



Programmable Controller

MELSEC iQ-F

MELSEC iQ-F
FX5-SF-MU4T5 / FX5-SF-8DI4

Hardware Manual



Manual Number	IB(NA)-0800626
Revision	B
Date	April 2021

Original instructions

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 April 2021

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.

Voir le manuel ci-dessous pour les indications en français sur les catégories « AVERTISSEMENT » et « ATTENTION ».

→ MELSEC iQ-F FX5 User's Manual (Safety Control)

PRECAUTIONS REGARDING WARRANTY

This product is jointly developed and manufactured by Mitsubishi Electric Corporation and SICK AG. Note that there are differences in warranty.

- Warranty

Item	Safety extension module	Other programmable controller products (e.g. MELSEC iQ-F series)
Free warranty period	12 months after delivery or 18 months after manufacture	36 months after delivery or 42 months after manufacture
Repair term after discontinuation of production	4 years	7 years

Associated Manual

Associated manuals

Manual name	Manual No.	Description
MELSEC iQ-F FX5 User's Manual (Safety Control)	SH082078ENG	Explains about safety extension modules.
MELSEC iQ-F FX5 User's Manual (Startup)	JY997D58201	Explains the details of hardware of FX5U CPU modules, including I/O specifications, wiring, installation, and maintenance.
MELSEC iQ-F FX5UJ User's Manual (Hardware)	SH082206ENG	Explains the details of hardware of the FX5UJ CPU module, including I/O specifications, wiring, installation, and maintenance.
MELSEC iQ-F FX5U User's Manual (Hardware)	JY997D55301	Explains the details of hardware of the FX5U CPU module, including I/O specifications, 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-SF-MU4T5/FX5-SF-8DI4 complies with EC Directive (EMC Directive), UL (UL, cUL) standards, and Machinery Directive. Further information can be found in the following manual.

→ MELSEC iQ-F FX5 User's Manual (Safety Control)

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

Safety extension module is an intelligent function module that can configure a safety control system using FX5 CPU modules.

FX5-SF-MU4T5 is a safety main module. The conventional system can be expanded to a safety control system by connecting the module to the right side of a general control system.

FX5-SF-8DI4 is a safety input expansion module. A Safety input is expanded by connecting the module on the right side of a safety main module.

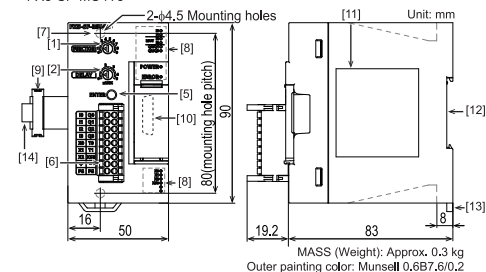
1.1 Incorporated Items

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

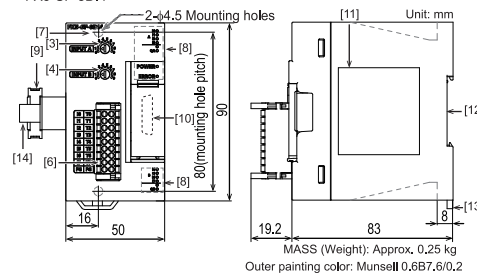
Product	Module
Included Items	Dust proof protection sheet(1 sheet) Hardware manual (This manual)

1.2 External Dimensions, Part Names

- FX5-SF-MU4T5



- FX5-SF-8DI4



- [1] FUNCTION rotary switch
- [2] DELAY rotary switch
- [3] INPUT A rotary switch
- [4] INPUT B rotary switch
- [5] ENTER button
- [6] Terminal block (spring clamp terminal block)
- [7] Direct mounting hole: 2 holes of φ4.5 (mounting screw: M4 screw)
- [8] LED Operation status display LEDs
- [9] Extension cable
- [10] Extension connector (for next module)
- [11] Name plate
- [12] DIN rail mounting groove (DIN rail: DIN 46277, 35 mm wide)
- [13] DIN rail mounting hook
- [14] Pullout tab

