MITSUBISHI

Channel Isolated Thermocouple Input Module

User's Manual
(Hardware)

QD68TD-G-H01

Thank you for purchasing the Mitsubishi programmable controller MELSEC-Q series.

Prior to use, please read this and relevant manuals thorougly to fully understand the product.

MELSEC-Q
Mitsubishi Programmable Controller

MODEL	Q68TD-G-H01-U-HW
MODEL CODE	13JY36
IB(NA)-0800389-A(0707)MEE	

● SAFETY PRECAUTIONS ●

(Read these precautions before use.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.
The instructions given in this manual are concerned with this product. For the safety instructions of the programmable controller system, please read the User's Manual for the CPU module.
In this section, the safety precautions are ranked as "DANGER" and "CAUTION".

⚠ DANGER	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 medium or slight personal injury or physical damage.

Note that the ⚠ CAUTION level may lead to a serious consequence according to the circumstances.
Always follow the precautions of both levels because they are important to personal safety.

Please keep this manual accessible when required and always forward it to the end user.

[DESIGN PRECAUTIONS]

⚠ DANGER
● Do not write data into the "system area" of the buffer memory of intelligent function modules. Also, do not use any "prohibited to use" signals as an output signal to an intelligent function module from the programmable controller CPU. Writing data into the "system area" or outputting a signal for "prohibited to use" may cause a programmable controller system malfunction.

⚠CAUTION

- Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other.
  They should be installed 100 mm (3.94 inch) or more from each other.
  Not doing so could result in noise that may cause malfunction.

[INSTALLATION PRECAUTIONS]

⚠CAUTION

- Use the programmable controller in the environment conditions given in the general specifications in the User's Manual for the CPU module. Failure to do so may cause an electric shock, fire, malfunction, or damage to or deterioration of the product.
- While pressing the installation lever located at the bottom of the module, fully insert the module fixing projection into the fixing hole in the base unit to mount the module. Incorrect module mounting may cause a malfunction, failure, or drop of the module. In an environment of frequent vibrations or impacts, secure the module with screws.
- The screws must be tightened within the specified torque range. If the screw is too loose, it may cause a drop or malfunction. Excessive tightening may damage the screw and/or the module, resulting in a drop or malfunction.
- Be sure to shut off all phases of the external power supply used by the system before mounting or removing the module. Failure to do so may cause damage to the product.
- Do not directly touch any conductive part or electronic part of the module. Doing so may cause a malfunction or failure of the module.

[WIRING PRECAUTIONS]

⚠CAUTION

- Always ground the shielded cables for the programmable controller. There is a risk of electric shock or malfunction.
- For wiring and connection, properly press, crimp or solder the connector with the tools specified by the manufactures and attach the connector to the module securely.
- Be careful to prevent foreign matter such as dust or wire chips from entering the module.
  Failure to do so may cause a fire, failure or malfunction.
- A protective film is attached to the module top to prevent foreign matter such as wire chips from entering the module during wiring.
  Do not remove the film during wiring.
  Be sure to remove it for heat dissipation before system operation.
- Be sure to place the cables connected to the module in a duct or clamp them. If not, dangling cables may swing or inadvertently be pulled, resulting in damage to the module and/or cables, or malfunctions due to poor cable connection.
- When disconnecting the external wiring cable connected to the module, do not pull it by holding the cable part. Disconnect the cable with connector with holding the connector plugged into the module. Pulling the cable part with the cable still connected to the module may cause a malfunction or damage to the module and/or cable.
- Always place the thermocouple at least 100mm (3.94inch) away from the main circuit cables and AC control lines. Fully keep it away from highvoltage cables and circuits, which include high frequency waves, such as an inverter's load circuit. Not doing so will cause the module more susceptible to noises, surges and inductions.
- Do not place a module near the equipment that generates magnetic noise.

Revisions

* The manual number is given on the bottom right of the cover.

Print Date	*Manual Number	Revision
Jul., 2007	IB(NA)-0800389-A	First edition

CONTENTS

Manual

The following manual is also related to this product.
Order it if necessary.

