# MITSUBISHI ELECTRIC

*Changes for the Better*

PROGRAMMABLE CONTROLLERS
MELSEC-F

for a greener tomorrow    eco Changes
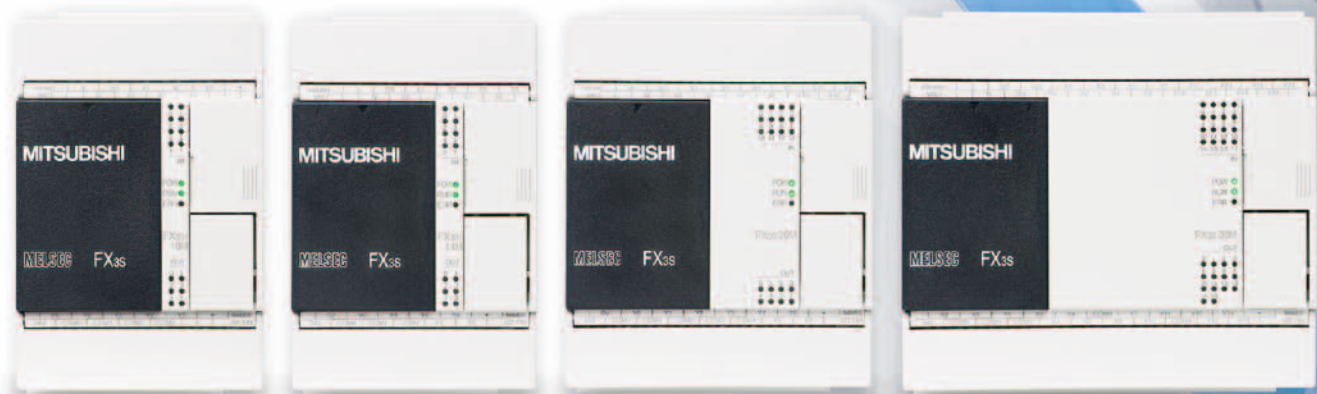
# New possibilities

– Introducing an entry level model for the FX3 series –
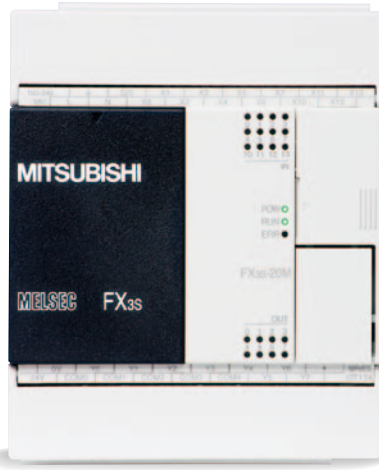
NEW **FX3s**

**Empowering Industries**

# FX3S

**NEW**

The newly released FX3S adds extra expandability to the high cost performance of the venerable entry-level FX1S. FX3S makes it possible to utilize analog, Ethernet and MODBUS® functions even in small-scale systems.
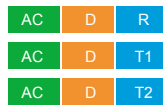
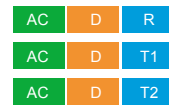## New possibilities

## Main unit lineup



| FX3S-10MR/ES | AC | D | R |
| FX3S-10MT/ES | AC | D | T1 |
| FX3S-10MT/ESS | AC | D | T2 |

6 inputs   4 outputs

| FX3S-14MR/ES | AC | D | R |
| FX3S-14MT/ES | AC | D | T1 |
| FX3S-14MT/ESS | AC | D | T2 |

8 inputs   6 outputs

| FX3S-20MR/ES | AC | D | R |
| FX3S-20MT/ES | AC | D | T1 |
| FX3S-20MT/ESS | AC | D | T2 |

12 inputs   8 outputs

| FX3S-30MR/ES | AC | D | R |
| FX3S-30MT/ES | AC | D | T1 |
| FX3S-30MT/ESS | AC | D | T2 |

16 inputs   14 outputs

| AC | AC power supply | D | DC input (sink/source) |
| R | Relay output | T1 | Transistor output (sink) | T2 | Transistor output (source) |

## System configuration example



Computer

GOT1000 Series

Memory Cassette

FX3S-CNV-ADP

High-speed counter input Up to 6ch
(60 kHz : 2 points, 10 kHz : 4 points)

2ch Analog Volume

USB

Ethernet

FX3S-30MR/ES

Computer

RS-422

Analog

Sensor
Up to 4ch

High-speed pulse output
Up to 2 axes
(100 kHz)

