



for a greener tomorrow



FACTORY AUTOMATION

# PROCESS AUTOMATION SOLUTIONS

for Plant-wide Control, Optimization & Productivity



- Advanced plant-wide control
- Maximized system availability
- Reduced initial and operational costs
- Open standards and scalability

# 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, maximising 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**

Maximising productivity and efficiency with cutting-edge automation technology.

# PROCESS AUTOMATION

## Solutions the World Depends On.

Mitsubishi Electric process automation solutions are helping customers better visualize and optimize their operations. Our expertise and experience in process automation systems combined with innovative technology from Mitsubishi Electric R&D centers around the world keep your operation moving at the cutting edge.

From lifeline solutions to industrial solutions, Mitsubishi Electric technology backed by our global network of support ensures the uninterrupted flow of processes with optimum cost and energy efficiency. No project is too big nor any detail too small. Our lifeline solutions supply entire cities with water and power, while our transportation solutions help move people in comfort and safety. In every industry from oil and gas to chemical production, our solutions streamline processes that demand precision control and management. Every day in office buildings around the world, our solutions are delivering safe, energy-efficient operation. From the first consultation to operation support and beyond to the next innovation, Mitsubishi Electric is your total process automation partner.

### Lifeline Solutions

Mitsubishi Electric process automation keeps the vital lifelines of society open and flowing with the world's most vigilant and dependable solutions.



Water and Wastewater



Power & Power Infrastructure

### Transportation Solutions

Keeping people and goods moving safely, efficiently and in comfort, our solutions empower our customers with effortless control of complex infrastructure.



Railway



Airport

### Industrial Solutions

Our best-in-class process automation solutions are the sum of all our technology and experience. We seamlessly integrate software shaped by our own experience as a manufacturer.



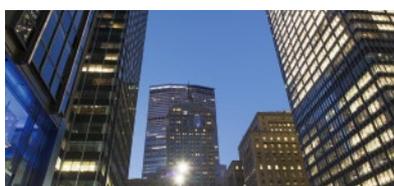
Mining, Metals, Minerals



Petro-Chemical and Oil & Gas

### Building Automation Solutions

From energy and environmental management to centralized control of entry and exit, our process automation solutions simplify the complexity of building and facility operation.



Office building



Facilities

# YOUR PROJECT PARTNER AND BEYOND

Mitsubishi Electric is the ideal partner for your project offering full life cycle services backed by world-class technology and experience in every phase.



## 1. CONSULTATION

*We know process automation is the answer, but what is the first step in shaping the solution?*

Mitsubishi Electric begins by gaining in-depth understanding of the customer's project needs. Then we offer our insights on the project, clarifying every choice and its advantages from planning to installation and beyond.

## 2. PLANNING & DESIGN

*Our in-house staff lacks the planning and design know-how for a project like this. Can Mitsubishi Electric do it all?*

Mitsubishi Electric's planning support covers every aspect of the project. In this phase, we not only provide cost estimates, design work of deliverables and project execution plans, but we continue to support in bidding, assessment and consulting.



## 3. BUILD UP

*Getting it done on time is a top priority. Cost and quality of the finish of deliveries are equally important.*

Mitsubishi Electric brings decades of experience in providing turnkey solutions. Our "on time, within budget" priority coupled with acclaimed engineering quality and process simulation to accelerate validation of operation ensures the quickest possible commissioning time.



### 4. OPERATION SUPPORT

*Looking beyond the completion of the project, what about maintenance or if we need emergency support?*

After your project goes online, Mitsubishi Electric continues to ensure reliable and safe operation. In addition to 24x7 support (in some countries), periodic maintenance check-ups and repair services, Mitsubishi Electric process automation solutions can be designed with predictive maintenance monitoring, system health self-diagnostics and other functions for your peace of mind.



### 5. FUTURE READY

*We are growing and advances in technology are happening at a dizzying pace.* Mitsubishi Electric keeps the project on the cutting edge of process automation with product and software upgrades. Our commitment to open architecture and industry standards promises a smooth path to future technological advances from our R&D centers or any industry-standard source.

