



Programmable Controller
MELSEC iQ-F

MELSEC iQ-F FX5-20PG-P

Hardware Manual



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Revision	A
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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 March 2017
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Safety Precautions (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 Manual

Manual name	Manual No.	Description
MELSEC iQ-F FX5 User's Manual (Positioning Control - Intelligent function module)	SH-081805ENG	Explains positioning module.
MELSEC iQ-F FX5U User's Manual (Hardware)	JY997D55301	Explains FX5U CPU module specification details for I/O, wiring, installation, and maintenance.
MELSEC iQ-F FX5UC User's Manual (Hardware)	JY997D61401	Explains FX5UC CPU module 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

FX5-20PG-P complies with the EC Directive (EMC Directive) and UL standards (UL, cUL). Further information can be found in the following manual.

→ MELSEC iQ-F FX5 User's Manual

(Positioning Control - Intelligent function module)

Regarding the standards that relate to the CPU module, please refer to either the product catalog or consult with your local Mitsubishi Electric representative.

Attention

This product is designed for use in industrial applications.

1. Outline

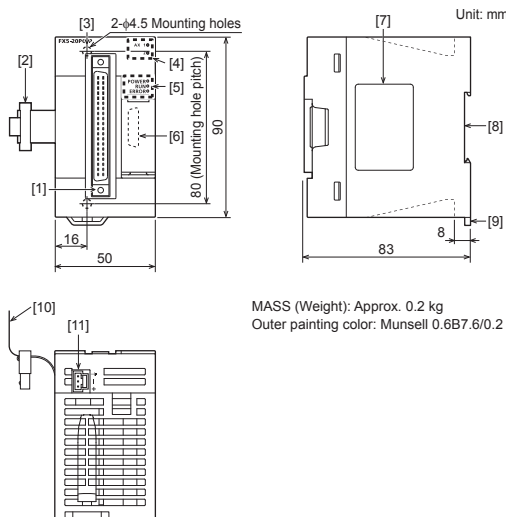
FX5-20PG-P 2-axis pulse train positioning module (hereinafter referred to as FX5-20PG-P) is an intelligent function module for high speed, high precision positioning with servo motors or stepping motors via drive units.

1.1 Incorporated Items

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

Product	Product
FX5-20PG-P 2 axis pulse train positioning module	
Included Items	FX2NC-100MPCB power cable: (1 m, three wire) Dust proof protection sheet (1 sheet) Hardware manual (This manual)

1.2 External Dimensions, Part Names



Unit: mm
MASS (Weight): Approx. 0.2 kg
Outer painting color: Munsell 0.6B7.6/0.2

- [1] Connector for external devices
- [2] Extension cable
- [3] Direct mounting hole: 2 holes of φ4.5 (mounting screw: M4 screw)
- [4] Axis display LED (AX1, AX2)
- [5] Operation status display LEDs
- [6] Extension connector (for next module)
- [7] Name plate
- [8] DIN rail mounting groove (DIN rail: DIN 46277, 35 mm wide)
- [9] DIN rail mounting hook
- [10] Pullout tab
- [11] Power connector

1.3 Indications of LEDs

□: OFF, ■: ON, ●: Flashing (Flashing interval ON: 200 ms/OFF: 200 ms)

FX5-20PG-P status	LED display	Indication
Power OFF	AX1 □ AX2 □ POWER □ RUN □ ERROR □	Power OFF
Normal operation (RUN LED is ON, ERROR LED is OFF)	AX1 □ AX2 □ POWER ■ RUN ■ ERROR □	Axes stopped Axes on standby
	AX1 ■ AX2 □ POWER ■ RUN ■ ERROR □	Axes in operation
Operation failure	AX1 ● AX2 □ POWER ■ RUN ■ ERROR ■	Minor error
	AX1 □ AX2 □ POWER ■ RUN ■ ERROR ●	Moderate error
	AX1 □ AX2 □ POWER ■ RUN □ ERROR □	Error (Initial not completed)

1.4 Signal Layouts

The signal layout of the FX5-20PG-P connector for external devices is as follows:

