Side B

JY997D20801A

Side A JAPANESE / Side B ENGLISH

MITSUBISHI

Changes for the Better

PROGRAMMABLE CONTROLLERS

MELSEC-F

FX3U-4DA

INSTALLATION MANUAL

Manual Number	JY997D20801
Revision	A
Date	February 2006

This manual describes the part names, dimensions, mounting, and specifications of the product. Before use, read this manual and manuals of relevant products fully to acquire proficiency in handling and operating the product. Make sure to learn all the product information, safety information, and precautions.
And, store this manual in a safe place so that you can take it out and read it whenever necessary. Always forward it to the end user.
Registration
The company name and the product name to be described in this manual are the registered trademarks or trademarks of each company.

Effective February 2006
Specifications are subject to change without notice.

Safety Precaution (Read these precautions before use.)

This manual classify the safety precautions into two categories:

⚠DANGER and ⚠CAUTION.

⚠DANGER	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 circumstances, procedures indicated by ⚠CAUTION may also be linked to serious results.
In any case, it is important to follow the directions for usage.

Associated Manuals

Manual name	Manual No.	Description
FX3U / FX3UC Series User's Manual - Analog Control Edition	JY997D16701 MODEL CODE: 09R619	Describes specifications for analog control and programming method for FX3U / FX3UC Series PLC.
FX3U/FX3UC Series Programming Manual - Basic & Applied Instruction Edition	JY997D16601 MODEL CODE: 09R517	Describes PLC programming for basic/applied instructions and devices.
FX3U Series User's Manual - Hardware Edition	JY997D16501 MODEL CODE: 09R516	Explains FX3U Series PLC specification details for I/O, wiring, installation, and maintenance.

Note: FX3UC Series PLC specification details for I/O, wiring, installation, and maintenance can only be found in the Japanese Manual.

How to obtain manuals
For the necessary product manuals or documents, consult with the Mitsubishi Electric dealer from where you purchase your product.

Certification of UL, cUL standards

The following product has UL and cUL certification.
UL, cUL File Number:E95239
Models: MELSEC FX3U series manufactured
FX3U-4DA

Compliance with EC directive (CE Marking)

This note does not guarantee that an entire mechanical module produced in accordance with the contents of this note will comply with the following standards.
Compliance to EMC directive and LVD directive for the entire mechanical module should be checked by the user / manufacturer. For more details please contact the local Mitsubishi Electric sales site.

Requirement for Compliance with EMC directive

The following products have shown compliance through direct testing (of the identified standards below) and design analysis (through the creation of a technical construction file) to the European Directive for Electromagnetic Compatibility (89/336/EEC) when used as directed by the appropriate documentation.

Type: Programmable Controller (Open Type Equipment)
Models: MELSEC FX3U series manufactured
from February 1st, 2006 FX3U-4DA

Standard	Remark
EN61131-2:2003 Programmable controllers - Equipment requirements and tests	Compliance with all relevant aspects of the standard. • Radiated Emissions • Mains Terminal Voltage Emissions • RF immunity • Fast Transients • ESD • Surge • Conducted • Power magnetic fields

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The analog special adapters 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 device 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 recommend that shielded cables should be used. If NO other EMC protection is provided, then users may experience temporary induced errors not exceeding +10%/-10% in very heavy industrial areas.
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- Sensitive analog cable 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. Ground the shield of the twisted shielded cable at one point on the signal receiving side.
- Please use FX3U-4DA while installed in a shielded enclosure. For the details, refer to the following manual.

→ **Refer to the FX3U Series User's Manual - Hardware Edition**

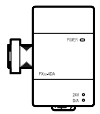
1. Outline

The FX3U-4DA special function block for analog output converts digital values supplied from PLC into analog values (voltage, current) and outputs those analog values from its four output points.

