MITSUBISHI ELECTRIC

*Changes for the Better*

for a greener tomorrow eco Changes

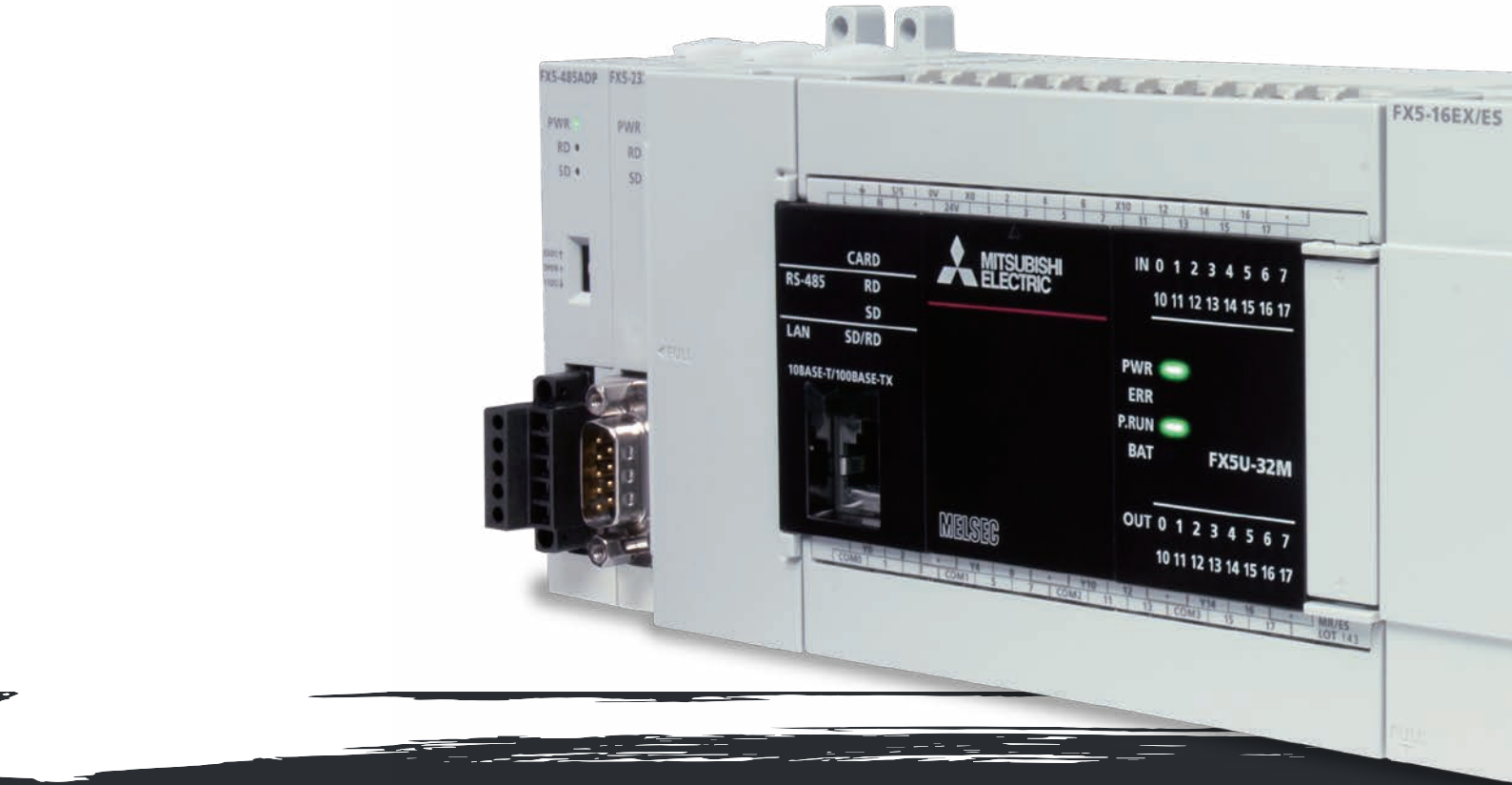
# MELSEC iQ-F Series
# iQ Platform-compatible PLC

## The next level of industry

MELSEC iQ-F series

# MELSEC iQ-F series

Witness the evolution of the micro PLC.
Designed on the concepts of outstanding performance, superior drive control, and user centric programming,
Mitsubishi's MELSEC-F Series has been reborn as the MELSEC iQ-F Series.



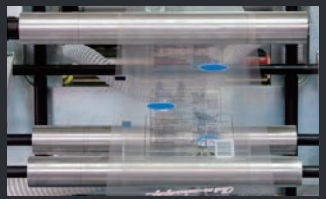

## The next level of industry

From stand alone use to networked system application,

MELSEC iQ-F Series brings your business to the next level of industry.


Conveyance


Food & Beverage


Packaging


Air-conditioning

## *New micro PLC designed on the concepts of ...*


- *Completely redesigned, high speed system bus*
- *Extensive built-in functions*
- *Enhanced security functions*


- *Built-in positioning (4-Axis 200 kHz)*
- *Simple linear interpolation (2-Axis simultaneous start)*
- *Synchronous control with Simple Motion unit (4-Axis)*
- *No need for dedicated positioning software*


- *Easy programming by drag and drop*
- *Reduced development time with module FB*
- *Parameterized setup for a variety of functions*

GX Works3


FX5

MELSEC iQ-F series **The next level of industry**

# iQ Platform

## iQ Platform for maximum return on investment

Minimize Total cost, Seamless integration, Maximize productivity, Transparent communications: these are common items that highlight the benefits of the iQ Platform. Enhanced further with the arrival of the new MELSEC iQ-F Series Programmable Logic Controller (PLC), reducing costs and improving productivity can be realized even easier. The iQ Platform minimizes TCO at all phases of the automation life cycle by improving development times, enhancing productivity, reducing maintenance costs, and making information more easily accessible.

## PLC & HMI

1. The new MELSEC iQ-F Series system bus is 150-times faster realizing improved system performance
2. Program standardization through function blocks and module labels
3. Powerful and robust security features

## Network

1. CC-Link IE Field, 1Gbps high-speed and large bandwidth communications network
2. Seamless connectivity within all levels of manufacturing with SLMP

## Engineering

1. Automatic generation of network configuration diagram
2. Share parameters across multiple engineering software via MELSOFT Navigator

iQ Platform

PLC & HMI

Network

Engineering environment






CC-Link IE Control

Ethernet

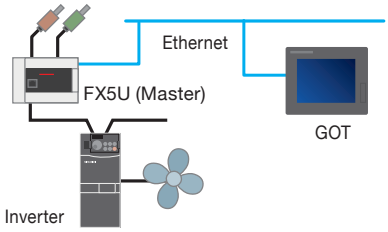
# Integrated Functions

## Built-in Analog

*Integrated 2 ch analog input and 1 ch analog output*
*(12 bit 0 -10 V DC input/output)*

FX5U is equipped with analog control capabilities right out of the box. No ladder logic is required when using parameter setting in the programming software.

›› Example of analog application with 2AD and 1DA.



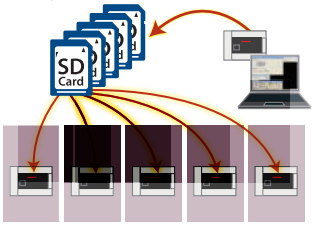

## Built-in SD Card Slot

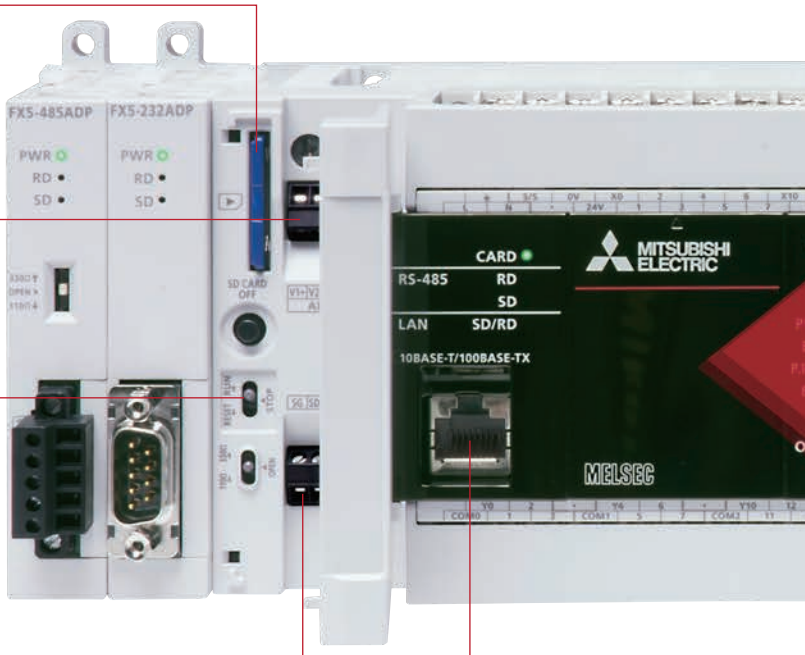
*Standard external memory*

External memory is useful for updating PLCs in the field. Program can be loaded onto SD card and then transferred to as many PLCs as necessary.

SD card can also be used for data logging. Record keeping is important for data analysis and tracking machine performance.

*... Future support*




## RUN/STOP/RESET Switch

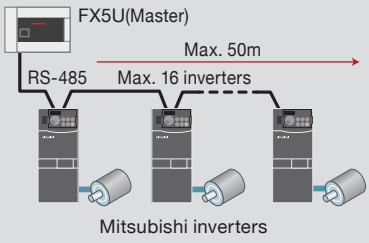
The run/stop switch conveniently includes the same reset functionality found on high end devices.
PLC can be rebooted without turning off the main power for efficient debugging.

