MITSUBISHI ELECTRIC
Changes for the Better

Automating the World

FACTORY AUTOMATION

MELSEC iQ-F Series
iQ Platform-compatible PLC

Introduction Proposal

MELSEC iQ-F series

Select iQ-F for new introduction

Automating the World

Our Factory Automation business is focused on "Automating the World" to make it a better, more sustainable environment supporting manufacturing and society, celebrating diversity and contributing towards an active and fulfilling role.
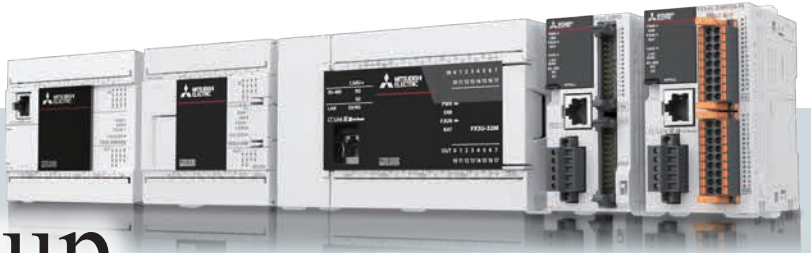
SUSTAINABLE DEVELOPMENT GOALS

The Mitsubishi Electric Group is actively solving social issues, such as decarbonization and labor shortages, by providing production sites with energy-saving equipment and solutions that utilize automation systems, thereby helping towards a sustainable society.

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.

Contents

OVERVIEW

MELSEC iQ-F series

Expand its product lineup

FX3 series

High functionality model

FX3U
FX3UC

Standard model

FX3G
FX3GC

Basic model

FX3S

MELSEC iQ-F series

High functionality model

FX5U
FX5UC

FX5UJ

Simple model

FX5S

Benefits

1 | **Improved basic performance**

Contributes to reduced programming man-hours.

Page 5

2 | **Improved usability**

Contributes to reduced wiring man-hours and downtime and improved equipment startup efficiency.

Page 8

3 | **Evolved drive linkage**

Supports a wide range of drive controls and contributes to adding value to equipment.

Page 16

4 | **Addition/Evolution of various functions**

Abundant functions and modules contribute to solving increasingly diverse issues.

Page 20

Point 1 Improved basic performance

Improved program processing speed

Improved performance

The iQ-F series contributes to reduced equipment takt time.

	FX3S	FX3G/FX3GC	FX3U/FX3UC
Operation processing speed	LD X0: 210 ns MOV D0 D1: 840 ns	[Standard mode] LD X0: 210 ns MOV D0 D1: 840 ns [Extended mode] LD X0: 420 ns MOV D0 D1: 1,960 ns	LD X0: 65 ns MOV D0 D1: 640 ns

▼

	FX5S	FX5UJ	FX5U/FX5UC
Operation processing speed	LD X0: 84 ns MOV D0 D1: 100 ns	LD X0: 34 ns MOV D0 D1: 34 ns	LD X0: 34 ns[*1] MOV D0 D1: 34 ns[*1]

＊1: When the program capacity is 64 k steps.

Memory area expansion

Improved performance

The increased program capacity of the iQ-F series allows for the creation of numerous control programs. Additionally, memory data areas are allocated for specific applications, allowing for the use of comments without worrying about program capacity.

	FX3S	FX3G/FX3GC	FX3U/FX3UC
Program capacity	4 k steps[*2]	32 k steps[*3]	64 k steps[*3]

▼

	FX5S	FX5UJ	FX5U/FX5UC
Program capacity	48 k steps	48 k steps	64/128 k steps[*4]

＊2: 16 k steps including comments and file registers
＊3: Including comments and file registers
＊4: FX5U/FX5UC program capacity of 128 k steps is supported by firmware version 1.100 or later.
　　In addition, GX Works3 version 1.047Z or later is required.

FX3 series

Program memory　　Total value above is program capacity.

Program
Comment
File register

MELSEC iQ-F series

Data memory　　The capacity assigned to each item can be used.

Program
Comment
File register

5
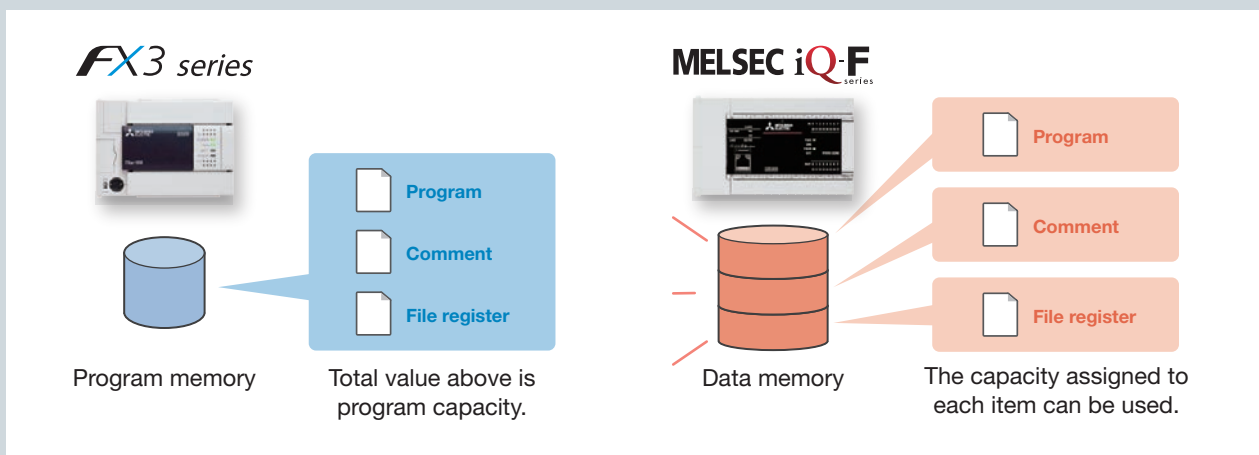
Extensive built-in interfaces and built-in functions

Improved functionality

Basic performance	FX3S	FX3G FX3GC	FX3U FX3UC		FX5S	FX5UJ	FX5U FX5UC
Built-in interface	RS-422 USB (Mini-B)	RS-422 USB (Mini-B)	RS-422		Ethernet USB (Mini-B)	Ethernet USB (Mini-B)	Ethernet RS-485
Built-in SD memory card slot	–	–	–		✓*4	✓	✓
Built-in analog input/output	Voltage input*1	–	–		–	–	Voltage input/ Voltage output*5
Battery-less*2	✓	✓	✓*3		✓	✓	✓
RESET switch	–	–	–		✓	✓	✓

＊1: Supported only by types with built-in analog input. 2 voltage input channels are built in.
＊2: Optional battery required for some functions.
＊3: Batteryless operation is possible when optional memory cassette (flash memory) is installed and parameters have been set.
＊4: Optional SD memory card module is required.
＊5: Supported only by FX5U. 2 voltage input channels and 1 voltage output channel are built in.

In addition to the above, the iQ-F series has many functions that have become easier to use. For details of each function, refer to the MELSEC iQ-F Series Catalog (L(NA)08428ENG).

▶ FX5U example

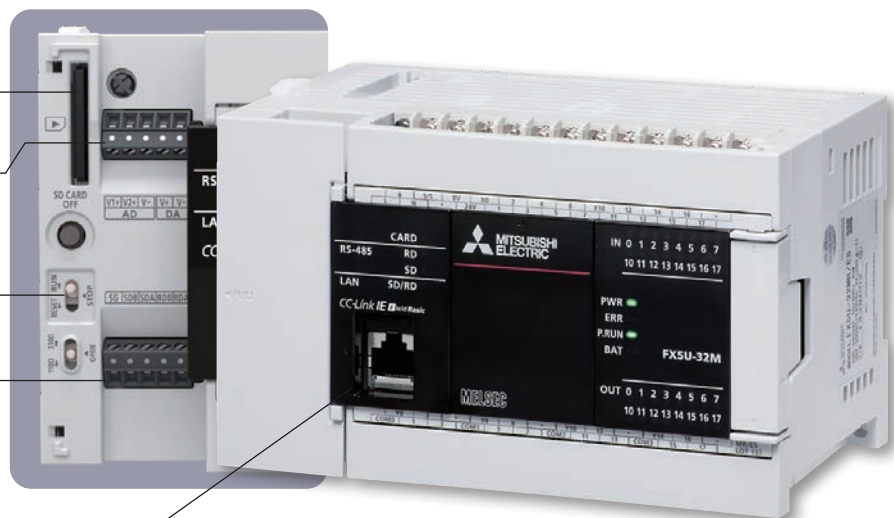Built-in SD memory card slot

Built-in analog input/ output

RUN/STOP/RESET switch

Built-in RS-485 port

Built-in Ethernet port

Built-in Ethernet port `FX5S` `FX5UJ` `FX5U` `FX5UC`

- The Ethernet port can handle communication with up to 8 connections on the network.
- It also supports CC-Link IE Field Network Basic.

Built-in RS-485 port (with MODBUS/RTU communication) `FX5U` `FX5UC`

- Built-in RS-485 port allows for communication with inverters, etc.
- MODBUS/RTU communication is also supported. It can connect to MODBUS compatible devices such as PLCs and temperature controllers.

Built-in USB (Mini-B) connector
`FX5S` `FX5UJ`

- Used as a programming interface.

RUN/STOP/RESET switch
`FX5S` `FX5UJ` `FX5U` `FX5UC`

- Equipped with a RUN/STOP/RESET switch, the device can be rebooted without turning off the main power for debugging.

Built-in SD memory card slot (FX5S is an option)
`FX5UJ` `FX5U` `FX5UC`

- Used for updating the firmware version using an SD memory card, saving device values when an error occurs, backing up/restoring data memory, etc..

Built-in analog input/output (with alarm output)
`FX5U`

- The FX5U has built-in 12-bit 2 ch analog voltage input and 1 ch analog voltage output.

7

Improved usability

Reduced input/output wiring man-hours

The iQ-F series has a lineup of input/output types including screw terminal block, MIL connector, and spring clamp terminal block. Selecting the input/output type according to the application can reduce wiring man-hours.

FX3 series

Screw terminal block and MIL connector input/output types are available.

> **Screw terminal block**

TURN

Wire

> **MIL connector**

PLUG IN

I/O cable

Terminal block

MELSEC iQ-F series

In addition to screw terminal blocks and MIL connectors, spring clamp terminal blocks have been added. Spring clamp terminal blocks can reduce wiring and reduce wiring man-hours.

> **Screw terminal block type**

> **MIL connector type**

+

> **Spring clamp terminal block type**

Simple wiring without special tools

Precision screwdriver

PUSH

Wire

\ **A precision screwdriver is also not required.** /

By using a ferrule terminal, wiring can be completed just by inserting with the push-in method.

Complete wiring smoothly, even in a confined panel.

Comprehensive network functions

Simple CPU communication function

Added function

Built-in Ethernet allows data communication with external devices.
No program required. Sending/receiving device data is possible with simple parameter settings.

FX3 series

Data communication with external devices requires additional devices and programs.

PC

FX3U-ENET-L

FX3U/ FX3UC

HUB

Another company's PLC

Program is required.

Simple CPU communication function

MELSEC iQ-F series

Allows data communications between specified devices at the specified timing just by setting simple parameters from GX Works3.

Just parameter setting.

PC

CPU module

Ethernet

HUB

Device data

Reduce programming man-hours

MELSEC iQ-R Series

Another company's PLC

SLMP-compatible device

MODBUS/ TCP-compatible device

Works with CC-Link IE Field Network Basic

Added function

The iQ-F series CPU module is equipped with the master station function for CC-Link IE Field Network Basic, and can connect up to 16 remote stations.