1.3 Indications of LEDs

1.3.1 FX5-SF-MU4T5

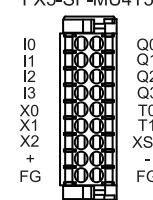
LED name	LED color	Description
POWER	Green	Indicates the power supply status.
ERROR	Red	Indicates an error status.
I0	Green	Indicates the input status of the I0.
I1	Green	Indicates the input status of the I1.
I2	Green	Indicates the input status of the I2.
I3	Green	Indicates the input status of the I3.
Q0/Q1	Green	Indicates the output statuses of the Q0 and Q1.
Q2/Q3	Green	Indicates the output statuses of the Q2 and Q3.
X0	Green	Indicates the input status of the X0.
X1	Green	Indicates the input status of the X1.
X2	Green	Indicates the input status of the X2.
XS0	Green	Indicates the input status of the XS0.

1.3.2 FX5-SF-8DI4

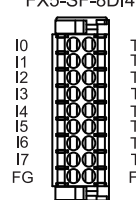
LED name	LED color	Description
POWER	Green	Indicates the power supply status.
ERROR	Red	Indicates an error status.
I0	Green	Indicates the input status of the I0.
I1	Green	Indicates the input status of the I1.
I2	Green	Indicates the input status of the I2.
I3	Green	Indicates the input status of the I3.
I4	Green	Indicates the input status of the I4.
I5	Green	Indicates the input status of the I5.
I6	Green	Indicates the input status of the I6.
I7	Green	Indicates the input status of the I7.
QA	Green	Indicates if the input conditions of INPUT A from input I0 to I3 are satisfied.
QB	Green	Indicates if the input conditions of INPUT B from input I4 to I7 are satisfied.

1.4 Terminal Arrangement

FX5-SF-MU4T5



FX5-SF-8DI4



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

→ MELSEC iQ-F FX5 User's Manual (Safety Control)

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) of the CPU module used. Do not 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 programmable controller. Failure to do so may cause fire, equipment failures or malfunctions.
- For the product supplied together with a dust proof sheet, the sheet should be affixed to the ventilation slits before the installation and wiring work to prevent 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.
- Work carefully when installing the product using a screwdriver. Failure to do so may cause damage to the product or accidents.
- Connect the extension cables, peripheral device cables, input/output cables and battery connecting cable securely to their designated connectors. Loose connections may cause malfunctions.
- Always turn off the power before attaching or detaching the following devices. Failure to do so may cause a failure or malfunction.
 - Peripheral devices, expansion boards, and expansion adapters
 - Extension modules and connector conversion modules
 - Battery
- Safety extension modules only suitable for mounting in a control panel with at least IP 54 degree of protection. Failure to meet the installation method may cause the module to fail or malfunction due to the deposition of dust or the adhesion of water.
- Wiring and replacement of this product must be performed by qualified maintenance personnel who is familiar with protection against electric shock.

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

→ MELSEC iQ-F FX5UJ User's Manual (Hardware)

→ 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 attach the terminal cover, provided as an accessory, before turning on the power or initiating operation after installation or wiring work. Failure to do so may cause electric shock.
- The temperature rating of the cable should be 80°C or more.
- Make sure to properly wire to the spring clamp terminal block 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.
 - 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**

- Perform class D grounding (grounding resistance: 100 Ω or less) of the grounding terminal on the CPU module and extension modules with a wire 1.5 mm² or thicker.
- Connect the power supply wiring to the dedicated terminals described in this manual. If an AC power supply is connected to an input/output terminal or DC power supply terminal, the programmable controller will burn out.
- Do not wire vacant terminals externally. Doing so may damage the product.
- Install modules so that excessive force will not be applied to terminal blocks, power connectors, I/O connectors, communication connectors, or communication cables. Failure to do so may result in wire damage/breakage or programmable controller failure.
- Make sure to observe the following precautions in order to prevent any damage to the machinery or accidents due to malfunction of the programmable controller caused by abnormal data written to the programmable controller due to the effects of noise:
 - Do not bundle the power line, control 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 connection cables at least 100 mm away from the main circuit, high-voltage line, load line or power line.
- Check the interface type and correctly connect the cable. Incorrect wiring or connecting the cable to an incorrect interface may cause failure of the module and external device.
- Connect circuits isolated from hazardous voltage by double/reinforced insulation to terminal blocks or power connectors.
- Individually ground the GND wires of the safety extension module with a ground resistance of 100 or less. Failure to do so may result in electric shock or malfunction.
- Check the rated voltage and terminal layout before wiring to the module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause a fire or failure.
- Tighten the terminal screw within the specified torque range. Undertightening can cause short circuit, fire, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- Mitsubishi safety extension modules must be installed in control panels. Connect the main power supply to the safety extension module through a relay terminal block.