## Built-in RS-485(MODBUS®) Communication

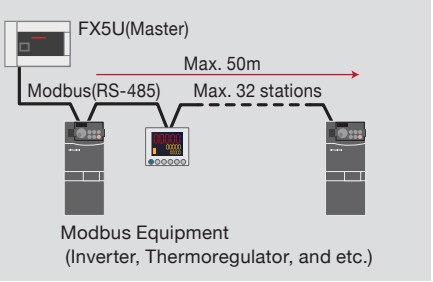
*No need for additional options for RS-485 communication*

For related systems and data transfer with external equipment and third party devices, serial communication has long been the established connection method. Serial communication allows the FX5U to connect both efficiently and reliably with other PLCs, sensors, printers, and modems, etc. Multi-drop networks, non-protocol communication, and remote maintenance are just some of the many uses.

›› Inverter Communication




›› MODBUS Communication



## Security

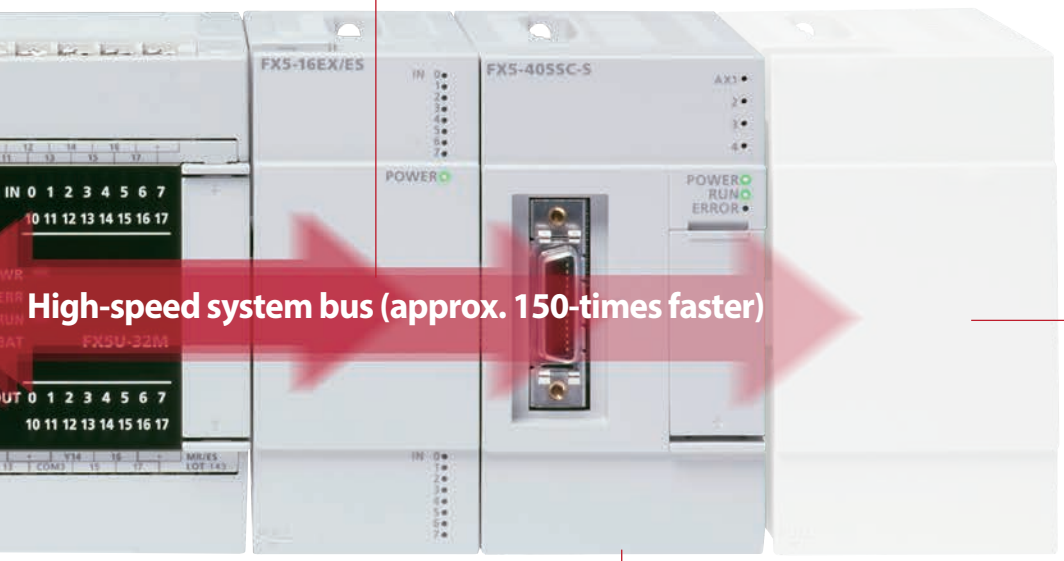
MELSEC iQ-F provides advanced security functions (file password, remote password, security key) for protection against unauthorized access.

›› Example of Security key function.


Copied program cannot be excuted because security key does not match.

## High-speed System Bus

The MELSEC iQ-F high speed system bus provides seamless data transfer from/to the CPU.
With new architecture that realizes data speeds of 1.5 k words per ms (150-times faster than FX3U), fast response is guaranteed even when using expansion modules.



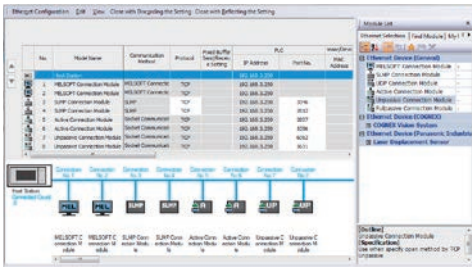

CC-Link IE slave Module
... Future support

SSCNET III/H

## Built-in Ethernet port *Built-in Ethernet supporting 8 ch*

In the information age, Ethernet has become the personal, commercial and industrial standard for easy and efficient data transfer. Whether it is between multiple PLC systems or PLC and PC servers, industrial users dictate foremost that data must always be consistent even in high-noise environments.

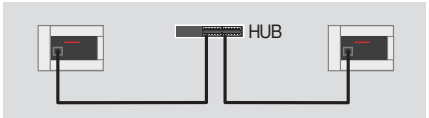
›› *MODBUS/TCP client* ... Coming Soon



Easy parameter setting

›› Socket Communication

Communicate with PLC and other devices.

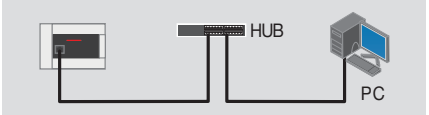



›› Remote Maintenance

Program read/write can be made by GX Works3 connected via VPN.

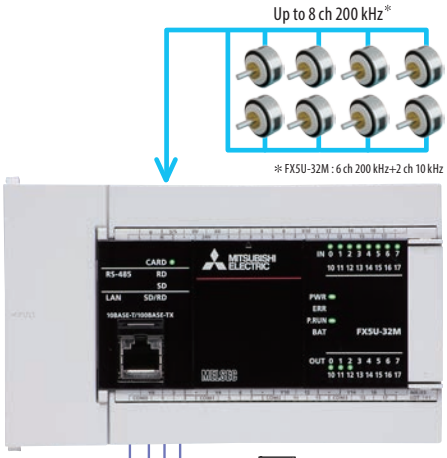

›› SLMP Communication

Device data read-out/writing to a PLC from an external device is possible.

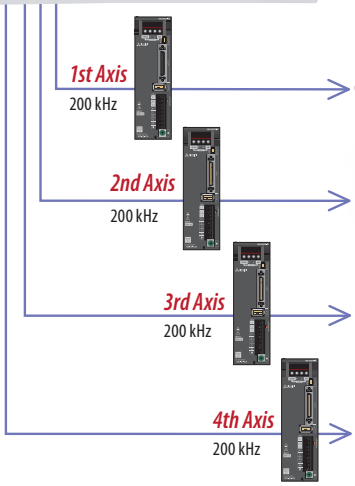


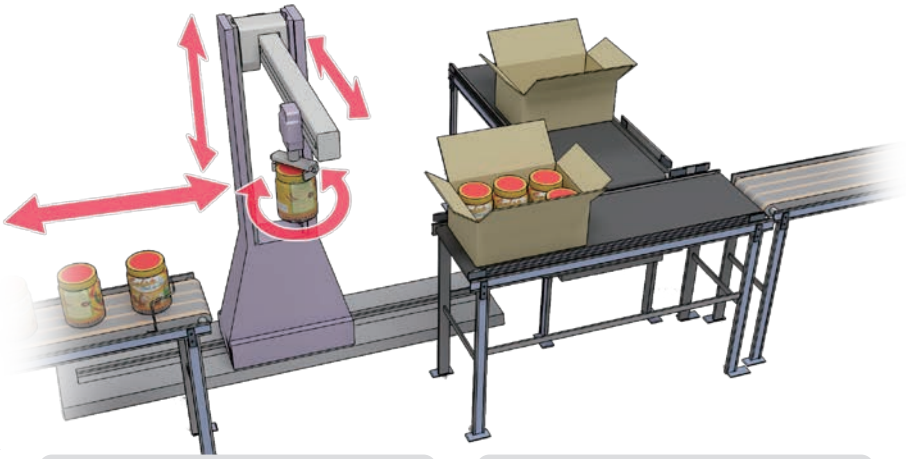
# Positioning Solution

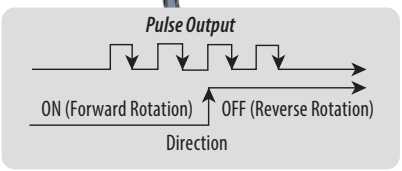
## Built-in Positioning (4-Axis built-in)

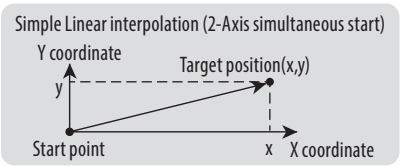



**The built-in high-speed pulse inputs and outputs on the FX5U, with special positioning operations instructions, are designed to satisfy simple independent-axis positioning applications using servo and stepping motors with speed and precision.**
**Positioning operations on different axes can also be started simultaneously.**





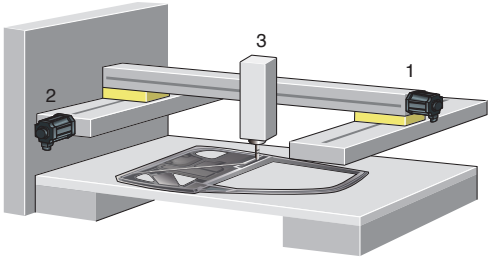

## Simple Motion Module (4-Axis module)

FX5-40SSC-S

SSCNET III/H

### Basic Positioning Control

**Positioning control is easily executed using a point table.**
**The machine can coat the workpiece by using a combination of linear interpolation, 2-Axis circular interpolation, and continuous trajectory control.**
**A smooth trajectory can be traced with the S-curve acceleration/deceleration function.**




1. X-Axis
2. Y-Axis
3. Z-Axis

**Application examples**

- Sealing
- Dispensers

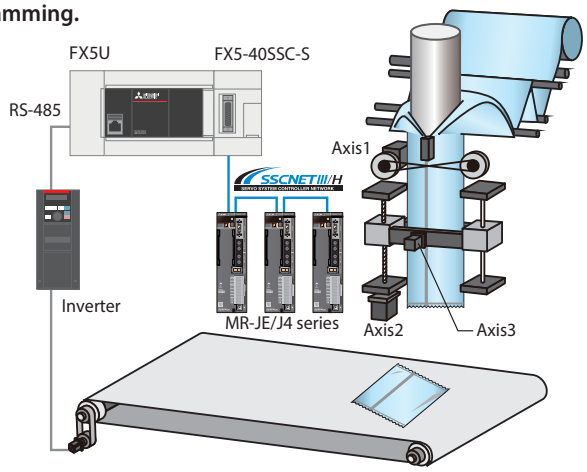
**Main functions**

- Continuous trajectory control
- Linear interpolation
- Circular interpolation
- S-curve acceleration/deceleration

# Advanced Motion Control

## Making Simple Motion with compactly packed extra functions

**Similar to positioning modules, simple motion modules are capable of a wide range of high-precision control such as positional control, advanced synchronous control, cam control, and speed-torque control with setup being done easily by parameters and programming.**




- Use synchronous control and cam functionality to make systems that work continuously and maximize output.
- In a vertical form, fill & seal machine, perform seal and cut while the film is continuously fed.
- With 64 cam profiles available, the same machine can be used for many different packaging styles.

