MITSUBISHI ELECTRIC
Changes for the Better

FACTORY AUTOMATION

Application Catalog for Ships

Opening a new passage with Mitsubishi Electric FA products

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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Improved energy saving and high precision control for ship facilities with leading-edge technology developed for the FA field.

International shipping volumes are increasing with the expansion of international trade.
With the goal of reducing environmental impact and saving energy, the movement toward the motorizing of ship facilities is gaining momentum.
Using the know-how built over years of experience in the FA field, we provide a full range of shipping solutions.

Mitsubishi Electric FA products provide a full range of shipping solutions.

Ship classification standards approval for Mitsubishi Electric FA products

Product	Model*	NK	LR	BV	DNV GL	RINA	ABS	CCS	KR
Programmable controller	MELSEC iQ-R series	●	●	●	●	●	●	—	—
	MELSEC-Q series	●	●	●	●	●	●	—	—
	MELSEC iQ-F series	●	●	●	●	●	●	—	●
	MELSEC-F series	●	●	●	●	●	●	—	●
Human Machine Interface (HMI)	GOT2000 series	●	●	●	●	●	●	—	—
Inverter	FR-A800 series	●	●	●	●	—	●	●	●
Magnetic contactor	S-T, S-N	●	●	●	—	—	—	—	●
	SD-T, SD-N	●	●	●	—	—	—	—	—
	B(D)-T, B(D)-N	●	—	—	—	—	—	—	—
Thermal overload relay	TH-T, TH-N	—	●	●	—	—	—	—	—
Electromagnetic relay	SR(D)-T	—	●	●	—	—	—	—	—
Auxiliary contact unit for magnetic contactor	UT-AX, UN-AX	—	●	●	—	—	—	—	—
Three-phase motor	SF-PR-VS	●	—	—	—	—	—	—	—
Air circuit breaker (ACB)	AE-SW	●	●	●	●	—	●	●	—
Molded case circuit breaker (MCCB)	NF(WS-V, WS)	●	●	●	●	—	●	●	—

*Some models have not been approved by all classification societies. For details of the models compliant with ship classification standards, please contact your local sales office.

●: Approved —: Not approved

NK NIPPON KAIJI KYOKAI

LR Lloyd's Register of Shipping

BV Bureau Veritas

DNV GL DNV GL AS

RINA Registro Italiano Navale

ABS American Bureau of Shipping

CCS China Classification Society

KR Korean Register of Shipping

Application Examples

A wide range of applications on a ship are available.

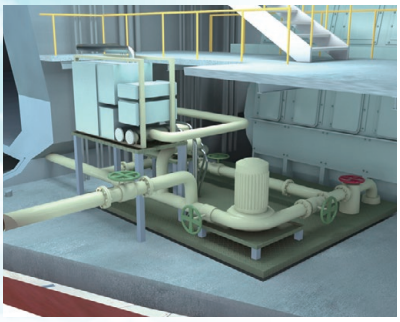
Winch (P.8)

Electric deck crane (P.9)

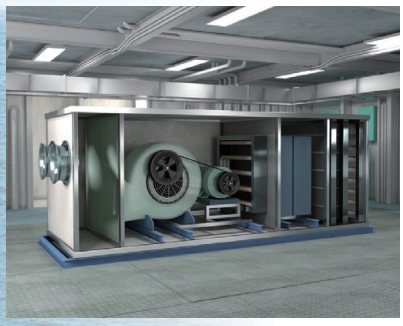
Engine cooling pump (P.10)

Mitsubishi Electric
Ship solution

Ballast water treatment device (P.11)



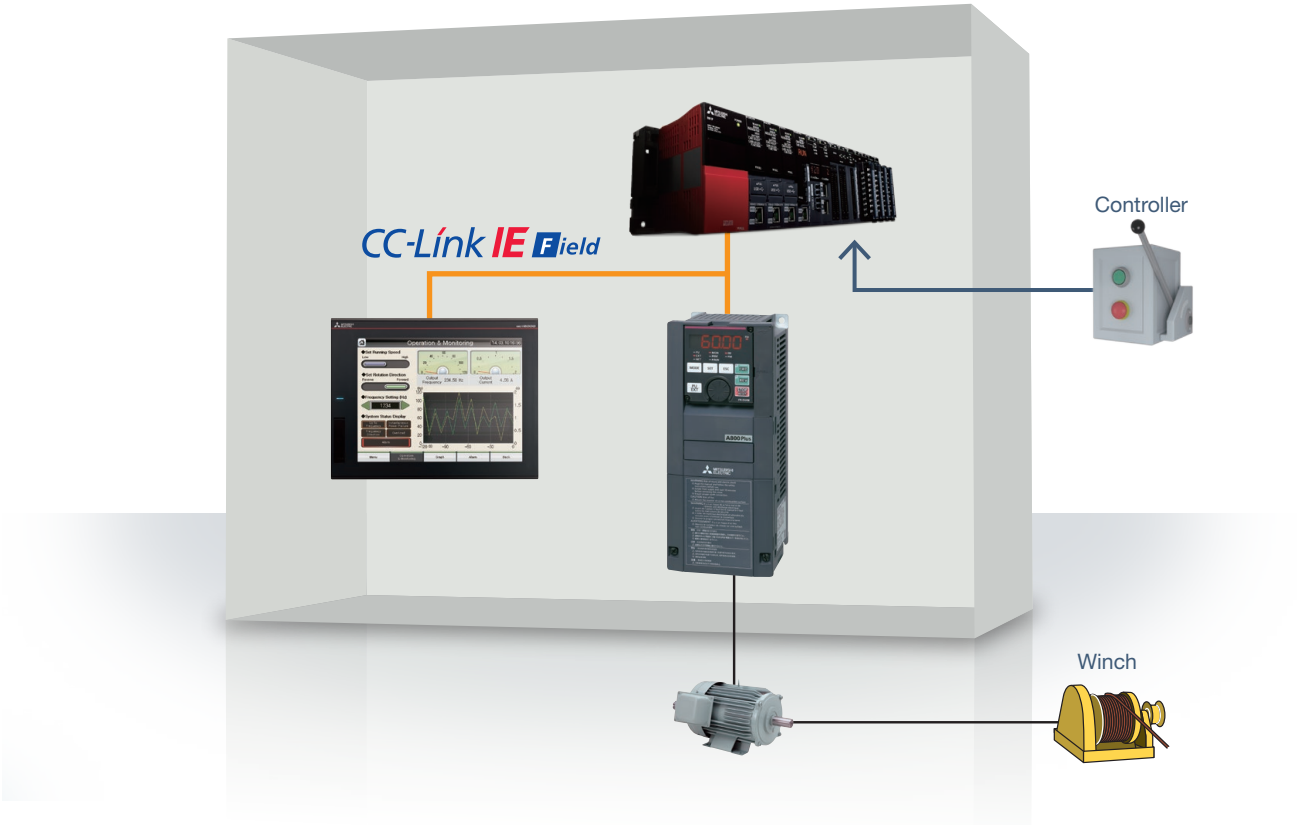
Fans and pumps (P.12)



Hatch (P.13)

Winch

Controls the raising/lowering of an anchor of a ship and winding/unwinding of a mooring rope.