Related manual

Manual name	Manual No. (Model code)
Channel Isolated Thermocouple Input Module Q68TD-G-H01/GX Configurator-TI (SW1D5C-QTIU)	SH-080699ENG (13JZ04)

Compliance with the EMC and Low Voltage Directives

When incorporating the Mitsubishi programmable controller into other machinery or system and ensuring compliance with the EMC and Low Voltage Directives, refer to Chapter 3 "EMC and Low Voltage Directive" of the User's Manual (Hardware) for the CPU module. The CE logo is printed on the rating plate of the programmable controller, indicating compliance with the EMC and Low Voltage Directives.

In addition, to make the product comply with the EMC and Low Voltage Directives, refer to Section 5.1 "Wiring Precautions".

1. OVERVIEW

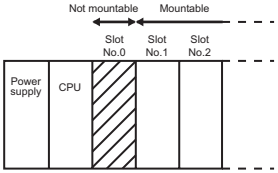
This manual describes the specifications and part names of type Q68TD-G-H01 Channel Isolated Thermocouple Input Module (hereinafter abbreviated as Q68TD-G-H01) that is used with the MELSEC-Q series CPU module.

1.1 Restrictions on mountable slot position

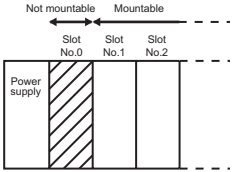
The Q68TD-G-H01 has restrictions on mountable slot position.
The following describes the restrictions of the slot position when mounting the Q68TD-G-H01 with a combination of the power supply module and the base unit.
For the slot that the Q68TD-G-H01 cannot be mounted, leave the slot open or mount a module other than the Q68TD-G-H01.
When using the Q68TD-G-H01 on the remote I/O station, the restriction is the same as for the main base unit.
When failing to comply with the following restrictions, the accuracy might not be in the specification range.

<table>
<tr><th rowspan="2">Power supply module</th><th colspan="2">Restrictions</th></tr>
<tr><th>Main base unit</th><th>Extension base unit</th></tr>
<tr><td>Q61SP</td><td rowspan="5">No restrictions</td><td rowspan="5">No restrictions</td></tr>
<tr><td>Q61P-A1</td></tr>
<tr><td>Q61P-A2</td></tr>
<tr><td>Q61P</td></tr>
<tr><td>Q62P</td></tr>
<tr><td>Q63P</td><td rowspan="2">No restrictions</td><td rowspan="2">Mount the module to I/O slot No.1 or later. (b)</td></tr>
<tr><td>Q63RP</td></tr>
<tr><td>Q64P</td><td rowspan="2">Mount the module to I/O slot No.1 or later. (a)</td><td rowspan="2">Mount the module to I/O slot No.2 or later. (c)</td></tr>
<tr><td>Q64RP</td></tr>
</table>

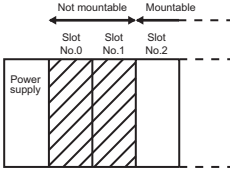
(a)


Not mountable
Mountable
Slot No.0
Slot No.1
Slot No.2
Power supply
CPU

(b)


Not mountable
Mountable
Slot No.0
Slot No.1
Slot No.2
Power supply

(c)


Not mountable
Mountable
Slot No.0
Slot No.1
Slot No.2
Power supply

2. PERFORMANCE SPECIFICATIONS

The following table shows the performance specifications of the Q68TD-G-H01.