Remote station: Control by built-in Ethernet

Master station

HUB

CC-Link IE Field Basic

Remote I/O

Mitsubishi Electric inverter

Servo amplifier

Code reader

Connectable device stations: **FX5U/FX5UC : Up to 16 stations**
FX5S/FX5UJ : Up to 8 stations

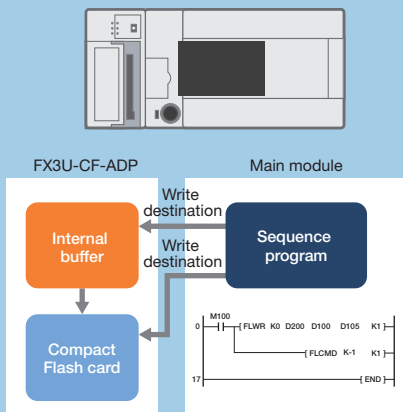# Functions to improve debugging efficiency

Data logging function*1

Data logging function for data collection is easier to use.

FX3 series

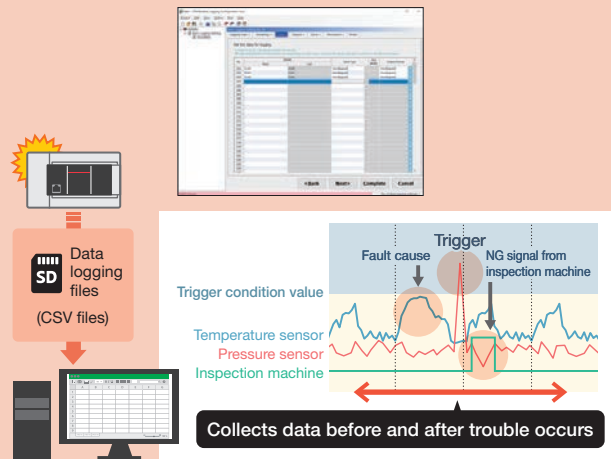Logged data is stored in the extension register or memory cassette extension file register by program.

| | FNC293 LOGRP | D1 | K2 | R2048 | K2 | D100 |

To write logged data to a CF card, connect the FX3U-CF-ADP and write using dedicated commands.

FX3U-CF-ADP　　　Main module

Write destination
Write destination

Internal buffer

Sequence program

Compact Flash card

```
      M100
  0   ├─┤├──[FLWR  K0  D200  D100  D105  K1 ]
                           [ FLCMD  K-1   K1 ]
 17                                    [ END ]
```

MELSEC iQ-F series

Settings can be easily performed without programming using the free CPU Module Logging Configuration Tool.
Data logging files can be stored in the SD memory card as CSV files or binary files.
In addition, the data logging files stored in the SD memory card can be automatically transferred to an FTP server.

SD Data logging files
(CSV files)

Trigger
Fault cause　　NG signal from inspection machine

Trigger condition value

Temperature sensor
Pressure sensor
Inspection machine

Collects data before and after trouble occurs

Visual display and efficient data analysis can be performed using GX LogViewer.

Memory dump function*1

With the iQ-F series, device values can be saved in a batch to an SD memory card when an error occurs.
Saved data can be checked on the program editor. This provides powerful support for troubleshooting when errors occur.

Factory　　　　　Office

SD Collect error information

Memory dump file reading

Ethernet
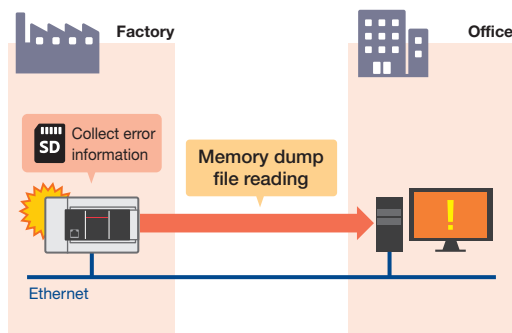
GX Works3 memory dump results display

Offline monitor screen
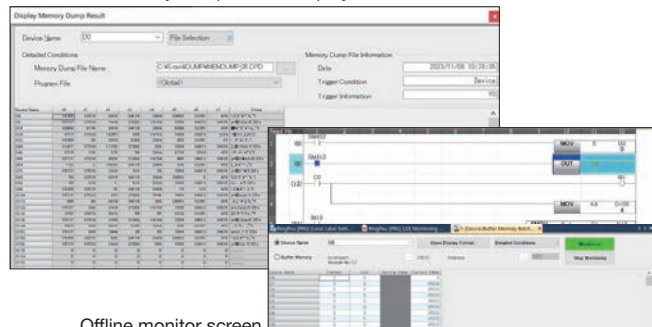
*1: The memory dump function and data logging function cannot be used simultaneously.

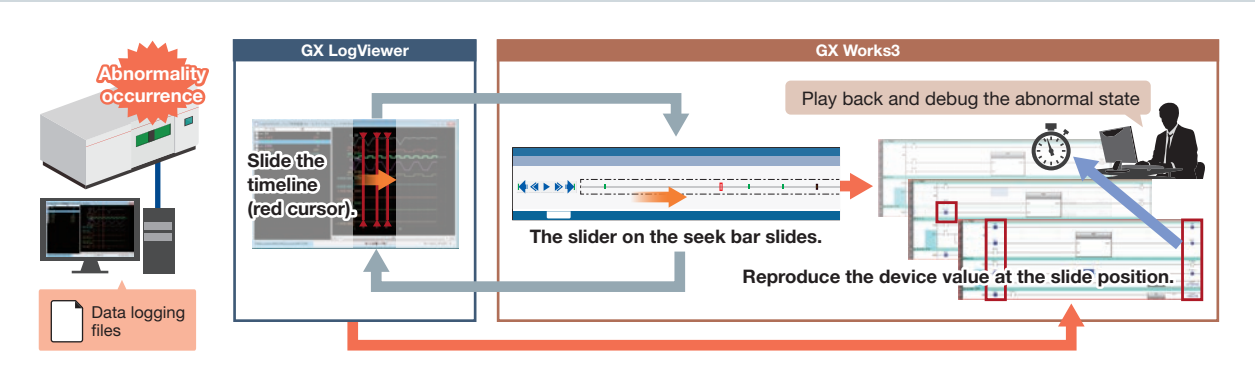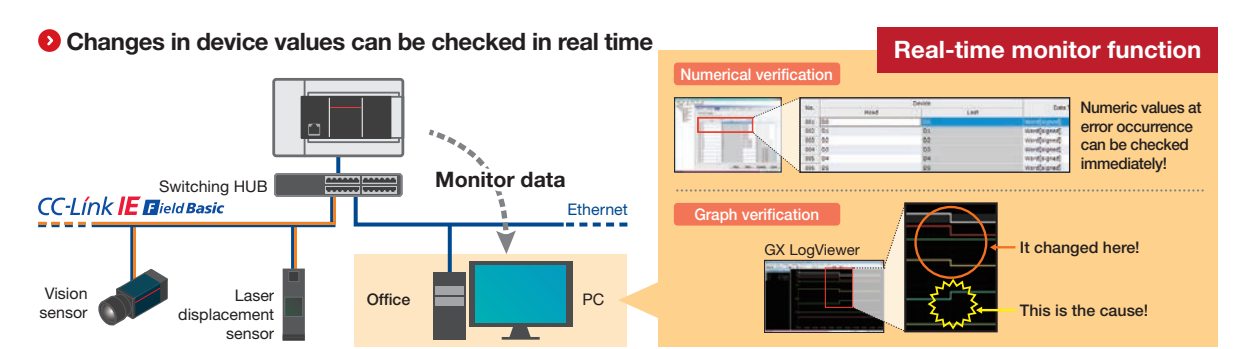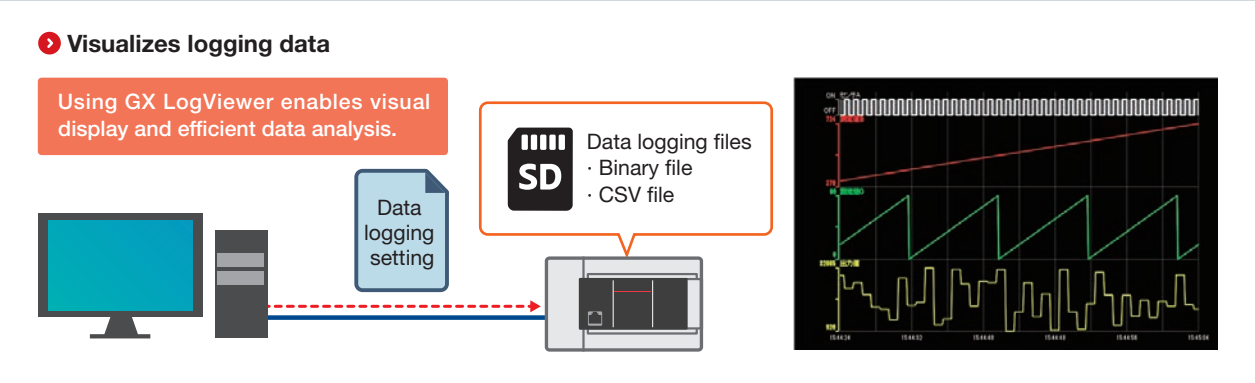## Offline monitor function

If data logging files are available, GX LogViewer's historical trend graph and ladder diagram can be linked to reproduce and confirm device status. Data is displayed as a waveform graph, and changes can be seen at a glance. Equipment abnormalities can be visualized.

GX LogViewer

Collected data can be visualized, which is useful to make debugging more efficient.
It's an easy-to-use tool for displaying and analyzing large amounts of data collected by the CPU module.
It enables the setting of the connection destination using the same operation as the setting and engineering tools, making it easy to check data. GX LogViewer is included in GX Works3 and provided free of charge∗.

∗: Please contact your local Mitsubishi Electric sales office or representative.

❯ Visualizes logging data

Using GX LogViewer enables visual display and efficient data analysis.

Data logging setting

Data logging files
· Binary file
· CSV file

❯ Changes in device values can be checked in real time

Real-time monitor function

Numerical verification

Numeric values at error occurrence can be checked immediately!

Graph verification

GX LogViewer

It changed here!

This is the cause!

Switching HUB

CC-Link IE Field Basic

Monitor data

Ethernet

Vision sensor

Laser displacement sensor

Office

PC

File transfer function (FTP server/FTP client)
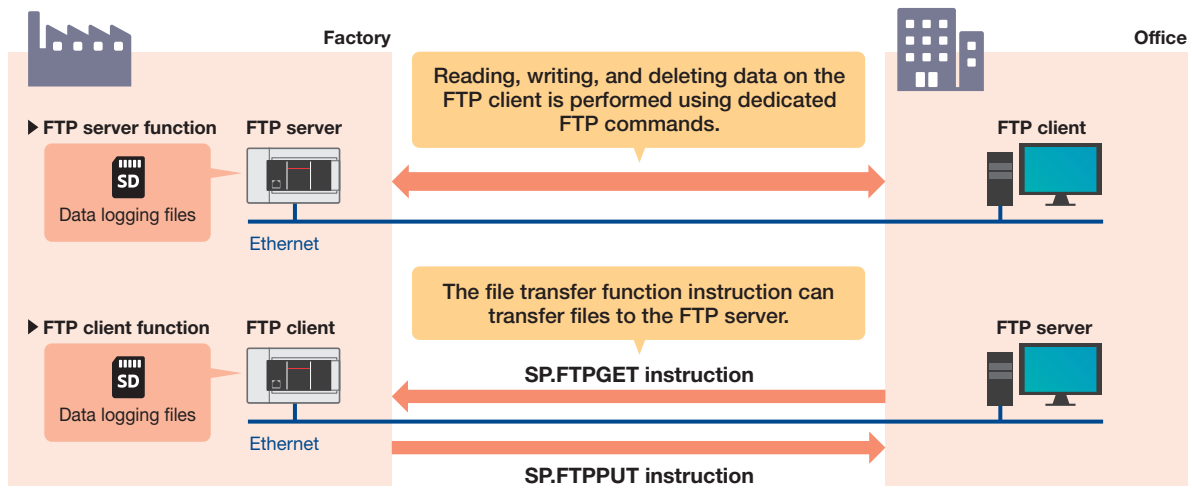
The CPU module supports FTP server functions and FTP client functions.
The FTP server functions allow factory data logging files to be accessed from remote offices. Files can be collected as a batch at any time without going to the factory, reducing maintenance work.
The file transfer function command of the FTP client function can transfer factory PLC data logging files to a server. Both functions can be used without complicated settings or operations.

