

# **mitsubishi**

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# **Thermocouple Input Module**

## **type A1S68TD**

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## **User's Manual**

(Hardware)

Thank you for buying the Mitsubishi general-purpose programmable 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-F(1112)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: " 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.

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.  
They should be installed 100mm (3.9inch) or more from each other.  
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.  
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.
- 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.
- Carry out wiring to the PLC correctly, checking the rated voltage and terminal arrangement of the product.  
Using a power supply that does not conform to the rated voltage, or carrying out wiring incorrectly, will cause fire or failure.
- Tighten the terminal screws to the stipulated torque.  
Loose screws will cause short circuits, fire, or malfunctions.
- 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.  
Doing so can cause a malfunction.
- Start cleaning or terminal screw retightening after switching power off externally in all phases.  
Not doing so can cause a malfunction.
- Do not disassemble or modify any module.  
This will cause failure, malfunction, injuries, or fire.
- Mount or dismount the module after switching power off externally in all phases.  
Not doing so can cause the module to fail or malfunction.
- Do not install/remove the terminal block more than 50 times after the first use of the product. (IEC 61131-2 compliant)

## **[DISPOSAL PRECAUTIONS]**

### **CAUTION**



- When disposing of this product, treat it as industrial waste.

## ● 安全注意事项 ●

（使用之前请务必阅读）

在使用本产品之前，应仔细阅读本手册以及本手册中所介绍的相关手册，同时在充分注意安全的前提下正确操作。

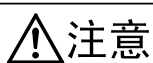
本手册中的注意事项记载与本产品有关的内容。关于使用本产品的系统方面的安全注意事项，请参阅所使用的 CPU 模块的用户手册。

在本手册中，安全注意事项被分为“警告”和“注意”两个等级。



**警告**

表示错误操作可能造成危险后果，导致死亡或重伤事故。



**注意**

表示错误操作可能造成危险后果，导致中度伤害、轻伤或财产损失。

此外，根据情况不同，即使标注为“注意”的事项也有可能引发严重事故。这两个等级的注意事项记载的均为重要内容，请务必遵守。

请妥善保管本手册以备需要时取阅，并将本手册交给最终用户。

### 【设计注意事项】



**警告**

- 请勿将控制线及通信电缆与主电路及动力线等捆扎在一起或相互靠得太近。应相距大约 100mm 以上距离。因为噪声有可能导致误动作。

### 【安装注意事项】



**注意**

- 应在所使用的 CPU 模块的用户手册记载的一般规格环境下使用可编程控制器。如果在一般规格范围以外的环境中使用可编程控制器，可能导致触电、火灾、误动作、产品损坏或性能劣化。
- 应将模块下部的模块固定用凸起部切实插入基板的固定孔中以进行安装。如果模块未正确安装，有可能造成误动作、故障或掉落。

## 【配线注意事项】

### 注意

- 必须将 FG 端子与可编程控制器的专用接地线连接。否则有可能导致误动作。
- 进行可编程控制器配线作业时，应在确认产品的额定电压及端子排列的基础上正确进行操作。  
如果连接了与额定值不符的电源或配线错误，可能导致火灾或故障。
- 应以规定的扭矩拧紧端子螺栓。  
如果端子螺栓拧得过松，有可能导致短路、火灾或误动作。
- 应注意防止切屑及配线头等异物掉入模块内。  
否则有可能导致火灾、故障或误动作。

## 【启动 / 维护注意事项】

### 注意

- 未从外部将电源全部断开的情况下请勿触摸端子。  
否则可能导致误动作。
- 在清洁模块或重新紧固端子螺栓时，请从外部将电源全部断开后再进行操作。  
如果未全部断开，有可能导致误动作。
- 请勿拆解或改造各模块。  
否则可能导致故障、误动作、人身伤害或火灾。
- 在拆装模块时，应从外部将电源全部断开后再进行操作。  
如果未全部断开，有可能导致模块故障或误动作。
- 产品投入使用后，端子排的拆装次数不应超过 50 次。  
(根据 IEC61131-2 规范)

## 【报废处理注意事项】

### 注意

- 本产品报废时，应当作工业废物处理。

## ● CONDITIONS OF USE FOR THE PRODUCT ●

- (1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
- i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
  - ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

- (2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.

MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.

("Prohibited Application")

Prohibited Applications include, but not limited to, the use of the PRODUCT in;

- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTS are required. For details, please contact the Mitsubishi representative in your region.

## **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.

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



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

\*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°C:

Overall accuracy = (±2.5°C)+(±0.4°C)×(5°C)×(±1°C)=±5.5°C

\*3: The maximum conversion speed means the time from thermocouple signal input to its conversion to the corresponding digital value.

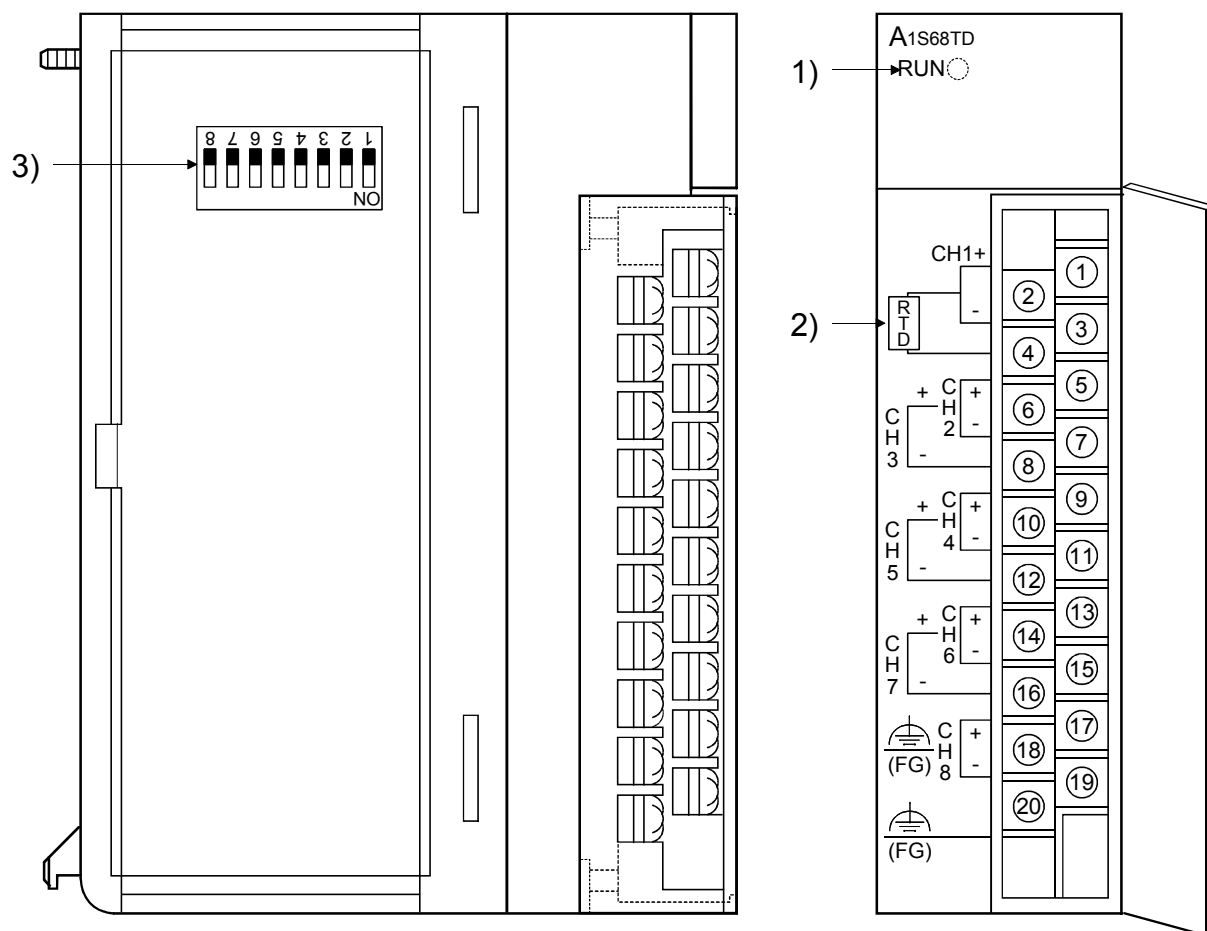
The conversion speed is 400 msec, regardless of the number of channels.