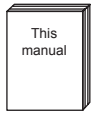
1.1 Incorporated Items

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

Product

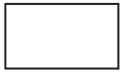


Manual



Special unit/block No. label

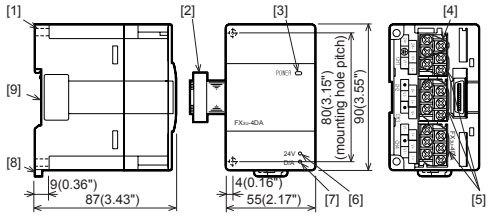
Dust proof sheet × 1



1.2 External Dimensions, Part Names, and Terminal Layout

1.2.1 External Dimensions and Part Names

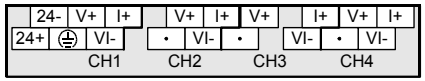
[Without top cover]



MASS(Weight) : Approx. 0.2kg(0.44lbs)

[1] Direct mounting hole:2 holes of ϕ4.5 (0.18") (mounting screw: M4 screw)
[2] Extension cable
[3] POWER LED (green):
Lit while 5V DC power is supplied from PLC.
[4] Terminal block for power supply (24V DC) (M3 terminal screw)
[5] Terminal block for analog output
[6] 24V LED (red):
Lit while 24V DC power is supplied properly to terminals [24+] and [24-].
[7] D/A LED (red):Flashes (at high speed) during D/A conversion.
[8] DIN rail mounting hook
[9] DIN rail mounting groove (35 mm (1.38") wide)

1.2.2 Terminal Layout



↓ Left side of the product (Extension cable side)

2. Installation

INSTALLATION PRECAUTIONS ⚠CAUTION

- Use the product in the environment within the general specifications described in PLC main unit manual (Hardware Edition).
Never use the product in areas with dust, oily smoke, conductive dusts, corrosive gas (salt air, Cl_2, H_2S, SO_2, or NO_2), flammable gas, vibrations or impacts, or expose it to high temperature, condensation, or wind and rain.
If the product is used in such a place described above, electrical shock, fire, malfunction, damage, or deterioration may be caused.
- Do not touch the conductive parts of the product directly, thus avoiding failure or malfunction.
- Install the product securely using the DIN rail or 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 nonconformity.
- When drilling screw holes or wiring, cutting chips or wire chips should not enter ventilation slits.
Such an accident may cause fire, failure or malfunction.
- Be sure to remove the dust proof sheet from the PLC's ventilation port when the installation work is completed.
Failure to do so could cause fires, equipment failures, and malfunctions.
- Fit the extension cables and communication cables securely to the designated connectors.
Contact failures may cause malfunctions.

2.1 Arrangements

The product connects on the right side of an PLC main unit or extension units/blocks (including special function units/blocks).
For connection to FX3UC Series PLC or FX2NC Series PLC extension block, FX2NC-CNV-IF or FX3UC-1PS-5V is required.
For further information of installation arrangements, refer to the following manual.

→ **Refer to the FX3U Series User's Manual - Hardware Edition**

2.2 Mounting

The product is mounted by the following method.

- Direct mounting
- DIN rail mounting

2.2.1 Direct Mounting

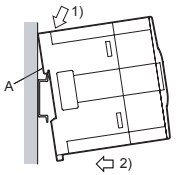
The product can be mounted with M4 screws by using the direct mounting holes. Refer to the External Dimensions (section 1.2) for the product's mounting hole pitch information.
An interval space between each unit of 1 to 2 mm (0.04" to 0.08") is necessary.
For further information of direct installation, also refer to the following manual.

→ **Refer to the FX3U Series User's Manual - Hardware Edition**

2.2.2 DIN Rail Mounting

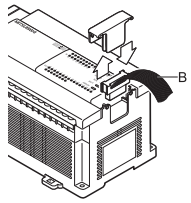
The product can be mounted on a DIN rail (DIN46227, 35mm width).

1) Fit the upper edge of the DIN rail mounting groove (right fig. A) onto the DIN rail.
2) Press the product against the DIN rail.



3) Connect the extension cable (right fig. B) to the main unit, input/output extension unit/block, and special function unit/block on the left.
For the details of the extension cable connection, refer to the following manual.

