
EMC and Low Voltage Directives

Compliant Manual

Before using, please read "● SAFETY PRECAUTIONS ●" of the User's Manual of each product.

MITSUBISHI ELECTRIC ENGINEERING COMPANY LIMITED

● EMC and Low Voltage Directives ●

Compliance with the EMC Directive, which is one of the EU directives, has been mandatory for products sold within EU member states since 1996 as well as compliance with the Low Voltage Directive since 1997.

For products compliant to the EMC and Low Voltage Directives, their manufacturers are required to declare compliance and affix the CE marking.

(1) Authorized representative in Europe

Authorized representative in Europe is shown below.

Name: Mitsubishi Electric Europe B.V.

Address: Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany

(2) For the conformity to EMC and Low Voltage Directive

To configure a system meeting the requirements of the EMC and Low Voltage Directives when incorporating the products (EMC and Low Voltage Directives compliant) into other machinery or equipment, refer to this Manual.

Moreover, refer to the manual to compliant to EMC and Low Voltage Directives of PLC used.

1. Measures to comply with the EMC Directive

The EMC Directive sets requirements for emission (conducted and radiated electromagnetic interference emitted by a product) and immunity (the ability of a product not to be influenced by externally generated electromagnetic interference). This section describes the precautions for machinery constructed with the products to comply with the EMC Directive.

In order to use this product in combination with a PLC module, it also needs to fill the demand for EMC conformity of a PLC module.

These precautions are based on the requirements of the EMC Directive and the harmonized standards. However, they do not guarantee that the entire machinery constructed according to the descriptions complies with the EMC Directive.

The manufacturer of the machinery must determine the testing method for compliance and declare conformity to the EMC Directive.

1.1 EMC Directive related standards

(1) Emission requirements

Standard	Test item	Test description	Value specified in standard
EN61131-2 : 2007,	CISPR16-2-3 Radiated emission *2	The electromagnetic wave emitted by the product to the external space is measured.	• 30 to 230MHzQP: 40dB μ V/m (measured at 10m distance) *1 • 230 to 1000MHzQP: 47dB μ V/m (measured at 10m distance)
IEC61131-2 : 2017	CISPR16-2-1, CISPR16-1-2 Conducted emission *2	The noise level which the product emits to the power line is measured.	•0.15 to 0.5MHz QP:79dB, Mean:66dB *1 •0.5 to 30MHz QP:73dB,Mean:60dB

*1 QP: Quasi-peak value, Mean: Average value

*2 This product is an open-type device and must be placed in a conductive control panel or similar type of enclosure. The tests were conducted with the programmable controller installed in a control panel.

(2) Immunity requirements

Standard	Test item	Test description	Value specified in standard
EN61131-2 : 2007, IEC61131-2 : 2017	EN61000-4-2, IEC61000-4-2 Electrostatic discharge immunity* ³	An electrostatic discharge is applied to the enclosure of the equipment.	<ul style="list-style-type: none"> • 8kV Air discharge • 4kV Contact discharge
	EN61000-4-3, IEC61000-4-3 Radiated, radio-frequency, electromagnetic field immunity* ³	An electric field is radiated to the product.	<ul style="list-style-type: none"> • 80% AM modulation@1kHz • 80M-1000MHz: 10V/m • 1.4G-2.0GHz: 3V/m • 2.0G-2.7GHz: 1V/m
	EN61000-4-4, IEC61000-4-4 Fast transient burst immunity* ³	Burst noise is applied to power lines and signal lines.	<ul style="list-style-type: none"> • AC/DC power, I/O power, and AC I/O (unshielded) lines: 2kV • DC I/O, analog, communication lines: 1kV
	EN61000-4-5, IEC61000-4-5 Surge immunity* ³	Lightning surge is applied to power lines and signal lines.	<ul style="list-style-type: none"> • AC power, AC I/O power, and AC I/O (unshielded) lines: 2kV CM, 1kV DM • DC power and DC I/O power lines: 0.5kV CM, 0.5kV DM • DC I/O, AC I/O(shielded),analog*⁴ , and communication lines: 1kV CM
	EN61000-4-6, IEC61000-4-6 Conducted RF immunity * ³	High-frequency noise is applied to power lines and signal lines.	0.15M to 80MHz, 80% AM modulation @1kHz, 10Vrms
	EN61000-4-8, IEC61000-4-8 Power-frequency magnetic field immunity* ³	The product is immersed in the magnetic field of an induction coil.	50/60Hz, 30A/m
	EN61000-4-11, IEC61000-4-11 Voltage dips and interruptions immunity* ³	Power voltage is momentarily interrupted.	<ul style="list-style-type: none"> • 0%, 0.5 periods, starting at zerocrossing • 0%, 250/300 periods (50/60Hz) • 40%, 10/12 periods (50/60Hz) • 70%, 25/30 periods (50/60Hz)

*³ This product is an open-type device and must be placed in a conductive control panel or similar type of enclosure. The tests were conducted with the programmable controller installed in a control panel.