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.



No.	Name and appearance	Description																																																										
1)	RUN LED	Displays the operation status of the A1S68TD On : Normal operation Flash : Switch setting error, write disabled error, lower/upper limit value setting error, disconnection detected, etc Off : 5 V power cut, watchdog timer error																																																										
	RUN ○																																																											
2)	RTD Pt100	RTD for measuring the terminal block temperature (supplied with the module)																																																										
3)	Thermocouple selector switch	Used to set the thermocouple type used for CH1-CH4 and CH5-CH8.																																																										
	<div><div>ON</div><div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div><div>12345678</div></div></div>	<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="6">Thermocouple type</td><td>K</td><td rowspan="4">OFF</td><td rowspan="4">OFF</td><td>OFF</td><td>OFF</td><td rowspan="4">OFF</td><td rowspan="4">OFF</td><td>OFF</td><td>OFF</td></tr><tr><td>E</td><td>ON</td><td>ON</td></tr><tr><td>J</td><td>ON</td><td>OFF</td><td>ON</td><td>ON</td></tr><tr><td>T</td><td>ON</td><td>ON</td><td>ON</td></tr><tr><td>B</td><td rowspan="3">ON</td><td rowspan="3">OFF</td><td>OFF</td><td>OFF</td><td rowspan="3">ON</td><td>OFF</td><td>OFF</td></tr><tr><td>R</td><td>ON</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>			Setting for CH1-CH4					Setting for CH5-CH8					SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Thermocouple type	K	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	E	ON	ON	J	ON	OFF	ON	ON	T	ON	ON	ON	B	ON	OFF	OFF	OFF	ON	OFF	OFF	R	ON	ON	ON	S	ON	OFF	ON
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## 4. Handling

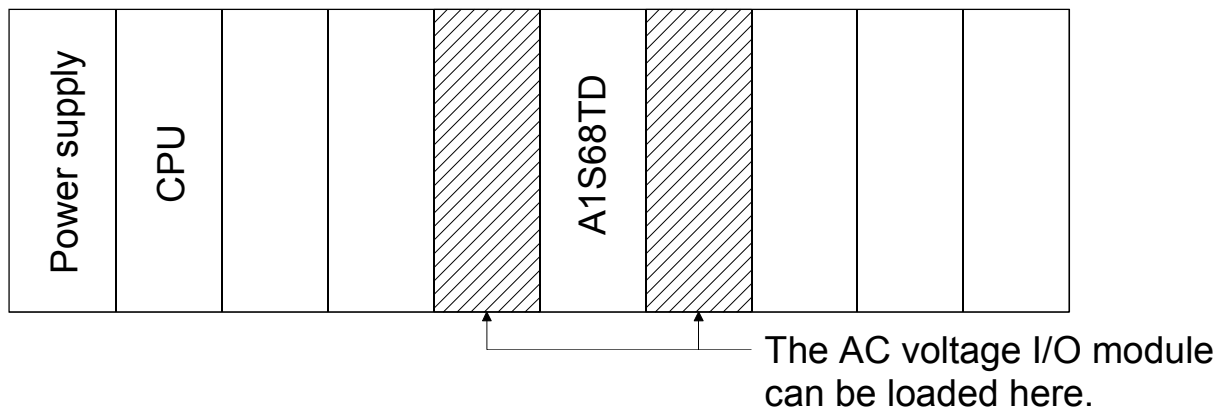
### 4.1 Cautions on handling

- (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.

