FA Goods

Positioning signal Conversion Module

FA-PT1LBD

User's Manual

Thank you for purchasing the FA Goods products.

Before using the products, please read this manual and the relevant manuals carefully to handle the products correctly.

MITSUBISHI ELECTRIC ENGINEERING COMPANY LIMITED

SAFETY PRECAUTIONS

(Read these precautions before using the FA Goods products.)

Before using the products, please read this manual and the relevant manuals carefully, and pay full attention to safety to handle the products correctly.

The precautions given in this manual are concerned with the FA Goods products only.

For the safety precautions of the programmable controller system, refer to the user's manual for the programmable controller used.

In this manual, the safety precautions are classified into two levels: "⚠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.

Under some circumstances, failure to observe the precautions given under "⚠CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

[Design Precautions]

⚠ WARNING

- ●Configure safety circuits externally to ensure that the entire system operates safely even when a fault occurs in the external power supply, the programmable controller, or the FA Goods products. Failure to do so may result in an accident due to an incorrect output or malfunction.
  - (1) 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 externally.
  - (2) Outputs may remain on or off due to a failure of a component such as a relay, transistor, and triac in an output terminal module. Configure an external circuit for monitoring output signals that could cause a serious accident.
- ●In an output circuit of an output terminal module, when a load current exceeding the rated current or an 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.
- ●Configure a circuit so that the programmable controller is turned on first and then the external power supply. If the external power supply is turned on first, an accident may occur due to an incorrect output or malfunction.

[Design Precautions]

⚠ CAUTION

- ●Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm (3.94 inches) or more between them. Failure to do so may result in malfunction or failure due to noise.
- ●When using a terminal block conversion module for a high-speed counter module, do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 150mm (5.91 inches) or more between them. Failure to do so may result in malfunction or failure due to noise.
- ●Keep a distance of 100mm (3.94 inches) or more between a thermocouple or RTD (Resistance Temperature Detector) and the main circuit line or AC control lines. Also, keep the thermocouple or RTD away from a circuit that includes harmonics, such as a high-voltage circuit and a load circuit of an inverter. If not, the thermocouple or RTD is more likely to be affected by noise, surges, and induction.
- ●At power-on or power-off, a voltage may occur or a current may flow between output terminals for a moment. To use an analog signal converter or analog terminal block conversion module, start the control after analog outputs become stable.
- ●Do not place an analog signal converter or analog terminal block conversion module near a device that generates magnetic noise.
- ●When a device such as a lamp, heater, or solenoid valve is controlled through an output terminal module, a large current (approximately 10 times greater than normal) may flow when the output is turned from off to on. Therefore, use an output terminal module that has a sufficient current rating.

[Installation Precautions]

⚠ WARNING

- ●Shut off the external power supply (all phases) used in the system before installation. Failure to do so may result in electric shock or damage to the products.

[Installation Precautions]

⚠ CAUTION

- ●Use FA Goods products in an environment that meets the general specifications in this manual. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the products.
- ●Securely fix the products with a DIN rail or screws. Incorrect installation may cause malfunction, failure, or drop of the module. When using the products in an environment of frequent vibrations, fix the products with screws.
- ●Tighten the screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or products, resulting in drop, short circuit, or malfunction.
- ●Attach DIN rail stoppers on the right and left sides of the spring clamp conversion module (FA1-TESV**) to fix the module securely.
- ●Shut off the external power supply (all phases) used in the system before mounting or removing the products. Failure to do so may result in damage to, malfunction of, or failure of the products.
- ●Do not directly touch any conductive parts and electronic components of the products. Failure to do so may cause malfunction or failure of the products.
- ●Install the products in the correct orientation if it is specified. Failure to do so may result in damage to or deterioration of the products.
- ●When drilling screw holes, be careful not to drop chips into the inside of the products or conductive parts. Such foreign matter can cause a fire, failure, or malfunction.
- ●When using replacement relays/triacs/transistors for a terminal module or signal conversion modules, use them in the correct combination. Incorrect combination may cause failure.
- ●Shut off the power supply before installing/removing a replacement relay/triac/transistor for a terminal module. Failure to do so may cause failure or malfunction.
- ●Securely install replacement relays/triacs/transistors on a terminal module and securely mount a signal conversion modules on an installation base. Failure to do so may cause damage to or drop of the products, or malfunction due to poor contact. Follow the correct procedure to install/remove them. Failure to do so may cause damage to or drop of the products, or malfunction due to poor contact.
- ●When relay/triac/transistor modules are installed on a terminal module or a signal conversion module is mounted on the installation base, hold the terminal module or installation base to transport them or install them to a panel. Holding the relay/triac/transistor or signal conversion module may cause drop or failure of the terminal module or installation base.