Wiring and replacement of an external power supply must be performed by maintenance personnel who is familiar with protection against electric shock. For wiring method, refer to MELSEC IQ-F FX5J User's Manual (Safety Control)
- When using the safety extension module under the severe noise environment, take noise reduction measures such as using a surge absorber and a ferrite core.

3.1 Applicable Cable

3.1.1 Spring clamp terminal block

1) Suitable wiring

Number of wires per terminal	Wire size		Temperature rating
	Single wire, strand wire	Ferrule with insulation sleeve	
Single wiring	AWG 24 to 16 (0.2 to 1.5 mm ²)	AWG 23 to 19 (0.25 to 0.75 mm ²)	80°C or more

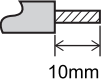
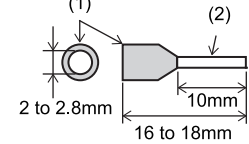
2) Wire end treatment

Strip the cable jacket approximately 10 mm from the tip, and connect a wire ferrule to the stripped part.

If the stripped part is too long, the exposed wire may touch a material part of the terminal, and it may result in electric shock or short circuit among adjacent terminals.

On the other side, if the stripped part is too short, it may cause contact failure to the spring clamp terminal.

Depending on the thickness of a sheath, it may be difficult to insert into an insulation sleeve. Select the wires by referring to the external dimensions.

Strand wire/single wire	Ferrule with insulation sleeve
	
	(1) Insulation sleeve (2) Contact area (crimp area)

The following table shows wire ferrules and tools for the wire ferrules that are suitable for terminal blocks. If the items other than those are used, the wire ferrule may not be able to remove. Before using a wire ferrule, check that it can be removed.

<Recommended products>

Manufacturer	Model	Wire size	Crimp tool
PHOENIX CONTACT GmbH & Co. KG	AI 0.5-10 WH	0.5mm ²	CRIMPFOX 6
	AI 0.75-10 GY	0.75mm ²	
	A 1.0-10	1.0mm ²	
	A 1.5-10	1.5mm ²	

3) Wiring of an electric wire

- When using a ferrule with insulation sleeve
Insert a wire to which a ferrule with insulation sleeve is cramped into the wire insertion opening.
- When using a single wire or strand wire
Using a flathead screwdriver, push the open/close button on the terminal block. While pushing the open/close button, insert the cable securely until it reaches the end. After the cable is fully inserted, release the open/close button.

After wiring, pull the cable slightly to check that the cable is securely clamped. <Reference>

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

4) Disconnection of a wire

Using a flathead screwdriver, push the open/close button of the cable to be disconnected. While pushing the open/close button, pull the cable.

3.2 Grounding

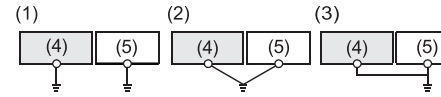
Observe the following:

- Provide class D grounding. (Grounding resistance: 100 Ω or less)
- Provide independent grounding when possible.

If independent grounding cannot be provided, employ "Shared grounding" shown below.

For details, refer to the following manual.

- MELSEC IQ-F FX5J User's Manual (Hardware)
- MELSEC IQ-F FX5U User's Manual (Hardware)
- MELSEC IQ-F FX5UC User's Manual (Hardware)



(1) Independent grounding: Best condition

(2) Shared grounding: Good condition

(3) Common grounding: Not allowed

(4) Programmable controller

(5) Equipment

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

4. SPECIFICATIONS

Design Precautions **WARNING**

- When the safety extension module detects a fault in the external power supply or itself, it turns off the outputs. Configure an external circuit so that the connected devices are powered off according to the output status (off) of the safety extension module. Incorrect configuration may result in an accident.
- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
 - Emergency stop circuits, protection circuits, and protective interlock circuits for conflicting operations (such as forward/reverse rotations or upper/lower limit positioning) must be configured external to the programmable controller.
 - Outputs may remain on or off due to a failure of a component such as a relay, transistor, and a triac in an output circuit. 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.
- In an output circuit, when a load current exceeding the rated current or an over current 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.
- When changing data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely.