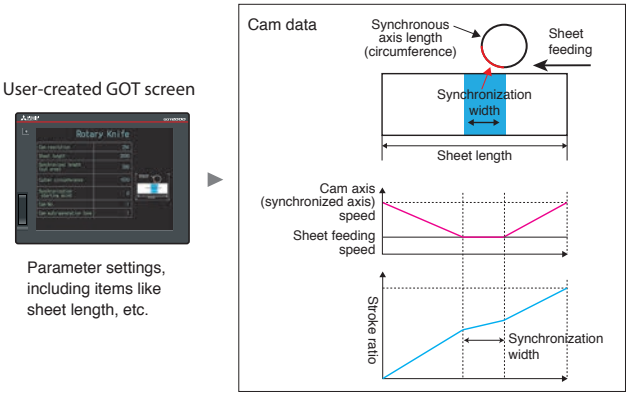
### Advanced synchronous control

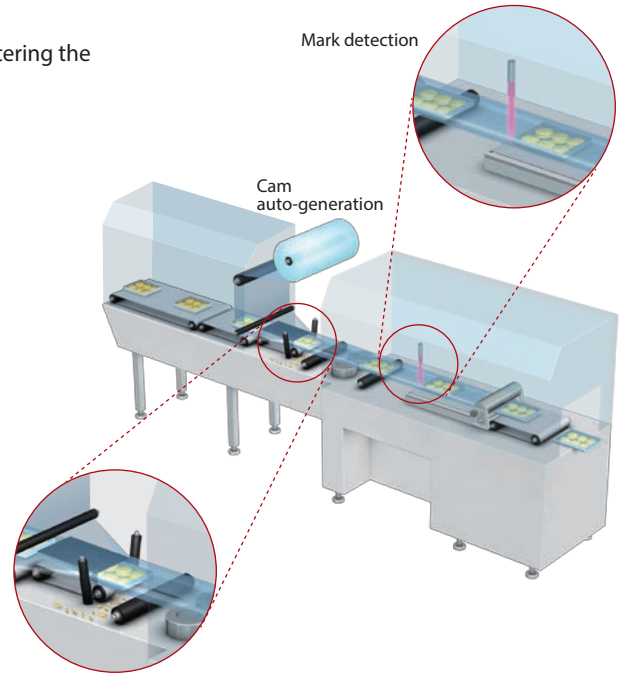
Software-based synchronous control can be used as an alternative to mechanical control, such as gear, shaft, transmission and cam. In addition, cam control is even easier with cam auto-generation. Synchronous control can be simply operated (start/stop) for each axis, allowing synchronous and positional control axes within the same program.

- Synchronous control
  All axes are synchronized using a synchronous encoder or servo input axes. Up to 4 control axes can be synchronized when using the synchronous encoder, such as that used for packaging machines, for example.

### Cam auto-generation

Cam data for a rotary cutter can be generated automatically simply by registering the sheet length, synchronization width, rotary cutter axis dimensions, etc.




### Mark detection

The actual position of the servo motor can be obtained based on the registration mark printed on the high-speed moving film. Compensation of the cutter axis position, based on the registration marks, keeps the constant cutting position.

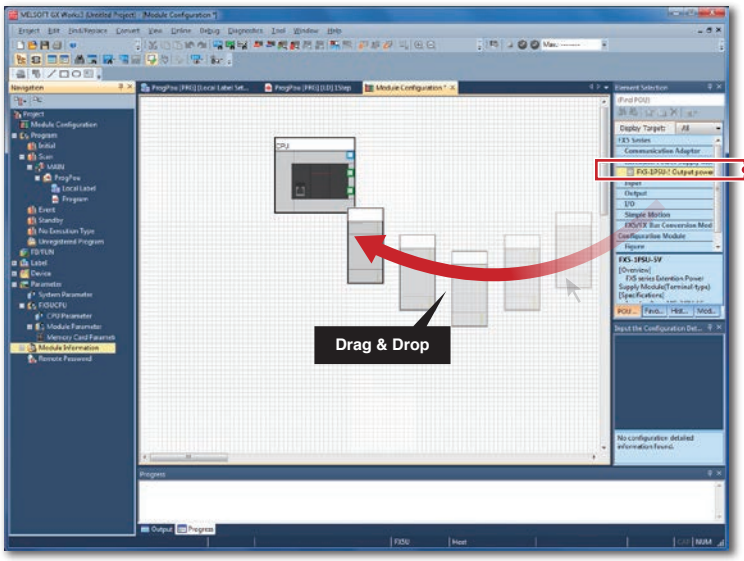
# Engineering Environment

# GX Works3

GX Works3 consists of various different components that help to simplify project creation and maintenance tasks.
A system design console that enables projects to be created at the system overview stage has been added.

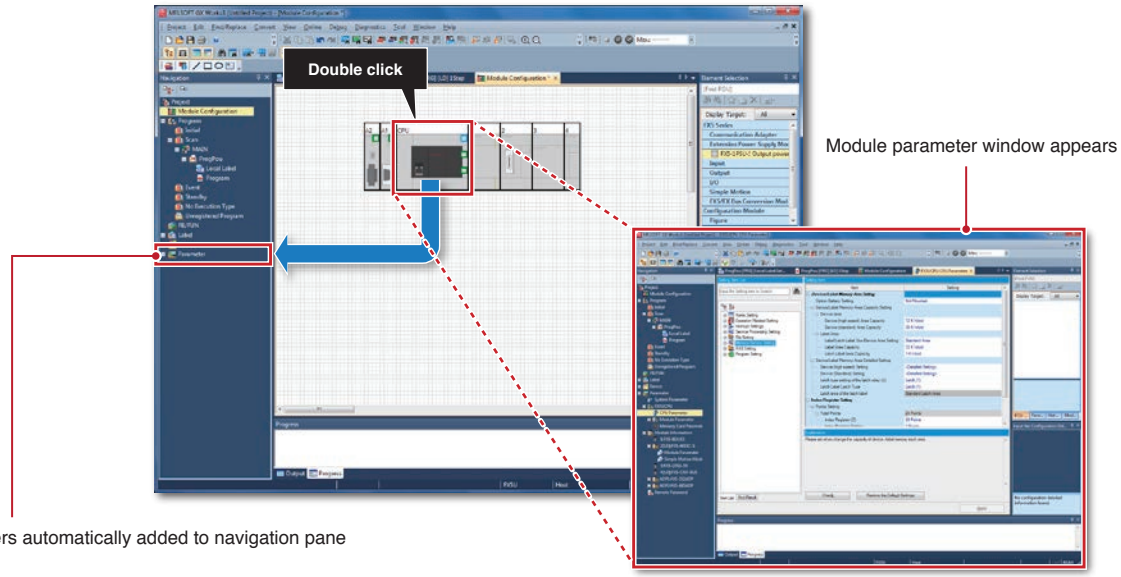
## System design with a convenient parts library

Most projects start from system design, so having a software application that caters to this initial stage is important. GX Works3 incorporates a system design feature that enables system components to be assembled directly in the programming software. It includes a parts library consisting of MELSEC iQ-F Series modules that can be used to simplify system creation.



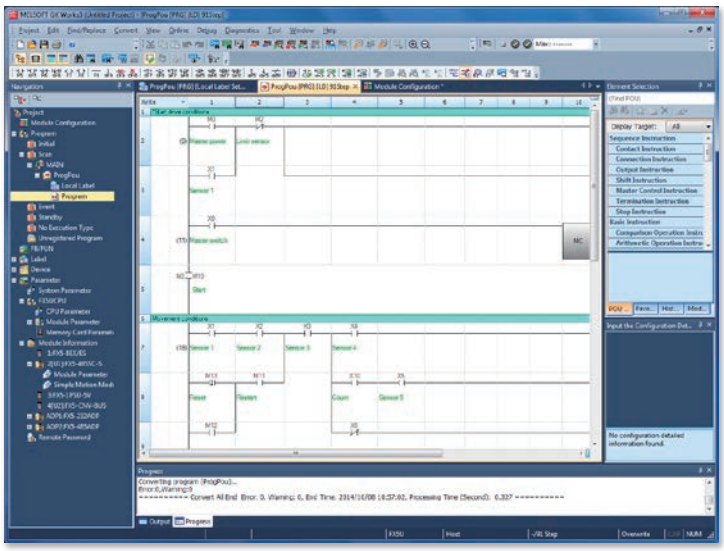

## Register module parameters on the fly

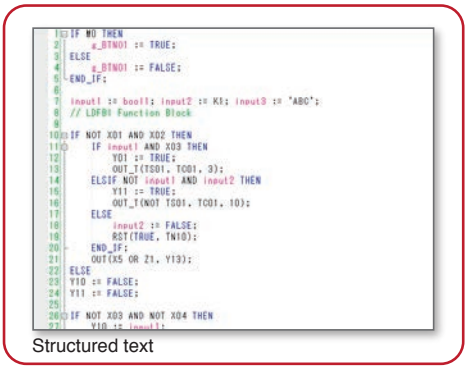
Another useful feature is the ability to register parameters automatically. Simply double-click on the desired module and the corresponding parameters will be registered in the project. A window with an easy-to-use parameter settings screen opens, enabling module parameters to be modified as needed.



