Side B | Side A JAPANESE / Side B ENGLISH

JY997D51701E

1

2

MITSUBISHI ELECTRIC

Programmable Controller

MELSEC-F

FX3S-30M□/E□-2AD

HARDWARE MANUAL

FX3S

Manual Number	JY997D51701
Revision	E
Date	December 2017

This manual describes the part names, dimensions, mounting, cabling and specifications of the product. Before use, read this manual and the manuals of all relevant products fully to acquire proficiency in handling and operating the product. Make sure to learn all the product information, safety information, and precautions.
Store this manual in a safe place so that it can be taken out and read whenever necessary. Always forward it to the end user.
Registration: Phillips is a registered trademark of Phillips Screw Company.
The company and product names described in this manual are registered trademarks or the trademarks of their respective companies.

Effective December 2017
Specifications are subject to change without notice.

Safety Precaution (Read these precautions before use.)

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
This manual classifies the safety precautions into two categories:

⚠WARNING and ⚠CAUTION.

⚠WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Depending on the circumstances, procedures indicated by ⚠CAUTION may also cause severe injury.
It is important to follow all precautions for personal safety.

STARTUP AND MAINTENANCE PRECAUTIONS ⚠WARNING

- Do not touch any terminal while the PLC's power is on.
  Doing so may cause electric shock or malfunctions.
- Before cleaning or retightening terminals, cut off all phases of the power supply externally. Failure to do so may cause electric shock.
- Before modifying or disrupting the program in operation or running the PLC, carefully read through this manual and the associated manuals and ensure the safety of the operation.
  An operation error may damage the machinery or cause accidents.

STARTUP AND MAINTENANCE PRECAUTIONS ⚠CAUTION

- Turn off the power to the PLC before attaching or detaching the memory cassette. If the memory cassette is attached or detached while the PLC's power is on, the data in the memory may be destroyed, or the memory cassette may be damaged.
- Do not disassemble or modify the PLC.
  Doing so may cause fire, equipment failures, or malfunctions.
  For repair, contact your local Mitsubishi Electric representative.
- Turn off the power to the PLC before connecting or disconnecting any connection cable.
  Failure to do so may cause equipment failures or malfunctions.

STARTUP AND MAINTENANCE PRECAUTIONS ⚠CAUTION

- Turn off the power to the PLC before attaching or detaching the following devices. Failure to do so may cause equipment failures or malfunctions.
  - Peripheral devices, display module, expansion boards, special adapters and memory cassette
- Do not use the chemicals for cleaning.
- If there is the possibility of touching the PLC inside a control panel in maintenance, make sure to discharge to avoid the influence of static electricity.

DISPOSAL PRECAUTIONS ⚠CAUTION

- Please contact a certified electronic waste disposal company for the environmentally safe recycling and disposal of your device.

TRANSPORTATION AND STORAGE PRECAUTIONS ⚠CAUTION

- The PLC is a precision instrument. During transportation, avoid impacts larger than those specified in section 3.1 by using dedicated packaging boxes and shock-absorbing palettes.
  Failure to do so may cause failures in the PLC.
  After transportation, verify operation of the PLC and check for damage of the mounting part, etc.

Associated manuals

How to obtain manuals

For the necessary product manuals or documents, consult with your local Mitsubishi Electric representative.

Associated manuals

FX3S-30M□/E□-2AD comes with this document (hardware manual).
For a detailed explanation of the FX3S Series hardware and information on instructions for PLC programming, refer to the relevant documents.
Specifications not described in this manual are same as FX3S PLC. For details, refer to the following manual.

→ **Refer to FX3S Series User's Manual - Hardware Edition.**

Manual name	Manual No.	Description
FX3S Series User's Manual - Hardware Edition	JY997D48601 MODEL CODE: 09R535	Explains FX3S Series PLC specification details for I/O, wiring, installation, and maintenance.
FX3S/FX3G/FX3GC/FX3U/FX3UC Series Programming Manual - Basic & Applied Instruction Edition	JY997D16601 MODEL CODE: 09R517	Describes PLC programming for basic/applied instructions STL/SFC programming and devices.
MELSEC-Q/L/F Structured Programming Manual (Fundamentals)	SH-080782 MODEL CODE: 13JW06	Programming methods, specifications, functions, etc. required to create structured programs.
FXCPU Structured Programming Manual [Device & Common]	JY997D26001 MODEL CODE: 09R925	Devices, parameters, etc. provided in structured projects of GX Works2.
FXCPU Structured Programming Manual [Basic & Applied Instruction]	JY997D34701 MODEL CODE: 09R926	Sequence instructions provided in structured projects of GX Works2.
FXCPU Structured Programming Manual [Application Functions]	JY997D34801 MODEL CODE: 09R927	Application functions provided in structured projects of GX Works2.
FX Series User's Manual - Data Communication Edition	JY997D16901 MODEL CODE: 09R715	Explains N:N link, parallel link, computer link, no protocol communication by RS instructions/FX2N-232IF.
FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition	JY997D16701 MODEL CODE: 09R619	Describes specifications for analog control and programming methods for FX3S/FX3G/FX3GC/FX3U/FX3UC Series PLC.
FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Positioning Control Edition	JY997D16801 MODEL CODE: 09R620	Explains the specifications for positioning control of FX3S/FX3G/FX3GC/FX3U/FX3UC Series and programming procedures.

Certification of UL, cUL standards

Please consult with Mitsubishi Electric for information on UL, cUL standard practices and the corresponding types of equipment.

Compliance with EC directive (CE Marking)

This product complies with EC directive, however, this document does not guarantee that a mechanical system including this product will comply with EC directive.
Compliance to EMC directive and LVD directive of the entire mechanical system should be checked by the user/manufacturer. For more details please contact the local Mitsubishi Electric sales site.

Caution for compliance with EC Directive

- Please use the FX3S programmable controllers while installed in conductive shielded control panels under a general industrial environment.
- Programmable controllers are open-type devices that must be installed and used within conductive control panels. Please secure the control box lid to the control box (for conduction). Installation within a control box greatly affects the safety of the system and aids in shielding noise from the programmable controller.
- For the control panel, use the product having sufficient strength, fire protectiveness and shielding property to an installation environment.
- 24 V DC of the power supply must be supplied from the circuit double/reinforced insulated from the main power supply (MAINS).

Caution for compliance with the LVD directive (EN61010-2-201:2013)*1

- To an external connection port other than AC power supply terminal and AC input/output terminal, connect the circuit separated from a dangerous voltage by a double/reinforced insulation.
- Between the commons having the adjacent relay output terminals, if an external power supply is higher than 120 V AC, the insulation is basic. Therefore, when using 120 V AC or higher external power supply and 30 V DC/AC or lower external power supply between the adjacent commons, do not handle 30 V DC/AC or lower external power supply as a touchable part, (When handling 30 V DC/AC or lower external power supply as a touchable part, add a basic insulation.)
- Do not wire two or more crimp terminals to one terminal. (If the wiring with two or more wires is needed, take an appropriate action such as adding an external terminal.)
- For crimp terminals to be used for the wiring applied with 30 V AC or higher, use the products with insulating sleeves.
- Cutoff device such as a breaker or a circuit protector should be installed in accordance with the following precautions.
  - Use EN60947-1 or EN60947-3 standards.
  - Use CP30-BA 2P 1-MD 0.5A or the cutoff device having the cutoff performance equivalent to CP30-BA 2P 1-MD 0.5A.
  - Place the cutoff device so that it can be operated easily.
  - Specify that the cutoff device is for this equipment.

*1 For the time of compliance with the LVD directive (EN61010-2-201:2013), refer to FX3S Series User's Manual - Hardware Edition.

Analog input/output

The analog input/output have been found to be compliant to the European standards in the aforesaid manual and directive. However, for the very best performance from what are in fact delicate measuring and controlled output devices, Mitsubishi Electric would like to make the following points.
As analog devices are sensitive by nature, their use should be considered carefully. For users of proprietary cables (integral with sensors or actuators), these users should follow those manufacturers' installation requirements.
Mitsubishi Electric recommends that shielded cables be used. If NO other EMC protection is provided, users may experience temporary loss or accuracy between +10 %/-10 % in very heavy industrial areas.
However, Mitsubishi Electric suggests that adequate EMC precautions be followed for the users complete control system.

- Sensitive analog cables should not be laid in the same trunking or cable conduit as high voltage cabling. Where possible, users should run analog cables separately.
- Good cable shielding should be used. When terminating the shield at Earth, ensure that no earth loops are accidentally created.
- When reading analog values, EMC accuracy can be improved by averaging the readings. This can be achieved either through functions on the analog products or through a user's program in the FX3S Series PLC main unit.

