MITSUBISHI

# Thermocouple Input Module type A1S68TD

## User's Manual

(Hardware)

Thank you for buying the Mitsubishi general-purpose programmable logic controller MELSEC-A Series

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

| | |
|---|---|
| MODEL | A1S68TD-U(HW)-E |
| MODEL CODE | 13J780 |
| IB (NA)-66570-C(0211)MEE | |

# ● SAFETY PRECAUTIONS ●

(Always read before starting use)

When using this equipment, thoroughly read this manual. Also pay careful attention to safety and handle the module properly.
These precautions apply only to this equipment.
Refer to the user's manual of the CPU module to use for a description of the PLC system safety precautions.
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]

| **⚠CAUTION** |
|---|
| ● Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other.<br>They should be installed 100mm (3.9inch) or more from each other.<br>Not doing so could result in noise that would cause erroneous operation. |

## [INSTALLATION PRECAUTIONS]

| ⚠CAUTION |
|---|
| ● Use each module in an environment as specified in the “general specification” in the detailed manual.<br>Using the PLC outside the range of the general specifications may result in electric shock, fire or malfunction, or may damage or degrade the module.<br>● Before mounting the module, insert the module fixing hook at the bottom of the module into the fixing hole in the base unit. Improper mounting of the module can cause a malfunction, failure or drop. |

## [WIRING PRECAUTIONS]

| ⚠CAUTION |
|---|
| ● Always ground the FG terminal to the protective ground conductor.Not doing so can cause a malfunction.<br>● Carry out wiring to the PLC correctly, checking the rated voltage and terminal arrangement of the product.<br>Using a power supply that does not conform to the rated voltage, or carrying out wiring incorrectly, will cause fire or failure.<br>● Tighten the terminal screws to the stipulated torque.<br>Loose screws will cause short circuits, fire, or malfunctions.<br>● Make sure that no foreign matter such as chips or wiring offcuts gets inside the module. It will cause fire, failure or malfunction. |

## [STARTING AND MAINTENANCE PRECAUTIONS]

| ⚠CAUTION |
|---|
| ● Do not touch the terminals before switching power off externally in all phases.<br>Doing so can cause a malfunction.<br>● Start cleaning or terminal screw retightening after switching power off externally in all phases.<br>Not doing so can cause a malfunction.<br>● Do not disassemble or modify any module.<br>This will cause failure, malfuntion, injuries, or fire.<br>● Mount or dismount the module after switching power off externally in all phases.<br>Not doing so can cause the module to fail or malfunction. |

## [DISPOSAL PRECAUTIONS]

| ⚠CAUTION |
|---|
| ● When disposing of this product, treat it as industrial waste. |

## About the Manuals

The following manuals are also related to this product.
In necessary, order them by quoting the details in the tables below.

Detailed Manual

| Manual name | Manual No. (Model code) |
|---|---|
| Thermocouple input module type A1S68TD User's Manual | IB-66571 (13J781) |

# 1. General Description

This manual describes the specifications and nomenclature of the A1S68TD type thermocouple input module (hereafter called the “A1S68TD”), which is be used in combination with a MELSEC-A series programmable controller AnSCPU module (hereafter called the “PLC CPU”).

# 2. Performance Specifications

The following table shows the performance specifications of the A1S68TD.

