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Programmable Controller MELSEC iQ-F

MELSEC iQ-F FX5-20PG-□

Hardware Manual



Manual Number	JY997D74101
Revision	D
Date	April 2022

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 April 2022
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Safety Precautions (Read these precautions before use.) This manual classifies the safety precautions into two categories:

MARNING and **MCAUTION** dicates that incorrect handling may cause hazardo anditions, resulting in death or severe injury. **<u></u> MARNING** licates that incorrect handling may cause hazard **∴**CAUTION onditions, resulting in minor or moderate injury

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 User's Manual (Positioning Control - Intelligent function module)	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 local Mitsubishi Electric representative.

Applicable standards

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

→ 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

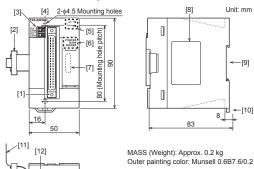
1. Outline

FX5-20PG-□ 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



[1] Connector for external devices

101:

- [2] Extension cable
- [3] Differential driver common terminal*
- [4] Direct mounting hole: 2 holes of \$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

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	AX1 □ AX2 □	POWER■ RUN ■ ERROR □	Axes stopped Axes on standby
(RUN LED is ON, 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)

1.4.1 40-pin connectors

			1	, ,		` '	
B20			A20	Pin No.	Signal	Pin No.	Signal
B19			A19	B20	PULSER B-	A20	PULSER B+
B18			A18	B19	PULSER A-	A19	PULSER A+
B17			A17	B18	PULSE COM*1	A18	PULSE COM*1
B16			A16	B17	PULSE R*1	A17	PULSE R*1
B15			A15	B16	PULSE COM*1	A16	PULSE COM*1
B14			A14	B15	PULSE F*1	A15	PULSE F*1
B13			A13	B14	CLRCOM	A14	CLRCOM
B12			A12	B13	CLEAR	A13	CLEAR
B11			A11	B12	RDYCOM	A12	RDYCOM
B10			A10	B11	READY	A11	READY
B9			A9	B10	PG0COM	A10	PG0COM
B8			A8	B9	PG05	A9	PG05
В7			A7	B8	PG024	A8	PG024
B6			A6	В7	COM	A7	COM
B5			A5	В6	COM	A6	СОМ
B4			A4	B5	CHG	A5	CHG
ВЗ			А3	B4	STOP	A4	STOP
B2			A2	В3	DOG	A3	DOG
В1			A1	B2	RLS	A2	RLS
	lacksquare	_	,	B1	FLS	A1	FLS

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

The digital layeate e	1 1 710 201 O B GIO GI	o ronowo.	
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+

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

Signal Differential driver PLS COM (Differential driver common) common terminal PLSM D

2. Installation

INSTALLATION PRECAUTIONS	<u></u> MARNING
Make sure to cut of	f all phases of the power supply externally

ly before attemptin

Make sure to cut off all phases of the power supply externally before attemptir 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 dust corrosive gas (salt air, C12, H2S, SO2 or NO2), flammable gas, vibration in impacts, or expose it to high temperature, condensation, or rain and wind. If the product is used in such conditions, electric shock, fire, malfunction deterioration or damage may occur.

ISTALLATION 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 sli

NSTALLATION **CAUTION** RECAUTIONS

- The dust proof sheet should be affixed to the ventilation silts 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, undur 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 FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware) Wiring

WIRING PRECAUTIONS **_**MARNING

- Make sure to cut off all phases of the power supply externally b 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°C or more.
 Make sure to properly wire to the spring clamp terminal block in according the state of the supplementations.

- 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 des

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

ACAUTION

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. power line.