❯ Allows for batch collection of logs from distant factories

Factory

Office

FTP server function   FTP server

SD
Data logging files

Reading, writing, and deleting data on the FTP client is performed using dedicated FTP commands.

FTP client

Ethernet

FTP client function   FTP client

SD
Data logging files

The file transfer function instruction can transfer files to the FTP server.

FTP server

SP.FTPGET instruction

Ethernet

SP.FTPPUT instruction

❯ Reduces changeover time and improves production efficiency on small production lines with multiple products

Office

Recipe file A

Recipe file B

Recipe file A

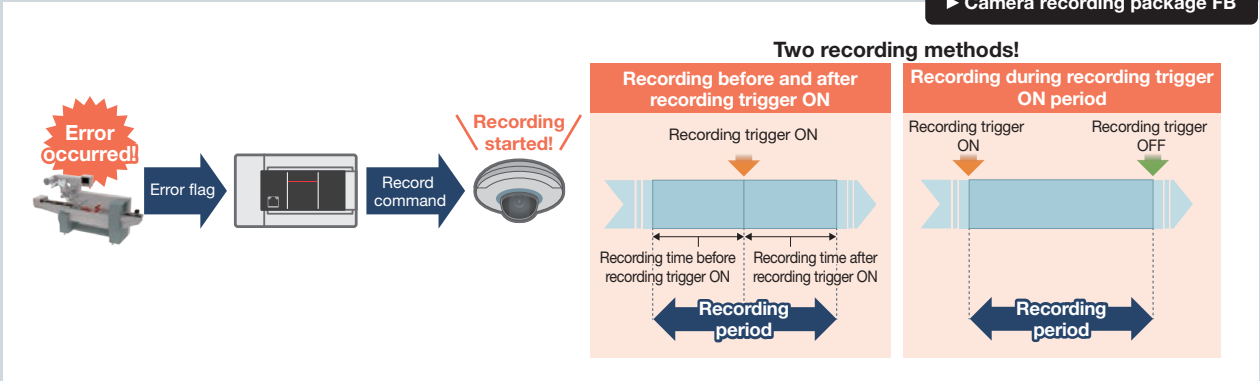FTP server

Ethernet

SD

CPU module (FTP client)

Factory
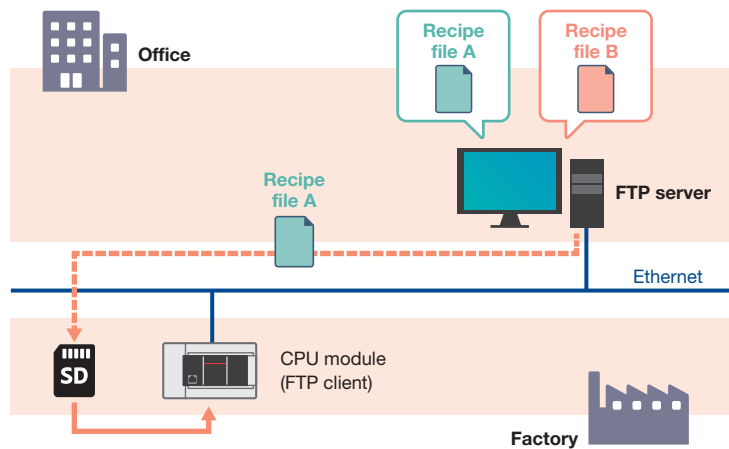
Recipe files can be acquired in the SD memory card by connecting to an FTP server. Simply enable the FTP client function and add the program to acquire the recipe file.

Camera recording package

The utilization status when an error occurs can be saved as a video.
By using FB, you can easily command the camera to record.

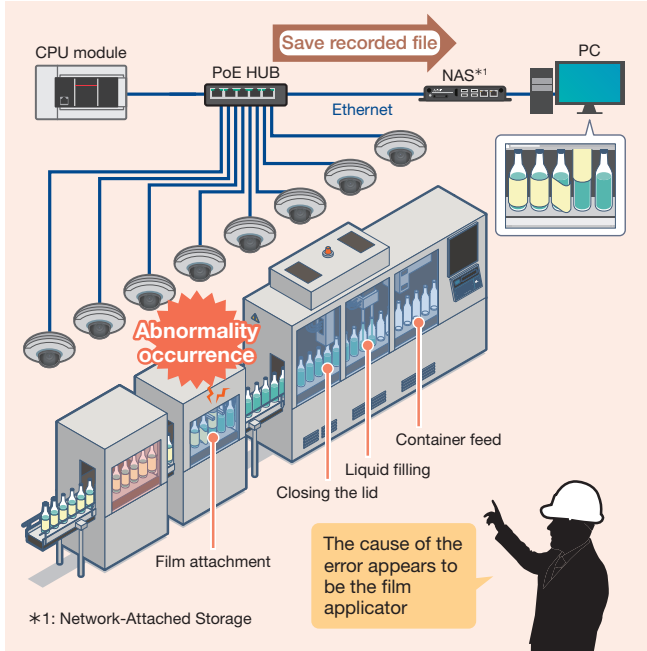► Camera recording package FB

Two recording methods!

Recording before and after recording trigger ON	Recording during recording trigger ON period

Error occurred! → Error flag → Record command → **Recording started!**

Recording trigger ON

Recording time before recording trigger ON | Recording time after recording trigger ON

Recording period

Recording trigger ON | Recording trigger OFF
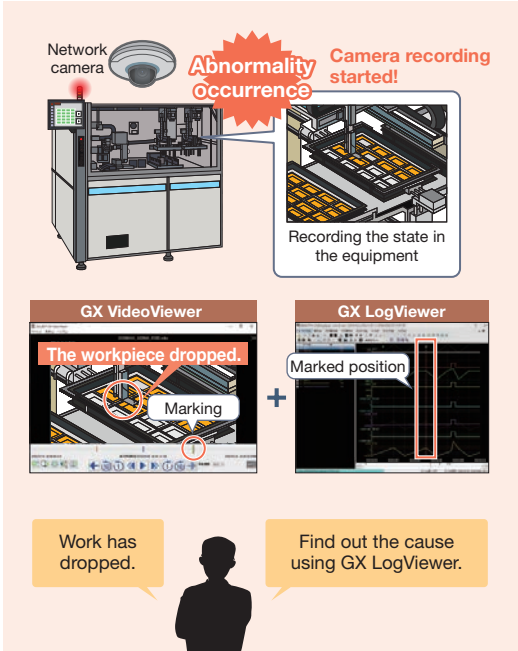
Recording period

Video files can be played back in GX VideoViewer.
Marked points of interest in the video can be shared with GX LogViewer and GX Works3 to track down the causes of problems.

► GX VideoViewer

System configuration example

CPU module

PoE HUB

Save recorded file

NAS*¹

PC

Ethernet

Abnormality occurrence

Container feed
Liquid filling
Closing the lid
Film attachment

*1: Network-Attached Storage

The cause of the error appears to be the film applicator

Example of application: Work transfer equipment with suction mechanism

Network camera

Abnormality occurrence

Camera recording started!

Recording the state in the equipment

GX VideoViewer	GX LogViewer
The workpiece dropped.	Marked position
Marking	

Work has dropped.

Find out the cause using GX LogViewer.

Number of connected cameras Up to 8 units	No additional module is required. Only by adding FB	Maximum number of pixels 1920 × 1080 pixel

FB and GX VideoViewer are provided free of charge*².

*2: Please contact your local Mitsubishi Electric sales office or representative.
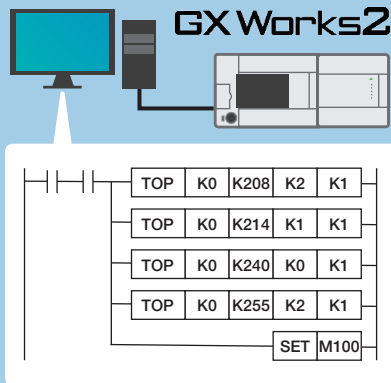
Setting various parameters with GX Works3

Module parameters

Module parameters can be set on the GX Works3 editor screen. This eliminates the need for programming to set module parameters, reducing man-hours for program creation.

FX3 series

It is necessary to create programs using FROM/TO commands to set module parameters.

GX Works2

TOP	K0	K208	K2	K1
TOP	K0	K214	K1	K1
TOP	K0	K240	K0	K1
TOP	K0	K255	K2	K1
			SET	M100

MELSEC iQ-F series

Without a program, module parameters can be set directly with GX Works3 parameter settings.

GX Works3

Parameter setting without programming

Automatic refresh with expansion module

With the automatic refresh function, the values of internal devices (X, Y, B, W, SB, SW, etc.) can be overwritten with the values in the expansion module's buffer memory and used in programs.

FX3 series

It is necessary to create programs using FROM/TO instruction to send/receive data from the expansion module.

GX Works2

| FROM | K0 | K10 | D10 | K1 |
FROM	K0	K11	D11	K1
FROM	K0	K12	D12	K1
FROM	K0	K13	D13	K1
			SET	M100
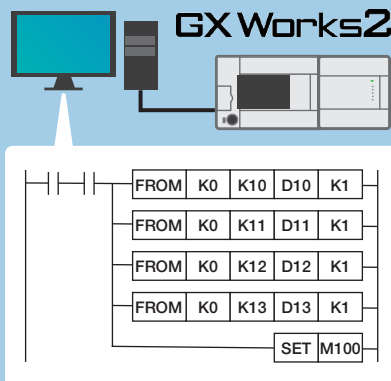
MELSEC iQ-F series

Parameters can be automatically transferred to CPU module devices and used in PLC programs by setting the module parameters to automatically refresh.
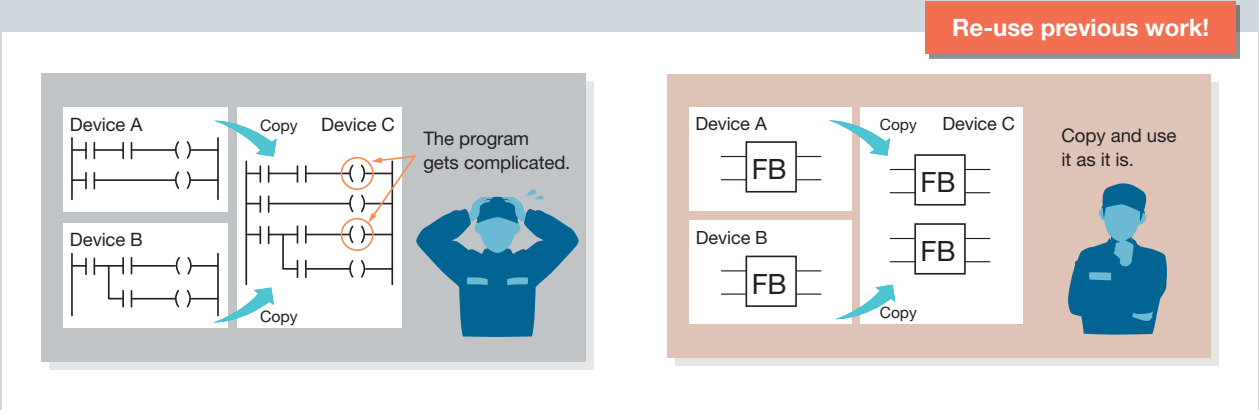
GX Works3

14
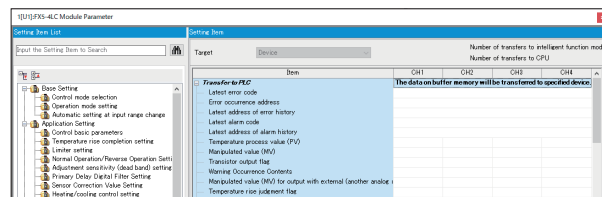
FB (Function block)

FBs are components made of circuit blocks that are used repeatedly in PLC programs. Using FBs can make programs compact and easy to understand.

