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MELSEC iQ-F FX5-20PG-□

Hardware Manual



Manual Number	JY997D74101
Revision	E
Date	October 2023

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

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Effective October 2023

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Safety Precautions (Read these precautions before use.)

This manual classifies the safety precautions into two categories: **MARNING** and **MCAUTION**

<u></u> <u></u> <u></u> <u></u> <u></u> <u></u> <u></u> <u></u> <u></u>	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 ACAUTION 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 Positioning Module User's Manual	SH-081805ENG	Explains positioning module.
MELSEC iQ-F FX5S/ FX5UJ/FX5U/FX5UC User's Manual (Hardware)	SH-082452ENG	Describes the details of hardware of the CPU module, including performance specifications, wiring, installation, and maintenance.

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

Applicable standards

FX5-20PG-□ complies with the EU Directive (EMC Directive), UL standards (UL cUL) and UKCA marking. Further information can be found in the following

→ MELSEC iQ-F FX5 Positioning Module User's Manual

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

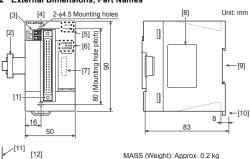
1. Outline

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

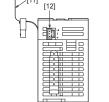
1.1 Incorporated Items e following product and items are included in the package

	Product	FX5-20PG-□ 2 axis pulse train positioning module
	FX2NC-100MPCB power cable: (1 m, three wire)	
	Included Items	Dust proof protection sheet (1 sheet)
included items	Hardware manual [Japanese /English] (This manual)	
		Hardware manual [Chinese]

1.2 External Dimensions, Part Names



Outer painting color: Munsell 0.6B7.6/0.2



- [1] Connector for external devices [2] Extension cable
- [3] Differential driver common terminal
- [4] Direct mounting hole: 2 holes of ϕ 4.5 (mounting screw: M4 screw)
- [5] Axis display LED (AX1, AX2) [6] Operation status display LEDs
- [7] Extension connector (for next module)
- [8] Name plate
- [9] DIN rail mounting groove (DIN rail: DIN 46277, 35 mm wide)
- [10] DIN rail mounting hook
- [11] Pullout tab
- [12] Power connector
- *1 FX5-20PG-D only

4. Specification

1.3 Indications of LEDs

shing interval ON: 200 ms/OFF: 200 ms)

FX5-20PG-□ status	LED display		Indication	
Power OFF	AX1 □ AX2 □	POWER □ RUN □ ERROR □	Power OFF	
Normal operation (RUN LED is ON,	AX1 □ AX2 □	POWER■ RUN ■ ERROR □	Axes stopped Axes on standby	
ERROR LED is OFF)	AX1 ■ AX2 □	POWER■ RUN ■ ERROR □	Axes in operation	
Operation failure	AX1 ● AX2 □	POWER■ RUN ■ ERROR■	Minor error	
Operation failure	AX1 □ AX2 □	POWER■ RUN ■ ERROR ●	Moderate error	

POWER■ AX1 🗆 AX2 🗆 Operation failure Error (Initial not completed)

1.4 Signal Layouts The signal layout of the FX5-20PG-□ connector for external devices is as follows Axis 2 (AX2)

Axis 1 (AX1)

1.4.1 40-pin connectors

B- A20	PULSER B+
	PULSER D+
A- A19	PULSER A+
OM ^{*1} A18 F	PULSE COM*1
R*1 A17	PULSE R*1
OM ^{*1} A16 F	PULSE COM*1
F*1 A15	PULSE F*1
M A14	CLRCOM
R A13	CLEAR
M A12	RDYCOM
Y A11	READY
M A10	PG0COM
A9	PG05
4 A8	PG024
A7	COM
A6	COM
A5	CHG
A4	STOP
A3	DOG
A2	RLS
A1	FLS
	DM 1 A18 F R1 A17 DM 1 A16 F F1 A15 DM A14 R A13 DM A12 Y A11 DM A10 A19

*1 The signal layouts of FX5-20PG-D are as follows

3 ,			
Axis	2 (AX2)	Axis	1 (AX1)
Pin No.	Signal	Pin No.	Signal
B18	PULSE R-	A18	PULSE R-
B17	PULSE R+	A17	PULSE R+
B16	PULSE F-	A16	PULSE F-
B15	PULSE F+	A15	PULSE F+

ation on signal, refer to the following manual.

→ MELSEC iQ-F FX5 Positioning Module User's Manua

1.4.2 Differential driver common terminal (FX5-20PG-D only)

PLS.	Signal
COM Differential driver common terminal	PLS COM (Differential driver comm
COMITMENT	

2. Installation

INSTALLATION PRECAUTIONS	<u></u> MARNING
Males seems to a	

Make sure to cut off all phases of the power supply externally before attempting installation or wiring work.
Fallure 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.