For further information on wiring, refer to the following

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

3.1 Applicable Connector Use the following 40 pin connectors

			Suitab		
Туре	Model	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) 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 Differential Driver Common Terminal

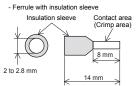
3.2.1	Suitable wiring	
No. of	f wire per terminal	One wire
Wire	Single wire, Strand wire (Material: Copper wire)	AWG24 to 16 (0.2 to 1.5 mm ²)
size	Ferrules with insulation sleeve	AWG23 to 19 (0.25 to 0.75 mm ²)
	Ferrules without insulation sleeve	AWG23 to 16 (0.25 to 1.5mm ²)
Tomp	oraturo rating	80°C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

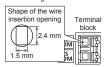
be inserted easily - Strand wire/single wire - Ferrule with insulation sleeve

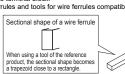




Check the shape of the wire insertion opening with the following chart, and use the smaller wire ferrule than the described size. Also, insert the wire with care so that the wire ferrule is in proper orientation. Failure to do so may cause the bite of the terminal and the damage of the terminal block.

The following table shows wire ferrules and tools for wire ferrules compatible





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	AI 0.34-8 TQ	0.3, 0.34 mm ²	
	insulation sleeve	AI 0.5-8 WH	0.5 mm ²	CRIMPFOX 6
PHOENIX CONTACT GmbH & Co. KG	0.0010	AI 0.75-8 GY	0.75 mm ²	
	Ferrules without insulation sleeve	A 0,25-7	0.25 mm ²	
		A 0,34-7	0.3, 0.34 mm ²	
		A 0,5-8	0.5 mm ²	
		A 0,75-8	0.75 mm ²	
		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.

<Reference>

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

→ MELSEC iQ-F FX5 User's Manua (Positioning Control - Intelligent function modula)



3.4 Grounding

 3.4 Grounting
 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 FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware) Independent grounding Shared grounding Common grounding (Best condition) (Good condition) (Not allowed)
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** 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 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 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 ar STARTUP AND MAINTENANCE **∴CAUTION**

Do not drop the product or exert strong impact to it. Doing so ma DISPOSAL PRECAUTIONS ______CAUTION

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

TRANSPORTATION

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

4.1 Applicable CPU Module

Woder Harrie	Applicability
FX5UJ CPU module	From first production
FX5U CPU module	Ver. 1.050 or later
FX5UC CPU module*1	Ver. 1.050 or later
** 51/5 010/150 51/6	0.4B0 504 1

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

4.2 Applicable Software Package

Software		Applicability		
	Contware	FX5-20PG-P	FX5-20PG-D	
GXWorks3	FX5UJ CPU module	Ver. 1.060N or later		
OX WORKSO	FX5U/FX5UC CPU module	Ver. 1.035M or later	Ver. 1.050C or later	
4.0 Ocused Occalifications				

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%	
External power supply	Allowable instantaneous power failure time	Operation continues when the instantaneous power failure is shorter than 5 ms.	
	Current consumption	120 mA	165 mA

4.5 Performance Specifications

Items	Specifications		
items	FX5-20PG-P	FX5-20PG-D	
Number of control axes	2 axes		
Pulse output form	Transistor	Transistor Differential driver	
Interpolation function	2-axis linear interpolation, 2-axis circular interpolation		
Control method		ol, path control (line and arc ol, speed-position switching itching 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 Input Specifications

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.)	

Items	Specifications			
	PG05	PG024		
Signal voltage	5 V DC	24 V DC		
Input current	5 mA	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 t	ransistor		
Response time	1 ms or less	1 ms or less		
Insulation of circuit	Photo-coupler insulation			
Indication of operation	None (Operation che	None (Operation check via buffer memory is possible.)		

Manual pulse generator A phase (PULSER A)/ Manual pulse generator B phase (PULSER B) 4.6.3

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.)

i.6.4 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	

Specifications No-voltage contact input Signal format Sink: NPN open collector transistor Source: PNP open collector transistor Response time 1 ms or less Insulation of circuit Photo-coupler insulation Indication of operatio None (Operation check via buffer memory is po

4.6.5 External co nd signal (CHG) Signal voltage 24 V DC 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

4.7.1 Deviation counter clear signal (CLEAR)

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

1 pps to 200 kpps 5 to 24 V DC

1.0 V or less Output ON voltage Indication of operation None (Operation check via buffer memory is possible.) 4.7.3 Pulse output (PULSE R+/PULSE F+) [FX5-20PG-D]

Specification of a differential driver (equivalent to AM26C31)

50 mA

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Output frequency

Rated load voltage

Max. load current

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 light
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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