MITSUBISHI

Channel Isolated Thermocouple Input Module

User's Manual
(Hardware)

Q68TD-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-B(0810)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
Oct., 2008	IB(NA)-0800389-B	Partly modified EMC and Low Voltage Directives Section 1.1, Chapter 2, Section 3.1, 5.1, 5.2, 5.3

CONTENTS

ABOUT MANUAL

The following manual is also related to this product.
In necessary, order it by quoting the details in the table below.

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

(1) For programmable controller system
To configure a system meeting the requirements of the EMC and Low Voltage Diretives when incorporating the Mitsubishi programmable controller (EMC and Low Voltage Directives compliant) into other machinery or equipment, refer to Chapter 9 "EMC AND LOW VOLTAGE DIRECTIVES" of the QCPU User's Manual (Hardware Design, Maintenance and Inspection).
The CE mark, indicating compliance with the EMC and Low Voltage Directives, is printed on the rating plate of the programmable controller.

(2) For the product
For the compliance of this product 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 the Q68TD-G-H01 Channel Isolated Thermocouple Input channel isolated thermocouple input module (hereinafter abbreviated referred to as Q68TD-G-H01) that is used with the MELSEC-Q series CPU module.

1.1 Restrictions on mountable slot position

(1) Restriction of combination use of Q68TD-G-H01 and Q68TD-G-H02
When mounting the Q68TD-G-H01 and Q68TD-G-H02 on the base unit, leave one slot or more than one slot of space between the Q68TD-G-H01 and the Q68TD-G-H02.

(2) Restrictions on mountable slot position of Q68TD-G-H01
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.
The Q68TD-G-H01 has no restrictions of the combination between a power supply module and a base unit other than the combination listed below.
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><td rowspan="2">Power supply module</td><td colspan="2">Restrictions</td></tr>
<tr><td>Main base unit</td><td>Extension base unit</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)

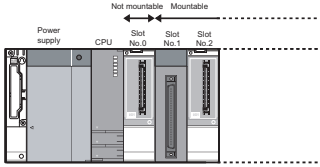


Figure 1.1 Mountable slot position of Q68TD-G-H01

(b)

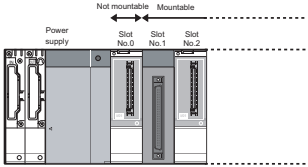


Figure 1.2 Mountable slot position of Q68TD-G-H01

(c)

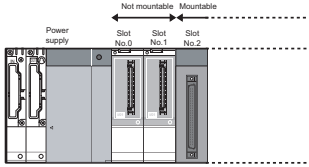


Figure 1.3 Mountable slot position of Q68TD-G-H01

2. PERFORMANCE SPECIFICATIONS

The following are the performance specifications of the Q68TD-G-H01.

(1) Performance specification list

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 *1</td><td>Refer to (2)</td></tr>
<tr><td colspan="2">Cold junction temperature compensation accuracy *1</td><td>±1.0℃</td></tr>
<tr><td colspan="2">Accuracy *1</td><td>Depends on the formula listed in *2</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 *3</td><td>320ms/8 channels</td></tr>
<tr><td colspan="2">Sampling period *4</td><td>320ms/8 channels</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">Disconnection detection</td><td>Not available *5</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) or less</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>0.18kg</td></tr>
<tr><td colspan="2">External dimensions</td><td>98(H) × 27.4(W) × 90(D)mm</td></tr>
</table>

*1 The Q68TD-G-H01 needs to be powered for 30 minutes warm-up in order to satisfy with the accuracy.

*2 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℃

*3 The conversion speed indicates the maximum time period from which the input temperature starts changing to which the temperature mesurement value of the buffer memory is stored.

*4 The sampling period indicates a cycle of updating a temperature measurement value.

*5 The Q68TD-G-H01 does not have the wire break detection function. However, the disconnection monitor 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. Also, the Q68TD-G-H01 needs to be powered for 30 minutes warm-up in order to satisfy with the accuracy.

*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) Prevent foreign matter such as dust or wire chips from entering the module.
Such foreign matter can cause a fire, failure, or malfunction.

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

(5) Tighten the screws such as module fixing screws with the following ranges

Table3.1 Tightening torque

Screw location	Tightening torque range
Module fixing screw (M3 screw)*1	0.36 to 0.48N•m
Connector screw (M2.6 screw)	0.20 to 0.29N•m

*1 The module can be easily fixed onto the base unit using the hook at the top of the module.
When using the programmable controller in an environment of frequent vibrations, however, fix the module with a module fixing screw.

(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) Before handling the module, touch a grounded metal object to discharge the static electricity from the human body.
Failure to do so may cause the module to fail or malfunction.

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.

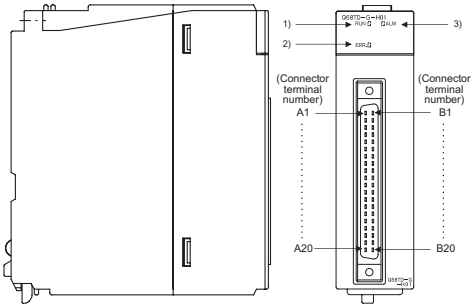
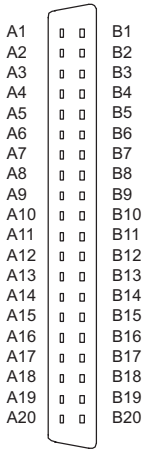


Figure 4.1 Part names

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.