→ **Refer to the FX3U Series User's Manual - Hardware Edition**



3. Wiring

WIRING PRECAUTIONS **⚠DANGER**

- Cut off all phases of power source externally, before installation or wiring work in order to avoid electric shock or damage of product.

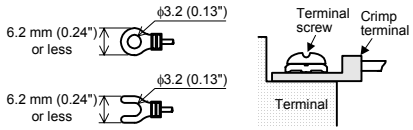
WIRING PRECAUTIONS **⚠CAUTION**

- Make sure to observe the precautions below in order to prevent any damage to a machine or any accident which might be caused by abnormal data written in the PLC due to the influence of noise:
  1) Do not lay close or bundle with the main circuit, high-voltage power line, or load line.
     Otherwise effects of noise or surge induction are likely to take place.
     Keep a safe distance of more than 100 mm (3.94") from the above when wiring.
  2) Ground the shield of the twisted shielded cable at one point on the signal receiving side. However, do not ground at the same point as high voltage lines.
- Properly perform wiring to the terminal block following the precautions below in order to prevent electrical shock, short, wire break, or damage to the product.
  - Termination of the wire should follow the dimensions described in this manual.
  - Tightening torque should be 0.5 to 0.8 N•m.

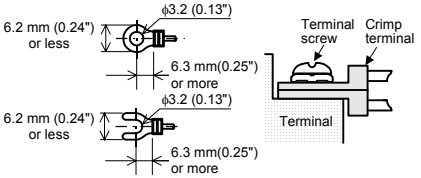
3.1 Applicable Cable and Terminal Tightening Torque

The size of the terminal screws is M3.
The end disposal of the cable shows below.
Tighten the terminal to a torque of 0.5N•m to 0.8N•m.

- When one wire is connected to one terminal



- When two wires are connected to one terminal



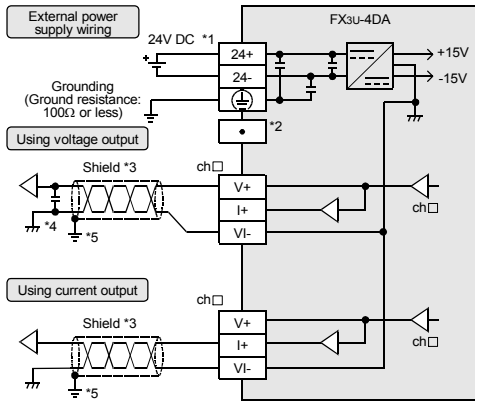
3.2 Power Supply Wiring

For the power supply wiring, refer to the following manual.

→ **Refer to the FX3U / FX3UC Series User's Manual - Analog Control Edition**

3.3 Wiring of Analog Output

→ **For the terminal layout, refer to Subsection 1.2.2**



ch□ : □ represents the channel number.

*1 For FX3U Series PLC (AC power type), the 24V DC service power supply is also available.

*2 Leave the [•] terminal unconnected.

*3 Use a 2-core twisted shield wire for analog output line, and separate it from other power lines or inductive lines.

*4 If there is ripple or noise in the output voltage, connect a capacitor of approximately 0.1 to 0.47 μF 25 V in the vicinity of the signal receiving side.

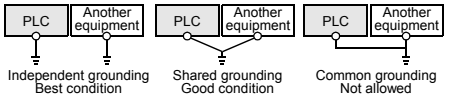
*5 Ground the shielded wire at one point on the signal receiving side.

3.4 Grounding

Grounding should be performed as stated below.

- The grounding resistance should be 100Ω or less.
- Independent grounding should be performed for best results.
  When independent grounding is not performed, perform "shared grounding" of the following figure.

→ **For details, refer to the FX3U Series User's Manual - Hardware Edition.**



- The grounding wire size should be AWG 14 (2 mm^2).
- The grounding point should be close to the PLC, and all grounding wire should be as short as possible.