# THE DECISIVE ADVANTAGES OF MITSUBISHI ELECTRIC

## Proven Solutions at the Cutting Edge

Mitsubishi Electric is ready with solutions that have been tested under the most challenging operating conditions. Whether you need advanced automation spanning all processes of a new project or an upgrade to an existing system, Mitsubishi Electric can configure the ideal process automation solution for your operation.



Advanced SCADA System

### TOTAL SOLUTIONS

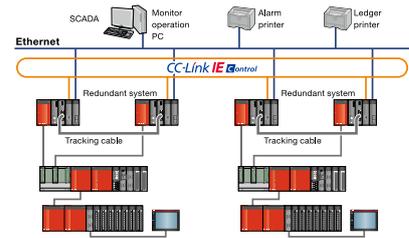
For plant management, Mitsubishi Electric's iQ PlantSuite is your total process automation solution.

Our acclaimed FA control systems, advanced monitoring systems and high efficiency power systems make migration to the latest process automation technology both simple and economical. We flexibly and seamlessly integrate factory automation components for exceptional cost and energy savings.



### REDUNDANT AND HIGH RELIABILITY SOLUTIONS

For social infrastructure and other systems where failure is never an option, you can depend on Mitsubishi Electric's process automation solutions. In addition to using Mitsubishi Electric components backed by a global reputation for reliability – many featuring built-in redundancy, we design and build a highly redundant system configuration for rock-solid stability.



Redundant PLC System

### MONITORING SOLUTIONS

Quickly and accurately grasp the state of all levels of your operations with the best monitoring and operational visualization solution in the industry. From user-friendly monitors to secure remote monitoring from a browser, tablet or smartphone, your plant technicians, maintenance personnel and management are kept updated on process status round the clock, ensuring fast response times.



Remote Monitoring with Smartphone

### ENERGY SAVING SOLUTIONS

On large complicated process automation systems, first we identify where the problem is and then offer the best energy saving solutions for your business. Mitsubishi Electric's solutions combine the industry's most efficient inverters and motor drives with metering devices and software to help you visualize and analyze energy usage and achieve facility-wide energy savings.



Energy Visualization and Analysis

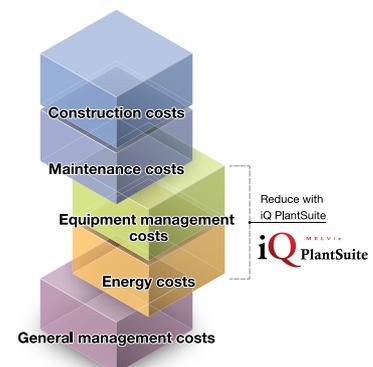
### VALUE-ADDED DESIGN AND SERVICE SOLUTIONS

For verification and improvement of operations through data collection and analysis and efficient building of optimized plant programs and monitoring, Mitsubishi Electric has the answer. For example, data automatically collected by high-speed logger modules and the networking of PLC, I/O and HMI devices are used for not only operation control, but also preventive maintenance. Our system design support solution can automatically generate monitor screens and offer standard debugged templates to speed and simplify system construction.



### COST PERFORMANCE SOLUTIONS

Our solutions are premised on minimizing your TCO from installation to maintenance. Our global build up experience ensures on-time, on-budget quality installation. Mitsubishi Electric reliability minimizes downtime while advanced fault detection systems and device diagnosis software preempt costly failures with fault prediction and preventive maintenance. And if problems arise, our expert support and maintenance keep you online.



Life cycle cost of building

# SHAPING SOLUTIONS

Mitsubishi Electric harnesses the power of process automation and digital data to provide leading companies in every sector with cutting-edge solutions. Improved safety and cost savings, elimination of human error, pre-emption of failure by predictive analysis, and management of remotely distributed assets are just a few of the many benefits of Mitsubishi Electric's process automation.