STALLATION	A CALITICA
RECAUTIONS	 ∴ 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.

NSTALLATION **∴**CAUTION RECAUTIONS

- 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, undure force will be applied to the PC board, thereby causing nonconformities.

- roree 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 FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware)

Wiring

WIRING PRECAUTIONS **<u>∧</u>** WARNING

- Make sure to cut off all phases of the power supply externally bef 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°€ or more.
 Make sure to properly wire to the spring clamp terminal block in accordal with the Ectionizing preguitions.

- with the following precautions Failure to do so may cause electric shock, equipment failures, a shortcircu
- wire breakage, malfunctions, or damage to the product.

 The disposal size of the cable end should follow the dimensions describe

- Do not solder-plate the electric wire ends.

 Do not connect more than the specified number of wires or of unspecified size.

⚠CAUTION

- malfunction. Make sure to observe the following precautions in order to prevent an damage to the machinery or accidents due to malfunction of the PLC cause 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 of power line.

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

→ MELSEC iQ-F FX5 Positioning Mod

ng Module User's Manual 3.1 Applicable Connector

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

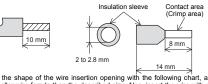
3.2.1	3.2.1 Suitable Wiring			
No. of	wire per terminal	One wire		
Wire	Single wire, Strand wire (Material: Copper wire)	AWG24 to 16 (0.2 to 1.5 mm ²)		
size	Ferrules with insulation sleeve	AWG23 to 19 (0.25 to 0.75 mm ²)		
	Ferrules without insulation sleeve	AWG23 to 16 (0.25 to 1.5mm ²)		
Temp	erature rating	80°C or more		

3.2.2 Wire end treatment

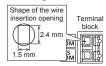
3.2.2 Wire end treatment
Strip the cable about 10 mm from the tip to connect a wire ferrule at the stripped area. Failure to do so may result in electric shock or short circuit between adjacent terminals because the conductive part. If the wire strip length is too short, it may result in the poor contact to the spring clamp terminal part.
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

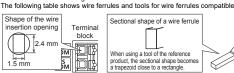
be inserted easily - Strand wire/single wire - Ferrule with insulation sleeve





Check the shape of the wire insertion opening with the following chart, and use the smaller wire ferrule than the described size. Also, insert the wire with care so that the wire ferrule is in proper orientation. Failure to do so may cause the bite of the terminal and the damage of the terminal block.





The following table shows wire ferrules and its associated tools compatible with the terminal block. The shape of the wire ferrule differs depending on the crimp tool to be used, use the reference product. If the product other than reference products used, the wire ferrule cannot be removed. Sufficiently confirm that the wire ferrule can be removed before use.

<Reference product>

Manufacturer	Sleeve	Ferrules model	Suitable wiring size	Crimp tool
	Ferrules	AI 0.25-8 YE	0.25 mm ²	
	with insulation sleeve	AI 0.34-8 TQ	0.3, 0.34 mm ²	
		AI 0.5-8 WH	0.5 mm ²	
	0.0010	AI 0.75-8 GY	0.75 mm ²	
PHOENIX CONTACT	NTACT	A 0,25-7	0.25 mm ²	CRIMPFOX 6
GmbH & Co. KG		A 0,34-7	0.3, 0.34 mm ²	CITIVII I OX 0
G.I.B.T & GG. 11G		A 0,5-8	0.5 mm ²	
		A 0,75-8	0.75 mm ²	
	0.0010	AI 1.0-8	1.0 mm ²	
		AI 1.5-7	1.25, 1.5 mm ²	

3.2.3 Connecting a cable

• When ferrules with insulation sleeve are used Insert a wire with the ferrule with insulation sleeve into the wire insertion opening and push the wire.

• When stranded wires and solid wires are used Push the open/close button of the terminal block with a flathead screwdriver. While pushing the open/close button, insert the wire into the insertion opening until the wire reaches the back, and then release the open/close button. Then, pull the wire lightly and check that it is clamped securely. insertion opening use button.

<Reference>

For further inform following manual.

Manufacturer	Model
PHOENIX CONTACT GmbH & Co. KG	SZS 0.4×2.5 VDE

3.2.4 Disconnection of the cable

Push the open/close button of the wire to be disconnected with a flathead screwdriver. Pull out the wire with the open/close button pushed. 3.3 Power Connector rmation on the power supply wiring and power cable, refer to the

→ MELSEC iQ-F FX5 Positioning Module User's M

\dashv (Green) (Black)

(Red) 3.4 Grounding

Ground the PLC as stated below.