For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding.

Improper operation may damage machines or cause accidents.

- For safety relays, configure an external circuit using a device such as a fuse or breaker to protect a short-circuit current.
- Create an interlock program using a reset button to prevent the safety extension module from restarting automatically after the safety function is activated and the safety extension module turns off the outputs.

Design Precautions **CAUTION**

- During control of an inductive load such as a lamp, heater, or solenoid valve, a large current (approximately ten times greater than normal) may flow when the output is turned off to on. Take proper measures so that the flowing current does not exceed the value corresponding to the maximum load specification of the resistance load.
- Turn ON the power supply of an FX5 CPU module and a safety extension module simultaneously (within 2 seconds). When a connection error still occurs even if the power supplies are turned ON simultaneously, review the power supply environment of the FX5 CPU module and the safety extension module.

When the power is supplied for a programmable controller and other devices from the same power supply system, wire the system separately so that the programmable controller and other devices can turn ON and OFF individually.

When a connection error occurs, check an error code, turn OFF the power supply of the CPU module and the safety extension module once, and then turn ON the power supplies simultaneously.
- Ensure that an entire system using a safety extension module meets the requirements for the corresponding safety category.

Design Precautions **CAUTION**

- Leave the following space between a programmable controller and equipments (such as a contactor and relay), external device wiring, or power cables to avoid the effect of radiated noise and heat.
 - Wiring: 100 mm or more
 - Device: 50 mm or more
- If a mechanical switch such as a relay is connected to an input terminal of a safety extension module, consider contact bounce.
- Observe the protective notes and measures.

Observe the following items in order to ensure proper use of the safety extension module.

- When mounting, installing and using the safety extension module, observe the standards and directives applicable in your country.
- The national/international rules and regulations apply to the installation, use and periodic technical inspection of the safety extension module, in particular.
 - Machinery Directive 2006/42/EC
 - EMC Directive 2004/108/EC
 - Provision and Use of Work Equipment Directive 89/655/EC
 - The work safety regulations/safety rules
- Manufacturers and owners of the machine on which the safety extension module is used are responsible for obtaining and observing all applicable safety regulations and rules.
- The notices, in particular the test notices of this manual (e.g. on use, mounting, installation or integration into the existing machine controller), must be observed.
- The test must be carried out by specialized personnel or specially qualified and authorized personnel and must be recorded and documented and retraced at any time by third parties.
- The external voltage supply of the device must be capable of buffering brief mains voltage failures of 20 ms as specified in IEC 60204-1.
- Safety extension modules conform to Class A, Group 1, in accordance with EN 55011. Group 1 encompasses all the ISM devices in which intentionally generated and/or used conductor-bound RF energy that is required for the inner function of the device itself occurs.
- Safety extension modules fulfill the requirements of Class A (industrial applications) in accordance with the "Interference emission" basic specifications. Safety extension modules are therefore only suitable for use in an industrial environment and not for private use.
- Wiring and replacement of this product must be performed by qualified maintenance personnel who is familiar with protection against electric shock.

Startup and Maintenance Precautions **WARNING**

- Do not touch any terminal while the programmable controller's power is on. Doing so may cause electric shock or malfunctions.
- Before cleaning or retightening terminals, cut off all phases of the power supply externally. Failure to do so in the power ON status may cause electric shock.
- Before modifying a program in operation, forcible output, running or stopping the programmable controller, read through this manual carefully, and ensure complete safety. An operation error may damage the machinery or cause accidents.
- Do not change the program in the programmable controller from two or more peripheral equipment devices such as an engineering tool or a GOT at the same time. Doing so may cause destruction or malfunction of the programmable controller program.
- Safety-oriented devices must be suitable for safety related signals.

A function interruption of safety outputs results in a loss of the safety functions so that the risk of serious injury exists.