*⁴ The accuracy of an analog signal isolation conversion module may temporary vary within $\pm 10\%$.

1.2 Installation in a control panel

This product is an open-type device intended to be placed in a conductive control panel or similar type of enclosure.

This ensures safety as well as effective shielding of electromagnetic noise emitted from this product.

Before handling this products, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to do so may cause failure or malfunction of this products.

(1) Control panel

- Use a conductive control panel.
- Mask off an area used for grounding in advance.
- To ensure electrical contact between inner plates and the control panel, mask off the bolt installation areas of each inner plate so that conductivity can be ensured in the largest area.
- Ground the control panel with a thick ground cable so that low impedance can be ensured even at high frequencies.
- Keep the diameter of the holes on the control panel to 10cm or less. If the diameter is larger than 10cm, electromagnetic wave may leak.

In addition, because electromagnetic wave leaks through a clearance between the control panel and its door, reduce the clearance as much as possible.

The tests were conducted by Mitsubishi Electric Engineering Co., Ltd. using a control panel having damping characteristics of 37dB(maximum) and 30dB (average) (measured at 3m distance, 30 to 300MHz).

(2) Ground cable

Ground cable for the module with terminal FG must be connected as described below.

- Provide a ground point to the control panel near the module with terminal FG. Ground the FG terminals of the module to the ground point with the thickest and shortest ground cable possible (a length of 30cm or shorter).

1.3 Cables

Use a shielded cable for a cable extended out of the control panel such as an I/O signal line (including a common line).

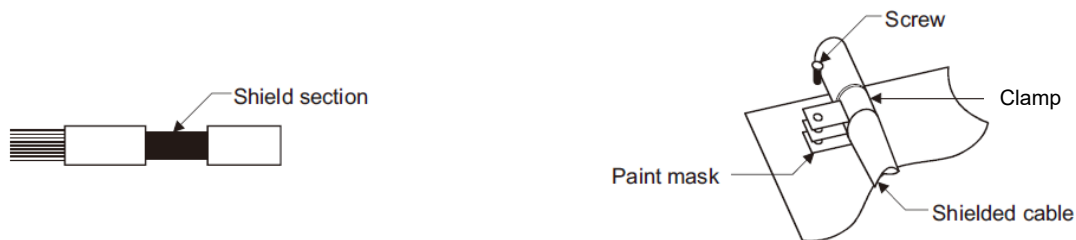
If a shielded cable is not used or not grounded properly, the noise immunity will not meet the requirement.

(1) Grounding a shielded cable

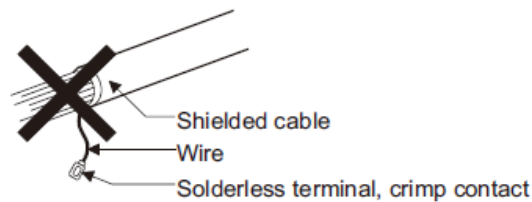
- Ground the shield of a shielded cable as close to the module as possible so that the grounded cable will not be affected by electromagnetic induction from ungrounded cables.
- Ground the exposed shield to a large area on the control panel.

A clamp can be used as shown below.

In this case, mask off the inner wall surface of the control panel, which comes in contact with the clamp.