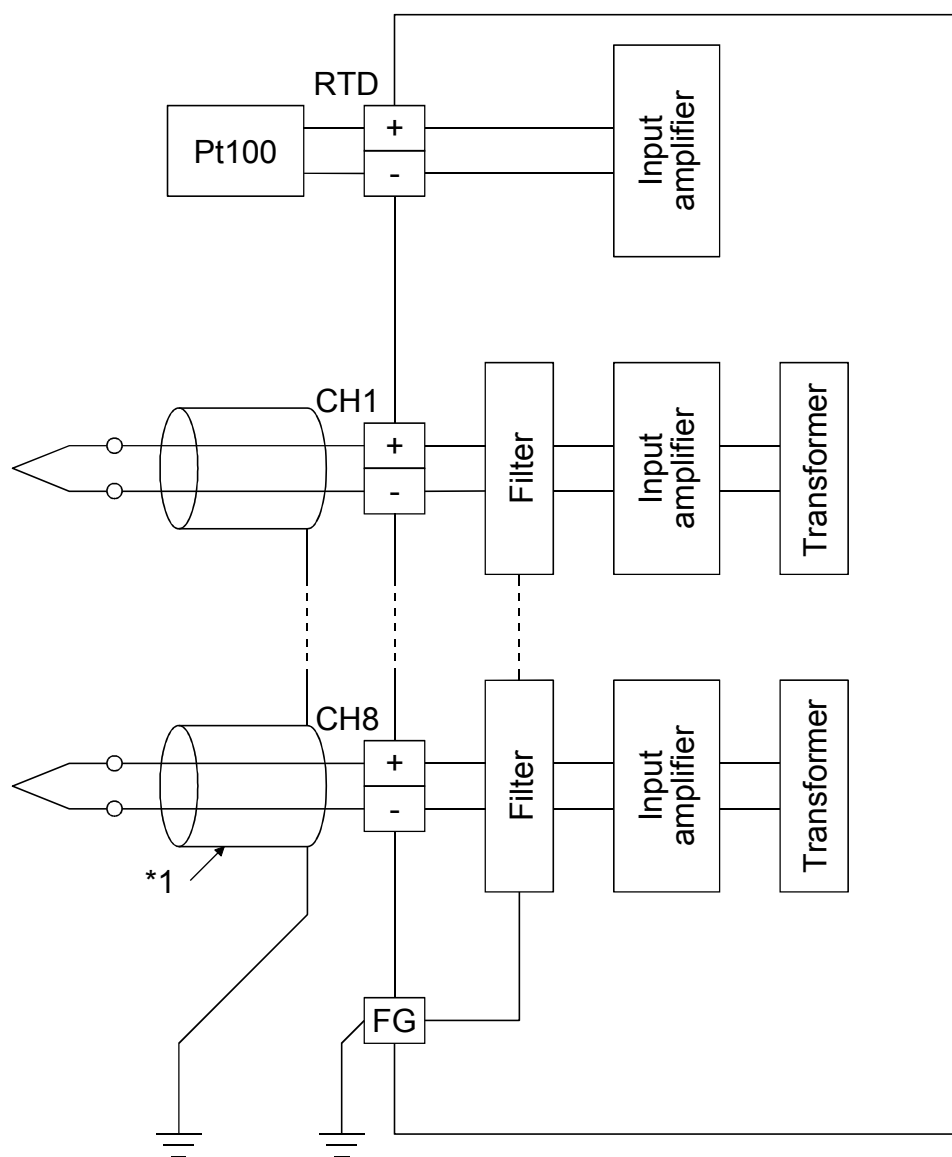
### 5.1 Wiring precautions

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.