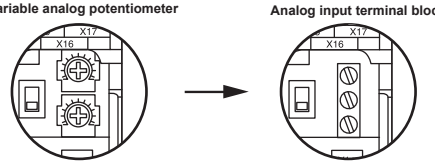
Incorporated Items

Check if the following product and items are included in the package:

	Included Items	
FX3S-30MR/ES-2AD, FX3S-30MT/ES-2AD, FX3S-30MT/ESS-2AD	Product	1 unit
	Dust proof protection sheet	1 sheet
	Manuals [Japanese/English]	1 manual

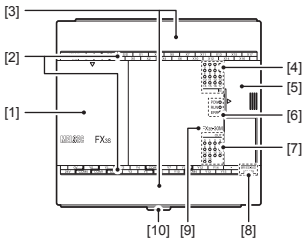
1. Feature

FX3S-30M□/E□-2AD is a product based on FX3S PLC, with built-in analog input in place of variable analog potentiometers.
(Refer to the following figure)
Specifications other than the built-in analog input are the same as FX3S PLC.
For details, refer to FX3S Series User's Manual - Hardware Edition.
For details on the built-in analog input, refer to Chapter 6.



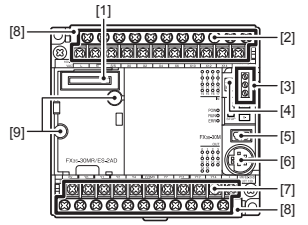
2. Outline

2.1 Part names



No.	Name		
[1]	Top cover		
[2]	Terminal names ⏚ shows a function grounding terminal.		
[3]	Terminal block covers		
[4]	Input display LEDs (red)		
[5]	Peripheral device connecting connector cover		
[6]	Operation status display LEDs		
	POW	Green	On while power is on the PLC.
	RUN	Green	On while the PLC is running.
	ERR	Red	Flashing when a program error occurs.
		Red	Lights when a CPU error occurs.
[7]	Output display LEDs (red)		
[8]	The year and month of production		
[9]	Model name (abbreviation)		
[10]	DIN rail mounting hooks		

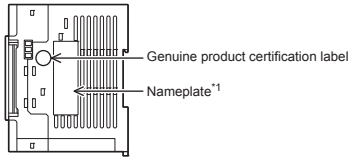
When the top covers are open



No.	Name
[1]	Optional equipment connector
[2]	Power supply terminal, Input (X) terminals
[3]	Analog input terminal block
[4]	RUN/STOP switch

No.	Name
[5]	Peripheral device connecting connector (USB)
[6]	Peripheral device connecting connector (RS-422)
[7]	Service power supply terminal, Output (Y) terminals
[8]	Terminal cover
[9]	Optional equipment connecting screw holes

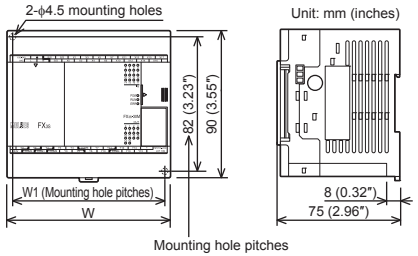
Right side



The authentication label for authorized products is affixed to the right side of the product to avoid to be forged.
Products that do not have the genuine product certification label or nameplate are not covered by the warranty.

*1 ⚠ is a mark that instructs to use the cable with an appropriate temperature rating (80°C or more) for wiring.

2.2 External dimensions and weight



Model name	W: mm (inches)	W1:mm (inches) Direct mounting hole pitches	MASS (Weight): kg (lbs)
FX3S-30M□/E□-2AD	100 (3.94")	92 (3.63")	Approx. 0.45 (0.99 lbs)

Installation
- 35-mm-wide DIN rail or Direct (screw) mounting (M4×2)

3. Installation (generic specifications)

As for installation of the special adapters and expansion boards, refer to the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

INSTALLATION PRECAUTIONS ⚠**CAUTION**

- Use the product within the generic environment specifications described in section 3.1 of this manual.
  Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, Cl_2, H_2S, SO_2 or NO_2), flammable gas, vibration or impacts, or expose it to high temperature, condensation, or rain and wind.
  If the product is used in such conditions, electric shock, fire, malfunctions, deterioration or damage may occur.
- Do not touch the conductive parts of the product directly.
  Doing so may cause device failure or malfunctions.
- Install the product securely using a DIN rail or mounting screws.
- Install the product on a flat surface.
  If the mounting surface is rough, undue force will be applied to the PC board, thereby causing nonconformities.
- When drilling screw holes or wiring, make sure that cutting and wiring debris do not enter the ventilation slits of the PLC.
  Failure to do so may cause fire, equipment failures or malfunctions.
- Be sure to remove the dust proof sheet from the PLC's ventilation port when installation work is completed. Failure to do so may cause fire, equipment failures or malfunctions.
- Connect the peripheral device cables securely to their designated connectors. Loose connections may cause malfunctions.

INSTALLATION PRECAUTIONS ⚠**CAUTION**

- Turn off the power to the PLC before attaching or detaching the following devices. Failure to do so may cause device failures or malfunctions.
  - Peripheral devices, display module, expansion boards, special adapters and memory cassette

Notes

- When a dust proof sheet is supplied with units, keep the sheet applied to the ventilation slits during installation and wiring work.
- To prevent temperature rise, do not install the PLC on a floor, a ceiling or a vertical surface.
  Install it horizontally on a wall as shown in section 3.2.
- Keep a space of 50 mm (1.97") or more between the unit main body and another device or structure (part A). Install the unit as far away as possible from high-voltage lines, high-voltage devices and power equipment.
  Failure to do so may cause fire, equipment failures or malfunctions.

3.1 Generic specifications

Item	Specification					
Ambient temperature	0 to 55 °C (32 to 131 °F) when operating and -25 to 75 °C (-13 to 167 °F) when stored					
Ambient humidity	5 to 95 %RH (no condensation) when operating					
Vibration resistance*1		Frequency (Hz)	Acceleration (m/s^2)	Half amplitude (mm)	Sweep Count for X, Y, Z: 10 times (80 min in each direction)	
	When installed on DIN rail	10 to 57	-	0.035		
		57 to 150	4.9	-		
	When installed directly	10 to 57	-	0.075		
		57 to 150	9.8	-		
Shock resistance*1	147 m/s^2 Acceleration, Action time: 11 ms, 3 times by half-sine pulse in each direction X, Y, and Z					
Noise resistance	By noise simulator at noise voltage of 1,000 Vp-p, noise width of 1 µs, rise time of 1 ns and period of 30 to 100 Hz					
Dielectric withstand voltage*2	1.5 kV AC for 1 min	Between each terminals and ground terminal*2				
	500 V AC for 1 min					
Insulation resistance*2	5 MΩ or higher by 500 V DC insulation resistance tester					
Grounding	Class D grounding (grounding resistance: 100 Ω or less) <Common grounding with a heavy electrical system is not allowed.>*3					
Working atmosphere	Free from corrosive or flammable gas and excessive conductive dusts					
Working altitude	<2000 m*4					
Installation location	Inside a control panel*5					
Over voltage category	II or less					
Pollution degree	2 or less					

*1 The criterion is shown in IEC61131-2.
*2 Dielectric withstand voltage and insulation resistance are shown in the following table.

Terminal	Dielectric strength	Insulation resistance
■ Terminals of main units		
Between power supply terminal (AC power) and ground terminal	1.5 kV AC for 1 min	5 MΩ or higher by 500 V DC insulation resistance tester
Between input terminal (24 V DC) and ground terminal	500 V AC for 1 min	
Between output terminal (relay) and ground terminal	1.5 kV AC for 1 min	
Between output terminal (transistor) and ground terminal	500 V AC for 1 min	
Main unit analog input terminal and ground terminal	Not allowed	Not allowed
■ Terminals of expansion boards, special adapters		
Between terminal of expansion board (except FX3G-4EX-BD and FX3G-2EYT-BD) and ground terminal	Not allowed	Not allowed
Between FX3G-4EX-BD input terminal (24 V DC) and ground terminal	500 V AC for 1 min	5 MΩ or higher by 500 V DC insulation resistance tester
Between FX3G-2EYT-BD output terminal (transistor) and ground terminal		
Between terminal of special adapter and ground terminal		

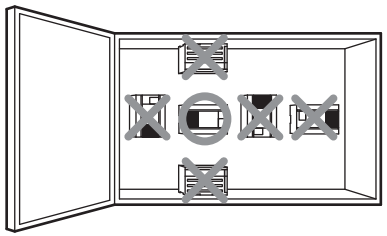
For dielectric with stand voltage test and insulation resistance test of each product, refer to the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

*3 For common grounding, refer to section 4.3.
*4 The PLC cannot be used at a pressure higher than the atmospheric pressure to avoid damage.
*5 The programmable controller is assumed to be installed in an environment equivalent to indoor.

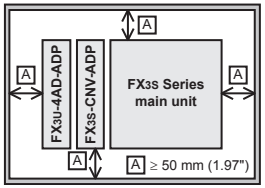
3.2 Installation location

Install the PLC in an environment conforming to the generic specifications (section 3.1), installation precautions and notes.

Installation location in enclosure



Space in enclosure
Special adapter can be connected on the left sides of the main unit.
If you intend to add special adapter in the future, keep necessary spaces on the left sides.



3.2.1 Affixing the dust proof sheet

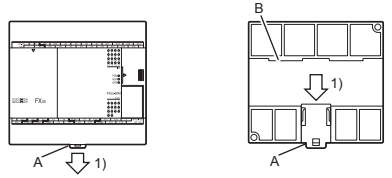
The dust proof sheet should be affixed to the ventilation port before beginning the installation and wiring work.
Be sure to remove the dust proof sheet when the installation and wiring work is completed.
→ **For the affixing procedure, refer to the instructions on the dust proof sheet.**

3.3 Procedures for installing to DIN rail

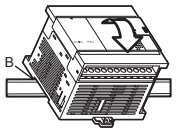
The products can be installed on a DIN46277 rail [35 mm (1.38") wide].
This section explains the installations of the main units.
For the special adapters, refer to the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

3.3.1 Installation

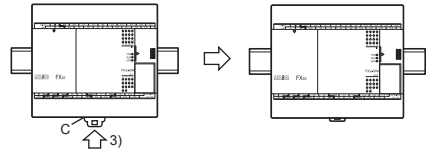
1) Push out all DIN rail mounting hooks (below fig. A).



2) Fit the upper edge of the DIN rail mounting groove (right fig. B) onto the DIN rail.



3) Lock the DIN rail mounting hooks (below fig. C) while pressing the PLC against the DIN rail.



3.4 Procedures for installing directly (with M4 screws)

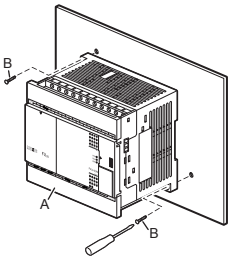
The product can be installed directly on the panel (with screws).
This section explains the installation of the main units.
For the special adapters, refer to the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

3.4.1 Mounting hole pitches

Refer to the External Dimensions (section 2.2) for the product's mounting hole pitch information.

3.4.2 Installation

1) Make mounting holes in the mounting surface referring to the external dimensions diagram.
2) Fit the main unit (A in the right figure) based on the holes, and secure it with M4 screws (B in the right figure).



4. Power supply/input/output specifications and examples of external wiring

For the details refer to the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

DESIGN PRECAUTIONS ⚠**WARNING**

- Make sure to have the following safety circuits outside of the PLC to ensure safe system operation even during external power supply problems or PLC failure. Otherwise, malfunctions may cause serious accidents.
  1) Most importantly, have the following: an emergency stop circuit, a protection circuit, an interlock circuit for opposite movements (such as normal vs. reverse rotation), and an interlock circuit (to prevent damage to the equipment at the upper and lower positioning limits).
  2) Note that when the PLC CPU detects an error, such as a watchdog timer error, during self-diagnosis, all outputs are turned off. Also, when an error that cannot be detected by the PLC CPU occurs in an input/output control block, output control may be disabled.
     External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
  3) If an overload of the 24 V DC service power supply occurs, the voltage automatically drops, inputs in the PLC are disabled, and all outputs are turned off. External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
  4) Note that when an error occurs in a relay or transistor output device, the output could be held either on or off. For output signals that may lead to serious accidents, external circuits and mechanisms should be designed to ensure safe machinery operation in such a case.

DESIGN PRECAUTIONS ⚠**CAUTION**

- Do not bundle the control line together with or lay it close to the main circuit or power line. As a guideline, lay the control line at least 100 mm (3.94") or more away from the main circuit or power line.
  Noise may cause malfunctions.
- Install module so that excessive force will not be applied to peripheral device connectors.
  Failure to do so may result in wire damage/breakage or PLC failure.

Notes

- Even if the AC power supply causes an instantaneous power failure for less than 10 ms, the PLC can continue to operate.
- If a long-time power failure or an abnormal voltage drop occurs, the PLC stops, and output is turned off. When the power supply is restored, it will automatically restart (when the RUN input is on).

WIRING PRECAUTIONS ⚠**WARNING**

- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work.
  Failure to do so may cause electric shock or damage to the product.
- The temperature rating of the cable should be 80°C or more.