[Wiring Precautions]

⚠ WARNING

- ●Shut off the external power supply (all phases) used in the system before wiring. Failure to do so may result in electric shock or damage to the products.
- ●After wiring, attach the included terminal cover to the products before turning them on for operation. Failure to do so may result in electric shock.

[Wiring Precautions]

⚠ CAUTION

- ●Use applicable solderless terminals and tighten them within the specified torque range. Failure to do so may cause failure, damage, or malfunction.
- ●Check the rated voltage and terminal layout before wiring to the products, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause a fire or failure.
- ●Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.
- ●When using a terminal block conversion module for a high-speed counter module, do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 150mm (5.91 inches) or more between them. Failure to do so may result in malfunction or failure due to noise.
- ●Keep a distance of 100mm (3.94 inches) or more between a thermocouple or RTD (Resistance Temperature Detector) and the main circuit line or AC control lines. Also, keep the thermocouple or RTD away from a circuit that includes harmonics, such as a high-voltage circuit and a load circuit of an inverter. If not, the thermocouple or RTD is more likely to be affected by noise, surges, and induction.
- ●Do not place an analog signal converter or analog terminal block conversion module near a device that generates magnetic noise.
- ●Place the cables in a duct or clamp them. If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the products or cables or malfunction due to poor contact.
- ●Tighten the terminal screws within the specified torque range. Undertightening can cause short circuit, fire, or malfunction. Overtightening can damage the screw and/or products, resulting in drop, short circuit, or malfunction.
- ●Tighten the connector screws within the specified torque range. Undertightening can cause short circuit, fire, or malfunction. Overtightening can damage the screw and/or products, resulting in drop, short circuit, fire, or malfunction.
- ●Securely connect connectors to the products. Failure to do so may cause malfunction.
- ●When disconnecting a cable from the products, do not pull the cable by the cable part. For the cable with connector, hold the connector part of the cable. For the cable connected to the terminal block, loosen the terminal screw. Pulling the cable connected to the products may result in malfunction or damage to the products or cable.
- ●Check the interface type and correctly connect the cable. Incorrect wiring (connecting the cable to an incorrect interface) may cause failure of the products and external device.
- ●Prevent foreign matter such as dust or wire chips from entering the products. Such foreign matter can cause a fire, failure, or malfunction.
- ●The products must be installed in control panels. Connect the main power supply to the products in the control panel through a relay terminal block. Wiring and replacement of the products must be performed by qualified maintenance personnel with knowledge of protection against electric shock.
- ●When connecting the products with a programmable controller, check that the product configuration is correct. An incorrect configuration may cause failure or malfunction.
- ●Use the products with no force applied to their connectors. Applied force may cause failure or disconnection.
- ●Attach protective covers or signal conversion modules to unused connectors or empty slots of the products. Failure to do so may cause a fire, failure, or malfunction due to foreign matter.
- ●When using replacement relays/triacs/transistors for a terminal module or signal conversion modules, use them in the correct combination. Incorrect combination may cause failure of a programmable controller, terminal module, installation base, or external device.
- ●Securely install replacement relays/triacs/transistors on a terminal module and securely mount a signal conversion modules on an installation base. Failure to do so may cause damage to or drop of the products, or malfunction due to poor contact. Follow the correct procedure to install/remove them. Failure to do so may cause damage to or drop of the products, or malfunction due to poor contact.
- ●Individually ground the FG terminal of the products with a ground resistance of 100 ohms or less. Failure to do so may result in electric shock or malfunction.

[Startup and Maintenance Precautions]

WARNING

- Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
- Shut off the external power supply (all phases) used in the system before cleaning the products or retightening the terminal screws, connector screws, or products fixing screws. Failure to do so may result in electric shock or cause failure or malfunction of the products. Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or products, resulting in drop, short circuit, or malfunction.

[Startup and Maintenance Precautions]

CAUTION

- Do not disassemble or modify the products. Doing so may cause failure, malfunction, injury, or a fire.
- Use any radio communication device such as a cellular phone or PHS (Personal Handy-phone System) more than 25cm away in all directions from the programmable controller and FA Goods products. Failure to do so may cause malfunction.
- Shut off the external power supply (all phases) used in the system before mounting or removing the products. Failure to do so may cause failure or malfunction of or damage to the products.
- After the first use of the products, do not connect/remove the products and cables more than 50 times (IEC 61131-2 compliant). Exceeding the limit may cause malfunction.
- Startup and maintenance of a control panel must be performed by qualified maintenance personnel with knowledge of protection against electric shock. Lock the control panel so that only qualified maintenance personnel can operate it.
- Before handling the 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 the products.

