and flexible edge computing environment independent of application vendors and device manufacturers.



### Edge applications

- Executes various processes such as monitoring, analyzing and diagnosing data from shop floors
- Possible to choose appropriate applications from an abundant lineup

### Edgecross

- Controls the collection, processing, diagnosis and feedback of data utilized in edge computing
- Abstract hierarchical management of production floor lines, equipment and devices

### Data collector

- Regardless of device manufacturer or network, collect various shop floor data
- Collect data from existing facilities

## Edge computing Products

**Industrial PC**  
MELIPC Series



**Data analysis/diagnosis software**  
Real-time Data Analyzer



**Mitsubishi Electric SCADA software**  
MC Works64  
Edge Computing Edition



**Energy Saving Support Software**  
EcoAdviser Coming soon



**GOT2000-compatible HMI Software**  
GT SoftGOT2000



\*Edgecross Consortium is an organization for formulating Edgecross specifications and promoting dissemination. <https://www.edgecross.org/en/>



# IoT Solution

## e-F@ctory IoT Solutions Cover Everything from the Production Shop Floor to IT Systems.

### Linking the Production Shop Floor and IT Data

#### MC Works64

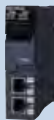
Offering solutions for various needs relating to supervisory control.



**iQ**Edgexross **MC Works64**

#### MES Interface Product Lineup

Link databases without using computers or programs.



**MELSEC iQ-R** **GOT2000**  
Making production data beautiful  
Graphic Operation Terminal

#### C Language Controller (with applications pre-installed)

Supports abundant connections, such as MQTT, REST, and SECS.

**MELSEC iQ-R**



### Data Analysis/Diagnosis Utilizing Edge-Computing

#### MELIPC Industrial Computer

Achieve edge-computing utilizing various data from the production shop floor.



**MELIPC**

#### Real-time Data Analyzer

Data analysis/diagnosis software equipped with abundant statistical methods and AI.



**iQ**Edgexross

#### GT SoftGOT2000

HMI software capable of abundant GOT functions using a computer or panel control.



**iQ**Edgexross  
**MELSOFT**  
**GT SoftGOT2000**

### IoT Shift and Data Collection on the Production Shop Floor

#### Simple CPU Communication Function

CPU has built-in Ethernet function that enables device data to be transmitted easily between controllers using only parameter settings.

Transmit device data using only parameter settings

PLC名	PLC種	機種	IPアドレス	ポート	通信速度	通信方式	通信プロトコル	通信先	通信種
SB	FX	FX3U	192.168.0.1	1	10Mbps	TCP/IP	PLC-Link	192.168.0.2	データ転送
SW	FX	FX3U	192.168.0.2	1	10Mbps	TCP/IP	PLC-Link	192.168.0.1	データ転送
LD	FX	FX3U	192.168.0.3	1	10Mbps	TCP/IP	PLC-Link	192.168.0.1	データ転送
LW	FX	FX3U	192.168.0.4	1	10Mbps	TCP/IP	PLC-Link	192.168.0.1	データ転送



#### GOT Device Transfer Function

Transfer data between various PLCs using only parameter settings. Capable of connecting Mitsubishi Electric PLCs and those of over 20 other companies.







Mitsubishi Electric is strengthening not only production shop floors and IT systems, but the entire edge-computing field in order to achieve further optimization and higher efficiency. We propose IoT solutions that suit our customers' goals, covering everything from collecting shop floor data to analysis and diagnosis, even including connectivity to IT systems and clouds.

#### OPC UA Server Module

Achieving OPC UA communication with simple settings.

**MELSEC iQ-R**



#### iQ Care Remote4U

Confirm/Analyze the operating status of processing machines and other equipment from a remote location via smartphone.

**iQ Care Remote4U**



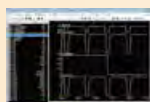
#### MX Sheet

Load data and perform statistical analysis in Excel; no need for a program.



#### GXLogViewer (Free)

Real-time display of analog waveforms for easy analysis.



#### Web Server Function (CPU standard-equipped)

Conduct CPU diagnosis and device batch monitoring via a computer or tablet web browser.



#### e-F@ctory Support Module

A sample project for easily analyzing and displaying equipment information collected by a PLC. No need to prepare complex analysis algorithms or graphs.



#### Data Collector Function

Collect data from systems with multiple networks, existing equipment, and special-purpose equipment.



**iQ Edgexross**

**CC-Link IE**

**SLMP**  
Serial Message Protocol

**OPC UA**

**MTConnect**

# e-Factory

## CASES

Introduction of Solutions

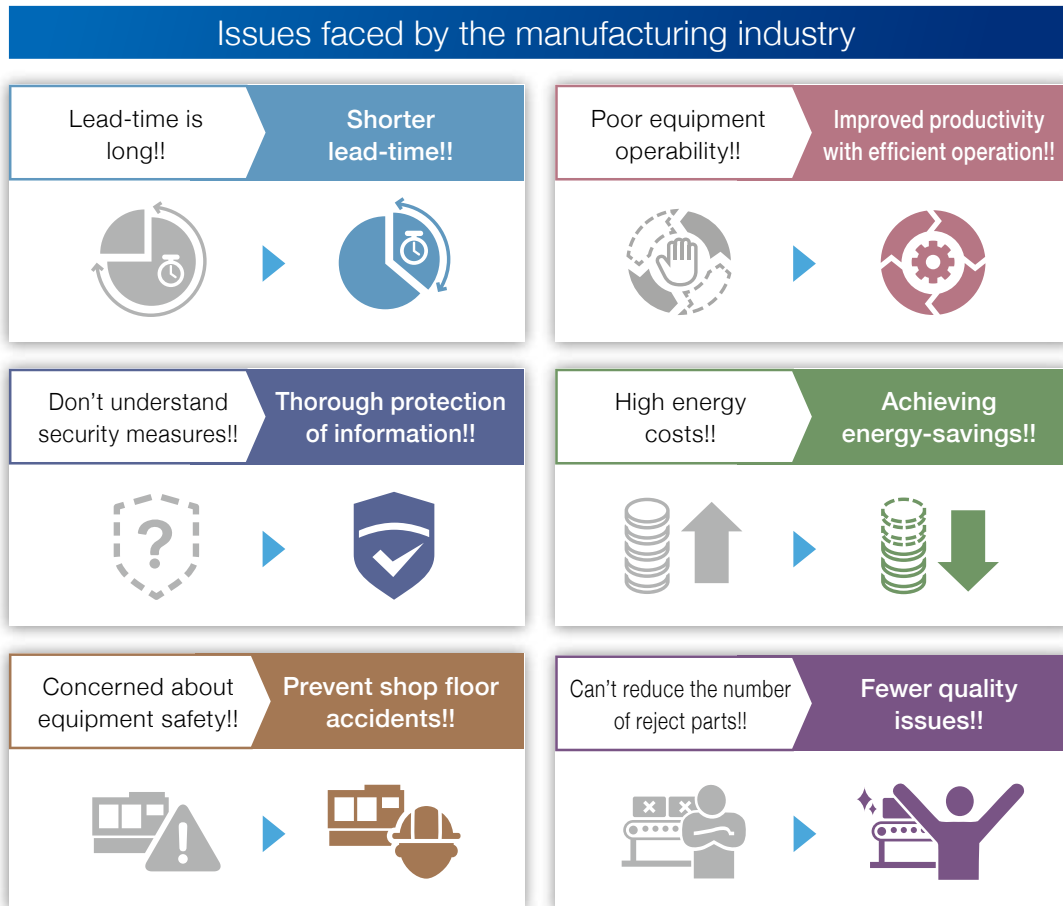


## Solutions Introduced

# e-F@ctory leverages knowledge accumulated to date to find the optimal solution for each industry type and process.

e-F@ctory was launched in 2003 and has helped many companies solve various issues.