## FAST & FLEXIBLE

In this railway system example, every asset is controlled by a programmable device, and every device delivers a wealth of information that can be used for efficient running of the system. Mitsubishi Electric's adoption of open standards from network protocols to programming standards not only facilitate choice and flexibility, but also future proof data collection and control.



### Trackside management

Mitsubishi Electric's compact modular Programmable Logic Controllers (PLCs) are used in trackside control and monitoring applications where reliability and security are a top priority.



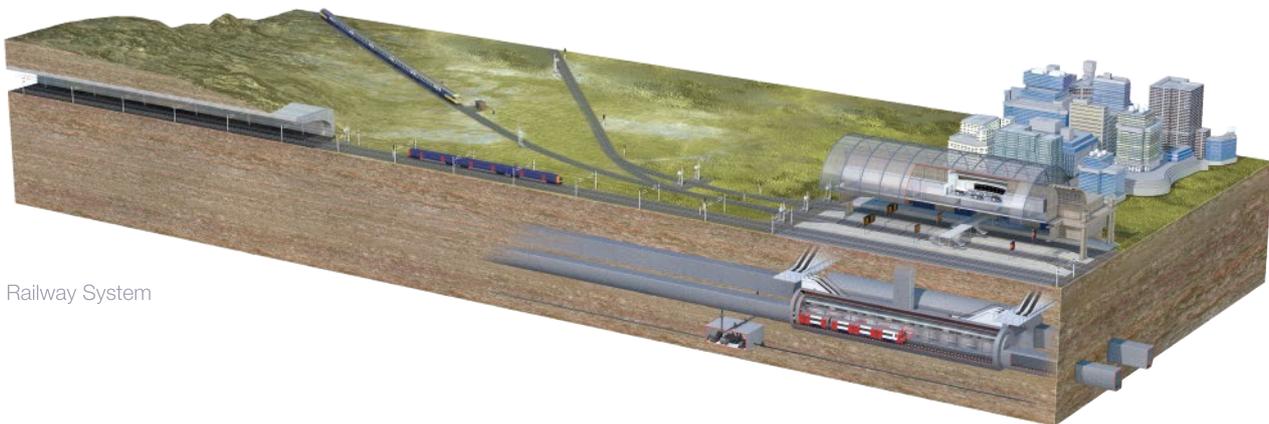
### Station management

Modular PLCs support alarm management and our life cycle engineering solution SCADA has enhanced visualization for improved station management and depot control.



### Electrification

Remote Terminal Units (RTUs), bay control, logic for switching devices and other traction substation automation rely on our industry standard "open protocol" modular PLCs.

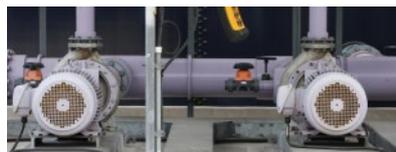


Railway System



### Tunnel ventilation

Ventilation Control and Supervisory Systems use high availability redundant modular PLCs, inverters and SCADA.



### De-watering

Inverters for pump control contribute to optimization and power savings of de-watering operations.



### Passenger information & facilities management

Platform door logic control is provided by compact PLCs.

## SIMPLE & SEAMLESS

Factory automation deals with solid objects and can be paused. However, process automation monitors and controls the flow of water, power and even air in a process that should never stop. This example illustrates how Mitsubishi Electric process innovation responds to the complexity and scale of process automation for the lifeline of water. From water resource management to wastewater and sewage processing, this total seamless solution not only delivers world-class reliability and built-in redundancy, but also features like remote monitoring.



### Pumping station

Energy efficient, intelligent control is ensured by Mitsubishi Electric's inverters optimized by pump applications. Pumps can be controlled from a central location or remotely via networks.



