MITSUBISHI ELECTRIC

PROGRAMMABLE CONTROLLERS

MELSEC iQ-F

MELSEC iQ-F FX5-4AD-ADP

Hardware Manual

FX5

Manual Number	JY997D60201
Revision	B
Date	January 2015

This manual describes the part names, dimensions, installation, 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 January 2015
Specifications are subject to change without notice.
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Safety Precaution (Read these precautions before use.)

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 minor or moderate injury or property damage.

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

Associated Manuals

Manual name	Manual No.	Description
MELSEC iQ-F FX5U User's Manual (Hardware)	JY997D55301	Explains FX5U PLC specification details for I/O, wiring, installation, and maintenance.
MELSEC iQ-F FX5UC User's Manual (Hardware)	JY997D61301	Explains FX5UC PLC specification details for I/O, wiring, installation, and maintenance.
MELSEC iQ-F FX5 User's Manual (Analog Control)	JY997D60501	Explains analog control.

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

Applicable standards

FX5-4AD-ADP comply with the EC Directive (EMC Directive) and UL standards (UL, cUL). Further information can be found in the following manual.
→ **MELSEC iQ-F FX5U User's Manual (Hardware)**
→ **MELSEC iQ-F FX5UC User's Manual (Hardware)**
Regarding the standards that relate to the CPU module, please refer to either the product catalog or consult with your nearest Mitsubishi product provider.

Attention
- This product is designed for use in industrial applications.

Note
- Manufactured by: Mitsubishi Electric Corporation
  2-7-3 Marunouchi, Chiyoda-ku, Tokyo, 100-8310 Japan
- Manufactured at: Mitsubishi Electric Corporation Himeji Works
  840 Chiyoda-machi, Himeji, Hyogo, 670-8677 Japan
- Authorized Representative in the European Community:
  Mitsubishi Electric Europe B.V.
  Gothaer Str. 8, 40880 Ratingen, Germany

Caution for EC Directive
- Installation in Enclosure
  Programmable controllers are open-type devices that must be installed and used within conductive control cabinets. Please use the programmable controller while installed within a conductive shielded control cabinet. Installation within a control cabinet greatly affects the safety of the system and aids in shielding noise from the programmable controller.
- Control cabinet
  - The control cabinet must be conductive.
  - Ground the control cabinet with the thickest possible grounding cable.
  - To ensure that there is electric contact between the control cabinet and its door, connect the cabinet and its doors with thick wires.
  - In order to suppress the leakage of radio waves, the control cabinet structure must have minimal openings. Also, wrap the cable holes with a shielding cover or other shielding devices.
  - The gap between the control cabinet and its door must be as small as possible by attaching EMI gaskets between them.

Shielding cover
Shielded cable
Wires*1
EMI gasket
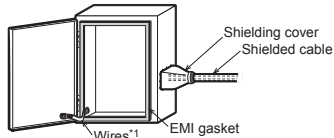
*1 These wires are used to improve the conductivity between the door and control cabinet.
- Cables
  - Make sure to use shielded cables as cables pulled out of the control cabinet.
  - Connect the shield such as shielded cables and shielding covers to the grounded control cabinet.
- It is possible that the accuracy temporarily fluctuates within ±10 %.
- Set the number of times of winding to "2 turns" within approximately 200 mm (7.87") from the terminal block of the analog cable on the FX5-4AD-ADP side, and attach a ferrite core. (Ferrite core used in our test: E04SR401938 manufactured by SEIWA ELECTRIC MFG. CO., LTD.)
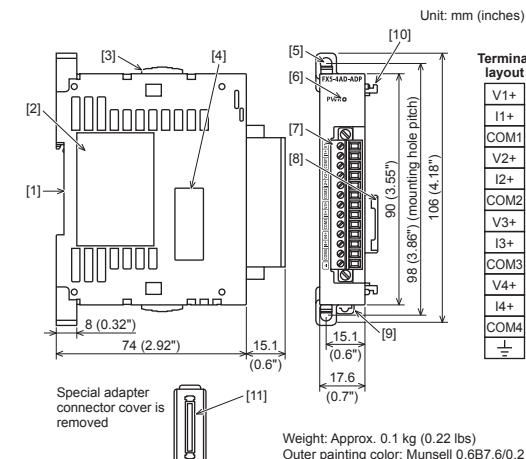
1. Outline

The FX5-4AD-ADP expansion adapter for analog input (hereinafter called 4AD-ADP) is a expansion adapter to add four analog input points.