[Disposal Precautions]

CAUTION

- When disposing of the products, treat them as industrial waste.

[Transportation Precautions]

CAUTION

- Do not apply shock that exceeds the shock resistance described in the general specifications during transportation since the products are precision devices. Doing so may cause failure of the module.
- The halogens (such as fluorine, chlorine, bromine, and iodine), which are contained in a fumigant used for disinfection and pest control of wood packaging materials, may cause failure of the products. Prevent the entry of fumigant residues into the product or consider other methods (such as heat treatment) instead of fumigation. The disinfection and pest control measures must be applied to unprocessed raw wood.

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) Sales representative in EU member states
The sales representative in EU member states is:
Company: MITSUBISHI ELECTRIC EUROPE B.V.
Address: Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany

(2) Method of ensuring compliance
To ensure that FA Goods products maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to "EMC and Low Voltage Directives Compliant Manual" (50D-FA9010-108).

REVISIONS

*The manual number is given on the bottom left of the last page.

Print Date	*Manual Number	Revision
October, 2012	50D-FA9010-135	First edition
March, 2013	50D-FA9010-135-A	Added or modified parts EMC and Low Voltage Directives
March, 2018	50D-FA9010-135-B	Added or modified parts SAFETY PRECAUTIONS, REVISIONS, 2.GENERAL SPECIFICATIONS, 9.PRECAUTIONS, 10. GRATIS WARRANTY TERMS AND GRATIS WARRANTY RANGE,11.EXCLUSION FROM LIABILITY FOR OPPORTUNITY LOSS AND SECONDARY LOSS, FOR YOUR SAFETY, 12.TRADEMARKS
September,2019	50D-FA9010-135-C	Modified parts 7. EXTERNAL CONNECTION EXAMPLE

CONTENTS

1. INTRODUCTION

This manual describes the specifications and handling of the module which converts an open collector output by the built-in I/O function (positioning function) of the MELSEC-L CPU module into a differential output.

2. GENERAL SPECIFICATIONS

<table>
<tr><th>Item</th><th colspan="5">Specifications</th></tr>
<tr><td>Operating ambient temperature</td><td colspan="5">0 to 55°C</td></tr>
<tr><td>Storage ambient temperature</td><td colspan="5">-25 to 75°C</td></tr>
<tr><td>Operating ambient humidity</td><td colspan="5">5 to 95%RH, non-condensing</td></tr>
<tr><td>Storage ambient humidity</td><td colspan="5">5 to 95%RH, non-condensing</td></tr>
<tr><td rowspan="6">Vibration resistance</td><td>Applicable standard</td><td colspan="4">JIS B 3502, IEC 61131-2</td></tr>
<tr><td></td><td>Frequency</td><td>Constant acceleration</td><td>Half amplitude</td><td>Sweep count</td></tr>
<tr><td rowspan="2">Under intermittent vibration</td><td>5 to 8.4Hz</td><td>—</td><td>3.5mm</td><td rowspan="2">10 times each in X, Y, and Z directions</td></tr>
<tr><td>8.4 to 150Hz</td><td>9.8m/s^2 (1G)</td><td>—</td></tr>
<tr><td rowspan="2">Under continuous vibration</td><td>5 to 8.4Hz</td><td>—</td><td>1.75mm</td><td rowspan="2">—</td></tr>
<tr><td>8.4 to 150Hz</td><td>4.9m/s^2 (0.5G)</td><td>—</td></tr>
<tr><td>Shock resistance</td><td colspan="5">Compliant with JIS B 3502 and IEC 61131-2 (147m/s2 (15G), 3 times each in X, Y, and Z bidirections)</td></tr>
<tr><td>Operating atmosphere</td><td colspan="5">No corrosive gases</td></tr>
<tr><td>Operating altitude*1</td><td colspan="5">2000m or lower</td></tr>
<tr><td>Installation location</td><td colspan="5">Inside a control panel</td></tr>
<tr><td>Overvoltage category*2</td><td colspan="5">II or less</td></tr>
<tr><td>Pollution degree*3</td><td colspan="5">2 or less</td></tr>
</table>

*1: Do not use or store the products under pressure higher than the atmospheric pressure of altitude 0m. Doing so may cause malfunction.

*2: This category indicates the section of the power supply to which the equipment is assumed to be connected between the public electrical power distribution network and the machinery within premises.

*3: This index indicates the degree to which conductive material is generated in terms of the environment in which the equipment is used.