	Axis 2 (AX2)		Axis 1 (AX1)	
	Pin No.	Signal	Pin No.	Signal
B20		A20		
B19	B20	PULSER B-	A20	PULSER B+
B18	B19	PULSER A-	A19	PULSER A+
B17	B18	PULSE COM	A18	PULSE COM
B16	B17	PULSE R	A17	PULSE R
B15	B16	PULSE COM	A16	PULSE COM
B14	B15	PULSE F	A15	PULSE F
B13	B14	CLRCOM	A14	CLRCOM
B12	B13	CLEAR	A13	CLEAR
B11	B12	RDYCOM	A12	RDYCOM
B10	B11	READY	A11	READY
B9	B10	PG0COM	A10	PG0COM
B8	B9	PG05	A9	PG05
B7	B8	PG024	A8	PG024
B6	B7	COM	A7	COM
B5	B6	COM	A6	COM
B4	B5	CHG	A5	CHG
B3	B4	STOP	A4	STOP
B2	B3	DOG	A3	DOG
B1	B2	RLS	A2	RLS
	B1	FLS	A1	FLS

For further information on signal, refer to the following manual.

→ MELSEC iQ-F FX5 User's Manual (Positioning Control - Intelligent function module)

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, Cl₂, H₂S, SO₂ or NO₂), 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 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.
- The dust proof sheet should be affixed to the ventilation slits before installation and wiring work to block foreign objects such as cutting and wiring debris. However, when the installation work is completed, make sure to remove the sheet to provide adequate ventilation. 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 extension cables securely to their designated connectors. Loose connections may cause malfunctions.

For further information on mounting, 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.

WIRING PRECAUTIONS **CAUTION**

- Securely connect the connector to the module. Poor contact may cause malfunction.
- 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 and communication cables 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.

3.1 Applicable Connector

Use the following 40 pin connectors.

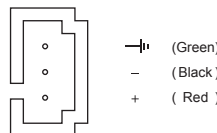
Type	Model	Suitable wiring			
		Size	Type	Material	Temperature rating
Soldering type connector (straight type)	A6CON1*1	0.088 to 0.3 mm ² (AWG28 to 22)	Strand wire	Copper wire	80°C or more
Crimping type connector (straight type)	A6CON2	0.088 to 0.24 mm ² (AWG28 to 24)			
Soldering type connector (dual purpose (straight/oblique) type)	A6CON4*1	0.088 to 0.3 mm ² (AWG28 to 22)			

*1 Use wire with a sheath outside diameter of 1.3 mm or less when the 40 pins are used. Select appropriate cables according to the current value used.

3.2 Power Connector

For further information on the power supply wiring and power cable, refer to the following manual.

→ MELSEC iQ-F FX5 User's Manual (Positioning Control - Intelligent function module)



3.3 Grounding

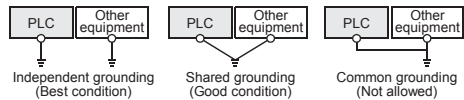
Ground the PLC as stated below.

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

For details, refer to the following manual.

→ MELSEC iQ-F FX5U User's Manual (Hardware)

→ MELSEC iQ-F FX5UC User's Manual (Hardware)



- Bring the grounding point close to the PLC as much as possible so that the ground cable can be shortened.

4. Specification

DESIGN PRECAUTIONS	⚠ WARNING
<ul style="list-style-type: none"> • Make sure to set up the following safety circuits outside the PLC to ensure safe system operation even during external power supply problems or PLC failure. Otherwise, malfunctions may cause serious accidents. <ul style="list-style-type: none"> - Most importantly, set up 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). - Note that when the CPU module 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 CPU module 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. - Note that the output current of the 24 V DC service power supply varies depending on the model and the absence/presence of extension modules. If an overload 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. - Note that when an error occurs in a relay, transistor or triac of an output circuit, the output might stay 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. • At Forward/Reverse rotation limits, make sure to wire the contacts with NC, negative-logic. Wiring contacts with NO, positive-logic may cause serious accidents. • In an output circuit, when a load current exceeding the current rating or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse. 	

DESIGN PRECAUTIONS	⚠ CAUTION
<ul style="list-style-type: none"> • Simultaneously turn on and off the power supplies of the CPU module and extension modules. 	

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

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

TRANSPORTATION PRECAUTIONS	⚠ CAUTION
<ul style="list-style-type: none"> • 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. 	

4.1 Applicable CPU Module

Model name	Applicability
FX5U CPU module	Ver. 1.050 or later
FX5UC CPU module*1	Ver. 1.050 or later

*1 FX5-CNV-IFC or FX5-C1PS-5V is necessary to connect FX5-20PG-P to the FX5UC CPU module.