## Main programming languages supported

The main IEC languages are supported by GX Works3. Various different programming languages can be used within the same project simultaneously and can be viewed easily via the menu tab. The variables and devices used in each program can be shared across multiple platforms, with user defined function blocks supported.

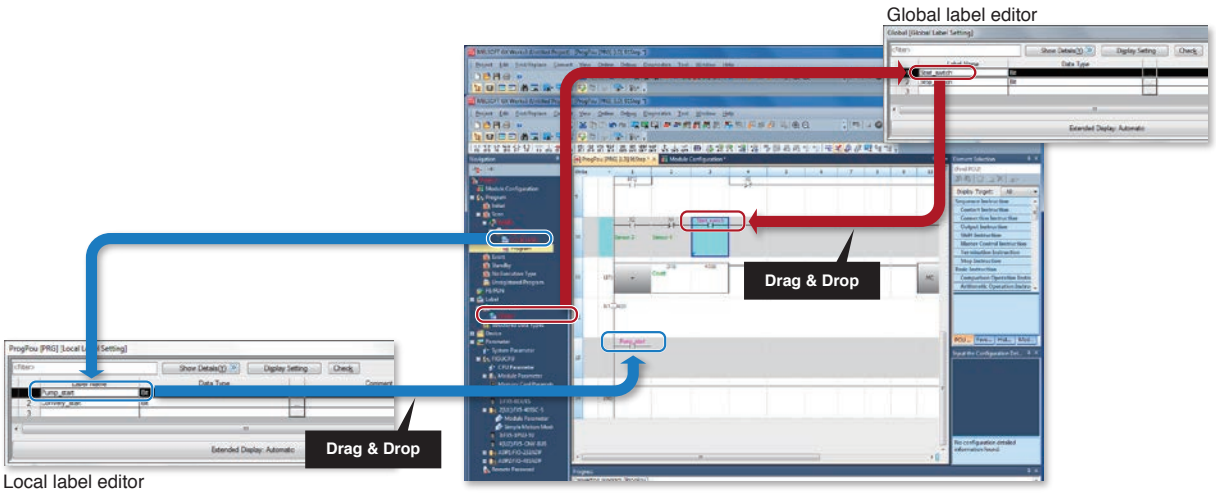




Structured text

## Reduce repetitive program tasks

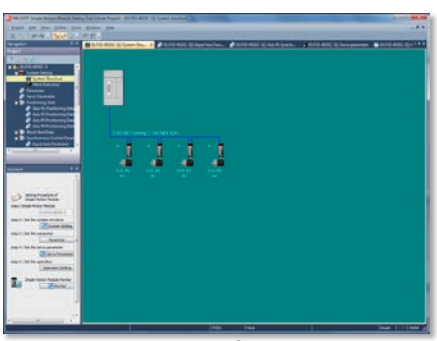
Global and local variables (labels) are supported providing an easy way to share device names across multiple projects, other MELSOFT software and third party SCADA. The variables can be registered into either the current program, function block as a local variable or within the project as a global variable to share across multiple programs within the same project. Variables specific to a particular module are also available, and can be used immediately, further reducing engineering time and cost.



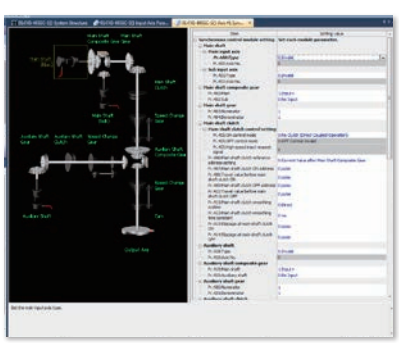

Local label editor

## Integrated motion setup tool

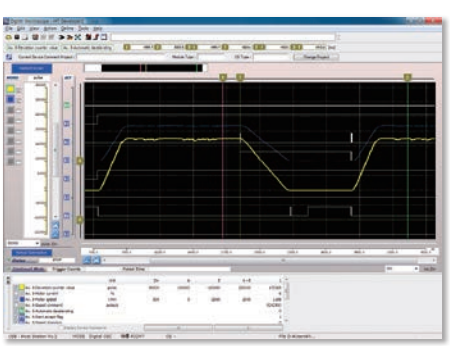
GX Works3 is equipped with a special motion setup tool that makes it easy to change simple motion module settings such as module parameters, positioning data and servo parameters. Also, the servo adjustment is simplified using it.



System configuration



Synchronous Control Parameter



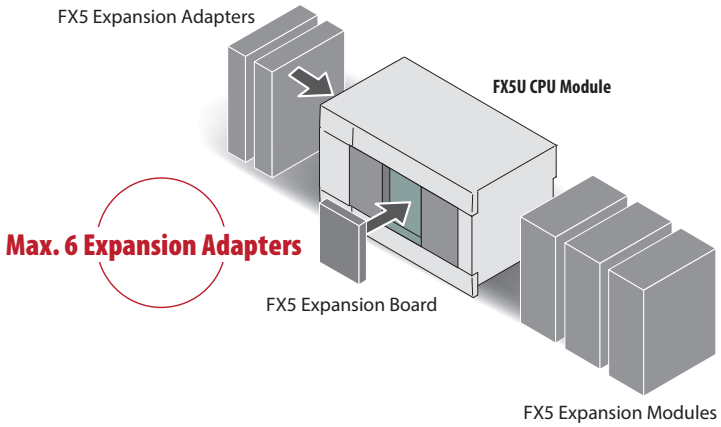
Digital oscilloscope

# Flexible Expandability

In addition to its built-in features,
FX5U also has a wealth of expansion options.

**New communication and analog expansion adapters available!**

The Expansion Adapters, also called ADPs, are extremely compact and easy to use. Various are available for serial communication and analog. Compared to the expansion boards, the ADPs offer more flexibility and performance.




## Expansion Adapters

Max. 2 ch

**Communication Adapter**

FX5-232ADP
FX5-485ADP

Max. 4 ch

**Analog Adapter**

*FX5-4AD-ADP*
*FX5-4DA-ADP*
*... Coming Soon*

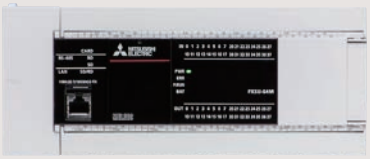
## Expansion Boards

Max. 1 ch

**Communication**

FX5-232-BD
FX5-485-BD
FX5-422-BD-GOT

## FX5U CPU Modules



FX5U-32MR/ES FX5U-64MR/ES FX5U-80MR/ES
FX5U-32MT/ES FX5U-64MT/ES FX5U-80MT/ES
FX5U-32MT/ESS FX5U-64MT/ESS FX5U-80MT/ESS

## Option

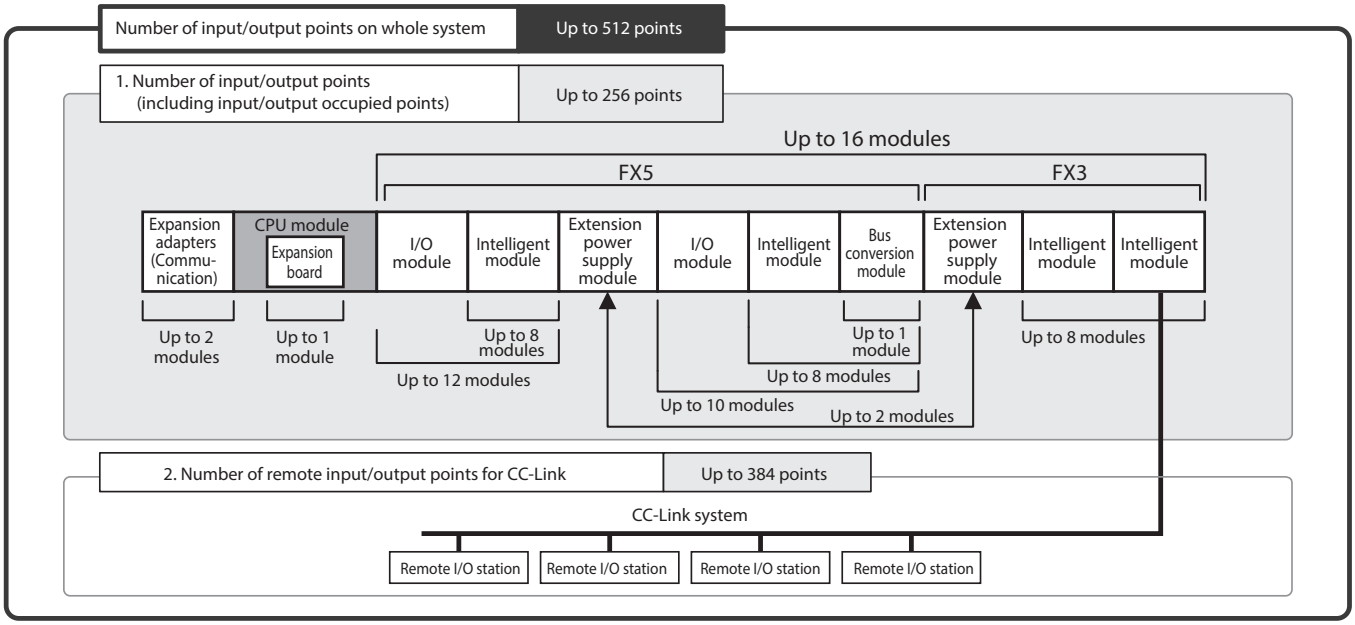
**Battery**

FX3U-32BL

**SD Card**

L1MEM-2GBSD
L1MEM-4GBSD

## Rules of System Configuration




## Expansion Modules

### I/O Modules

#### Powered I/O Modules

Powered Input/Output Modules

FX5-32ER/ES
FX5-32ET/ES
FX5-32ET/ESS

#### Unpowered I/O Modules

Input Modules

FX5-8EX/ES
FX5-16EX/ES

Output Modules

FX5-8EYR/ES
FX5-8EYT/ES
FX5-8EYT/ESS
FX5-16EYR/ES
FX5-16EYT/ES
FX5-16EYT/ESS

### Intelligent Function Modules

Simple Motion

FX5-40SSC-S

Network

*CC-Link/IE Field* slave

*... Future support*

### Extension Power Supply Module

Power Supply Module

FX5-1PSU-5V

## Bus Conversion Module

Bus Conversion Module

FX5-CNV-BUS

## FX3U Expansion Modules

### Extension Power Supply Module

Power Supply Module

FX3U-1PSU-5V

### FX3U Intelligent Modules

**Analog**

FX3U-4AD
FX3U-4DA

**Positioning**

FX3U-1PG

**Network**

FX3U-64CCL
FX3U-32DP
FX3U-16CCL-M
FX3U-64DP-M

**Temperature**

FX3U-4LC

**High Speed Counter**

FX3U-2HC

FX3U intelligent function modules must be set up by PLC program.
Parameter setup is not available in GX Works3.