3. PERFORMANCE SPECIFICATIONS

Item \ Model name		FA－PT1LBD
Number of conversion axes		1
PULSE F/R output specification	Output	Differential drivers equivalent to the AM26C31
	Maximum number of output pulses	200k pulses/s
	Maximum connection distance with drive unit	10m
Power supply for command pulse output		24VDC±10% , 50mA or less
PG0,CHG,DOG,FLS,RLS input specification		Conforms to the specifications of the built-in I/O function (positioning function) of the MELSEC-L CPU module.
READY input specification		
CLEAR output specification		
Module power supply		24VDC ±10% (ripple ratio: within 5%, CLASS 2)
Current consumption		Approx. 40mA (24 VDC)
Withstand voltage		Between power supply and signal：500VAC, 1min.
Insulation resistance		Between power supply and signal：10MΩ or more
Terminal block	Terminal block screw	M3 screw, number of terminals: 25P, 7.62mm pitch, spring-up screw with finger protection cover
		Tightening torque range: 58.8 to 88.2N·cm (6 to 9kgf·cm, 5.22 to 7.5lbf·in), UL standard conformity tightening torque： 59N·cm, 5.22 lbf·in
	Applicable wire	22 to 14 AWG: 0.3 to 2.0mm^2 (when solderless terminals are used)
	Mounting screw for 7-point two-piece terminal block	M3.5 screw, Tightening torque range: 68 to 98N·cm (7 to 9.9kgf·cm, 6.1 to 8.5lbf·in)
Installation method	Screw	M4 × 0.7mm × 16mm or more
		Tightening torque range: 78 to 108N·cm (8 to 11kgf·cm, 7 to 9.5lbf·in)
	DIN rail	Applicable DIN rail: TH35-7.5Fe, TH35-7.5Al (compliant with IEC 60715)
Weight		Approx.170g

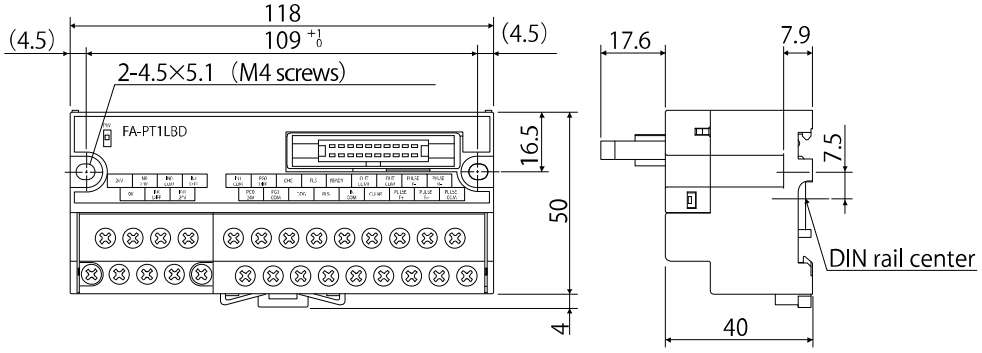
*1：For wiring to the terminal block, refer to the manual of the MELSEC-L CPU module to be connected, published by Mitsubishi Electric.

4. CONNECTABLE MODULES AND CABLES

Module model for a programmable controller			Cable model	Module model
MELSEC-L Series CPU	L02SCPU L02CPU L02CPU-SET L06CPU L06CPU-SET L26CPU L26CPU-SET L26CPU-BT L26CPU-BT-SET	Sink output type	FA-SCBL10FM2LV-LB	FA-PT1LBD
	L02SCPU-P L02CPU-P L02CPU-P-SET L06CPU-P L06CPU-P-SET L26CPU-P L26CPU-P-SET L26CPU-PBT L26CPU-PBT-SET	Source output type	FA-SCBL10FM2LV-LB	