Do not connect any loads that exceed the rated values of the safety outputs.

Wire the safety extension module so that 24 V DC signals cannot unintentionally contact safety outputs.

Connect the GND wires (ground cable) of the power supply to earth so that the devices do not switch on when the safety output line is applied to the frame potential.

Use suitable components or devices that fulfill all the applicable regulations and standards.

Actuators at the outputs can be wired as single channel. In order to maintain the respective safety integrity levels, the lines have to be routed in such a manner that cross circuits to other live signals can be excluded, for example by routing them within protected areas such as in a control panel or in separate sheathed cables.

Startup and Maintenance Precautions

⚠ WARNING

- When errors occurred such as an accident or damage, stop the system operation immediately and ensure the safety. Restart the system after the cause is identified and eliminated.

Startup and Maintenance Precautions

⚠ CAUTION

- Do not disassemble or modify the programmable controller. Doing so may cause a failure, malfunction, or fire.
- For repair, please contact your local Mitsubishi Electric sales office.
- Turn off the power to the programmable controller before connecting or disconnecting any extension cable. Failure to do so may cause device failures or malfunctions.
- Always turn off the power before attaching or detaching the following devices. Failure to do so may cause a failure or malfunction.
 - Peripheral devices, expansion boards, and expansion adapters
 - Extension modules and connector conversion modules
 - Battery
- Before handling the module, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to do so may cause the module to fail or malfunction.
- After the first use of the product, do not perform each of the following operations more than 50 times (IEC 61131-2/JIS B 3502 compliant). Exceeding the limit may cause malfunction.
- Startup and maintenance of a control panel must be performed by qualified maintenance personnel who is familiar with protection against electric shock.

Disposal Precautions

⚠ CAUTION

- When disposing of this product, treat it as industrial waste.

Transportation Precautions

⚠ CAUTION

- The programmable controller is a precision device. During transportation, avoid impacts larger than those specified in the general specifications of the user's manual (hardware) of the CPU module used by using dedicated packaging boxes and shock-absorbing pallets. Failure to do so may cause failures in the programmable controller. After transportation, verify operation of the programmable controller and check for damage of the mounting part, etc.

4.1 Applicable CPU module

Model name	Applicability
FX5UJ CPU module	Ver. 1.010 or later
FX5U CPU module	Ver. 1.200 or later
FX5UC CPU module ^{*1}	Ver. 1.200 or later

*1 FX5-CNV-IFC or FX5-C1PS-5V is necessary to connect FX5-8AD to the FX5UC CPU module.

4.2 General Specifications

The general specifications other than below are the same as those of the CPU module connected.

For the general specifications, refer to the following manuals.

- MELSEC IQ-F FX5UJ User's Manual (Hardware)
- MELSEC IQ-F FX5U User's Manual (Hardware)
- MELSEC IQ-F FX5UC User's Manual (Hardware)

Item	Specification
Electromagnetic Compatibility (EMC)	EN 61000-6-2, EN 61131-2, DIN EN 61326-3-1, EN 55011 (class A)
Protection degree	IP20

4.2.1 Dielectric withstand voltage test and insulation resistance test

Perform dielectric withstand voltage test and insulation resistance test at the following voltages between each terminal and the safety extension module ground terminal.

Wire the terminals with caution since each terminal is not insulated.

Between terminals	Dielectric withstand voltage	Insulation resistance
Between the power supply terminal of safety extension module (DC power supply) and CPU module ground terminal	500 VAC for one minute	10 MΩ or higher by 500 VDC insulation resistance tester.
Between safety extension module input terminal and CPU module ground terminal		
Between safety extension module output terminal and CPU module ground terminal		

4.3 Safety Specifications

Item	Specification
Safety integrity level	SIL3 (IEC 61508)/SILCL 3 (IEC 62061)
Category	Category 4 (DIN EN ISO 13849-1)
Performance level	PLe (DIN EN ISO 13849-1)
PFHd	1.5×10 ⁻⁸
T _M (mission time)	20 years (EN ISO 13849-1)

4.4 Power Supply Specifications

- FX5-SF-MU4T5

Item	Specification
Internal power supply	5 VDC 200 mA, 24 VDC 5 mA
External power supply	24 VDC (+20%, -15%) 125 mA
Power supply voltage circuit system	PELV or SELV ^{*1} , max. 6 A ^{*2}
Rated input current ^{*3}	5.2 A

*1 PELV (protective extra low voltage) and SELV (safety extra low voltage) are circuits that are protected by voltage limit or insulation.