# CPU module specification

## ☐ Generic Specifications

| Item | Specifications | | | | |
|---|---|---|---|---|---|
| Operating ambient temperature*1 | 0 to 55°C (32 to 131°F)*2 | | | | |
| Storage ambient temperature | -25 to 75°C(-13 to 167°F ) | | | | |
| Operating ambient humidity | 5 to 95%RH, non-condensation | | | | |
| Storage ambient humidity | 5 to 95%RH, non-condensation | | | | |
| Vibration resistance*2 | — | Frequency | Acceleration | Half amplitude | Sweep count |
| | Installed on DIN rail | 5 to 8.4 Hz | — | 1.75 mm | 10 times each in X, Y, Z directions (80 min in each direction) |
| | | 8.4 to 150 Hz | 4.9 m/s² | — | |
| | Direct installing | 5 to 8.4 Hz | — | 3.5 mm | |
| | | 8.4 to 150 Hz | 9.8 m/s² | — | |
| Shock resistance*3 | 147 m/s², Action time: 11 ms, 3 times by half-sine pulse in each direction X, Y, and Z | | | | |
| Noise durability | By noise simulator at noise voltage of 1000 Vp-p, noise width of 1 µs and period of 30 to 100 Hz | | | | |
| Grounding | Class D grounding (grounding resistance: 100 Ω or less) <Common grounding with a heavy electrical system is not allowed.>*4 | | | | |
| Operating atmosphere | Free from corrosive or flammable gas and excessive conductive dust | | | | |
| Operating altitude*5 | 0 to 2000 m | | | | |
| Installation location | Inside a control panel | | | | |
| Overvoltage category | II or less | | | | |
| Pollution degree*6 | 2 or less | | | | |
| Equipment class | Class 2 | | | | |

*1 : The simultaneous ON ratio of available PLC inputs or outputs changes with respect to the ambient temperature, refer to manuals of each product.
*2 : For details on Intelligent function modules, refer to manuals of each product.
*3 : The criterion is shown in IEC61131-2.
*4 : Ground the PLC independently or jointly.
*5 : The PLC cannot be used at a pressure higher than the atmospheric pressure to avoid damage.
*6 : This index indicates the degree to which conductive material is generated in the environment in which the equipment is used. Pollution level 2 is when only non-conductive pollution occurs. Temporary conductivity caused by condensation must be expected occasionally.

## ☐ Power Supply Specifications

| Item | | Specifications | | |
|---|---|---|---|---|
| | | FX5U-32M | FX5U-64M | FX5U-80M |
| Rated voltage | | 100 to 240 V AC | | |
| Allowable supply voltage range | | 85 to 264 V AC | | |
| Frequency rating | | 50/60 Hz | | |
| Allowable instantaneous power failure time | | Operation can be continued upon occurrence of instantaneous power failure for 10 ms or less. | | |
| Power fuse | | 250 V, 3.15 A Time-lag fuse | 250 V, 5 A Time-lag fuse | |
| Rush current | | 25 A max. 5 ms or less/100 V AC 50 A max. 5 ms or less/200 V AC | 30 A max. 5 ms or less/100 V AC 60 A max. 5 ms or less/200 V AC | |
| Power consumption*1 | | 30 W | 40 W | 45 W |
| 5 V DC power supply capacity | | 900 mA | 1100 mA | 1100 mA |
| 24 V DC service power supply capacity*2 | When service power supply is used for input circuits | 400 mA | 600 mA | 600 mA |
| | When external power supply is used for input circuits | 480 mA | 740 mA | 770 mA |

*1 : This value is for when all 24 V DC service power supplies are used in the maximum configuration in which they can be connected to the CPU module. The input current is included.
*2 : When I/O modules are connected, they consume current from the 24 V DC service power.

## ☐ Performance Specifications

| Item | | Specifications |
|---|---|---|
| Control system | | Stored-program repetitive operation |
| Input/output control system | | Refresh system (Direct access input/output allowed by specification of direct access input/output [DX, DY]) |
| Programming specifications | Programming language | Ladder diagram (LD), structured text (ST) |
| | Programming extension function | Function block (FB), structured ladder, label programming (local/global) |
| | Constant scan | 0.2 to 2000 ms (can be set in 0.1 ms increments) |
| | Fixed cycle interrupt | 1 to 60000 ms (can be set in 1 ms increments) |
| | Timer performance specifications | 100 ms, 10 ms, 1 ms |
| | No. of program executions | 32 |
| | No. of FB files | 16 |
| Operation specifications | Execution type | Standby type, initial execution type, scan execution type, event execution type |
| | Interrupt type | Internal timer interrupt, interrupt from input, high-speed comparison match interrupt |
| Command processing time | LD X0 | 34 ns |
| | MOV D0 D1 | 34 ns |
| Memory capacity | Program capacity | 64 K steps (128 Kbytes) |
| | SD memory card | Memory card capacity (SD/SDHC memory card: Max. 4 Gbytes) |
| | Device/label memory | 120 Kbytes |
| | Data memory/standard ROM | 5 Mbytes |
| Flash memory write count | | Maximum 20000 times |
| File storage capacity | Device/label memory | 1 |
| | Data memory P: No. of program files/FB: No. of FB files | P: 32, FB: 16 |
| Clock function | Display data | Year, month, day, hour, minute, second, day of week (leap year automatic detection) |
| | Precision | -2.96 to +3.74 s (TYP.+1.42 s/d at 0°C (32°F)) -3.18 to +3.74 s (TYP.+1.50 s/d at 25°C (77°F)) -13.20 to +2.12 s (TYP.-3.54 s/d at 55°C (131°F)) |
| No. of input/output points | (1) No. of input/output points | 256 points or less |
| | (2) No. of remote I/O points | 384 points or less |
| | Total No. of points of (1) and (2) | 512 points or less |
| Power failure retention*1 | Retention method | Large-capacity capacitor |
| | Retention time | 10 days |
| | Data retained | Clock data |

*1 : The retention period of a fully charged capacitor (electricity is conducted across the PLC for at least 30 minutes) is 10 days (ambient temperature: 25°C (77°F)).

## ☐ Number of device points

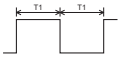
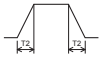
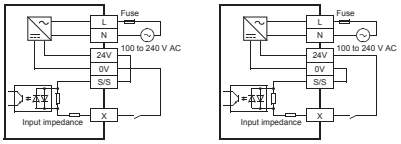
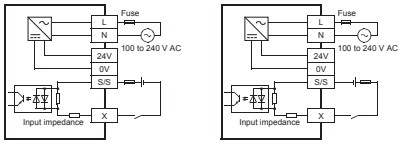
| Item | | | Base | Max. number of points | |
|---|---|---|---|---|---|
| No. of user device points | Input relay (X) | | 8 | 1024 points | The total number of input/output points must not exceed 256 points. |
| | Output relay (Y) | | 8 | 1024 points | |
| | Internal relay (M) | | 10 | 32768 points (can be changed with parameter)*1 | |
| | Latch relay (L) | | 10 | 32768 points (can be changed with parameter)*1 | |
| | Link relay (B) | | 16 | 32768 points (can be changed with parameter)*1 | |
| | Annunciator (F) | | 10 | 32768 points (can be changed with parameter)*1 | |
| | Link special relay (SB) | | 16 | 32768 points (can be changed with parameter)*1 | |
| | Step relay (S) | | 10 | 4096 points (fixed) | |
| | Timer system | Timer (T) | 10 | 1024 points (can be changed with parameter)*1 | |
| | Accumulation timer system | Accumulation timer (ST) | 10 | 1024 points (can be changed with parameter)*1 | |
| | Counter system | Counter (C) | 10 | 1024 points (can be changed with parameter)*1 | |
| | | Long counter (LC) | 10 | 1024 points (can be changed with parameter)*1 | |
| | Data register (D) | | 10 | 8000 points (can be changed with parameter)*1 | |
| | Link register (W) | | 16 | 32768 points (can be changed with parameter)*1 | |
| | Link special register (SW) | | 16 | 32768 points (can be changed with parameter)*1 | |
| No. of system device points | Special relay (SM) | | 10 | 10000 points (fixed) | |
| | Special register (SD) | | 10 | 12000 points (fixed) | |

*1 : Can be changed with parameters within the capacity range of the CPU built-in memory.
*2 : Total of the index register (Z) and long index register (LZ) is maximum 24 words.