5. EXTERNAL DIMENSIONS

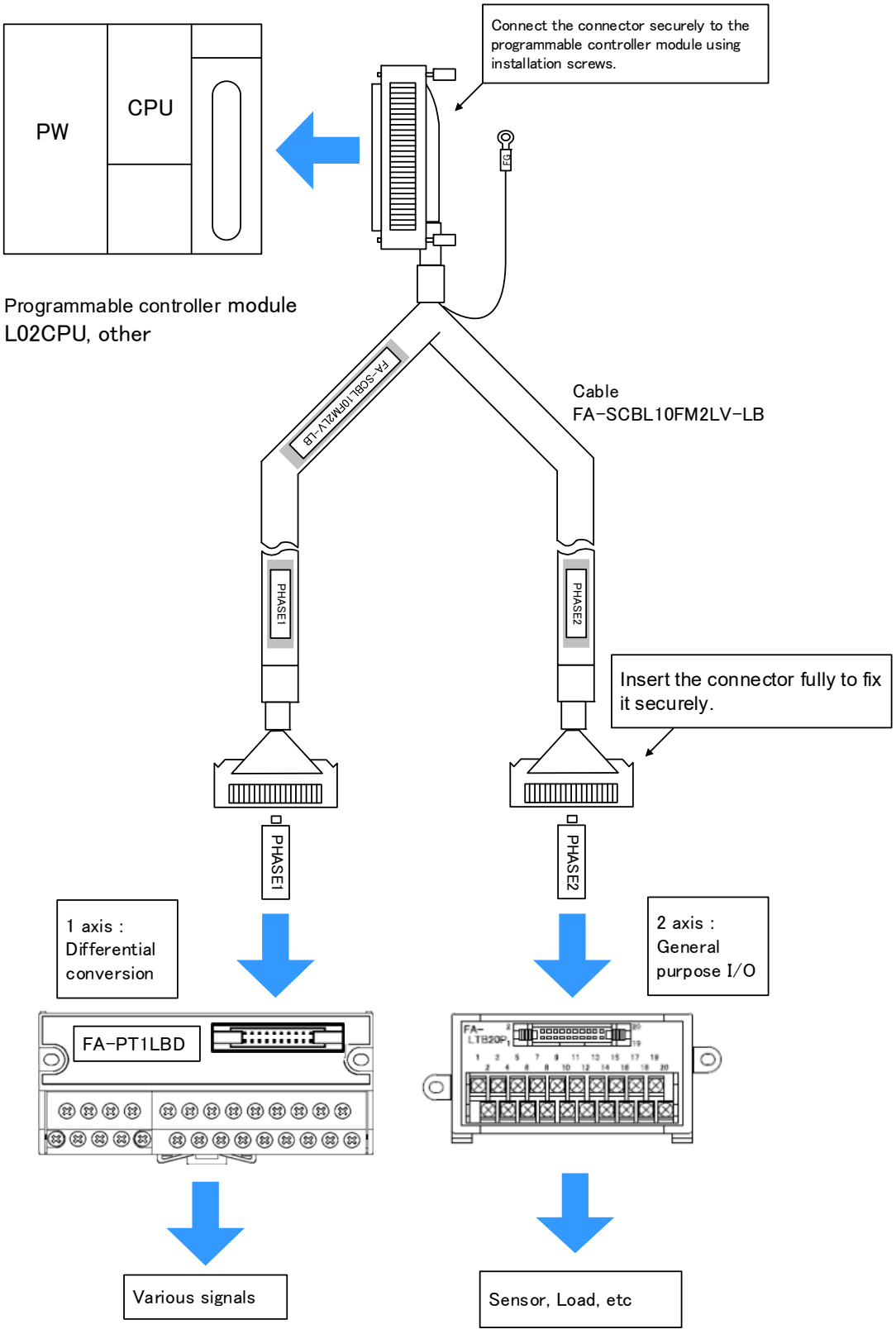
[Unit：mm]