GOT1000 Series
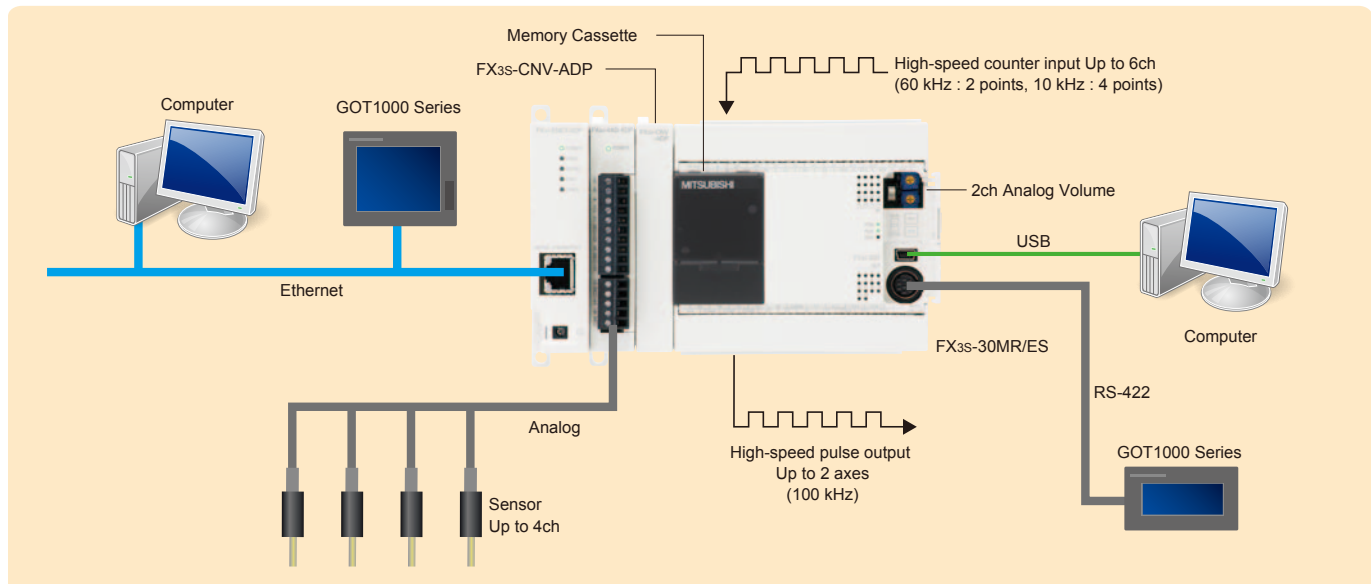
# All-inclusive FX3 series

**High-end Model**

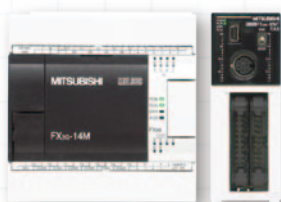## FX3U  FX3UC

Superior speed, power, and flexibility.
Realize high speed control, network support,
data logging, and more.

**Standard Model**

## FX3G  FX3GC

From automation to network, to more advanced control.
Supports features required for basic control and a variety
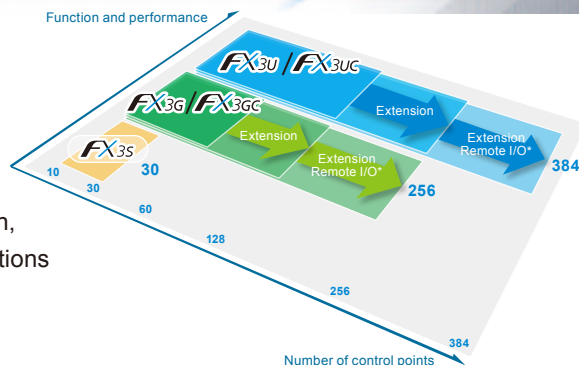of applications.

**Entry level Model**

## FX3S  NEW

Simple and cost effective.  Basic model that supports
analog and communication expansion.
Perfect for simple automation tasks.

Number of control points

## FX3 series is the 3rd generation of micro programmable controllers.

High speed, large capacity, and enhanced performance and
functions are assured.

Equipped with excellent expandability for analog, communication,
Ethernet, and positioning functions, a whole world of FX applications
awaits.