(1) List of Performance Specifications

Table 2.1 List of performance specifications

<table>
<tr><th colspan="2">Item</th><th>Specifications</th></tr>
<tr><td colspan="2">Number of channels</td><td>8 channels</td></tr>
<tr><td rowspan="2">Output</td><td>Temperature conversion value</td><td>16-bit signed binary (-2700 to 18200)</td></tr>
<tr><td>Scaling value</td><td>16-bit signed binary</td></tr>
<tr><td colspan="2">Standard with which thermocouple conforms</td><td>JIS C1602-1995,IEC 60584-1(1995),IEC60584-2(1982)</td></tr>
<tr><td colspan="2">Usable thermocouples and conversion accuracies</td><td>Refer to (2)</td></tr>
<tr><td colspan="2">Cold junction temperature compensation accuracy</td><td>±1.0℃</td></tr>
<tr><td colspan="2">Accuracy</td><td>Depends on the formula listed in *1</td></tr>
<tr><td colspan="2">Resolution</td><td>B,R,S,N : 0.3℃ K,E,J,T : 0.1℃</td></tr>
<tr><td colspan="2">Conversion speed</td><td>320ms/8 channels *2</td></tr>
<tr><td colspan="2">Number of analog input points</td><td>8 channels + cold junction temperature compensation channel/module</td></tr>
<tr><td colspan="2">Isolation specifications</td><td>
<table>
<tr><th>Specific isolated area</th><th>Isolation method</th><th>Dielectric withstand voltage</th><th>Isolation resistance</th></tr>
<tr><td>Between thermocouple input and programmable controller power supply</td><td>Transformer isolation</td><td>500VACrms for 1min.</td><td rowspan="2">500VDC 10MΩ or more</td></tr>
<tr><td>Between thermocouple input channels</td><td>Transformer isolation</td><td>1000VACrms for 1min.</td></tr>
<tr><td>Between cold junction temperature compensation channel and programmable controller power supply</td><td>No insulation</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td colspan="2">Wire break detection</td><td>Not available *3</td></tr>
<tr><td colspan="2">Maximum number of writes for Flash memory</td><td>50,000</td></tr>
<tr><td colspan="2">Number of I/O points occupied</td><td>16 points (I/O assignment:Intelligent 16 points)</td></tr>
<tr><td colspan="2">External wiring connection system</td><td>40-pin connector</td></tr>
<tr><td colspan="2">Applicable wire size</td><td>0.3mm^2 (AWG#22)</td></tr>
<tr><td colspan="2">External device connection connector (option)</td><td>A6CON4</td></tr>
<tr><td colspan="2">Internal current consumption (5 VDC)</td><td>0.49A</td></tr>
<tr><td colspan="2">Weight</td><td>0.16kg</td></tr>
<tr><td colspan="2">Outline dimensions</td><td>98(H) × 27.4(W) × 90(D)mm</td></tr>
</table>

*1 Calculate the accuracy in the following method.
(Accuracy) = (conversion accuracy) + (temperature characteristic) × (operating ambient temperature variation) + (cold junction temperature compensation accuracy)
An operating ambient temperature variation indicates a deviation of the operating ambient temperature from the 25±5℃ range.
Example: When using the thermocouple B (refer to (2)) with the operating ambient temperature of 35℃ and the measured temperature of 1000℃, the accuracy is as follows.
(±2.5℃)+(±0.4℃)×(35℃-30℃)+(±1℃)=±5.5℃

*2 The conversion speed is a period that a temperature measurement value is stored into the buffer memory during sampling processing. Regardless of the number of conversion-enabled channels, a temperature measurement value is stored into the buffer memory every 320ms. In addition, storing a temperature measurement value into the buffer memory is executed on every channel one by one.

*3 The Q68TD-G-H01 does not have the wire break detection function. However, the disconnection monitoring function is available to select a measured temperature value on a disconnection occurrence from either "Up scale (the maximum value of measured temperature range + 5% of measured temperature range)", "Down scale (the minimum value of measured temperature range - 5% of measured temperature range)", or "Given value". Checking a disconnection status takes up to 11s.

(2) Usable Thermocouples and Conversion Accuracies
The following table explains the usable thermocouples and conversion accuracies.

