MITSUBISHI

Thermocouple Input Module
Channel Isolated Thermocouple /Micro Voltage Input Module

MITSUBISHI
General-Purpose PROGRAMMABLE LOGIC CONTROLLER

User's Manual
(Hardware)

Q64TD
Q64TDV-GH

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

Prior to use, please read this manual thoroughly and familiarize yourself with the product

MELSEC-Q
Mitsubishi Programmable Logic Controller

MODEL	Q64TD-U-H-JE
MODEL CODE	13JT30
IB(NA)-0800155-B(0201)MEE	

● SAFETY PRECAUTIONS ●

(Read these precautions before using.)

When using Mitsubishi equipment, thoroughly read this manual and the associated manuals introduced in this manual. Also pay careful attention to safety and handle the module properly.
These SAFETY PRECAUTIONS classify the safety precautions into two categories: “DANGER” and “CAUTION”.

⚠ DANGER	Procedures which may lead to a dangerous condition and cause death or serious injury, if not carried out properly.
⚠ CAUTION	Procedures which may lead to a dangerous condition and cause superficial to medium injury, or physical damage only, if not carried out properly.

Depending on circumstances, procedures indicated by ⚠ CAUTION may also be linked to serious results.
In any case, it is important to follow the directions for usage.

Store this manual in a safe place so that you can take it out and read it whenever necessary. Always forward it to the end user.

[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 PLC CPU.
Writing data into the "system area" or outputting a signal for "prohibited to use" may cause a PLC 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 PLC in an environment that meets the general specifications contained in the CPU user's manual.
  Using this PLC in an environment outside the range of the general specifications may cause electric shock, fire, malfunction, and damage to or deterioration of the product.
- When installing the module, securely insert the module fixing tabs into the mounting holes of the base module while pressing the installation lever located at the bottom of the module downward.
  Improper installation may result in malfunction, breakdown or the module coming loose and dropping. Securely fix the module with screws if it is subject to vibration during use.
- Tighten the screws within the range of specified torque.
  If the screws are loose, it may cause the module to fallout, short circuits, or malfunction.
  If the screws are tightened too much, it may cause damage to the screw and/or the module, resulting in fallout, short circuits or malfunction.
- Switch all phases of the external power supply off when mounting or removing the module.
  Not ding so may cause electric shock or damage to the module.
- Do not directly touch the conductive area or electronic components of the module. Doing so may cause malfunction or failure in the module.

[WIRING PRECAUTIONS]

⚠ CAUTION

- Always ground the FG terminal for the PLC.
  There is a risk of electric shock or malfunction.
- When turning on the power and operating the module after wiring is completed, always attach the terminal cover that comes with the product.
  There is a risk of electric shock if the terminal cover is not attached.
- Tighten the terminal screws within the range of specified torque.
  If the terminal screws are loose, it may result in short circuits or malfunction.If the terminal screws are tightened too much, it may cause damage to the screw and/or the module, resulting in short circuits or malfunction.
- Be careful not to let foreign matter such as sawdust or wire chips get inside the module.They may cause fires, failure or malfunction.

[WIRING PRECAUTIONS]

⚠ CAUTION
● The top surface of the module is covered with protective film to prevent foreign objects such as cable offcuts from entering the module when wiring. Do not remove this film until the wiring is complete. Before operating the system, be sure to remove the film to provide adequate ventilation. ● Always place the thermocouple at least 100mm (3.94inch) away from the main circuit cables and AC control lines. Fully keep it away from high-voltage cables and circuits which include harmonics, such as an inverter's load circuit. Not doing so will make the module more susceptible to noises, surges and inductions.

REVISIONS

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

Print Date	* Manual Number	Revision
Nov.,2000	IB (NA)-0800155-A	First edition
Jan.,2002	IB (NA)-0800155-B	Model Q64TDV-GH was added. Addition Section2.2 Correction About the Manuals, Chapter1, Section2.1,Chapter4,Section5.1 Section5.2, Section5.3,Chapter6

CONTENTS

About the Manuals

The following manuals are related to this product.
Referring to this list, please request the necessary manuals.

Detailed manual

Manual Name	Manual Number (Model Code)
Thermocouple Input Module , Channel Isolated Thermocouple/Micro Voltage Input Module User's Manual Q64TD/Q64TDV-GH/GX Configurator-TI (SW1D5C-QTIU-E)	SH-080141 (13JR30)

Conformance to the EMC Directive/Low Voltage Directive

For details on making Mitsubishi PLC conform to the EMC directive and low voltage instruction when installing it in your product, please see Chapter 3, "EMC Directive and Low Voltage Instruction" of the User's Manual (Hardware) of the PLC CPU to use.
The CE logo is printed on the rating plate on the main body of the PLC that conforms to the EMC directive and low voltage instruction.