1.1 Incorporated Items

Verify that the following product and items are included in the package:

Product	FX5-4AD-ADP analog input expansion adapter
Included Items	Hardware manual (This manual)

1.2 External Dimensions, Part Names, and Terminal Layout

Unit: mm (inches)

Terminal layout
V1+
I1+
COM1
V2+
I2+
COM2
V3+
I3+
COM3
V4+
I4+
COM4
⏚

Special adapter connector cover is removed

Weight: Approx. 0.1 kg (0.22 lbs)
Outer painting color: Munsell 0.6B7.6/0.2

[1] DIN rail mounting groove (DIN rail: DIN46277, 35 mm (1.38") wide)
[2] Name plate
[3] Expansion adapter slide lock
[4] Expansion adapter connector cover
[5] Direct mounting hole: 2 holes of φ4.5 (0.18") (mounting screw: M4 screw)
[6] PWR LED (green)
[7] Terminal block (European type terminal block)
[8] Expansion adapter connector
[9] DIN rail mounting hook
[10] Expansion adapter fixing hook
[11] Expansion adapter connector

2. Installation

INSTALLATION 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.
- Use the product within the generic environment specifications described in the FX5 User's Manual (Hardware).
  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.

INSTALLATION PRECAUTIONS	⚠CAUTION

- Do not touch the conductive parts of the product directly.
  Doing so may cause device failures or malfunctions.
- 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.
- 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.
- Install the product securely using a DIN rail or mounting screws.
- Connect the expansion board and expansion adapter securely to their designated connectors.
  Loose connections may cause malfunctions.

For the installation, refer to the following manual.
→ **MELSEC iQ-F FX5U User's Manual (Hardware)**
→ **MELSEC iQ-F FX5UC User's Manual (Hardware)**

3. Wiring

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.
- 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 ends of stranded wires 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.

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.
- Make sure to observe the following precautions in order to prevent any damage to the machinery or accidents due to malfunction of the PLC caused by abnormal data written to the PLC due to the effects of noise:
  1) Do not bundle the power line or analog input/output cable together with or lay them close to the main circuit, high-voltage line, load line or power line. As a guideline, lay the power line, control line and communication cables at least 100 mm (3.94") away from the main circuit, high-voltage line, load line or power line.
  2) Ground the shield of the analog input/output cable at one point on the signal receiving side.
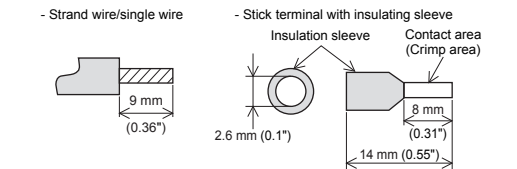   However, do not use common grounding with heavy electrical systems.

3.1 Cable end treatment and tightening torque

3.1.1 European type terminal block

1) Suitable wiring

| No. of wire per terminal	Wire size	
	Single wire, Strand wire	Ferrules with insulating sleeve
One wire	AWG22 to 20 (0.3 to 0.5 mm^2)	AWG22 to 20 (0.3 to 0.5 mm^2)
Two wires	AWG22 (0.3 mm^2)	-

2) Tightening torque
Tighten the terminal screws with 0.20 N•m.
Do not tighten the screws outside the specified torque.
Failure to do so may cause equipment failures or malfunctions.

3) Wire end treatment
Strip the coating of strand wire and twist the cable core before connecting it, or strip the coating of single wire before connecting it.
When using a wire ferrule with an insulating sleeve, choose a wire with proper cable sheath referring to the above outside dimensions, otherwise the wire cannot be inserted easily.

- Strand wire/single wire

9 mm (0.36")

- Stick terminal with insulating sleeve
Insulation sleeve
Contact area (Crimp area)
2.6 mm (0.1")
8 mm (0.31")
14 mm (0.55")

<Reference>

Manufacturer	Model	Caulking tool
Phoenix Contact GmbH & Co. KG	AI 0.5-8 WH	CRIMPFOX 6 CRIMPFOX 6T-F

4) 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.

With straight tip

0.4 mm (0.01")　　2.5 mm (0.09")
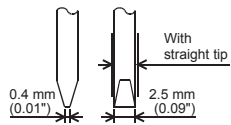
Note:
If the diameter of screwdriver grip is too small, tightening torque may not be achieved. To achieve the appropriate tightening torque shown in the table above, use the following screwdriver or appropriate replacement (grip diameter: approximately 25 mm (0.98")).