GX Works3

Componentizing a program to be used repeatedly

FB

FB

Compact and easy to read

Program reuse

Added function
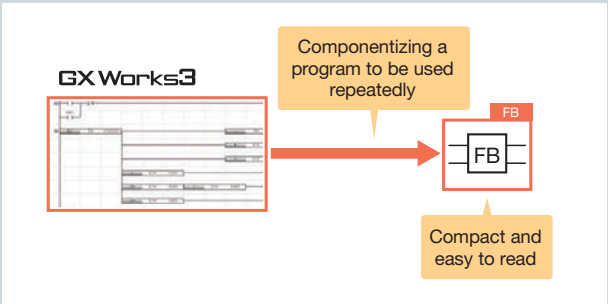
When creating a program, program reuse can be performed by simple drag & drop operation, leading to program development efficiency and standardization.

Re-use previous work!

Device A

Copy   Device C

The program gets complicated.

Device B

Copy

Device A

Copy   Device C

FB

FB

Device B

FB

FB

Copy

Copy and use it as it is.

Module FBs

Added function

Module FBs for controlling various modules are available. Using the module FBs eliminates the need for programming the processing of each module and reduces programming man-hours.

Numerous module FBs are available.

FB is provided for free (Included with GX Works3)

⟩ Module FBs

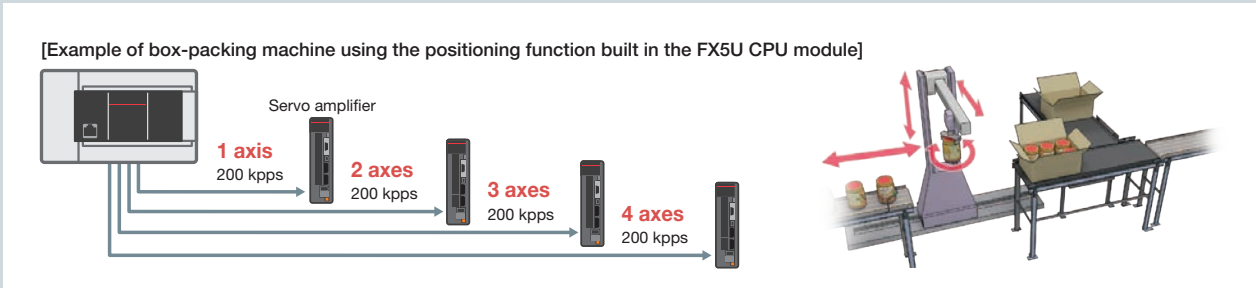| CPU	Positioning	Ethernet/ CC-Link IE TSN/ CC-Link IE Field	Motion/Simple motion	Analog
· Input/ output FB etc.	· FX5-20PG-P, FX5-20PG-D FB etc.	· Ethernet FB, FX5-ENET/IP FB etc.	· FX5-□SSC-G, FX5-□SSC-S FB etc.	· FX5-4AD, FX5-4DA FB, etc.

15

Evolved drive linkage
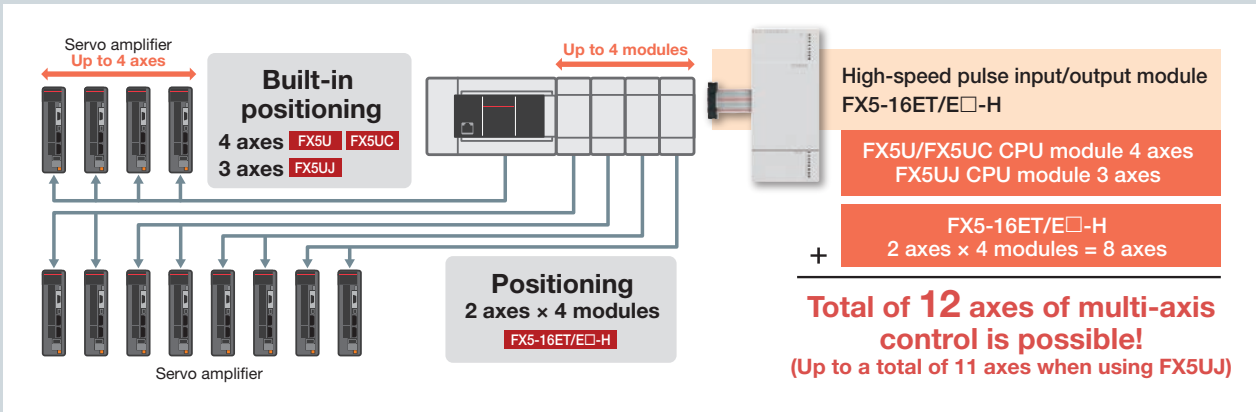
Low-cost drive control

Built-in positioning

Improved functionality

Positioning functions for up to 4 axes are built into the CPU module (transistor output type only). A low-cost system can be constructed with a maximum pulse output of 200 kpps and control of up to 4 axes from the CPU module itself.

[Example of box-packing machine using the positioning function built in the FX5U CPU module]

Servo amplifier

1 axis 200 kpps

2 axes 200 kpps

3 axes 200 kpps

4 axes 200 kpps

High-speed pulse input/output module

Added models

In addition to the built-in positioning of up to 4 axes, positioning control of up to 8 axes can be performed by using the high-speed pulse input/output module. Together with the built-in positioning, a system for controlling up to 12 axes can be constructed at low cost.

Servo amplifier
Up to 4 axes

Built-in positioning
4 axes FX5U FX5UC
3 axes FX5UJ

Up to 4 modules

High-speed pulse input/output module
FX5-16ET/E□-H

FX5U/FX5UC CPU module 4 axes
FX5UJ CPU module 3 axes

Positioning
2 axes × 4 modules
FX5-16ET/E□-H

+

FX5-16ET/E□-H
2 axes × 4 modules = 8 axes

Servo amplifier

Total of 12 axes of multi-axis control is possible!
(Up to a total of 11 axes when using FX5UJ)

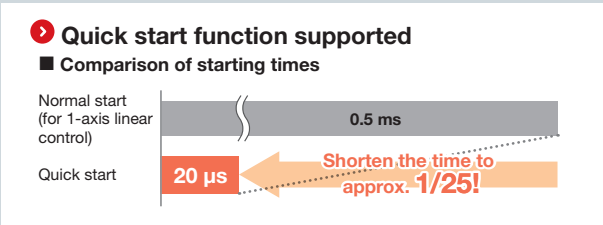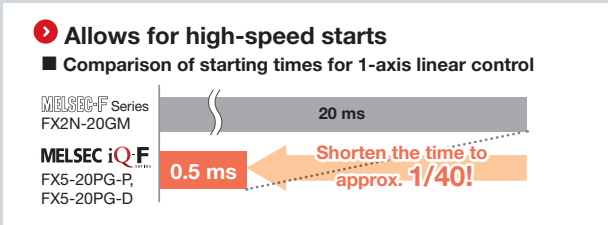### Positioning module

Improved functionality

2-axis pulse train positioning module
FX5-20PG-P (Transistor output)

2-axis pulse train positioning module
FX5-20PG-D (Differential driver output)

Normal startup is faster than the MELSEC-F series. In addition, fast startup can be performed, allowing for prior analysis of positioning data.
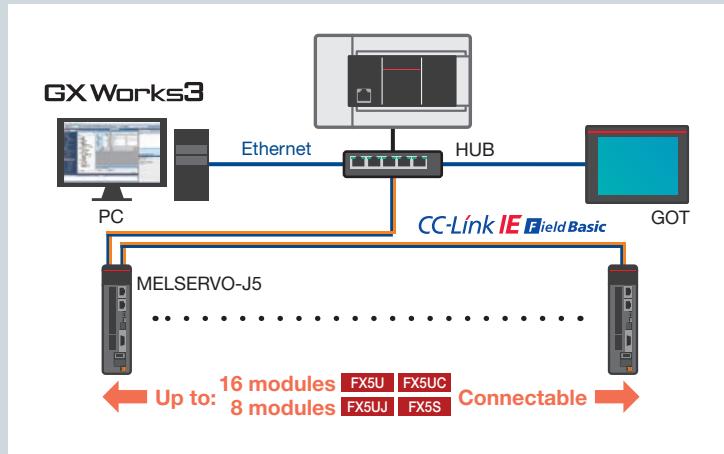
Allows for high-speed starts
■ Comparison of starting times for 1-axis linear control

MELSEC-F Series
FX2N-20GM — 20 ms

MELSEC iQ-F
FX5-20PG-P,
FX5-20PG-D — 0.5 ms

Shorten the time to approx. 1/40!

Quick start function supported
■ Comparison of starting times

Normal start (for 1-axis linear control) — 0.5 ms

Quick start — 20 µs

Shorten the time to approx. 1/25!

Communication positioning

CC-Link IE Field Network Basic connection

Added function

CC-Link IE Field Network Basic can connect the CPU module and up to 16 MELSERVO-J5 modules.

GX Works3

PC   Ethernet   HUB   GOT

CC-Link IE Field Basic

MELSERVO-J5

Up to: 16 modules FX5U FX5UC
8 modules FX5UJ FX5S   Connectable

PLCopen® support FB

Added function

Programming can be done using the PLCopen® Motion Control FB library, an international standard. By using FBs, program creation and reuse can be performed without worrying about the communication interface with the servo amplifier, allowing for improved equipment and machinery quality. FB is provided free of charge∗.

∗: Please contact your local Mitsubishi Electric sales office or representative.
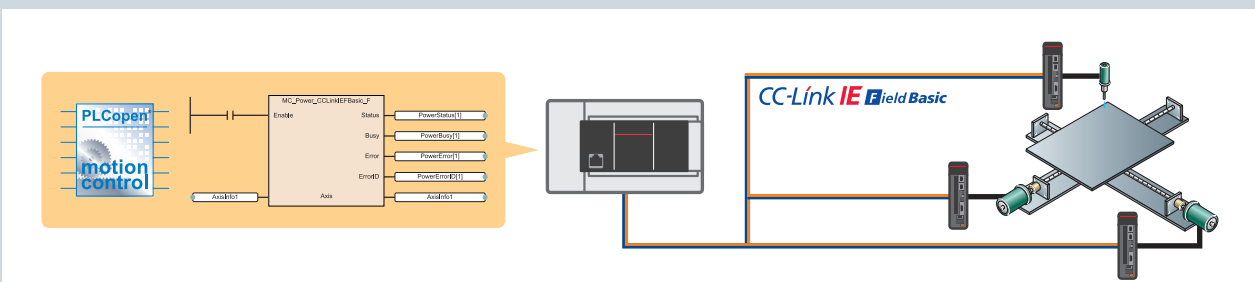
FB Library (example)

Name	Content
MC_Power_CCLinkIEFBasic_F	Switches the status of the servo amplifier for the specified axis to the operable state
MCv_Home_CCLinkIEFBasic_F	Executes the homing of the specified axis
MC_Stop_CCLinkIEFBasic_F	Forcibly stops the specified axis
MC_Halt_CCLinkIEFBasic_F	Stops the specified axis
MC_MoveAbsolute_CCLinkIEFBasic_F	Specifies the target absolute position of the specified axis and executes positioning

Reduced programming man-hours

Improved program quality

Total of 13 different FB available

FB is provided for free

17

High-accuracy motion control
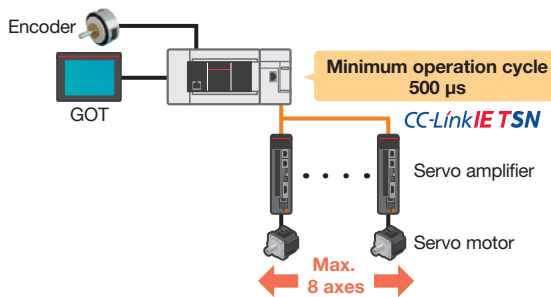
Motion control

Motion modules (FX5-40SSC-G, FX5-80SSC-G) provide advanced motion control.
By using a motion module and the high-performance servo amplifier MELSERVO-J5 series, advanced positioning control can be supported.