1. OVERVIEW

This user's manual provides the specifications, handling, part names and others of the Q64TD thermocouple temperature input module (abbreviated to the Q64TD) and Q64TDV-GH channel isolated thermocouple/micro voltage input module (abbreviated to the Q64TDV-GH) used with the MELSEC-Q series CPU module.

2. SPECIFICATIONS

The following are the specifications of the Q64TD/Q64TDV-GH.

2.1 Specifications of Q64TD

2.1.1 Performance Specifications

Item		Specifications
Number of channels		4 channels
Output	Temperature conversion value	16-bit, signed binary (-2700 to 18200: Value to the first decimal place × 10 times)
	Scaling value	16-bit, signed binary
Standard with which thermocouple conforms		JIS C1602-1995
Usable thermocouples and measured temperature range accuracies		Refer to Section 2.1.2
Cold junction temperature compensation accuracy		±1.0℃
Accuracy		As per calculation expression marked *1
Resolution		B,R,S,N : 0.3℃ K,E,J,T : 0.1℃
Conversion speed		40ms/channel *2
Number of analog input points		4 channels + Pt100 connection channel/module
Insulation system		Across thermocouple input and earth : Transformer insulation Across thermocouple input channels : Transformer insulation Across cold junction temperature compensation input (Pt100) and earth : No insulation
Dielectric withstand voltage		1780VrmsAC/3 cycles (altitude 2000m)
Insulation resistance		Across thermocouple input and earth : 500VDC 100MΩ or more using insulation resistance tester Across thermocouple input channels : 500VDC 10MΩ or more using insulation resistance tester
Wire break detection		Yes (Each channel independent) *3
E^2PROM write count		Max. 100 thousand times
Number of occupied points		16 points
Connection terminals		18-point terminal block
Applicable wire size		0.3 to 0.75mm^2
Applicable crimping terminals		1.25-3 R1.25-3(Sleeved crimping terminals are unusable)
Internal current consumption (5VDC)		0.50A
Weight		0.25kg
Outline dimensions		98(H) × 27.4(W) × 90(D)mm

*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 the thermocouple used is B, the operating ambient temperature is 35℃, and the measured temperature is 1000℃, the accuracy is:
(±2.5℃) + (±0.4℃) × (5℃) + (±1℃) = ±5.5℃

*2: The conversion speed is a period from when a temperature is input and converted into a corresponding digital value until the value is stored into the buffer memory. When two or more channels are used, the conversion speed is "40ms × number of conversion enabled channels".

*3: At wire break detection, the temperature measurement value right before wire break occurrence is held.

2.1.2 Usable Thermocouples and Measured Temperature Range 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 ±0.5℃ and ±0.25% 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 made, but accuracy is not guaranteed.

2.2 Specifications of Q64TDV-GH

2.2.1 Performance Specifications

Item		Specifications
Number of channels		4 channels
Output	Temperature conversion value	16-bit, signed binary (-2700 to 18200: Value to the first decimal place × 10 times)
	Micro voltage conversion value	16-bit signed binary (-25000 to 25000)
	Scaling value	16-bit, signed binary
Standard with which thermocouple conforms		JIS C1602-1995
Usable thermocouples and measured temperature range accuracies		Refer to Section 2.2.2
Cold junction temperature compensation accuracy		±1.0℃
Thermocouple input accuracy		As per calculation expression marked *1
Micro voltage input range		-100mV to +100mV (input resistance 2MΩ or more)
Micro voltage input accuracy		Refer to Section 2.2.3.
Resolution	Thermocouple input	B:0.7℃ R,S:0.8℃ K,T:0.3℃ E:0.2℃ J:0.1℃ N:0.4℃
	Micro voltage input	4μV
Sampling period		20ms/channel *2
Conversion speed		Sampling period×3*3
Number of analog input points		4 channels + Pt100 connection channel/module
Absolute maximum input		±5V
Insulation system		Across thermocouple input/micro voltage input and earth : Transformer insulation Across thermocouple input/micro voltage input channels : Transformer insulation Across cold junction temperature compensation input (Pt100) and earth : No insulation
Dielectric withstand voltage		1780VrmsAC/3 cycles (altitude 2000m)
Insulation resistance		Across thermocouple input/micro voltage input and earth : 500VDC 100MΩ or more using insulation resistance tester Across thermocouple input/micro voltage input channels : 500VDC 10MΩ or more using insulation resistance tester
Wire break detection		Yes (Each channel independent) *4
E^2PROM write count		Max. 100 thousand times
Number of occupied points		16 points
Connection terminals		18-point terminal block
Applicable wire size		0.3 to 0.75mm^2
Applicable crimping terminals		1.25-3 R1.25-3(Sleeved crimping terminals are unusable)
Internal current consumption (5VDC)		0.50A
Weight		0.25kg
Outline dimensions		98(H) × 27.4(W) × 112(D)mm