*2 The current of the power supply that powers the module must be limited to a maximum of 6 A, either through the power supply itself or a fuse.

*3 The maximum current which is supplied from the external power supply, when using all output terminals in the maximum configuration that can be configured (attaching FX5-SF-MU4T5 (one module) and FX5-SF-8DI4 (two modules)).

- FX5-SF-8DI4

Item	Specification
Internal power supply ^{*1}	24 VDC (+20%, -15%) 125 mA

*1 Electric power provided from the external power supply of FX5-SF-MU4T5.

4.5 Performance Specifications

- Safety inputs of an FX5-SF-MU4T5

Item	Specification
Number of inputs	4 points
Input voltage (ON)	13 VDC or more (13 VDC to 30 VDC)
Input voltage (OFF)	5 VDC or less (-5 VDC to 5 VDC)
Input current (ON)	3 mA (2.4 mA to 3.8 mA)
Input current (OFF)	2.1 mA or less (-2.5 mA to 2.1 mA)
Input response time (filter delay)	2 ms
Indication of input operation	LED lights when an input is ON.

Item	Specification	
Minimum switch-off time ^{*1, *2} (I0/I1)	Program 1, 2, 4, 5, 6, 9	24 ms
	Program 3.1, 7, 8	4 ms
	Program 3.2	76 ms/24 ms
Minimum switch-off time ^{*1, *2} (I2/I3)	Program 4, 5, 6	24 ms
	Program 1, 2, 3, 7, 8, 9	4 ms
Synchronous time monitoring	Program 1 and 2	1500 ms
	Program 4 and 5	500 ms
Muting ON ^{*3}	Program 3	61 ms
Muting OFF	Program 3	61 ms (165 ms ^{*4})
Muting gap suppression ^{*5}	Program 3	94 ms to 100 ms
Reset time		106 ms
Maximum teach-in time of ENTER button ^{*6}		3 s
Duration of actuation of a reset button (X0 and X1)		50 ms to 5 s

*1 The minimum switch-off time is the minimum time takes until a switch-off condition is detected after a module is switched off.

*2 A response time without any sensors. When sensors are connected, the data of the connected sensors is applied and the minimum switch-off time is extended.

*3 The time from when a muting condition is enabled (I2/I3 are turned ON) until a muting function is activated.

*4 It indicates a maximum switch-off time at a muting error.

*5 A muting input (I2 or I3) keeps LOW for the specified period of time.

*6 A time from when an ERROR LED starts flashing.

- General inputs of an FX5-SF-MU4T5

Item	Specification
Number of inputs	4 points (3 general inputs/ 1 ENABLE input)
Input voltage (ON)	13 VDC or more (13.0 VDC to 30.0 VDC)
Input voltage (OFF)	5 VDC or less (-5.0 VDC to 5.0 VDC)
Input current (ON)	3 mA (2.4 mA to 3.8 mA)
Input current (OFF)	2.1 mA or less (-2.5 mA to 2.1 mA)
Indication of input operation	LED lights when an input is ON.
Minimum switch-off time (XS0)	4 ms

- Test outputs of an FX5-SF-MU4T5

Item	Specification	
Number of outputs	2 points	
Output method	PNP output (source output), short-circuit protection, cross-circuit detection ^{*1}	
Output voltage	16 VDC to 30 VDC	
Output current ^{*2}	120 mA	
Test cycle (T0, T1)	Program 1, 2, 4, 5, 6, 9	40 ms
	Program 3.2	T0 = 400 ms T1 = 40ms

*1 A cross-circuit detection is performed only in the module.

