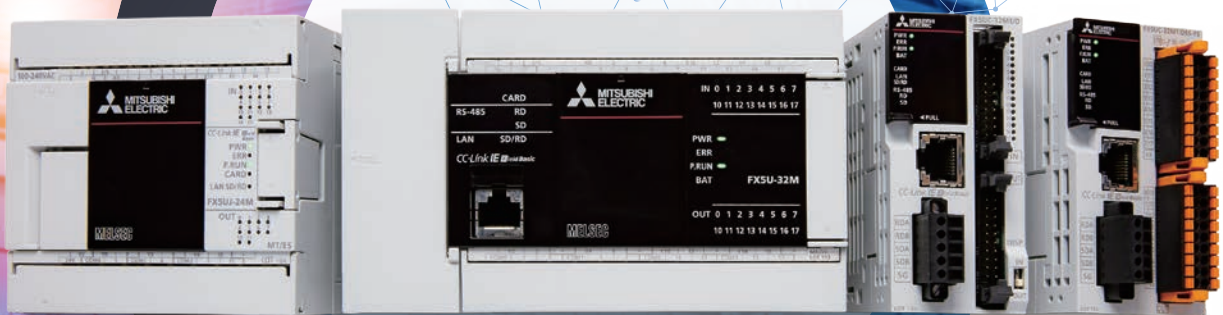


Quick Start IoT Leaflet

Quick Start **IoT** with **MELSEC iQ-F**
series



Connect

Monitor

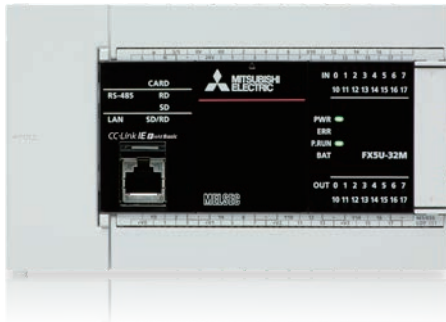
Collect

Utilize

Are you facing any problems introducing IoT to your facilities and equipment?

The MELSEC iQ-F series can help you get started easily and right away.

Screw terminal block type



Maximum number of control points	Program capacity	Pulse train	Up to
512* points	64 k/128 k steps	200 kpps	4 axes

FX5U All-in-one model

As an all-rounder CPU, this module can help introducing IoT to facilities and equipments in any scenes.

High-speed counter function (Max. 8 ch)	Positioning function (Up to 4 axes)
Ethernet port	RS-485 port
SD memory card slot	Analog input/output

Screw terminal block type



Maximum number of control points	Program capacity	Pulse train	Up to
256 points	48 k steps	200 kpps	3 axes

FX5UJ Model with USB (Mini-B) connector

Equipped with variety of built-in functions while demonstrating excellence in cost performance, this single module is recognized for its ease of use.

High-speed counter function (Max. 8 ch)	Positioning function (Up to 3 axes)
Ethernet port	USB (Mini-B) connector
SD memory card slot	

Spring clamp terminal block type



Maximum number of control points	Program capacity	Pulse train	Up to
512* points	64 k/128 k steps	200 kpps	4 axes

FX5UC Vibration resistant/maintenance-free model

Employs a spring clamp terminal block which strengthens vibration resistance and shortens wiring time.

High-speed counter function (Max. 8 ch)	Positioning function (Up to 4 axes)
Ethernet port	RS-485 port
SD memory card slot	

Connector type



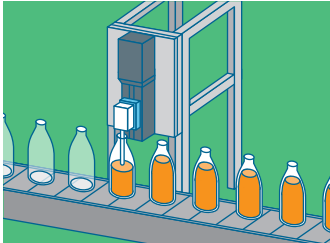
FX5UC Compact model

Because I/O connection is configured through external terminal block, this module can be located freely in any panel.

High-speed counter function (Max. 8 ch)	Positioning function (Up to 4 axes)
Ethernet port	RS-485 port
SD memory card slot	

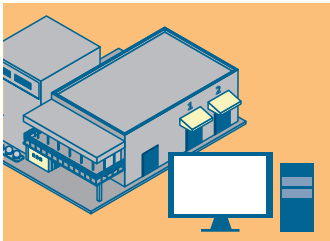
*: It is the maximum number of control points including remote I/O points.

13 approaches that are possible with this small PLC!



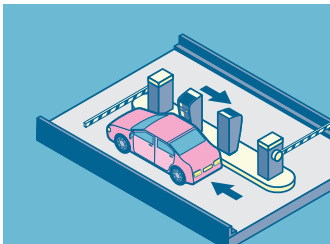
Simple connection

1. To realize the visualization of your existing equipment with as little modifications as possible
2. To easily set and operate your actuators
3. To shorten process changeover time



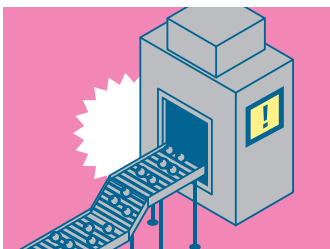
Data collection

4. To collect as much equipment logs as needed
5. To collect logs from remote sites together
6. To enable seamless data exchange between the high-level system and the connected devices



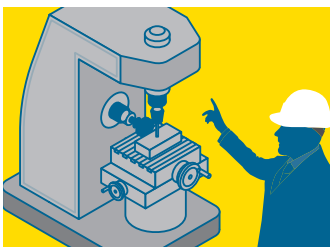
State visualization

7. To remotely monitor your equipment's states via mobile terminals
8. To directly monitor operation states on the site
9. To visualize the whole process



For analysis/troubleshooting

10. To perform predictive maintenance before any failure
11. To reduce debugging man-hours
12. To analyze the errors faster



More safely

13. To introduce safer controls to your equipment

To realize the visualization of your existing equipment with as little modifications as possible

On-site issues

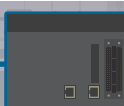
- PLCs manufactured by different manufacturers are used for different equipment. It is troublesome to change the existing equipment's configuration.
- If I could manage multiple PLCs' data together while minimizing the required capital investment...

[Before introduction]

Company A programmable controller

Company B programmable controller

Company C programmable controller



Input/output connection

Non-protocol connection

The system's configuration will become complicated...

I want to avoid large-scale equipment modification...



MELSEC iQ-F solves your problems

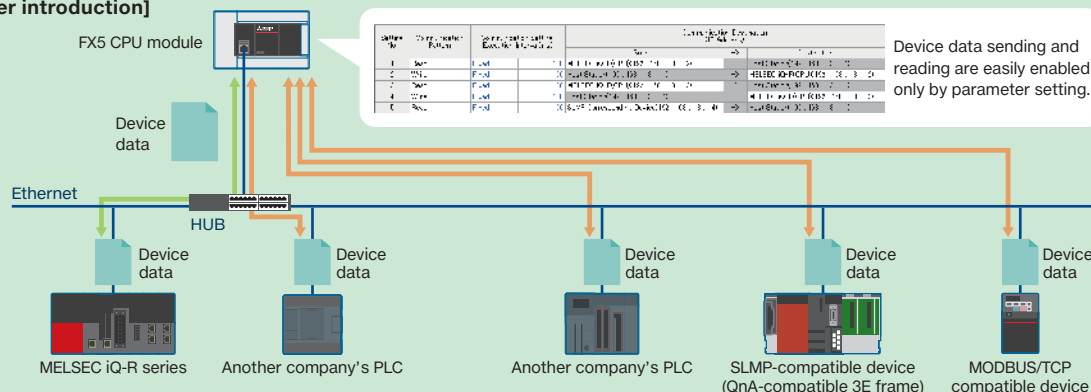
Quick Start

Simple CPU communication function **FX5U** **FX5UC** **FX5UJ**

- Program-less! Simple communication will be possible with only parameter settings!
- Can be connected to not only PLCs manufactured by Mitsubishi Electric but also those manufactured by other companies.



[After introduction]



List of supported PLCs*1

Manufacturer	Supported PLCs
Mitsubishi Electric	MELSEC iQ-R series, MELSEC-Q series, MELSEC-L series, MELSEC iQ-F series, MELSEC-F (FX3) series
Siemens	S7-1200, S7-1500, S7-200SMART
OMRON	CJ1M-CPU1□-ETN, CJ2H-CPU6□-EIP, CJ2M-CPU3□, CJ1W-EIP21, CJ1W-ETN21, CP1L-E□
Panasonic	AFP0HC32ET, AFP0HC32EP, AFP7CPS41E, AFP7CPS31E, AFP7CPS41ES, AFP7CPS31ES, AFP7CCET1
KEYENCE	KV-8000, KV-7500, KV-XLE02, KV-NC1EP
—	SLMP-compatible device (QnA Compatible 3E Frame), MODBUS/TCP-compatible device

Benefits

- ▶ The only requirement is to connect existing equipment to Ethernet, and no program change is needed. This simple system configuration only requires retrofitting the MELSEC iQ-F series and connecting it to the existing equipment.
- ▶ The MELSEC iQ-F series is an all-in-one PLC*2 and thus, by purchasing only one CPU module, it could be connected to PLCs manufactured by other companies. The cost was affordable, and the introduction was easy.

*1: FX5UJ CPU modules are connectable to the built-in Ethernet port of the MELSEC iQ-F series and SLMP-compatible devices only. (Other types of communication to be supported in the future.)

*2: A PLC with a power supply, a CPU and an I/O module integrated together.

There is no doubt about choosing the MELSEC iQ-F series

It supports a wide range of networks.

Complete line-up

The MELSEC iQ-F series supports various general purpose/industrial networks. Compared with PLCs of the same class, it supports the most networks and can be configured according to your equipment.



List of supported networks

Module	Compatible networks	FX5U/FX5UC CPU module		FX5UJ CPU module		Remarks
		Supported	Connectable stations/modules	Supported	Connectable stations/modules	
CPU module	Simple CPU communication	✓	16 modules	✓*1	8 modules	
	CC-Link IE Field Network Basic	✓	16 stations	✓	8 stations	Master only
	General-purpose Ethernet	✓	Up to 8 stations in total	✓	Up to 8 stations in total	*2, *4
	MODBUS/TCP	✓		✓		*4
	MODBUS/RTU	✓	32 stations	✓	32 stations	Master/Slave
FX5 extension module	FX5-CCLGN-MS	✓	60 stations	✓	*5	Master/Slave
	FX5-CCLIEF	✓	—	✓	—	Slave only
	FX5-CCL-MS	✓	28 stations	✓	14 stations	Master/Slave
	FX5-ENET	✓	32 modules	✓	32 modules	*6
		✓	32 stations	✓	32 stations	Master only
		✓	32 stations	✓	32 stations	*3
		✓	—	✓	—	B-ASC profile compatible
		✓	32 modules	✓	32 modules	*6
	FX5-ENET/IP	✓	32 stations	✓	32 stations	Scanner
		✓	32 stations	✓	32 stations	*3
		✓	—	✓	—	B-ASC profile compatible
		✓	64 stations	✓	64 stations	Master only
	FX5-ASL-M	✓	128 stations	✓	128 stations	Master only
	FX5-OPC	✓	4 (Concurrent sessions)	✓	*5	Server only

*1: FX5UJ CPU modules are connectable to the built-in Ethernet port of the MELSEC iQ-F series and SLMP-compatible devices only. (Other types of communication to be supported in the future.)

*2: Protocol type: MELSOFT connection, socket communication, communication protocol support, SLMP server

*3: Protocol type: MELSOFT connection, socket communication, SLMP server

*4: FX5UJ CPU module is currently only connectable to the slave stations. It will be connectable to the master station in the future.

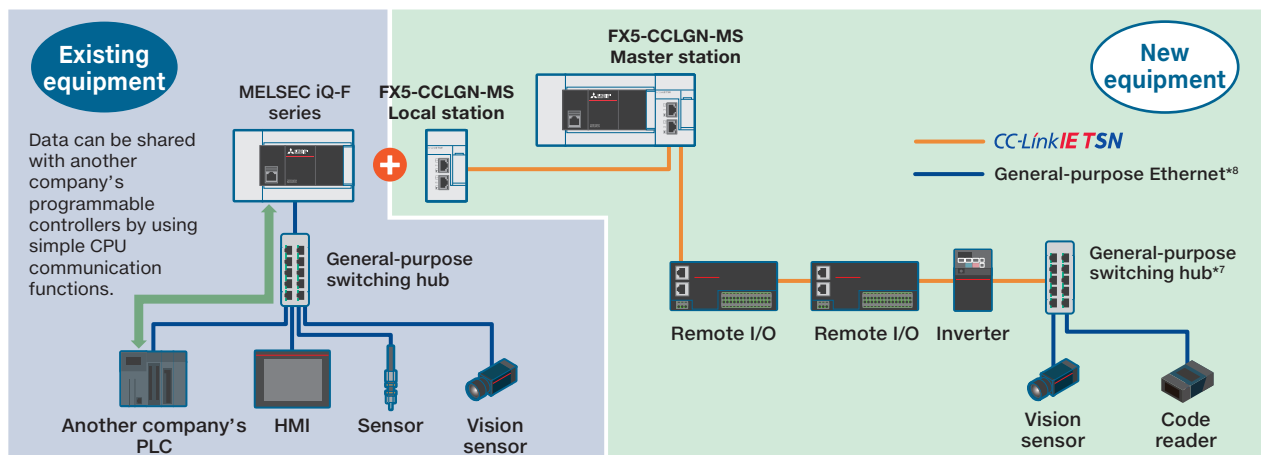
*5: Those will be supported in the future.