Features

Simple system construction

Each device is compatible with the CC-Link IE Field Network so a network can be created using Ethernet cables.

Functions made for the applications

Using the crane dedicated inverter designed for lift applications enables more extensive brake sequences.

Relevant devices


P.23
Inverter


P.25
Human Machine Interface (HMI)


P.20
Programmable controller


P.24
Motor

Electric deck crane

Controls the turning, lifting/lowering, and elevating movement of a shipboard deck crane for cargo handling.

Features

Reduced tact time

Using the shortest-time torque startup function of the crane dedicated inverter shortens the time from startup to brake release.

Easier maintenance

The dedicated monitor of the crane dedicated inverter contributes to preventive maintenance.

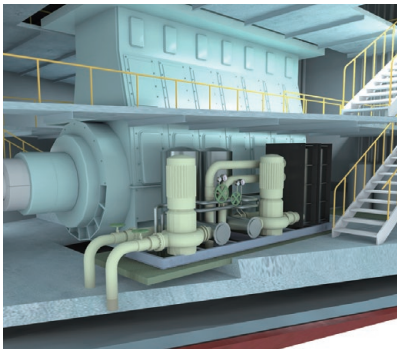
Wire reduction

Connecting multiple inverters via CC-Link IE Field Network reduces wiring.

Also, the monitoring function can be enhanced.

Relevant devices

Engine cooling pump



Controls the optimum flow rate of coolant for the circulation pump.

Features

Energy saving

The optimum flow rate can be controlled depending on the temperature of the seawater and the engine.

The best match for high-efficiency motors

A high level of energy efficiency is achieved by combining the IE3-compliant high-efficiency motor and the inverter.

Energy saving at a glance

Connecting the inverter with the Energy measuring unit via the CC-Link communication allows power consumption to be monitored and managed.

Relevant devices


P.23
Inverter

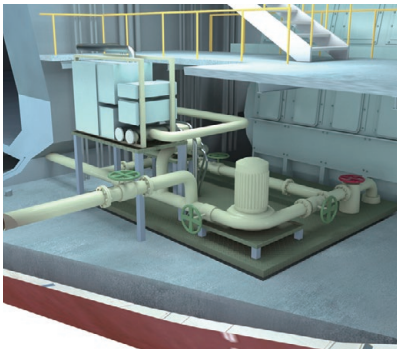

P.25
Human Machine Interface (HMI)


P.20
Programmable controller

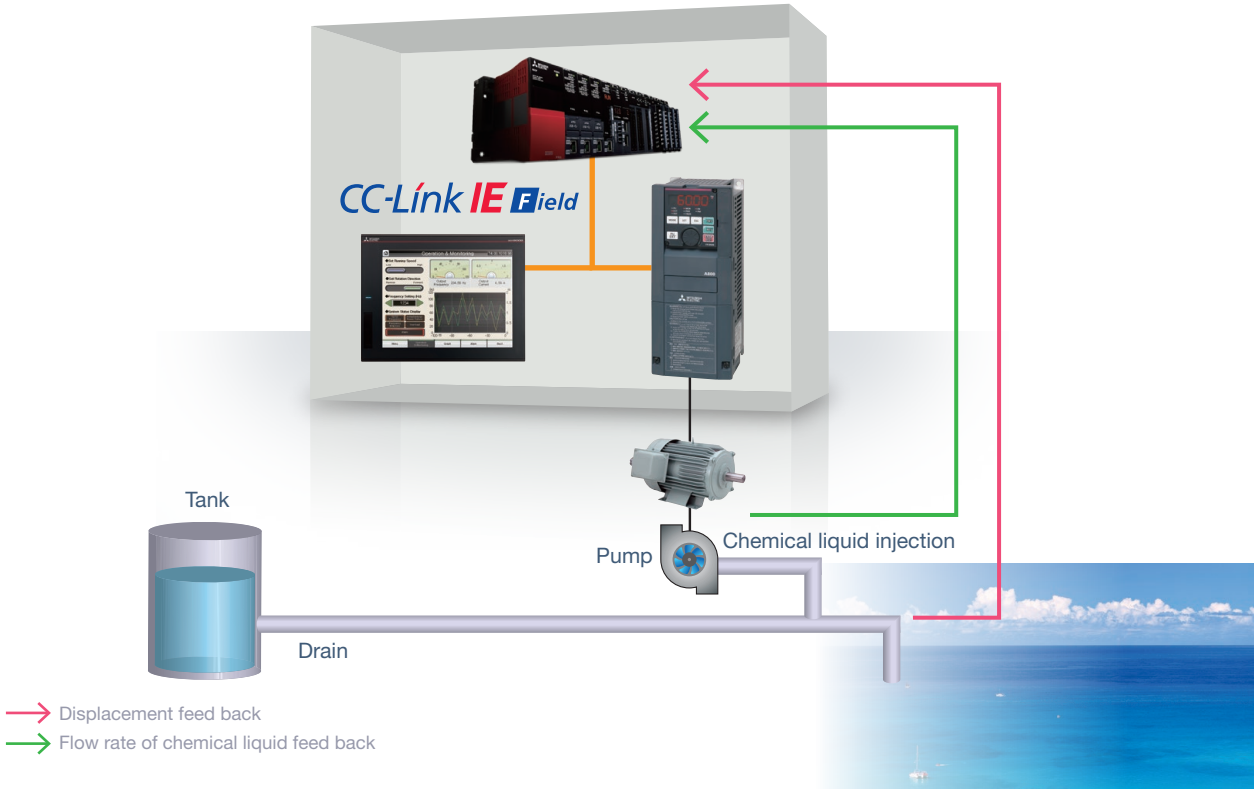

P.24
Motor


P.14
Energy measuring unit

Ballast water treatment device



Controls the optimum flow rate of chemical liquid for the ship's indispensable ballast water treatment device.



Features

Easy flow control

The optimum flow rate of chemical liquid can be controlled according to a displacement of ballast water.

Simple system construction

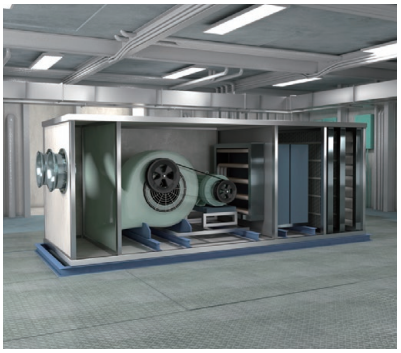
Each device is compatible with the CC-Link IE Field Network so a network can be created using Ethernet cables.

The best match for high-efficiency motors

A high level of energy efficiency is achieved by combining the IE3-compliant high-efficiency motor and the inverter.

Relevant devices

Fans and pumps



Controlling the motor according to the surroundings such as temperature achieves significant energy savings.

Features

The best match for high-efficiency motors

A high level of energy efficiency is achieved by combining the IE3-compliant high-efficiency motor and the inverter.

Energy saving at a glance

Connecting the inverter with the Energy measuring unit via the CC-Link communication allows power consumption to be monitored and managed.

Relevant devices


P.23
Inverter


P.25
Human Machine Interface (HMI)


P.20
Programmable controller


P.24
Motor


P.14
Energy measuring unit

Hatch

Controls the opening/closing of a door smoothly when loading/unloading a ship hatch.