4.2 General Specifications

The items other than the following are equivalent to those of the CPU module. For the general specification, refer to the following manual.

→ MELSEC iQ-F FX5U User's Manual (Hardware)

→ MELSEC iQ-F FX5UC User's Manual (Hardware)

Items	Specifications	
Dielectric withstand voltage	500 V AC for 1 minute	Between all terminals and ground terminal
Insulation resistance	10 MΩ or higher by 500 V DC insulation resistance tester	

4.3 Power Supply Specifications

Items	Specifications	
External power supply	Power supply voltage	24 V DC +20%, -15%
	Allowable instantaneous power failure time	Operation continues when the instantaneous power failure is shorter than 5 ms.
	Current consumption	120 mA

4.4 Performance Specifications

Items	Specifications
Number of control axes	2 axes
Pulse output form	Transistor
Interpolation function	2-axis linear interpolation, 2-axis circular interpolation
Control method	PTP (Point To Point) control, path control (line and arc can be set), speed control, speed-position switching control, position-speed switching control
Control unit	mm, inch, degree, pulse
Positioning data	600 data/axis
Maximum connection distance between servos	2 m
Number of write accesses to flash ROM	100000 times maximum
Number of occupied I/O points	8 points

4.5 Input Specifications

4.5.1 Drive unit READY signal (READY), Stop signal (STOP), Upper limit signal (FLS), Lower limit signal (RLS)

Items	Specifications
Signal voltage	24 V DC
Input current	5 mA
ON current	3.5 mA or more
OFF current	1.7 mA or less
Signal format	No-voltage contact input Sink: NPN open collector transistor Source: PNP open collector transistor
Response time	4 ms or less
Insulation of circuit	Photo-coupler insulation
Indication of operation	None (Operation check via buffer memory is possible.)

4.5.2 Zero signal (PG05/PG024)

Items	Specifications	
	PG05	PG024
Signal voltage	5 V DC	24 V DC
Input current	5 mA	
ON current	2 mA or more	3 mA or more
OFF current	0.5 mA or less	0.2 mA or less
Signal format	NPN open collector transistor	
Response time	1 ms or less	
Insulation of circuit	Photo-coupler insulation	
Indication of operation	None (Operation check via buffer memory is possible.)	

4.5.3 Manual pulse generator A phase (PULSER A)/ Manual pulse generator B phase (PULSER B)

Items	Specifications
Signal voltage	5 V DC
Input current	14 mA
ON current	2 mA or more
OFF current	0.2 mA or less
Signal format	NPN open collector transistor
Response frequency	100 kHz
Insulation of circuit	Photo-coupler insulation
Indication of operation	None (Operation check via buffer memory is possible.)

4.5.4 Near-point dog signal (DOG)

Items	Specifications
Signal voltage	24 V DC
Input current	5 mA
ON current	3.5 mA or more
OFF current	1.7 mA or less
Signal format	No-voltage contact input Sink: NPN open collector transistor Source: PNP open collector transistor
Response time	1 ms or less
Insulation of circuit	Photo-coupler insulation
Indication of operation	None (Operation check via buffer memory is possible.)

4.5.5 External command signal (CHG)

Items	Specifications
Signal voltage	24 V DC
Input current	5 mA
ON current	2.7 mA or more
OFF current	0.8 mA or less
Signal format	No-voltage contact input Sink: NPN open collector transistor Source: PNP open collector transistor
Response time	20 μs
Insulation of circuit	Photo-coupler insulation
Indication of operation	None (Operation check via buffer memory is possible.)

4.6 Output Specifications

4.6.1 Deviation counter clear signal (CLEAR)

Items	Specifications
Pulse output form	Transistor
Signal output time	1 to 65535 ms
Rated load voltage	5 to 24 V DC
Max. load current	100 mA
Output ON voltage	1.5 V or less
Indication of operation	None (Operation check via buffer memory is possible.)

4.6.2 Pulse output (PULSE R/ PULSE F)

Items	Specifications
Pulse output form	Transistor
Output form	PULSE/SIGN mode, CW/CCW mode, A phase/B phase (multiple of 4), A phase/B phase (multiple of 1)
Output frequency	1 pps to 200 kpps
Rated load voltage	5 to 24 V DC
Max. load current	50 mA
Output ON voltage	1.0 V or less
Indication of operation	None (Operation check via buffer memory is possible.)

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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:
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(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.

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