*6: FX5-ENET and FX5-ENET/IP are connectable to the built-in Ethernet port of the MELSEC iQ-F series, Ethernet module of the MELSEC iQ-F series, and MODBUS/TCP-compatible devices only. (Other types of communication to be supported in the future.)

Featured Product

The MELSEC iQ-F series' CC-Link IE TSN master/local module (FX5-CCLGN-MS) can be connected to up to **60 stations** and supports medium-scale systems. Unlike the conventional networks, TCP/IP can also co-exist on the same network, allowing easy configuration.

Furthermore, it realizes high-speed communication using the TSN technology (minimum periodic synchronization interval = 250 μs) and real time capability.



*7: Use a general-purpose switching hub supporting 1 Gbps communication speed.

*8: SLMP-compatible device, MELSOFT product

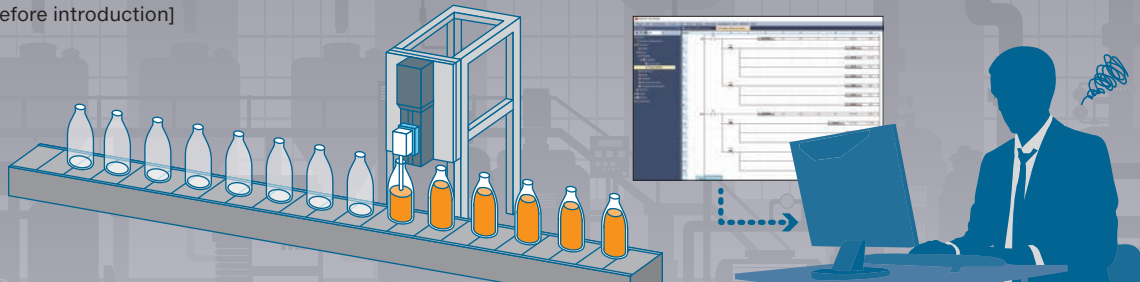
2

To easily set and operate your actuators

On-site issues

- Multiple actuators are used in the system, but the program for operation is complicated.
- Because the program needs to be changed, it takes time and effort to change the system's configuration.

[Before introduction]



MELSEC iQ-F solves your problems

Quick Start

Predefined Protocol Support Tool Function FX5U FX5UC

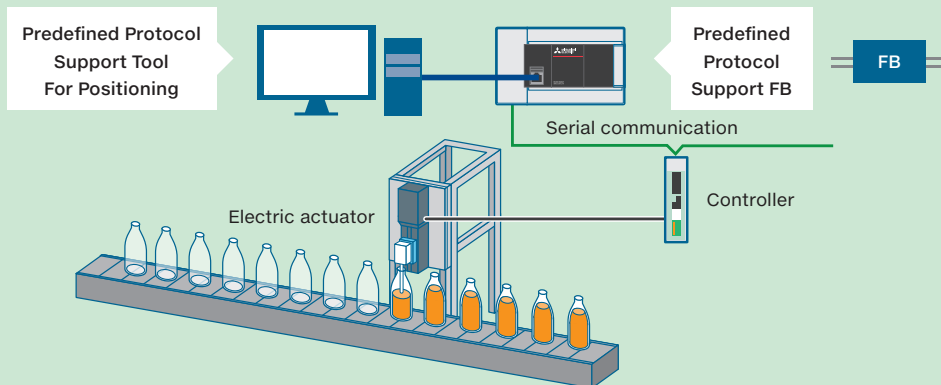
- The predefined protocol support tool for positioning can easily configure positioning settings!
- A dedicated FB* is provided and no complicated program is required!

*: FB = Function Block



[After introduction]

The MELSEC iQ-F series provides **predefined protocol support FBs for positioning (seven types in total)**. Using these FBs can ease the programming work. Furthermore, **the predefined protocol support tool for positioning** enables you to easily change the parameter settings of your electric actuators. The predefined protocol support tool for positioning also enables you to conduct test operations and helps you when starting up and debugging your system.



Benefits

- ▶ Predefined protocol support FBs for positioning were used, and the programming man-hours were reduced.
- ▶ The predefined protocol support tool for positioning enabled easy inputting of an electric actuator's parameters and test operations. Thus, it is useful for starting up and debugging the system.

More details!

Predefined Protocol Support Tool Function

Predefined Protocol Support Tool For Positioning



7 types in total
FB

The MELSEC iQ-R/iQ-F series can excellently cooperate with various types of electric actuators. The predefined protocol support tool for positioning, which is used to set parameters, and dedicated FBs, which can be used for programming, are provided.

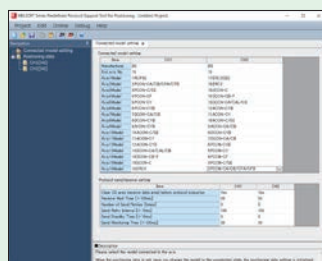
Predefined Protocol Support Tool For Positioning

If positioning control data in an electric actuator are connected via serial communication, it is possible to configure them without being aware of their communication protocol.

In addition, the positioning data test function allows an earlier start up of the system.

GX Works3 > Tool > Module Tool List

(1) Setting screen



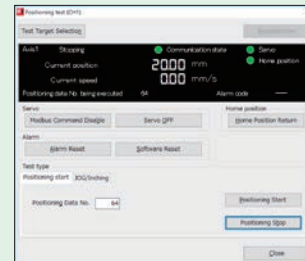
Parameter setting

64 data/axis

Up to 32 axes (2 ch)

Predefined Protocol Support Tool For Positioning > Debug

(2) Positioning test screen



This positioning test is a function to adjust an electric actuator's positioning operation while monitoring its operation.

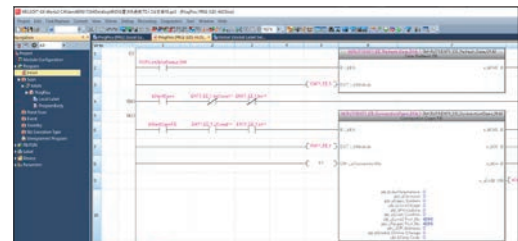
★Note: Conduct a positioning test while the FX5U/FX5UC CPU module and an actuator to be tested are connected to each other.

Predefined Protocol Support FB

The positioning data are set by the predefined protocol support tool for positioning can be controlled by a program.

Predefined Protocol Support FB For Positioning List (for IAI)

FB name	FB type
M+IAIStartHomePositioning_F	Home Position Return
M+IAIJogInching_F	JOG/Inching Operation
M+IAIReadPositioningTable_F	Position Table Read
M+IAISetPositioningTable_F	Position Table Setting
M+IAIStartPositioning_F	Positioning Operation
M+IAIMonitoring_F	Operation Monitor
M+IAIServoControl_F	Servo ON/OFF



Specifications supporting predefined protocol support functions for positioning

Item	Description
Communication module	Built-in RS-485 ports, expansion boards (FX5-232-BD*, FX5-485-BD), expansion adapters (FX5-232ADP*, FX5-485ADP)
Maximum number of axes/ch	16 axes/ch Up to 2 channels can be used.
Positioning data	64 data/axis (Acceleration/deceleration values can be set individually.)
Positioning guidance	Present (Explanations, ranges, etc. for individual parameters are guidance displayed.)
Connectable devices	- IAI Corporation Supported devices: PCON/ACON/SCON/DCON/ERC2/ERC3 series and RCP6S - ORIENTAL MOTOR Co., Ltd. Supported devices: AR/AZ/RKII series - SMC Corporation Supported devices: LECP6/LECA6

★: Transformation from RS-232 to RS-485 is required. Recommended transformation devices are RCB-TU-SIO-A and RCB-TU-SIO-B manufactured by IAI Corporation.

To shorten process changeover time

On-site issues

- Changing over the process for high-mix low-volume production takes time.
- Having to retrieve and deliver the SD memory cards containing production instruction leads to time loss.

[Before introduction]



MELSEC iQ-F solves your problems

Quick Start

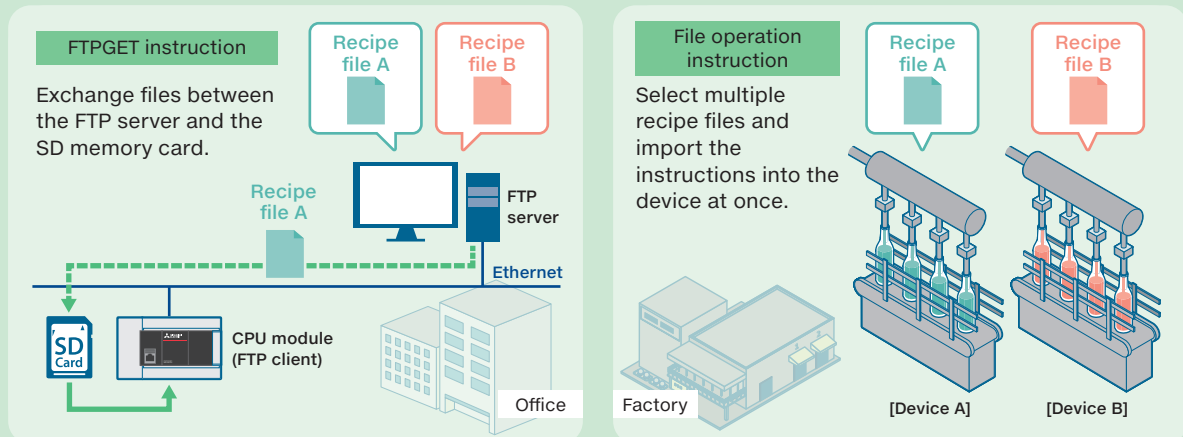
FTPGET instruction × File operation instruction **FX5U** **FX5UC**

- The automatic recipe data changeover function shortens process changeover time.
- Easy remote storage of the recipe files from anywhere.



[After introduction]

The MELSEC iQ-F series come with the recipe file changeover function and the file-edit function to help reduce process changeover time and achieve greater efficiency.



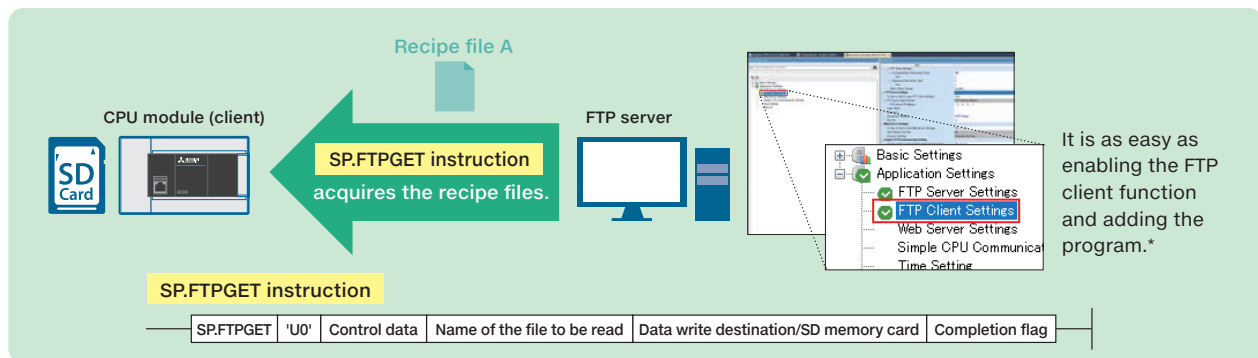
Benefits

- ▶ Shorter process changeover time and improved cycle time mean greater daily production volume.
- ▶ The automatic recipe data changeover function eliminates human errors in importing the recipe data.
- ▶ Remote PC file retrieval via Ethernet eliminates the need to physically replace the SD memory card.

FTPGET instruction × File operation instruction

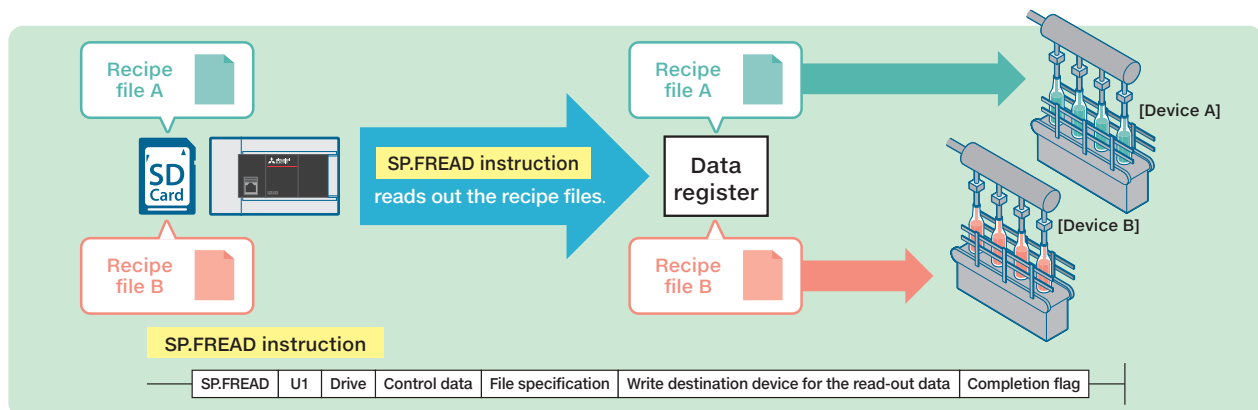
FTPGET instruction

An FTPGET instruction is an instruction to read out the files on the FTP server to be written to the programmable controller. Select the recipe files on the FTP server from the program, and send them to the SD memory card on the programmable controller.



File operation instruction Data read (SP.FREAD) from the specified file

An SP.FREAD instruction is an instruction to read the device data from the files on the SD memory card. The files acquired from the FTP server using the SP.FTPGET instruction is read with the file operation instruction.



Instructions list

Instruction name	Function and usage example
SP.FREAD	This instruction reads data from the specified file (BIN/CSV format) on an SD memory card. Usage example: Store the data on the SD memory card that was acquired with FTPGET instruction to the device in the CPU module.
SP.FWRITE	This instruction writes data to the specified file (BIN/CSV format) on an SD memory card. Usage example: Store data device values in place of data logging function by increasing the number of setting numbers and points.
SP.FDELETE	This instruction deletes the specified file or folder on the SD memory card. Usage example: Delete unnecessary data to create more space in the SD memory card.
SP.FCOPY	This instruction copies the specified file or folder on the SD memory card. Usage example: Create backup data.
SP.FMOVE	This instruction moves the specified file or folder on the SD memory card. Usage example: Organize data.
SP.FRENAME	This instruction renames the specified file or folder on the SD memory card. Usage example: Organize the recipe data in categorized folders.
SP.FSTATUS	This instruction acquires the status of the specified file or folder on the SD memory card. - File attribute (read-only, hidden file, etc.) - File size - Last modified date/time Usage example: Check the file size to decide which files to delete.

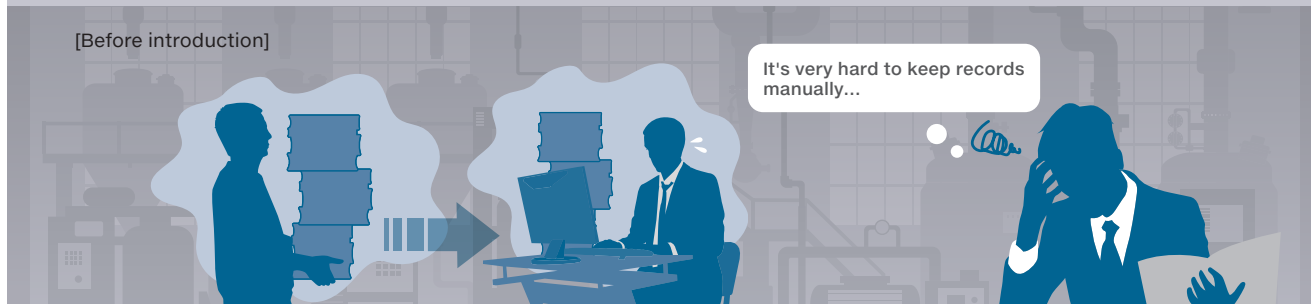
★: Requires the communication settings to be made for the FTP client/server.

To collect as much equipment logs as needed

On-site issues

- It is troublesome to record serial numbers and measurements regularly. However, such data must be recorded in case of trouble.
- Although equipment logs are recorded, there are too many data and it is difficult to judge where to start.

[Before introduction]



MELSEC iQ-F solves your problems

Quick Start

Data logging function FX5U FX5UC FX5UJ

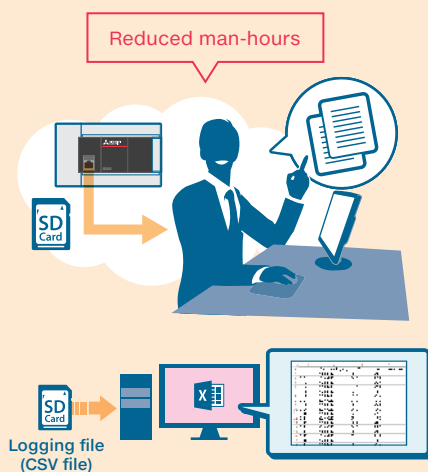
- It enables collecting logged data easily with no program required!
- The logged data are output in CSV format* which can be managed by Microsoft® Excel®!



[After introduction]

No program is required, and logging data can be acquired only by setting parameters. Therefore, products' ID numbers read by a 2D code reader can be easily collected.

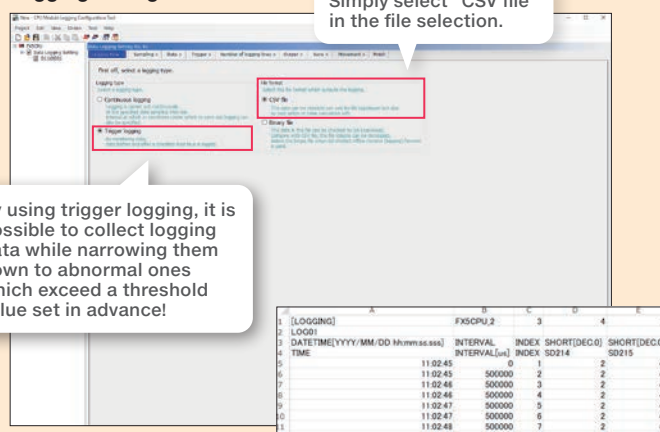
Also, logged data can be collected automatically, and they can be managed by Microsoft® Excel®, etc. if they are stored in the CSV file format.



Logging Configuration Tool

Simply select "CSV file" in the file selection.

By using trigger logging, it is possible to collect logging data while narrowing them down to abnormal ones which exceed a threshold value set in advance!



<Example output in CSV file format>

Benefits

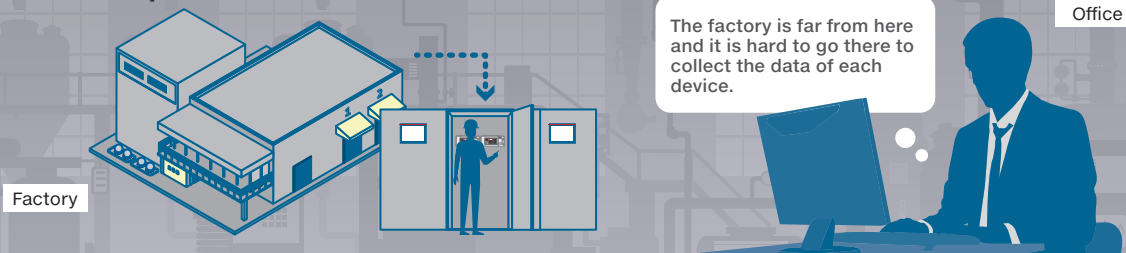
- ▶ When a trouble occurred, data collected during production could be checked and therefore, time to investigate its cause could be reduced.
- ▶ Data can be stored in the CSV format and therefore, they can be easily managed by Microsoft® Excel®.

*: The FX5UJ CPU module is planned to be supported in the future.

On-site issues

- The logs of devices are being collected, but it is necessary to visit the site at a remote location.
- It takes time and effort to visit the installation places of multiple devices and collect their logged data.

[Before introduction]



MELSEC iQ-F solves your problems
Quick Start**FTP server function/FTP client function*2**

FX5U

FX5UC

FX5UJ

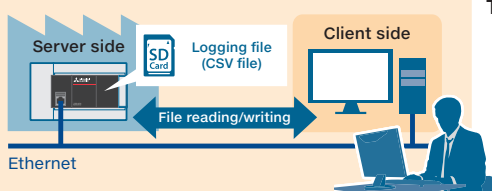
- Enables the data of devices located at remote sites to be transferred, allowing easy collection.
- The logged data can be stored on a PC automatically!



[After introduction]

CASE 1: When it is needed to collect data together at an arbitrary timing.**FTP server function**

By enabling the FTP server function using GX Works3, it becomes possible to read and write files from a PC in your office.



To activate FTP, use a command prompt**1 on your PC's screen.

```

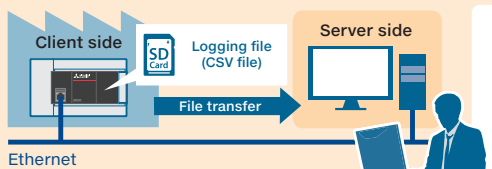
Microsoft Windows [OS
(C) Copyright Microsoft Corp. 1990-2001.

C:\Windows>ftp
ftp> open 192.168.3.250
Connected to 192.168.3.250.
230 User logged in.
User (192.168.3.250 (none)): FX5UJ
331 Password required.
Password:
230 User logged in.
ftp>
  
```

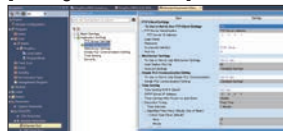
- 1 FTP start (FTP)
- 2 Connect with FTP server (open CPU module IP address)
- 3 Specify login name (login name)
- 4 Specify password (password)

CASE 2: When it is needed to automatically transfer data to your PC**FTP client function*2**

By enabling the FTP client function by GX Works3 and adding a program, it becomes possible to automatically transfer data to a specified location.



[Setting of GX Works3]



FTPPUT instruction will enable automatic transfer at any time.

[Adding program] FTTPUT instruction

FTTPUT (FTP client file transmission) instruction

FTTPUT (U) (S1) (S2) (S3) (S4)

Benefits

- ▶ It became possible to easily collect and check the logging files of devices abroad while staying in my country.
- ▶ It became possible to easily collect and transfer data automatically without visiting the site to collect them regularly. It will also be possible to not forget about collecting such data.

*1: A tool to use a statement called a command to perform Windows® operations and settings.

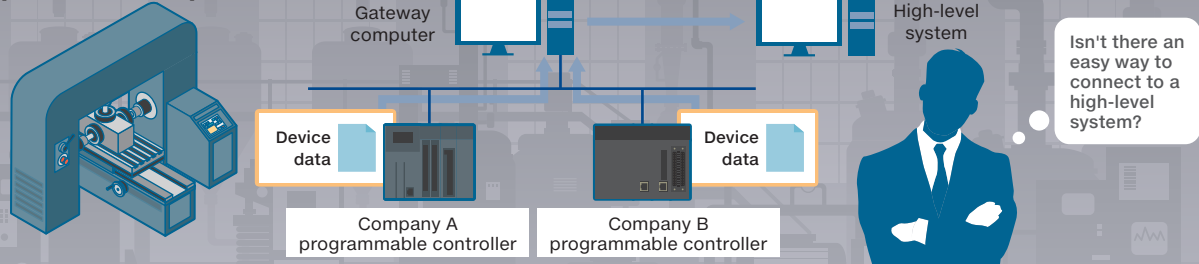
*2: The FX5UJ CPU module is planned to be supported in the future.

To enable seamless data exchange between the high-level system and the connected devices

On-site issues

- Separate control of stand-alone equipment adds extra work.
- The use of multiple programmable controllers by different manufacturers stands in the way of achieving centralized control.

[Before introduction]



MELSEC iQ-F solves your problems

Quick Start

MELSEC iQ-F FX5-OPC

FX5U

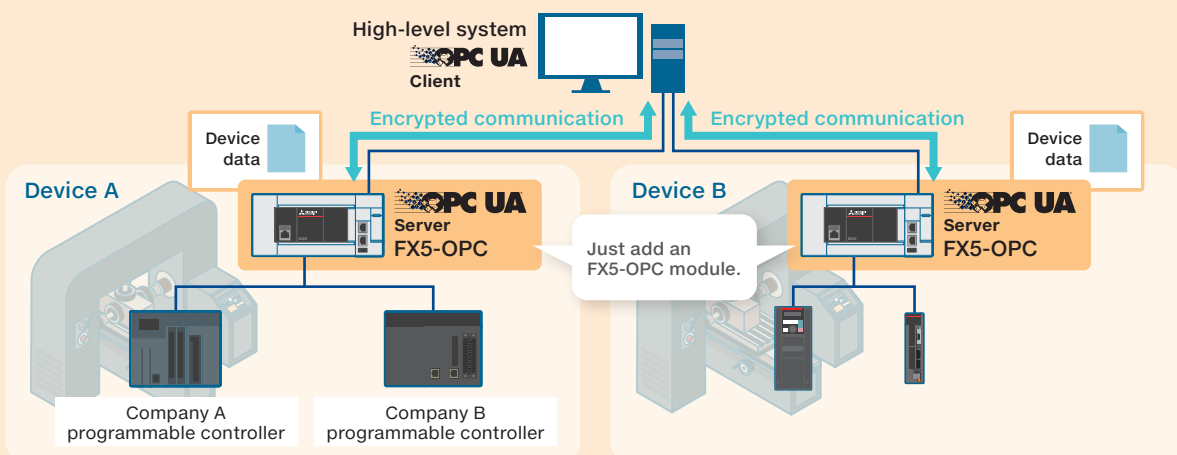
FX5UC

- FX5-OPC allows for data integration between stand-alone equipment and high-level systems.
- No need for an integrated programmable controller or an OPC UA-compatible gateway computer. Just connect to your familiar programmable controller.



[After introduction]

Access the data of the FX5U(C) CPU module via the FX5-OPC, which works as a server. Encrypted communication capability of FX5-OPC protects your sensitive information, such as machining information, from unauthorized access.



Benefits

- ▶ Centralized control of individual device data and simplified data management
- ▶ A simple addition of an FX5-OPC to the existing equipment enables a collective acquisition of all equipment data.
- ▶ Secure data exchange with a tight security.

More details!



What is OPC UA?

OPC UA is a platform-independent communications standard developed by the OPC foundation, USA. It enables data exchange between vendor and OS neutral products, and offers secure and reliable data communications between manufacturing levels and higher-level IT systems.

FX5-OPC product specifications

OPC UA server modules are also available in the MELSEC iQ-R series to suit your needs.

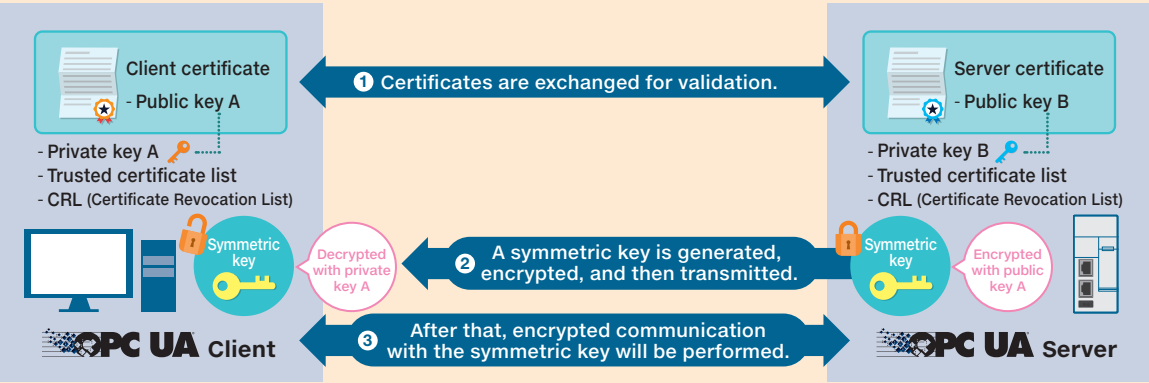
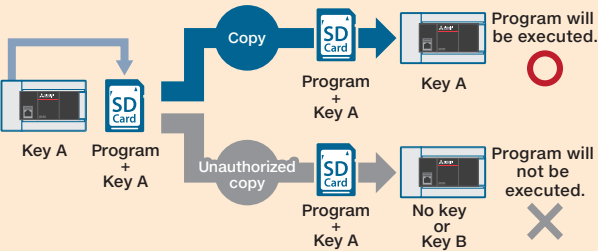
	FX5-OPC	RD81OPC96 (iQ-R OPC UA server module)
Data transmission speed	100 Mbps/10 Mbps	100 Mbps/10 Mbps
OPC UA function	Server function	Server function
Maximum number of parallel sessions	4	15
Maximum number of subscriptions ^{★1}	8	150
Maximum number of monitored items ^{★2}	4000	12000
Engineering tool	- OPC UA Module Configuration Tool - GX Works3	- OPC UA Module Configurator-R - GX Works3

+ONE

Enhanced security

The MELSEC iQ-F series feature a password protection and an authentication function to protect your sensitive data from an everincreasing threat of cyber attacks. Certificates are exchanged between FX5-OPC and the connected device to block unauthorized access and ensure secure communication with the high-level device.

Security key authentication example



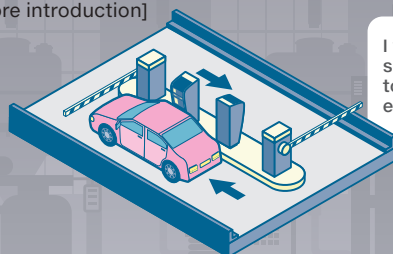
★1: Number of subscriptions = The number of monitored item control groups
★2: Number of monitored items = The number of devices connected to the CPU module that can be acquired via OPC.

To remotely monitor your equipment's states via mobile terminals

On-site issues

- It is necessary to visit the remote site just to check the state of a device/equipment.
- To check that device's state, it is necessary to activate the engineering tool.

[Before introduction]



I wish I could use my smartphone or tablet to freely check the equipment...



MELSEC iQ-F solves your problems

Quick Start

Web server function

FX5U

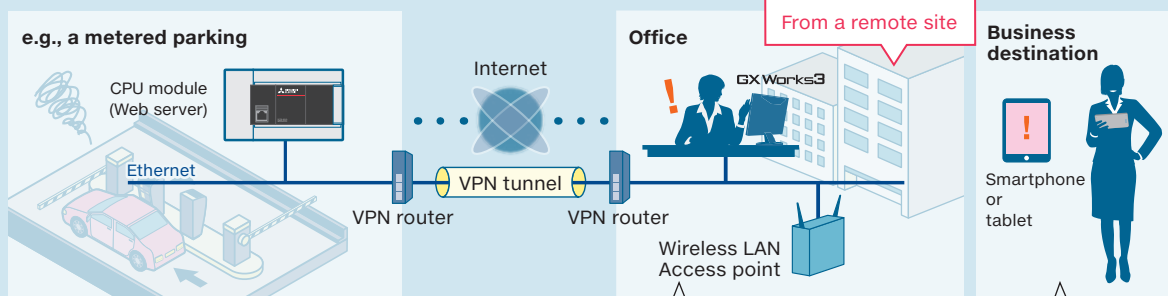
FX5UC

FX5UJ

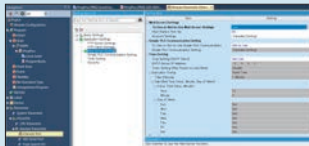
- No program is required! Simple diagnosis can be made just by accessing the PLC!
- The PLC can be accessed with a smartphone or tablet!
- An original Web page can be designed by the user!



[After introduction] You can watch the operation state of a device from a remote site!



GX Works3 setting screen



[Module Parameter] > [Ethernet Port] > Web Server Settings

System Web page

PLC	Err.	Occurrence Date	Error status	Error code	Overview
FX5U	Err.	2019-01-30	Minor error	3400	Operation error

If you use your PC's Web browser to access the system web page, you can check error situations, etc.

User Web page

"User Web pages" unique for each user can also be created. If a dedicated tool is used, drawing will also become easy.



User Web page drawing tool

Benefits

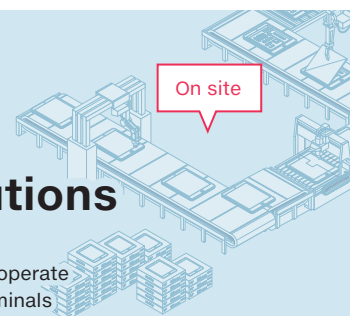
- ▶ It was possible to check the situation of the site by freely using the smartphone or tablet without any need of a PC or an engineering tool.
- ▶ Before visiting the site, a simple diagnosis helped the preparation fully and therefore, I was able to perform my work efficiently.
- ▶ By adding device maintenance services and options, it was possible to provide added values.

+ONE

GOT Mobile

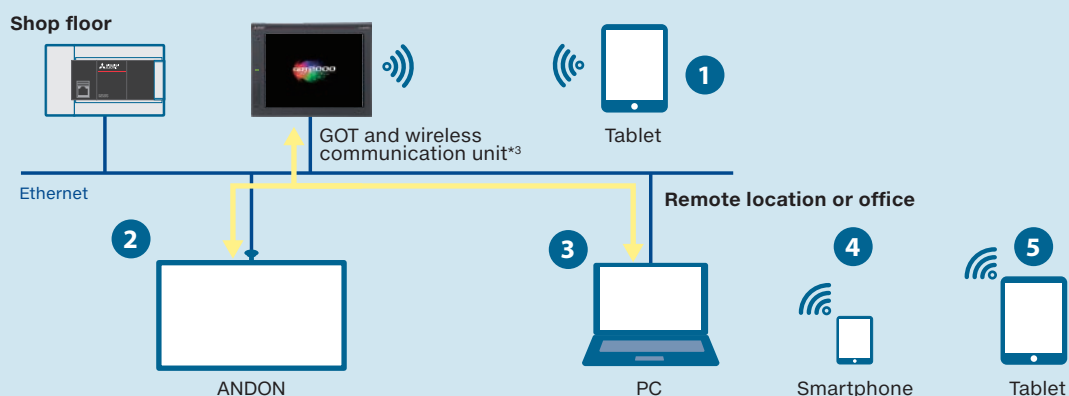
GOT Web-based Remote Solutions

The GOT Mobile is a function which enables the user to monitor and operate equipment with no dedicated tool from tablets and other mobile terminals via an on-site GOT.



Five information devices can access a GOT at the same time!*

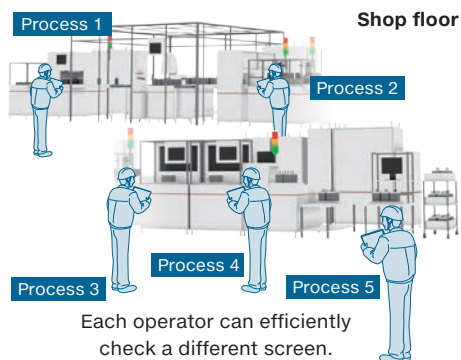
Each information device can display and operate a different screen.*



Improve setup procedure

Monitor production by multiple operators

When the equipment is large, up to five stations can efficiently work at the same time to check and make settings.

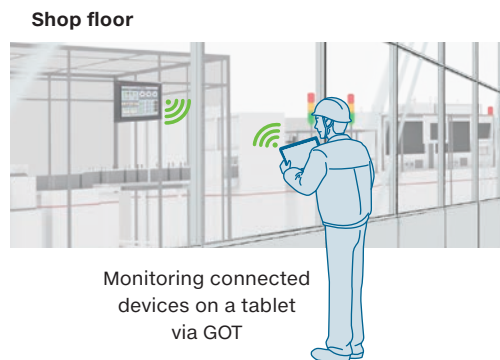


Each operator can efficiently check a different screen.

Improve productivity

Monitor production from outside of the clean room

The status of equipment can be monitored using tablets from outside of the clean room.



★1: Up to five clients can connect to a GOT at the same time.

★2: Simultaneous operations can be prevented on the same network. For details, please see the relevant product manual.

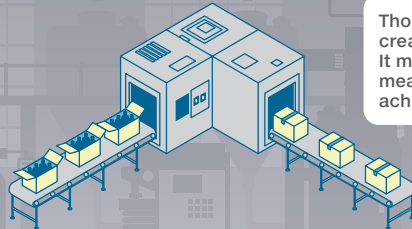
★3: For the countries where the unit can be used and other details, please refer to the Graphic Operation Terminal GOT2000 Series/GOT SIMPLE Series Catalog (L(NA)08270ENG) or the relevant product manual.



On-site issues

- Interested in introducing IoT to equipment, but unsure of the procedures.
- Data are collected from a production site, but unsure where improvements can be made.
- Full update of the system to implement visualization is not desired. Such as replacing all PLCs with new ones.

[Before introduction]



Though we have data, we must create programs for visualization. It may be expensive, and it is meaningless if no improvement is achieved after the introduction.


MELSEC iQ-F solves your problems

Quick Start
e-F@ctory Starter Package

FX5U

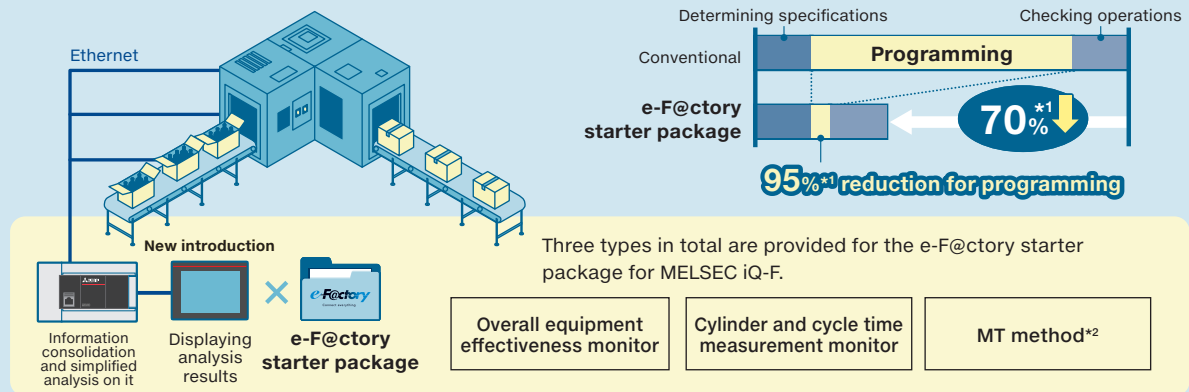
FX5UC

- Areas that need improvement will become obvious! Equipment visualization can be realized from its operation states!
- Only by adding a single PLC to existing equipment can realize visualization easily!
- Also, there is no need to worry about programming! Sample programs are provided!



[After introduction]

By introducing the e-F@ctory starter package, development costs can be reduced greatly, and the visualization of equipment can be realized easily.


What is the e-F@ctory starter package...

The e-F@ctory starter package is a package of sample projects for analyzing equipment information collected in the programmable controller and displaying analyzed results on the GOT (HMI). Designing complex analysis algorithms and graphs is unnecessary, constructing the equipment operation monitoring system **easily** and **quickly**.

Benefits

- ▶ The visualization of the equipment and devices has been realized, and helped to improve the production site.
- ▶ Only a single MELSEC iQ-F series CPU module with built-in serial and Ethernet ports allowed the visualization of the existing equipment.
- ▶ The introduction of the e-F@ctory starter package was carried out using sample programs/screens and reduced man-hours.

+ONE

The MELSEC iQ-R series delivers more abundant features!

Mitsubishi Electric
e-F@ctory starter package
E001ENG



★1: When the e-F@ctory starter package's functions are used as they are (e.g., the functions satisfy the user's specification).