❯ System configuration example (for FX5-80SSC-G)

Encoder
GOT
Minimum operation cycle 500 μs
CC-Link IE TSN
Servo amplifier
Servo motor
Max. 8 axes

❯ List of applicable motion modules

Supported network	Supported servo amplifier	Number of connectable module
CC-Link IE TSN	MELSERVO-J5	FX5S/FX5UJ not supported

Number of connectable module	Number of connectable module
FX5U Up to 4 modules	FX5UC Up to 4 modules

Simple motion module connection

Simple motion modules (FX5-40SSC-S, FX5-80SSC-S) provide advanced motion control.
It can be used for various purposes by combining linear interpolation, 2-axis circular interpolation, constant quantity feed, and continuous path control in a point table-based program.

❯ System configuration example (for FX5-80SSC-S)
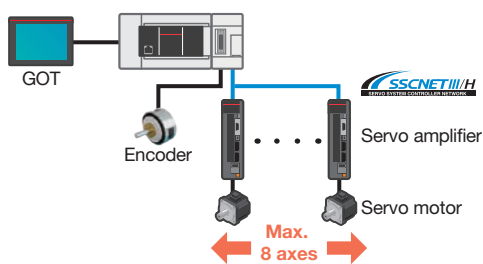
GOT
Encoder
SSCNET III/H
Servo amplifier
Servo motor
Max. 8 axes

❯ List of applicable motion modules

Supported network	Supported servo amplifier	Number of connectable module
SSCNET III/H	MELSERVO-J4	FX5UJ Up to 1 module

Number of connectable module	Number of connectable module	Number of connectable module
FX5U Up to 16 modules	FX5UC Up to 15 modules	FX5S not supported

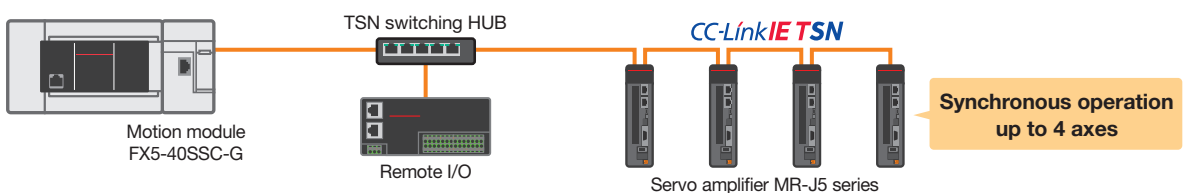## Synchronous operation enables extra controls

Synchronous control and cam control can be used to build a system perfect for your equipment.
Up to 128 types of cam data can be registered to respond quickly to any type of contents (fillings). Continuous operation can be performed without stopping the workpiece.

❯ System configuration example (for FX5-40SSC-G)

TSN switching HUB
CC-Link IE TSN
Motion module FX5-40SSC-G
Remote I/O
Servo amplifier MR-J5 series
Synchronous operation up to 4 axes

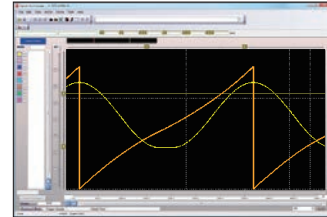## Integrated simple motion setup tool

The simple motion setup tool is integrated in GX Works3.
GX Works3 makes it easy to change simple motion module settings such as module parameters, positioning data, and servo parameters. It also simplifies the servo adjustment.
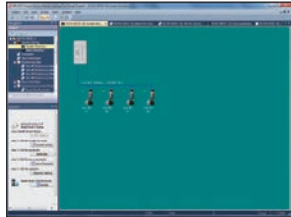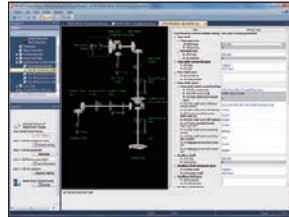
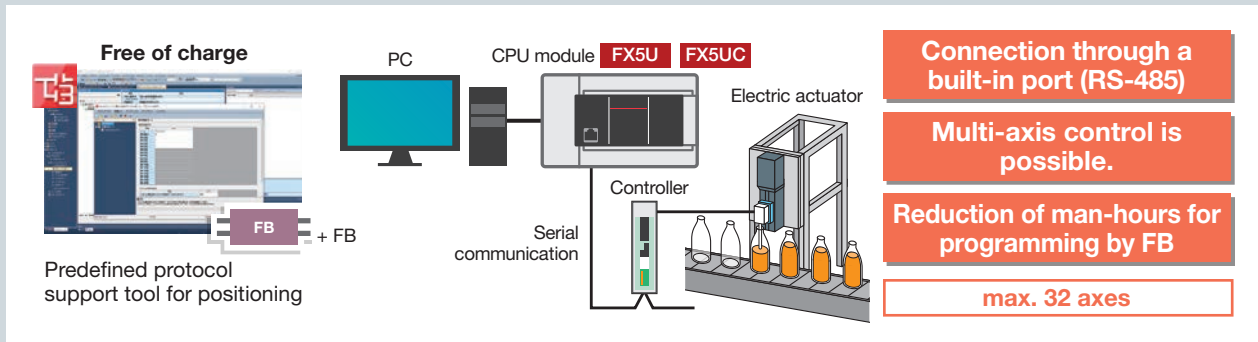System Configuration　　　　Synchronized Control Parameter　　　　Digital Oscilloscope

Electric actuator connection

## Predefined protocol support tools make actuator setup easy

"Predefined protocol support tool for positioning" and "Predefined protocol support FBs for positioning" are provided for free. Programming man-hours can be reduced by using the support tools or FB.

Free of charge

PC

CPU module FX5U FX5UC

Electric actuator

FB + FB

Predefined protocol support tool for positioning

Serial communication

Controller

Connection through a built-in port (RS-485)

Multi-axis control is possible.

Reduction of man-hours for programming by FB

max. 32 axes

Predefined protocol support tools and FB can facilitate fine-tuning in case of trouble

A communication protocol can be set only by selecting the model. You can adjust the positioning operation connected by each manufacturer while monitoring the operation of the electric actuator.

Setting by selecting a model for each axis

Setting by selecting a manufacturer

19
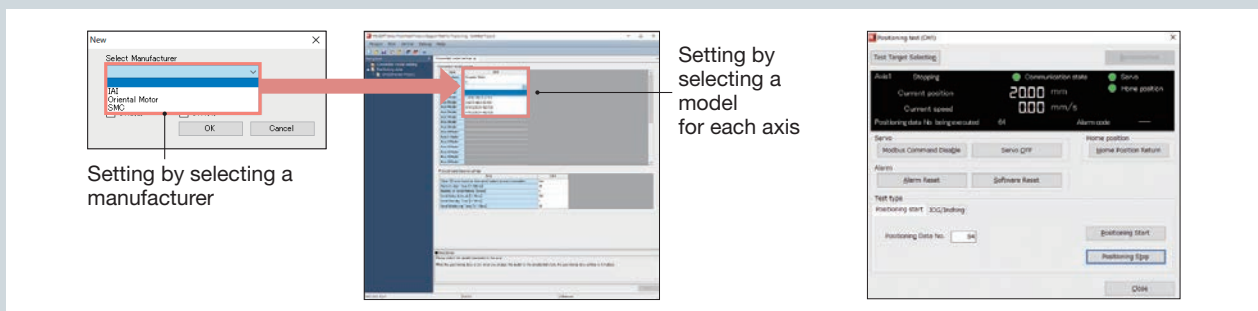
Addition/Evolution of various functions

IoT related

Web server function

Simple diagnosis can be performed by simply accessing the PLC with a smartphone or tablet. Simple diagnosis can be performed prior to on-site investigation, enabling efficient maintenance. It can be performed by just making simple settings, eliminating the need for program creation.

System Web page FX5S | FX5UJ | FX5U | FX5UC

CPU module monitoring and diagnostics can be performed from a web browser on a PC or tablet.

User Web page FX5S | FX5UJ | FX5U | FX5UC

Customers can display their own customized web pages on PCs or tablets. (An SD memory card is required to use user Web page.)

MQTT communication function FX5UJ | FX5U | FX5UC

Data can be transferred to an MQTT broker from an FX5-ENET connected to an iQ-F series CPU module. In addition, the PLC can specify the required data to the MQTT broker and receive distribution.

> **Application Examples** FX5UJ | FX5U | FX5UC

Site
MQTT Publisher   client

Abnormal increase in temperature

Transmission of measured data

Cloud
MQTT Broker   server

Deliver measurement data.

User
MQTT Subscriber   client

The abnormal increase is reflected in the dashboard software to notify users of the error

By using cloud applications, voice notification or e-mail transmission can also be performed.

> **Application Examples** FX5UJ | FX5U | FX5UC

Site
MQTT Publisher   client

Abnormal increase in temperature

Temperature error detected

Transmission of error details to the cloud

Specification of which automated voice to use

Cloud
MQTT Broker   server
MQTT Subscriber   client

Cloud application

User
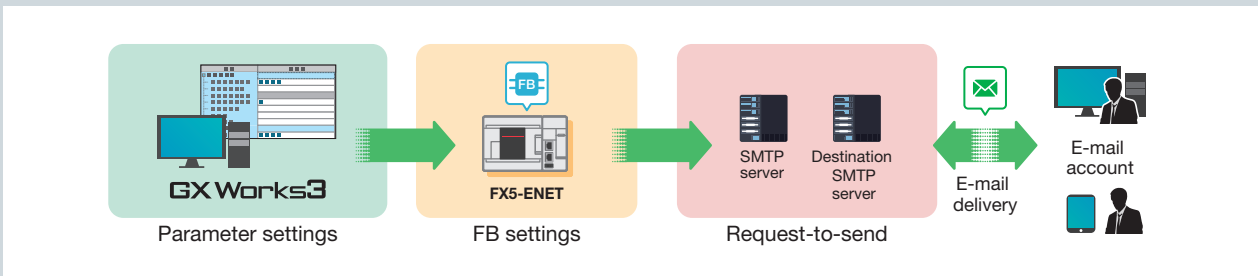Abnormal increase in temperature

Call to phone number, etc. using automated voice

Voice-based notification via phone

20

E-mail function FX5UJ FX5U FX5UC

Simpler

By connecting the FX5-ENET to the iQ-F series CPU module, e-mails can be sent to remote computers, smartphones, etc. via an e-mail server.

GX Works3 — Parameter settings → FX5-ENET — FB settings → SMTP server / Destination SMTP server — Request-to-send → E-mail delivery → E-mail account

Parameters can be easily set using GX Works3.
Set the destination, send data, etc. on the FB, and send the e-mail from the SMTP server with a send request.

Firmware update function

Added function

With the iQ-F series, firmware on CPU modules or intelligent function modules can be updated to use the latest functions.

The firmware version can be upgraded without replacing the CPU module in use.
For information on which intelligent function modules can be updated, please contact your local branch office.
In addition, many module FBs are free of charge∗.

∗: Please contact your local Mitsubishi Electric sales office or representative.

Download the firmware update file

■ **When using an SD memory card**
FX5S FX5UJ FX5U FX5UC

■ **When using GX Works3**
FX5S

21
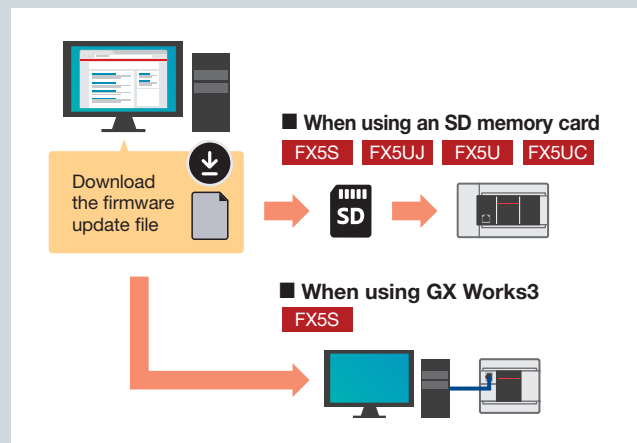
Strengthened security

Security measures matching the application can be used to protect important data.