Function and performance

FX3U | FX3UC
FX3G | FX3GC
Extension
FX3S
Extension
Extension Remote I/O*
Extension Remote I/O*
10    30    256    384
30
60
128
256
384

Number of control points

| FX3 series feature comparison | | FX3S NEW | FX3G | FX3U |
|---|---|---|---|---|
| **Hardware** | Main unit I/O Control size | 10/14/20/30 points Max. 30 points | 14/24/40/60 points Max. 128 points (Max. 256 with remote I/O*) | 16/32/48/64/80/128 points Max. 256 points (Max. 384 with remote I/O*) |
| | Power supply | AC | AC, DC | AC, DC |
| | 24 V DC input | Sink/Source | Sink/Source | Sink/Source |
| | Output | Relay Type Transistor Type | Relay Type Transistor Type | Relay Type Transistor Type |
| **Built-in features** | Internal memory | 16,000 steps EEPROM (program capacity is limited to 4,000 steps.) | 32,000 steps EEPROM | 64,000 steps RAM (Battery backed) |
| | Communication port | USB/RS-422 | USB/RS-422 | RS-422 (USB option) |
| | High-speed counter | 1-phase 60 kHz : 2 points 10 kHz : 4 points | 1-phase 60 kHz : 4 points 10 kHz : 2 points | 1-phase 100 kHz : 6 points 10 kHz : 2 points |
| | Positioning control (transistor output type) | 2 axes 100 kHz | 14/24 Point type : 2 axes 40/60 Point type : 3 axes 100 kHz | 3 axes 100 kHz |
| | Variable analog potentiometer | 2 points | 2 points | — |

* : Remote I/O is CC-Link I/O.

## Excellent cost performance!

Equipped with the performance of FX3 series while maintaining backwards compatibility with FX1S.
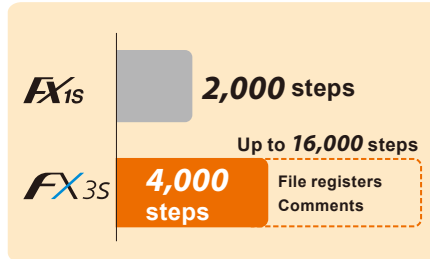
### ● High-speed operation

- FX3S processes basic instructions in 0.21 μs, which is faster by approximately 3 times compared with FX1S.
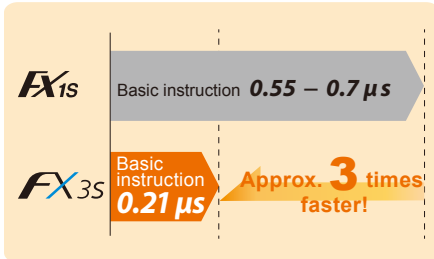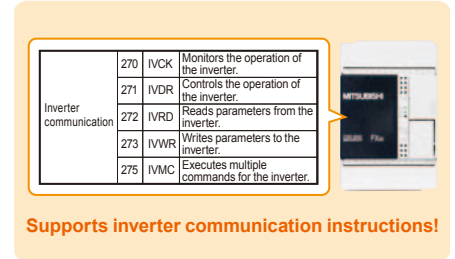
### ● Increased program capacity

- Up to 4,000 steps program capacity.
- 2,000 steps file register capacity.
- Up to 12,000 steps for comments.
  In total, the built-in EEPROM of the FX3S can store up to 16,000 steps.

### ● More instructions

- Supports inverter communication instructions.
- Supports floating point instructions.
- Supports 116 applied instructions (31 more instructions than FX1S).

| FX1S | Basic instruction **0.55 – 0.7 μ s** |
| --- | --- |
| FX3S | **Basic instruction 0.21 μs** Approx. **3** times faster! |

| FX1S | **2,000** steps |
| --- | --- |
| FX3S | Up to **16,000** steps / **4,000** steps / File registers Comments |

| Inverter communication | 270 | IVCK | Monitors the operation of the inverter. |
| --- | --- | --- | --- |
| | 271 | IVDR | Controls the operation of the inverter. |
| | 272 | IVRD | Reads parameters from the inverter. |
| | 273 | IVWR | Writes parameters to the inverter. |
| | 275 | IVMC | Executes multiple commands for the inverter. |

**Supports inverter communication instructions!**

### ● Enhanced communication functions

- Built-in USB (MINI B) port and RS-422 port.
- 115.2 kbps serial communication.
  USB port supports 12 Mbps communication speed.
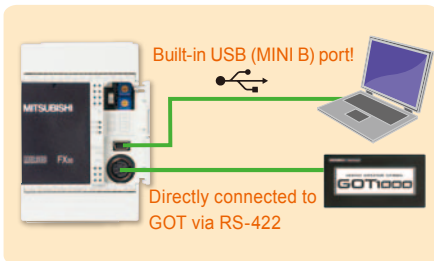
### ● Enhanced analog expandability

- Analog expansion board can be connected.
- Special analog adapter can be connected.
- Analog input adapter for temperature sensor can be connected.