★2: Abbreviation of the Mahalanobis-Taguchi method

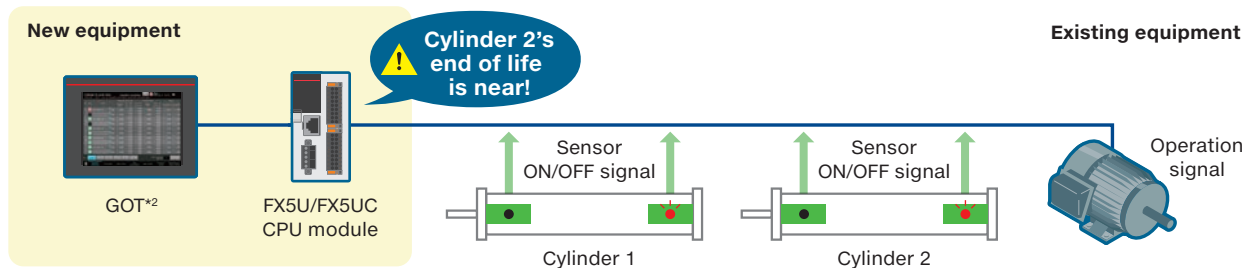
Advanced strength of the MELSEC iQ-F series

e-F@ctory starter package



Cylinder & cycle time*1 measurement monitor FX5U FX5UC

The operating time of a cylinder and the cycle time of the equipment can be measured, and it is possible to visualize if the measurements are above their thresholds.
The cumulative operation count and time can be also measured, and the mechanical life can be monitored.



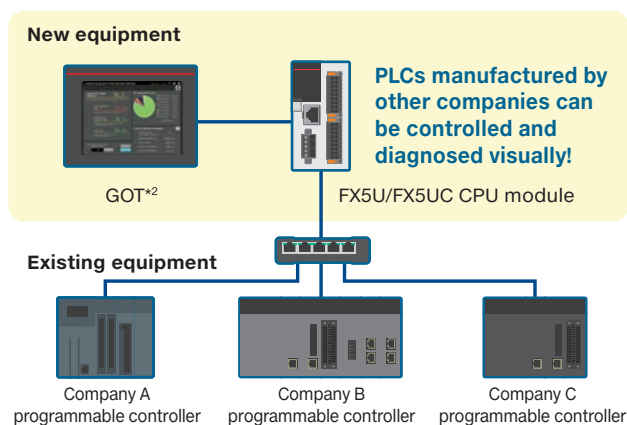
Project specifications

Item	Description
Number of supported cylinders	30
Number of intermediate position sensors	2
Measurement time	Up to 32,767 msec

Item	Required capacity
Number of steps	Approx. 11.1 k steps
Amount used for labels	Approx. 15.4 k words
Amount of latch labels used	Approx. 0.6 k words
Memory area capacity setting	Device (high-speed) area capacity
	Device (standard) area capacity
	Label area capacity
	Latch label area capacity

Overall equipment effectiveness monitor FX5U FX5UC

Any rejection rate, equipment unavailability, etc. can be visualized.



Project specifications

Item	Required capacity
Number of steps	Approx. 0.7 k steps
Amount used for labels	Approx. 1.8 k words
Amount of latch labels used	0.1 k words



Screen overview

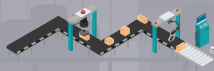
No.	Description
1	In cooperation with the production volume counting function, calculates/displays overall equipment efficiency, etc.
2	Shows the graph of equipment operating time and non-operating time (according to non-operating causes).
3	Shows product type data, the production volume of product types currently produced, etc.

*1: Working hours required for a particular process in a production line
*2: GT SoftGOT2000 is also supported.

On-site issues

- Different devices are adopted from different manufactures. Therefore, the whole process is not unified and difficult to understand.
- There are multiple lines and it is necessary to visit each site to check their production status.

[Before introduction]



Company A programmable controller



Company B programmable controller



Company C programmable controller

If only there was a way to monitor multiple lines with one PC...



MELSEC iQ-F series

x GOT solutions solve your problems

Quick Start**GT SoftGOT2000*1**

- No special system is required! Just use GT SoftGOT2000 to monitor on-site programmable controllers and the whole process.
- There is no need to visit the site, and multiple lines can be monitored together remotely!

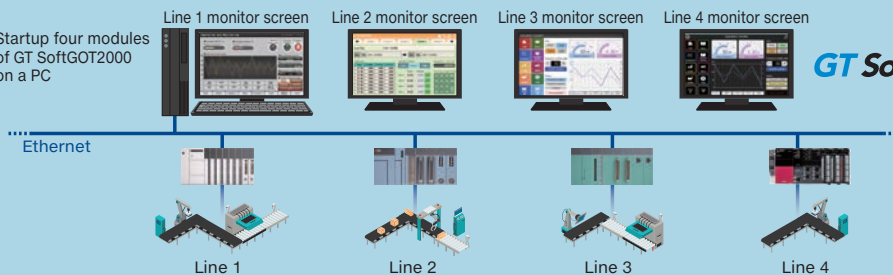


[After introduction]

GT SoftGOT2000 will allow you monitor multiple lines together using a single PC.

Multiple monitors display large screens

Startup four modules of GT SoftGOT2000 on a PC



Since multiple modules of GT SoftGOT2000 can be started on a single PC*2, multiple lines can be monitored collectively. By displaying the screen on multiple monitors, the contents can be viewed in larger screens.

What is the GT SoftGOT2000?

GT SoftGOT2000 is the HMI software that runs on PCs and panel computers. It can be used to monitor and operate the information of industrial devices that are connected to a PC or a panel computer via a network.



GT SoftGOT2000 license key (for USB port)



GT SoftGOT2000 Solutions L(NA)08606ENG

Benefits

- ▶ The PC was connected to different devices' PLCs so that the visualization of the whole process was easily realized.
- ▶ It is possible to monitor devices from the office or other remote locations without visiting the site.

*1: GT SoftGOT2000 is a software included in GT Works3. A separate license key (GT27-SGTKEY-U) must be installed during use.

*2: It is recommended to use up to four modules of GT SoftGOT2000 online on a personal computer simultaneously.

+ONE



Process remote monitoring



iQ Monozukuri easily introduces IoT to the shop floor

Visualization of operation status improves manufacturing process and productivity

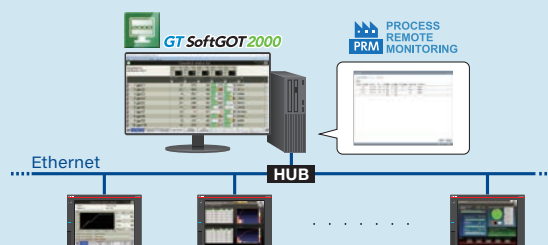
iQ Monozukuri Process Remote Monitoring is an application package to easily introduce IoT technologies to the shop floor, collect and visualize information of multiple devices, and collectively manage the information.

Manufacturing process and productivity of the whole production can be improved by analyzing the data displayed on GT SoftGOT2000. The operation status of the shop floor and the information such as operation logs and alarms can be collected from each device via an on-site GOT.

Features

- Incorporating the package into existing equipment makes system implementation easy
- Collectively manage information that used to be managed individually
- Template screens to analyze the equipment status are included

Displaying collected information in a screen of GT SoftGOT2000



[Collecting information of the shop floor]

Process Remote Monitoring setting tool collects and visualizes information of the shop floor. This tool can be used by selecting GOTs (more than one) that have the information to be collected and setting the information needed (such as devices or resource data).

Without specialized knowledge such as programming, information to be displayed in GT SoftGOT2000 can be easily set.

Introduction

Easily collect and visualize information of multiple devices on a production line

Operation

Managing multiple kinds of equipment on a production line

Analysis

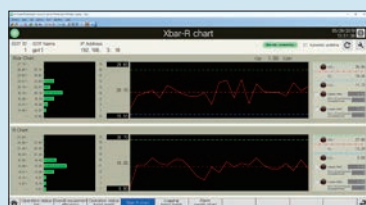
Easily analyze with a template for analysis

Improvement

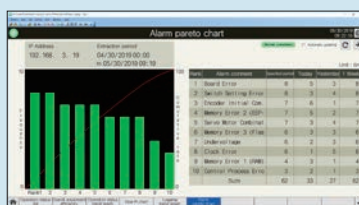
Extract a problem from the analysis results. Identify the root cause of the problem, and plan and implement countermeasures.

[Examples of template screens for process remote monitoring]

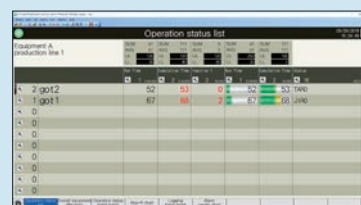
Xbar-R chart



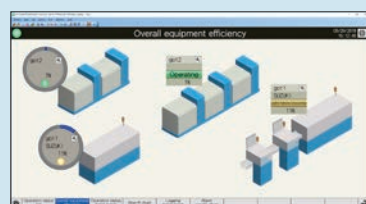
Alarm pareto chart



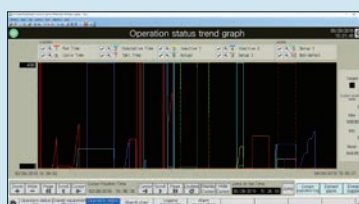
Operation status list



Overall equipment efficiency



Operation status trend graph



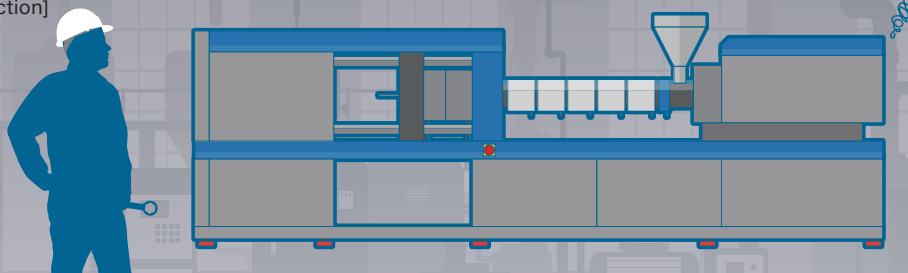
FA Application Package
iQ Monozukuri
Process Remote Monitoring
L(NA)08674ENG



On-site issues

- The machine should undergo maintenance before failure, but it is difficult to judge where to begin.
- It is expensive to analyze data and introducing predictive maintenance is not easy.
- Temperature and current values are individually monitored, but failure and emergency alarms go off even if there is no problem.

[Before introduction]



MELSEC iQ-F solves your problems

Quick Start

e-F@ctory Starter Package **FX5U** **FX5UC**

- A sample analysis method program using the "MT method" is provided!
- You can introduce predictive maintenance using only the MELSEC iQ-F series and GOT!



[After introduction]

The MT method is a statistical technique which can detect "abnormality".

Use the e-F@ctory starter package for MELSEC iQ-F being provided. You can select up to 10 items and data will be collected and analyzed comprehensively.

This will enable you to detect "abnormality" about the equipment and to prevent sudden failure from occurring.

MT method

(CPU module FX5U-32MR/ES, etc.)

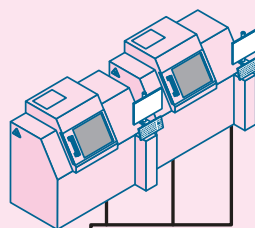


Sampling/logging

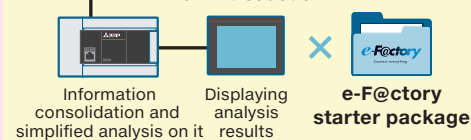
(Multi input module FX5-8AD, etc.)

Sensor

(Temperature, flow rate, pressure, current, etc.)



New introduction



Benefits

- ▶ With the complimentary sample programs and screens, the predictive maintenance could be introduced easily during the initial commissioning.
- ▶ It was possible to easily select which data would be effective by selecting and testing items such as temperature and current value.
- ▶ It was possible to use multiple items to conduct a comprehensive analysis, helping to find the cause of an abnormal event.

More details!

Advanced strength of the MELSEC iQ-F series

e-F@ctory starter package



MT method FX5U FX5UC

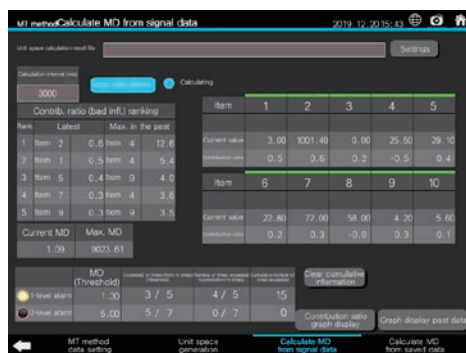
[MT method for predicting abnormality]

The MT method is a multivariate analysis technique which utilizes the Mahalanobis distance used in statistical analyses. This is an optimal technique to predict abnormality.

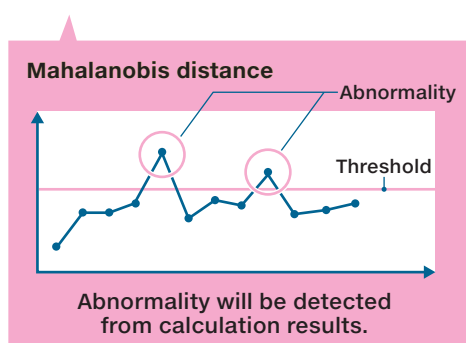
[What can be done by MT method]

- Multiple items (electric current, voltage, temperature, etc.) can be analyzed, and a single value will be obtained to show how much it deviates from the normal (average) values.
- Bases for the TM method are created from normal data and therefore, even if abnormality occurs for the first time, it can be detected.