<table>
<tr><th colspan="2">Item</th><th>Specification</th></tr>
<tr><td colspan="2">Temperature sensor input</td><td>0 to 1700℃</td></tr>
<tr><td rowspan="2">Output</td><td>Detected temperature value</td><td>16 bit signed binary (0 to 17000 Value to the first decimal place x 10)</td></tr>
<tr><td>Scaling value</td><td>16-bit signed binary (0 to 2000)</td></tr>
<tr><td colspan="2">Applicable thermocouple types and their temperature measurement ranges and accuracy</td><td>
<table>
<tr><th>Applicable thermocouple type *1</th><th>Temperature measurement range</th><th>Conversion accuracy (at operating ambient temperature of 25±5℃)</th><th>Temperature characteristic (when operating ambient temperature varies by 1℃)</th></tr>
<tr><td>B</td><td>800 to 1700℃</td><td>±2.5℃</td><td>±0.4℃</td></tr>
<tr><td>R</td><td>300 to 1600℃</td><td>±2℃</td><td>±0.3℃</td></tr>
<tr><td>S</td><td>300 to 1600℃</td><td rowspan="5">±0.5℃ ot ±0.25℃ of the measured temperature, whichever is larger</td><td rowspan="5">±0.07℃ ot ±0.02℃ of the measured temperature, whichever is larger</td></tr>
<tr><td>K</td><td>0 to 1200℃</td></tr>
<tr><td>E</td><td>0 to 800℃</td></tr>
<tr><td>J</td><td>0 to 750℃</td></tr>
<tr><td>T</td><td>0 to 350℃</td></tr>
</table>
</td></tr>
<tr><td colspan="2">Cold junction compensation accuracy</td><td>±1℃</td></tr>
<tr><td colspan="2">Overall accuracy</td><td>According to the calculation formula in *2</td></tr>
<tr><td colspan="2">Maximum resolution</td><td>B, R, S : 0.3℃<br>K, E, J, T : 0.1℃</td></tr>
<tr><td colspan="2">Maximum conversion speed</td><td>400 ms/8 channels *3</td></tr>
<tr><td colspan="2">Absolute maximum input</td><td>±5V</td></tr>
<tr><td colspan="2">Number of analogue input points</td><td>8 channels +Pt100 connection channel/module</td></tr>
</table>

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td>Isolation specifications</td><td>
<table>
<tr><th>Specific isolated area</th><th>Isolation method</th><th>Dielectric withstand voltage</th><th>Insulation resistance</th></tr>
<tr><td>Between thermocouple input and PLC power supply</td><td rowspan="2">Transformer isolation</td><td rowspan="2">500V AC for 1 minute</td><td rowspan="2">5MΩ or more (measured with a 500V DC insulation resistance tester)</td></tr>
<tr><td>Between thermocouple input channels</td></tr>
<tr><td>Between cold junction temperature compensation (Pt100) and PLC power supply</td><td>Not isolated</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Number of occupied I/O points</td><td>32 points</td></tr>
<tr><td>Connection terminal</td><td>20-terminal block</td></tr>
<tr><td>External power supply</td><td>Unnecessary</td></tr>
<tr><td>Applicable wire size</td><td>0.75 to 1.5 $mm^2$</td></tr>
<tr><td>Applicable solderless terminal</td><td>R1.25-3 1.25 YS3, RAV 1.25 3, V1.25 YS3A</td></tr>
<tr><td>Internal current consumption (5 VDC)</td><td>0.32A</td></tr>
<tr><td>Weight kg (lb)</td><td>0.28 (0.61)</td></tr>
<tr><td>External dimensions mm (inch)</td><td>130 (5.12)(H)×34.5 (1.36) (W)×93.6 (3.69) (D)</td></tr>
</table>

*1: Use the thermocouple selector DIP switches to set the thermocouple type for every four channels (CH1-CH4, CH5-CH8).
The switches are set to thermocouple type K on delivery.

*2: The formula for calculation of overall accuracy is as follows
(Overall accuracy) = (Conversion accuracy) + (Temperature characteristic) × (Operation ambient temperature version) + (Cold junction compensation accuracy)
(Example) Overall accuracy when the type of thermocouple used is type B and the operation ambient temperature is 35℃:
Overall accuracy = (±2.5℃)+(±0.4℃)×(5℃)×(±1℃)=±5.5℃