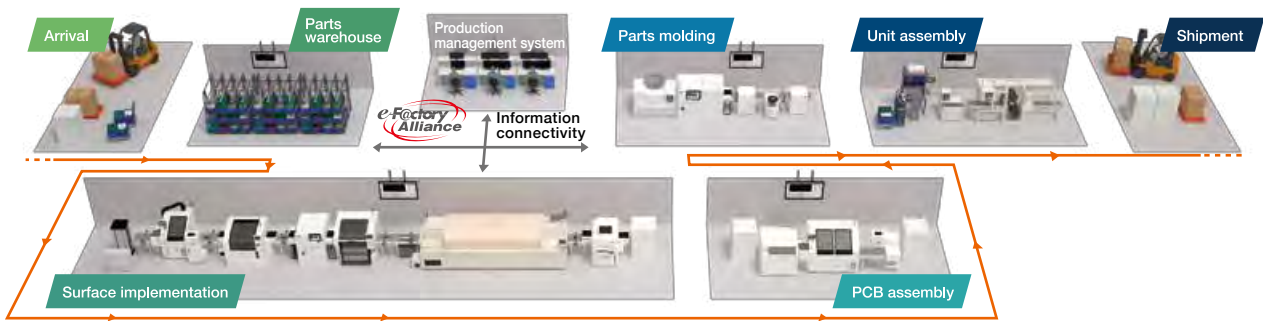
From the knowledge accumulated down through the years, e-F@ctory proposes optimal solutions for each industry type and process to achieve productivity and quality improvements, cycle-time reductions, preventive maintenance, “visualization” of energy, energy savings and so on.





# Electricity/Electronic Fields (Compact LCD)

Electricity and electronic fields require elaborate and complex work, yet a high percentage of tasks are still performed manually. A major issue faced is how to automate the processes of part loading, surface implementation, PCB assembly, unit assembly and shipment in order to reduce human error. e-F@ctory helps provide a solution to this issue by providing robots equipped with force sensors and work support systems.



**Parts warehouse**      **Parts warehouse**

**Error-proofing**

**Issues**

- Incorrect part selection/supply
- Process stops due to parts shortage

**Solution**

- Prevent mistakes with a work instruction system
- Advance notification of shortages with a status indicator

**Parts molding**      **Deburring/Polishing**

**Deburring/Polishing**

**Issues**

- Complicated adjustments in order to machine workpieces of various shapes
- Tool wear

**Solution**

- Shorten start-up time with simple teaching
- Detect wear amount with a force sensor

**Unit assembly**      **Unit assembly**

**Bolt-tightening support**

**Issues**

- Incorrect assembly during high-mix, low-volume production
- Flexible support of production load fluctuations

**Solution**

- Prevent mistakes with a work instruction system
- Optimize to suit production status

**Unit assembly**      **Inspection**

**Force sensor application**

**Issues**

- Manual work by humans is required to connect connectors to inspection units

**Solution**

- Full automation of inspection process through introduction of a robot equipped with a force sensor

**Unit assembly**      **Packaging**

**Packaging**

**Issues**

- Seal suited to workpiece, cutting operation and cut length correction necessary

**Solution**

- Simplification of equipment start-up with a seal/cut mechanism and correction function

**Progress management**      **Progress management**

**ANDON**

**Issues**

- Visualization of production status is time-consuming and cumbersome
- Can't install status indicators for the sake of visualization alone

**Solution**

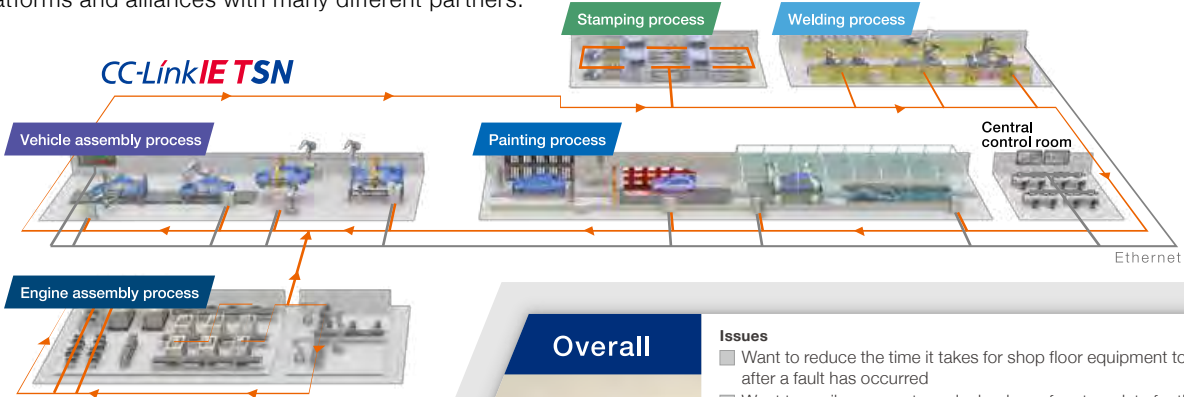
- Able to efficiently build and operate systems not only capable of status visualization on large screens, but also tablets and computers. Features a signage function to improve the added-value of the visualization system



# Automotive/Automotive Parts Fields

In vehicle manufacturing plants that handle a vast number of parts and wide variety of processes, there is a need to solve various issues such as responding to mixed production of many different car models, improving production speed and quality, considering worker safety and engaging in environment-oriented initiatives.

e-F@ctory helps provide solutions to the issues customers face by offering optimal solutions through forming common platforms and alliances with many different partners.



### Overall

**Issues**

- Want to reduce the time it takes for shop floor equipment to recover after a fault has occurred
- Want to easily carry out regular backup of system data for the overall line
- Want to prevent trouble by assessing signs of power abnormalities in equipment

**Solution**

- ✓ GOT backup/System recovery without a computer using a restore function
- ✓ Batch backup of all system data with the integration engineering tool
- ✓ Prevent sudden breakdowns by constantly monitoring electric current (or electric power)

### Stamping process / Coil set

**Issues**

- Want to perform loading/unloading to/from processing machines automatically
- Concerned about cost of installing a robot
- Want to further improve the productivity of processing machines

**Solution**

- ✓ Installing a robot increases production volume approximately 1.5 times, compensating for equipment depreciation in about one year
- ✓ Flexibly supports different product types and production adjustments, and reduces dangerous work (Note: Calculated using Mitsubishi Electric conditions and calculations)

### Welding process / Outer join welding

**Issues**

- Want to ascertain the status of each device in the welding process

**Solution**

- ✓ By installing a PLC, the values of designated devices can be monitored in real-time with arbitrary sensitivity and timing, which leads to preventive maintenance

### Painting process / Paint inspection

**Issues**

- In the past, operators inspected accuracy visually and manually. With consideration to mass production, want to shorten time required to inspect each workpiece and eliminate measured value variation due to operators' level of experience

**Solution**

- ✓ The tasks of lot no. scanning, accuracy inspection and measured value recording are all performed automatically, therefore shortening inspection time. Able to perform batch inspection with a sensor jig, therefore creating an inspection system not dependent on operator experience. Reduces manufacturing costs by reducing number of people required for inspection work

### Engine assembly process / Assembly

**Issues**

- Human error occurs, such as missing a machining step, therefore machining in the wrong order. Want to manufacture products that have passed through the necessary processes with certainty and create a system that can manage process sequence

**Solution**

- ✓ Through individual management of parts for machining, able to ascertain whether or not parts have been machined in line with the correct process sequence. Workpiece individual management is possible with a laser engraving + barcode reader, and major additional machining is not required

### Vehicle assembly process / Glass attachment

**Issues**

- Want the coating apparatus to be able to trace the glass surface so that adhesive agent is applied evenly

**Solution**

- ✓ Correction of nozzle position with a laser displacement sensor

### Inspection/shipment processes / External inspection

**Issues**

- Would like to automate inspection work performed manually and visually by operators
- Would like inspection results to have traceability
- Many man-hours are required to develop programs for sensors

**Solution**

- ✓ Automation is possible by installing sensors for gap measurement
- ✓ Inspection history can be traced using logging data
- ✓ Less man-hours required for development due to a "single-tool" engineering environment and sample programs