4. Specification

STARTUP AND MAINTENANCE PRECAUTIONS **⚠CAUTION**

- Do not disassemble or modify the unit.
  Doing so may cause failure, malfunction or fire.
  * For repair, contact your local Mitsubishi Electric distributor.
- Do not drop the product or do not exert strong impact, doing so may cause damage.

DISPOSAL PRECAUTIONS **⚠CAUTION**

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

TRANSPORT AND STORAGE PRECAUTIONS **⚠CAUTION**

- During transportation avoid any impact as the product is a precision instrument. Check the operation of the product after transportation.

4.1 Applicable PLC

Model name	Applicability
FX3U Series PLC	Ver. 2.20 (from the first product) and later
FX3UC Series PLC	Ver. 1.30 (from the product manufactured in August, 2004 with SER No. 48□□□□) and later

The version number can be checked by monitoring D8001 as the last three digits indicate it.

4.2 General Specification

The items other than the following are equivalent to those of the PLC main unit.
For other general specifications, refer to the manual of the PLC main unit.

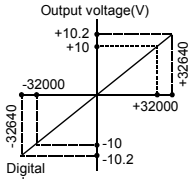
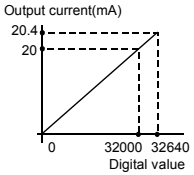
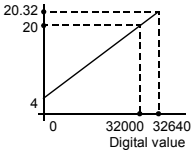
→ **Refer to the FX3U Series User's Manual - Hardware Edition.**

Item	Specification	
Dielectric withstand voltage	500V AC for one minute	Conforming to JEM-1021 Between all terminals and ground terminal of PLC main unit
Insulation resistance	5MΩ or more by 500V DC megger	

4.3 Power Supply Specification

Item	Specification
D/A conversion circuit driving power	24V DC ±10%, 160mA for 24V DC Connect a 24V DC power supply to the terminal block.
CPU driving power	5V DC, 120mA 5V DC power is supplied internally from the main unit.

4.4 Performance Specification

Item	Description	
	Voltage output	**Current output**
Analog output range	-10 to +10V DC (External load: 1kΩ to 1MΩ)	0 to 20mA, 4 to 20mA DC (External load: 500 Ω or less)
Offset[*1]	-10 to +9V[*2]	0 to 17mA[*3]
Gain[*1]	-9 to +10V[*2]	3 to 30mA[*3]
Digital input	With sign, 16bits, binary	15bits, binary
Resolution	0.32mV (20V/64000)	0.63μA (20mA/32000)
Total accuracy	• ±0.3% (±60mV) for full scale of 20V (when ambient temperature is 25°C±5°C) • ±0.5% (±100mV) for full scale of 20V (when ambient temperature is 0°C to 55°C)	• ±0.3% (±60μA) for full scale of 20mA (when ambient temperature is 25°C±5°C) • ±0.5% (±100μA) for full scale of 20mA (when ambient temperature is 0°C to 55°C)
A/D conversion time	1ms (The number of selected channels will not affect this value.)	
Output characteristics[*4]	• Output mode 0 	• Output mode 2 Output current(mA)  • Output mode 3 Output current(mA) 
Insulation method	• The photo-coupler insulates the analog output area from the PLC. • The DC-DC converter insulates the analog output area from the power supply unit. • Channels are not insulated from each other.	
Occupied points	8 point (Count either the input or output points of the PLC.)	

*1 Change the offset and gain values to change the output characteristics. However, the resolution doesn't change even when the offset and gain values change.
When analog value (mV, μA) specification is enabled in the output mode 1 or 4, the offset value and the gain value don't change.

*2 The offset and the gain should satisfy the following condition:
1 V ≤ (Gain - Offset) ≤ 10 V

*3 The offset and the gain should satisfy the following condition:
3 mA ≤ (Gain - Offset) ≤ 30 mA

*4 The output characteristics vary depending on the output mode to be used.
For the details of the output characteristics, refer to the following manual.