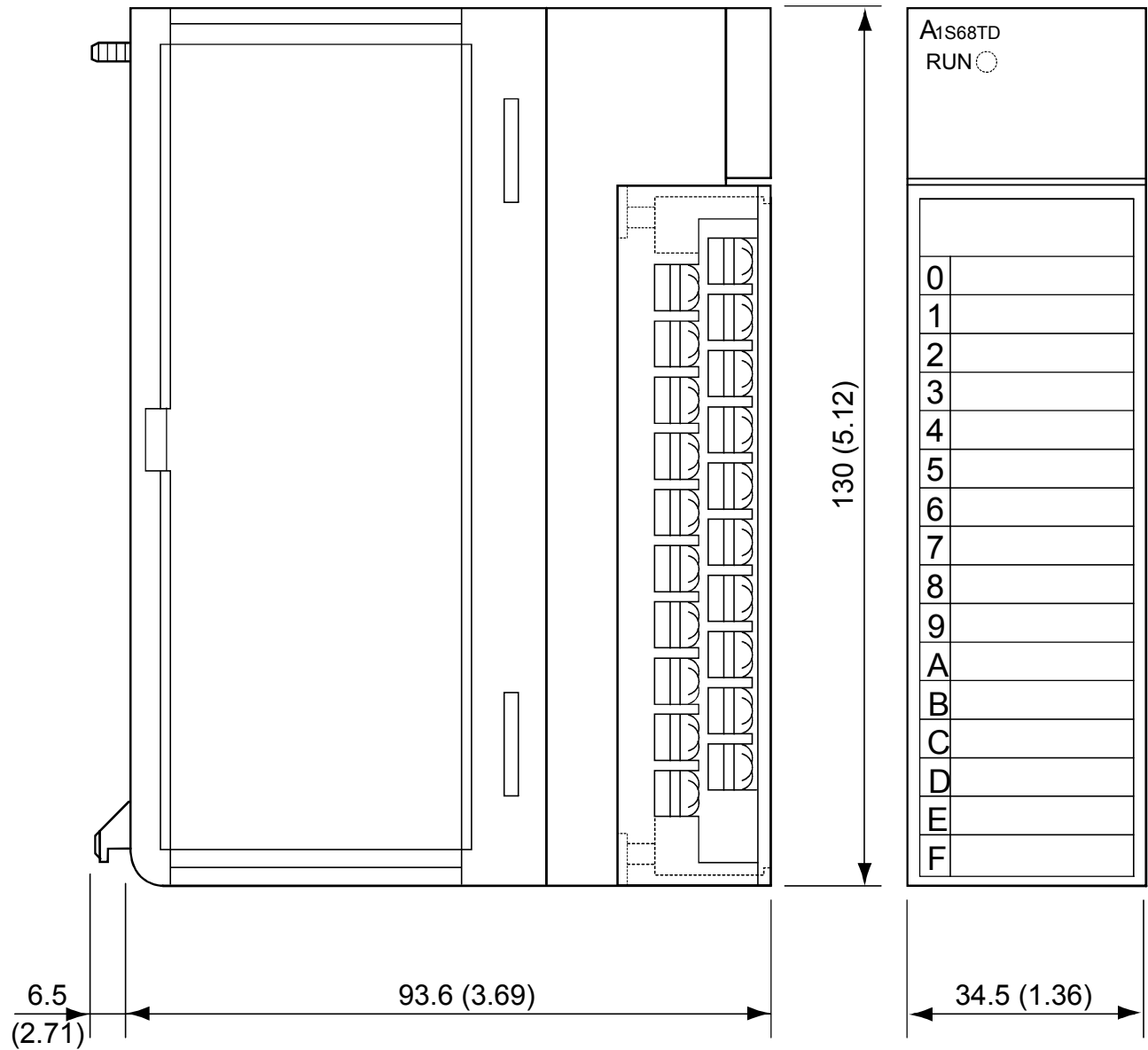
- (1) Use separate cables for AC input current and external input signals to the A1S68TD.  
This can prevent the effects of surge or induction of the AC input current.
- (2) Keep the thermocouple at least 100mm away from the main circuit and AC control circuit wiring.  
Provide sufficient space between 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



## 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.

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Specifications subject to change without notice.