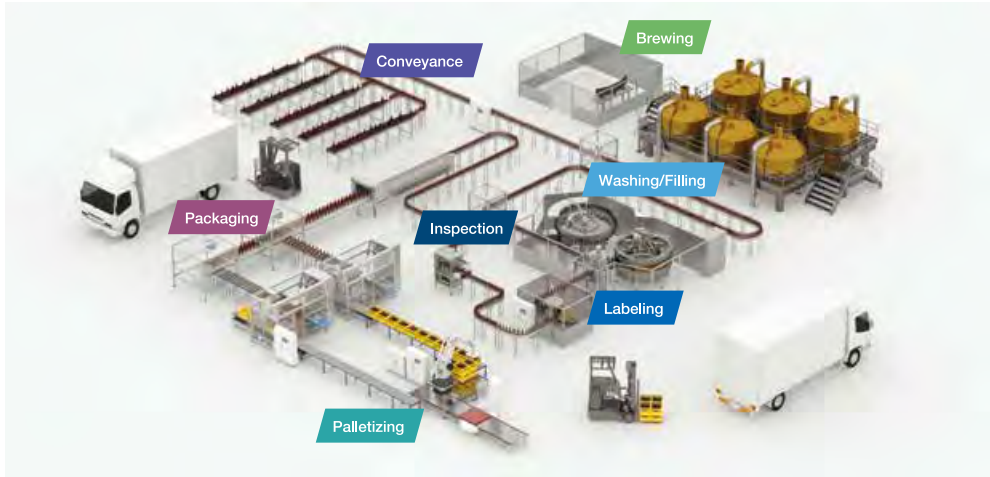
Cases



# Food/Beverage Fields

In the food and beverage fields, where stringent quality control is essential, there is a demand to both maintain quality and achieve greater efficiency in areas such as high-accuracy process control to maintain temperatures, humidity and pressure, reduce equipment set-up changeover time, improve contamination measures and food traceability (product tracking, raw material retroactivity), and perform multifaceted inspections.

e-F@ctory contributes to the safe and secure production of food and beverages through versatile visualization and inspection systems using cameras and sensors.



### Brewing process



**Issues**

- Want to manage different processes on a factory-wide level
- Unique flavors require high-accuracy process control

**Solution**

- Improve productivity and quality with factory visualization
- Easily build process control systems

### Washing/Filling process



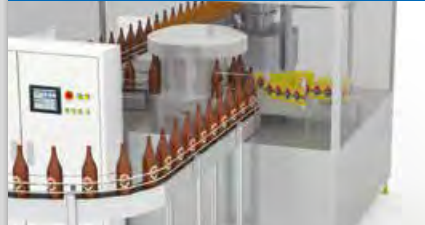
**Issues**

- Filling/Sealing with greater accuracy and speed
- Set-up changeover time reduced

**Solution**

- Improved nozzle control suppresses splashing and foaming
- GOT utilized to simplify set-up changeover

### Labeling process



**Issues**

- High-accuracy printing and labeling necessary to achieve traceability

**Solution**

- Synchronization with high-speed conveyor ensures accurate printing and label attachment

### Inspection process



**Issues**

- Want to thoroughly eliminate rejects

**Solution**

- Multifaceted inspections through a high-performance visualization system and seamless collection and management of measurement data

### Conveyance process



**Issues**

- Want conveyance with greater stability
- Highly conscious of energy savings and space savings

**Solution**

- Stable operation with a speed fluctuation of 1%
- Energy-saving/Space-saving operations owing to a guard motor equipped with a high-accuracy gear and motor compliant with domestic and international high-efficiency regulations

### Packaging process



**Issues**

- Further improved productivity
- Shorter production line downtime

**Solution**

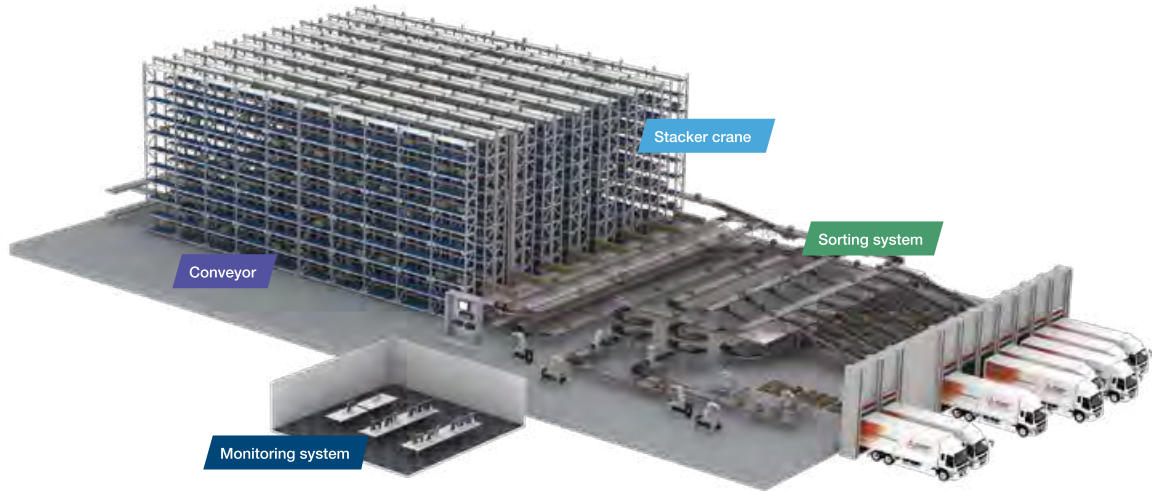
- Higher performance of complex packaging units
- Appraise breakdown forecast information of production line and perform preventive maintenance at appropriate time



# Distribution Field

In distribution warehouses, equipment manufactured by different companies, such as stackers, conveyors and sorting systems, must all operate together as a single system.

In a distribution system assuming continuous operation, there is a need for high-speed, efficiency, and shorter downtime in each process. e-F@ctory supports smooth distribution with a high-speed sorting system, promotion of automation, predictive maintenance using remote monitoring, and other innovative features.



## Sorting system



- Issues**
- Want high-speed, high-accuracy devices
  - Want to reduce cost

- Solution**
- High-speed control utilizing PLCs, servos, FA sensors, and networks
  - Easy connection due to high affinity between each FA device

## Stacker crane



- Issues**
- Want to shorten loading/unloading time
  - Want to shorten start-up and maintenance time
  - Want to improve safety

- Solution**
- Quick loading/unloading with a high-accuracy positioning function
  - High-speed operation with no load collapse through arbitrary S-shaped acceleration/deceleration
  - Devices can be controlled/monitored via a network

## Monitoring system



- Issues**
- Want to understand production status in real time
  - Want predictive maintenance of the production facilities

- Solution**
- Real-time data collection through network response of each FA device
  - Processing and analysis of shop floor data through utilization of edge-computing products
  - Collaboration with e-F@ctory Alliance Partners

## Conveyor



- Issues**
- Want to reduce downtime
  - Want to save space
  - Want to reduce system costs

- Solution**
- Remote control/monitoring through the network compatibility of FA products
  - Detect sensor status with less wiring through ASLINK
  - Power outage countermeasures using a UPS

Mitsubishi Electric's Nagoya Works introduced e-F@ctory and, as a result, has benefited from significant improvements in areas such as productivity, quality, energy-savings and safety, as well as establishment of security.

## 01 Improving Productivity with Operations Management/ Energy-savings/Work Support Systems

### Issues

- Stabilization of operating rate by reducing incorrect part implementation
- Shorten time required to analyze failure causes
- Alleviate burden on experienced operators who give instructions
- Safety measures for operators who perform loading/unloading work

### Solutions

- ✓ Introduction of a system using a C controller for managing surface implementation
- ✓ Introduction of a screw-fastening support system using a display screen
- ✓ Introduction of a system for managing energy savings of air-conditioning and lighting using MC Works64 and a PLC
- ✓ Introduction of a vertical conveyance system using a safety PLC



MC Works<sup>64</sup>



## 02 Improving Quality on the Assembly Line

### Issues

- Support fluctuating demand and high-mix, varying volume production
- Improve equipment operating rate and quality

### Solutions

- ✓ Directly collect various information from equipment with a Manufacturing Execution System (MES) interface (PLC)
- ✓ Directly connect equipment and a MES to strengthen information management and carry out various improvement activities





# 03

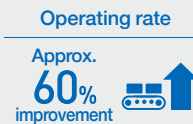
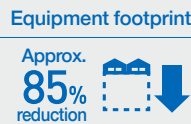
## Improving Productivity with AI Robots

### Issues

- Improve operating rate of lines with long man-hours
- Support production that is high-mix, small volume, high cycle
- Reduce equipment footprint

### Solutions

- ✓ Introduction of a robot production system that combines humans and machines
- ✓ Centralized management of quality/equipment information utilizing e-F@ctory
- ✓ Collection and management (traceability) of product data (barcodes) and quality (test) data for each piece of equipment
- ✓ Utilization of robot intelligent technology (assembly/inspection using force sensors)



# 04

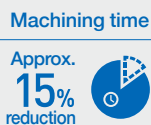
## Improving Productivity of the Camshaft Machining Line

### Issues

- Improve line balance by shortening grinding time on bottleneck processes

### Solutions

- ✓ Management of production information by introducing e-F@ctory
  - Automatic work instructions to the machining line based on information from the host production management server
  - Expansion of unmanned operation with systematic set-up changeover and improvement of productivity
- ✓ Grinder-free system utilizing a C controller
  - Automatic calculation of lathe correction value from automatically measured outer diameter to achieve stable lathe finishing
  - Significant reduction in cycle time thanks to eliminating grinding of the motor-shaft portion



**Mitsubishi Electric's Fukuyama Works introduced e-F@ctory and, as a result, has benefited from productivity improvements and innovative energy-savings thanks to management of short stoppages**

## 01 Improving Productivity with a Short Stoppage Management System

Issues

In the case of circuit breaker manufacturing lines, conventionally, people were in charge of status management and solving issues for each individual line, therefore there were delays in responding to short stoppages and improvements were only temporary.