❯ Preventing program leakage.
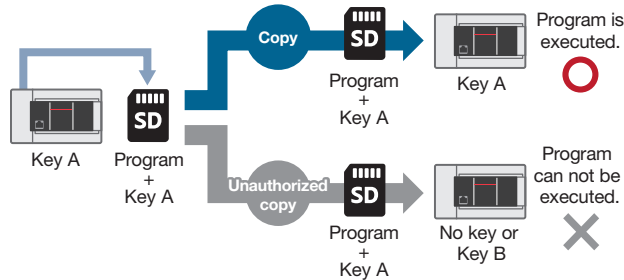
► Security key authentication function
Engineering Tool: GX Works3

Prevents data theft tampering misoperation and illegal execution etc. caused by unauthorized access. Programs cannot be executed on a CPU module without a registered security key preventing program leakage.

Copy

Program + Key A

Key A

Program is executed.

Key A

Program + Key A

Unauthorized copy

Program + Key A

No key or Key B

Program can not be executed.

❯ Prevents unauthorized access via network
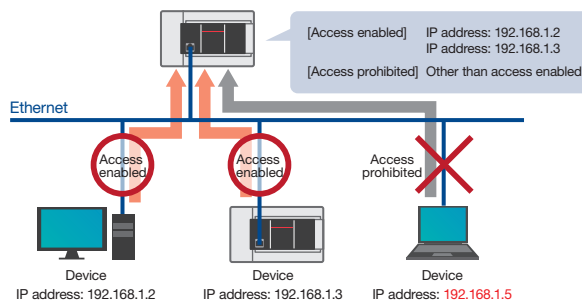
► IP filter function
Engineering Tool: GX Works3

Prevents access from devices other than authorized devices by registering the IP addresses of devices that can access the CPU module.
Reduces the risk of unauthorized hacking or data tampering.

[Access enabled]   IP address: 192.168.1.2
                    IP address: 192.168.1.3

[Access prohibited] Other than access enabled

Ethernet

Access enabled

Access enabled

Access prohibited

Device
IP address: 192.168.1.2

Device
IP address: 192.168.1.3

Device
IP address: 192.168.1.5

❯ Increased reliability through enhanced security

► OPC UA server function
Engineering Tool: GX Works3,
OPC UA Module Configuration Tool

With FX5-OPC, electronic certificates are exchanged between devices to restrict communication and enable worry-free communication with higher-level devices.

Client certificate
• Public key A

❶ Exchange and verify certificates

Server certificate
• Public key B

· Private key A
· Trust list
· CRL (revocation list)

· Private key B
· Trust list
· CRL (revocation list)

Common key

Decryption with private key A

❷ Generate a common key, encrypt it, and send it

Common key

Encryption with public key A

OPC UA Client

❸ Further communication is encrypted using the common key

OPC UA Server

＊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.

Support for safe control

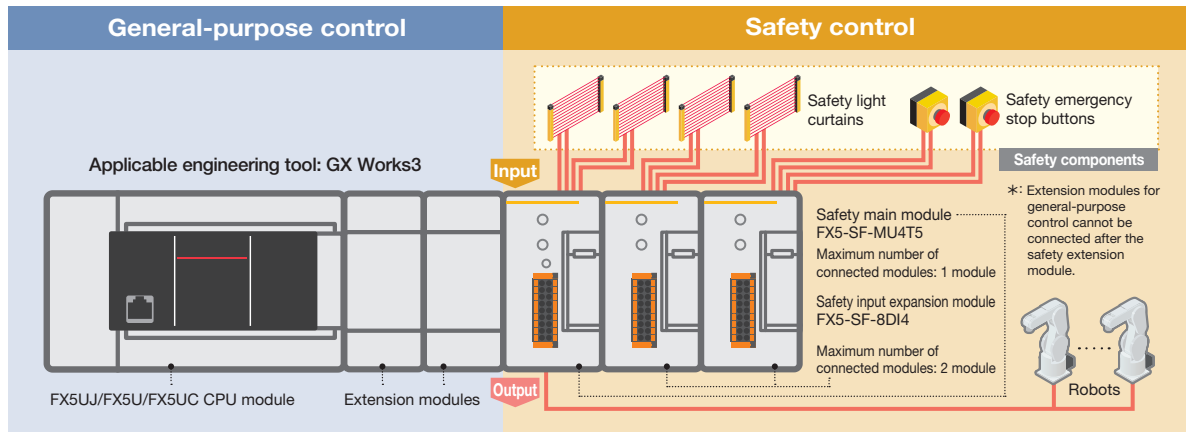### Safety extension modules make it easy to create safe systems.

Device safety is highly important amid the globalization of various industries and systems.
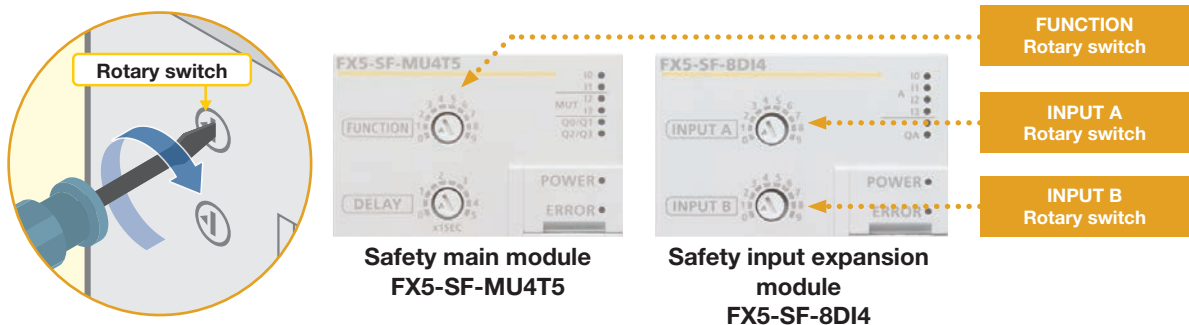The MELSEC iQ-F series also features a lineup of modules that complies with safety standards.

A safety control system can be installed by simply connecting the safety extension modules to the FX5UJ/FX5U/FX5UC CPU modules.

Safety extension module	Safety main module FX5-SF-MU4T5	Safety input expansion module FX5-SF-8DI4
	FX5UJ FX5U FX5UC	FX5UJ FX5U FX5UC
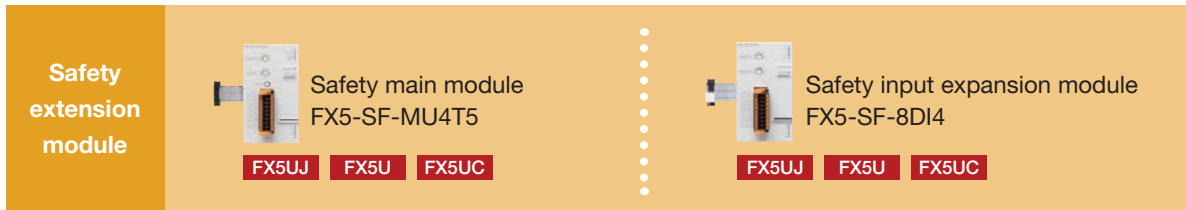
This single system can be used to perform general-purpose control and safety control.
No safety program or monitor wiring is required. Reduce the labor required for system construction.

General-purpose control | Safety control

Safety light curtains
Safety emergency stop buttons
Safety components

Applicable engineering tool: GX Works3

Input

＊: Extension modules for general-purpose control cannot be connected after the safety extension module.

Safety main module FX5-SF-MU4T5
Maximum number of connected modules: 1 module

Safety input expansion module FX5-SF-8DI4
Maximum number of connected modules: 2 module

FX5UJ/FX5U/FX5UC CPU module | Extension modules | Output

Robots

Nine different programs are built in.
Safe systems can be constructed with a simple turn of a rotary switch and selection.
This eliminates the need for sequence programs designed for safety control.

Rotary switch

FX5-SF-MU4T5

FUNCTION Rotary switch

INPUT A Rotary switch

INPUT B Rotary switch

FX5-SF-8DI4

**Safety main module
FX5-SF-MU4T5**

**Safety input expansion module
FX5-SF-8DI4**

FX3 series and iQ-F series specification comparison

Corresponding models in terms of number of input/output points, program capacity, and input/output terminal format (terminal blocks, connectors, etc.) are identified and their differences are shown. Depending on the application and operating conditions, models other than the corresponding models shown may be more suitable.

For details, please refer to Transition from MELSEC FX3G, FX3U, FX3UC Series to MELSEC iQ-F Series Handbook (JY997D66201) and select the appropriate replacement model for your existing system.

❯ FX3S and FX5S specification comparison ＊Not listed in the above-mentioned Transition Handbook.

		FX3S	**FX5S**
Main module hardware	Number of main module points	10/14/20/30 points Up to 30 points	30/40/60 points Up to 60 points
	Power supply	AC, DC	AC
	Input type	Sink/source	Sink/source
	Output type	Relay Transistor (sink output/source output)	Relay Transistor (sink output/source output)
Main module functions	Built-in memory (capacity/type)	16 k steps EEPROM (Program capacity Max. 4 k)	48 k steps Flash memory
	Built-in communication port	RS-422/USB	Ethernet port/USB
	Built-in high-speed counter	6 CH 60 kHz: 2 points 10 kHz: 4 points	8 CH 100 kHz: 4 points 10 kHz: 4 points
	Built-in positioning (Transistor output type)	2 axes 100 kHz	4 axes 100 kpps

Unit: mm

FX3S Series main module
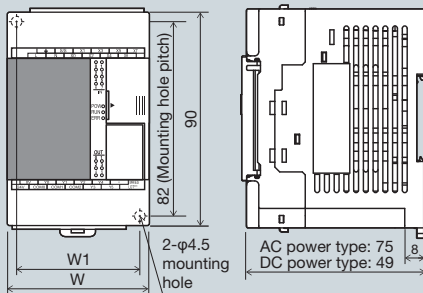
Model	W	W1 (Mounting hole pitch)
FX3S-10M□, FX3S-14M□	60	52
FX3S-20M□	75	67
FX3S-30M□	100	92

FX5S CPU module
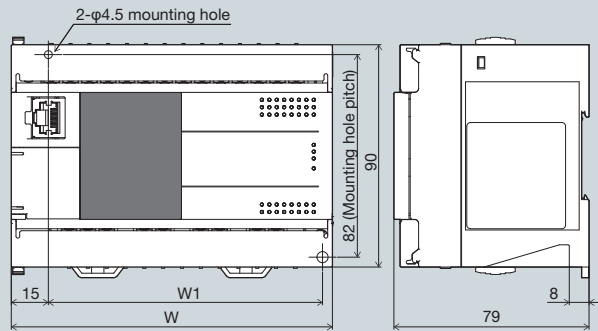
Model	W	W1 (Mounting hole pitch)
FX5S-30M□	100	81
FX5S-40M□	130	111
FX5S-60M□	175	156

• The pitch of the holes for installation in a control panel differs between the FX3S and FX5S. When making a direct installation in a control panel, installation holes must be added.

• Terminal block is not removable so terminal block replacement cannot be performed.