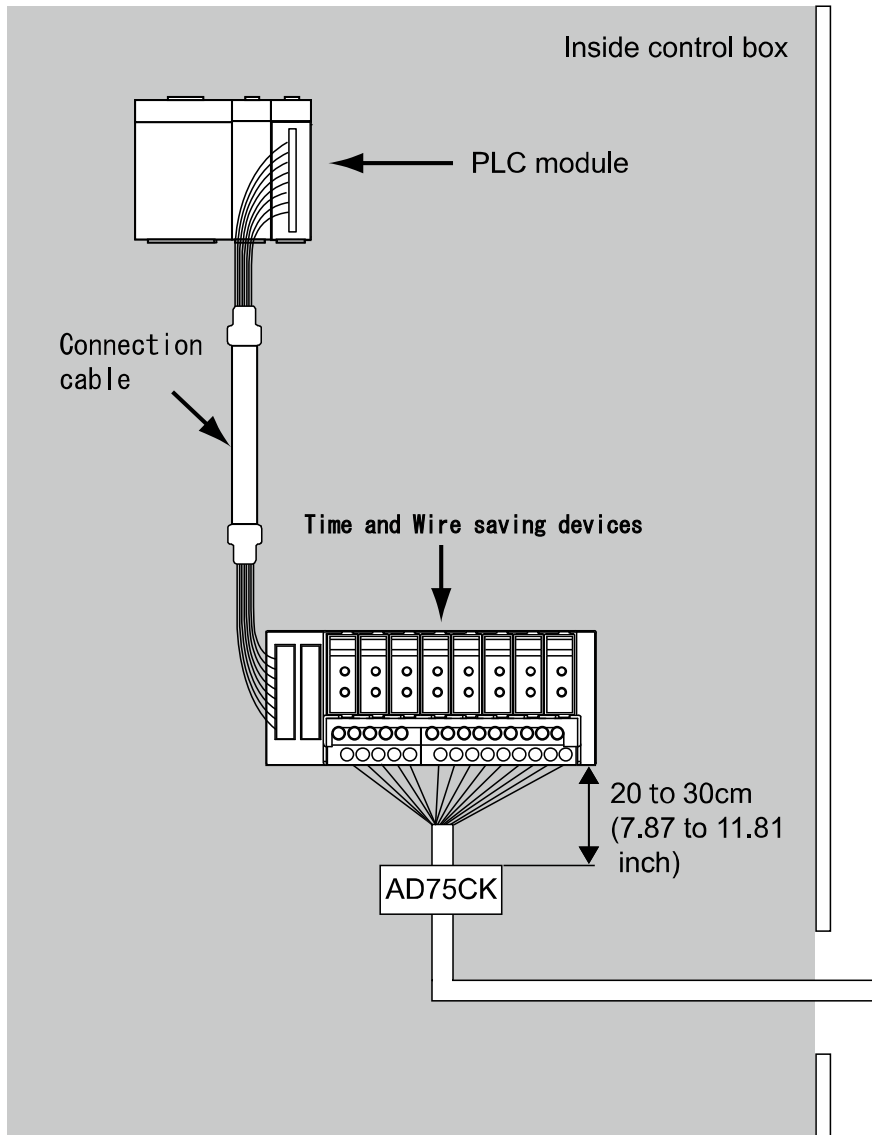


Note) Do not use the tip of a PVC wire soldered onto a shield of the shielded cable for grounding. Doing so will raise the high-frequency impedance, resulting in loss of the shielding effect.



(2) Grounding cables using a cable clamp

Use shielded cables for external wiring of the products each modules, and ground the shields of the shielded cables to the control panel with an AD75CK cable clamp (manufactured by Mitsubishi)*5. Ground the shields within 20 to 30cm from the module.