Solutions

- ✓ Management of operating status for all production processes at an equipment level
- ✓ Collection and analysis of management data online and in real-time
- ✓ Identification of cause behind problems and swift improvement

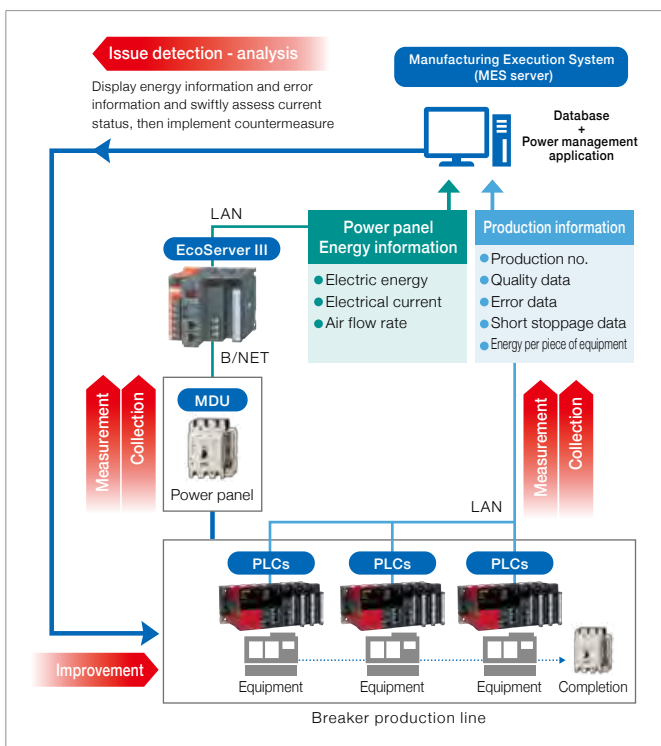
Benefits

Short stoppage occurrence

Approx. **75%** reduction

Operating rate

Approx. **50%** reduction



## 02 Energy-savings with Demand Management

Issues

Management and control of General Administration Building power demand

Solutions

- ✓ Real-time measurement, collection and visualization of power consumption
- ✓ Automatic online adjustment of air-conditioning

Benefits

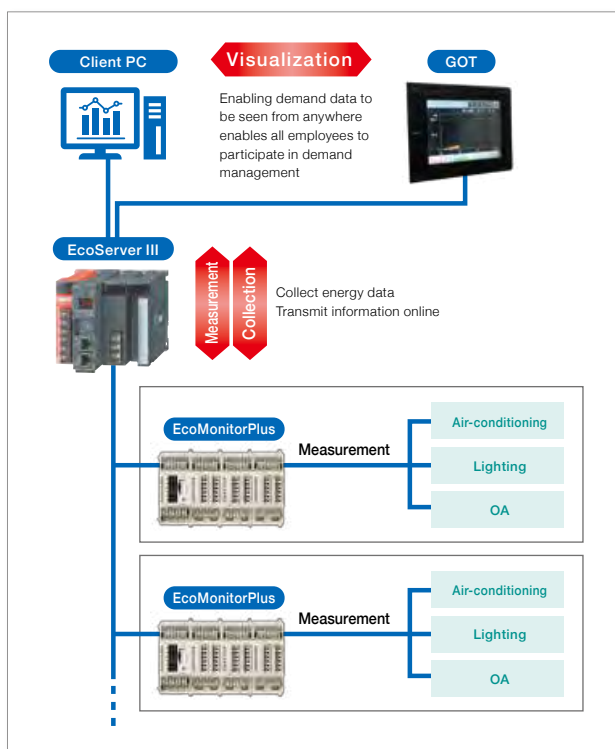
General Administration Building

**24%** less energy consumption

Fukuyama Works overall

Approx. **100 million** yen annual reduction in costs

(base year: 1996, FY2010 results)





### 03 High-Efficiency Energy-savings Based on Production Status and Power Demand Forecasts

Issues

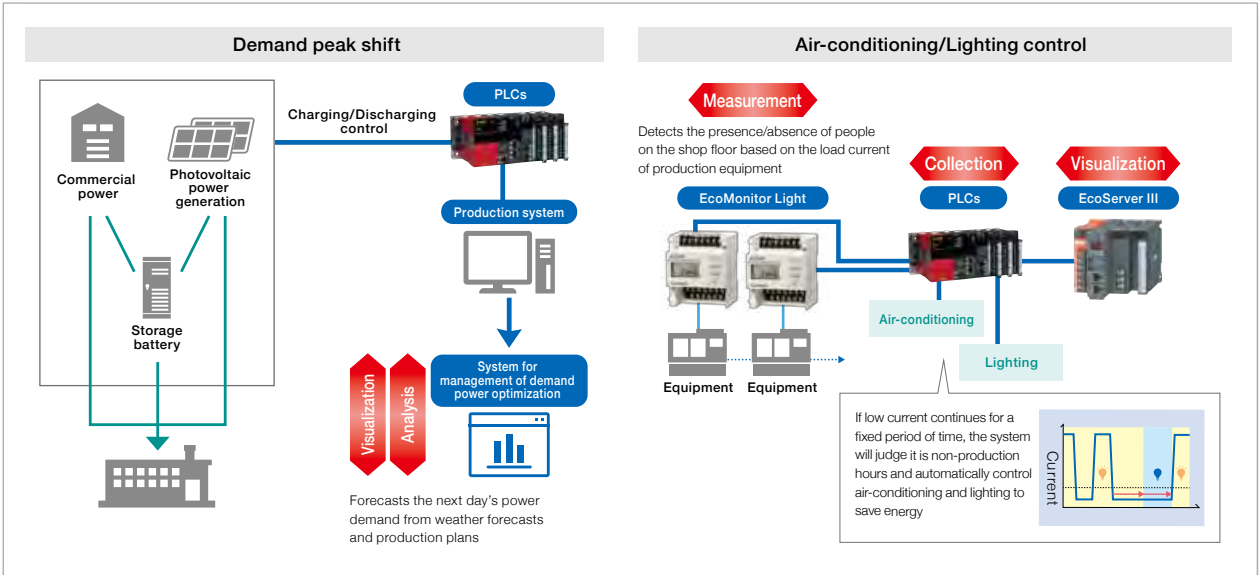
Ongoing energy savings in smart meter production buildings overall

Solutions

- ✓ Effective demand peak shift with power demand, weather information, etc. managed online
- ✓ Measure load current for each piece of production equipment and control air-conditioning and lighting while detecting the presence/absence of operators

Benefits

<p>Air-conditioning/lighting Annual power consumption</p> <p>Approx. <b>20%</b> reduction</p>	<p>In monetary value</p> <p>Achieve/maintain a reduction of approx. <b>500,000 yen</b></p>
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Cases



## Promoting paperless operations and centralized control of production information

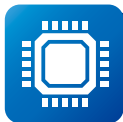


company Sunouchi Corporation

- Issues**
- Unable to quickly provide answers regarding delivery dates due to paper-based information-sharing, therefore lose potential business
  - Many foreign-national employees, therefore need to show clear numbers to achieve accurate operations
  - Difficult to identify causal factors of rejects

**Measure** | Systemization of production planning and connection to sales management system  
Collection of shop floor data with a PLC and handy terminal

- Results**
- ✓ Able to confirm everything in the system from delivery date response to production and shipment
  - ✓ Automatic recording/sharing of performance in numerical form
  - ✓ Identify causal factors through traceability connecting information on products and individual processes



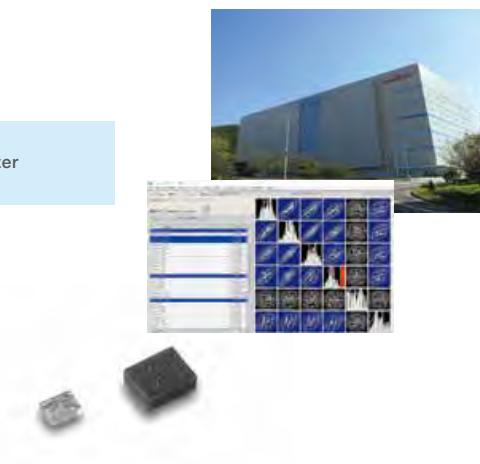
## Engineers analyzing shop floor big data themselves and improving yield

company Kanazawa Murata Manufacturing Co., Ltd.