Features

Smooth control

With the soft start/stop function by inverter control, mechanical impact/vibration can be reduced.

Simple system construction

Each device is compatible with the CC-Link IE Field Network so a network can be created using Ethernet cables.

Wire reduction

Connecting multiple inverters via CC-Link IE Field Network reduces wiring. Also, the monitoring function can be enhanced.

Relevant devices

Solving Concerns and Problems

Energy saving

Simple energy measurement with EcoMonitorLight

How much energy can be saved by installing energy-saving devices?

EcoMonitorLight allows you to measure energy easily, and see the results

Just want to measure energy in a simple low-cost manner

The integrated display allows you to perform the main unit settings and check measured values quickly.

Considering system expansion in the future. But is this product okay for now?

Start from checking the conditions in locations you are concerned about. It is possible to expand later to data logging and networks (CC-Link or CC-Link IE Field Network Basic communication) in phases.

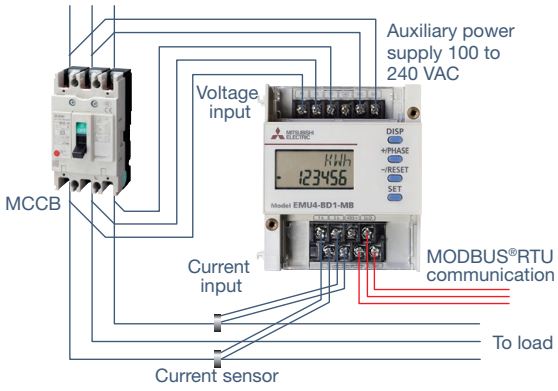
Want to easily manage measurement data from specific locations

We can provide you software for managing data using a personal computer. You can also link up with an upper-level system by using MODBUS® RTU (RS-485) communication.

EMU4-HD1-MB

Display periodic power consumption and CO_2 conversions.

Connection example



Easy management of measurement data of measurement points

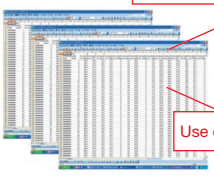
For customers who want to periodically collect and easily manage energy measurement data!

Logging Unit

You can output data stored in the logging unit to an SD memory card in CSV file format.

CSV File Data

You can manage data from multiple logging units on a single SD memory card.



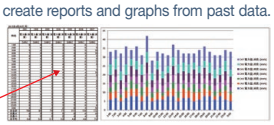
Examples of CSV data screens

Use of Logging Unit Utility

Use of GX LogViewer

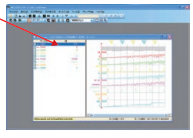
Data Processing

You can process measurement data to create reports and graphs from past data.



Example of GX LogViewer Screen

The GX LogViewer can display graphs easily! You can drag and drop CSV files to display graphs easily.



You can download GX LogViewer" and "Logging Unit Utility " free of charge from the Mitsubishi Electric website."
"GX LogViewer" corresponds also after version 1.30 G.

Reference catalog

Energy measuring unit
EcoMonitorLight

Easy installation with the FR-A846 and the SF-PR-VS

Reconstructing the system for energy saving seems like a hassle...

Easy installation outside the enclosure with the IP55 compatible inverter (FR-A846)!

The IP code represents the specified protection ratings using a code.
The first and the second digits following IP (International Protection) represent the protection ratings.

IP 5 5

•First digit (protection rating against solid objects)

IP rating	Description
Class 5	Protection against dust. No ingress of dust that may inhibit normal operation.

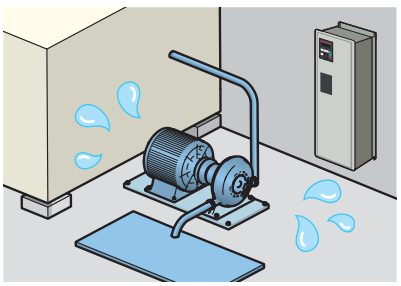
•Second digit (protection rating against water)

IP rating	Description
Class 5	Protection against water jets from all directions

FR-A846

Installation directly next to machinery

- Inverters can be installed nearby machinery.
- Inverters can even operate in high-humidity or dusty environments, facilitating a more flexible choice of installation locations.
- The inverter can be installed outside of the enclosure. This allows the easy installation of a new inverter without expanding enclosure space. The enclosure design becomes easier in terms of countermeasures against heat, and the control panel is downsized as well.

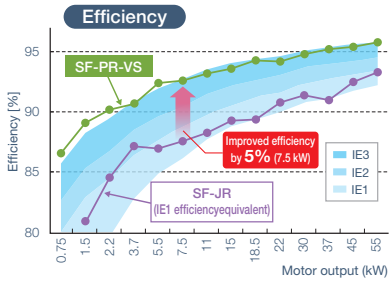


Feed water pump

Check!

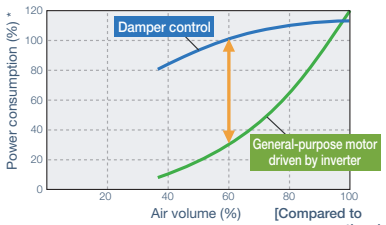
Energy saving with high-performance energy-saving motor (SF-PR-VS)

The SF-PR-VS motor conforms to the Japanese Top Runner Standard (IE3 equivalent). When the motor is used, its energy-saving operation contributes to the reduction in electricity charges, which in turn lowers running costs.



Increased energy saving with inverters

Compared to commercial power supply operation, significant energy savings can be gained by decreasing the rotation speed.



* Rated motor output is 100%.

Solving Concerns and Problems

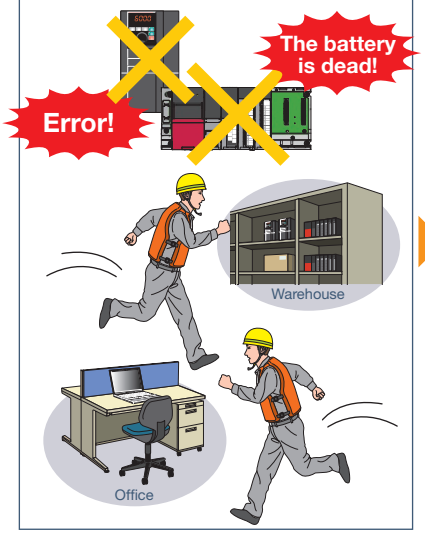
Troubleshooting

When a problem occurs, a wide variety of functions solve the problem quickly.

I need to restore operation quickly....

Backing up programs

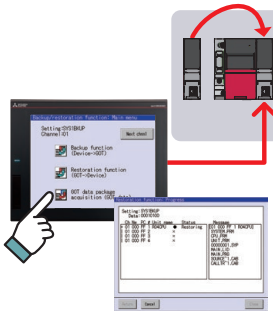
Before



After

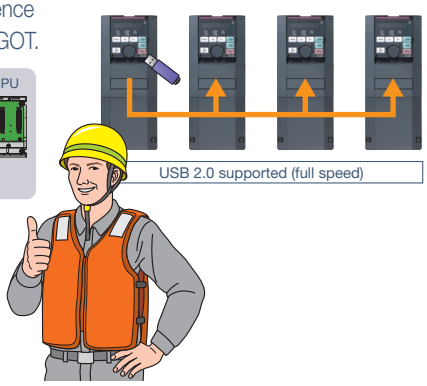
GOT Backup/ Restoration function

There is no need for a personal computer on the production floor. The storage (backing up) and writing (restoring) of sequence programs can be completed with the GOT.



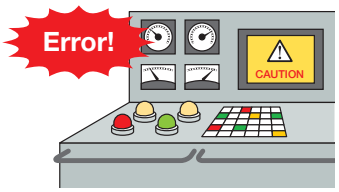
INV USB memory mode

The inverter parameters can be backed up by copying to a USB memory device.



Prevent accidental operation

Before

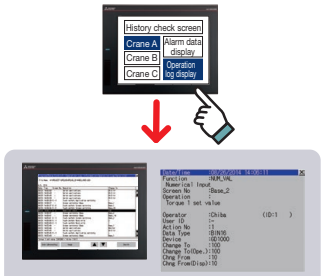


- Unauthorized personnel are able to operate the machinery.
- When an error occurs the operators cannot tell us why.

After

GOT Operation log function and Operator authentication function

Recording the operation log with the operator information in an SD memory card or USB memory device helps you identify the cause of the error immediately.



INV Password function

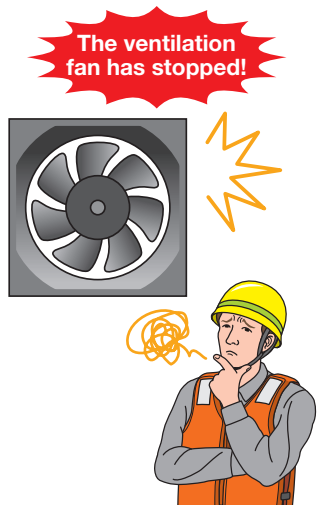
Setting a 4-digit password to the inverter can restrict parameter reading/writing.

When a problem occurs, a wide variety of functions solve the problem quickly.

Can I identify the cause of the error easily?

Easy fault diagnosis

Before



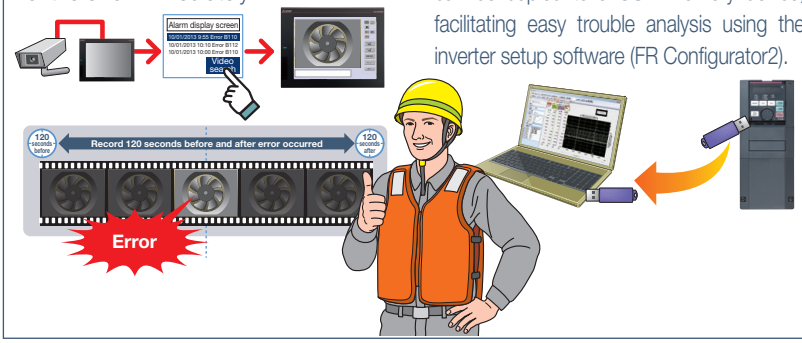
After

GOT Multimedia function

By checking the operational status of the ventilation fan on the recorded video image, you can identify the cause of the error immediately.

INV Trace function

The operating status immediately before the protective function is activated can be stored in an inverter. The stored data (trace data) can be copied to a USB memory device, facilitating easy trouble analysis using the inverter setup software (FR Configurator2).



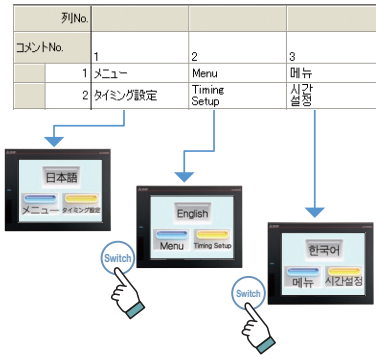
Switch language

Before

After

GOT Language switching function

It is easy to create language switching screens.



INV Language selection

The optional LCD operation panel (FR-LU08) displays in nine languages.

Supported languages

English	Italian
Japanese	Russian
German	Turkish
French	Polish
Spanish	

Solving Concerns and Problems

Easier maintenance

Preventive maintenance with energy measuring module

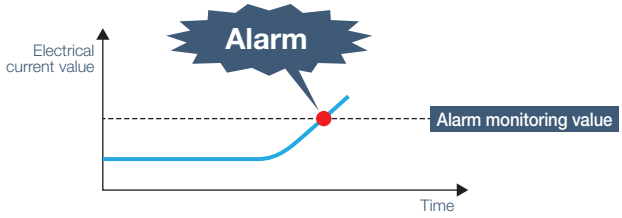
How can I prevent a sudden failure of motors?

Monitor motor current values and prevent faults

Solution Example — **Preventive Maintenance**

Constantly measuring current (or power) consumption can help prevent serious faults and equipment failure, ultimately resulting in reduced production losses.

Example: Increase in current (or power) consumption detected → Preventive measures to fix the problem such as refilling the lubricant or replacing the grinding machine cutter blade.



Set upper and lower limit alarm monitoring values (monitor equipment failures)

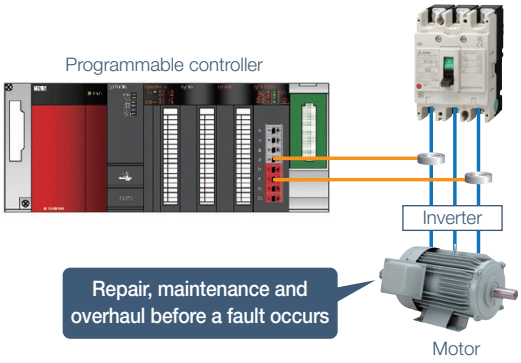
↓ Alarm

Equipment maintenance and repair
(Example: Refill lubricant, replace cutter blade)

↓

Preventive maintenance measures are taken before equipment stoppage, reducing production losses.

Preventive Maintenance Diagram



Example: Monitor motor current values and prevent faults

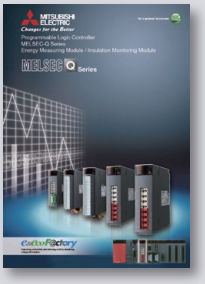
By constantly monitoring the motor current for abnormal changes, any motor trouble can be detected before a serious problem occurs.

Sudden changes in current/power and usage volumes are often a sign that there is a problem with equipment. The energy measuring module detects any signs of trouble to allow the problem to be remedied before failure of equipment or an accident occurs. Maintenance and overhaul measures can be taken to avoid damage caused by production line stoppages and the expense of replacing equipment. In this way, energy measuring module helps to ensure safe operation of equipment while reducing costs.