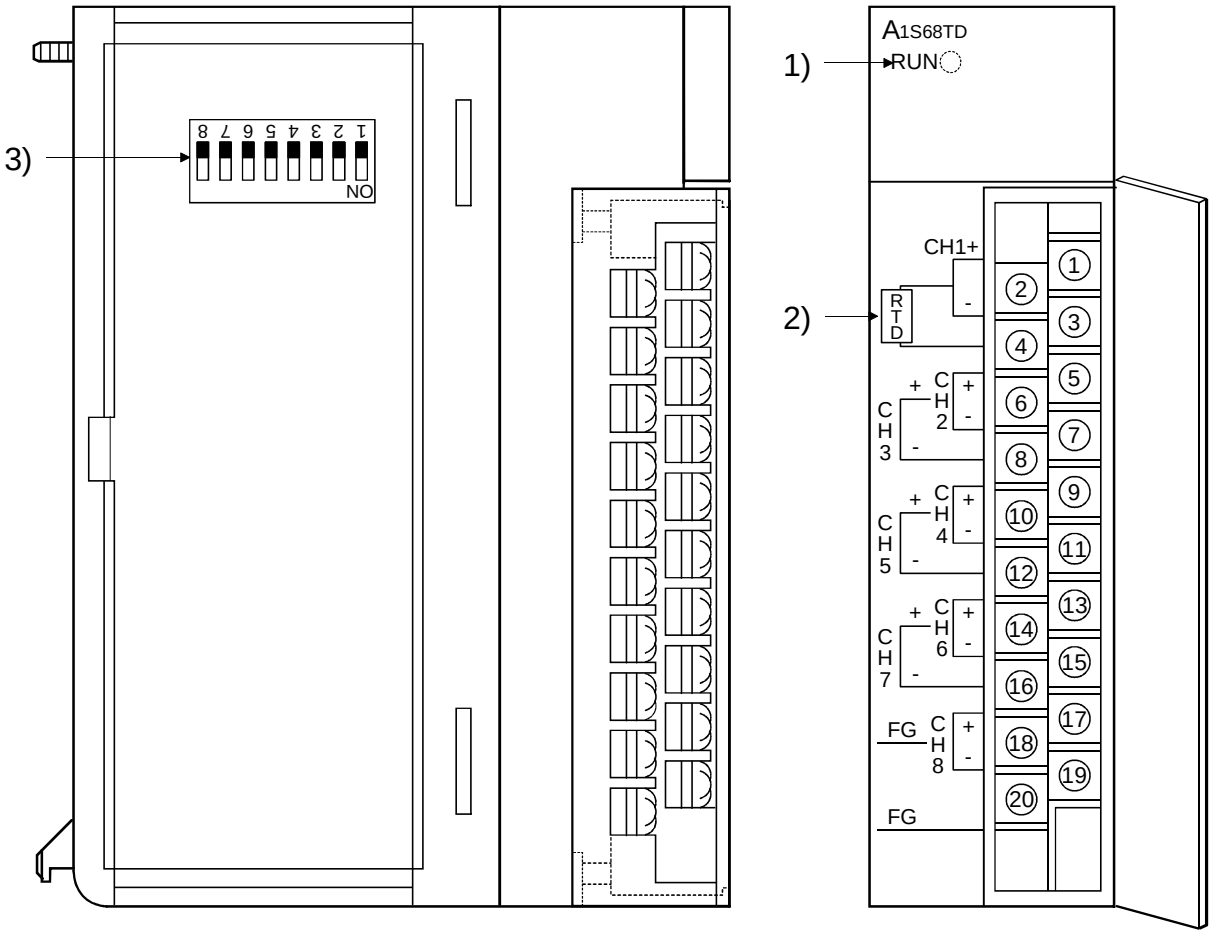
*3: The maximum conversion speed means the time from thermocouple signal input to its conversion to the corresponding digital value.
The conversion speed is 400 msec, regardless of the number of channels.

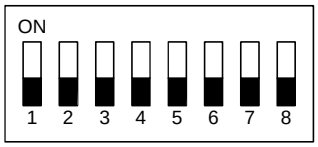
For the general specifications, refer to the user's manual for the PLC CPU are used.

# 3. Nomenclature and Settings

## 3.1 Nomenclature

This section gives the name of each part of the A1S68TD.