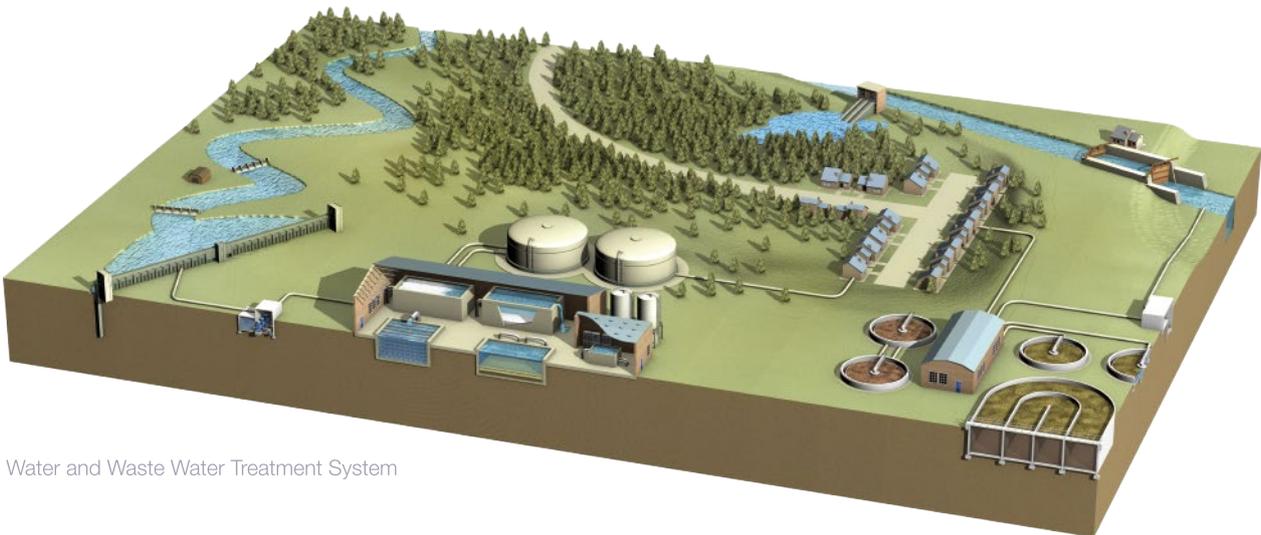
### Central management

Mitsubishi Electric's lineup of Human Machine Interface (HMI) units and industrial PCs let operators and service staff access needed information and process data on site or from a central location.



### Remote monitoring

Our mobile visualization solution provides round the clock monitoring via a smart handset.



Water and Waste Water Treatment System

### Flocculation

Mitsubishi Electric controllers with redundant architecture provide the reliability and flexibility while distributed remote I/Os enable enhanced flexibility and easy connection with PLCs.

### Disinfection

In this critical stage, fail-safe redundant architecture is featured everywhere from our platform PLC system to the redundant network architecture.

### Filtration

Compact and powerful PLCs flexibly handle all local control functions. Also in the filtration stage, Mitsubishi Electric inverters can improve efficiency and keep power consumption down.

# ACROSS INDUSTRIES

Mitsubishi Electric partners with customers around the world, providing high-quality processing automation solutions that deliver value to millions with unrivaled reliability, cost savings, energy efficiency and performance.

PROJECT		THE CHALLENGE	
<p><b>Social Infrastructure</b> Sewage Treatment Plant Germany</p> 	<p>Without comprehensive process control and automation, the management of this vast and complex installation is practically impossible. Mitsubishi Electric provided process management of the entire plant from a central point, and operation and monitoring from all distributed operator stations.</p> 		
<p><b>Transportation</b> Subway Singapore</p> 	<p>Installation/upgrading of the rail environmental control systems (ECS) and tunnel ventilation systems (TVS) for virtually the entire Singapore subway network.</p> 		
<p><b>Social Infrastructure</b> Cogeneration/Waste Incineration Plant Germany</p> 	<p>Process automation solution for 3 incineration lines including continuous emission monitoring.</p> 		

# ACROSS THE WORLD

OUR SOLUTION		RESULT
<p>In addition to fully replacing existing end-of-life automation equipment with state-of-the-art, high-efficiency, industry standard devices, Mitsubishi Electric provided a total process automation solution.</p> <ul style="list-style-type: none"> <li>• Process management system</li> <li>• Network using switch technology</li> <li>• Central control room with large screen display</li> <li>• Low-voltage switchgear</li> <li>• Installation &amp; wiring</li> <li>• Support through the commissioning, trial operation and training stages.</li> </ul>	▶	<p><b>Solution capable of processing up to</b></p> <p><b>150,000</b></p> <p><b>process variables!</b></p> <p>By distributing the process control &amp; automation in 60 process servers, together with redundant data storage, utmost availability and highest operational safety of the plant are ensured.</p>
<p>The highly redundant architecture provides dependable central control and monitoring of ventilation fans, exhaust fans, chillers, refrigerators, alarms and other critical applications.</p> <ul style="list-style-type: none"> <li>• SCADA: PLC-based DCS featuring iQ PlantSuite and high redundancy PLCs</li> <li>• ECS featuring robust, hot-standby redundant PLCs.</li> </ul>	▶	<p><b>Safety and Comfort for</b></p> <p><b>Asia's First Fully</b></p> <p><b>Automated Underground</b></p> <p><b>Rail System!</b></p> <p>Designed for use in large, complex systems, Mitsubishi Electric's PLCs are easy to set up and make condition monitoring of the environment and systems very straightforward.</p>
<p>From our SCADA distributed control system for control of energy from waste facilities to the full entire electrotechnical system and even the redesign of control room ergonomics, Mitsubishi Electric provided a total solution.</p> <ul style="list-style-type: none"> <li>• Efficient migration concept</li> <li>• SCADA: PLC-based DCS featuring iQ PlantSuite and high redundancy PLCs</li> <li>• Control room solution</li> </ul>	▶	<p><b>Over 20 years</b></p> <p><b>of safe, efficient incineration</b></p> <p><b>of waste</b></p> <p>Since 1994, the scalability of Mitsubishi Electric's solution has continued to respond to the customer's needs. Today the system supports 40,000 data points in a highly complex distributed system with a maximum throughput of 295,000 tons of waste per annum.</p>

# ANY SCOPE

From water and sewage treatment plants and transportation systems that serve entire cities to smaller scale discrete plant improvement projects with a big impact, Mitsubishi Electric tackles every challenge with a world of expertise and experience.

PROJECT		THE CHALLENGE	
<p><b>Transportation</b> Energy Supply Center Germany</p> 		<p>Modernization and expansion of the process and control management system for the airport's co-generation plant that not only supplies heat and refrigeration, but also generates electric power and serves as an emergency power supply in case of a grid failure. Supplied by Mitsubishi Electric to a modern system in stages.</p>	
<p><b>Materials (Cement)</b> UK</p> 		<p>At the cement mill, energy consumption accounted for an estimated 40% of production costs. Mitsubishi Electric's processing automation solution enhanced a part of the improvement project through precision control of an additional fan at the mill inlet.</p>	
<p><b>Chemical (Plastics)</b> UK</p> 		<p>Capitalizing on deregulation of power generation, a combined heat and power (CHP) system was installed, and its system integrator turned to Mitsubishi Electric for a process automation system that delivers the highest reliability for as low a development cost as possible.</p>	