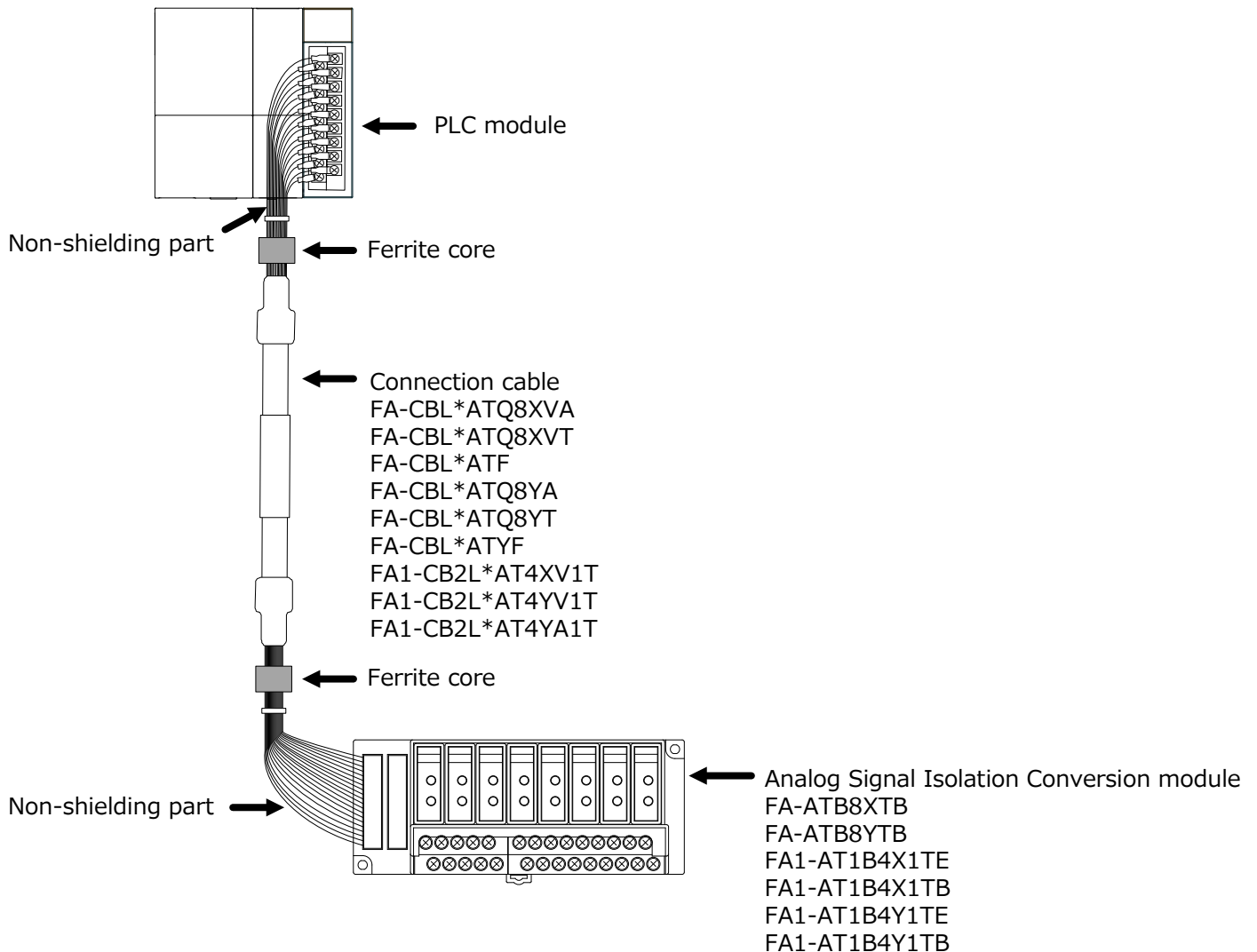


*5: AD75CK cable clamp is a product of Mitsubishi Electric Corporation .

(3) Analog Signal Isolation Conversion module

- Install a ferrite core to two non-shielding parts near the PLC of a PLC connection cable, and near an analog signal isolation conversion module.

Ferrite core of recommendation : such as the ESD-SR-250 manufactured by TOKIN Corporation *6



*6: such as the ESD-SR-250 ferrite core is a product of TOKIN Corporation.

(4) I/O signal cables

For I/O signal cables (including common lines), ground the shield sections (in the same way as explained in (1)) when the cables are extended out of the control panel.

The length of I/O signal cables connected to the following models must be 30 m or less.

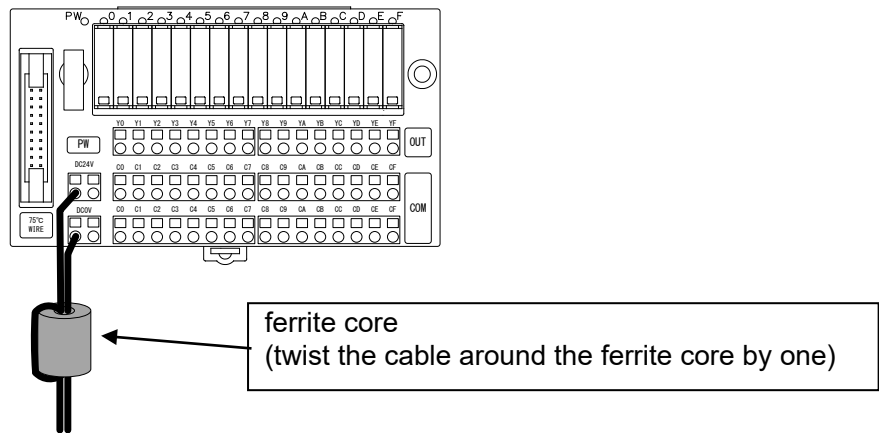
Applicable models: FA1-AT1B4X1TE, FA1-AT1B4X1TB, FA1-AT1B4Y1TE, and FA1-AT1B4Y1TB