*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 the thermocouple used is B, the operating ambient temperature is 35℃, and the measured temperature is 1000℃, the accuracy is:
(±3.5℃) + (±0.4℃) × (5℃) + (±1℃) = ±6.5℃

*2: A period until a thermocouple input value/micro voltage input value is converted into a temperature measurement value/micro voltage conversion value.

*3: A period until a thermocouple input value/micro voltage input value is converted into a temperature measurement value/micro voltage conversion value and the resultant value is stored into the buffer memory.

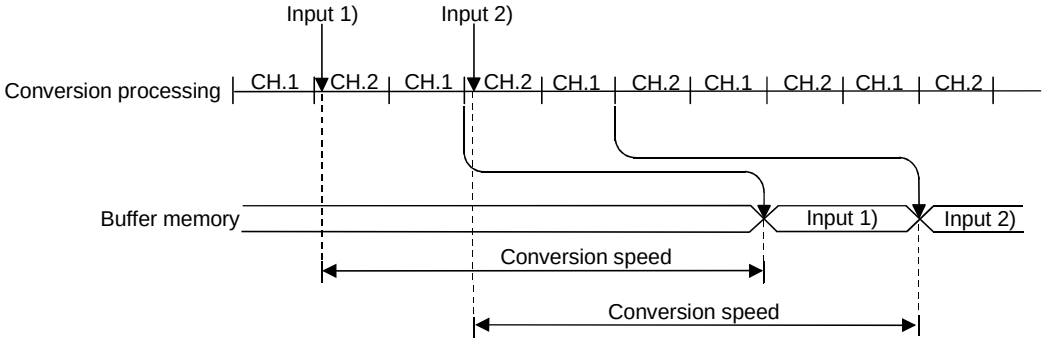
The conversion speed is a delay time that occurs during sampling processing. It is independent of averaging processing.

Example: When two channels are enabled for conversion

(Conversion speed) = (sampling period) × 3

= (20ms × 2 channels) × 3

= 120ms



*4:At wire break detection, the temperature measurement value/micro voltage conversion value right before wire break occurrence is held.

2.2.2 Usable Thermocouples and Measured Temperature Range 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	±4.0℃	±0.4℃	±14.0℃
	800 to 1700℃*2	±3.5℃		±13.5℃
	1700 to 1820℃	——— *3	——— *3	——— *3
R	-50 to 0℃	——— *3	——— *3	——— *3
	0 to 300℃*2	±4.0℃	±0.4℃	±14.0℃
	300 to 1600℃*2	±3.5℃		±13.5℃
	1600 to 1760℃	——— *3	——— *3	——— *3
S	-50 to 0℃	——— *3	——— *3	——— *3
	0 to 300℃*2	±4.0℃	±0.4℃	±14.0℃
	300 to 1600℃*2	±3.5℃		±13.5℃
	1600 to 1760℃	——— *3	——— *3	——— *3
K	-270 to -200℃	——— *3	——— *3	——— *3
	-200 to 0℃*2	±2.0℃	±0.25℃	±8.25℃
	0 to 200℃*2	±1.5℃		±7.75℃
	0 to 1200℃*2	±2.0℃		±8.25℃
	1200 to 1370℃	——— *3	——— *3	——— *3
E	-270 to -200℃	——— *3	——— *3	——— *3
	-200 to 200℃*2	±1.5℃	±0.15℃	±5.25℃
	200 to 900℃*2	±2.0℃		±5.75℃
	900 to 1000℃	——— *3	——— *3	——— *3
J	-210 to -40℃	——— *3	——— *3	——— *3
	-40 to 200℃*2	±1.5℃	±0.15℃	±5.25℃
	200 to 750℃*2	±2.0℃		±5.75℃
	750 to 1200℃	——— *3	——— *3	——— *3
T	-270 to -200℃	——— *3	——— *3	——— *3
	-200 to 0℃*2	±2.0℃	±0.1℃	±4.5℃
	0 to 350℃*2	±1.5℃		±4.0℃
	350 to 400℃	——— *3	——— *3	——— *3
N	-270 to -200℃	——— *3	——— *3	——— *3
	-200 to 0℃*2	±2.5℃	±0.25℃	±8.75℃
	0 to 200℃*2	±2.0℃		±8.25℃
	0 to 1250℃*2	±2.5℃		±8.75℃
	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 made, but accuracy is not guaranteed.