### ● Compatibility with global standards

- Conforms to the EC Directive and UL Standard.
- Conforms to the Radio Law in South Korea.
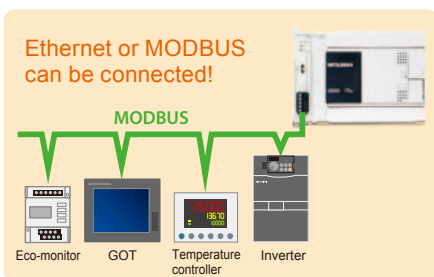- Select between sink and source inputs.

Built-in USB (MINI B) port!

Directly connected to GOT via RS-422

Supports temperature and analog functions!

**4** Up to channels

CE   c UL us LISTED

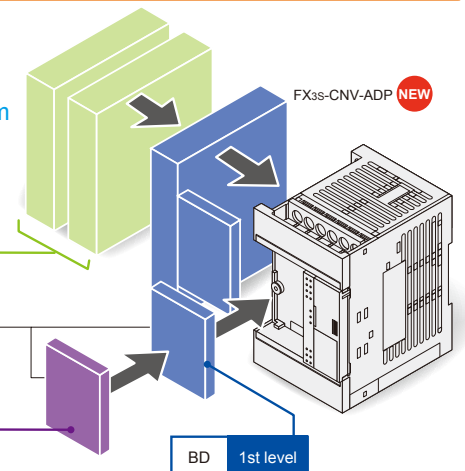## Unprecedented expandability with optional products!

Analog, Ethernet and MODBUS products can be connected.

### ● Enhanced expandability

- Special adapter for Ethernet can be connected.
- Special adapter for serial communication (compatible with MODBUS) can be connected.

Ethernet or MODBUS can be connected!

MODBUS

Eco-monitor   GOT   Temperature controller   Inverter

Optional product configuration diagram

FX3S-CNV-ADP NEW

Expansion board or memory cassette
(Restrictions with special adapter connections exist.)

BD 2nd level

BD 1st level

Max. 1 unit

Max. 1 unit    +    Max. 1 unit

**Analog special adapters**
FX3U-4AD-ADP
FX3U-4DA-ADP
FX3U-3A-ADP
FX3U-4AD-PT-ADP
FX3U-4AD-PTW-ADP
FX3U-4AD-PNK-ADP
FX3U-4AD-TC-ADP

**Communication special adapters**
FX3U-232ADP-MB
FX3U-485ADP-MB
FX3U-ENET-ADP*

**Memory cassette**
FX3G-EEPROM-32L

FX3G-EEPROM-32L can be connected to the second BD level when a communication board, analog expansion board or FX3S-CNV-ADP is connected on the first level.

**Connector conversion adapter**
FX3S-CNV-ADP NEW

**Memory cassette**
FX3G-EEPROM-32L

Max. 1 unit

**Communication expansion boards**
FX3G-232-BD
FX3G-422-BD
FX3G-485-BD

**Analog expansion boards**
FX3G-2AD-BD
FX3G-1DA-BD
FX3G-8AV-BD

Up to two special adapters (up to one analog adapter and up to one communication adapter) can be connected.
(Restrictions with expansion board connections exist.)
∗ : When using FX3U-ENET-ADP, connect it at the last stage (left end) of adapters.

## New possibilities using FX3S

Achieve extensive cost reductions by flexibly combining FX3S with other PLCs.
For example, by properly distributing PLCs in a network in accordance with the desired application, you can reduce loads on each CPU and costs of the entire system. In addition, you can construct an energy-saving system by combining with power monitoring functions.



