



Side A JAPANESE  
Side B ENGLISH

PROGRAMMABLE CONTROLLERS  
MELSEC iQ-F

MELSEC iQ-F FX5-4AD-TC-ADP

Hardware Manual



Manual Number	JY997D66701
Revision	A
Date	October 2016

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.

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Effective October 2016  
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Safety Precaution (Read these precautions before use.)

This manual classifies the safety precautions into two categories:

**WARNING** and **CAUTION**

<b>WARNING</b>	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
<b>CAUTION</b>	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 FX5 User's Manual (Analog Control)	JY997D60501	Explains analog control.
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.

How to obtain manuals

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

Applicable standards

FX5-4AD-TC-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.

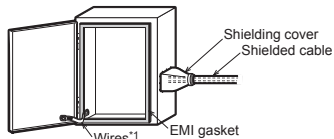
Attention

This product is designed for use in industrial applications.

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.



- \*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 %.

1. Outline

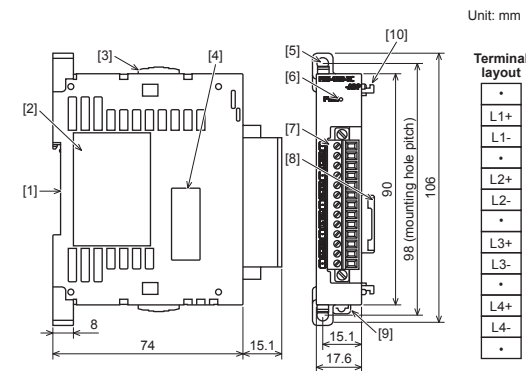
FX5-4AD-TC-ADP expansion adapter for thermocouple temperature sensor input (hereinafter called TC-ADP) is an expansion adapter for connecting a thermocouple (K, J, T, B, R, S) temperature sensor, and measuring 4 channels of temperature.

1.1 Incorporated Items

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

Product	Product Name
	FX5-4AD-TC-ADP thermocouple temperature sensor input expansion adapter
Included Items	Hardware manual (This manual)

1.2 External Dimensions, Part Names, and Terminal Layout



Special adapter connector cover is removed  
Weight: Approx. 0.1 kg  
Outer painting color: Munsell 0.6B7.6/0.2

- [1] DIN rail mounting groove (DIN rail: DIN46277, 35 mm wide)
- [2] Name plate
- [3] Expansion adapter slide lock
- [4] Expansion adapter connector cover
- [5] Direct mounting hole: 2 holes of φ4.5 (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 User's Manual (Hardware) for the CPU module to be used. Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, Cl<sub>2</sub>, H<sub>2</sub>S, SO<sub>2</sub> or NO<sub>2</sub>), 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.

To use two or more FX5-4DA-ADP, connect them to only one side of this product. Do not connect them to both sides.  
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:
  - 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 away from the main circuit, high-voltage line, load line or power line.
  - 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

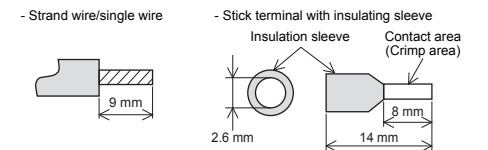
3.1.1 European type terminal block

- Wiring type  
Use shielded compensating lead wire that is suitable for the thermocouple type when wiring the thermocouple.
- 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 <sup>2</sup> )	AWG22 to 20 (0.3 to 0.5 mm <sup>2</sup> )
Two wires	AWG22 (0.3 mm <sup>2</sup> )	-

- 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.

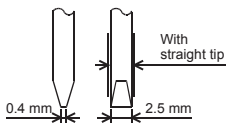
- Wire end treatment  
Strip the coating of strand wire and twist the cable core before connecting it, or strip the coating of single wire before connecting it. When using a wire ferrule with an insulating sleeve, choose a wire with proper cable sheath referring to the above outside dimensions, otherwise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



<Reference>

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

- 5) 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.



**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

- 6) 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.

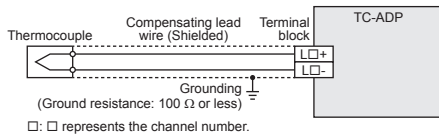
### 3.2 Wiring of Thermocouple

→ For the terminal configuration, refer to Section 1.2

#### 3.2.1 Selection of the thermocouple

- Thermocouple type
  - There are 6 types of thermocouples: K, J, T, B, R, and S type.
  - Use insulated thermocouple types.
- Compensating lead wire
  - When the thermocouple is extended, use compensating lead wire that is suitable for the type.
  - The influence of wiring resistance of thermocouple and compensating lead wire is approximately  $-0.083 \mu\text{V}/\Omega$ .

#### 3.2.2 Example of thermocouple wiring



#### 3.2.3 Precautions on thermocouple wiring

- Separate the cable of the resistance thermometer detector from other power cables or areas easily affected by inductive noise (from commercial power, etc.).