Measure current (power) consumption → Identify errors → Service before equipment fails → Eliminate costs of faults

Reference catalog

MELSEC-Q Series
Energy Measuring Module /
Insulation Monitoring Module



MEMO

Our Products Programmable controller

MELSEC iQ-R series

Revolutionary, next-generation controllers building a new era in automation

The foundation for our next-generation automation solutions, realizing an automation controller that adds value while reducing TCO*

* TCO: Total Cost of Ownership

reddot design award winner 2016

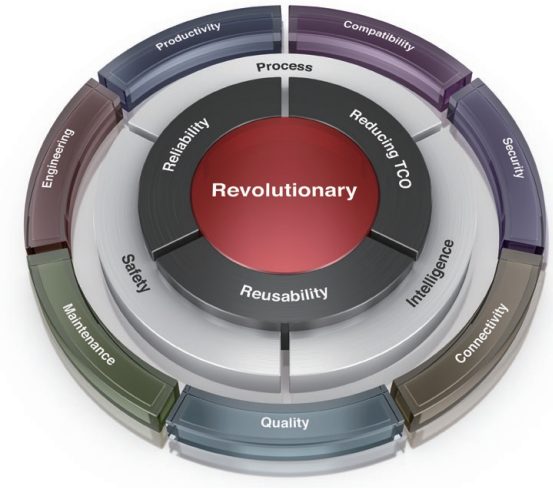
iF DESIGN AWARD 2015

CC-Link IE TSN CC-Link IE Control CC-Link IE Field CC-Link IE Field Basic CC-Link

Please contact your local sales office for information on supported models.

Features

To succeed in highly competitive markets, it's important to build automation systems that ensure high productivity and consistent product quality.
The MELSEC iQ-R Series has been developed from the ground up based on common problems faced by customers and rationalizing them into seven key areas: Productivity, Engineering, Maintenance, Quality, Connectivity, Security and Compatibility. Mitsubishi Electric is taking a three-point approach to solving these problems: Reducing TCO, increasing Reliability and Reusability of existing assets.
As a bridge to the next generation in automation, the MELSEC iQ-R Series is a driving force behind revolutionary progress in the future of manufacturing.



Mitsubishi Electric PAC MELSEC iQ-R "Promotion" Movie

Process

High availability process control in a scalable automation solution

Safety

System design flexibility with integrated safety control

Intelligence

Extensive data handling from shop floor to business process systems

Productivity

Improve productivity through advanced performance/ functionality

Quality

Reliable and trusted MELSEC product quality

Security

Robust security that can be relied on

Engineering

Reducing development costs through intuitive engineering

Connectivity

Seamless network reduces system costs

Compatibility

Extensive compatibility with existing products

Maintenance

Reduce maintenance costs and downtime utilizing easier maintenance features

Mitsubishi Electric FA Global website
MELSEC iQ-R Series concept

MELSEC iQ-R Search

www.mitsubishielectric.com/fa/products/cnt/plcr/pmerit/concept/index.htm

Some models have not been approved by all classification societies. For details of the models compliant with ship classification standards and precautions, please contact your local sales office.

Our Products Programmable controller

MELSEC iQ-F series

The next level of industry

- Outstanding performance
- Superior Drive Control
- Intuitive Programming Environment

CC-Link IE Field Basic CC-Link

Please contact your local sales office for information on supported models.

Features

Improved CPU performance and function

Substantial increase in processing speed as compared with the FX3 series by improving CPU performance and using new high-speed bus.
Enhanced internal functions such as the Ethernet port, RS-485 port, analog, and SD memory card slots.
Plus, improved security protects Customer assets.

Cost effective micro PLCs

Improved engineering environment

Substantial usability improvement by next generation engineering software (GX Works3).
Parameterized setup for communication settings, analog and high-speed counter.
Graphical module configuration.

An engineering software that contributes greatly to the reduction of the design man-hour.

Improved coordination with drive control

Improved function of built-in positioning and simple motion control (SSCNETIII/H) compatible.
Improved machine cycle time with expanded functions.

Drive control functions that reduce cycle time and enhance machine productivity.

Product Lineup

Terminal Block type

FX5U

FX5U

Connector type

FX5UC

FX5UC

Spring Cramp Terminal type

FX5UC

Some models have not been approved by all classification societies. For details of the models compliant with ship classification standards and precautions, please contact your local sales office.

Our Products Programmable controller

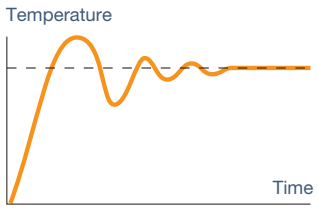
FX3 series

Push the limits of control.

Features

Easy control of temperature and flow rate

By using FX3 series built-in PID instruction, there is no need for complex algorithms or a temperature controller. Programming is simple, and system cost can also be reduced.



Easy control of Mitsubishi Electric inverters

FX3 series programmable controllers have dedicated inverter instructions for communication to Mitsubishi Electric inverters over RS-485 and reduce engineering time for inverter control.

Inverter communication instructions

IVRD	Parameter reading
IVWR	Parameter writing
IVDR	Operation command
IVCK	Operation monitor
IVMC	Multiple command

Easy control of MODBUS devices

With FX3 series MODBUS compatible special communication adapters, programming is easy with dedicated instruction and function codes.

Product Lineup

Entry level Model

FX3S

FX3S

Standard Model

FX3G FX3GC

FX3G FX3GC

High-end Model

FX3U FX3UC

FX3U FX3UC

Some models have not been approved by all classification societies. For details of the models compliant with ship classification standards and precautions, please contact your local sales office.

Our Products

Inverter

FR-A800

Unparalleled Performance.
Uncompromising Quality.

- Pursuing leading drive performance
- Security & safety
- Easy setup & operation
- System support

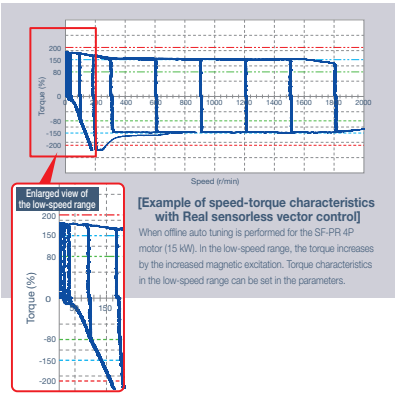
CC-Link IE TSN CC-Link IE Field CC-Link IE Field Basic CC-Link

Please contact your local sales office for information on supported models.

Features

Move heavy weights swiftly

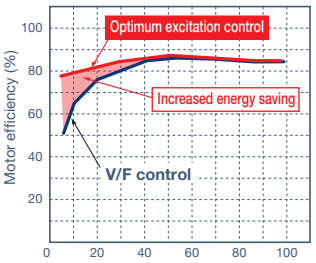
High torque at low speeds enables the slow and steady movement of heavy loads, which leads to smooth cargo handling.



[Example of speed-torque characteristics with Real sensorless vector control]
When offline auto tuning is performed for the SF-PR 4P motor (15 kW). In the low-speed range, the torque increases by the increased magnetic excitation. Torque characteristics in the low-speed range can be set in the parameters.

Increased energy saving with increased motor efficiency

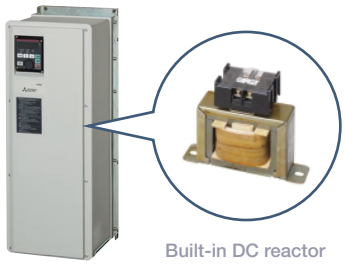
Optimum excitation control continuously adjusts the excitation current to an optimum level to provide the highest motor efficiency. A substantial energy saving can be achieved.



[Compared to our conventional product]

Installation directly next to machinery

The FR-A846 is compatible with IP55. It can be installed nearby the machine, minimizing cable length between the inverter and motor. By enclosing a DC reactor, it requires less wiring and less space.



Built-in DC reactor

Product Lineup

High performance and high functionality inverter

FR-A800(-E)(-GF)(-GN) FR-A846(-E) IP55 compatible model

Compliant with the ship classification standard only for the 400 V class

Compliant with the ship classification standard only for a built-in Class C2 EMC filter

Crane-dedicated inverter

FR-A800(-E)-CRN

Compliant with the ship classification standard only for the 400 V class

Product Features

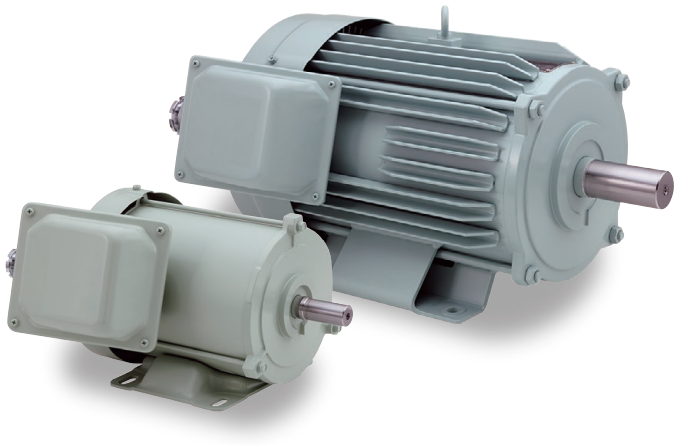
Some models have not been approved by all classification societies. For details of the models compliant with ship classification standards and precautions, please contact your local sales office.

Our Products

Motor

SF-PR-VS

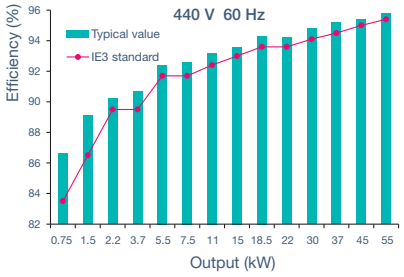
- Energy-saving motor for ships compliant with the Top Runner Standard
- Enabling a constant-torque operation in the low-speed range with an inverter
- Added insulation for protection against inverter surge in 400 V motors.



Features

Energy-saving motor for ships compliant with the Top Runner Standard

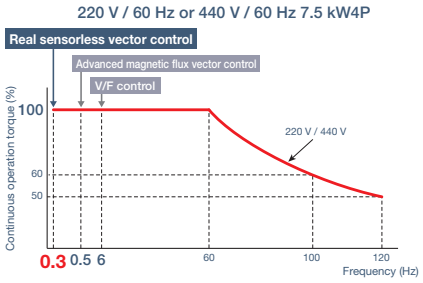
We achieve a much higher efficiency than the Top Runner Standard (IE3) using the motors for ships.



Efficiency of the SF-PR-VS (4P)
*Typical value (for reference)

Enabling a constant-torque operation in the low-speed range with an inverter

A wide range of speed control is possible with an inverter.



V/F control: 6 Hz, Advanced magnetic flux vector control: 0.5 Hz

Characteristics of the SF-PR-VS when driven by an inverter
*Typical value (for reference)

Added insulation for protection against inverter surge in 400 V class motors.

When driving a 400 V class motor by the inverter, micro surge voltages causing motor burnout occur. The added insulation protects the motor against micro surges, so user's no longer need to worry motor burnout.

Specifications

Compliant standard (Motor alone)	NK (Nippon Kaiji Kyokai) or JG (Japanese Government)
Model	SF-PR□-VS [□ = V, F] (Indoor type (IP44) only)
Output	0.75 to 55 kW (6 poles up to 45 kW)
Number of poles	2, 4, 6 poles
Frame number	80M to 225S

Voltage/Frequency	220 V 60 Hz or 440 V 60 Hz
Thermal class	120(E): 80M to 112M 130(B): 132S to 180 M 155(F): 180L to 225S
Surrounding air temperature	NK: 45°C JG: 40°C
Coating color	Standard coating color Munsell 7.5BG7/2 or 2.5G7/2

*The terminals box is a terminal block type with cable passing bracket for ships.

Some models have not been approved by all classification societies. For details of the models compliant with ship classification standards and precautions, please contact your local sales office.

Our Products Human Machine Interface (HMI)

Graphic Operation Terminal

GOT2000

The extensive GOT2000 lineup provides a wealth of ideas for the needs of manufacturers around the world. The GOT2000 boasts advanced functionality, acts as a seamless gateway to other industrial automation devices, all while increasing productivity and efficiency.

CC-Link IE TSN CC-Link IE Control CC-Link IE Field CC-Link IE Field Basic CC-Link

Please contact your local sales office for information on supported models.

Features

Low brightness mode for operation during night

Brightness can be adjusted to 32 levels.

Set authority and save operation history for each operator

Setting the operation authority and the viewing authority achieves "enhanced security" and allows "access management per operator". Use of the operator authentication function combined with the operation log function enables you to check the "who, what, when, and how" of an operation performed. (The operation log function is available on GT27 and GT25 models)

Water, dust, and oil-proof

Since GOT complies with water, dust, and oil-proof IP67F standard, it is acceptable for use in areas where water or oil are present. The GT25 rugged model complies with IP67F and IP66F ratings.

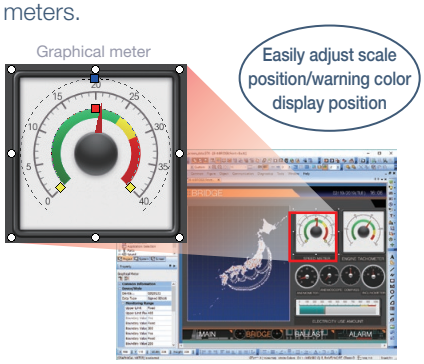
* Note that the structure does not guarantee protection in all users' environments.

Drive control (inverter) interactive functions

Various sample screens are available for easy adjustment and monitoring of parameters. In addition, the machine diagnosis screen can be used to detect errors such as clogged filters and clogged pipes on the GOT. (Sample screens are available on GT27 and GT25 models)

Quickly and easily create screens for ships

With HMI/GOT Screen Design Software GT Works3, it is easy to create meters that are frequently used on screens for ships. Just select a meter (from four shapes) and design, then adjust it with a mouse operation. The status of facilities is indicated with warning colors displayed on graphical meters.



Product Lineup

Multi-touch gesture functions equipped model

GT27 model

High performance, cost efficient, mid-range model

GT25 model

Compact models with basic functions

GT21 model

Some models have not been approved by all classification societies. For details of the models compliant with ship classification standards and precautions, please contact your local sales office.

Our Products Magnetic Starter

MS-T Series

All your expectations packed into one small device

- Down-sized width
- Expansion of the standard range of operation coil ratings
- Terminal cover with finger protection
- Variety of terminals for smart wiring
- Compliant with main International Standards

Features

Down-sizing

With a Magnetic Contactor that boasts the smallest width dimension* in the industry, customers can easily down-size their boards more than ever before.

*For AC-operated 10 A frame class general-purpose Magnetic Contactor (based on survey conducted by Mitsubishi Electric dated January 2019)

Expansion of operation coil rating range

The applicable voltage ranges have been extended in some operation coils, which reduces the number of operation coil rating types from 13 (previous series) to 7. Users can reduce their inventory by global standardization.