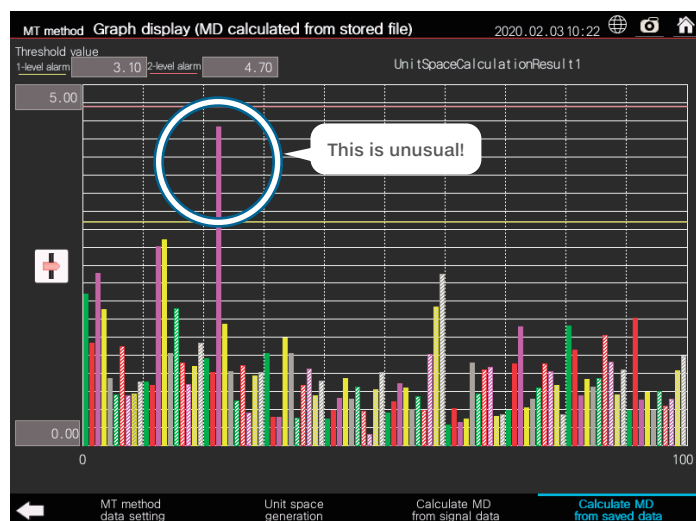
[Screen for calculating MD from signal data]



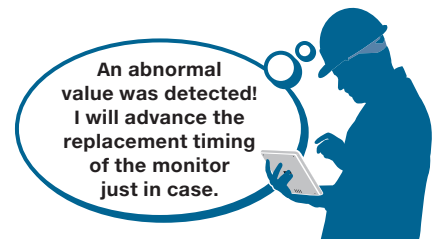
A divergence level from normal data (the Mahalanobis distance) will be calculated.



[Screen displaying MD graph]



Calculation results can be displayed in a graph. Defect trend can be visualized.



Project specifications

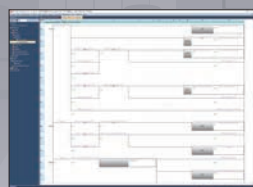
Item		Description
MT method	Number of items	Up to 10 items
	Number of data samples	Up to 100 points
	Processing speed	Unit space generation
		Mahalanobis distance calculation
		Approx. 1,000 msec
		Approx. 15 msec

Item	Required capacity
Number of steps	Approx. 50 k steps
Amount of labels used	Approx. 12 k words
Amount of file registers used	Approx. 22 k words

On-site issues

- Devices and settings need to be changed during debugging of the program. However, it is hard to determine which part of the program will be affected due to the change.
- Analyzing a complicated program is difficult and it takes time and effort even for minor program modification.

[Before introduction]



I want to correct an errored portion, but I'm not sure if other program portions will be affected if I do so...



MELSEC iQ-F × **GX Works3** solves your problems

Quick Start

Data flow analysis function

FX5U

FX5UC

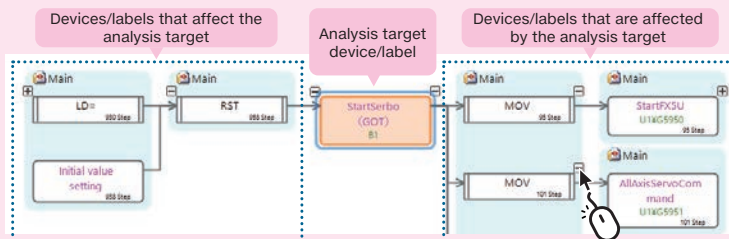
FX5UJ

- It is possible to quickly identify the part of the program which is causing the problem!
- The relationship of cause and result becomes more clear.



[After introduction] Even for a complicated program, efficient debugging reduces work time!

It is troublesome to sequentially check programs one by one. The data flow analysis function can graphically display programs that affect the analysis target device/label in the flow chart and facilitates factor analysis at error occurrence.



This data flow analysis can be applied not only to the ladder language but also to the ST, FBD and LD languages.

Useful functions

Jump from data flow diagram

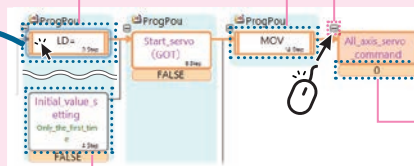
If you double click, then you can jump to the program editor.

Program editor



Double click

Not only devices/labels but also command names will be displayed.



Unfold/fold a corresponding part.

By only clicking "+/-", you can track and check program connections.

Monitor values can be displayed.

Monitor values can be displayed on a data flow diagram during monitoring and offline monitoring.

Devices/labels and comments are displayed simultaneously.

Benefits

- ▶ Affected areas can be visually detected, and therefore, it becomes easier to identify causes and shortens debugging time.
- ▶ Based on analysis results, only the related areas will be displayed and debugging will become more efficient.

+ONE

Memory dump function FX5U FX5UC FX5UJ

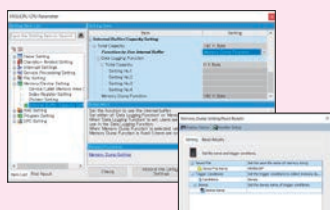
From a remote site

Saving data when a trouble occurs!

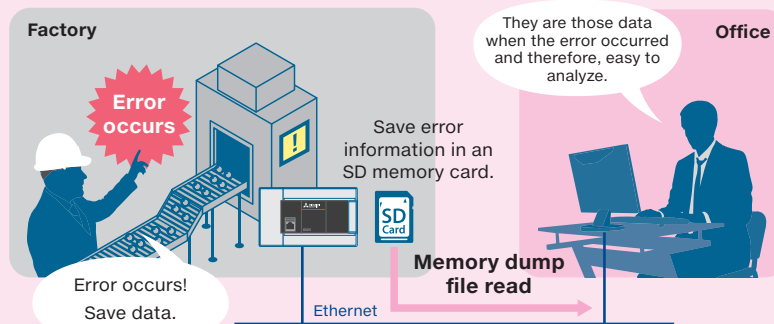
It is hard to identify the location where an error occurred after a trouble happened. If the memory dump function is executed when an error occurs to save device values, it will become easier to identify the error's cause(s) and recovery time will be shortened.

In addition, by reading the memory dump file via Ethernet, the data can be checked from the office without visiting the site.

It can be introduced only by setting parameters!



Before using the memory dump function, conduct various settings by GX Works3 and write parameters to your PLC.



For a quick cause investigation, it is important to collect the data at the timing of error occurrence.

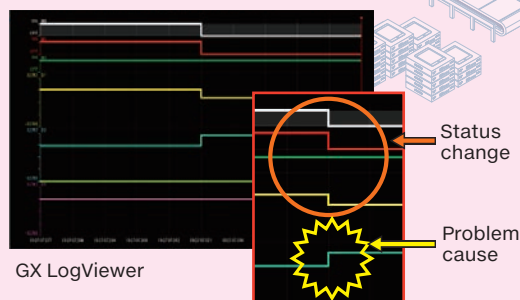
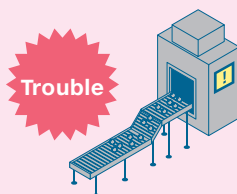
+ONE

Real-time monitoring function FX5U FX5UC FX5UJ

On site

Identify the cause of trouble while monitoring the operation in front of the device!

The operation of a device in question can be visualized if its measured data are displayed in a waveform graph. Changes can be noticed at a glance and speedy investigation can be conducted.



If you use the operation assistance function, you can efficiently investigate the cause.

Cursor jump function

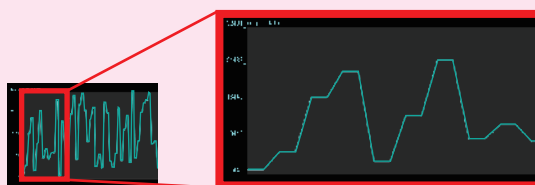
([Graph Operation] > [Cursor Jump])

The cursor can be moved to the specified value, date, and index position in the trend graph.



[Scale the time axis]

([Ctrl] plus mouse wheel rotation)

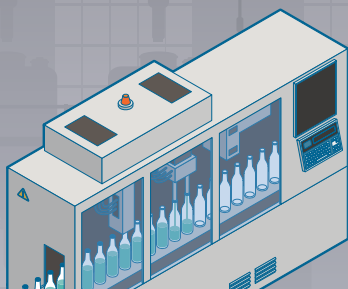


12 To analyze the errors faster

On-site issues

- Recurrence of errors after restoration. Difficulty identifying the root cause of the problem.
- Time consuming data analysis to identify the problem cause.

[Before introduction]



What was actually happening when the error occurred?



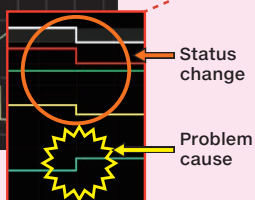
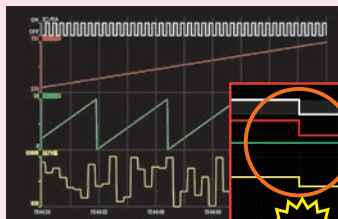
Camera recording package FX5U FX5UC FX5UJ

- See the error cause at a glance in the recording.
- Easily analyze and debug the data with GX VideoViewer available for free.

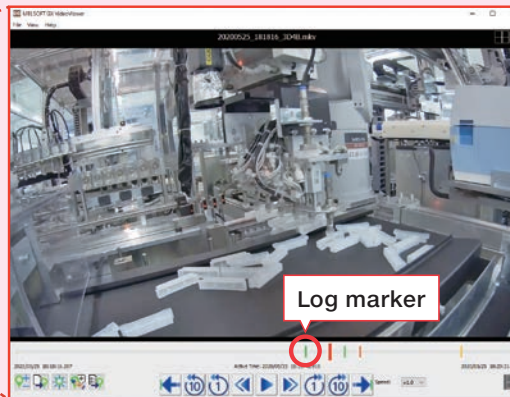


[After introduction] Fix the program while viewing the recorded data about the error.

GX LogViewer



GX VideoViewer



Import the log markers to GX LogViewer and GX Works3, and use them in combination with the waveform graph to help analyze the data. Quickly jump to the program responsible for the problem to debug the program efficiently.

Benefits

- ▶ Fast program debugging with the combined use of the device data and the video recording allows for shorter recovery time.
- ▶ No need to purchase a number of other devices that add to the cost.

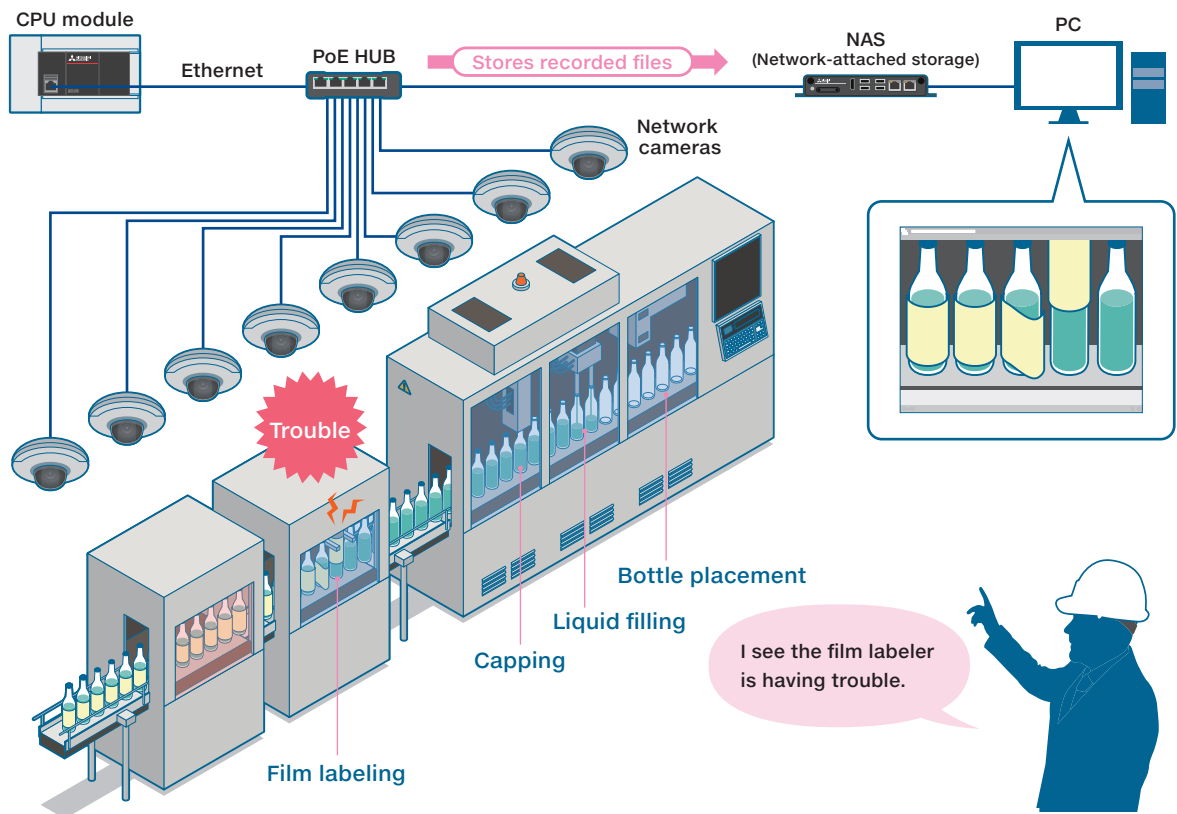
More details!