Perform class D grounding, (Grounding resistance: 100Ω 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 FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware)

Independent grounding (Best condition) mmon grou (Not allow Bring the grounding point close to the PLC as much as possible so that the ground cable can be shortened

DESIGN PRECAUTIONS **⚠** WARNING 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. Most importantly, set up the following: an emergency stop circuit, a protection

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

circuit, an interlock circuit for opposite movements (such as normal vs. reverse

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 a 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. 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 ar 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.

ACAUTION ESIGN PRECAUTIONS Simultaneously turn on and off the power supplies of the CPU module an

∴CAUTION

Do not drop the product or evert strong impact to it. Doing so may

DISPOSAL PRECAUTIONS ______CAUTION Please contact a certified electronic waste disposal company for the

TRANSPORTATION

environmentally safe recycling and disposal of your device

The product is a precision instrument. During transportation, avoid impacts large than those specified in the general specifications by using dedicated packaging Failure to do so may cause failures in the product. After transportation, veri pperation of the product and check for damage of the mounting part, etc.

4.1 Applicable CPU Module

STARTUP AND MAINTENANCE

Wodername	Applicability
FX5UJ CPU module	From first production
FX5U CPU module	Ver. 1.050 or later
FX5UC CPU module*1	Ver. 1.050 or later
*4 EVE CNIVIEC ** EVE	CARC EV is recovery to compact EVE 20DC R to the

4.2 Applicable Software Package

Software		Applicability		
	Contware	FX5-20PG-P	FX5-20PG-D	
GXWorks3	FX5UJ CPU module	Ver. 1.060N or later		
OXWORSO	FX5U/FX5UC CPU module	Ver. 1.035M or later	Ver. 1.050C or later	
4.3 Gono	ral Specifications			

4.3 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 FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware)

Dielectric withstand voltage 500 V AC for 1 minute Between all terminals 10 MΩ or higher by 500 V DC Insulation resistance

4.4 Power Supply Specifications

Items		Specifications	
	items	FX5-20PG-P	FX5-20PG-D
	Power supply voltage	24 V DC +20%, -15%	1
External power supply	Allowable instantaneous power failure time	Operation continues w power failure is shorter	
11.7	Current consumption	120 mA	165 mA

4.5 Performance Specifications

Items	Speci	fications
items	FX5-20PG-P	FX5-20PG-D
Number of control axes	2 axes	
Pulse output form	Transistor	Differential driver
Interpolation function	2-axis linear interpolation,	2-axis circular interpolation
Control method		rol, path control (line and arc ol, speed-position switching vitching control
Control unit	mm, inch, degree, pulse	
Positioning data	600 data/axis	
Maximum connection distance between servos	2 m	10 m
Number of write accesses to flash ROM	100000 times maximum	•
Number of occupied	8 points	

4.6.1 Input Specifications 4.6.1 Drive unit READY signal (READY), Stop signal (STOP), Upper limit

signal (FLS), Lov	wer 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.)

14	Specif	ications
Items	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 transi	stor
Response time	1 ms or less	
Insulation of circuit	Photo-coupler insulation	
Indication of operation	None (Operation check via	a buffer memory is possible.)

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

generator b pila	se (FOLOLIK D)
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.)

nal (DOG)
Specifications
24 V DC
5 mA
3.5 mA or more
1.7 mA or less

Items	Specifications
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.)
4.0.5. E	-1 -1 (OHO)

Signal voltage Input current 5 mA ON current 2.7 mA or more OFF current 0.8 mA or less No-voltage contact input Sink: NPN open collector transistor Source: PNP open collector transistor Signal format Response time Insulation of circui

4.7 Output Specifications

Signal output time

Max. load current

Output ON voltage

Indication of operation

4.7.1 Deviation counter clear signal (CLEAR) Specifications

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.)
4.7.2 Pulse output (PUL	SE R/ PULSE F) [FX5-20PG-P]
Items	Specifications
items	Specifications
Pulse output form	Transistor
Pulse output form	Transistor PULSE/SIGN mode, CW/CCW mode, A phase/B phase (multiple of 4),

1 to 65535

4.7.3 Pulse output (PULSE R+/PULSE F+) [FX5-20PG-D]

50 mA

1.0 V or less

None (Operation check via buffer memory is possible.)

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Exclusion of loss in opportunity and secondary loss from warranty liability Exclusion of loss in opportunity and secondary loss from warranty lambility
Regardless of the grafts 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