Conventional product

Coil designation	Rated voltage [V]	
	50Hz	60Hz
24 VAC	24	24
48 VAC	48–50	48–50
100 VAC	100	100–110
120 VAC	110–120	115–120
127 VAC	125–127	127
200 VAC	200	200–220
220 VAC	208–220	220
230 VAC	220–240	230–240
260 VAC	240–260	260–280
380 VAC	346–380	380
400 VAC	380–415	400–440
440 VAC	415–440	460–480
500 VAC	500	500–550

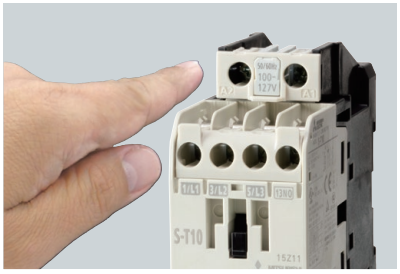
MS-T series

Coil designation	Rated voltage [V]
	50Hz/60Hz
24 VAC	24
48 VAC	48–50
100 VAC	100–127
200 VAC	200–240
300 VAC	260–300
400 VAC	380–440
500 VAC	460–550

The conventional seven types are available for the 50A and larger frames.

Terminal cover with finger protection is provided as standard.

In addition to the Magnetic Contactor, a terminal cover is also provided as standard for the thermal relay, electro-magnetic relay and auxiliary contact unit options. This prevents electric shocks and increases safety during maintenance and inspections.



Product Lineup

Magnetic Contactor

S-T□

Thermal Overload Relay

TH-T□KP

Magnetic Starter

MSO-T□KP

Some models have not been approved by all classification societies. For details of the models compliant with ship classification standards and precautions, please contact your local sales office.

Our Products Low-Voltage Circuit Breaker

WS-V, W&WS, AE-SW series

Various low-voltage circuit breakers are prepared for ships.

- Creating the next level of high-performance
- Extensive lineup of products catering to rapidly expanding globalization
- User-friendly products

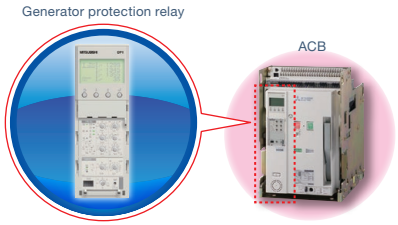
Features

Extensive lineup of products compliant with various ship classifications

The products are approved for the ship classification standards by NK, LR, ABS, DNV GL, BV, and CCS.

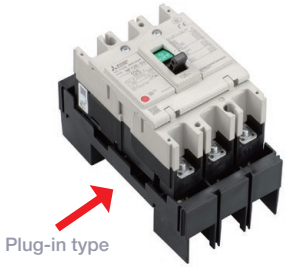
AE-SW generator protection relay

The generator protection relay, with the rated value specified by customers, provides the most optimal protection.



Plug-in type

The molded case circuit breaker (MCCB) is used as a circuit breaker for switchboards or distribution boards. The plug-in type allows installation or removal in a single motion making it suitable for replacing and updating work in a short time.



Product Lineup

Molded Case Circuit Breaker / Earth Leakage Circuit Breaker

WS-V series

W&WS series

Air Circuit Breaker

AE-SW series

Some models have not been approved by all classification societies. For details of the models compliant with ship classification standards and precautions, please contact your local sales office.

Mitsubishi Electric's global FA network delivers reliable technologies and security around the world.

Production base Development center Global FA Center Mechatronics showroom Mitsubishi Electric sales office

Russia FA Center
MITSUBISHI ELECTRIC EUROPE B.V.
Russian Branch St.Petersburg office

Germany FA Center
MITSUBISHI ELECTRIC EUROPE B.V.
Germany Branch

UK FA Center
MITSUBISHI ELECTRIC EUROPE B.V.
UK Branch

Czech Republic FA Center
MITSUBISHI ELECTRIC
EUROPE B.V.Czech office

Italy FA Center
Mitsubishi Electric
Europe B.V. Italian Branch

Europe FA Center
MITSUBISHI ELECTRIC
EUROPE B.V.
Polish Branch

Turkey FA Center
Mitsubishi Electric
Turkey A.Ş. Ümraniye

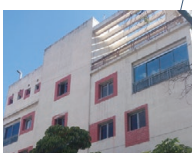
India Gurgaon FA Center
MITSUBISHI ELECTRIC INDIA PVT.LTD.
Gurgaon Head Office

India Ahmedabad FA Center
MITSUBISHI ELECTRIC INDIA PVT.LTD.
Ahmedabad Branch

India Pune FA Center
MITSUBISHI ELECTRIC INDIA PVT.LTD.
Pune Branch

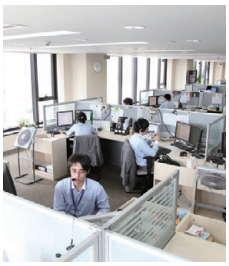
Indonesia FA Center
PT.MITSUBISHI
ELECTRIC INDONESIA

India Bangalore FA Center
MITSUBISHI ELECTRIC INDIA PVT.LTD.
Bangalore Branch

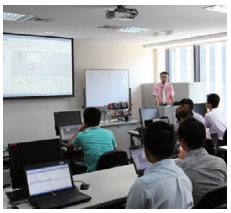


India Chennai FA Center
MITSUBISHI ELECTRIC INDIA PVT.LTD.
Chennai Branch

Available services



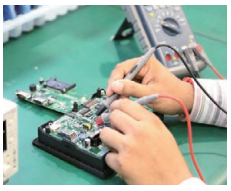
Technical consultation (engineering)
Our Japanese and/or local staff offer technical advice, and can also propose the best products and systems for a customer's specific application needs.



Training
From basic operations to applied programming, our training schools offer regular courses that use actual machines. We also offer customized training programs and onsite training sessions.

Showrooms
The latest automation technologies, including programmable controllers, HMIs, inverters, servo systems, and industrial automation machinery such as electrical-discharge machines, laser processing machines, CNCs, and industrial robots can be seen at Mitsubishi Electric showrooms.

Technical support
Our FA centers and service shops work together to provide repairs, onsite engineering support, and spare parts.



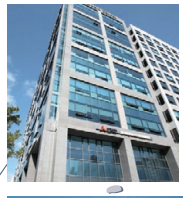
Repairs
Handle repairs of our FA products.

Service bases are established around the world to provide the same services as in Japan globally.
Overseas bases are opening one after another to support our customers' business expansion.

Area	Our overseas	FA centers
EMEA	26	7
China	17	4
Asia	31	13
Americas	15	6
Others	1	0
Total	90	30

·As of July 2017

Thailand FA Center
MITSUBISHI ELECTRIC FACTORY AUTOMATION(THAILAND) CO.,LTD



Korea FA Center
MITSUBISHI ELECTRIC AUTOMATION KOREA CO.,LTD.