Table2.2 Usable thermocouples and conversion accuracies

Usable Thermo couple Type	Measured Temperature Range*1	Conversion Accuracy (At operating ambient temperature 25 ± 5℃)	Temperature Characteristic (Per operating ambient temperature variation of 1℃)	Max. Temperature Error at Ambient Temperature 55℃
B	0 to 600 ℃	----- *3	----- *3	----- *3
	600 to 800 ℃ *2	± 3.0 ℃	± 0.4 ℃	± 13.0 ℃
	800 to 1700 ℃ *2	± 2.5 ℃		± 12.5 ℃
	1700 to 1820 ℃	----- *3	----- *3	----- *3
R	-50 to 0 ℃	----- *3	----- *3	----- *3
	0 to 300 ℃ *2	± 2.5 ℃	± 0.4 ℃	± 12.5 ℃
	300 to 1600 ℃ *2	± 2.0 ℃	± 0.3 ℃	± 9.5 ℃
	1600 to 1760 ℃	----- *3	----- *3	----- *3
S	-50 to 0 ℃	----- *3	----- *3	----- *3
	0 to 300 ℃ *2	± 2.5 ℃	± 0.4 ℃	± 12.5 ℃
	300 to 1600 ℃ *2	± 2.0 ℃	± 0.3 ℃	± 9.5 ℃
	1600 to 1760 ℃	----- *3	----- *3	----- *3
K	-270 to -200 ℃	----- *3	----- *3	----- *3
	-200 to 0 ℃ *2	Larger value of ±0.5 ℃ and ±0.5% of measured temperature	Larger value of ±0.06 ℃ and ±0.2% of measured temperature	± 11.0 ℃
	0 to 1200 ℃ *2	Larger value of ±0.25 ℃ and ±0.5% of measured temperature	Larger value of ±0.06 ℃ and ±0.02% of measured temperature	± 9.0 ℃
	1200 to 1370 ℃	----- *3	----- *3	----- *3
E	-270 to -200 ℃	----- *3	----- *3	----- *3
	-200 to 0 ℃ *2	Larger value of ±0.5 ℃ and ±0.5% of measured temperature	Larger value of ±0.06 ℃ and ±0.15% of measured temperature	± 8.5 ℃
	0 to 900 ℃ *2	Larger value of ±0.5 ℃ and ±0.25% of measured temperature	Larger value of ±0.06 ℃ and ±0.02% of measured temperature	± 6.75 ℃
	900 to 1000 ℃	----- *3	----- *3	----- *3
J	-210 to -40 ℃	----- *3	----- *3	----- *3
	-40 to 750 ℃ *2	Larger value of ±0.5 ℃ and ±0.25% of measured temperature	Larger value of ±0.06 ℃ and ±0.02% of measured temperature	± 5.625 ℃
	750 to 1200 ℃	----- *3	----- *3	----- *3
T	-270 to -200 ℃	----- *3	----- *3	----- *3
	-200 to 0 ℃ *2	Larger value of ±0.5 ℃ and ±0.5% of measured temperature	Larger value of ±0.06 ℃ and ±0.1% of measured temperature	± 6.0 ℃
	0 to 350 ℃ *2	Larger value of ±0.5 ℃ and ±0.25% of measured temperature	Larger value of ±0.06 ℃ and ±0.02% of measured temperature	± 2.625 ℃
	350 to 400 ℃	----- *3	----- *3	----- *3
N	-270 to -200 ℃	----- *3	----- *3	----- *3
	-200 to 0 ℃ *2	Larger value of ±0.5 ℃ and ±0.5% of measured temperature	Larger value of ±0.06 ℃ and ±0.2% of measured temperature	± 11.0 ℃
	0 to 1250 ℃ *2	Larger value of ±0.5 ℃ and ±0.25% of measured temperature	Larger value of ±0.06 ℃ and ±0.02% of measured temperature	± 9.375 ℃
	1250 to 1300 ℃	----- *3	----- *3	----- *3

*1 If a value entered from the thermocouple is outside the measured temperature range given in the table, it is handled as the maximum/minimum value of the measured temperature range.

*2 The accuracies only in the temperature ranges of Class 1 to 3 (shaded areas) in JIS C1602-1995 apply.

*3 Temperature measurement can be executed, but accuracy is not guaranteed.

3. IMPLEMENTATION AND INSTALLATION

3.1 Handling Precautions

(1) Do not drop or give a strong impact to the case.

(2) Do not remove the printed-circuit board of the module from the case.
Doing so may cause a failure.

(3) Be careful to prevent foreign matters such as cutting chips or wire chips from entering the module.
Failure to do so may cause a fire, failure or malfunction.

(4) A protective film is attached to the module top to prevent foreign matter such as wire chips from entering the module during wiring.
Do not remove the film during wiring.
Be sure to remove it for heat dissipation before system operation.

(5) Tighten the module fixing screws with the specified torque shown below.
Insufficient tightening torque could result in short, failure or malfunction.

Table3.1 Tightening torque

Screw location	Tightening torque range
Module fixing screw (M3)	0.36 to 0.48N•m
Connector fixing screw (M2.6 screw)	0.20N•m

(6) When mounting the module to the base unit, insert the module fixing projection into the fixing hole in the base unit, and mount the module with using the hole as a supporting point.
Incorrect module mounting may cause a malfunction, failure, or drop of the module.

(7) Always make sure to touch the grounded metal to discharge the electricity charged in the body, etc., before touching the module.
Failure to do so may cause a failure or malfunctions of the module.