- Issues**
- After replacing equipment parts and other consumables, actual production can't begin until prototypes are made
  - Want to obtain and analyze data on the shop floor with flexibility

**Measure** | Introduction of MELIPC, an Edgex-compatible industrial-use computer

- Results**
- ✓ Reduced man-hours approximately 20 hours a month
  - ✓ Reduced cost by 1-3 million yen
  - ✓ Maintenance technicians knowledgeable on the shop floor can freely verify with their own ideas



## Achieve traceability with detailed history management as a foothold to stronger global expansion



company MITSUBISHI STEEL MFG. CO., LTD.

- Issues**
- Product traceability including machining history
  - Visualization utilizing IoT

**Measure** | Introduction of traceability system, Traceabia, and Miranda VR, which collect production shop floor data

- Results**
- ✓ Speedy identification of causes for faults
  - ✓ Understand energy usage down to detailed unit of measurement
  - ✓ Obtain important insight for strengthening global expansion





## A Quality Control System That Thoroughly Recognizes the “Individuality” of Products

company Mitsubishi Motors

- Issues**
- Even if the overall trend can be assessed, the status of individual products cannot be assessed in real-time
  - Even if faulty products are found, it is difficult to accurately trace back through production processes
  - Specialized knowledge and enormous effort is needed to change programs
  - If problems arise with communications, the production line needs to be changed

**Measure** Centralized management of each product’s production history with a quality control system adopting an MES Interface

- Results**
- Enabled assessment of production processes for individual products as well as change points of products and equipment status
  - Enabled various ways to utilize collected data, such as for productivity improvement/streamlining, etc.
  - Alleviated development costs during extra equipment installations and production line changes
  - Enabled data collection without stopping the line even when communication problems have arisen



## Achieving Preventive Maintenance and Securing Safety with Sensor Control

OMNI<sup>®</sup> YOSHIDA  
オムニヨシダ株式会社

company Omni Yoshida Co., Ltd.

- Issues**
- Further improvement of conveyor safety
  - Visualization of 100 pairs of sensors

**Measure** Introduction of safety PLC “MELSEC-QS” and the AnyWire sensor management solution “AnyWireASLINK” that performs the centralized management of sensors

- Results**
- Improved functionality and reliability of securing safety with a PLC + CC-Link IE field network + CC-Link Safety
  - Detects breakdowns without delay using a self-diagnosis safety PLC
  - Centralized management of multiple sensors, enabling preventive maintenance and identification of disconnected wire locations



## Customization of a High-Output Laser Processing Machine to Specialize in Thick Plate and Expand Orders Outside of Usual Range

NITTETSU

company Nittetsu

- Issues**
- Many problems in laser processing machines used in the past and the oscillator (the heart of a processing machine) was also lacking in stability
  - Want to confirm status of processing machines remotely

**Measure** Introduction of laser processing machines and remote service “iQ Care Remote4U”

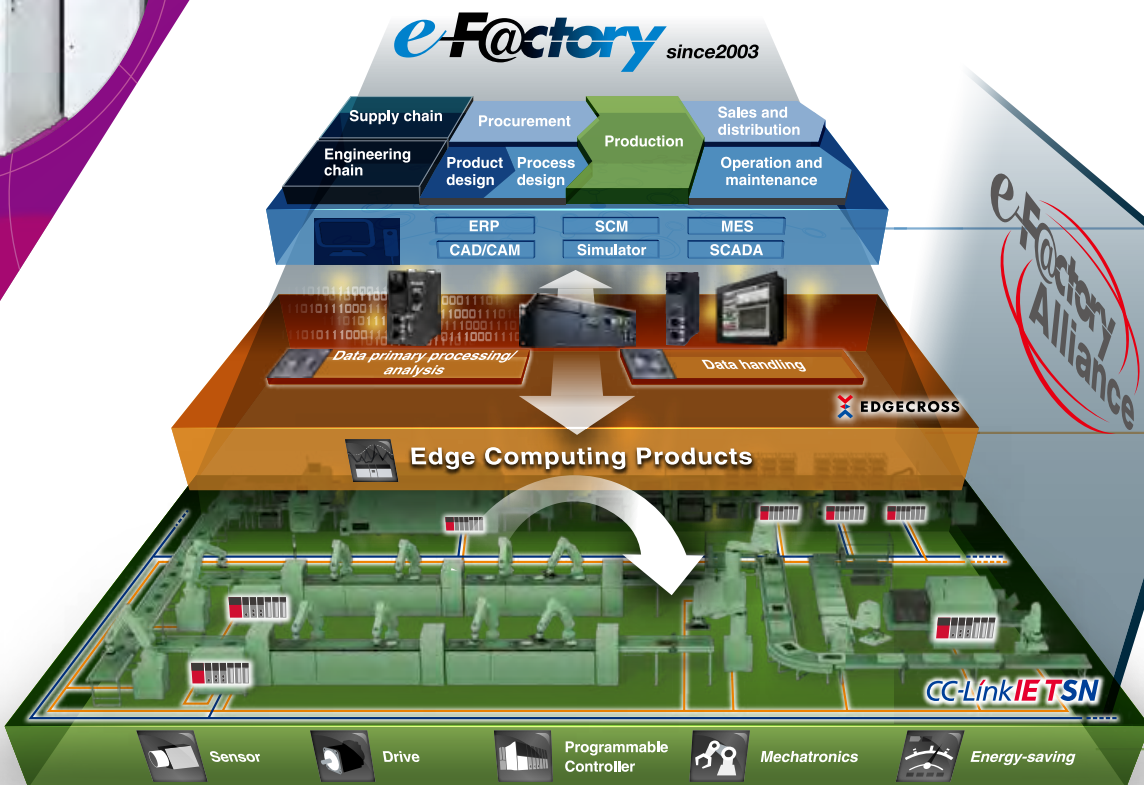
- Results**
- Installed a high-output laser processing machine ahead of other companies to become an outstanding company in terms of thick plate processing
  - Accumulated know-how through cooperation with Mitsubishi Electric members
  - Achieved efficient machine management by utilizing a remote service



# e-Factory

## COMPONENTS

Introduction of Core Products/  
Technologies



- Productivity
- Quality
- Sustainability
- Safety
- Security

# The Advanced Products, Software and Networks Behind e-F@ctory

The new e-F@ctory enables connectivity with an even higher number of devices and networks. e-F@ctory goes beyond the barriers of companies and standards to connect a wide variety of devices and equipment to each other to make innovative monozukuri possible.

## IT System/Software

Mitsubishi Electric SCADA Software  
**MC Works<sup>64</sup>**



## Edge Computing/Products

Industrial PC



**MELIPC**

C Controller



**MELSEC iQ-R**  
series

MES interface products



**MELSEC iQ-R**  
series



Making production data beautiful  
**GOT2000**  
Graphic Operation Terminal

## Shop Floor/Solutions

Compact and Modular Controllers



FA sensors



Inverters, Servos and Motors



Visualisation: HMIs



Numerical Control (NC)



Robots: SCARA, Articulated arm



Low voltage: MCCB, MCB, ACB



Power monitoring, energy management



Power/environment peripheral devices



Processing machines: EDM, Lasers, IDS



**CC-Link IETSN**

**iQ** Edgecross  
**iQ** Platform

**iQ** Monozukuri  
iQCare  
**Remote4U**

**iQSS**  
**MELSOFT iQ Works**

Industrial PC

MELIPC Series **MELIPC**



Preinstallation of Edgexcross data collector

Suited to the two applications of “real-time control” for control of devices, and “edge computing” to collect and analyze data in the edge layer. The extensive lineup features everything from high-end to low-range models, and contributes to improvements on the production shop floor through data utilization.