2.2.3 Micro voltage input range and accuracies

Input Type	Measurable Voltage Range	Conversion Accuracy	
		(At 25±5℃ operating ambient temperature)	(At 0 to 55℃ operating ambient temperature)
Micro voltage input	-100 to 100mV	±0.2mV	±0.8mV

3. LOADING AND INSTALLATION

3.1 Handling Instructions

(1) Do not drop the case and connectors of the module and subject them to hard impact.
(2) Do not remove the printed circuit boards of the module from the case. Doing so can cause a failure.
(3) Be careful to prevent wire-offcuts and other foreign matter from entering the module. They can cause a fire, failure or malfunction.
(4) To prevent wire-offcuts and other foreign matter from entering the module during wiring, the module carries a foreign matter ingress prevention label at its top. During wiring, do not remove this label. For system operation, always remove this label to ensure adequate heat dissipation.
(5) Tighten the mounting and terminal screws of the module within the following ranges.

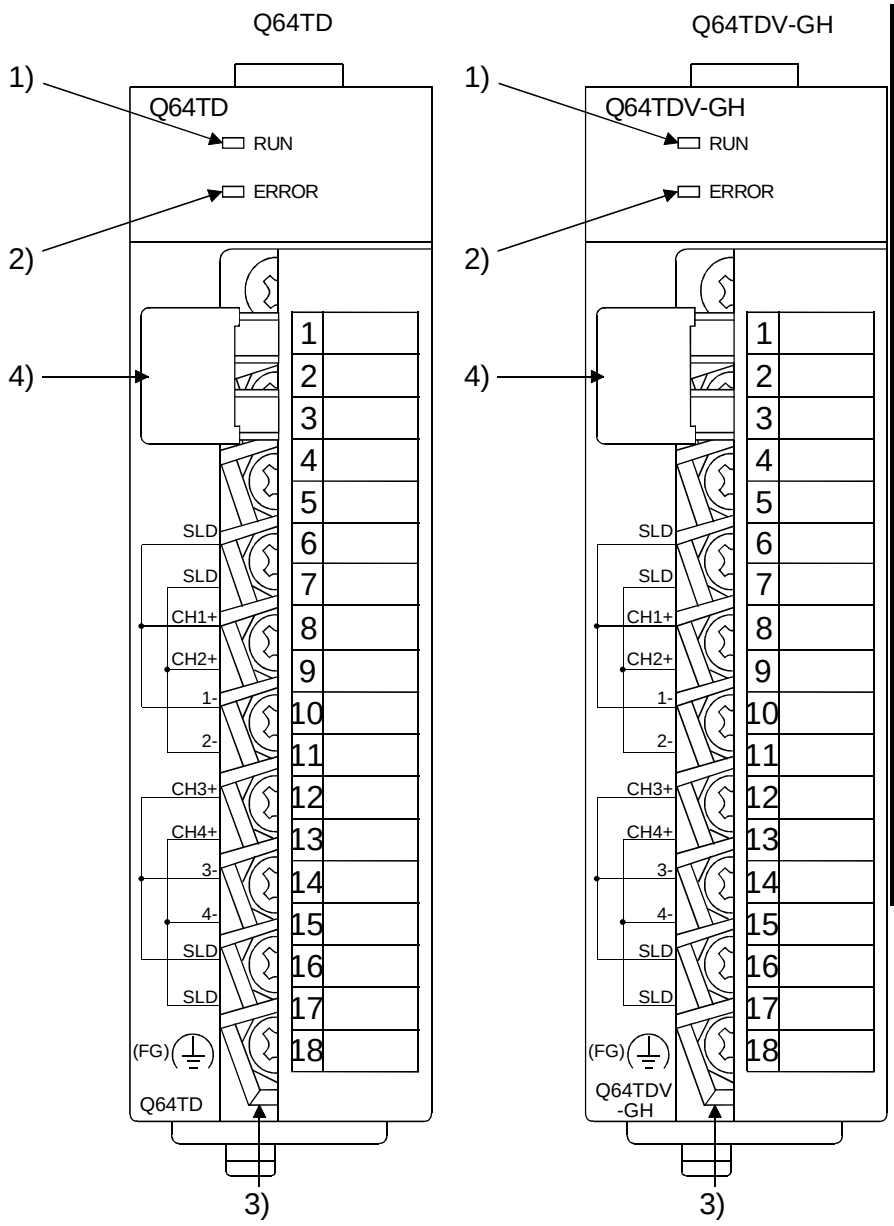
Screw Location	Tightening Torque Range
Module mounting screw (M3 screw)	36 to 48 N · cm
Terminal block terminal screw (M3 screw)	42 to 58 N · cm
Terminal block mounting screw (M3.5 screw)	66 to 89 N · cm