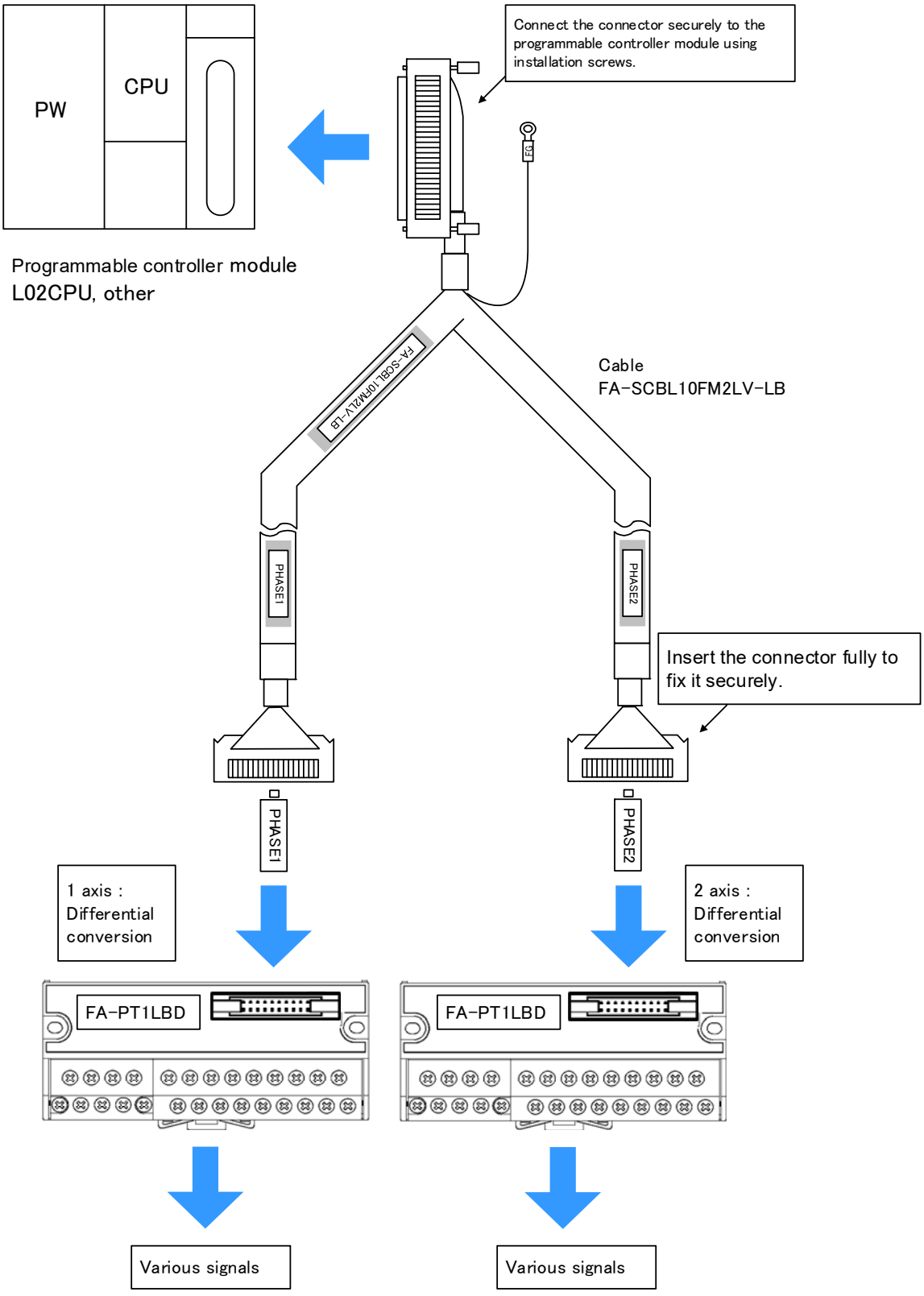
6. CONNECTING METHOD

6-1. Connection example with a connector module of a programmable controller

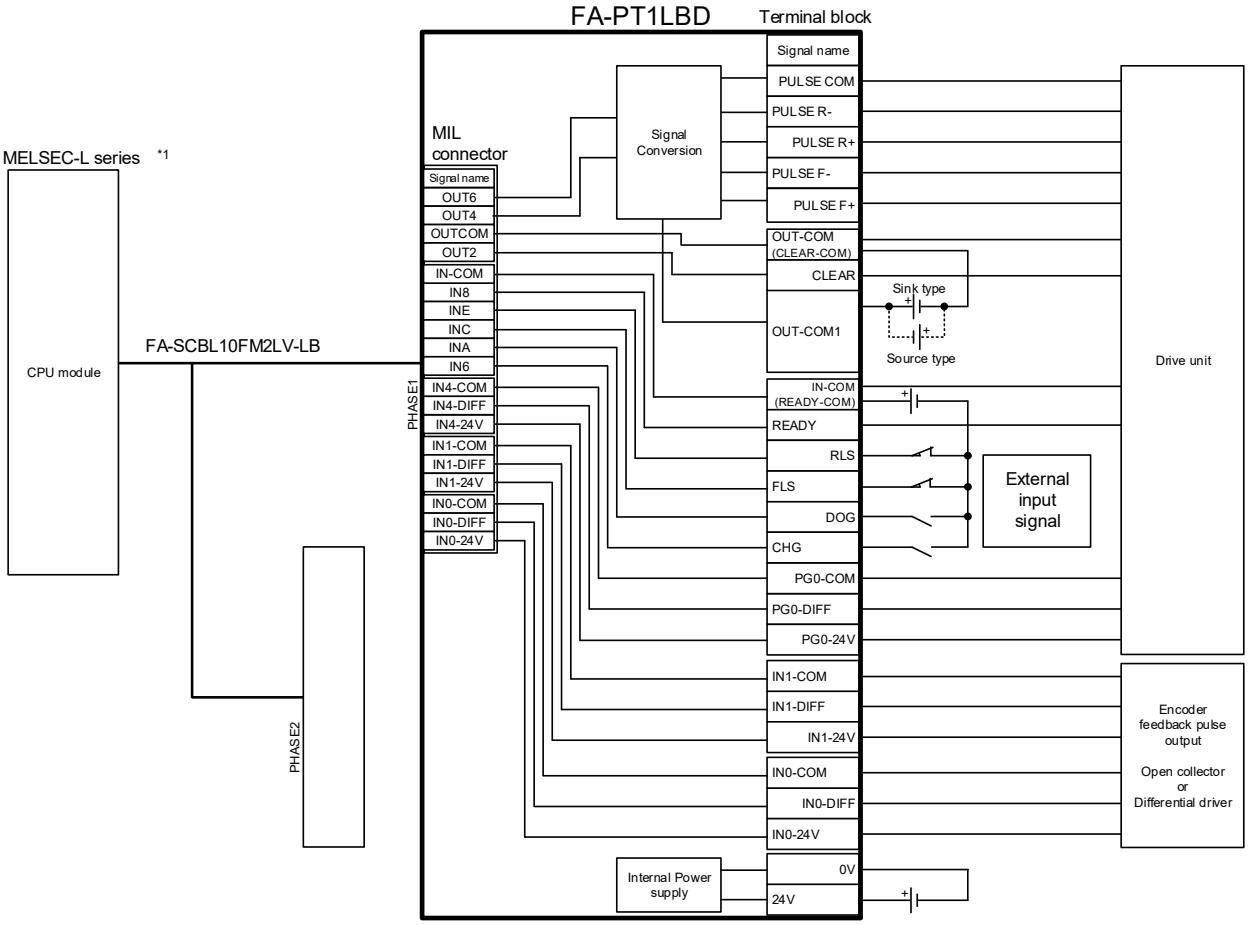
6-1-1. Axis 1: Differential conversion, Axis 2: General purpose I/O