❯ FX3G and FX5S, FX5UJ specification comparison

		FX3G	FX5S	FX5UJ
Main module hardware	Number of main module points	14/24/40/60 points Up to 128 points (Up to 256 points including remote I/O)	30/40/60 points Up to 60 points	24/40/60 points Up to 256 points (Up to 256 points including remote I/O)
	Power supply	AC, DC	AC	AC, DC
	Input type	Sink/source	Sink/source	Sink/source
	Output type	Relay Transistor (sink output/source output)	Relay Transistor (sink output/source output)	Relay Transistor (sink output/source output)
Main module functions	Built-in memory (capacity/type)	32 k steps EEPROM	48 k steps Flash memory	48 k steps Flash memory
	Built-in communication port	RS-422/USB	Ethernet port/USB	Ethernet port/USB
	Built-in high-speed counter	6 CH 60 kHz: 4 points 10 kHz: 2 points	8 CH 100 kHz: 4 points 10 kHz: 4 points	8 CH 100 kHz: 4 points 10 kHz: 4 points
	Built-in positioning (Transistor output type)	14/24-point type: 2 axes 40/60-point type: 3 axes 100 kHz	4 axes 100 kpps	3 axes 200 kpps

Unit: mm

FX3G Series main module
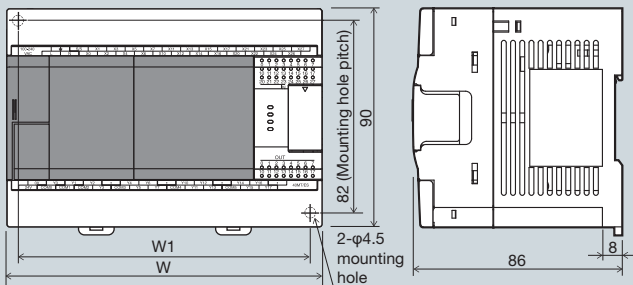
Model	W	W1 (Mounting hole pitch)
FX3G-14M□, FX3G-24M□	90	82
FX3G-40M□	130	122
FX3G-60M□	175	167

FX5S CPU module
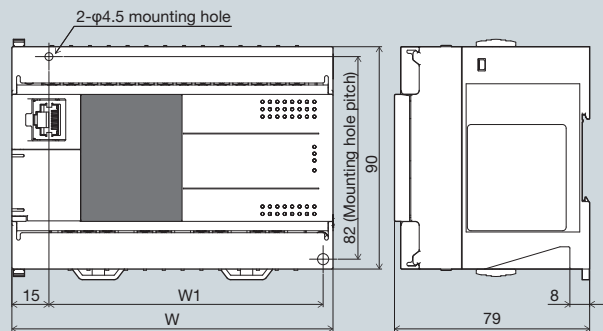
Model	W	W1 (Mounting hole pitch)
FX5S-30M□	100	81
FX5S-40M□	130	111
FX5S-60M□	175	156

FX5UJ CPU module
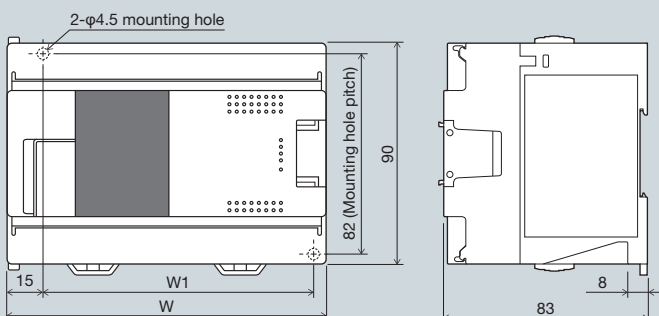
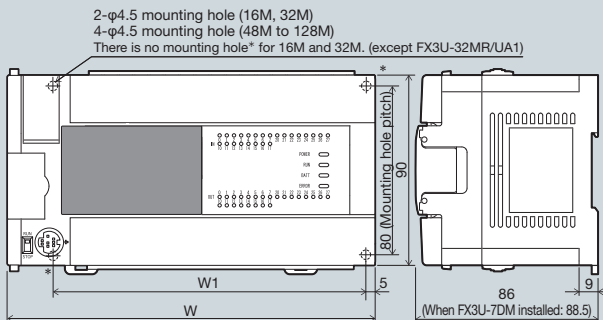| Model	W	W1 (Mounting hole pitch)
FX5UJ-24M□	95	76
FX5UJ-40M□	130	111
FX5UJ-60M□	175	156

- For the FX3G, FX5S, and FX5UJ, the pitch of the installation holes to the panel differs depending on the model name. When making a direct installation in a control panel, installation holes must be added.
- The terminal block shapes differ, one terminal block cannot be replaced with the other.

FX3U and FX5UJ, FX5U specification comparison

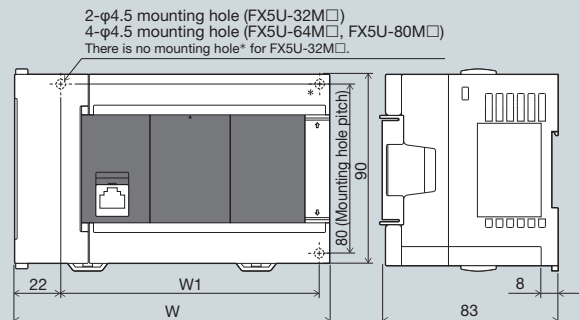|		FX3U	FX5UJ	FX5U
Main module hardware	Number of main module points	16/32/48/64/80/128 points Up to 256 points (Up to 384 points including remote I/O)	24/40/60 points Up to 256 points (Up to 256 points including remote I/O)	32/64/80 points Up to 384 points (Up to 512 points including remote I/O)
	Power supply	AC, DC	AC, DC	AC, DC
	Input type	Sink/source 100 V AC	Sink/source	Sink/source
	Output type	Relay Transistor (sink output/source output) Triac output	Relay Transistor (sink output/source output)	Relay Transistor (sink output/source output)
Main module functions	Built-in memory (capacity/type)	64 k steps RAM (Battery backup)	48 k steps Flash memory	64 k/128 k steps Flash memory
	Built-in communication port	RS-422 (Ethernet port and USB are an option)	Ethernet port/USB	Ethernet port/RS-485
	Built-in high-speed counter	8 CH 100 kHz: 6 points 10 kHz: 2 points	8 CH 100 kHz: 4 points 10 kHz: 4 points	8 CH 200 kHz: 8 points
	Built-in positioning (Transistor output type)	3 axes 100 kHz	3 axes 200 kpps	4 axes 200 kpps

Unit: mm

FX3U Series main module

2-φ4.5 mounting hole (16M, 32M)
4-φ4.5 mounting hole (48M to 128M)
There is no mounting hole* for 16M and 32M. (except FX3U-32MR/UA1)

80 (Mounting hole pitch)
90
W1
W
5
86 (When FX3U-7DM installed: 88.5)
9

Model	W	W1 (Mounting hole pitch)
FX3U-16M□	130	103
FX3U-32M□	150	123
FX3U-48M□, FX3U-32MR/UA1	182	155

Model	W	W1 (Mounting hole pitch)
FX3U-64M□	220	193
FX3U-80M□, FX3U-64MR/UA1	285	258
FX3U-128M□	350	323

FX5U CPU module

2-φ4.5 mounting hole (FX5U-32M□)
4-φ4.5 mounting hole (FX5U-64M□, FX5U-80M□)
There is no mounting hole* for FX5U-32M□.

80 (Mounting hole pitch)
90
22
W1
W
83
8

Model	W	W1 (Mounting hole pitch)
FX5U-32M□	150	123
FX5U-64M□	220	193
FX5U-80M□	285	258

FX5UJ CPU module

2-φ4.5 mounting hole

82 (Mounting hole pitch)
90
15
W1
W
83
8
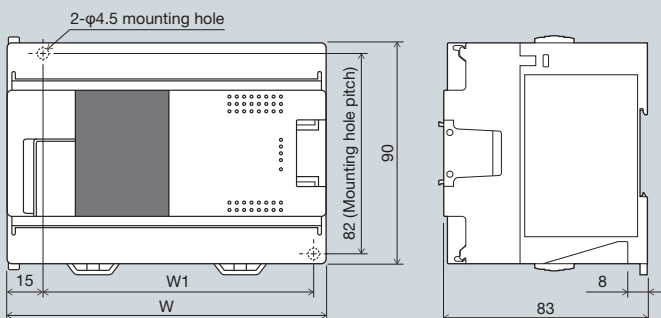
Model	W	W1 (Mounting hole pitch)
FX5UJ-24M□	95	76
FX5UJ-40M□	130	111
FX5UJ-60M□	175	156

• For the FX3U, FX5UJ, and FX5U, the pitch of the installation holes to the panel differs depending on the model name. When making a direct installation in a control panel, installation holes must be added.
• The terminal block shapes differ, one terminal block cannot be replaced with the other.

● FX3GC, FX3UC and FX5UC specification comparison

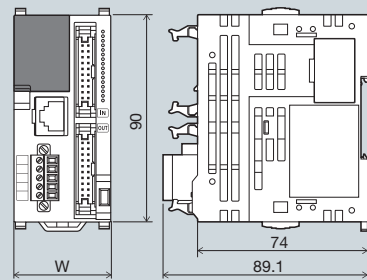|		FX3GC	FX3UC	FX5UC
Main module hardware	Number of main module points	32 points Up to 128 points (Up to 256 points including remote I/O)	16/32/64/96 points Up to 256 points (Up to 384 points including remote I/O)	32/64/96 points Up to 384 points (Up to 512 points including remote I/O)
	Power supply	DC	DC	DC
	Input type	Sink/source	Sink/source	Sink/source
	Output type	Transistor (sink output/source output)	Relay Transistor (sink output/source output)	Relay Transistor (sink output/source output)
Main module functions	Built-in memory (capacity/type)	32 k steps EEPROM	64 k steps RAM (Battery backup)	64 k/128 k steps Flash memory
	Built-in communication port	RS-422/USB	RS-422 (Ethernet port is an option)	Ethernet port/RS-485
	Built-in high-speed counter	6 CH 100 kHz: 4 points 10 kHz: 2 points	8 CH 100 kHz: 6 points 10 kHz: 2 points	8 CH 200 kHz: 8 points
	Built-in positioning (Transistor output type)	2 axes 100 kHz	3 axes 100 kpps	4 axes 200 kpps

Unit: mm

FX3GC series main module
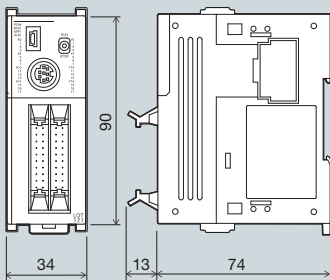
Model
FX3GC-32MT/D, DSS

FX3UC series main module
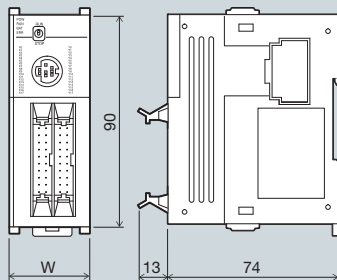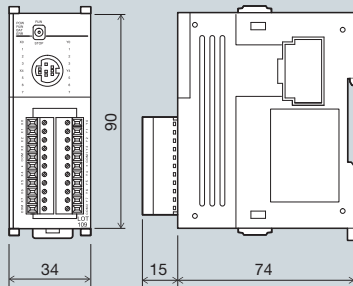