3.2 Installation Environment

Refer to the user's manual of the CPU module used.

4. PART NAMES

The following explains the part names of the Q68TD-G-H01.

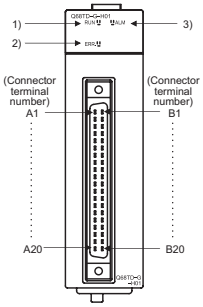
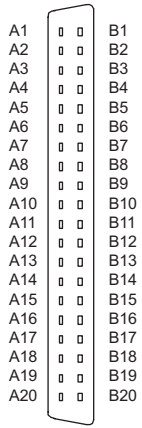


Table4.1 Part names

Number	Name	Description
1)	RUN LED	Displays the operating status of the Q68TD-G-H01. On : Normal operation Flashing : During offset/gain setting mode Off : 5V power supply interrupted, watchdog timer error occurred, or online module change enabled.
2)	ERR. LED	Displays the error status of the Q68TD-G-H01. On : Error Flashing : Error in switch settings Switch No. 5 of the intelligent function module has been set to a value other than zero. Off : Normal operation
3)	ALM LED	Displays the warning status of the Q68TD-G-H01. On :Warning (process alarm, rate alarm) occurring Flashing :Checking a disconnection status Off :Normal operation



Seen from the front of the module

Table4.2 Signal name

Terminal number	Signal name	Terminal number	Signal name
A1	CH1+	B1	CH1-
A2	---	B2	---
A3	CH2+	B3	CH2-
A4	---	B4	---
A5	CH3+	B5	CH3-
A6	---	B6	---
A7	CH4+	B7	CH4-
A8	---	B8	---
A9	CH5+	B9	CH5-
A10	---	B10	---
A11	CH6+	B11	CH6-
A12	---	B12	---
A13	CH7+	B13	CH7-
A14	---	B14	---
A15	CH8+	B15	CH8-
A16	---	B16	---
A17	---	B17	---
A18	---	B18	---
A19	---	B19	RTD+
A20	RTDG	B20	RTD-

*For actual wiring, refer to Section 5.2 External Wiring.

The following explains the wiring precautions and module connection example.

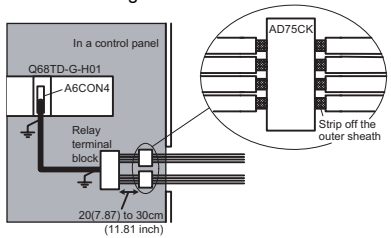
5.1 Wiring Precautions

External wiring that is less susceptible to noise is required as a condition of enabling a highly reliable system and making full use of the capabilities of Q68TD-G-H01.

(1) Use separate cables for the AC control circuit and the external input signals of the Q68TD-G-H01 to avoid the influence of the AC side surges and inductions.

(2) Always place the thermocouple at least 100mm away from the main circuit cables and AC control circuit lines. Fully keep it away from high-voltage cables and circuits, which include high frequency waves, such as an inverter's load circuit. Not doing so will cause the module more susceptible to noises, surges and inductions.

(3) The following wiring is required for the product to comply with the EMC and Low Voltage Directives.



(a) Use shielded cables for every external wiring and use the AD75CK cable clamp to ground to the panel. AD75CK can ground four cables together when using cables with outer diameter of about ϕ7mm.

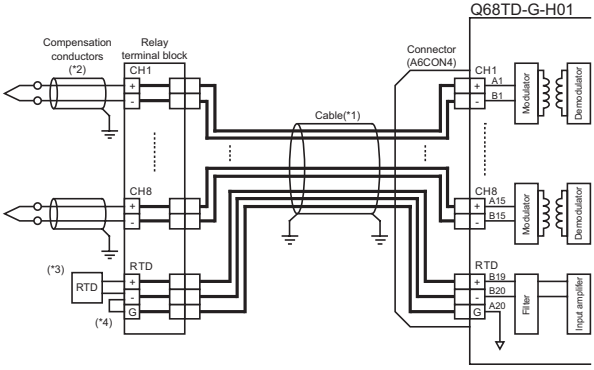
(b) For wiring between A6CON4 and a relay terminal block, use shielded cables to ground to the panel. In addition, keep the wiring distance within 3m.

(c) Before touching the relay terminal block, always touch the grounded metal to discharge the electricity charged in the body.