**MI5000**

- Equipped with Windows® and VxWorks®, integrates device control and information processing into one module
- High-accuracy device control with CC-Link IE Field Network



**MI3000/MI2000/MI1000**

- MI3000 Able to display and operate data collected
- MI3000 MI2000 Able to accumulate data analysis and large-capacity data
- MI1000 Computer functions in a compact size



Edgexcross-compatible Software

Data analysis/diagnosis software  
**Real-time Data Analyzer**



- Enables offline analysis and real-time diagnosis of a wide variety of data from the shop floor.
- AI Maisart\* waveform recognition technology makes it possible to learn/recognize the sensor current wavelengths of devices.
- Enables detection of faults within the system with easy-to-use statistical methods such as the Mahalanobis-Taguchi method and multiple regression analysis.

\*Abbreviation of Mitsubishi Electric's AI creates the State-of-the-ART in technology.



GOT2000-compatible HMI Software  
**GT SoftGOT2000**



- Able to use GOT2000 functions on a computer
- Able to reuse screen data from the GOT2000 Series
- Interconnectivity with other applications



- Alarm display
- Trend display
- Graph display
- Operation log
- Recipe function

Mitsubishi Electric SCADA software  
**MC Works64 Edge Computing Edition**



- Enables monitoring of a wide variety of data from the shop floor
- Enables remote monitoring with 3D display and other forms of advanced visuals and web browser/mobile devices



Energy Saving Support Software **Coming soon**  
**EcoAdviser**



- Enables not only measurement/collection of energy data, but also various analyses to suit the operational status, such as usage ratio, variation, and correlation diagrams.





## MES Interface Products - Use databases without computers or programs

### MELSEC iQ-R/MELSEC-Q Series PLC MES Interface Module



Directly connects PLCs and databases without using gateway computer or communication program.



- Directly transmits information collected from the production shop floor to a database.
- High-speed transmission of manufacturing results and receipt of recipe information.
- Optimal for building traceability systems.

### Computerized Numerical Controller (CNC) M800/M80 Series MES Interface Function

CNC sends machining information and operation status of machine tools to MES.



- Enhances traceability and supports visualization of the entire factory.
- When machining is complete, etc., the information collected by the CNC is sent from the built-in MES interface to the database.
- Achieves visualization of operation status, as well as the visualization of machining results and alarm occurrence status.

### GOT2000 HMI MES Interface Function Graphic Operation Terminal



The GOT2000 HMI collects and sends data to the MES from FA products connected to it.



- Collects data from existing equipment and other equipment that utilize third-party PLCs.
- Supports operators' tasks by providing access to a barcode reader, document viewer, or other such tools.
- Equipped with substantial information management functions characteristic of a display unit (HMI).

### OPC UA Built-in Servers - Building secure systems

#### MELSEC iQ Series OPC UA Server Module



Simply setup using OPC UA communications.

- When designing manufacturing devices, it is possible to internally store and manage the data that is to be released using tag names and layered structures.
- OPC UA security functions can be set optionally on an as needed basis.
- Intuitive operation possible using a Wizard format and setup screen selection format.



## High-Speed Logging of Shop Floor Information

### MELSEC iQ-R/MELSEC-Q Series High-speed Data Logger Module



- Data logging synchronized with PLC scans.
- Swift problem-solving when trouble arises.
- Contributes to operational analysis, trend analysis and preventive maintenance of devices.



### BOX Data Logger

- Easy, computer-free logging of equipment data.
- Automatic creation of ledgers and reports in Excel® files.
- Able to install stand-alone type on existing equipment at a later stage.



## Performing Control, Information Processing and Host Communication Process with a C/C++ Programs

### MELSEC iQ-R/MELSEC-Q Series C Controller Module



- Easy programming independent of the microprocessor.
- Parameter settings, diagnosis and monitoring with CW Configurator.
- Easy application development.



### MELSEC iQ-R Series C Intelligent Function Module



- C/C++ supports complicated computation processing.
- Easy application development.
- Optimal for usage even in clean rooms which must be kept dust-free.

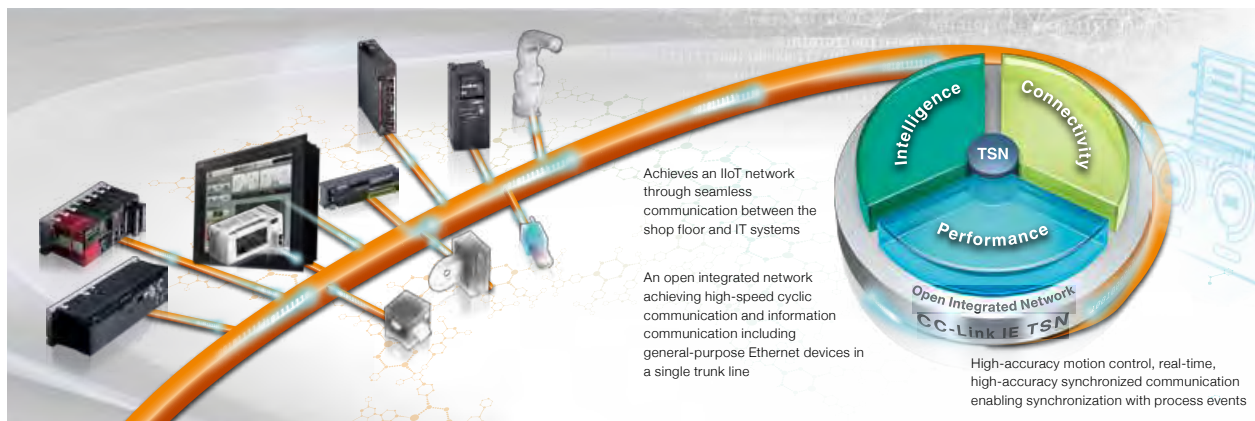


# CC-Link IE TSN



## Open integrated network connecting the production shop floor and IT systems

CC-Link IE TSN is a network achieving seamless communication using TSN technology and innovative communication protocols to collect data from various devices on the shop floor in real time and transmit it to IT systems, thereby creating new added value.



### Performance

In today's production shop floor environments, there is a need to improve productivity and quality. As such, it is essential to have a network that can utilize AI and preventive maintenance to transmit high volumes of data to IT systems while performing high-speed, stable control. CC-Link IE TSN uses an updated communication method to achieve significantly improved communication performance, therefore enabling high-accuracy motion control in addition to high-speed I/O control.

### Intelligence

In industrial communications, to reduce overall cost, there is a need for intelligent networks that contribute to easy system construction and maintenance. CC-Link IE TSN supports various convenient functions such as automatic generation of system configuration diagrams and batch distribution of network parameters, thereby significantly reducing system development costs and maintenance costs.

### Connectivity

In order to achieve monozukuri at a more advanced level, there is a need for networks that can connect to various devices at the same time as securing real-time performance. CC-Link IE TSN makes it possible to combine general-purpose Ethernet communication and control communication, and connect to general-purpose Ethernet devices without impacting control communication. Furthermore, it is possible to build a network compatible with various topologies; therefore, flexible IIoT systems can be built.

## e-F@ctory Support Module

The e-F@ctory Support Module is a sample project for MELSEC iQ-R Series PLCs and GOT2000 Series HMIs. It shows how easy it is to achieve the low-cost implementation of IIoT (easy data analysis, visualization, etc.) at the production shop floor level.

### Utilization of IIoT on the Shop Floor

Applying IIoT technologies to the manufacturing industry, production equipment status, product manufacturing status and product quality status can all be understood in real-time, thus making it easy to provide feedback to equipment and workers, and achieve ongoing cost reduction throughout the entire production shop floor.

### Supporting Implementation of IIoT at the Production Shop Floor Level

Because programs for visualization, easy analysis, and other functions are provided in a sample project format, implementing IIoT at the production shop floor level can be accomplished using only basic configurations such as device allocation and parameter settings.

### Various Functions Incorporated

The e-F@ctory Support Module incorporates various functions to implement IIoT for production shop floor data through visualization, easy analysis, and other means, and can be easily matched for use with customers' applications.