→ **Refer to the FX3U / FX3UC Series User's Manual - Analog Control Edition**

4.5 Output characteristics

The output characteristics in each output mode are as follows.

Output mode	Output mode	Analog output range	Digital input range
0	Voltage output mode	-10 to +10V	-32000 to +32000
1	Voltage output analog value mV specification mode	-10 to +10V	-10000 to +10000
2	Current output mode	0 to 20mA	0 to 32000
3	Current output mode	4 to 20mA	0 to 32000
4	Current output analog value μA specification mode	0 to 20mA	0 to 20000

MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE : TOKYO BUILDING, 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
HIMEJI WORKS : 840, CHIYODA CHO, HIMEJI, JAPAN

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FX 3U

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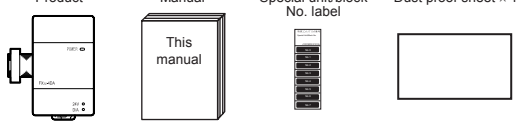

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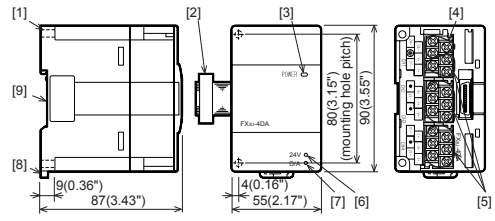
[Without top cover]



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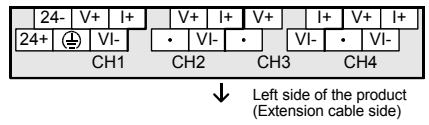

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- Install the product on a flat surface.
  If the mounting surface is rough, undue force will be applied to the PC board, thereby causing nonconformity.
- When drilling screw holes or wiring, cutting chips or wire chips should not enter ventilation slits.
  Such an accident may cause fire, failure or malfunction.
- Be sure to remove the dust proof sheet from the PLC's ventilation port when the installation work is completed.
  Failure to do so could cause fires, equipment failures, and malfunctions.
- Fit the extension cables and communication cables securely to the designated connectors.
  Contact failures may cause malfunctions.

2.1 Arrangements

The product connects on the right side of an PLC main unit or extension units/blocks (including special function units/blocks).
For connection to FX3UC Series PLC or FX2NC Series PLC extension block, FX2NC-CNV-IF or FX3UC-1PS-5V is required.
For further information of installation arrangements, refer to the following manual.

→ **Refer to the FX3U Series User's Manual - Hardware Edition**

2.2 Mounting

The product is mounted by the following method.

- Direct mounting
- DIN rail mounting

2.2.1 Direct Mounting

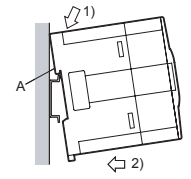
The product can be mounted with M4 screws by using the direct mounting holes. Refer to the External Dimensions (section 1.2) for the product's mounting hole pitch information.
An interval space between each unit of 1 to 2 mm (0.04" to 0.08") is necessary.
For further information of direct installation, also refer to the following manual.

→ **Refer to the FX3U Series User's Manual - Hardware Edition**

2.2.2 DIN Rail Mounting

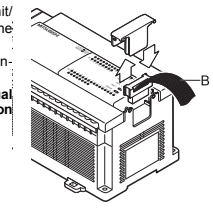
The product can be mounted on a DIN rail (DIN46227, 35mm width).

1) Fit the upper edge of the DIN rail mounting groove (right fig. A) onto the DIN rail.
2) Press the product against the DIN rail.



3) Connect the extension cable (right fig. B) to the main unit, input/output extension unit/block, and special function unit/block on the left.
For the details of the extension cable connection, refer to the following manual.

→ **Refer to the FX3U Series User's Manual - Hardware Edition**



3. Wiring

WIRING PRECAUTIONS ⚠DANGER

- Cut off all phases of power source externally, before installation or wiring work in order to avoid electric shock or damage of product.