(5) Power cables for external power supply terminal

- Use a CE-marked AC-DC power supply as an external power supply and I/O power supply for the the products each modules. Install the AC-DC power supply inside the same control panel where the module is installed. Keep the length of a power cable connected to the external power supply terminal to 3m or less.
- External power supply used for the tests conducted by Mitsubishi Electric Engineering Co., Ltd.: PS5R-VF24 manufactured by IDEC Corporation

(6) FA1-TH16Y1SR20S1E, FA1-TH1E16Y1SR20S1E, FA1-TH16Y1TR20S1E, FA1-TH1E16Y1TR20S1E FA1-TH8X2SC20S1E, FA1-TH4X2SC20S1E, FA1-TH16X24RA1L20S1E, FA1-TH16X24RA1H20S1E

- Install a ferrite core to near an External power supply. Twist the cable around the ferrite core by one as shown below.
- ferrite core used for the tests conducted by : KRFC-13(manufactured by KITAGAWA INDUSTRIES CO.,LTD.)



2. Measures to comply with the Low Voltage Directive

The Low Voltage Directive requires electrical equipment that is designed or adapted for use between 50 to 1000VAC or 75 to 1500VDC to satisfy the safety requirements.

This section describes the precautions for use of the products to comply with the Low Voltage Directive. In order to use this product in combination with a PLC module, it also needs to fill the demand for the Low Voltage Directive conformity of a PLC module.

These descriptions are based on the requirements of the Low Voltage Directive and the harmonized standards. However, they do not guarantee that the entire machinery constructed according to the descriptions complies with the Low Voltage Directive. The manufacturer of the machinery must determine the testing method for compliance and declare conformity to the Low Voltage Directive.

2.1 Standard applied for the products

The standard applied for the products is EN50178 safety of devices used in measurement rooms, control rooms, or laboratories.

The products that operate at 50VAC/75VDC or higher rated input voltage have also been developed in accordance with EN50178.

However, the modules which operate at less than 50VAC/75VDC rated input voltage are not targeted for the Low Voltage Directive compliance.

For products with the CE mark, refer to the "Product Information" menu of the MEEFAN homepage.

2.2 Power supply

Power supply modules are designed to meet the overvoltage category II.

Confirm that the power supply to a programmable controller meets the overvoltage category II.

2.3 Control panel

This product is an open type device (a device designed to be housed inside other equipment) and must be installed inside a control panel for use

(1) Protection against electric shock

Handle the control panel as follows to protect a person who does not have adequate knowledge of electrical installation from an electric shock.

- Lock the control panel so that only a person who is trained and has acquired enough knowledge of electrical installation can open the panel.
- Design the control panel so that the power supply is automatically shut off when the panel is opened.
- Use a control panel with a protection degree of IP20 or higher.

(2) Protection from dust and water


The control panel needs to be dustproof and waterproof. Insufficient dustproof and waterproof lower the dielectric withstand of the control panel, possibly causing dielectric breakdown.

The insulation of this product is designed to be used in an environment of pollution degree 2. Use them in an environment of pollution degree 2 or below.

The environment of pollution degree 2 can be achieved when this product is installed inside the control panel with a protection degree of IP54 or equivalent.

2.4 Grounding

Use module with terminal FG in an grounding status.

Functional grounding  : Improves the noise resistance.

2.5 External wiring

(1) Module power supply and external power supply

For the Digital signal converter and the Analog Signal Isolation Conversion module which requires 24VDC as module power supply, the 5/12/24/48VDC I/O Conversion module, and the Analog Terminal Block Conversion module and the High-Speed Counter Module Terminal Block Conversion Module and the Positioning Module Terminal Block Conversion module and the GOT goods which requires the external power supply, use the 5/12/24/48VDC circuit which is doubly insulated from the hazardous voltage circuit or use the power supply whose insulation is reinforced.

(2) External devices

For external devices connected to this product, use the one of which insulation between the interface circuit section to this product and the hazardous voltage circuit section is reinforced (if the device internally has a hazardous voltage circuit section).