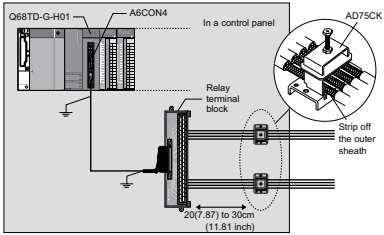
5.1 Wiring Precautions

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.

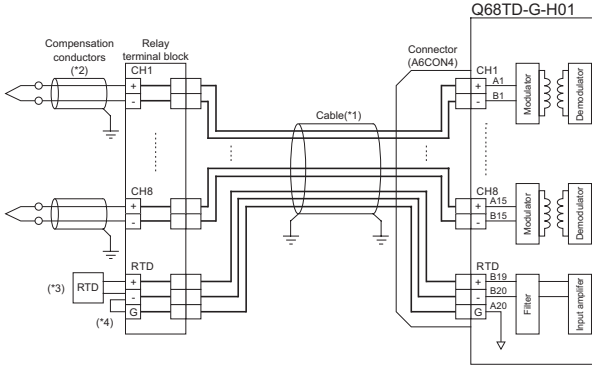
(b) For wiring between A6CON4 and a relay terminal block, use shielded cables to ground to the panel. In addition, keep the wiring distance within 3m.

(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.
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 cable.
In addition, always ground the shield.
*2 Always use shielded compensation conductors.
In addition always ground the shield.
*3 When setting the Q68TD-G-H02 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.

Figure 5.1 Wiring procedure

POINT
The Q68TD-G-H01 needs to be powered for 30 minutes warm-up in order to satisfy with the accuracy. Moreover, the Q68TD-G-H01 needs to be powered for 30 minutes warm-up when the offset/gain setting is performed and after the online module replacement is performed.

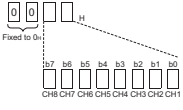
5.3 Intelligent Function Module Switch Settings

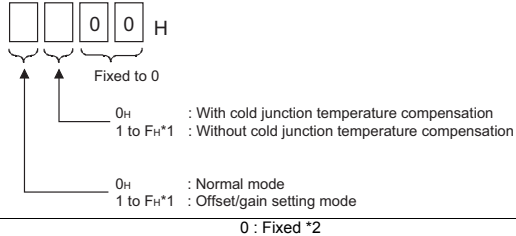
(1) Setting item

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.

Table 5.1 Intelligent function module switch settings

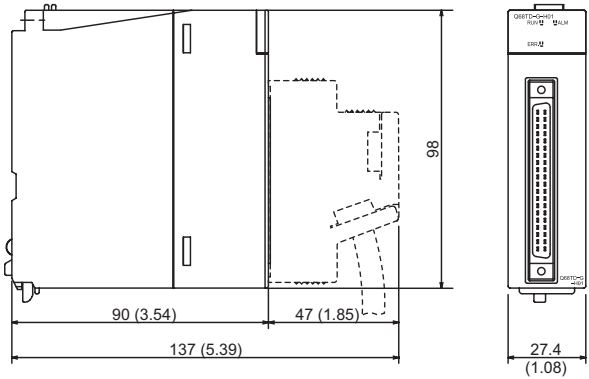
<table>
<tr><td></td><td colspan="2">Setting item</td></tr>
<tr><td>Switch 1</td><td>Thermocouple type settings (CH1 to CH4)
H
CH4 CH3 CH2 CH1</td><td rowspan="2">
<table>
<tr><th>Thermocouple type</th><th>Setting value</th></tr>
<tr><td>Thermocouple K</td><td>0</td></tr>
<tr><td>Thermocouple E</td><td>1</td></tr>
<tr><td>Thermocouple J</td><td>2</td></tr>
<tr><td>Thermocouple T</td><td>3</td></tr>
<tr><td>Thermocouple B</td><td>4</td></tr>
<tr><td>Thermocouple R</td><td>5</td></tr>
<tr><td>Thermocouple S</td><td>6</td></tr>
<tr><td>Thermocouple N</td><td>7</td></tr>
</table>
When setting a value other than 0 to 7 , a thermocouple type settings error 10 [](([] indicates target channel number.) occurs and a temperature conversion is not performed.
</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 colspan="2">Offset/gain setting mode
 

0: Factory default setting
1: User range setting</td></tr>
<tr><td>Switch 4</td><td colspan="2"> 
</td></tr>
<tr><td>Switch 5</td><td colspan="2">0 : Fixed *2</td></tr>
</table>

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

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

6. EXTERNAL DIMENSIONS



Unit : mm(in.)

Warranty

Mitsubishi will not be held liable for damage caused by factors found not to be the cause of Mitsubishi; machine damage 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.

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