WIRING PRECAUTIONS ⚠**CAUTION**

- Connect the AC power supply wiring to the dedicated terminals described in this manual. If an AC power supply is connected to a DC input/output terminal or DC power supply terminal, the PLC will burn out.
- Noise resistance may be lower when the L and N wires of an AC power supply are not wired correctly. Please wire using the correct polarity.
- Do not wire vacant terminals externally. Doing so may damage the product.
- Perform class D grounding (grounding resistance: 100 Ω or less) to the grounding terminal on the main unit with a wire 2 mm^2 or thicker.
  Do not use common grounding with heavy electrical systems (refer to section 4.3).
- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits.
  Failure to do so may cause fire, equipment failures or malfunctions.
- Make sure to properly wire to the main unit in accordance with the following precautions.
  Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
  - Make sure to properly wire to the main unit in accordance with the rated voltage, current, and frequency of each terminal.
  - The disposal size of the cable end should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Tighten the screws using a Phillips-head screwdriver No.2 (shaft diameter 6mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.

Notes

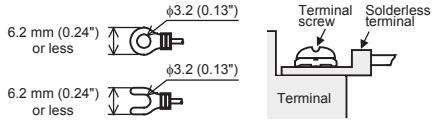
- Input/output wiring 50 to 100 m (164'1" to 328'1") long will cause almost no problems of noise, but, generally, the wiring length should be less than 20 m (65'7") to ensure the safety.

4.1 Wiring

4.1.1 Cable end treatment and tightening torque

For the terminals of FX3S series PLC, M3 screws are used.
The electric wire ends should be treated as shown below.
Tighten the screws to a torque of 0.5 to 0.8 N•m.
Do not tighten terminal screws with a torque outside the above-mentioned range. Failure to do so may cause equipment failures or malfunctions.

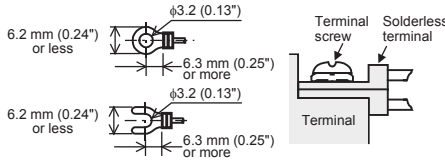
- When one wire is connected to one terminal



<Reference>

Terminal manufacturer	Type No.	Applicable cable	Certification	Pressure bonding tool
J.S.T. Mfg. Co., Ltd.	FV1.25-B3A	AWG22 to 16	UL Listed	YA-1 (J.S.T. Mfg. Co., Ltd.)
	FV2-MS3	AWG16 to 14		

- When two wires are connected to one terminal*1



<Reference>

Terminal manufacturer	Type No.	Applicable cable	Certification	Pressure bonding tool
J.S.T. Mfg. Co., Ltd.	FV1.25-B3A	AWG22 to 16	UL Listed	YA-1 (J.S.T. Mfg. Co., Ltd.)

*1 To adapt the LVD directive (EN61010-2-201:2013) of the EC directive, avoid the wiring with two wires to the built-in terminal, and take an appropriate action such as adding an external terminal.
For the time of compliance with the LVD directive (EN61010-2-201:2013), refer to FX3S Series User's Manual - Hardware Edition.

4.2 Power supply specifications and example of external wiring

For details, refer to the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

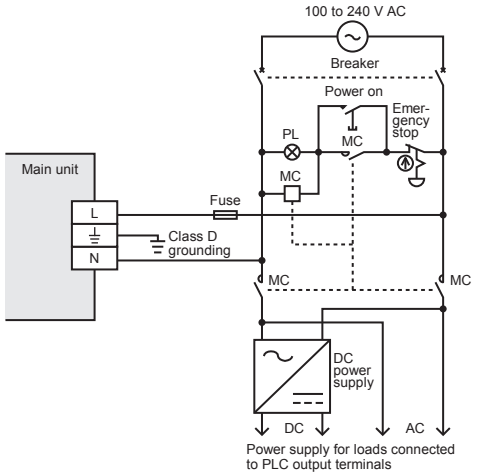
4.2.1 Power supply specifications

Item	Specification
Supply voltage	100 to 240 V AC
Voltage fluctuation range	-15%, +10%
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	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).

4.2.2 Example of external wiring

100 to 240 V AC power is supplied to the main unit.

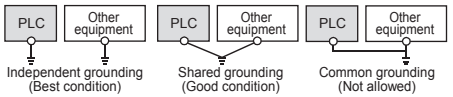


Power supply for loads connected to PLC output terminals

4.3 Grounding

Ground the PLC as stated below.

- Perform class D grounding. (Grounding resistance: 100 Ω or less)
- Ground the PLC independently if possible.
  If it cannot be grounded independently, ground it jointly as shown below.



- Use ground wires thicker than AWG14 (2 mm^2).
- Position the grounding point as close to the PLC as possible to decrease the length of the ground wire.