# ANY SCALE

OUR SOLUTION		RESULT
<p>The system originally installed by Mitsubishi Electric was structured in clear process management areas, facilitating phased migration. The key to our upgraded solution is the high level of reliability, fast response and automation functionality of our powerful process management system.</p> <ul style="list-style-type: none"> <li>• Process management system</li> <li>• Automation systems</li> <li>• Failure-proof sequence control</li> <li>• Network using switch technology</li> <li>• Installation &amp; wiring</li> <li>• Support through the commissioning, trial operation and training stages.</li> </ul>	▶	<p>Even in the Europe-wide power outage on November 4, 2006 during the expansion and commissioning phase.</p> <p><b>Uninterrupted Airport Operation!</b></p> <p>The entire project was smoothly executed within a tight schedule and without affecting airport operations.</p>
<p>The new inverter controls the 220kW motor driving the additional fan. By measuring pressure changes in the mill and precisely increasing or decreasing motor speed to maintain constant pressure, the solution prevents negative pressure which brings in too much cool air and reduces the mill's drying capacity or positive pressure which can blow out coal dust and create a hazard.</p> <ul style="list-style-type: none"> <li>• Drives: Inverter</li> </ul>	▶	<p><b>35% reduction in motor power consumption in production</b></p> <p>"We needed a drive that would be energy efficient and that could operate reliably in hot and dusty conditions."</p>
<p>Featuring hot-standby PLCs, the new control system automatically changes over if a fault is detected without loss of data, and combines ladder logic programming and other advantages of a modern PLC-based system with superior handling of analogue signals. The solution contributes to every project requirement of safety, efficiency and low development cost.</p> <ul style="list-style-type: none"> <li>• SCADA: PLC-based DCS (hot-standby mode)</li> </ul>	▶	<p><b>Cost of the system is 1/4 of a conventional system</b></p> <p>The PLC control system we developed had a system cost of around £0.25 million compared to £1 million for a more conventional system.</p>