### Achieving IIoT with Minimal Impact on Existing Equipment

By adding a PLC and HMI embedded with the e-F@ctory Support Module, it is easy to implement IIoT on the production shop floor with minimal impact on existing equipment.



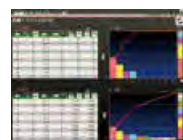
e-F@ctory support module GOT HMI example



Dashboard



Process capability index (histogram)



Equipment trouble Pareto diagram



Cylinder plan monitor/cycle monitor

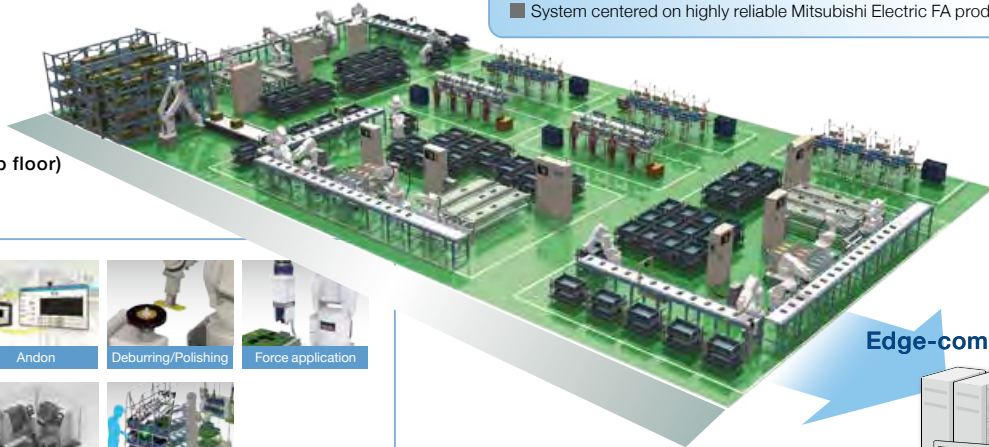
**iQ Monozukuri is a step towards realizing e-F@ctory by merging production shop floors and IT systems via open integrated networks.**

The iQ Monozukuri FA application package helps customers find solutions to various monozukuri issues they are confronted with, and is an optimal product with the know-how that makes it possible to introduce, expand, operate and maintain efficient systems.

**What iQ Monozukuri Provides**

- Lineup of a myriad of applications for each process, application, and piece of equipment
- Monozukuri know-how and ideas cultivated by Mitsubishi Electric and its partners over many years
- System centered on highly reliable Mitsubishi Electric FA products

**Production system**  
(production shop floor)



Processes/  
Applications



Equipment



**Edge-computing**



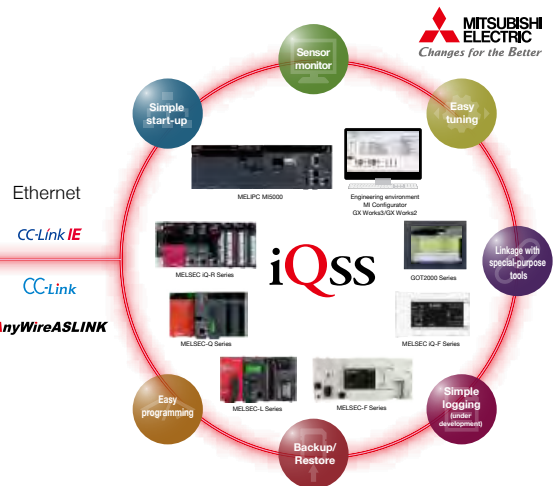
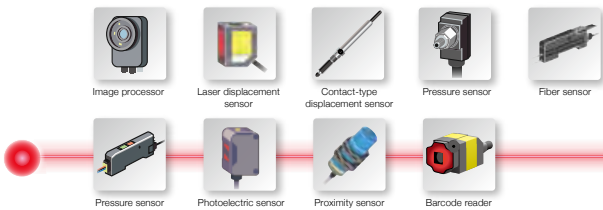
**IT system**

**iQSS (iQ Sensor Solution)**

**iQSS**

Set sensors, perform maintenance, etc. using a single tool. iQSS helps customers reduce total cost of operation through connectivity between sensors, PLCs, HMIs and engineering environments.

Each partner manufacturer



**Reducing Overall Cost of Sensor Systems**

**MELSENSOR**

MELSENSOR makes it possible to reduce the overall cost of sensor systems, including costs related to design, start-up, operation and maintenance, utilizing automatic sensor detection, address change and tool connectivity functions.

Products

# iQ Care Remote4U



This service utilizes IoT to collect and accumulate various information from laser processing and electrical-discharge machines, thereby enabling real-time confirmation and diagnosis from a remote location. It is possible to confirm system faults, or signs thereof, and estimate machining time in real-time using a mobile terminal such as a computer, smartphone, etc.

## Remote Diagnosis Function

Connects directly from a terminal installed in a service center to customers' processing machines for rapid support through remote diagnosis. Supports changes to machining conditions, analysis of alarm content, and provision of preventive maintenance information.



## Dashboard Function

Enables confirmation of processing machine operating information in real-time via a computer or smartphone. Collects, accumulates, and performs central management of operating/cost information from multiple units. Contributes to production process improvement and operating cost reduction through visualization-based analysis.



# MELSOFT iQ Works

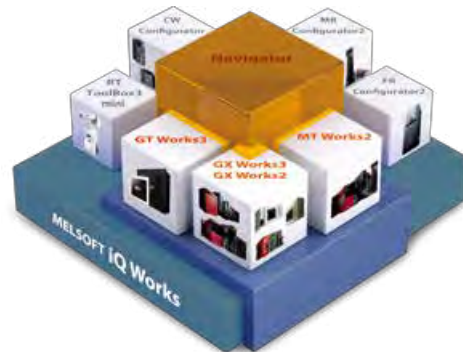


A product integrating individual engineering software with the system management software "MELSOFT Navigator" at the core. Improves system design and programming efficiency and reduces total cost.

## System Management Software

### MELSOFT Navigator

Software made from a combination of various engineering software for the purpose of system upstream design and connectivity between software.

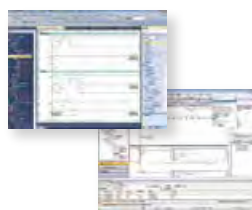


## Programmable Controller Engineering Software

Software that comprehensively supports PLC design and maintenance.

### MELSOFT GX Works3

Helps to reduce engineering costs by offering graphical and intuitive operability, simple "selection-based" programming and a diagnosis function enabling troubleshooting to be performed with ease.



### MELSOFT GX Works2

Helps to reduce engineering costs by inheriting the programming assets accumulated on GX Developer and pursuing comfortable operability by refining familiar functions.

## Other Engineering Software

■ Display unit screen preparation software  
**MELSOFT GT Works3**

■ Motion controller engineering software  
**MELSOFT MT Works2**

■ Robot engineering software  
**MELSOFT RT ToolBox3 mini\***

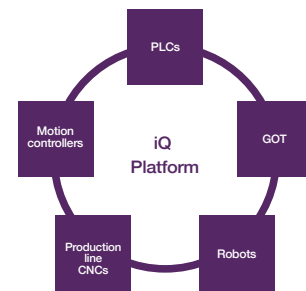
\* When using product ID of iQ Works, RT ToolBox3 mini (summarized edition) is installed. If RT ToolBox3 (w/simulation function) is needed, please purchase RT ToolBox3 product ID.

■ Inverter set-up software  
**MELSOFT FR Configurator2**

■ C controller set-up software  
**MELSOFT CW Configurator**

■ Servo set-up software  
**MELSOFT MR Configurator2**

A solution proposed by Mitsubishi Electric that integrates and connects shop floor controllers, HMIs, engineering environments and networks. iQ Platform uses leading technology to integrate and optimize our customers systems in order to reduce costs involved with development, production and maintenance.



## Exhaustively solving FA issues from the perspective of TCO

### Controllers & HMIs

#### Improving productivity and product quality

- 1 Significantly improving total system performance through the high-speed system bus performance of the MELSEC Series
- 2 Equipped with the function block\* and label-dedicated memory required for program standardization
  - \* Parts work as circuit block that is repeatedly used in sequence programs.
- 3 Equipped with an integrated, robust security function

### Networks

#### Reducing loss with high accuracy and speedy production

- 1 Able to incorporate 1Gbps high-speed communication without loss using CC-Link IE
- 2 Achieving seamless communication of individual devices with SLMP

### Engineering Environments

#### Streamlining development, operation and maintenance

- 1 Able to detect large-scale network configuration diagrams from actual equipment
- 2 Achieves mutual parameter reflection between MELSOFT Navigator and individual engineering software
- 3 Automatically tracks device changes in system labels shared by each controller and the HMI

## IT System/Software

# MC Works64

MC Works64 helps to fulfill a vast variety of needs related to monitoring and control, including improvement of visibility and operability, improvement in reliability, reduction of engineering man-hours, visualization of energy and preventive maintenance.