| Item | | | Base | Max. number of points |
|---|---|---|---|---|
| Module access device | Intelligent function module device | | 10 | 65536 points (designated by U□\G□) |
| No. of index register points | Index register(z)*2 | | 10 | 24 points |
| | Long index register (LZ)*2 | | 10 | 12 points |
| No. of file register points | File register (R) | | 10 | 32768 points (can be changed with parameter)*1 |
| No. of nesting points | Nesting (N) | | 10 | 15 points (fixed) |
| No. of pointer points | Pointer (P) | | 10 | 4096 points |
| | Interrupt pointer (I) | | 10 | 178 points (fixed) |
| Others | Decimal constant (K) | Signed | — | 16 bits: -32768 to 32767, 32 bits: -2147483648 to 2147483647 |
| | | Unsigned | — | 16 bits: 0 to 65535, 32 bits: 0 to 4294967295 |
| | Hexadecimal constant (H) | | — | 16 bits: 0 to FFFF, 32 bits: 0 to FFFFFFFF |
| | Real constant (E) | Single precision | — | E-3.40282347+38 to E-1.17549435-38, 0, E1.17549435-38 to E3.40282347+38 |
| | Character string | | — | Shift-JIS code max. 255 single-byte characters (256 including NULL) |

## ☐ Input Specifications

### 24 V DC input (sink/source)

| Item | | Specifications | | |
|---|---|---|---|---|
| | | FX5U-32M | FX5U-64M | FX5U-80M |
| No. of input points | | 16 points | 32 points | 40 points |
| Connection type | | Removable terminal block (M3 screws) | | |
| Input type | | Sink/source | | |
| Input signal voltage | | 24 V DC +20 %, -15% | | |
| Input signal current | X000 to X017 | 5.3 mA/24 V DC | | |
| | X020 and subsequent | 4.0 mA/24 V DC | | |
| Input impedance | X000 to X017 | 4.3 kΩ | | |
| | X020 and subsequent | 5.6 kΩ | | |
| ON input sensitivity current | X000 to X017 | 3.5 mA or more | | |
| | X20 and subsequent | 3.0 mA or more | | |
| OFF input sensitivity current | | 1.5 mA or less | | |
| Input response frequency | X000 to X005 | 200 kHz | — | |
| | X006 to X017 | 10 kHz | — | |
| | X000 to X007 | — | 200 kHz | |
| | X006 to X017 | — | 10 kHz | |
| | X020 and subsequent | — | 0.1±0.05 kHz | |
| Pulse waveform | Waveform |  T1 (pulse width)  T2 (rise/fall time) | | |
| | X000 to X005 | T1: 2.5 µs or more, T2: 1.25 µs or more | — | |
| | X006 to X017 | T1: 50 µs or more, T2: 25 µs or more | — | |
| | X000 to X007 | — | T1: 2.5 µs or more,T2: 1.25 µs or more | |
| | X010 to X017 | — | T1: 50 µs or more,T2: 25 µs or more | |
| Input response time (H/W filter delay) | X000 to X005 | ON: 2.5 µs or less, OFF: 2.5 µs or less | — | |
| | X006 to X017 | ON: 30 µs or less, OFF: 50 µs or less | — | |
| | X000 to X007 | — | ON: 2.5 µs or less,OFF: 2.5 µs or less | |
| | X010 to X017 | — | ON: 30 µs or less,OFF: 50 µs or less | |
| Input response time (Digital filter setting value) | | None, 10 µs, 50 µs, 0.1 ms, 0.2 ms, 0.4 ms, 0.6 ms, 1 ms, 5 ms, 10 ms, 20 ms, 70 ms<br>When using the product in an environment with much noise, set the digital filter. | | |
| Input signal format | | No-voltage contact input<br>Sink: NPN open collector transistor<br>Source: PNP open collector transistor | | |
| Input circuit configuration | | • When using service power supply<br>Sink input wiring / Source input wiring<br>  <br>• When using external power supply<br>Sink input wiring / Source input wiring<br>  | | |



### Analog input

| Item | | Specifications |
|---|---|---|
| Analog input points | | 2 points (2 channels) |
| Analog input | Voltage | 0 to 10 V DC (input resistance 115.7 kΩ) |
| Digital output | | Unsigned 12-bit binary |
| I/O characteristics, Maximum resolution | Digital output value | 0 to 4000 |
| | Maximum resolution | 2.5 mV |
| Accuracy (Accuracy in respect to maximum digitaloutput value) | Ambient temperature 25±5°C (77±41°F) | Within ±0.5% (±20 digit*1) |
| | Ambient temperature 0 to 55°C (32 to 131°F) | Within ±1.0% (±40 digit*1) |
| Conversion speed | | 30 µs/channel (data refreshed every operation cycle) |
| Absolute maximum input | | -0.5 V, +15 V |
| Insulation method | Between input terminal and PLC | Not insulated |
| | Between input terminals | Not insulated |
| Occupied points | | 0 points (does not pertain to the max. No. of input/output points of the PLC.) |
| Terminal block used | | European-type terminal block |

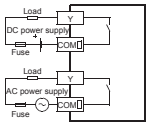
*1 : "Digit" refers to digital values.

### Built-in RS-485 communication

| Item | Specifications |
|---|---|
| Transmission standards | Conforms to RS-485/RS-422 specifications |
| Data transmission speed | Max. 115.2 kbps |
| Communication method | Full duplex (FDX) / half duplex (HDX) |
| Maximum total extension distance | 50 m (164' 0") |
| Protocol type | MELSOFT connection |
| | Non-protocol communication |
| | MODBUS RTU |
| | Inverter communication |
| Insulation method | Not insulated |
| Terminal resistors | Built-in (OPEN/110 Ω/330 Ω) |
| Terminal block used | European-type terminal block |

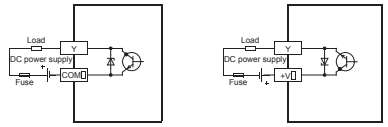
## ☐ Output Specifications

### Relay output

| Item | | Output Specifications | | |
|---|---|---|---|---|
| | | FX5U-32M | FX5U-64M | FX5U-80M |
| No. of output points | | 16 points | 32 points | 40 points |
| Connection type | | Removable terminal block (M3 screws) | | |
| Output type | | Relay | | |
| External power supply | | 30 V DC or less<br>240 V AC or less ("250 V AC or less" if not a CE, UL, cUL compliant item) | | |
| Max. load | | 2 A/point<br>The total load current per common terminal should be the following value.<br>• 4 output points/common terminal: 8 A or less<br>• 8 output points/common terminal: 8 A or less | | |
| Min. load | | 5 V DC, 2 mA (reference values) | | |
| Open circuit leakage current | | — | | |
| Response time | OFF→ON | Approx. 10 ms | | |
| | ON→OFF | Approx. 10 ms | | |
| Insulation of circuit | | Mechanical insulation | | |
| Indication of output operation | | LED is lit when output is on | | |
| Output circuit configuration | |  <br>A number is entered in the ☐ of [COM☐]. | | |



### Transistor output

| Item | | Output Specifications | | |
|---|---|---|---|---|
| | | FX5U-32M | FX5U-64M | FX5U-80M |
| No. of output points | | 16 points | 32 points | 40 points |
| Connection type | | Removable terminal block (M3 screws) | | |
| Output type | | Transistor/sink output (FX5U-☐MT/ES)<br>Transistor/source output (FX5U-☐MT/ESS) | | |
| External power supply | | 5 to 30 V DC | | |
| Max. load | | 0.5 A/point<br>The total load current per common terminal should be the following value.<br>• 4 output points/common terminal: 0.8 A or less<br>• 8 output points/common terminal: 0.8 A or less | | |
| Open circuit leakage current | | 0.1 mA or less/30 V DC | | |
| Voltage drop when ON | Y000 to Y003 | 1.0 V or less | | |
| | Y004 and subsequent | 1.5 V or less | | |
| Response time | Y000 to Y003 | 2.5 µs or less/10 mA or more (5 to 24 V DC) | | |
| | Y004 and subsequent | 0.2 ms or less/200 mA or more (24 V DC) | | |
| Insulation of circuit | | Photo-coupler insulation | | |
| Indication of output operation | | LED is lit when output is on | | |
| Output circuit configuration | | Sink output wiring / Source output wiring<br>  <br>A number is entered in the ☐ of [COM☐ ]. A number is entered in the ☐ of [+V☐ ]. | | |



### Analog output

| Item | | Specifications |
|---|---|---|
| Analog output points | | 1 points (1 channels) |
| Digital input | | Unsigned 12-bit binary |
| Analog output | Voltage | 0 to 10 V DC (external load resistance 2 k to 1 MΩ) |
| I/O characteristics, Maximum resolution | Digital input value | 0 to 4000 |
| | Maximum resolution | 2.5 mV |
| Accuracy (Accuracy in respect to maximum analog output value) | Ambient temperature 25±5°C (77±41°F) | Within ±0.5% (±20 digit*1) |
| | Ambient temperature 0 to 55°C (32 to 131°F) | Within ±1.0% (±40 digit*1) |
| Conversion speed | | 30 µs (data refreshed every operation cycle) |
| Insulation method | Between output terminal and PLC | Not insulated |
| Occupied points | | 0 points (does not pertain to the max. No. of input/output points of the PLC.) |
| Terminal block used | | European-type terminal block |

*1 : "Digit" refers to digital values.