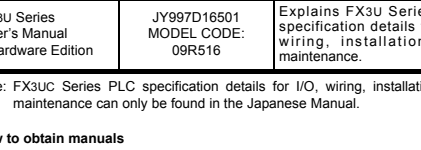
WIRING PRECAUTIONS ⚠CAUTION

- Make sure to observe the precautions below in order to prevent any damage to a machine or any accident which might be caused by abnormal data written in the PLC due to the influence of noise:
  1) Do not lay close or bundle with the main circuit, high-voltage power line, or load line.
  Otherwise effects of noise or surge induction are likely to take place.
  Keep a safe distance of more than 100 mm (3.94") from the above when wiring.
  2) Ground the shield of the twisted shielded cable at one point on the signal receiving side. However, do not ground at the same point as high voltage lines.
- Properly perform wiring to the terminal block following the precautions below in order to prevent electrical shock, short, wire break, or damage to the product.
  - Termination of the wire should follow the dimensions described in this manual.
  - Tightening torque should be 0.5 to 0.8 N•m.

3.1 Applicable Cable and Terminal Tightening Torque

The size of the terminal screws is M3.
The end disposal of the cable shows below.
Tighten the terminal to a torque of 0.5N•m to 0.8N•m.

- When one wire is connected to one terminal



- When two wires are connected to one terminal

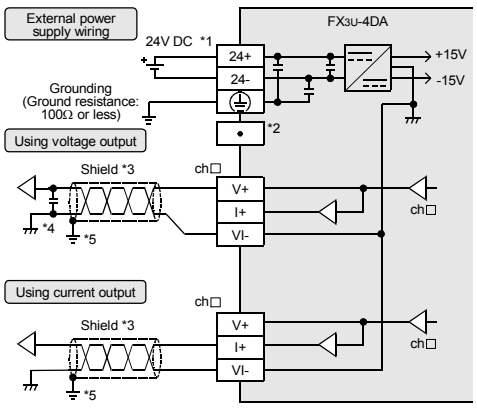
3.2 Power Supply Wiring

For the power supply wiring, refer to the following manual.

→ **Refer to the FX3U / FX3UC Series User's Manual - Analog Control Edition**

3.3 Wiring of Analog Output

→ **For the terminal layout, refer to Subsection 1.2.2**



ch□ : □ represents the channel number.

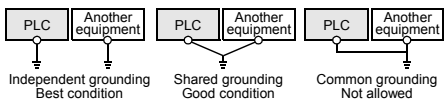
*1 For FX3U Series PLC (AC power type), the 24V DC service power supply is also available.
*2 Leave the [•] terminal unconnected.
*3 Use a 2-core twisted shield wire for analog output line, and separate it from other power lines or inductive lines.
*4 If there is ripple or noise in the output voltage, connect a capacitor of approximately 0.1 to 0.47 μF 25 V in the vicinity of the signal receiving side.
*5 Ground the shielded wire at one point on the signal receiving side.

3.4 Grounding

Grounding should be performed as stated below.

- The grounding resistance should be 100Ω or less.
- Independent grounding should be performed for best results.
  When independent grounding is not performed, perform "shared grounding" of the following figure.

→ **For details, refer to the FX3U Series User's Manual - Hardware Edition.**



- The grounding wire size should be AWG 14 (2 mm^2).
- The grounding point should be close to the PLC, and all grounding wire should be as short as possible.

4. Specification

STARTUP AND MAINTENANCE PRECAUTIONS ⚠CAUTION

- Do not disassemble or modify the unit.
  Doing so may cause failure, malfunction or fire.
  * For repair, contact your local Mitsubishi Electric distributor.
- Do not drop the product or do not exert strong impact, doing so may cause damage.

DISPOSAL PRECAUTIONS ⚠CAUTION

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

TRANSPORT AND STORAGE PRECAUTIONS ⚠CAUTION

- During transportation avoid any impact as the product is a precision instrument. Check the operation of the product after transportation.