CC-Link V2

- ● Controls the whole system.
- ● Controls each floor.
- ● Controls installations.
- ● Apparatus with specific function.
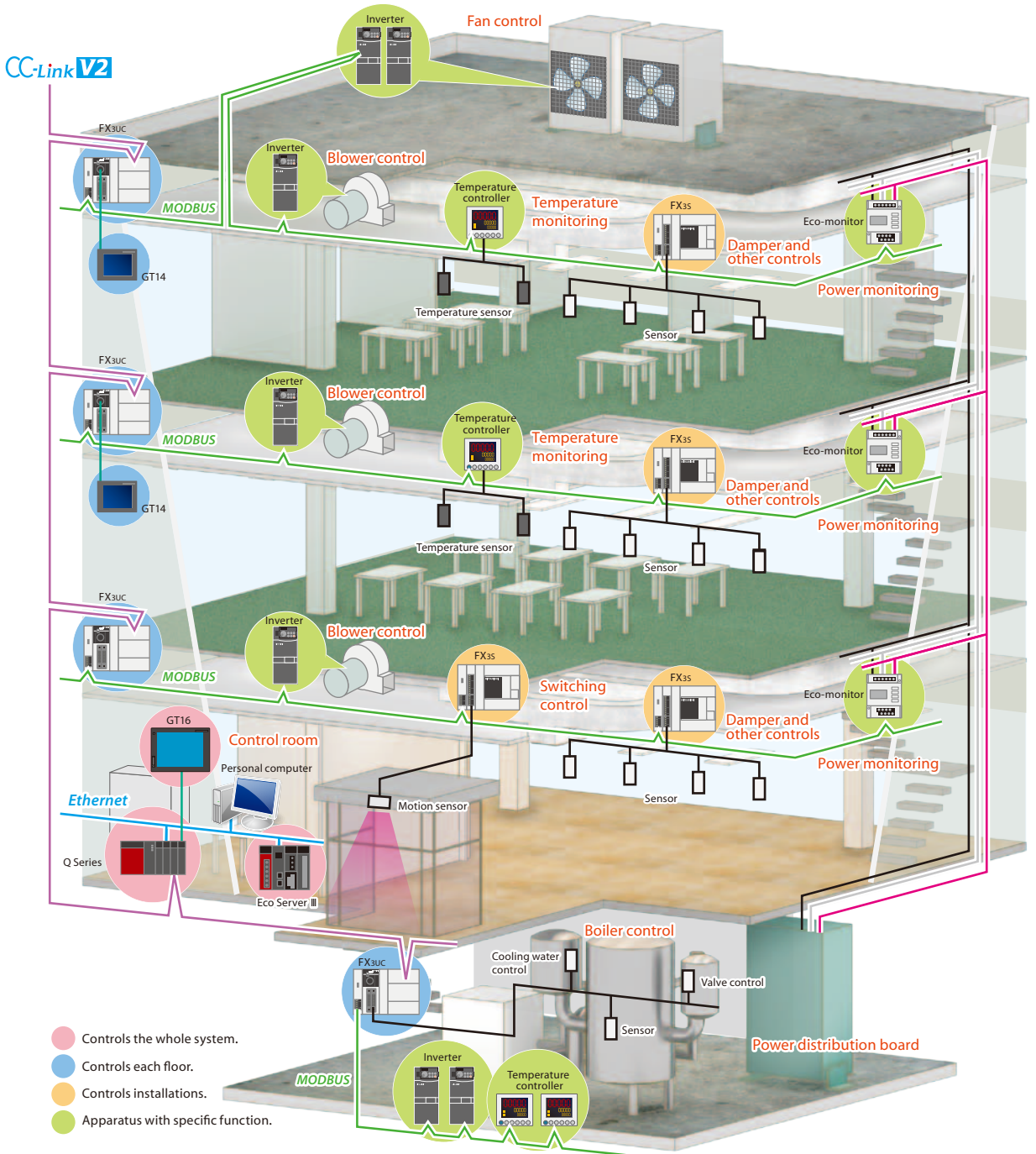
## Straightforward programming with GX Works2

Powerful, intuitive, and efficient.
GX Works2 reduces program development time with an easy to use interface.

Use GX Works2 also for setting up Ethernet.

FX3U-ENET-ADP



**Setup**

PLC engineering software

GX Works2

# PROGRAMMABLE CONTROLLERS

## ■Power Supply Specifications

| Item | Specification | | | |
|---|---|---|---|---|
| | FX3S-10M□/E□ | FX3S-14M□/E□ | FX3S-20M□/E□ | FX3S-30M□/E□ |
| Supply voltage | 100 to 240 V AC | | | |
| Allowable supply voltage range | 85 to 264 V AC | | | |
| Rated frequency | 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 1 A | | | |
| Rush current | 15 A max. 5 ms or less/100 V AC, 28 A max. 5 ms or less/200 V AC | | | |
| Power consumption*1 | 19 W | 19 W | 20 W | 21 W |
| 24 V DC service power supply | 400 mA | | | |

*1 : This item shows values when all 24 V DC service power supplies are used in the maximum configuration connectable to the main unit, and includes the input current (5 or 7 mA per point).

## ■24 V DC Input (sink/source) specifications
**(Please see the manual for input circuit configuration.)**

| Item | | Specification | | | |
|---|---|---|---|---|---|
| | | FX3S-10M□ | FX3S-14M□ | FX3S-20M□ | FX3S-30M□ |
| Number of input points | | 6 points | 8 points | 12 points | 16 points |
| Input connecting type | | Fixed terminal block (M3 screw) | | | |
| Input form | | Sink/Source | | | |
| Input signal voltage | | 24 V DC +10%, -10% | | | |
| Input impedance | X000 to X007 | 3.3 kΩ | | | |
| | X010 to X017 | — | | 4.3 kΩ | |
| Input signal current | X000 to X007 | 7 mA/24 V DC | | | |
| | X010 to X017 | — | | 5 mA/24 V DC | |
| ON input sensitivity current | X000 to X007 | 4.5 mA or more | | | |
| | X010 to X017 | — | | 3.5 mA or more | |
| OFF input sensitivity current | | 1.5 mA or less | | | |
| Input response time | | Approx. 10 ms | | | |
| Input signal form | Sink input | No-voltage contact input NPN open collector transistor | | | |
| | Source input | No-voltage contact input PNP open collector transistor | | | |
| Input circuit insulation | | Photocoupler insulation | | | |
| Input operation display | | LED on panel lights when photocoupler is driven. | | | |