Manufacturer	Model names
Phoenix Contact GmbH & Co. KG	SZS 0.4×2.5

5) Terminal block fixed screw tightening torque
Tighten the screws within the range of 0.2 to 0.3 N•m.
Do not tighten terminal screws exceeding with a torque outside the abovementioned range.
Failure to do so may cause equipment failures or malfunctions.

3.2 Wiring of Analog Input

→ **For the terminal configuration, refer to Section 1.2**
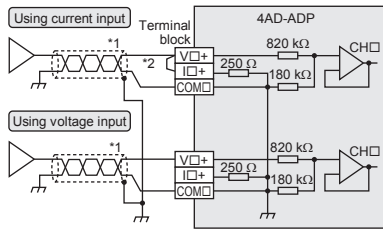
V□ +, I□+, COM□, CH□: □ represents the channel number.

*1 Use 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 'I□+' terminals when current is input. (□: input channel number)

3.3 Grounding
Grounding should be performed as stated below.
- The grounding resistance should be 100 Ω or less.
- Independent grounding should be performed for best results.
  When independent grounding is not performed, perform "shared grounding" of the following figure.
  For the details, refer to the following manual.
  → **MELSEC iQ-F FX5U User's Manual (Hardware)**
  → **MELSEC iQ-F FX5UC User's Manual (Hardware)**

Independent grounding (Best condition)　　Shared grounding (Good condition)　　Common grounding (Not allowed)
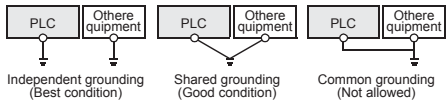
- The grounding wire size should be AWG 22 to 20 (0.3 to 0.5 mm²).
- The grounding point should be close to the PLC, and all grounding wire should be as short as possible.

4. Specifications

4.1 Applicable CPU module

Model name	Applicability
FX5U CPU module	Ver. 1.010 or later
FX5UC CPU module	Ver. 1.010 or later

4.2 General Specifications
The items other than the following are equivalent to those of the CPU module.
For general specifications, refer to the following manual.
→ **MELSEC iQ-F FX5U User's Manual (Hardware)**
→ **MELSEC iQ-F FX5UC User's Manual (Hardware)**

Item	Specification	
Dielectric withstand voltage	500 V AC for one minute	Between all external terminals and ground terminal of CPU module
Insulation resistance	10 MΩ or higher by 500 V DC insulation resistance tester	

4.3 Power Supply Specifications

Item	Specification
Internal electric supply (A/D conversion circuit)	24 V DC 20 mA Internal electric supply is carried out from 24 V DC power supply of a CPU module.
Internal electric supply (Interface)	5 V DC 10 mA Internal electric supply is carried out from 5 V DC power supply of a CPU module.

4.4 Performance Specifications

Item	Specification			
Number of analog input points	4 points (4 channels)			
Analog input voltage	-10 to +10 V DC (input resistance 1 MΩ)			
Analog input current	-20 to +20 mA DC (input resistance 250 Ω)			
Digital output value	14-bit binary value			
Input characteristics, resolution*1		Analog input range	Digital output value	Resolution
	Voltage	0 to 10 V	0 to 16000	625 μV
		0 to 5 V	0 to 16000	312.5 μV
		1 to 5 V	0 to 12800	312.5 μV
		-10 to +10V	-8000 to +8000	1250 μV
	Current	0 to 20 mA	0 to 16000	1.25 μA
		4 to 20 mA	0 to 12800	1.25 μA
		-20 to +20 mA	-8000 to +8000	2.5 μA
Accuracy (accuracy for the full scale digital output value)	Ambient temperature 25±5℃: within ±0.1 % (±16 digit) Ambient temperature 0 to 55℃: within ±0.2 % (±32 digit)			
Conversion speed	Maximum 450 μs (The data will be updated at every scan time of the PLC.)			
Absolute maximum input	Voltage: ±15 V, Current: ±30 mA			
Isolation method	Between input terminal and PLC: Photocoupler Between input channels: Non-isolation			
Number of occupied I/O points	0 point (This number is not related to the maximum number of I/O points of the PLC.)			

*1 For the input conversion characteristic, refer to the following.
→ **MELSEC iQ-F FX5 User's Manual (Analog Control)**

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