6-1-2. 2 axis: Differential conversion



7. EXTERNAL CONNECTION EXAMPLE



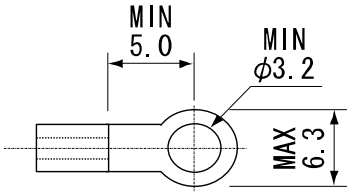
*1 : The connection direction of the power supply for command pulse signals differs depending on an output type of the CPU module used.

8. APPLICABLE SOLDERLESS TERMINALS

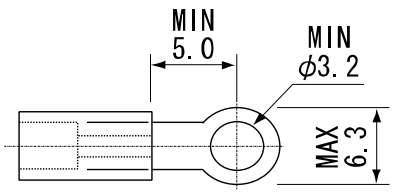
Type		Round		Y-shaped	
Manufacture	Applicable wire size	Non-insulated solderless terminal	Insulated solderless terminal	Non-insulated solderless terminal	Insulated solderless terminal
Nichifu Co., Ltd. NTM	0.3 to 1.25mm^2	R1.25-3N R1.25-3.5N	TG$^{V}_{N}$1.25-3N TG$^{V}_{N}$1.25-3.5N	1.25Y-3 1.25Y-3N 1.25Y-3L 1.25Y-3.5	TG$^{V}_{N}$1.25Y-3 TG$^{V}_{N}$1.25Y-3N TG$^{V}_{N}$1.25Y-3L TG$^{V}_{N}$1.25Y-3.5
	1.25 to 2.0mm^2	R2-3N	TG$^{V}_{N}$2-3N	2Y-3 2Y-3.5S	TG$^{V}_{N}$2Y-3 TG$^{V}_{N}$2Y-3.5S
Japan Solderless Terminal Mfg. Co., Ltd. JST	0.3 to 1.25mm^2	1.25-MS3	V1.25-MS3	1.25-B3A 1.25-C3A 1.25-N3A 1.25-C3.5A	V1.25-B3A V1.25-N3A
	1.25 to 2.0mm^2	2-MS3	V2-MS3	2-N3A 2-M3A	V2-N3A
Nippon Tanshi Co.,Ltd. NTK	0.3 to 1.25mm^2	R1.25-3ML R1.25-3.5SL	RAV1.25-3ML RAP1.25-3ML	VD1.25-3L VD1.25-3.5SS VD1.25-3.5S	VDAV1.25-3L VDAV1.25-3.5SS VDAV1.25-3.5S
	1.25 to 2.0mm^2	R2-3SL	RAV2-3SL RAP2-3SL	VD2-3S VD2-3.5SS VD2-3.5S	VDAV2-3.5SS VDAV2-3.5S

● Solderless terminal dimensions [Unit : mm]