## ■Relay output specifications
**(Please see the manual for output circuit configuration.)**

| Item | | Relay output specification | | | |
|---|---|---|---|---|---|
| | | FX3S-10MR/ES | FX3S-14MR/ES | FX3S-20MR/ES | FX3S-30MR/ES |
| Number of output points | | 4 points | 6 points | 8 points | 14 points |
| Output connecting type | | Fixed terminal block (M3 screw) | | | |
| Output form | | Relay | | | |
| External power supply | | 30 V DC or less, 240 V AC or less (250 V AC or less when the unit does not comply with CE, UL or cUL standards.) | | | |
| Max. load | Resistance load | 2 A/point The total load current of resistance loads per common terminal should be the following value. • 1 output point/common terminal: 2 A or less • 4 output points/common terminal: 8 A or less | | | |
| | Inductive load | 80 VA (UL and cUL standards approved at 120 and 240 V AC.) | | | |
| Min. load | | 5 V DC, 2 mA (reference value) | | | |
| Open circuit leakage current | | — | | | |
| Response time | OFF→ON ON→OFF | Approx. 10 ms | | | |
| Output circuit insulation | | Mechanical insulation | | | |
| Output operation display | | LED on panel lights when power is applied to relay coil. | | | |

## ■Transistor output specifications
**(Please see the manual for output circuit configuration.)**

| Item | | Transistor output specification | | | |
|---|---|---|---|---|---|
| | | FX3S-10MT□ | FX3S-14MT□ | FX3S-20MT□ | FX3S-30MT□ |
| Number of output points | | 4 points | 6 points | 8 points | 14 points |
| Output connecting type | | Fixed terminal block (M3 screw) | | | |
| Output form | | Transistor/sink output (FX3S-□MT/ES) Transistor/source output (FX3S-□MT/ESS) | | | |
| External power supply | | 5 to 30 V DC | | | |
| Max. load | Resistance load | 0.5 A/point The total load current of resistance loads per common terminal should be the following value. • 1 output point/common terminal: 0.5 A or less • 4 output points/common terminal: 0.8 A or less | | | |
| | Inductive load | 12 W/24 V DC The total of inductive loads per common terminal should be the following value. • 1 output point/common terminal: 12 W or less/ 24 V DC • 4 output points/common terminal: 19.2 W or less/24 V DC | | | |
| Open circuit leakage current | | 0.1 mA or less/30 V DC | | | |
| ON voltage | | 1.5 V or less | | | |
| Response time | OFF→ON ON→OFF | Y000, Y001: 5 µs or less/10 mA or more (5 to 24 V DC) Y002 to Y015: 0.2 ms or less/200 mA or more (at 24 V DC) | | | |
| Output circuit insulation | | Photocoupler insulation | | | |
| Output operation display | | LED on panel lights when photocoupler is driven. | | | |

## ■Performance specifications
**(General specification is the same as that of FX3U series. Please see the "MELSEC FX-FAMILY" catalog.)**