<table>
<tr><th>No.</th><th>Name and appearance</th><th>Description</th></tr>
<tr><td>1)</td><td>RUN LED<br>RUN ○</td><td>Displays the operation status of the A1S68TD<br>On : Normal operation<br>Flash : Switch setting error, write disabled error, lower/upper limit value setting error, disconnection detected, etc<br>Off : 5 V power cut, watchdog timer error</td></tr>
<tr><td>2)</td><td>RTD Pt100</td><td>RTD for measuring the terminal block temperature (supplied with the module)</td></tr>
<tr><td>3)</td><td>Thermocouple selector switch<br> 
</td><td>Used to set the thermocouple type used for CH1-CH4 and CH5-CH8.
<table>
<tr><th colspan="2"></th><th colspan="5">Setting for CH1-CH4</th><th colspan="3">Setting for CH5-CH8</th></tr>
<tr><th colspan="2"></th><th>SW1</th><th>SW2</th><th>SW3</th><th>SW4</th><th>SW5</th><th>SW6</th><th>SW7</th><th>SW8</th></tr>
<tr><td rowspan="8">Thermocouple type</td><td>K</td><td rowspan="4">OFF</td><td rowspan="4">OFF</td><td rowspan="2">OFF</td><td>OFF</td><td rowspan="8">OFF</td><td rowspan="4">OFF</td><td rowspan="2">OFF</td><td>OFF</td></tr>
<tr><td>E</td><td>ON</td><td>ON</td></tr>
<tr><td>J</td><td rowspan="2">ON</td><td>OFF</td><td rowspan="4">OFF</td><td rowspan="2">ON</td><td>OFF</td></tr>
<tr><td>T</td><td>ON</td><td>ON</td></tr>
<tr><td>B</td><td rowspan="4">ON</td><td rowspan="2">OFF</td><td>OFF</td><td rowspan="4">ON</td><td rowspan="2">OFF</td><td>OFF</td></tr>
<tr><td>R</td><td>ON</td><td>ON</td></tr>
<tr><td>S</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td></tr>
</table></td></tr>
</table>

# 4. Handling

## 4.1 Cautions on handling

(1) The module case and the terminal block are made of resin. Do not drop the module or subject it to shock.

(2) Do not remove the printed circuit board from the module case.
This could cause failure.

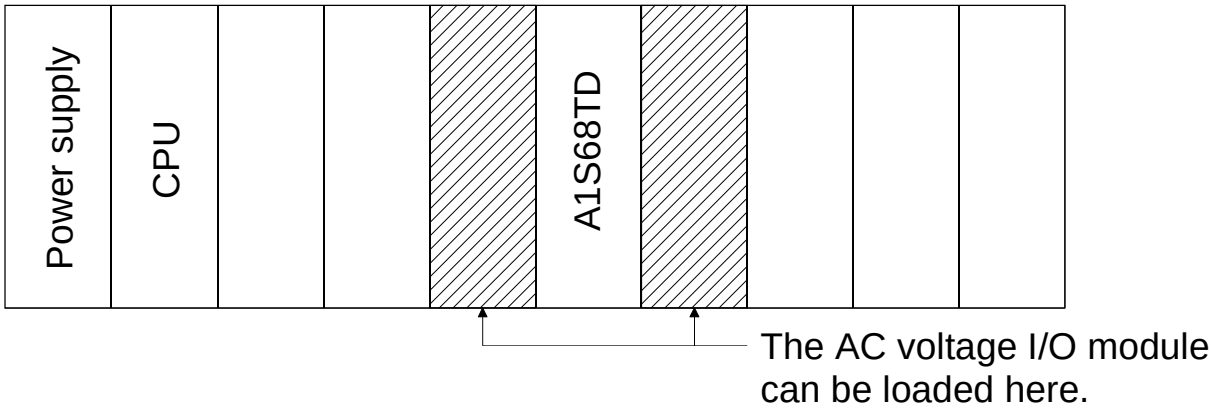
(3) During wiring, take all possible measures to prevent wire scraps or foreign matter from entering the module.
If anything enters the module, remove it completely.

(4) Tighten the module mounting screws and the terminal screws to the torques specified in the following table:

| Screw | Tightening torque range |
|---|---|
| Module mounting screw (M4 screw) | 78 to 118N • cm |
| Terminal block terminal screw (M3.5 screw) | 59 to 88N • cm |
| Terminal block mounting screw (M4 screw) | 78 to 118N • cm |

## 4.2 Cautions on installation

(1) Do not load an AC voltage I/O module in the right end or left end slot of the A1S68TD.
Doing so may cause the I/O module to generate noise, making stable temperature measurement impossible.




(2) During wiring, follow the instructions in Chapter 5 to prevent noise.

# 5. Wiring

This section gives the cautions on wiring and a connection example for the module.