(6) To mount the module on the base, securely insert the module fastening latch into the fastening hole on the base. Improper installation may result in a module malfunction, or may cause the module to fall off.

3.2 Installation Environment

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

4. NAMES AND SETTINGS OF THE PARTS



Terminal Block Layout	
Terminal number	Signal name
1	RTD +
2	
3	RTD -
4	
5	
6	CH1 SLD
7	CH2 SLD
8	CH1 +
9	CH2 +
10	CH1 -
11	CH2 -
12	CH3 +
13	CH4 +
14	CH3 -
15	CH4 -
16	CH3 SLD
17	CH4 SLD
18	FG

Number	Name and Appearance	Description
1)	RUN LED	Indicates the operating status of the Q64TD/Q64TDV-GH. On : Operating normally. Flicker : Offset/gain setting mode Off : 5V power-off , Watchdog timer error occurrence or module change enabled status during online module change
2)	ERR LED	Indicates the error status of the Q64TD/Q64TDV-GH. On : Error occurrence Flicker : Switch setting error Switch 5 was set to other than 0 in intelligent function module switch setting of GX Developer. Off : Operating normally.
3)	Terminal block	Used for wiring of the thermocouple, etc.
4)	Cold junction temperature compensation resistor	Used for cold junction temperature compensation using Pt100.

5. WIRING

5.1 Wiring Instructions

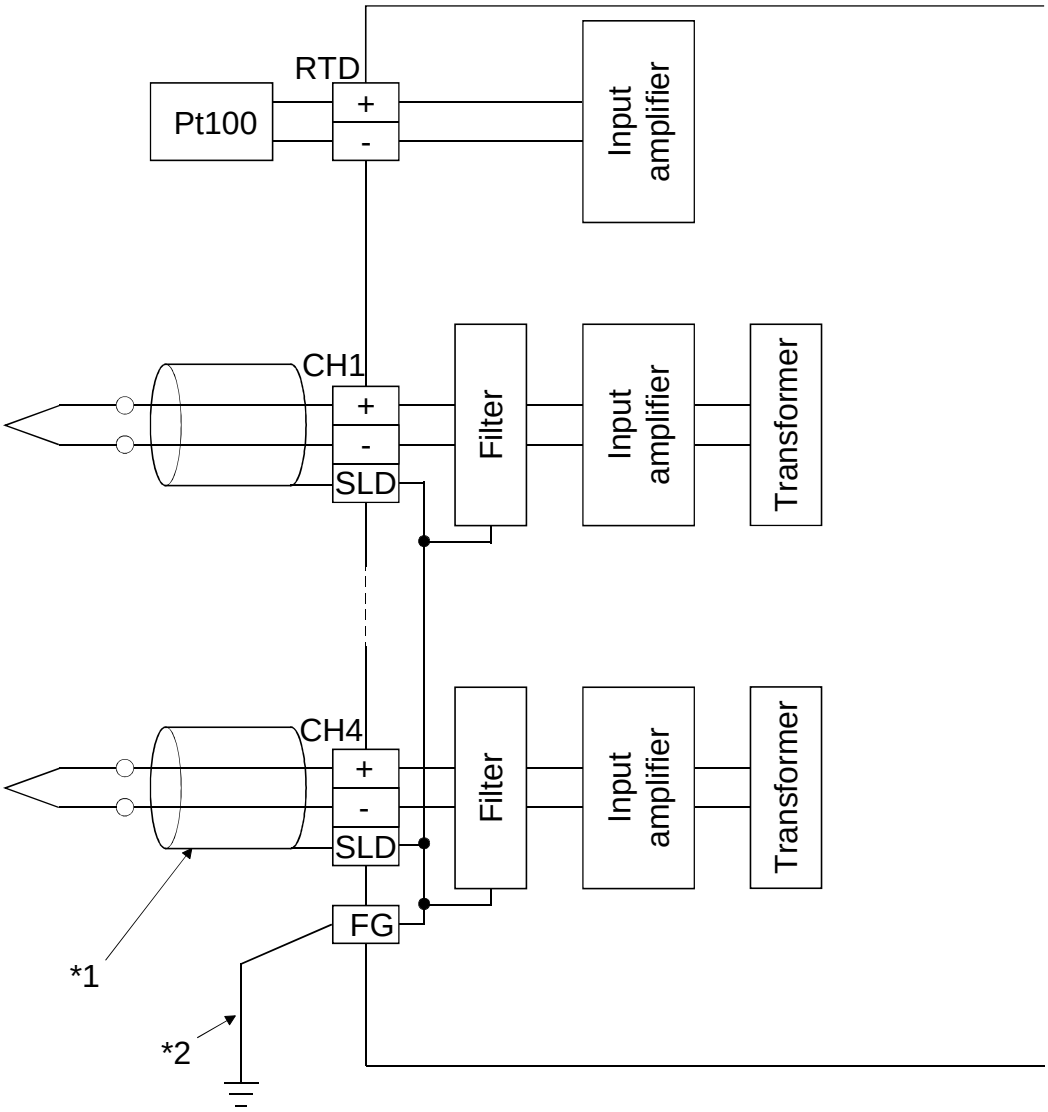
(1) Use separate cables for the AC control circuit and Q64TD/Q64TDV-GH's external input signals to avoid the influence of AC side surges and inductions.