*2 All the output current in a system is limited. Observe the following limit values.
Supply current for all sensors connected to an FX5-SF-MU4T5 (T0/T1) and FX5-SF-8DI4 (T0 to T7): I < 600 mA

- Safety outputs of an FX5-SF-MU4T5

Item	Specification	
Number of outputs	4 points	
Output method	PNP output (source output), short-circuit protection, cross-circuit detection ^{*1}	
Output voltage	18.4 VDC to 30.0 VDC	
Output current	2.0 A (@T _A ≤45°C) 1.5 A (@T _A ≤55°C)	
Total current I _{sum}	4.0 A (@T _A ≤45°C) 3.0 A (@T _A ≤55°C)	
Leak current (in switch OFF status)	1 mA or less	
Indication of output operation	LED lights when an output is ON.	
Response time ^{*2} (I0/I1)	Program 1, 2, 4, 5, 6, 9	29 ms
	Program 3.1, 7, 8	9 ms
	Program 3.2	81 ms/29 ms ^{*3}
Response time ^{*2} (I2/I3)	Program 4, 5, 6	29 ms
	Program 1, 2, 3, 7, 8, 9	9 ms
Response time (XS0)	9 ms	
Off delay time	0 / 0.5 / 1 / 1.5 / 2 / 2.5 / 3 / 3.5 / 4 / 5 s	

*1 A cross-circuit detection is performed only in the module.

*2 A response time without any sensors. When sensors are connected, the data of the connected sensors is applied and the minimum switch-off time is extended.

*3 In the program 3.2, either one of the I0 and I1 terminal is connected to an available sensor and the other terminal is connected to the T0 or T1 terminal depending on the sensor specifications.
When a sensor is connected to I0, the response time is 81 ms. For I1, the response time is 29 ms.

- Number of occupied I/O points in FX5-SF-MU4T5

Item	Specification
Number of occupied I/O points	8 points

- Safety inputs of an FX5-SF-8DI4

Item	Specification	
Number of inputs	8 points	
Input voltage (ON)	13 VDC or more (13.0 VDC to 30.0 VDC)	
Input voltage (OFF)	5 VDC or less (-5.0 VDC to 5.0 VDC)	
Input current (ON)	3 mA (2.4 mA to 3.8 mA)	
Input current (OFF)	2.1 mA or less (-2.5 mA to 2.1 mA)	
Indication of input operation	LED lights when an input is ON.	
Minimum switch-off time	Program 1, 2, 3, 4, 5, 8	24 ms
	Program 6, 7	4 ms
Synchronous time monitoring	Program 3, 5	1500 ms

- Test outputs of an FX5-SF-8DI4

Item	Specification
Number of outputs	8 points
Output method	PNP output (source output), short-circuit protection, cross-circuit detection ^{*1}
Output voltage	16 VDC to 30 VDC
Output current	30 mA

Item	Specification
Test cycle	40 ms

*1 A cross-circuit detection is performed only in the module.

- Response time of FX5-SF-8DI4

Item	Specification	
Response time	Program 1, 2, 3, 4, 5, 8	33 ms
	Program 6, 7	13 ms

- Number of occupied I/O points in FX5-SF-8DI4

Item	Specification
Number of occupied I/O points	0 points

5. EU Declaration of Conformity

EU DECLARATION OF CONFORMITY

We,
 Manufacturer : MITSUBISHI ELECTRIC CORPORATION
 Address : TOKYO 100-8310, JAPAN
 (Place of Declare)
 Brand Name :  MITSUBISHI ELECTRIC
 declare under our sole responsibility that the product
 Description : Programmable Controller
 Type of Model : MELSEC iQ-F Series FX5
 Notice : Refer to next page about each type name

to which this declaration relates is in conformity with the following standard and directive.

Directive		Harmonized Standard	Notified Body
EMC Directive	2014/30/EU	EN61131-2:2007	-
Machinery Directive	2006/42/EU	EN ISO 13849-1:2015	1
RoHS Directive	2011/65/EU (EU)2015/863	EN IEC 63000:2018	-


This declaration is based on the conformity assessment of following Notified Body			
No.	Name and Address	Identification Number	Issued certificate No.
1	TUV SÜD Product Service GmbH Ridlerstraße 65, 80339 Munich, Germany	0123	M6A 083244 0001

APPENDIX List of type name to declare

FX5-SF-8DI4	FX5-SF-MU4T5			
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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.