| Item | | Performance | |
|---|---|---|---|
| Operation control system | | Stored program repetitive operation system with interruption function. | |
| Input/output control system | | Batch processing system (when END instruction is executed) Input/output refresh instruction and pulse catch function are provided. | |
| Programming language | | Relay symbol system + step-ladder system (SFC notation possible) | |
| Program memory | Built-in memory capacity/type | 16,000 steps/EEPROM memory (Program capacity is 4000 steps.) Max. allowable write: 20,000 times | |
| | Memory cassette (Option) | 32,000 steps/EEPROM memory (with loader function) The FX3S series PLC is available only to 16,000 steps. (Program capacity is 4000 steps.) Max. allowable write: 10,000 times | |
| | Writing function during running | Provided (Program can be modified while the PLC is running.) | |
| | Keyword function | With keyword/Customer keyword function | |
| Real-time clock | Clock function*2 | Built-in 1980 to 2079 (with correction for leap year) 2- or 4-digit year, accuracy within 45 seconds/month at 25 °C | |
| Kinds of instructions | Basic instructions | Sequence instructions: 29 Step-ladder instructions: 2 | |
| | Applied instructions | 116 kinds | |
| Processing speed | Basic instructions | 0.21 µs/instruction | |
| | Applied instructions | 0.5 µs to several hundred µs/instruction | |
| Number of input/output points | Input points | 16 points or less (Extension is impossible.) | |
| | Output points | 14 points or less (Extension is impossible.) | |
| Input/output relay | Input relay | X000 to X017 | The device numbers are octal. |
| | Output relay | Y000 to Y015 | |
| Auxiliary relay | For general | M0 to M383 | 384 points |
| | EEPROM keep | M384 to M511 | 128 points |
| | For general | M512 to M1535 | 1024 points |
| | For special | M8000 to M8511 | 512 points |
| State | For initial state (EEPROM keep) | S0 to S9 | 10 points |
| | EEPROM keep | S10 to S127 | 118 points |
| | For general | S128 to S255 | 128 points |
| Timer (on-delay timer) | 100 ms | T0 to T31 | 32 points 0.1 to 3,276.7 sec |
| | 100 ms/10 ms | T32 to T62 | 31 points 0.1 to 3,276.7 sec/0.01 to 327.67 sec When M8028 is driven ON, timers T32 to T62 (31 points) are changed to 10 ms resolution. |
| | 1 ms | T63 to T127 | 65 points 0.001 to 32.767 sec |
| | 1 ms accumulating type | T128 to T131 | 4 points 0.001 to 32.767 sec |
| | 100 ms accumulating type | T132 to T137 | 6 points 0.1 to 3,276.7 sec |
| Variable analog potentiometers | | Available as analog timers VR1: D8030   VR2: D8031 | |
| Counter | 16 bits up (For general) | C0 to C15 | 16 points Counting from 0 to 32,767 |
| | 16 bits up (EEPROM keep) | C16 to C31 | 16 points Counting from 0 to 32,767 |
| | 32 bits up/down (For general) | C200 to C234 | 35 points Counting from -2,147,483,648 to +2,147,483,647 |
| High-speed counter | 1-phase 1-count input in both directions (32 bits up/down) (EEPROM keep) | C235 to C245 | Counting from -2,147,483,648 to +2,147,483,647 |
| | 1-phase 2-count input in both directions (32 bits up/down) (EEPROM keep) | C246 to C250 | |
| | 2-phase 2-count input in both directions (32 bits up/down) (EEPROM keep) | C251 to C255 | |
| Data register (32 bits when paired) | For general (16 bits) | D0 to D127 | 128 points |
| | For EEPROM keep (16 bits) | D128 to D255 | 128 points |
| | For general (16 bits) | D256 to D2999 | 2744 points |
| | File register (EEPROM keep) | D1000 to D2999 | Max. 2000 points / Can be set as file registers in units of 500 points from D1000 in the program area (EEPROM) using parameters. |
| | For special (16 bits) | D8000 to D8511 | 512 points |
| | For index (16 bits) | V0 to V7 Z0 to Z7 | 16 points |
| Pointer | For branching of JUMP and CALL | P0 to P255 | 256 points For CJ instructions and CALL instructions |
| | Input interruption | I0□□ to I5□□ | 6 points |
| | Timer interruption | I6□□ to I8□□ | 3 points |
| Nesting | For master control | N0 to N7 | 8 points For MC instructions |
| Constant | Decimal number (K) | 16 bits | -32,768 to +32,767 |
| | | 32 bits | -2,147,483,648 to +2,147,483,647 |
| | Hexadecimal number (H) | 16 bits | 0 to FFFF |
| | | 32 bits | 0 to FFFFFFFF |
| | Real number (E) | 32 bits | $-1.0 \times 2^{128}$ to $-1.0 \times 2^{-126}$, 0 , $1.0 \times 2^{-126}$ to $1.0 \times 2^{128}$ Decimal-point and exponential notations are possible. |
| Software/peripheral equipment | | GX Works2 | Version 1.492N or later *3 |
| | | FX-30P | Version 1.50 or later |

*2 : The current time of the clock is backed up by the capacitor built-in the PLC. Supply the power to the PLC for 30 minutes or more to completely charge this large-capacity capacitor. (The capacitor works for 10 days [atmosphere: 25 °C].)
*3 : To program FX3S in GX Developer, select FX3G as the PLC type. Please read the FX3S series user's manual about limitations.