(2) Always place the thermocouple/micro voltage signal cable 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 harmonics, such as an inverter's load circuit. Not doing so will make the module more susceptible to noises, surges and inductions.

(3) Insulation-sleeved crimping terminals cannot be used with the terminal block.
It is recommended to fit mark tubes or insulation tubes to the wire connection parts of the crimping terminals.

5.2 External Wiring

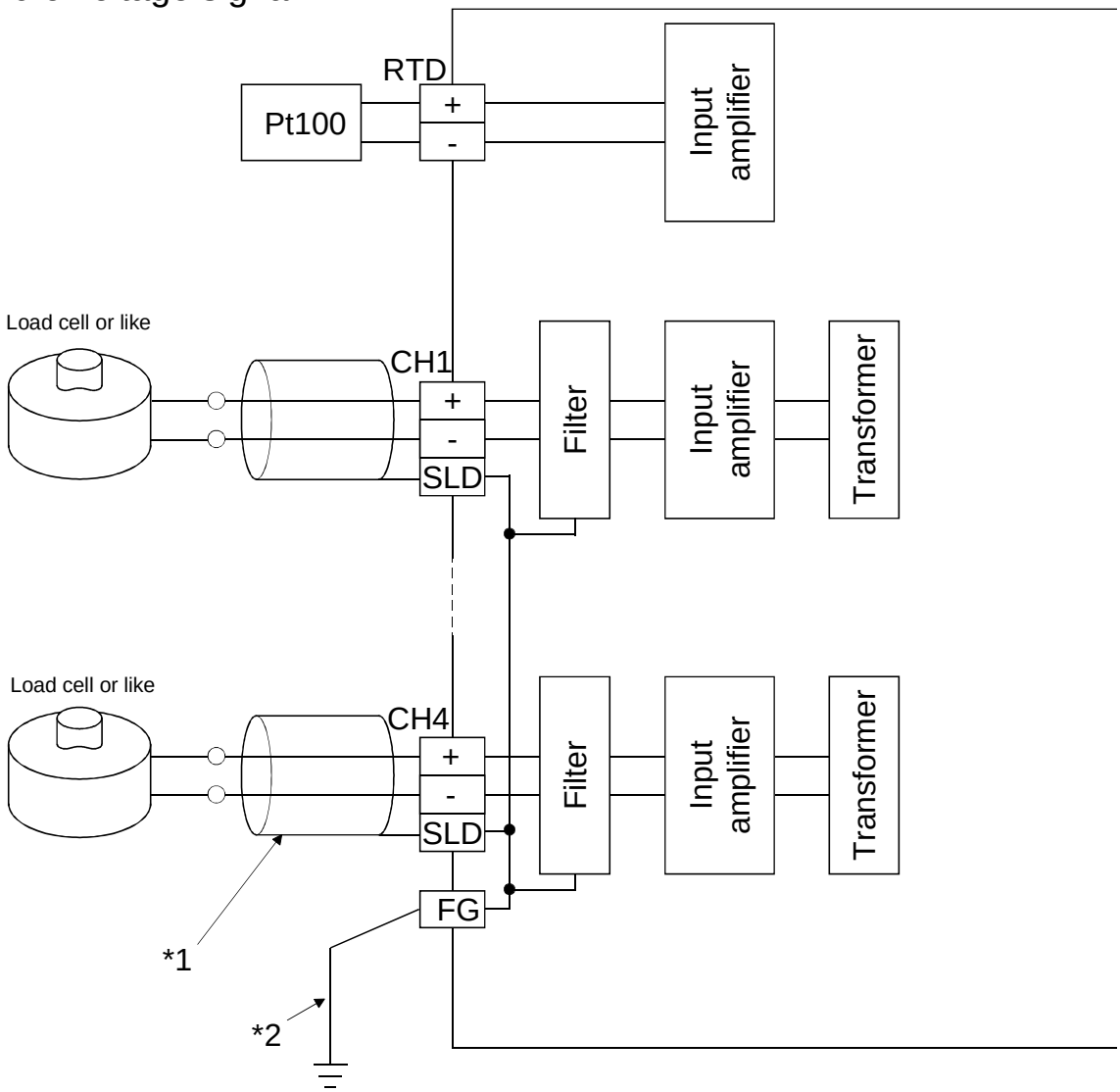
(1) Thermocouple



*1:As cables, always use shielded compensation conductors.