5.2 External Wiring

(1) Wiring procedure

1) For wiring, set a relay terminal block to outside.
2) Connect the thermocouple and the compensation conductors to the relay terminal block.
3) When setting the Q68TD-G-H01 to "With cold junction temperature compensation", connect the cold junction temperature compensation resistor (RTD), which is supplied with Q68TD-G-H01, to the relay terminal block.
4) Use A6CON4 to wire between the relay terminal block and Q68TD-G-H01.



*1 Always use shielded cabled.
In addition, always ground the shield.
*2 Always use shielded compensation conductors.
In addition always ground the shield.
*3 When setting the Q68TD-G-H01 to "With cold junction temperature compensation", always connect the cold junction temperature compensation resistor (RTD).
*4 When connecting the RTD, always connect the terminals between RTD- and RTD G.

5.3 Intelligent Function Module Switch Settings

(1) Setting item

Intelligent function module switch has switches 1 to 5.The setting is executed with 16-bit data.

When not setting the intelligent function module switch, the default of switches 1 to 5 is 0.

Intelligent Function Module Switch Settings

<table>
<tr><th></th><th>Setting Item</th></tr>
<tr><td>Switch 1</td><td>Thermocouple type settings
(CH1 to CH4)
□ □ □ □ H
CH4 CH3 CH2 CH1</td></tr>
<tr><td>Switch 2</td><td>Thermocouple type settings
(CH5 to CH8)
□ □ □ □ H
CH8 CH7 CH6 CH5</td></tr>
<tr><td>Switch 3</td><td>Offset/gain setting mode
b15 b14 b13 b12 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0
0 0 0 0 0 0 0 0 CH8 CH7 CH6 CH5 CH4 CH3 CH2 CH1
Fixed to 0
0 : Factory setting
1 : Users range setting</td></tr>
<tr><td>Switch 4</td><td>□ □ 0 0 H
Fixed to 0
0H : With cold junction temperature compensation
1 to FH *1 : Without cold junction temperature compensation
0H : Normal mode
1 to FH *1 : offset/gain setting mode</td></tr>
<tr><td>Switch 5</td><td>0 : Fixed *2</td></tr>
</table>

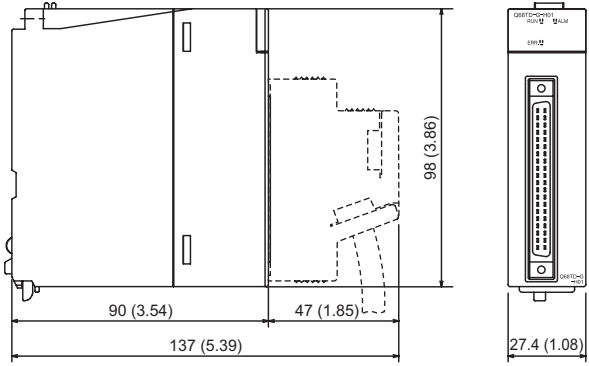
Thermocouple type	Setting value
Thermocouple K	0
Thermocouple E	1
Thermocouple J	2
Thermocouple T	3
Thermocouple B	4
Thermocouple R	5
Thermocouple S	6
Thermocouple N	7

Setting a value other than 0 to 7 results in an error.

*1 Setting any value within the setting range will provide the same operation.
When the setting range is 1 to FH, set 1 for example.

*2 Setting a value other than "0" results in an error.

6. EXTERNAL DIMENSIONS



Unit : mm(inch)

Warranty

Mitsubishi will not be held liable for damage caused by factors found not to be the cause of Mitsubishi; opportunity loss or lost profits caused by faults in the Mitsubishi products; damage, secondary damage, accident compensation caused by special factors unpredictable by Mitsubishi; damages to products other than Mitsubishi products; and to other duties.

⚠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.
- 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.

Country/Region	Sales office/Tel
U.S.A	Mitsubishi Electric Automation Inc. 500 Corporate Woods Parkway Vernon Hills, IL 60061 Tel : +1-847-478-2100
Brazil	MELCO-TEC Rep. Com.e Assessoria Tecnica Ltda. Rua Correia Dias, 184, Edificio Paraiso Trade Center-8 andar Paraiso, Sao Paulo, SP Brazil Tel : +55-11-5908-8331
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