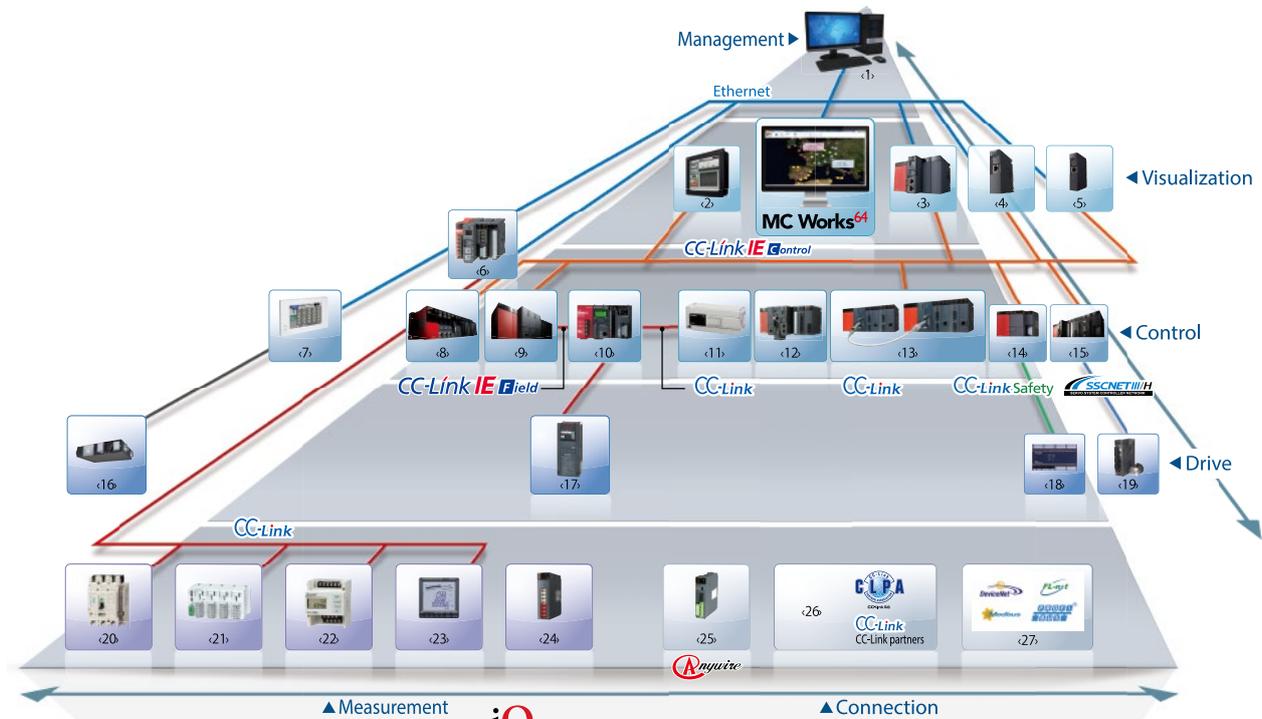
# TOTAL INTEGRATION

## The Sum of Experience

Combining our advanced SCADA with world-class FA products, Mitsubishi Electric's integrated solution for management, monitoring, control, driving and connecting processes provides you with mission-critical performance. Drawing on years of experience in working with different processes and based on structure shown here, we configure a robust solution to meet the needs and challenges of your plant or infrastructure. Vertically your solution can integrate advanced ERP (Enterprise Resource Planning) and MES (Manufacturing Execution System) management solutions, and horizontally span automation of vast infrastructure such as the examples and case studies shown on the previous pages.



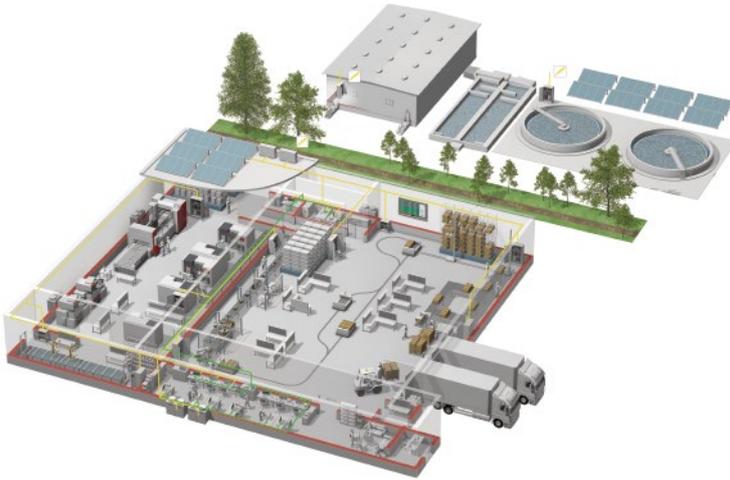
iQ PlantSuite is Mitsubishi Electric's total solution for infrastructure and provides all the necessary components including FA products and SCADA.



- |  |  |  |
|--|--|--|
| 1) ERP/MES   | 13) MELSEC-Q process CPU / redundant CPU   | 23) Electronic multi-measuring instrument  |
| 2) GOT2000/GOT1000                                       | 14) MELSEC Safety PLC                      | 24) MELSEC-Q energy measuring module   |
| 3) MES interface IT                                      | 15) Motion controller                      | 25) AnyWire DB A20 compatible product  |
| 4) MES interface IT module                               | 16) Indoor / outdoor unit                  | 26) CC-Link IE, CC-Link, CC-Link/LT, CC-Link Safety, SSCNET Partner products             |
| 5) High-speed data logger module                         | 17) FREQROL inverter                       | 27) Compatible with various other networks. Modbus, FL-net, PROFIBUS-DP, DeviceNet, etc. |
| 6) Energy saving Data Collection Server EcoWebserver III | 18) Safety remote I/O module               |  |
| 7) Air-conditioning controller                           | 19) MELSERVO AC servo                      |  |
| 8) MELSEC iQ-R PLC                                       | 20) MDU breaker                            |  |
| 9) MELSEC-Q PLC  | 21) EcoMonitorPro Energy measuring unit    |  |
| 10) MELSEC-L PLC   | 22) EcoMonitor light Energy measuring unit |  |
| 11) MELSEC-F PLC   |  |  |
| 12) C language controller                                |  |  |

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 CC-Link IE, CC-Link, CC-Link/LT and CC-Link Safety are registered trademarks of CC-Link Partner Association.  
 Modbus is a registered trademark of Schneider Automation Incorporated.  
 PROFIBUS-DP is a registered trademark of PROFIBUS International.  
 DeviceNet is a registered trademark of Open DeviceNet Vendor Association.  
 Anywire is a registered trademark of Anywire Corporation.

# 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.

# Global Partner. Local Friend.



- Sales office
- FA center
- ◆ FA center satellite
- Production center
- R&D center

**Our service and support concept is ingrained in everything we do**

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