### 3.3 Grounding

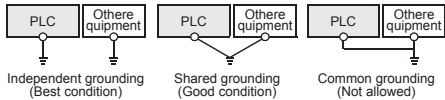
Grounding should be performed as stated below.

- 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)



- The grounding wire size should be AWG 22 to 20 (0.3 to 0.5 mm<sup>2</sup>).
- The grounding point should be close to the PLC, and all grounding wire should be as short as possible.

## 4. Specifications

STARTUP AND MAINTENANCE PRECAUTIONS	CAUTION
<ul style="list-style-type: none"> <li>Do not disassemble or modify the PLC. Doing so may cause fire, equipment failures, or malfunctions. For repair, contact your local Mitsubishi Electric representative.</li> <li>Do not drop the product or exert strong impact to it. Doing so may cause damage.</li> </ul>	

DISPOSAL PRECAUTIONS	CAUTION
<ul style="list-style-type: none"> <li>Please contact a certified electronic waste disposal company for the environmentally safe recycling and disposal of your device.</li> </ul>	

TRANSPORTATION PRECAUTIONS	CAUTION
<ul style="list-style-type: none"> <li>The product is a precision instrument. During transportation, avoid impacts larger than those specified in the general specifications by using dedicated packaging boxes and shock-absorbing pallets. Failure to do so may cause failures in the product. After transportation, verify operation of the product and check for damage of the mounting part, etc.</li> </ul>	

#### 4.1 Applicable CPU Module

Model name	Applicability
FX5U CPU module	Ver. 1.040 or later
FX5UC CPU module	Ver. 1.040 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		
	Centigrade (°C)	Fahrenheit (°F)	
Number of analog input points	4 points (4 channels)		
Usable thermocouple	K, J, T, B, R, S		
Temperature measuring range	K	-200 to +1200°C -328 to +2192°F	
	J	-40 to +750°C -40 to +1382°F	
	T	-200 to +350°C -328 to +662°F	
	B	600 to 1700°C 1112 to 3092°F	
	R	0 to 1600°C 32 to 2912°F	
	S	0 to 1600°C 32 to 2912°F	
Digital output value	16-bit signed binary		
	K	-2000 to +12000 -3280 to +21920	
	J	-400 to +7500 -400 to +13820	
	T	-2000 to +3500 -3280 to +6620	
	B	6000 to 17000 11120 to 30920	
	R	0 to 16000 32 to 29120	
S	0 to 16000 32 to 29120		
Accuracy <sup>1</sup>	Ambient temperature 25±5°C	K	±3.7°C (-100 to +1200°C) <sup>2</sup> ±4.9°C (-150 to -100°C) <sup>2</sup> ±7.2°C (-200 to -150°C) <sup>2</sup>
		J	±2.8°C
		T	±3.1°C (0 to 350°C) <sup>2</sup> ±4.1°C (-100 to 0°C) <sup>2</sup> ±5.0°C (-150 to -100°C) <sup>2</sup> ±6.7°C (-200 to -150°C) <sup>2</sup>
		B	±3.5°C
		R	±3.7°C
		S	±3.7°C
	Ambient temperature -20 to 55°C	K	±6.5°C (-100 to +1200°C) <sup>2</sup> ±7.5°C (-150 to -100°C) <sup>2</sup> ±8.5°C (-200 to -150°C) <sup>2</sup>
		J	±4.5°C
		T	±4.1°C (0 to 350°C) <sup>2</sup> ±5.1°C (-100 to 0°C) <sup>2</sup> ±6.0°C (-150 to -100°C) <sup>2</sup> ±7.7°C (-200 to -150°C) <sup>2</sup>
		B	±6.5°C
		R	±6.5°C
		S	±6.5°C
Resolution	K, J, T	0.1°C	0.1 to 0.2°F
	B, R, S	0.1 to 0.3°C	0.1 to 0.6°F
Conversion speed	Approx. 85 ms/channel <sup>3</sup>		
Isolation method	Between input terminal and CPU module: 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.)		

<sup>1</sup> To satisfy the accuracy, it is required to warm up (supply power) for 45 min.

<sup>2</sup> The accuracy differs depending on the range of the measured temperature in ( ).

<sup>3</sup> For details of the conversion speed, refer to the following manual.

→ MELSEC IQ-F FX5 User's Manual (Analog Control)

This manual confers no industrial property rights or any rights of any other kind, nor does it confer any patent licenses. Mitsubishi Electric Corporation cannot be held responsible for any problems involving industrial property rights which may occur as a result of using the contents noted in this manual.

#### Warranty

Exclusion of loss in opportunity and secondary loss from warranty liability  
Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:  
(1) Damages caused by any cause found not to be the responsibility of Mitsubishi.  
(2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.  
(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.  
(4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

#### 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.

**MITSUBISHI ELECTRIC CORPORATION**

HEAD OFFICE : TOKYO BUILDING, 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN