MITSUBISHI ELECTRIC

Programmable Controller

MELSEC iQ-F

Powered by
Anywire

MELSEC iQ-F FX5-ASL-M

Hardware Manual

FX5

Manual Number	JY997D73301
Revision	B
Date	September 2017

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:
Anywire and ANYWIREASLINK is a trademark of Anywire Corporation.
The company name and the product name to be described in this manual are the registered trademarks or trademarks of each company.

Effective September 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.

PRECAUTIONS REGARDING WARRANTY

Note that there is precaution regarding warranty of this product.

Item	FX5-ASL-M	Other programmable controller products (e.g. MELSEC iQ-F series)
Repair term after discontinuation of production	1 year	7 years

Associated Manual

Manual name	Manual No.	Description
MELSEC iQ-F FX5 User's Manual (ASLINK)	SH-081796ENG	Explains function of FX5-ASL-M.
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-ASL-M 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 (ASLINK)**
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

The FX5-ASL-M type AnyWireASLINK system master module (hereinafter referred to as FX5-ASL-M) is an intelligent function module for building an AnyWireASLINK system with FX5 CPU module.
The FX5-ASL-M is jointly developed and manufactured by Mitsubishi Electric and Anywire Corporation.
The AnyWireASLINK system is a sensor network system.
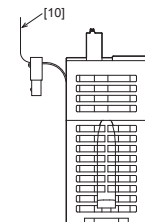
1.1 Incorporated Items

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

Product	FX5-ASL-M type AnyWireASLINK system master module
Included Items	Dust proof protection sheet (1 sheet)
	Hardware manual (This manual)

1.2 External Dimensions, Part Names
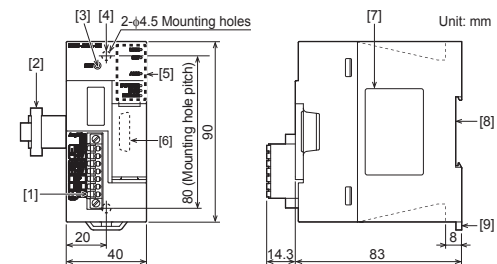
Unit: mm

MASS (Weight): Approx. 0.2 kg
Outer painting color: Munsell 0.6B7.6/0.2
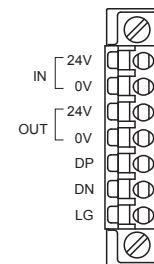
[1] Transmission cable terminal block
[2] Extension cable
[3] SET switch
[4] Direct mounting hole: 2 holes of φ4.5 (mounting screw: M4 screw)
[5] Operation status display LEDs
[6] Extension connector (for next module)
[7] Name plate
[8] DIN rail mounting groove (DIN rail: DIN 46277, 35 mm wide)
[9] DIN rail mounting hook
[10] Pullout tab

1.3 Indications of LEDs

LED display	LED color	Status	Indication
POWER	Green	On	Power on
		Off	Power off or module failure
RUN	Green	On	Normal operation
		Off	Error
ERROR	Red	On	Minor error or major error
		Flashing	Moderate error or major error
		Off	Normal operation
LINK	Green	Flashing	Normal operation
		Off	5 V DC power off or module failure
SET	Green	On	Automatic address detection in progress
		Flashing	Writing in the EEPROM
		Off	Normal operation
ALM	Red	On	DP/DN disconnection, no response from the slave module
		Flashing (1-second intervals)	DP-DN short circuit, 24V-DP short circuit
		Flashing (0.2-second intervals)	A 24 V DC power supply is not being supplied or the voltage is low
		Off	Normal operation

1.4 Terminal Layout

Terminal name		Description
IN	24V	Power supply terminals for driving the transmission circuit of the AnyWireASLINK system and for slave modules. Connect to a 24 V DC external power supply.
	0V	
OUT	24V	Terminals for connecting insulation type (4-wire) slave modules. If the modules are connected to these terminals, supplying power for each module from the 24 V DC external power supply is not necessary.
	0V	
DP		AnyWireASLINK transmission signal terminals DP: Transmission cable (+), DN: Transmission cable (-) Connect to the DP and DN terminals on the slave module or terminating module.
DN		
LG		Connected to the neutral point of the noise filter inserted between the 24V and 0V terminals. Ground the LG terminal with the functional ground terminal (FG terminal) on the programmable controller at a single point.

For further information for wiring to the terminal block, refer to the following manual.
→ **MELSEC iQ-F FX5 User's Manual (ASLINK)**

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.
- Make sure to properly wire to the terminal block (European type) in accordance with the following precautions.
Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
  - The disposal size of the cable end should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Twist the ends of stranded wires and make sure that there are no loose wires.
  - Do not solder-plate the electric wire ends.
  - Do not connect more than the specified number of wires or electric wires of unspecified size.
  - Affix the electric wires so that neither the terminal block nor the connected parts are directly stressed.

WIRING PRECAUTIONS ⚠CAUTION

- Connect the power supply wiring to the dedicated terminals described in this manual.
  If an AC power supply is connected to a DC input/output terminal or DC power supply terminal, the PLC will burn out.
- Do not apply the 24 V DC power before wiring the entire AnyWireASLINK system.
- 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 control line together with or lay them close to the main circuit, high-voltage line, load line or power line. As a guideline, lay the power line, control line and communication cables at least 100 mm away from the main circuit, high-voltage line, load line or power line.
  - Ground the shield of the shielded wire or shielded cable at one point on the PLC. However, do not use common grounding with heavy electrical systems.
- Place the cables in a duct or clamp them.
  If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunction due to poor contact.
- When disconnecting the cable from the module, do not pull the cable by the cable part.
  For the cable connected to the terminal block, loosen the terminal screw.
  Pulling the cable connected to the module may result in malfunction or damage to the module or cable.

3.1 Transmission Cable Terminal Block

For details on the terminal block layout, refer to section 1.4.

Item	Description
Model name	FMC 1,5/ 7-STF-3,81 (PHOENIX CONTACT GmbH & Co. KG)
Tightening torque	0.2 to 0.3 N•m (Connector fixing screw)

- To tighten the terminal block, a flathead screwdriver having a tip size of 0.4×2.5 mm is required.
- When the transmission cable terminal block is removed
  Before removing the transmission cable terminal block, check that the fixing screws on both sides are completely loosened (removed from the socket). Pulling with excessive force while the fixing screws of both ends are still tightened may damage the device.
- When the transmission cable terminal block is attached
  Before tightening, check that there are no short circuits due to disconnected or frayed wires. Then tighten the screws at both sides securely.
  (Tightening torque: 0.2 to 0.3 N•m)

Suitable wiring and cable

Classification	Name	Diameter	Type	Material	Temperature rating
Transmission cable (DP, DN)	UL-listed general-purpose 2-wire cable (VCTF, VCT)	1.25 mm², 0.75 mm²	Strand wire	Copper wire	70 °C or more
	UL-listed general-purpose wire	1.25 mm², 0.75 mm²			
	Dedicated flat cable	1.25 mm², 0.75 mm²			90 °C
Power supply cable (24V, 0V)	UL-listed general-purpose 2-wire cable (VCTF, VCT)	0.75 to 2.0 mm²	Strand wire		70 °C or more
	UL-listed general-purpose wire	0.75 to 2.0 mm²	Strand wire/ single wire		
	Dedicated flat cable	1.25 mm², 0.75 mm²	Strand wire		90 °C

3.2 Cable Treatment

Bare cables can be connected to the transmission cable terminal block; however, for safety reasons, it is recommended to connect crimped wire ferrules.
Use UL-listed solderless terminals and, for processing, use a tool recommended by the manufacturer.

Recommended wire ferrules (PHOENIX CONTACT GmbH & Co. KG)

| Electric wire size	Recommended wire ferrule model name (PHOENIX CONTACT GmbH & Co. KG)
0.75 mm²	AI 0,75-10 GY
1.25 mm²	AI 1,5-10

3.3 Wiring Precautions

- Do not run multiple transmission cables (DP, DN) using a multicore cable.

- The voltage should not fall below the lower limit of the allowable voltage range due to voltage drop caused by the cable.
  If the voltage falls below the lower limit, malfunctions may occur.
- Do not connect soldered cables directly to the terminals. Doing so may loosen the screws, resulting in a poor contact.
- It is recommended to use a 1.25 mm² lead wire for the main line because the power supply is superimposed on the signal wire in the AnyWireASLINK system.
- General-purpose wire, cabtyre cable and flat cable, etc. can be used. Use stranded wires instead of single core wires.
- Use a crimping tool to connect a bar solderless terminal to a cable.
- Before inserting a bar solderless terminal, check the shapes of the wire insertion opening and bar solderless terminal. Then, insert the terminal in the correct orientation. A bar solderless terminal wider than the wire insertion opening may damage the terminal block.
- Signal names are not printed on the transmission cable terminal block. To avoid incorrect wiring, wire cables to the terminal block attached to the FX5-ASL-M.
- Do not insert multiple bar solderless terminals into one wire insertion opening. Doing so may cause damage on the terminal block or cable, or malfunction.

3.4 External Wiring
3.4.1 Example of external wiring
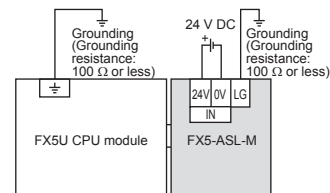

3.4.2 Power on timing
The AnyWireASLINK system external power supply should be turned ON simultaneously with or before the power supply of the CPU module it is connected to. (The order is inverted when the system is powered off.)