Secure maintenance with MELSEC iQ-F

Camera recording package

Multi-angle analysis

A maximum of eight cameras are connectable to each CPU module.
Monitor and record each production process from multiple angles to conduct multi-angle analysis.



Compatible with a various types of network cameras

The MELSEC iQ-F series connects to a variety of network cameras.
Use the cameras that best suit your needs.

Compatible network cameras by AXIS*1

Camera type	Series	Number of compatible models
Fixed box network camera	Q16, P13, M11, M10	22
Fixed bullet network camera	Q17, P14, M20	10
Fixed dome network camera	Q36, Q35, P33, P32, M42, M32, M31-L, M30	42
Pan/Tilt/Zoom (PTZ) network camera*2	Q62, Q61, Q60, P56, P54, M55, M50, V59, Q86, Q87	26
Panoramic network camera	Q60, Q37, P38, P37, M30	10
Moduler network camera	FA, F, P12	10
Thermal camera	Q19, P12	6

126 models total

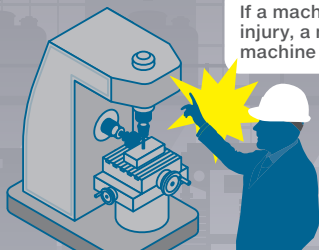
*1: Compatible with the network camera firmware Ver. 6.50.4.2 and later. See right for details.
*2: The camera recording package does not support the pan/tilt/zoom function.



On-site issues

- Preventive measures should be taken on the equipment so that the equipment will cause no personal injury by any chance, creating an environment where the staff members can work safely.
- It takes time and effort to create a safety program. Need a way study how to introduce it easily and quickly.

[Before introduction]



If a machine caused a personal injury, a manufacturer of the machine will be accused!

We want to introduce safety controls, but we have no know-how to create safety control programs.

**MELSEC iQ-F**

series safety extension module solves your problem

Quick Start**MELSEC iQ-F safety extension module**

FX5U

FX5UC

FX5UJ

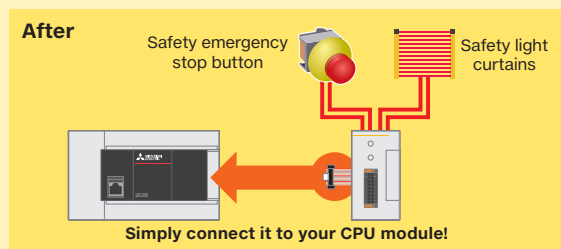
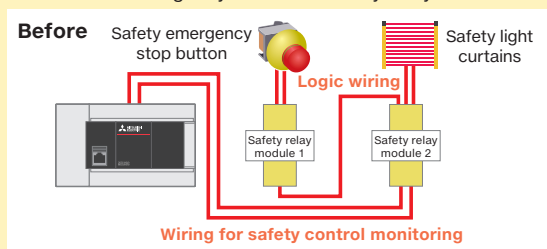
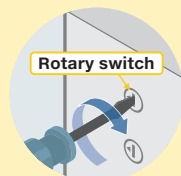
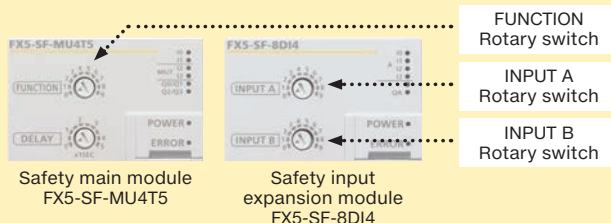
- The safety extension module will enable an easy introduction of safety system!
- No safety program is required! Its built-in logic will allow safety controls to be realized easily.



[After introduction]

POINT1 Easily create a system just by connecting a safety extension module.

There is no need for wiring such as the one needed for monitoring the safety status or the wiring needed between relays when constructing a system with safety relays.

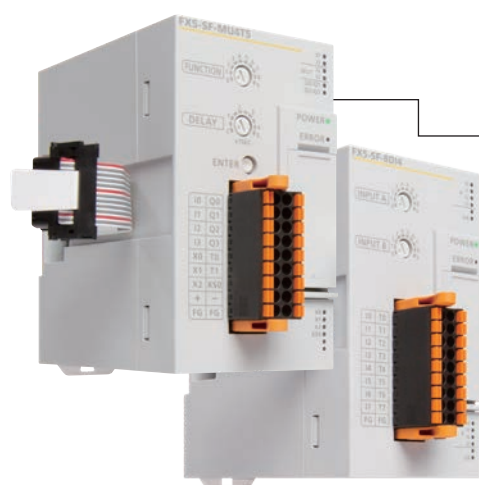
**POINT2 Turn the rotary switch to select the built-in program**

Just turn the switch with a precision screwdriver or a similar tool!
Nine types of built-in programs!

Benefits

- ▶ The safety system could be simply introduced only by connecting the FX5U/FX5UC CPU module to the CPU module with no safety program required.
- ▶ Any complicated monitor wiring with a general control PLC is not required, and the wiring is simple and easy to understand.

Outline of MELSEC iQ-F safety extension module product specifications



Safety main module
FX5-SF-MU4T5

Safety input
expansion module
FX5-SF-8DI4

Maximum number of connectable modules	Number of safety inputs	Number of safety outputs	Program for a safety control
1 module	4 points (dual-channel: 2 points)	4 points (dual-channel: 2 points)	9 types
2 modules	8 points (dual-channel: 4 points)	—	9 types

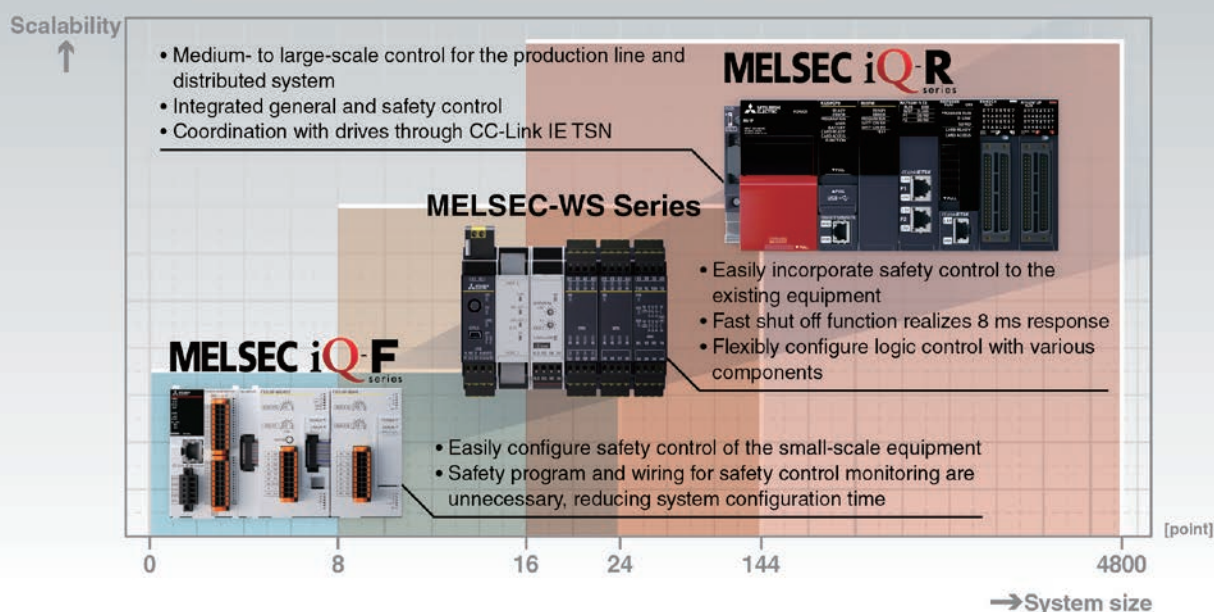
	Safety main module FX5-SF-MU4T5	Safety input expansion module FX5-SF-8DI4
Off delay time	0/0.5/1/1.5/2/2.5/3/3.5/4/5 s	—
External dimensions W × H × D (mm)	50 × 90 × 102.2	
Safety integrity level	SIL3 (IEC 61508)/SILCL 3 (IEC 62061)	
Performance level	PL e (DIN EN ISO 13849-1)	
Compatible CPU module	FX5UJ/FX5U/FX5UC CPU module	

A wide variety of safety PLCs/safety controllers

Safety control devices to meet your requirements

Selection points

Appropriate devices according to the system scale and scalability are available.

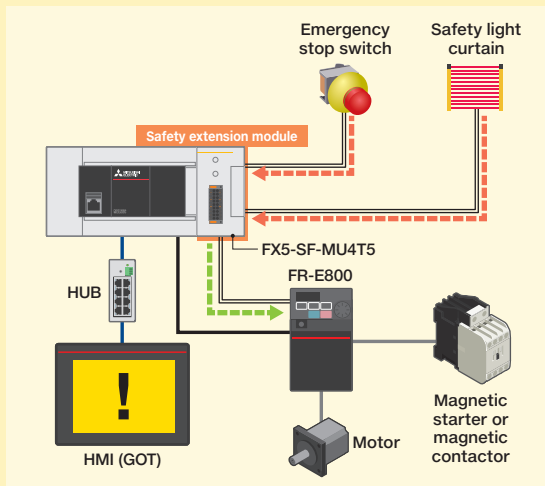


Safety Programmable Controller/
Safety Controller
L(NA)08192E

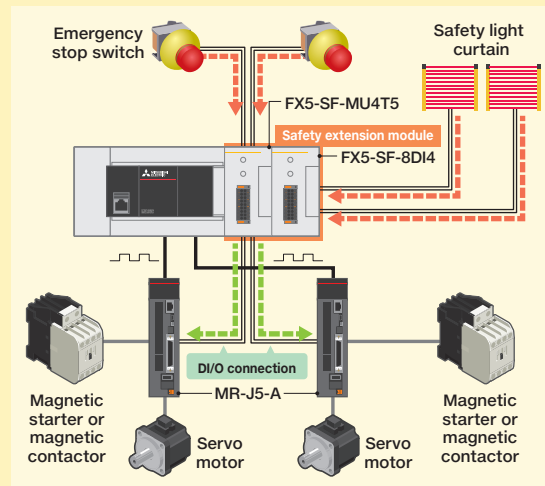
Safety extension module + driving device gives a low-cost solution for a safety system

A combined use of the safety extension module and a driving device* with the safe torque off (STO) function is an inexpensive solution for stepping up safety.

System configuration example (inverter)



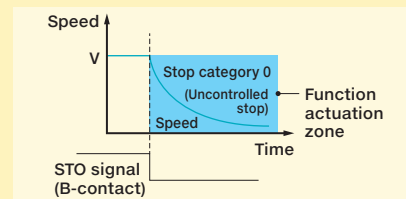
System configuration example (servo)



Control cable Safety signal STO

[What is Safe torque off (STO) function?]

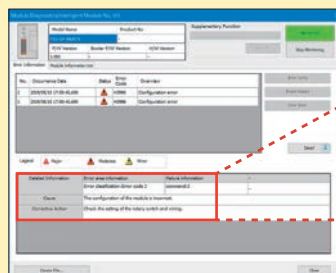
Responding to the input signal from external equipment, the STO function shuts off power to the servo motor electronically using the internal circuit (shuts off through secondary-side output). This function corresponds to the Stop category 0 of IEC/EN 60204-1.



★: Driving devices that are hard-wired to receive STO signals only

Diagnostic function

A maximum of 16 errors will be logged in the buffer memory of the safety extension module for troubleshooting. The diagnostic function of GX Works3 provides information about and measures for the errors.



Module diagnostics screen

Detailed Information	Error area information	Failure information
	Error classification: Error code 2	Command: 3
Cause	The configuration of the module is incorrect.	
Corrective Action	Check the setting of the rotary switch and wiring.	

A lineup of driving devices

In addition to featuring the STO function, FR-E800-SCE (inverter) and MR-J5-G-RJ (AC servo) are standard-equipped with other safety functions, eliminating the need for wiring add-on safety devices and helping to build a simpler system.

[Inverter 800 series]

List of Safety Sub-Functions*1*2

	Inverter	FR-E800-SCE	FR-E800/E800-E	FR-A800/F800
STO	Safe torque off	Cat. 3 PL e, SIL 3	Cat. 3 PL d, SIL 2	Cat. 3 PL e, SIL 3
SS1	Safe stop 1 ramp monitored	Cat. 3 PL e, SIL 3	—	—
SBC	Safe brake control	Cat. 3 PL e, SIL 3	—	—
SLS	Safety-limited speed	Cat. 3 PL e, SIL 3	—	—
SSM	Safe speed monitor	Cat. 3 PL e, SIL 3	—	—

*1: The use of the functions may require certain specifications to be met. For detail, see the operation manual of the applicable model (functional safety edition).

*2: To meet the safety standards, inverters must be used with a safety module certified to meet ISO 13849-1 safety category 3 or higher standard.