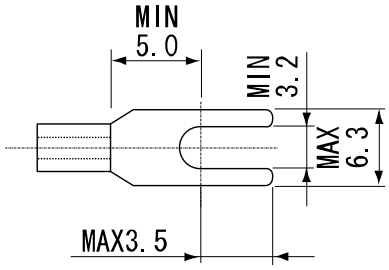
Round non-insulated solderless terminal



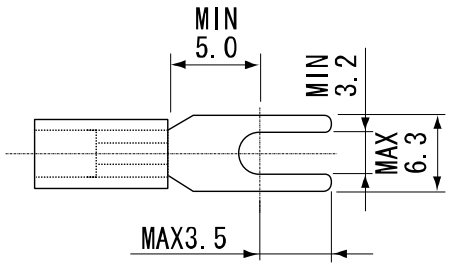
Round insulated solderless terminal



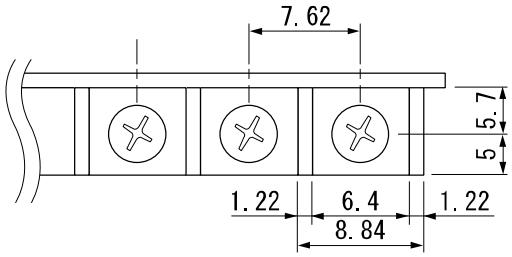
Y-shaped non-insulated solderless terminal



Y-shaped insulated solderless terminal



● Terminal block shape [Unit : mm]



9. PRECAUTIONS

(1) For wiring to the terminal block, refer to the manual of the programmable controller module to be connected, published by Mitsubishi Electric.
(2) Ground the FG wire provided with the cable in the same manner as the programmable controller module. Note that the bunched-up extra wire without grounding may act as an antenna, possibly introducing noise.

10. GRATIS WARRANTY TERMS AND GRATIS WARRANTY RANGE

If any fault or defect (hereinafter referred to as "Failure") attributable to Mitsubishi Electric Engineering should occur within the gratis warranty period, Mitsubishi Electric Engineering shall replace the product free of charge via the distributor from whom you made your purchase.

● Gratis warranty period

The gratis warranty period of this product shall be one (1) year from the date of purchase or delivery to the designated place.

● Gratis warranty range

(1) The gratis warranty range shall be limited to normal use based on the usage conditions, methods and environment, etc., defined by the terms and precautions, etc., given in the instruction manual, user's manual, and caution labels on the product.
(2) In the following cases, a repair fee shall be applied even if within the gratis warranty period.
1) Failure resulting from inappropriate storage or handling, carelessness or negligence by the user, or Failure caused by the user's hardware or software design.
2) Failure caused by unapproved modifications, etc., to the product by the user.
3) Failure that could have been avoided if, when the Mitsubishi Electric Engineering product was assembled into the user's device, safeguards defined by legal regulations applicable to the user's device or functions or structures considered standard by the industry had been provided.
4) Failure recognized as preventable if the consumed products specified in instruction manuals, etc., were normally maintained or replaced.
5) Replacement of consumable parts (relays, etc.).
6) Failure caused by external factors beyond anyone's control such as fires or abnormal voltage, and Failure caused by Force Majeure such as earthquakes, lightning, or wind and water damage.
7) Failure caused by reasons unpredictable by scientific technology standards at the time of shipment from Mitsubishi Electric Engineering.
8) Any other failure not attributable to Mitsubishi Electric Engineering or found by the user to not be attributable to Mitsubishi Electric Engineering.

11. EXCLUSION FROM LIABILITY FOR OPPORTUNITY LOSS AND SECONDARY LOSS

Regardless of the gratis warranty period, Mitsubishi Electric Engineering shall not be liable for compensation for damages arising from causes not attributable to Mitsubishi Electric Engineering, opportunity losses or lost profits incurred by the user due to Failures of Mitsubishi Electric Engineering products, damages or secondary damages arising from special circumstances, whether foreseen or unforeseen by Mitsubishi Electric Engineering, compensation for accidents, compensation for damages to products other than Mitsubishi Electric Engineering products, or compensation for replacement work, readjustment of onsite machinery and equipment, startup test runs or other duties carried out by the user.

12. TRADEMARKS

MELSEC, MELSEC iQ-R, CC-Link, CC-Link IE, and CC-Link L/T are trademarks or registered trademarks of Mitsubishi Electric Corporation. Other company names and product names in the text are trademarks or registered trademarks of each company.
In some cases, trademark symbols such as '™' or '®' are not specified in this manual.

⚠ FOR SAFE OPERATIONS

- 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 Engineering.
- This product has been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

MITSUBISHI ELECTRIC ENGINEERING COMPANY LIMITED

1-13-5 Kudankita, Chiyoda-ku, Tokyo, Japan 102-8404

Specifications subject to change without notice.

50D-FA9010-135-C

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