### Want to improve efficiency of monitoring and operation tasks

- Synchronized monitoring on a single screen when a 3D graphic screen is used
- Confirm necessary information together with a multi-monitor, multi-view display function
- Transmit information instantly with an email function and new push notification

### Want to promote energy savings

- Visualization of energy consumption/CO<sub>2</sub> emissions for overall system and individual devices

### Want to build a highly reliable system

- Duplication of data collection servers (collector) and data storage servers (logger)
- MC Historian enables prolonged period logging, even for large-volume data

### Want to perform wide-range monitoring over multiple plants

- Real, wide-range monitoring possible by utilizing map data
- Guard customers' valuable data through safe communications and cloud environments

### Want to improve operating rate

- Prevent trouble leading to prolonged equipment stoppages
- Rapid cause identification by customers through know-how accumulation

# e-Factory Alliance

## PARTNERS

Partners



Broad knowledge and skill  
as a comprehensive  
FA manufacturer



Know-how of all fields  
relating to monozukuri

Co-creation

Customer



Giving customers  
back the values born  
from co-creation



# e-F@ctory Ecosystem – Co-creation with over 700 Partners\*

As a solutions provider, we collaborate with many partners across all monozukuri fields. This ecosystem provides optimal solutions in various regions and fields in response to the issues experienced by our customers.

\*As of June 2019



Expanding partners around the world



**Producing entire production systems**  
**Achieving advanced systems integration**



IT



Production shop floor



Robots



**Development of application software strengthening connection affinity with Mitsubishi FA devices**



ERP/MES/SCADA



CAD/CAM/3D simulator



Data analysis



**Provide device compatibility with Mitsubishi FA equipment**  
**Achieve improved system builds and maintainability**



Sensors



RFID



Related network devices







# Factory Automation Global website

Mitsubishi Electric Factory Automation provides a mix of services to support its customers worldwide. A consolidated global website is the main portal, offering a selection of support tools and a window to its local Mitsubishi Electric sales and support network.

## ■ From here you can find:

- Overview of available factory automation products
- Library of downloadable literature
- Support tools such as online e-learning courses, terminology dictionary, etc.
- Global sales and service network portal
- Latest news related to Mitsubishi Electric factory automation

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**Mitsubishi Electric Factory Automation  
Global website:**  
**[www.MitsubishiElectric.com/fa](http://www.MitsubishiElectric.com/fa)**

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## Online e-learning

An extensive library of e-learning courses covering the factory automation product range has been prepared. Courses from beginner to advanced levels of difficulty are available in various languages.



### ■ Beginner level

Designed for newcomers to Mitsubishi Electric Factory Automation products gaining a background of the fundamentals and an overview of various products related to the course.

### ■ Basic to Advanced levels

These courses are designed to provide education at all levels. Various different features are explained with application examples providing an easy and informative resource for in-house company training.

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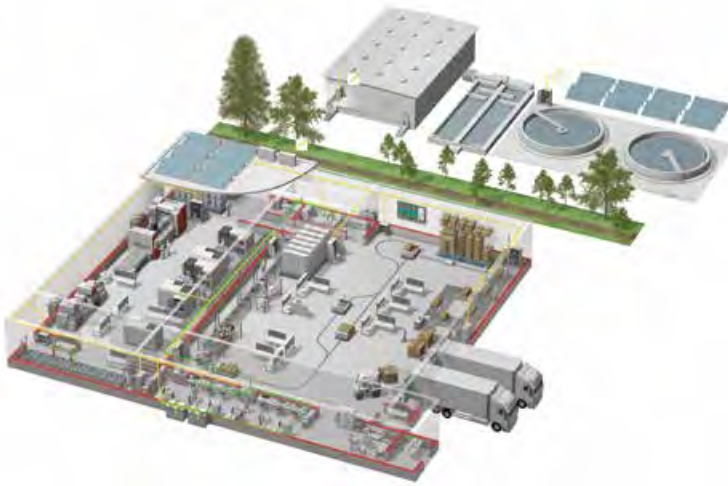
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This publication explains the typical features and functions of the products herein and does not provide restrictions or other information related to usage and module combinations. Before using the products, always read the product user manuals. Mitsubishi Electric will not be held liable for damage caused by factors found not to be the cause of Mitsubishi Electric; opportunity loss or lost profits caused by faults in Mitsubishi Electric products; damage, secondary damage, or accident compensation, whether foreseeable or not, caused by special factors; damage to products other than Mitsubishi Electric products; or any other duties.

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- The products have been manufactured as general-purpose parts for general industries, and are not designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the products for special purposes such as nuclear power, electric power, aerospace, medicine or passenger-carrying vehicles, consult with Mitsubishi Electric.
- The products have been manufactured under strict quality control. However, when installing the products where major accidents or losses could occur if the products fail, install appropriate backup or fail-safe functions in the system.

# YOUR SOLUTION PARTNER



Mitsubishi Electric offers a wide range of automation equipment from PLCs and HMIs to CNC and EDM machines.

## A NAME TO TRUST

Since its beginnings in 1870, some 45 companies use the Mitsubishi name, covering a spectrum of finance, commerce and industry.

The Mitsubishi brand name is recognized around the world as a symbol of premium quality.

Mitsubishi Electric Corporation is active in space development, transportation, semi-conductors, energy systems, communications and information processing, audio visual equipment and home electronics, building and energy management and automation systems, and has 237 factories and laboratories worldwide in over 121 countries.

This is why you can rely on Mitsubishi Electric automation solution - because we know first hand about the need for reliable, efficient, easy-to-use automation and control in our own factories.

As one of the world's leading companies with a global turnover of over 4 trillion Yen (over \$40 billion), employing over 100,000 people, Mitsubishi Electric has the resource and the commitment to deliver the ultimate in service and support as well as the best products.



Low voltage: MCCB, MCB, ACB



Medium voltage: VCB, VCC



Power monitoring, energy management



Compact and Modular Controllers



Inverters, Servos and Motors



Visualisation: HMIs



Numerical Control (NC)



Robots: SCARA, Articulated arm



Processing machines: EDM, Lasers, IDS

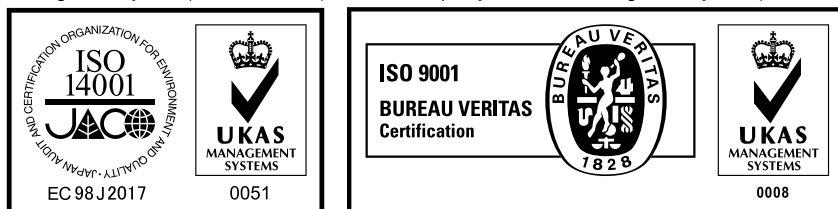


Transformers, Air conditioning, Photovoltaic systems

\* Not all products are available in all countries.

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Mexico	MITSUBISHI ELECTRIC AUTOMATION, INC. Mexico Branch Boulevard Miguel de Cervantes Saavedra 301, Torre Norte Piso 5, Ampliacion Granada, Miguel Hidalgo, Ciudad de Mexico, Mexico, C.P.115200	Tel : +52-55-3067-7512
Brazil	MITSUBISHI ELECTRIC DO BRASIL COMERCIO E SERVICOS LTDA. Avenida Adelino Cardana, 293, 21 andar, Bethaville, Barueri SP, Brasil	Tel : +55-11-4689-3000 Fax : +55-11-4689-3016
Germany	MITSUBISHI ELECTRIC EUROPE B.V. German Branch Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany	Tel : +49-2102-486-0 Fax : +49-2102-486-7780
UK	MITSUBISHI ELECTRIC EUROPE B.V. UK Branch Travellers Lane, UK-Hatfield, Hertfordshire, AL10 8XB, U.K.	Tel : +44-1707-28-8780 Fax : +44-1707-27-8695
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## MITSUBISHI ELECTRIC CORPORATION

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