### Built-in Ethernet communication

| Item | | Specifications |
|---|---|---|
| Data transmission speed | | 100M/10M (bps) |
| Communication mode | | Full duplex (FDX) / half duplex (HDX) |
| Transmission method | | Base band |
| Maximum segment length | | 100 m (328' 1") |
| Cascade connection | 10BASE-T | Cascade connection max. 4 stages*1 |
| | 100BASE-TX | Cascade connection max. 2 stages*1 |
| Protocol type | | MELSOFT connection |
| | | SLMP (3E frame) |
| | | Socket communication |
| Number of simultaneously open connections allowed | | 8 connections |
| Insulation method | | Pulse transformer insulation |
| Interface | | RJ45 connector |
| Cable used*2 | For 10BASE-T connection | Ethernet standard-compatible cable, category 3 or higher (STP cable) |
| | For 100BASE-TX connection | Ethernet standard-compatible cable, category 5 or higher (STP cable) |

*1 : Number of stages that can be connected when a repeater hub is used. When a switching hub is used, check the specifications of the switching hub used.
*2 : A straight cable can be used. If a personal computer and CPU module are directly connected (simple connection), a cross cable can be used.

# Simple motion module specification

## ☐ Control specification

| Item | | Specifications FX5-40SSC-S |
|---|---|---|
| Number of control axes (Virtual servo amplifier axis included) | | Up to 4 axes |
| Operation cycle (Operation cycle settings) | | 1.777 ms |
| Interpolation function | | Linear interpolation (Up to 4 axes), Circular interpolation (2 axes) |
| Control modes | | PTP (Point To Point) control, Trajectory control (both linear and arc), Speed control,Speed-position switching control, Position-speed switching control, Speed-torque control |
| Acceleration/deceleration process | | Trapezoidal acceleration/deceleration, S-curve acceleration/deceleration |
| Compensation function | | Backlash compensation, Electronic gear, Near pass function |
| Synchronous control | Input axis | Servo input axis,Virtual servo amplifier axis, Synchronous encoder axis |
| | Output axis | Cam axis (Up to 4 axes) |
| Cam control | Number of registration | Up to 64 (depending on memory capacity, cam resolution and number of coordinates) |
| | Cam data type | Stroke ratio data type, Coordinate data type |
| | Cam auto-generation | Cam auto-generation for rotary cutter |
| Control unit | | mm, inch, degree, pulse |
| Number of positioning data | | 600 data (positioning data No. 1 to 600)/axis (Can be set with MELSOFT GX Works3 or a sequence program.) |
| Backup | | Parameters, positioning data, and block start data can be saved on flash ROM (battery-less backup) |
| Home position return | Home position return method | Proximity dog method, Count method 1, Count method 2, Data set method, Scale home position signal detection method |
| | Fast home position return control | Provided |
| | Sub functions | Home position return retry, Home position shift |
| Positioning control | Linear control | 1-axis linear control, 2-axis linear interpolation control, 3-axis linear interpolation control, 4-axis linear interpolation control ※1 (Composite speed, Reference axis speed) |
| | Fixed-pitch feed control | 1-axis fixed-pitch feed, 2-axis fixed-pitch feed, 3-axis fixed-pitch feed, 4-axis fixed-pitch feed |
| | 2-axis circular interpolation | Sub point designation, center point designation |
| | Speed control | 1-axis speed control, 2-axis speed control, 3-axis speed control, 4-axis speed control |
| | Speed-position switching control | INC mode, ABS mode |
| | Position-speed switching control | INC mode |
| | Current value change | Positioning data, Start No. for a current value changing |
| | NOP instruction | Provided |
| | JUMP instruction | Unconditional JUMP, Conditional JUMP |
| | LOOP, LEND | Provided |
| | High-level positioning control | Block start, Condition start, Wait start, Simultaneous start, Repeated start |
| Manual control | JOG operation | Provided |
| | Inching operation | Provided |
| | Manual pulse generator | Possible to connect 1 module (Incremental), Unit magnification (1 to 10000 times) |
| Expansion control | Speed-torque control | Speed control without positioning loops, Torque control, Tightening & press-fit control |
| Absolute position system | | Made compatible by setting a battery to servo amplifier |
| Synchronous encoder interface | | Up to 4 channels (Total of the internal interface, via PLC CPU interface, and servo amplifier interface) |
| | Internal interface | 1 channel (Incremental) |
| Functions that limit control | Speed limit function | Speed limit value, JOG speed limit value |
| | Torque limit function | Torque limit value_same setting, torque limit value_individual setting |
| | Forced stop | Valid/Invalid setting |
| | Software stroke limit function | Movable range check with current feed value, movable range check with machine feed value |
| | Hardware stroke limit function | Provided |
| Functions that change control details | Speed change function | Provided |
| | Override function | 1 to 300 [%] |
| | Acceleration/deceleration time change function | Provided |
| | Torque change function | Provided |
| | Target position change function | Target position address and speed are changeable |
| Other functions | M-code output function | Provided |
| | Step function | Deceleration unit step, Data No. unit step |
| | Skip function | Via PLC CPU, Via external command signal |
| | Teaching function | Provided |
| Parameter initialization function | | Provided |
| External input signal setting function | | Via internal interface, CPU, servo amplifier |
| Amplifier-less operation function | | Provided |
| Mark detection function | | Regular mode, Specified Number of Detections mode, Ring Buffer mode |
| | Mark detection signal | Up to 4 points |
| | Mark detection setting | 4 settings |
| Optional data monitor function | | 4 points/axis |
| Driver communication function | | Provided |
| SSCNET connect/disconnect function | | Provided |
| Digital oscilloscope function※2 | Bit data | 16 ch |
| | Word data | 16 ch |

※1 : 4-axis linear interpolation control is enabled only at the reference axis speed.

※2 : 8 ch word data and 8CH bit data can be displayed in real time.

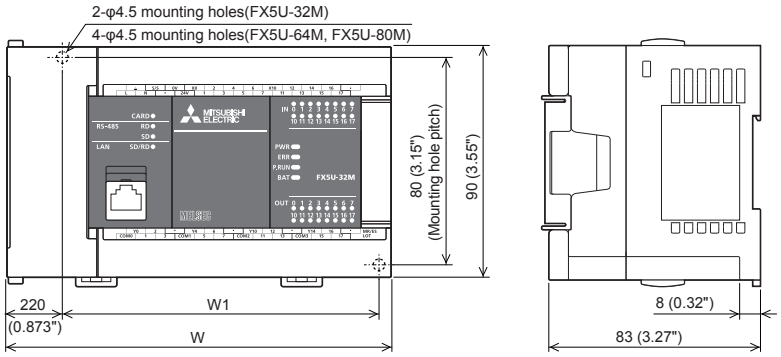
## ☐ Module specification

| Item | | | Specifications |
|---|---|---|---|
| Servo amplifier connection method | | | SSCNET III/H |
| Maximum overall cable distance [m(ft.)] | | | 400 (1312.32) |
| Maximum distance between stations [m(ft.)] | | | 100 (328.08) |
| Peripheral I/F | | | Via CPU module (Ethernet, RS-485) |
| Manual pulse generator operation function | | | Possible to connect 1 module |
| Synchronous encoder operation function | | | Possible to connect 4 modules (Total of the internal interface , via PLC CPU interface, and servo amplifier interface) |
| Input signals(DI) | | Number of input points | 4 points |
| | | Input method | Positive common/Negative common shared (Photocoupler isolation) |
| | | Rated input voltage/current | 24 V DC/ Approx. 5 mA |
| | | Operating voltage range | 19.2 to 26.4 V DC (24 V DC +10%/-20%, ripple ratio 5% or less) |
| | | ON voltage/current | 17.5 V DC or more/ 3.5 mA or more |
| | | OFF voltage/current | 7 V DC or less/ 1.0 mA or less |
| | | Input resistance | Approx. 6.8 kΩ |
| | | Response time | 1 ms or less (OFF→ON, ON→OFF) |
| | | Recommended wire size | AWG24 (0.2 $mm^2$) |
| Forced stop input signal (EMI) | | Number of input points | 1 point |
| | | Input method | Positive common/Negative common shared (Photocoupler isolation) |
| | | Rated input voltage/current | 24 V DC/ Approx. 5 mA |
| | | Operating voltage range | 19.2 to 26.4 V DC (24 V DC +10%/-20%, ripple ratio 5% or less) |
| | | ON voltage/current | 17.5 V DC or more/ 3.5 mA or more |
| | | OFF voltage/current | 7 V DC or less/ 1.0 mA or less |
| | | Input resistance | Approx. 6.8 kΩ |
| | | Response time | 4 ms or less (OFF→ON, ON→OFF) |
| | | Recommended wire size | AWG24 (0.2 $mm^2$) |
| Signal input form | | | Phase A/Phase B (magnification by 4/ magnification by 2/magnification by 1), PULSE/SIGN |
| Manual pulse generator/Incremental synchronous encoder signal | Differential output type (26LS31 or equivalent) | Input pulse frequency | Up to 1 Mpulse/s (After magnification by 4, up to 4 Mpulse/s) |
| | | Pulse width | 1 µs or more |
| | | Leading edge/trailing edge time | 0.25 µs or less |
| | | Phase difference | 0.25 µs or more |
| | | Rated input voltage | 5.5 V DC or less |
| | | High voltage | 2.0 to 5.25 V DC |
| | | Low voltage | 0 to 0.8 V DC |
| | | Differential voltage | ±0.2V |
| | | Cable length | Up to 30 m (98.43ft.) |
| | Voltageoutput/ Opencollector type (5 V DC) | Input pulse frequency | Up to 200 kpulse/s (After magnification by 4, up to 800 kpulse/s) |
| | | Pulse width | 5 µs or more |
| | | Leading edge/trailing edge time | 1.2 µs or less |
| | | Phase difference | 1.2 µs or more |
| | | Rated input voltage | 5.5 V DC or less |
| | | High voltage | 3.0 to 5.25 V DC/2 mA or less |
| | | Low voltage | 0 to 1.0 V DC/5 mA or more |
| | | Cable length | Up to 10m (32.81ft.) |
| 24 V DC internal current consumption | | | 0.25 A |
| Mass | | | 0.30 kg |
| Exterior dimensions [mm(inch)] | | | 90.0(3.55)(H)×50.0(1.97)(W)×83.0(3.27)(D) |