Also, wire the shielded cables as short as possible.

*2:Always connect to the earth terminal of the control box.

(2) Micro voltage signal



*1:As cables, always use shielded conductors.
Also, wire the shielded cables as short as possible.
*2:Always connect to the earth terminal of the control box.

5.3 Intelligent Function Module Switch Setting

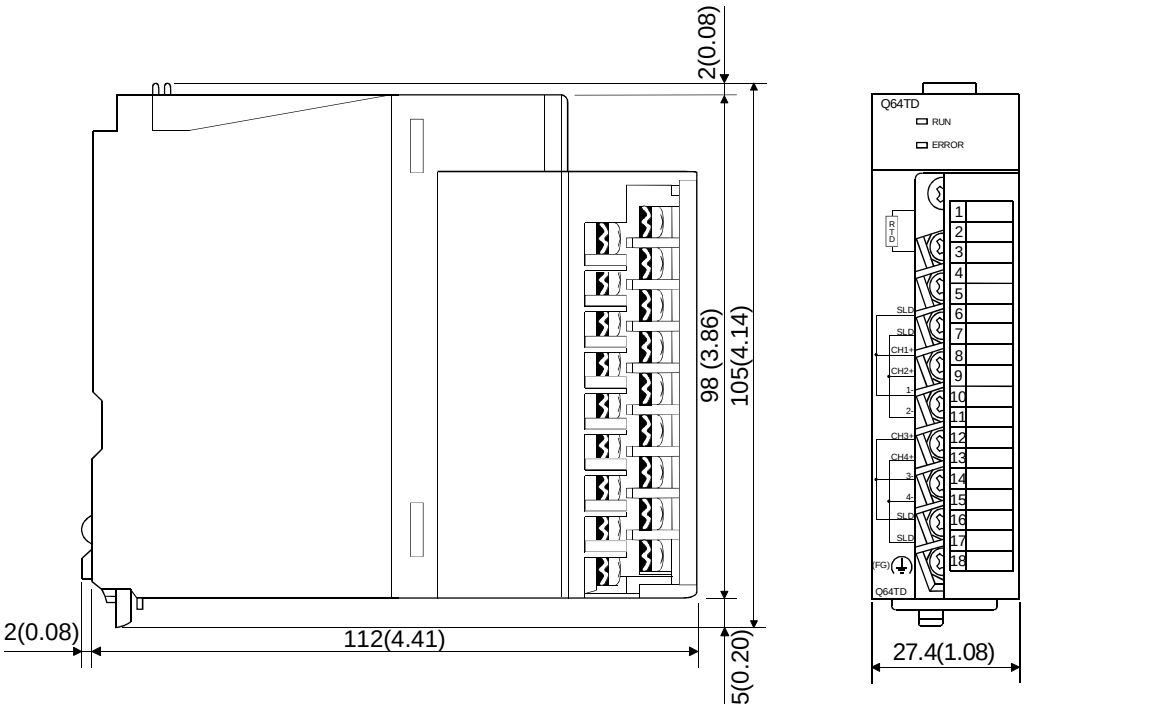
Make the intelligent function module switch setting using the I/O assignment setting of GX Developer.
You can make setting easily by entering hexadecimal numbers into 4 digits.