MITSUBISHI ELECTRIC CORPORATION
Factory Automation Systems Group

Taichung FA Center
MITSUBISHI ELECTRIC TAIWAN CO.,LTD

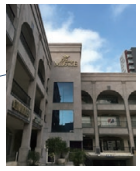
Taipei FA Center
SETSUYO ENTERPRISE CO.,LTD

Ho Chi Minh FA Center
MITSUBISHI ELECTRIC VIETNAM COMPANY LIMITED

Hanoi FA center
Mitsubishi Electric Vietnam Company Limited
Hanoi Branch

ASEAN FA Center
MITSUBISHI ELECTRIC ASIA PTE.LTD.

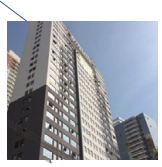
North America FA Center
MITSUBISHI ELECTRIC AUTOMATION,INC.



Mexico Monterrey FA Center
Monterrey Office, Mitsubishi Electric Automation, Inc.

Mexico FA Center
Querétaro Office, Mitsubishi Electric Automation, Inc.

Mexico City FA Center
Mexico FA Center
Mexico Branch, Mitsubishi Electric Automation, Inc.

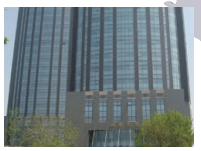


Brazil FA Center
Mitsubishi Electric do Brasil Comércio e Serviços Ltda.

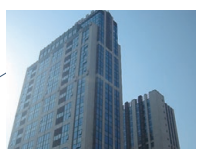
Brazil Votorantim FA Center
MELCO CNC do Brasil Comércio e Serviços S.A.

China

Beijing FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA)LTD.



Tianjin FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA)LTD.



Shanghai FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD.

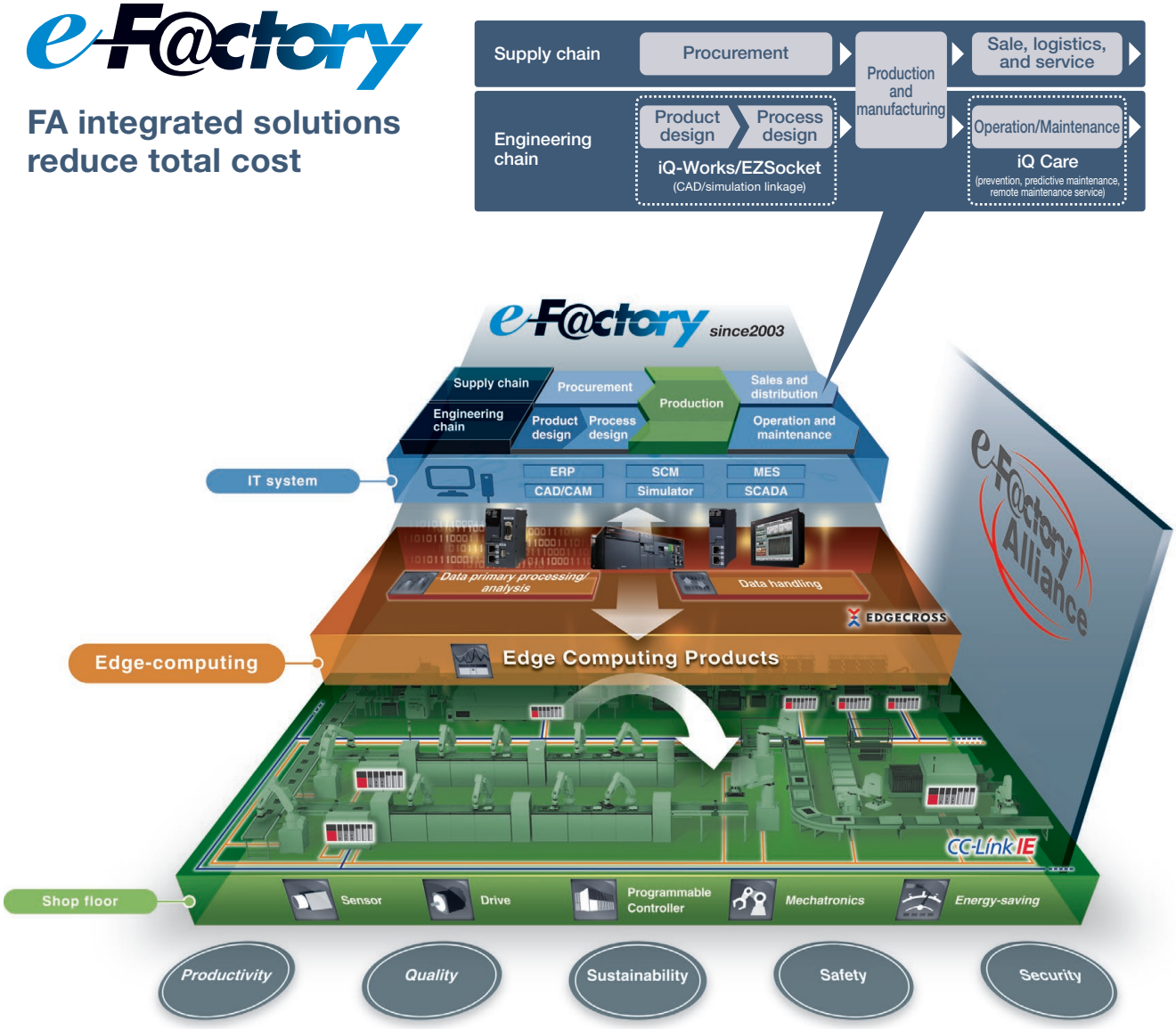
Guangzhou FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA)LTD.

This solution solves customers' issues and concerns by enabling visualization and analysis that lead to improvements and increase availability at production sites.

Utilizing our FA and IT technologies and collaborating with e-F@ctory Alliance partners, we reduce the total cost across the entire supply chain and engineeringchain, and support the improvement initiatives and one-step-ahead manufacturing of our customers.

e-F@ctory

FA integrated solutions reduce total cost

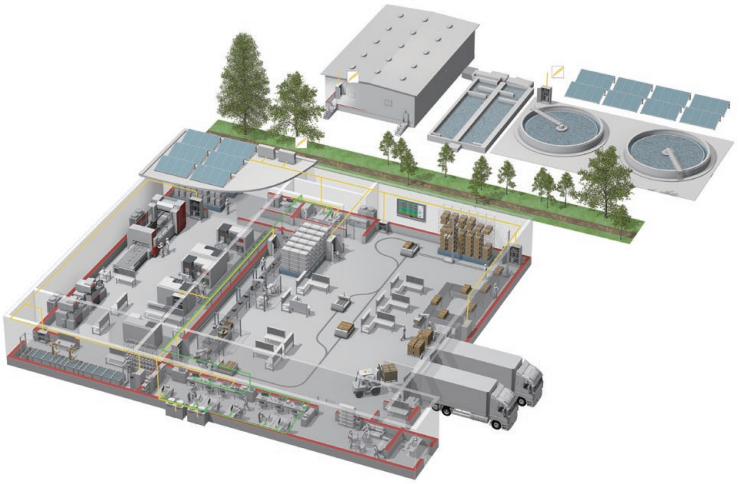


Overall production information is captured in addition to energy information, enabling the realization of efficient production and energy use (energy savings).

⚠ Safety Warning

To ensure proper use of the products listed in this catalog, please be sure to read the instruction manual prior to use.

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.

MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE: TOKYO BLDG., 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

L(NA)06105ENG-D(2203)MEE