## 5.1 Wiring precautions

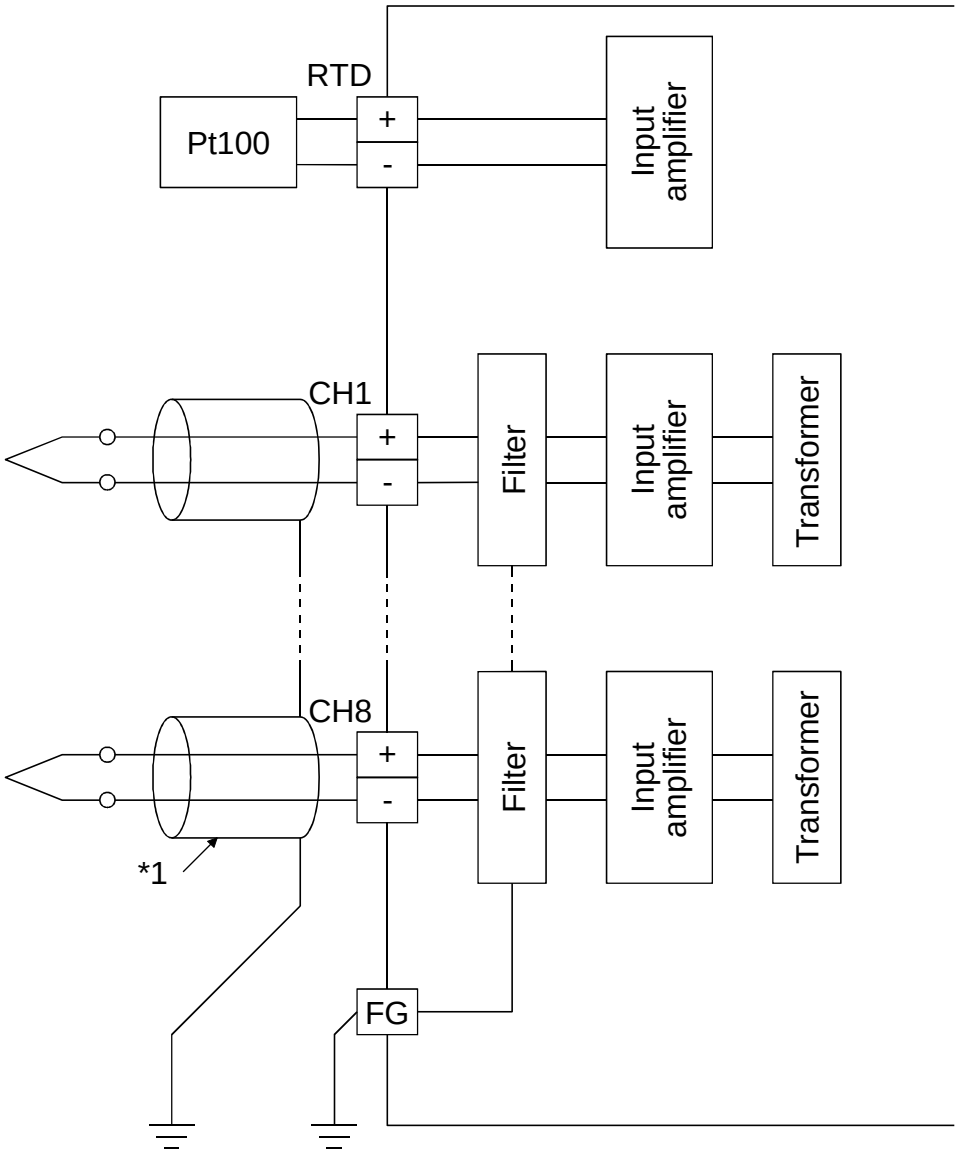
To establish a highly reliable system by making the best use of the A1S68TD functions, external wiring that is not susceptible to the effects of noise is required.
The cautions on wiring are presented below.

(1) Use separate cables for AC input current and external input signals to the A1S68TD. This can prevent the effects of surge or induction of the AC input current.

(2) Keep the thermocouple at least 100mm away from the main circuit and AC control circuit wiring.
Provide sufficient space between the thermocouple and circuits that generate high harmonics, such as high-voltage wires and main load circuits, otherwise, the thermocouple will be affected by noise, surge or induction.