# External Dimensions

## Main Modules

Unit: mm (inches)



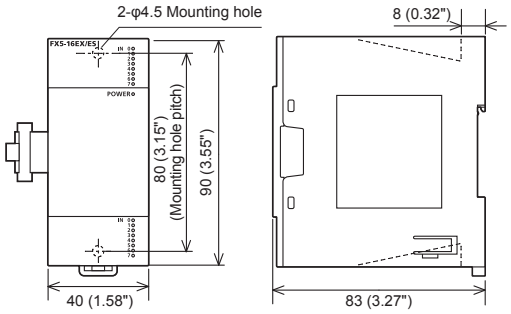

| Model | W: mm (inches) | W1 (mounting hole pitch): mm (inches) | Mass (weight) |
|---|---|---|---|
| FX5U-32M□ | 150 (5.91") | 123 (4.85") | Approx. 0.65 kg (1.43" lbs) |
| FX5U-64M□ | 220 (8.67") | 193 (7.60") | Approx. 1.00 kg (2.2" lbs) |
| FX5U-80M□ | 285 (11.23") | 258 (10.16") | Approx. 1.20 kg (2.64" lbs) |

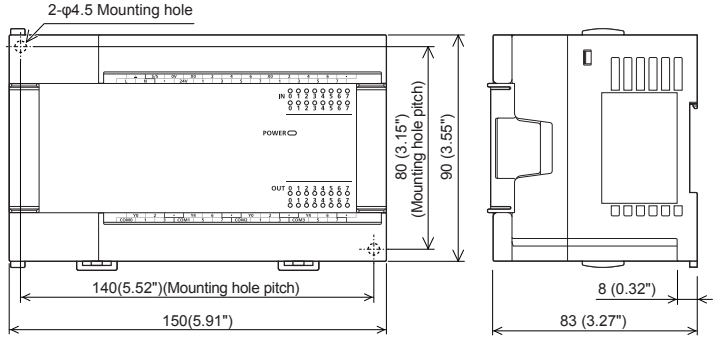
• Exterior color : Main body: Munsell 0.6B7.6/0.2
• Accessories : Dust proof protection sheet, Manual supplied with product

## Expansion Modules

### I/O Modules

Unit: mm (inches)



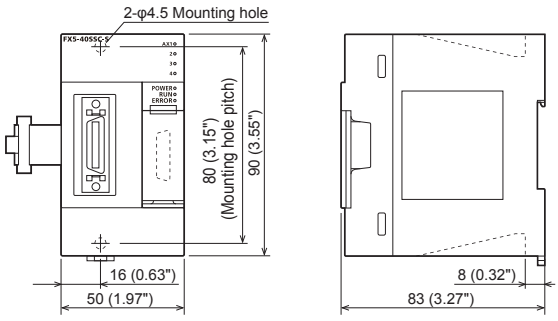




| Model | Mass (weight) |
|---|---|
| FX5-8EX/ES, FX5-8EYR/ES, FX5-8EYT/ES, FX5-8EYT/ESS | Approx. 0.2 kg (0.44" lbs) |
| FX5-16EX/ES, FX5-16EYR/ES, FX5-16EYT/ES, FX5-16EYT/ESS | Approx. 0.25 kg (0.551" lbs) |

| Model | Mass (weight) |
|---|---|
| FX5-32ER/ES, FX5-32ET/ES, FX5-32ET/ESS | Approx. 0.65 kg (1.43" lbs) |

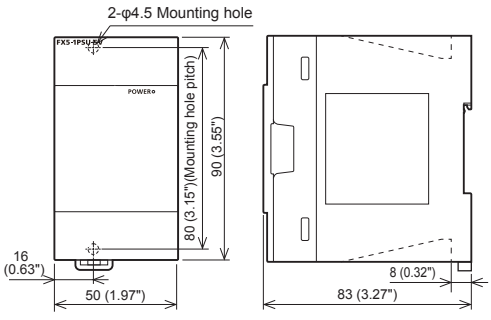
### Intelligent Function Module

FX5-40SSC-S



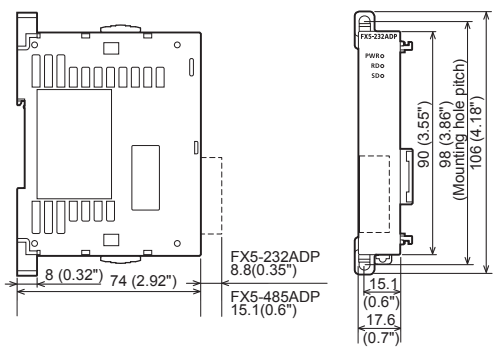

### Extension Power Supply Module

FX5-1PSU-5V



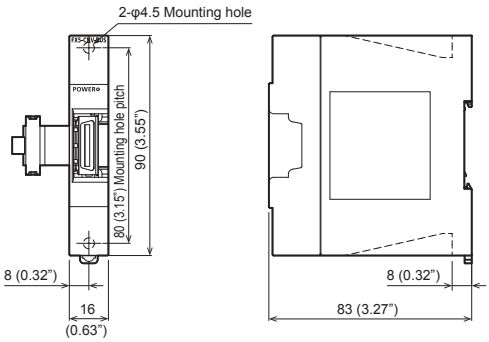

### Expansion Adapters

FX5-232ADP / FX5-485ADP




### Bus Conversion Module

FX5-CNV-BUS



# Products list

### CPU & I/O module

| Model | Specification | | | | |
|---|---|---|---|---|---|
| | Power Supply | Input | | Output | |
| FX5U-32MR/ES | 100 to 240 V AC 50/60 Hz | 16 points | 24 V DC Sink/source | 16 points | Relay |
| FX5U-32MT/ES | | | | | Transistor/sink |
| FX5U-32MT/ESS | | | | | Transistor/source |
| FX5U-64MR/ES | | 32 points | | 32 points | Relay |
| FX5U-64MT/ES | | | | | Transistor/sink |
| FX5U-64MT/ESS | | | | | Transistor/source |
| FX5U-80MR/ES | | 40 points | | 40 points | Relay |
| FX5U-80MT/ES | | | | | Transistor/sink |
| FX5U-80MT/ESS | | | | | Transistor/source |
| FX5-8EX/ES | Power supply from CPU module | 8 points | 24 V DC Sink/source | — | — |
| FX5-16EX/ES | | 16 points | | | |
| FX5-8EYR/ES | | — | — | 8 points | Relay |
| FX5-8EYT/ES | | | | | Transistor/sink |
| FX5-8EYT/ESS | | | | | Transistor/source |
| FX5-16EYR/ES | | — | — | 16 points | Relay |
| FX5-16EYT/ES | | | | | Transistor/sink |
| FX5-16EYT/ESS | | | | | Transistor/source |
| FX5-32ER/ES | 100 to 240 V AC 50/60 Hz | 16 points | 24 V DC Sink/source | 16 points | Relay |
| FX5-32ET/ES | | | | | Transistor/sink |
| FX5-32ET/ESS | | | | | Transistor/source |

### Expansion modules

| Model | Specification |
|---|---|
| FX5-40SSC-S | Simple motion module |
| FX5-1PSU-5V | Extension power supply module |
| FX5-CNV-BUS | Bus conversion module |

### Expansion Boards & Adapters

| Model | Specification |
|---|---|
| FX5-232-BD | For RS-232C communication |
| FX5-485-BD | For RS-485 communication |
| FX5-422-BD-GOT | For GOT RS-422 communication |
| FX5-232ADP | For RS-232C communication |
| FX5-485ADP | For RS-485 communication |

### Option

| Model | Specification |
|---|---|
| FX3U-32BL | Option battery |

### User's manuals for the applicable modules

| Manual name <manual number> | Description |
|---|---|
| MELSEC iQ-F series FX5U Hardware Manual <JY997D53401> | Describes the details of input/output specifications, wiring and installation of the FX5U CPU module from FX5U User's Manual [Hardware]. |
| MELSEC iQ-F series FX5U User's Manual [Hardware]<JY997D55301> | Describes the details on hardware of the FX5U series CPU module, including input/output specifications, wiring, installation, and maintenance. |
| MELSEC iQ-F series FX5 User's Manual [Application]<JY997D55401> | Describes basic knowledge required for program design, functions of the CPU module, devices/labels, and parameters. |
| MELSEC iQ-F series FX5 Programming Manual [Program Design]<JY997D55701> | Describes specifications of ladders, ST, and other programs and of labels. |
| MELSEC iQ-F series FX5 Programming Manual [Instructions, Functions]<JY997D55801> | Describes specifications of instructions and functions that can be used in programs. |
| MELSEC iQ-F series FX5 User's Manual [Serial Communication]<JY997D55901> | Describes inverter communication, and non-protocol communication. |
| MELSEC iQ-F series FX5 User's Manual [MODBUS Communication]<JY997D56101> | Describes MODBUS serial communication. |
| MELSEC iQ-F series FX5 User's Manual [Ethernet Communication]<JY997D56201> | Describes the functions of the built-in Ethernet port communication function. |
| MELSEC iQ-F series FX5 User's Manual [Positioning Control]<JY997D56301> | Describes the built-in positioning function. |
| FX5 Series User's Manual [Startup]<JY997D55301> | Performance specifications, procedures before operation, and troubleshooting of the CPU module. |

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Texts, figures and diagrams shown in this product catalog are intended exclusively for explanation and assistance in planning and ordering the FX5 programmable logic controllers (PLCs) and the associated accessories. Only the manuals supplied with the units are relevant for installation, commissioning and handling of the units and the accessories. The information given in the manuals must be read before installation and commissioning of the units or software.
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