3.5 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)**
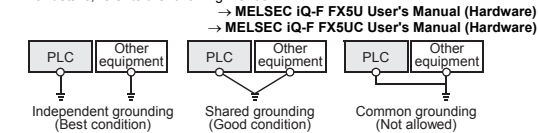
- Bring the grounding point close to the PLC as much as possible so that the ground cable can be shortened.

4. Specification

DESIGN PRECAUTIONS ⚠WARNING

- An AnyWireASLINK system has no control function for ensuring safety.
- 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.
- Construct an interlock circuit in the program so that the whole system always operates on the safe side before executing the control (for data change) of the PLC in operation. Read the manual thoroughly and ensure complete safety before executing other controls (for program change, parameter change, forcible output and operation status change) of the PLC in operation. Otherwise, the machine may be damaged and accidents may occur due to erroneous operations.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.

DESIGN PRECAUTIONS ⚠CAUTION

- Configure safety circuits, such as an emergency stop circuit and interlock circuit, external to the AnyWireASLINK system.
- Install module so that excessive force will not be applied to the terminal blocks. Failure to do so may result in wire damage/breakage or PLC failure.
- Simultaneously turn on and off the power supplies of the CPU module and extension modules.

STARTUP AND MAINTENANCE PRECAUTIONS ⚠CAUTION

- 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

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

TRANSPORTATION PRECAUTIONS ⚠CAUTION

- 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 palettes.
  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-ASL-M 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	
Operating ambient temperature[*1]	-20 to 55°C, non-freezing[*2]	
Storage ambient temperature	-25 to 75°C, non-freezing	
Operating ambient humidity	5 to 95%RH, non-condensation[*3]	
Storage ambient humidity	5 to 95%RH, non-condensation	
Operating altitude[*4]	0 to 2000 m	
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	

*1 The simultaneous ON ratio of available PLC inputs or outputs changes with respect to the ambient temperature. For details, refer to the following manual.
→ **MELSEC iQ-F FX5U User's Manual (Hardware)**
→ **MELSEC iQ-F FX5UC User's Manual (Hardware)**
*2 In the case where operating ambient temperature is lower than 0°C, the specifications are different from the above description. For details, refer to the following manual.
→ **MELSEC iQ-F FX5U User's Manual (Hardware)**
→ **MELSEC iQ-F FX5UC User's Manual (Hardware)**
*3 When used in a low-temperature environment, use in an environment with no sudden temperature changes.
If there are sudden temperature changes because of opening/closing of the control panel or other reasons, condensation may occur, which may cause a fire, fault, or malfunction. Furthermore, use an air conditioner in dehumidifier mode to prevent condensation.
*4 The PLC cannot be used at a pressure higher than the atmospheric pressure to avoid damage.

4.3 Power Supply Specifications

Items		Specifications
External power supply	Power supply voltage	24 V DC +15%, -10%, ripple voltage 0.5 Vp-p or lower Recommended voltage: 26.4 V DC (24 V DC +10%) *Please use a UL Class 2 power supply
	Current consumption	100 mA
	Transmission cable supply current	MAX 2 A
Internal power supply	Power supply voltage	5 V DC
	Current consumption	200 mA

4.4 Performance Specifications

Items	Specifications
Transmission clock	27.0 kHz
Maximum transmission distance (total length)	200 m[*1]
Transmission system	DC power superimposed total frame cyclic system
Connection type	Bus topology (multidrop system, T-branch system, tree branch system)
Transmission protocol	Dedicated protocol (AnyWireASLINK)
Error control	Checksum, double-check system
Number of connected I/O points	384 points maximum[*2] (input: maximum 256 points, output: maximum 256 points)
Number of connected slave modules	128 maximum (varies depending on the current consumption of each slave module)
External interface (power supply part/communication part)	Push-in type 7-piece spring clamp terminal block
RAS function	• Disconnected transmission cable location detection function • Transmission cable short detection function • Transmission cable voltage drop detection function
Transmission cable (DP, DN)	• UL-listed general-purpose 2-wire cable • UL-listed general-purpose wire • Dedicated flat cable
Power supply cable (24V, 0V)	
Memory	Built-in EEPROM (Number of times of overwrite: 100000 times)
Number of occupied I/O points	8 points
Number of connectable units	1 module[*3]

*1 For slave modules with integrated transmission cables (DP, DN), the length of the transmission cables (DP, DN) is included in the total length.
For wiring of 50m or more with 4 wires (DP, DN, 24V, 0V), insert the noise filter for power supply cables between the power supply and cables. For details, refer to the manual for the ASLINK FILTER (ANF-01) manufactured by Anywire Corporation.
*2 The number of available remote I/O points per system varies depending on the number of I/O points of the extension devices. For the limit of I/O points, refer to the following manual.
→ **MELSEC iQ-F FX5U User's Manual (Hardware)**
→ **MELSEC iQ-F FX5UC User's Manual (Hardware)**
*3 FX5-ASL-M and FX3U-128ASL-M cannot be used together.

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.

⚠ 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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