(3) Generally, ground the shielded wire or shielded cable at one point on the PLC CPU. However, depending on the external noise level, it may be advisable to ground it at an external location.

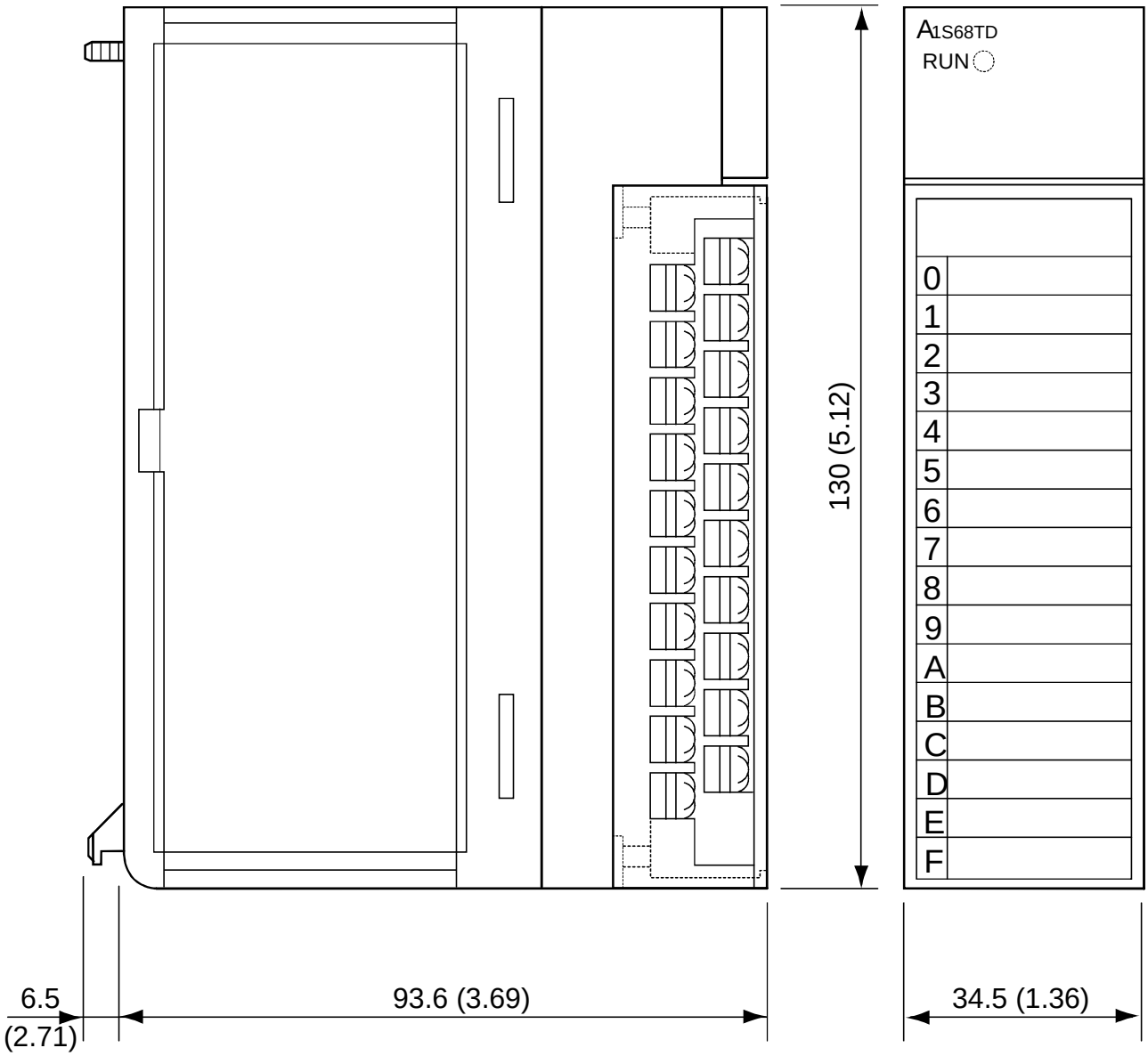
## 5.2 Module connection example




*1: Use a shielded compensating conductor for the cable.

# 6. Outside Dimensions

The outside dimensions of the A1S68TD are shown below.




Unit: mm (inch)

**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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