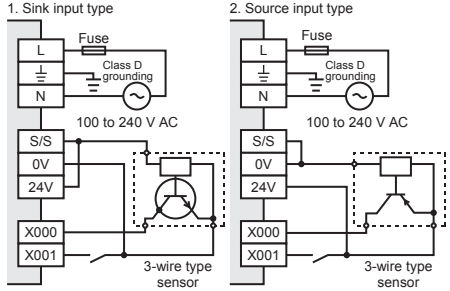
4.4 Input specifications and external wiring

For details, refer to the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

4.4.1 Input specifications

Item		Specification
Number of input 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 (Input sensor 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.

4.4.2 Examples of input wiring



4.4.3 Instructions for connecting input devices

As for the details of Instructions for connecting input devices, refer to the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

4.5 Relay output specifications and example of external wiring

For details, refer to the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

4.5.1 Relay output specifications

Item		Specification
Number of output 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*1
Max. load	**Resistance load**	2 A/point*2
	Inductive load	80 VA*3
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.

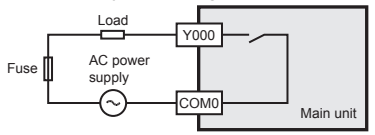
*1 250 V AC or less when the unit does not comply with CE, UL or cUL standards.
*2 The total load current of resistance loads per common terminal should be the following value.
- 1 output point/common terminal: 2 A or less
- 4 output points/common terminal: 8 A or less

As for the number of outputs per common terminal, refer to "Chapter 5 interpretation of partition" and the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**
*3 UL and cUL standards approved at 120 and 240 V AC.

4.5.2 Life of relay output contact

As for the details of life of relay output contact, refer to the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

4.5.3 Example of relay output wiring



4.5.4 Cautions in external wiring

As for the details of cautions in external wiring, refer to the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

4.6 Transistor output specifications and example of external wiring

For details, refer to the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

4.6.1 Transistor output specifications

Item			Specification
Number of output points			14 points
Output connecting type			Fixed terminal block (M3 screw)
Output form	FX3S-30MT/ES-2AD		Transistor (Sink)
	FX3S-30MT/ESS-2AD		Transistor (Source)
External power supply			5-30 V DC
Max. load	Resistance load		0.5 A/point*1
	Inductive load		12 W/24 V DC*2
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 (5-24 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.

*1 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

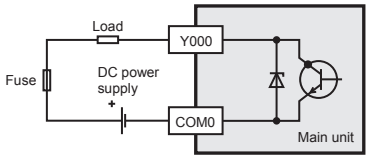
As for the number of outputs per common terminal, refer to "Chapter 5 interpretation of partition" and the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

*2 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

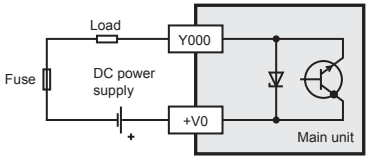
As for the number of outputs per common terminal, refer to "Chapter 5 interpretation of partition" and the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

4.6.2 External wiring of transistor output

1. External wiring of sink output type



2. External wiring of source output type



4.6.3 Cautions in external wiring

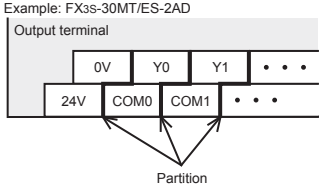
As for the details of cautions in external wiring, refer to the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

5. Terminal block layouts

For details on the terminal block layout, refer to the following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

Interpretation of partition
The partition of the output terminals (see following figure) indicates the range of the output connected to the same common.

Example: FX3S-30MT/ES-2AD



6. Built-in analog specifications and wiring

For details on the built-in analog input specifications and wiring, refer to following manual.
→ **Refer to FX3S Series User's Manual - Hardware Edition.**

WIRING PRECAUTIONS ⚠**WARNING**

- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work.
  Failure to do so may cause electric shock or damage to the product.

WIRING PRECAUTIONS ⚠**CAUTION**

- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits.
  Failure to do so may cause fire, equipment failures or malfunctions.

WIRING PRECAUTIONS ⚠**CAUTION**

- Make sure to observe the following precautions in order to prevent any damage to the machinery or accidents due to abnormal data written to the PLC under the influence of noise:
  1) Do not bundle the power line or shield of the analog input/output cable together with or lay it close to the main circuit, high-voltage line, or load line.
     Otherwise, noise disturbance and/or surge induction are likely to take place. As a guideline, lay the control line at least 100 mm (3.94") or more away from the main circuit, high-voltage line, or load line.
  2) Ground the shield of the analog input/output cable at one point on the signal receiving side.
     However, do not use common grounding with heavy electrical systems.
- Make sure to properly wire to the terminal block (European type) in accordance with the following precautions.
  Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
  - The disposal size of the cable end should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Twist the end of strand wire and make sure that there are no loose wires.
  - Do not solder-plate the electric wire ends.
  - Do not connect more than the specified number of wires or electric wires of unspecified size.
  - Affix the electric wires so that neither the terminal block nor the connected parts are directly stressed.