Model	W
FX3UC-16MT/D, DSS	34.0
FX3UC-32MT/D, DSS	34.0
FX3UC-64MT/D, DSS	59.7
FX3UC-96MT/D, DSS	85.4

Model
FX3UC-16MR/D-T
FX3UC-16MR/DS-T

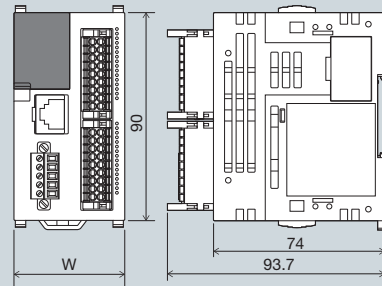### FX5UC CPU module

Model	W
FX5UC-32MT/D, DSS	42.1
FX5UC-64MT/D, DSS	62.2
FX5UC-96MT/D, DSS	82.3

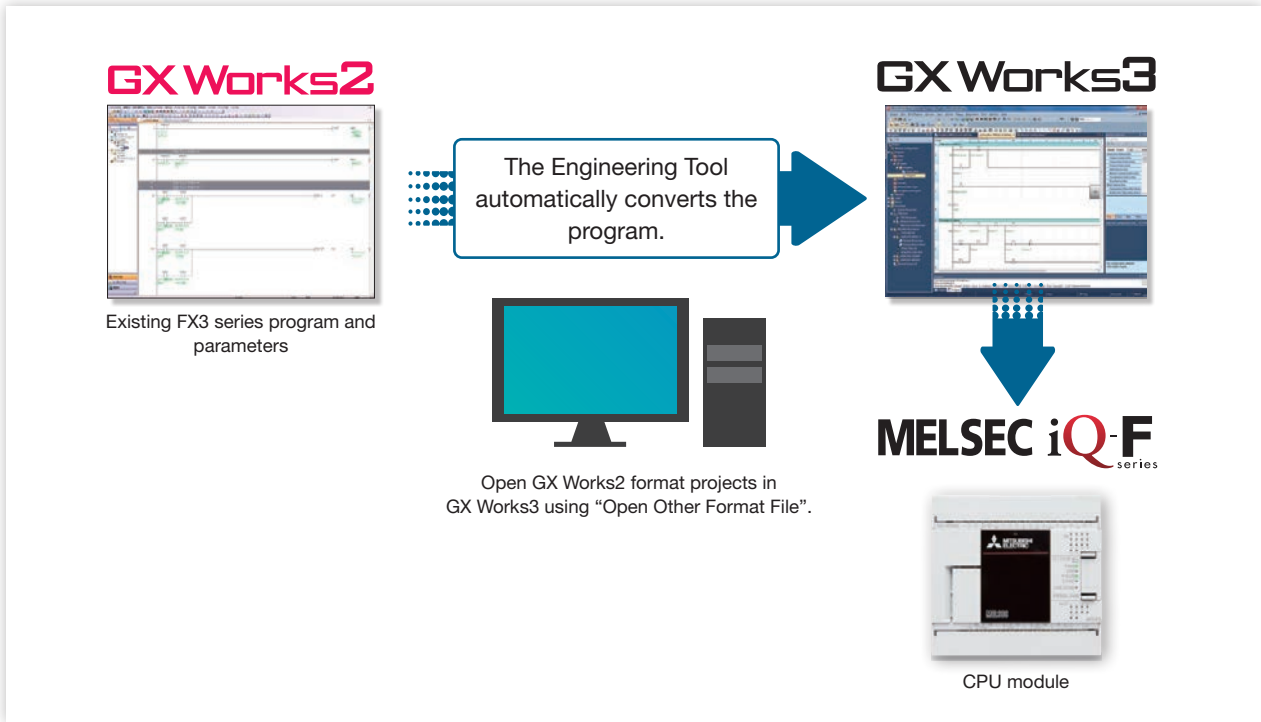| Model	W
FX5UC-32MT/D□-TS	48.1
FX5UC-32MR/DS-TS	68.2

• Horizontal dimensions of FX3GC/FX3UC and FX5UC are different.

Updating programs from the FX3 series to the iQ-F series

Existing FX3 series program assets can be utilized to reduce program development man-hours.

How to transition projects

The operations for transitioning the FX3 series programs for the iQ-F Series use are performed in GX Works2 or GX Works3.

GX Works2

Existing FX3 series program and parameters

The Engineering Tool automatically converts the program.

Open GX Works2 format projects in GX Works3 using "Open Other Format File".

GX Works3

MELSEC iQ-F series

CPU module

Precautions when Converting the Projects

- When transitioning FX3 series projects in GX Works3, the program (commands, devices) may be changed. For details, please refer to the GX Works3 Operating Manual (SH-081215ENG).

- When transitioning a project, the number of steps may increase and it may not be possible to write the project to the iQ-F series.

- Reserved words and prohibited character restrictions in GX Works3 may be applied to label names used in GX Works2.

Precautions when Replacing the Parameters

When transitioning an FX3 series project to an iQ-F series project, parameters (PC parameters, network parameters) and special module (intelligent function module) setting data will be deleted. Setting data must be set again in GX Works3.

Program modification is necessary

When converting an FX3 series project to an iQ-F series project, although most of it will be automatically converted by the engineering tool, there are differences in internal device assignment or functions, so program modification is required.
Be sure to refer to Transition from MELSEC FX3G, FX3U, FX3UC Series to MELSEC iQ-F Series Handbook (JY997D66201).
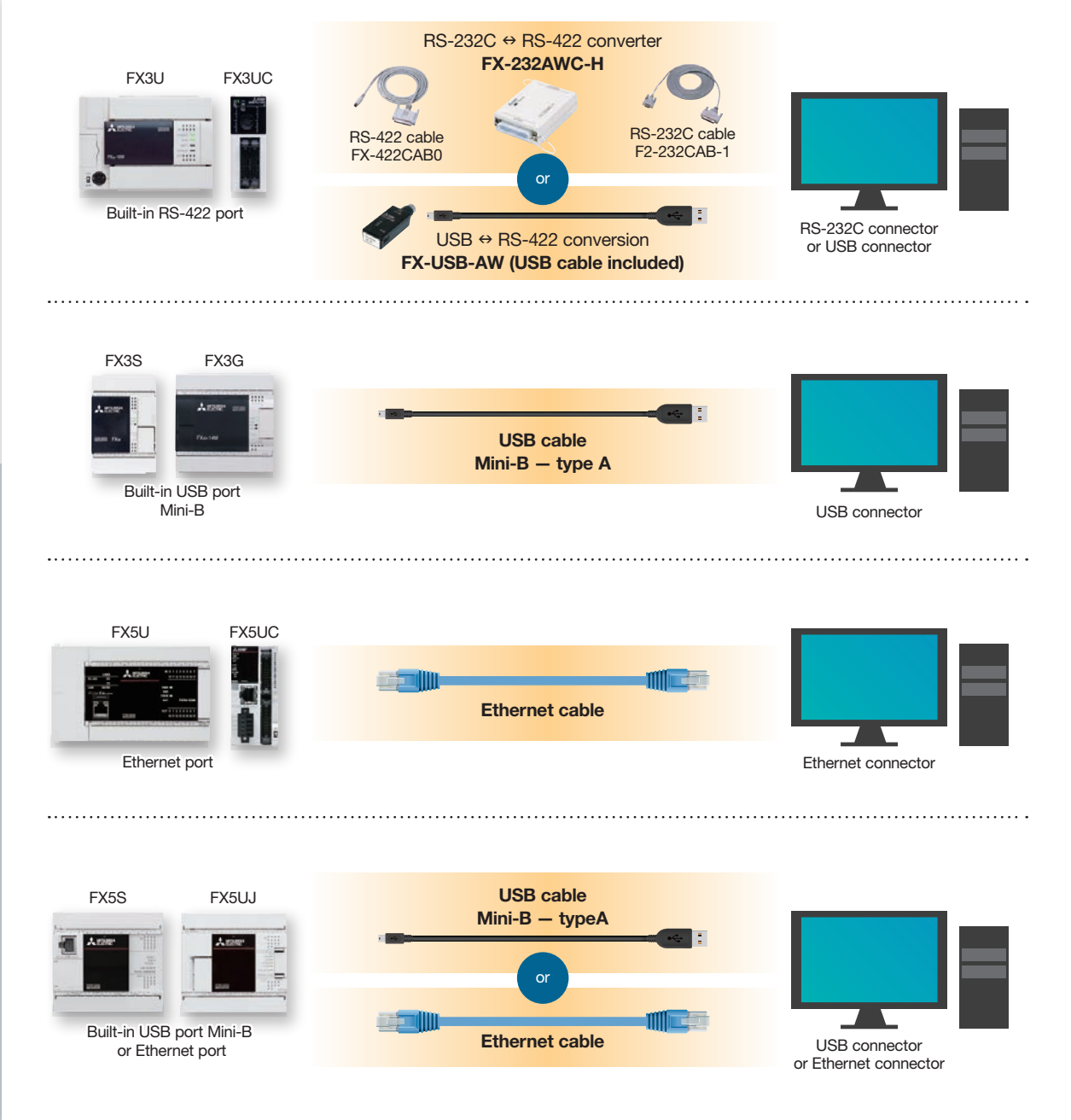
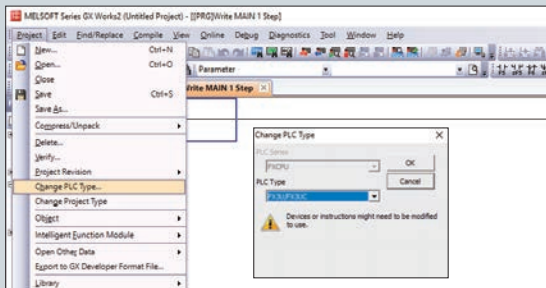It is available on the Mitsubishi Electric FA website.

Connecting computer and PLC

How to read data from an FX3 series PLC and convert it for an iQ-F Series PLC program.

(1) Connect the computer and an FX3 series PLC with a cable and RS-422/USB converter or RS-232C/RS-422 converter.
(2) Read the program using GX Works2, and save it as a file after conversion processing.
(3) Open the GX Works2 format project in GX Works3 using "Open Other Format File" and write it to the iQ-F series PLC.

FX3U FX3UC

Built-in RS-422 port

RS-232C ↔ RS-422 converter
FX-232AWC-H

RS-422 cable
FX-422CAB0

RS-232C cable
F2-232CAB-1

or

USB ↔ RS-422 conversion
FX-USB-AW (USB cable included)

RS-232C connector
or USB connector

FX3S FX3G

Built-in USB port
Mini-B

**USB cable
Mini-B — type A**

USB connector

FX5U FX5UC

Ethernet port

Ethernet cable

Ethernet connector

FX5S FX5UJ

Built-in USB port Mini-B
or Ethernet port

**USB cable
Mini-B — typeA**

or

Ethernet cable

USB connector
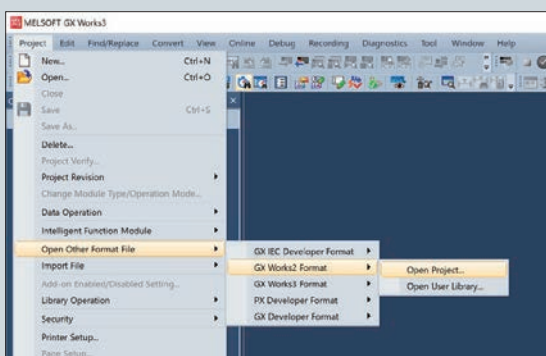or Ethernet connector

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Conversion from GX Works2 to GX Works3

**Procedure 1** Perform only when transitioning from models prior to the FX3 series.

In GX Works2, set the PC type to the FX3 series.

Go to [Project] – [Change PLC Type] in GX Works2 and select the FX3 series model name.

Procedure 2

In GX Works3, read the GX Works2 project.

In the [Project] menu, select [Open Other Format File] and select [GX Works2 Format] and [Open Project], and specify the GX Works2 project storage destination.
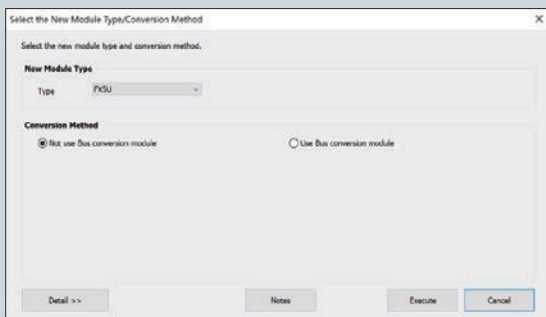
Procedure 3

Select the conversion destination model.

Select the model to be used.
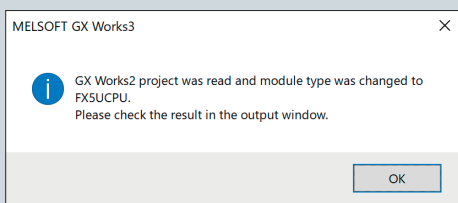
Procedure 4

When the conversion is complete, the completed message shown at left appears.
If necessary, modify the converted program.

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Compact and Modular Controllers	Servos, Motors and Inverters	Visualization: HMIs	Edge Computing Products
Numerical Control (NC)	Collaborative and Industrial Robots	Processing machines: EDM, Lasers	SCADA, analytics and simulation software

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iQ Platform-compatible PLC
MELSEC iQ-F Series