L(NA)06075ENG L(NA)06131ENG

[AC Servo System MELSERVO-J5 series]

List of Safety Sub-Functions*1*2

Servo amplifier		MR-J5-G MR-J5-A	MR-J5-G(4)-RJ MR-J5D1-G4 MR-J5D2-G4 MR-J5D3-G4 *3*4		MR-J5W2-G MR-J5W3-G *3*4*5
Servo motor		• Servo motor with functional safety • Rotary servo motor • Linear servo motor • Direct drive servo motor	• Servo motor with functional safety	• Rotary servo motor • Linear servo motor • Direct drive servo motor	• Servo motor with functional safety • Rotary servo motor • Linear servo motor • Direct drive servo motor
STO	Safe torque off	Cat. 3 PL e, SIL 3	Cat. 4 PL e, SIL 3	Cat. 4 PL e, SIL 3	Cat. 4 PL e, SIL 3
SS1-t	Safe stop 1 time controlled	—	Cat. 4 PL e, SIL 3	Cat. 4 PL e, SIL 3	Cat. 4 PL e, SIL 3
SS1-r*6	Safe stop 1 ramp monitored	—	Cat. 4 PL e, SIL 3	Cat. 3 PL d, SIL 2	—
SS2-t*6	Safe stop 2 time controlled	—	Cat. 4 PL e, SIL 3	—	—
SS2-r*6	Safe stop 2 ramp monitored	—	Cat. 4 PL e, SIL 3	—	—
SOS*6	Safe operating stop	—	Cat. 4 PL e, SIL 3	—	—
SBC*6	Safe brake control	—	Cat. 4 PL e, SIL 3	Cat. 4 PL e, SIL 3	Cat. 4 PL e, SIL 3
SLS*6	Safety-limited speed	—	Cat. 4 PL e, SIL 3	Cat. 3 PL d, SIL 2	—
SSM*6	Safe speed monitor	—	Cat. 4 PL e, SIL 3	Cat. 3 PL d, SIL 2	—
SDI*6	Safe direction	—	Cat. 4 PL e, SIL 3	Cat. 3 PL d, SIL 2	—
SLI*6	Safety-limited increment	—	Cat. 4 PL e, SIL 3	—	—
SLT	Safety-limited torque	—	Cat. 3 PL d, SIL 2	Cat. 3 PL d, SIL 2	—

*1: The table above shows the case of DI/O connection (CN8). See the MELSERVO-J5 catalog for information regarding network connection.

*2: For 200 V class servo amplifiers, the firmware version B2 or later is required.

*3: When DI/O connection (CN8) is used, a diagnosis using test pulses is required to meet Category 4 PL e, SIL 3.

*4: The listed safety levels are applicable when a safety CPU or a safety controller that meets Category 4 PL e, SIL 3 executes safety sub-function control. When a forced stop switch, a safety switch, or an enable switch is directly connected to the servo amplifier, the safety level is Category 3 PL d, SIL 2.

*5: The safety sub-functions are supported by MR-J5W manufactured in November 2019 or later.

*6: A fully closed loop system does not support SS1-r, SS2, SOS, SLS, SSM, SDI, and SLI.

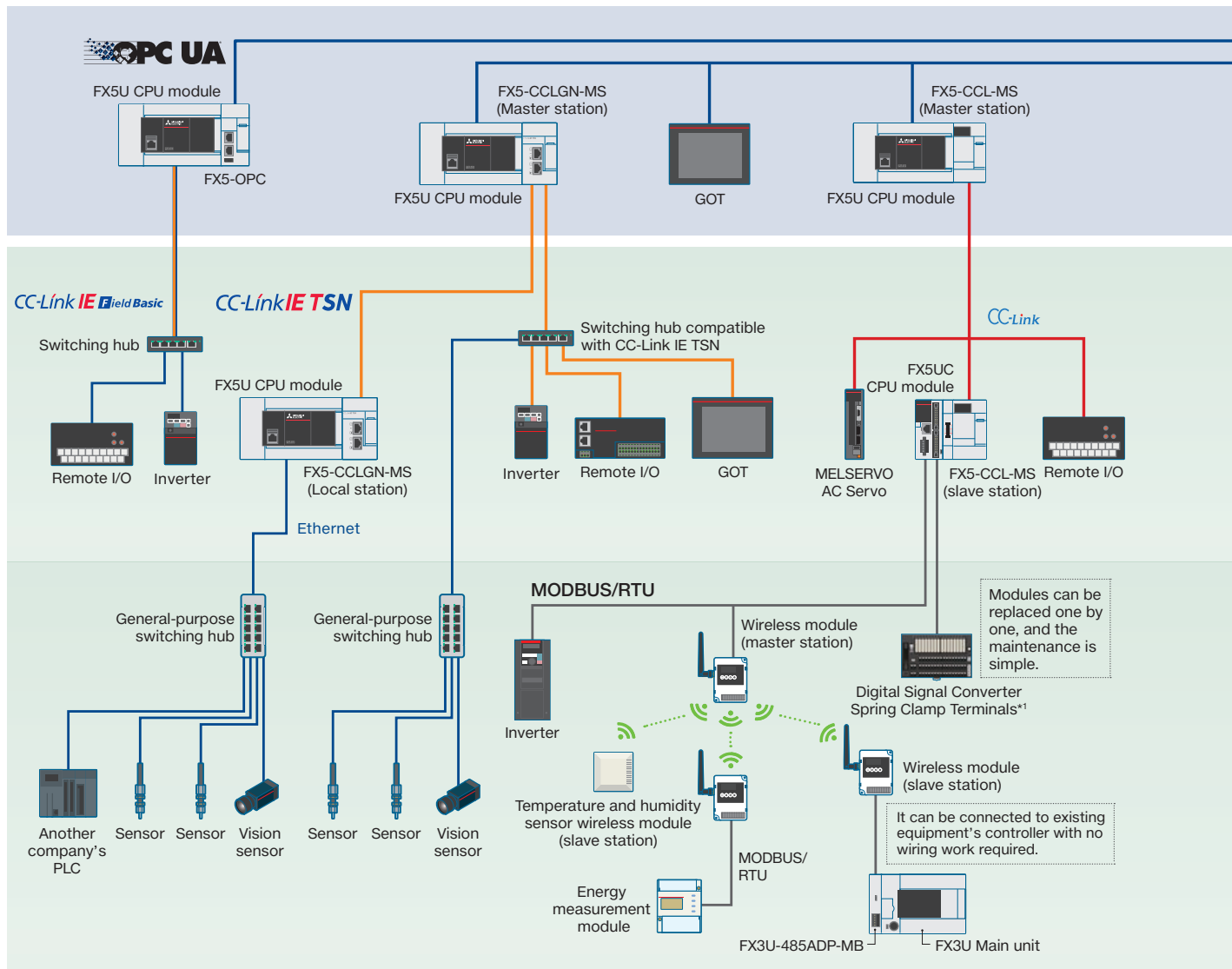


L(NA)03179ENG

See the catalog shown above for the details of MELSERVO-J5.

Expanding connection cooperation for easy-to-connect MELSEC iQ-F

(examples of its system configurations)



With its strengthened cooperation with various FA devices and sensors, it can be connected to them easily. For details about the products of our company and our partner manufacturers, please contact your local Mitsubishi Electric sales office or representative.

FA devices



Mitsubishi Electric Corporation
Programmable Controller
MELSEC iQ-R series



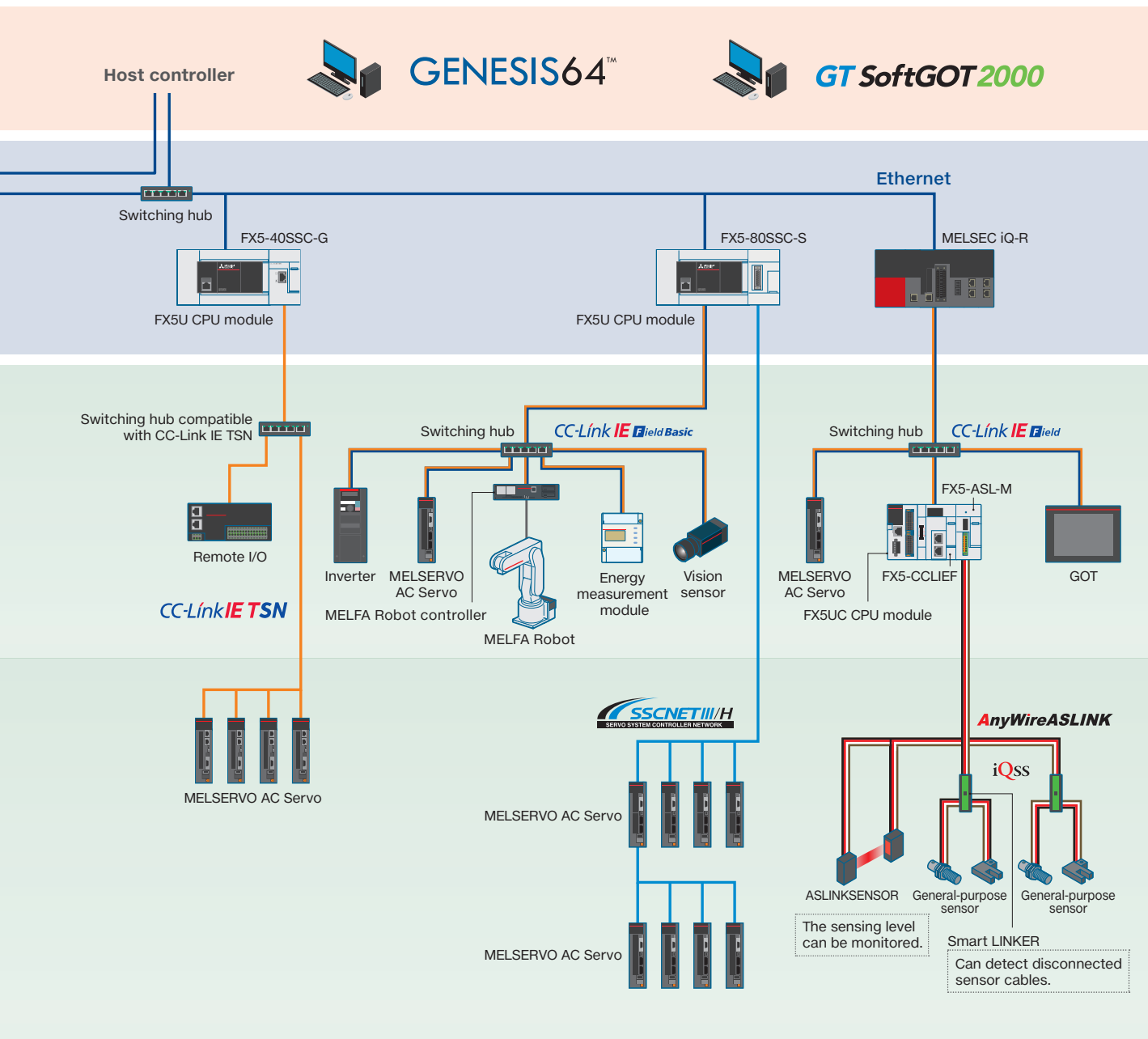
Mitsubishi Electric Corporation
GOT



Mitsubishi Electric Corporation
Industrial/
Collaborative Robots
MELFA



Mitsubishi Electric Corporation
AC Servo MELSERVO



★1: Manufactured by Mitsubishi Electric Engineering CO., LTD.

GENESIS64™

Mitsubishi Electric Corporation
SCADA GENESIS64™



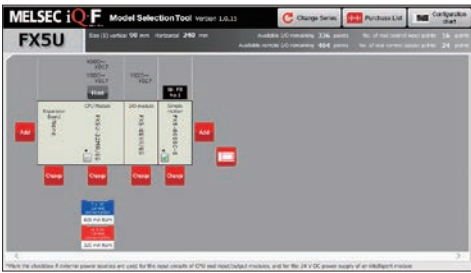
Mitsubishi Electric Corporation
Inverter



Mitsubishi Electric Corporation
Energy measurement module

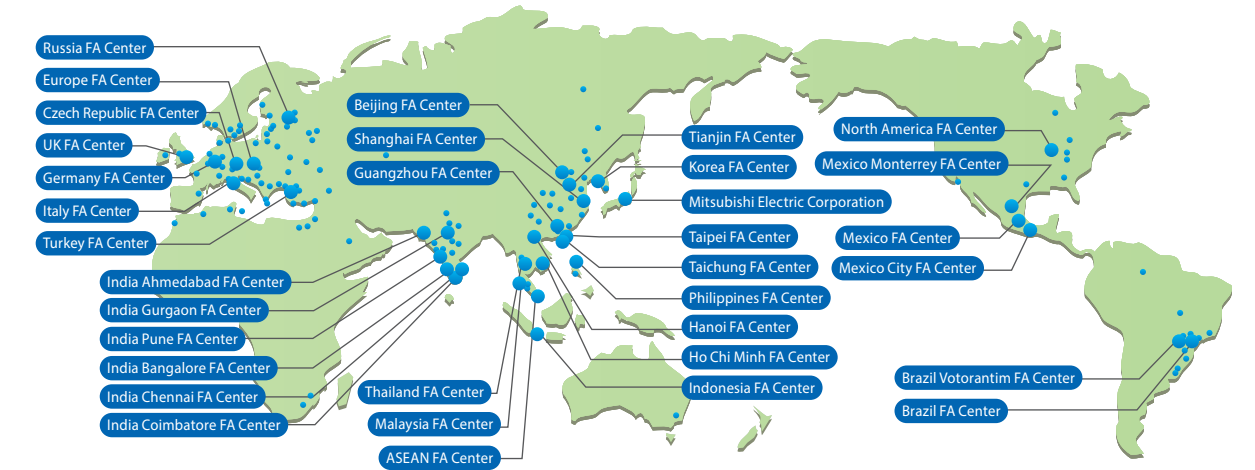
MELSEC iQ-F series model selection tool will help you to select their models.

Without referring to catalogs and manuals, you can easily check how to combine products and perform various calculations required when you select models. Also, you can create your “purchasing list” which is useful when you request a purchase quote.



Global FA Center

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