6.1 Analog input terminal block (European type)

1) Wire size
Wiring to analog device should use wire from following table.

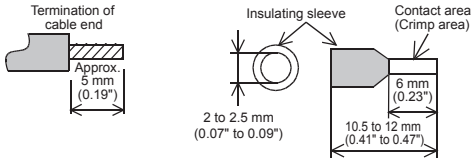
No. of wire per terminal	Wire size		
	Solid wire	Stranded wire	Ferrules with plastic sleeve
1	0.14 to 1.5 mm² (AWG26 to 16)	0.14 to 1.0 mm² (AWG26 to 16)	0.25 to 0.5 mm² (AWG24 to 20)
2	0.14 to 0.5 mm² (AWG26 to 20)	0.14 to 0.2 mm² (AWG26 to 24)	-

2) Termination
Strip the coating of strand wire and twist the cable core before connecting it, or strip the coating of single wire before connecting it. An alternative connection is to use a ferrule with insulating sleeve.

Manufacturer	Model	Caulking tool
Phoenix Contact Co., Ltd.	AI 0.25-6BU (AWG24)	CRIMPFOX 6*1 (or CRIMPFOX 6T-F*2)
	AI 0.34-6TQ (AWG22)	
	AI 0.5-6WH (AWG20)	

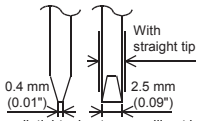
*1 Old model name: CRIMPFOX ZA 3
*2 Old model name: CRIMPFOX UD 6

- Stranded wire/solid wire
- Ferrule with insulation sleeve



When using a ferrule with insulation sleeve, choose a wire with proper cable sheath referring to the above outside dimensions, otherwise the wire cannot be inserted easily.
Tighten the screws to a torque of 0.22 to 0.25 N•m.
Do not tighten terminal screws with a torque outside the above-mentioned range. Failure to do so may cause equipment failures or malfunctions.

3) Tool
For tightening the terminal, use a commercially available small screwdriver having a straight form that is not widened toward the end as shown right.

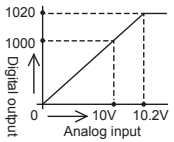


Caution:
If the diameter of screwdriver grip is too small, tightening torque will not be able to be achieved. To achieve the appropriate tightening torque shown in the table above, use the following screwdriver or appropriate replacement (grip diameter : approximately 25 mm (0.98")).

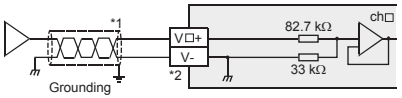
Manufacturer	Model name
Phoenix Contact Co., Ltd.	SZS 0.4×2.5

6.2 Analog input specifications and external wiring

6.2.1 Analog input performance specifications

Item	Input specification
Analog input range	0-10 V DC (Input resistance: 115.7 kΩ)
Absolute maximum input	-0.5 V, +15 V
Digital output	10 bits, binary
Device allocation	D8270 (The digital value of CH1 is stored) D8271 (The digital value of CH2 is stored)
Resolution	10 mV (10 V/1000)
Total accuracy	- ± 1.0 % (± 100 mV) for 10 V full scale (when ambient temperature is 25 ± 5 °C) - ± 2.0 % (± 200 mV) for 10 V full scale (when ambient temperature is 0 to 55 °C)
A/D conversion time	180 µs (The data will be updated at every scan time of the PLC.)
Input characteristics	
Insulation method	No insulation between each channel or the PLC.
Occupied points	0 point (This number is not related to the maximum number of input/output points of the PLC.)

6.2.2 Example of analog input



V□+, ch□:□represents the channel number.

*1 Use the 2-core shielded twisted pair cable for the analog input lines, and separate the analog input lines from other power lines or inductive lines.
*2 Make sure to short-circuit the "V□+" and "V-" terminals when ch is not used.

6.2.3 Analog input terminal block layouts

V1+
V2+
V-

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产品中有害物质的名称及含量

部件名称		有害物质					
		铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
可编程控制器	外壳	○	○	○	○	○	○
	印刷基板	×	○	○	○	○	○

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