<table>
<tr><th></th><th>Setting Item</th></tr>
<tr><td>Switch 1</td><td>Input type setting
□ □ □ □ H
CH4 CH3 CH2 CH1</td><td>
<table>
<tr><th>Input type</th><th>Set 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>
<tr><td>Micro voltage input*</td><td>8</td></tr>
</table>
</td></tr>
<tr><td>Switch 2</td><td>Offset/gain setting
□ □ □ □ H
CH4 CH3 CH2 CH1</td><td>
<table>
<tr><th>Offset/gain setting</th><th>Set value</th></tr>
<tr><td>Factory setting</td><td>0</td></tr>
<tr><td>User setting</td><td>1</td></tr>
</table>
</td></tr>
<tr><td>Switch 3</td><td colspan="2">Empty</td></tr>
<tr><td>Switch 4</td><td colspan="2">□ □ □ □ H
0H : With cold junction temperature compensation
1 to FH: Without cold junction temperature compensation
(Invalid when the setting of Switch 1 is 8 (micro voltage input))
0H : Normal mode
1 to FH: Offset/gain setting mode</td></tr>
<tr><td>Switch 5</td><td colspan="2">Empty</td></tr>
</table>

* Micro voltage input can be set on the Q64TDV-GH only.

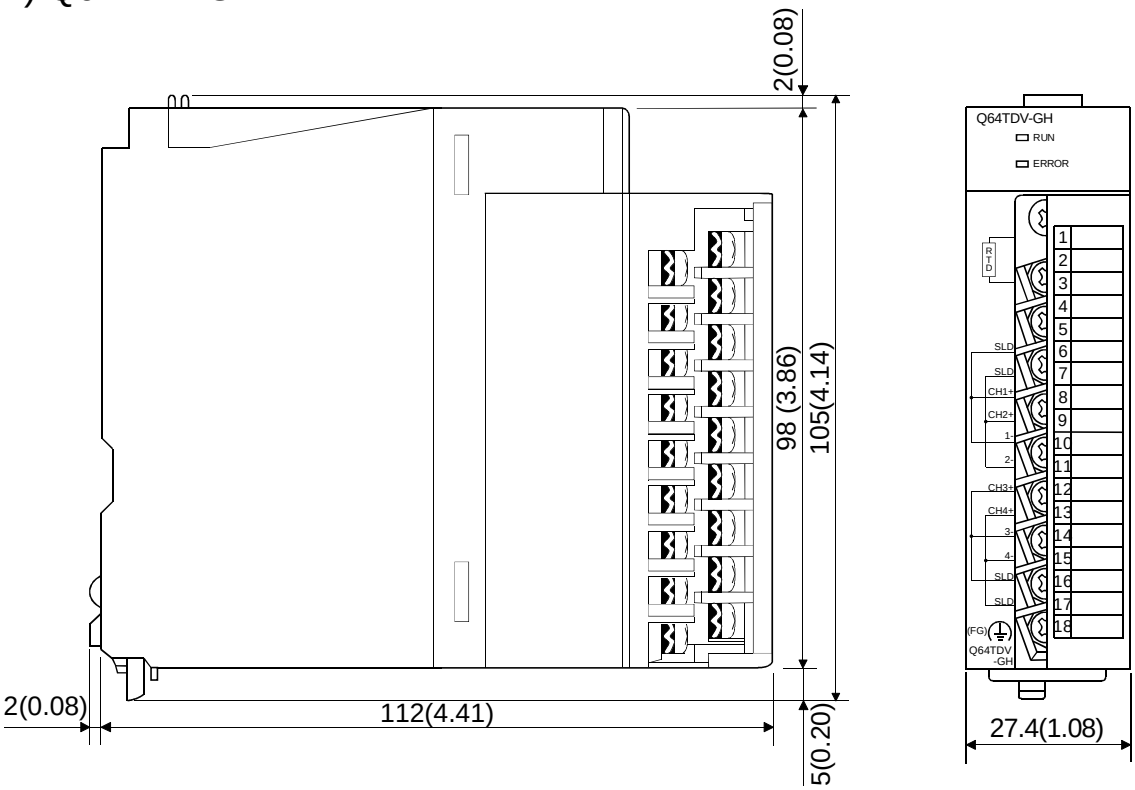
6. OUTLINE DRAWINGS

1) Q64TD



Unit: mm (in.)

2) Q64TDV-GH



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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