## ■External Dimensions



FX3S
FX3S-CNV-ADP

2-φ4.5 mounting holes

Unit: mm (inches)

MASS (Weight): 0.1 kg (0.22 lbs)
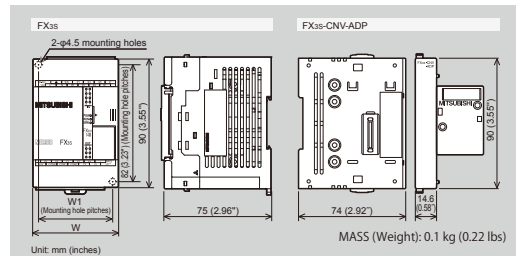
Accessories : Dust proof protection sheet
Manual supplied with product
Installation : 35 mm (1.38") wide DIN rail or Direct installation (with M4 screws)

| Series | W: mm (inches) | W1: mm (inches) Direct mounting hole pitches | MASS (Weight): kg (lbs) |
|---|---|---|---|
| FX3S-10M | 60(2.37") | 52(2.05") | 0.30(0.66 lbs) |
| FX3S-14M | 60(2.37") | 52(2.05") | 0.30(0.66 lbs) |
| FX3S-20M | 75(2.96") | 67(2.64") | 0.40(0.88 lbs) |
| FX3S-30M | 100(3.94") | 92(3.63") | 0.45(0.99 lbs) |

## ■Product specification

| Series | Model name | Power Supply | Input Specifications | | Output Specifications | | |
|---|---|---|---|---|---|---|---|
| | | | Number of points | Input type | Number of points | Output type | |
| Main Units | FX3S-10MR/ES | 100 to 240 V AC | 6 | 24 V DC (Sink/ Source) | 4 | Relay | NEW |
| | FX3S-10MT/ES | | 6 | | 4 | Transistor (Sink) | NEW |
| | FX3S-10MT/ESS | | 6 | | 4 | Transistor (Source) | NEW |
| | FX3S-14MR/ES | | 8 | | 6 | Relay | NEW |
| | FX3S-14MT/ES | | 8 | | 6 | Transistor (Sink) | NEW |
| | FX3S-14MT/ESS | | 8 | | 6 | Transistor (Source) | NEW |
| | FX3S-20MR/ES | | 12 | | 8 | Relay | NEW |
| | FX3S-20MT/ES | | 12 | | 8 | Transistor (Sink) | NEW |
| | FX3S-20MT/ESS | | 12 | | 8 | Transistor (Source) | NEW |
| | FX3S-30MR/ES | | 16 | | 14 | Relay | NEW |
| | FX3S-30MT/ES | | 16 | | 14 | Transistor (Sink) | NEW |
| | FX3S-30MT/ESS | | 16 | | 14 | Transistor (Source) | NEW |
| Connector conversion adapter | FX3S-CNV-ADP | Special adapter connection conversion adapter | | | | | NEW |
| Special adapters | FX3U-232ADP-MB | For RS-232C(MODBUS)communication | | | | | |
| | FX3U-485ADP-MB | For RS-485(MODBUS)communication | | | | | |
| | FX3U-ENET-ADP*4 | For Ethernet communication | | | | | |
| | FX3U-4AD-ADP | 4-ch voltage/current input | | | | | |
| | FX3U-4DA-ADP | 4-ch voltage/current output | | | | | |
| | FX3U-3A-ADP | 2-ch voltage/current input 1-ch voltage/current output | | | | | |
| | FX3U-4AD-PT-ADP | 4-ch platinum resistance thermometer sensor input (-50 to +250 °C) | | | | | |
| | FX3U-4AD-PTW-ADP | 4-ch platinum resistance thermometer sensor input (-100 to +600 °C) | | | | | |
| | FX3U-4AD-PNK-ADP | 4-ch Pt1000/Ni1000 resistance thermometer sensor input | | | | | |
| | FX3U-4AD-TC-ADP | 4-ch thermocouple (K, J type) temperature sensor input | | | | | |
| Expansion boards | FX3G-232-BD | For RS-232C communication | | | | | |
| | FX3G-422-BD | For RS-422 communication | | | | | |
| | FX3G-485-BD | For RS-485 communication | | | | | |
| | FX3G-8AV-BD | For 8-ch Analog volume | | | | | |
| | FX3G-2AD-BD | 2-ch voltage/current input | | | | | |
| | FX3G-1DA-BD | 1-ch voltage/current output | | | | | |
| Memory cassette | FX3G-EEPROM-32L | 32,000 steps EEPROM memory (with transfer switch)*5 | | | | | |

*4 : FX3U-ENET-ADP Ver. 1.20 or later is applicable to the FX3S series PLC.
*5 : FX3S series PLC can hold 16,000 steps of memory, but user program capacity is limited to 4000 steps.

## Registration
• Ethernet is a trademark of Xerox Corporation in the United States.
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