4.1 Applicable PLC

Model name	Applicability
FX3U Series PLC	Ver. 2.20 (from the first product) and later
FX3UC Series PLC	Ver. 1.30 (from the product manufactured in August, 2004 with SER No. 48□□□□) and later

The version number can be checked by monitoring D8001 as the last three digits indicate it.

4.2 General Specification

The items other than the following are equivalent to those of the PLC main unit.
For other general specifications, refer to the manual of the PLC main unit.

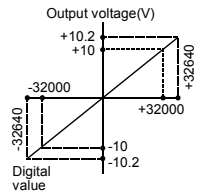
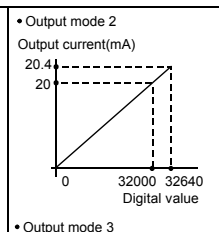
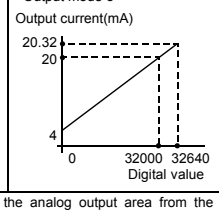
→ **Refer to the FX3U Series User's Manual - Hardware Edition.**

Item	Specification	
Dielectric withstand voltage	500V AC for one minute	Conforming to JEM-1021 Between all terminals and ground terminal of PLC main unit
Insulation resistance	5MΩ or more by 500V DC megger	

4.3 Power Supply Specification

Item	Specification
D/A conversion circuit driving power	24V DC ±10%, 160mA for 24V DC Connect a 24V DC power supply to the terminal block.
CPU driving power	5V DC, 120mA 5V DC power is supplied internally from the main unit.

4.4 Performance Specification

Item	Description	
	Voltage output	Current output
Analog output range	-10 to +10V DC (External load: 1kΩ to 1MΩ)	0 to 20mA, 4 to 20mA DC (External load: 500 Ω or less)
Offset*1	-10 to +9V*2	0 to 17mA*3
Gain*1	-9 to +10V*2	3 to 30mA*3
Digital input	With sign, 16bits, binary	15bits, binary
Resolution	0.32mV (20V/64000)	0.63μA (20mA/32000)
Total accuracy	• ±0.3% (±60mV) for full scale of 20V (when ambient temperature is 25°C±5°C) • ±0.5% (±100mV) for full scale of 20V (when ambient temperature is 0°C to 55°C)	• ±0.3% (±60μA) for full scale of 20mA (when ambient temperature is 25°C±5°C) • ±0.5% (±100μA) for full scale of 20mA (when ambient temperature is 0°C to 55°C)
A/D conversion time	1ms (The number of selected channels will not affect this value.)	
Output characteristics *4	• Output mode 0 	• Output mode 2  • Output mode 3 
Insulation method	• The photo-coupler insulates the analog output area from the PLC. • The DC-DC converter insulates the analog output area from the power supply unit. • Channels are not insulated from each other.	
Occupied points	8 point (Count either the input or output points of the PLC.)	

*1 Change the offset and gain values to change the output characteristics. However, the resolution doesn't change even when the offset and gain values change.
When analog value (mV, μA) specification is enabled in the output mode 1 or 4, the offset value and the gain value don't change.
*2 The offset and the gain should satisfy the following condition:
1 V ≤ (Gain - Offset) ≤ 10 V
*3 The offset and the gain should satisfy the following condition:
3 mA ≤ (Gain - Offset) ≤ 30 mA
*4 The output characteristics vary depending on the output mode to be used.
For the details of the output characteristics, refer to the following manual.

→ **Refer to the FX3U / FX3UC Series User's Manual - Analog Control Edition**

4.5 Output characteristics

The output characteristics in each output mode are as follows.

Output mode	Output mode	Analog output range	Digital input range
0	Voltage output mode	-10 to +10V	-32000 to +32000
1	Voltage output analog value mV specification mode	-10 to +10V	-10000 to +10000
2	Current output mode	0 to 20mA	0 to 32000
3	Current output mode	4 to 20mA	0 to 32000
4	Current output analog value μA specification mode	0 to 20mA	0 to 20000

⚠ For safe use

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi Electric.
- This product has been manufactured under strict quality control. However when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

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