

Thank you for purchasing our Digital temperature indicating controller BCS1. This manual contains instructions for the mounting, functions, operations and notes when operating the BCS1. To prevent accidents arising from the misuse of this controller, please ensure the operator receives this manual.

**Safety precautions (Be sure to read these precautions before using our products.)**  
 The safety precautions are classified into categories: "Warning" and "Caution".  
**⚠ Warning:** Procedures which may lead to dangerous conditions and cause death or serious injury, if not carried out properly.  
**⚠ Caution:** Procedures which may lead to dangerous conditions and cause superficial to medium injury or physical damage or may degrade or damage the product, if not carried out properly.

**⚠ Warning**

- To prevent an electric shock or fire, only Shinko or other qualified service personnel may handle the inner assembly.
- To prevent an electric shock, fire or damage to the instrument, parts replacement may only be undertaken by Shinko or other qualified service personnel.

**⚠ Safety precautions**

- To ensure safe and correct use, thoroughly read and understand this manual before using this instrument.
- This instrument is intended to be used for industrial machinery, machine tools and measuring equipment. Verify correct usage after consulting the purpose of use with our agency or main office. (Never use this instrument for medical purposes with which human lives are involved.)
- External protection devices such as protection equipment against excessive temperature rise, etc. must be installed, as malfunction of this product could result in serious damage to the system or injury to personnel. Also proper periodic maintenance is required.
- This instrument must be used under the conditions and environment described in this manual. Shinko Technos Co., Ltd. does not accept liability for any injury, loss of life or damage occurring due to the instrument being used under conditions not otherwise stated in this manual.

**Caution with respect to Export Trade Control Ordinance**

To avoid this instrument from being used as a component in, or as being utilized in the manufacture of weapons of mass destruction (i.e. military applications, military equipment, etc.), please investigate the end users and the final use of this instrument. In the case of resale, ensure that this instrument is not illegally exported.

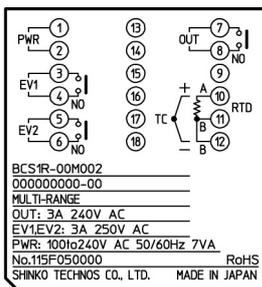
**1. Model**

**1.1 Model**

		BCS1	R	-	0	0	M00	-	0	00000000-00
Series	BCS1	BCS1								
Control output (OUT)	Relay contact		R							
	Non-contact voltage		S							
Supply voltage	100-240V AC					0				
Input	Multi-range input						M00			
Event output (Option)	No Event output								0	
	2 Event outputs									2

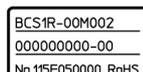
**1.2 How to read the model label**

Model labels are attached to the right side of the case (Fig. 1.2-1) and at the bottom of the inner assembly (Fig. 1.2-2).



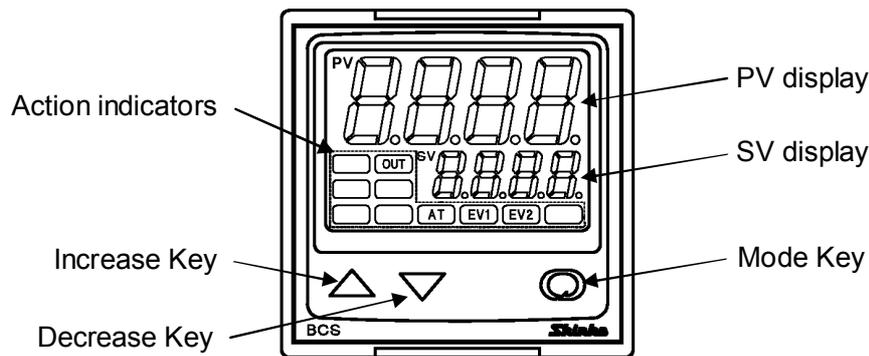
(Fig. 1.2-1)

(e.g.) Control output (OUT) : Relay contact output  
 Supply voltage : 100 to 240V AC  
 Input : Multi-range input  
 Event output : 2 Event outputs (Option)



(Fig. 1.2-2)

## 2. Name and functions of sections



(Fig. 2-1)

### [Displays, Indicators]

- PV display (Red)** : Indicates the PV (process variable) or setting characters in any setting mode.  
**SV display (Green)** : Indicates the SV (desired value), output MV (manipulated variable) or each set value in any setting mode.  
**OUT indicator (Green)** : Lights when control output (OUT) is ON.  
**EV1 indicator (Red)** : Lights when Alarm 1 (A1) output (option) is ON.  
**EV2 indicator (Red)** : Lights when Alarm 2 (A2) output (option) is ON.  
**AT indicator (Yellow)** : Flashes while auto-tuning (AT) or auto-reset is performing.

### [Keys]

- Increase Key** ( $\triangle$ ) : Increases the numeric value or makes a selection.  
**Decrease Key** ( $\nabla$ ) : Decreases the numeric value or makes a selection.  
**Mode Key** ( $\odot$ ) : Switches the setting mode, or registers the set (or selected) value.  
[By pressing the Mode Key, the set (or selected) value can be registered.]

## 3. Mounting to the control panel

### 3.1 Site selection



### Caution

Use within the following temperature and humidity ranges.

Temperature: 0 to 50°C (32 to 122°F), Humidity: 35 to 85%RH (No icing, non-condensing)

If the BCS1 is installed through the face of a control panel, the ambient temperature of the BCS1 must be kept to under 50°C. Otherwise, the life-span of electronic parts (especially electrolytic capacitors) of the BCS1 will be shortened.

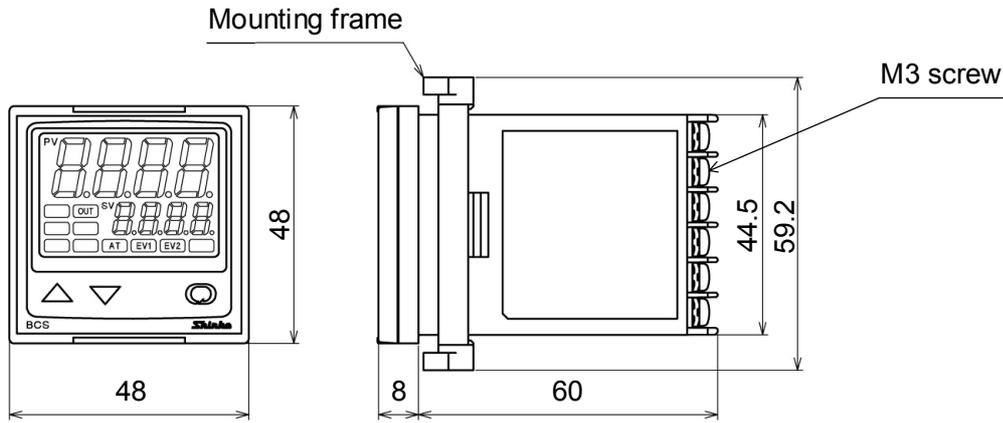
**This instrument is intended to be used under the following environmental conditions (IEC61010-1):**

**Overvoltage category II, Pollution degree 2**

Ensure the mounting location corresponds to the following conditions:

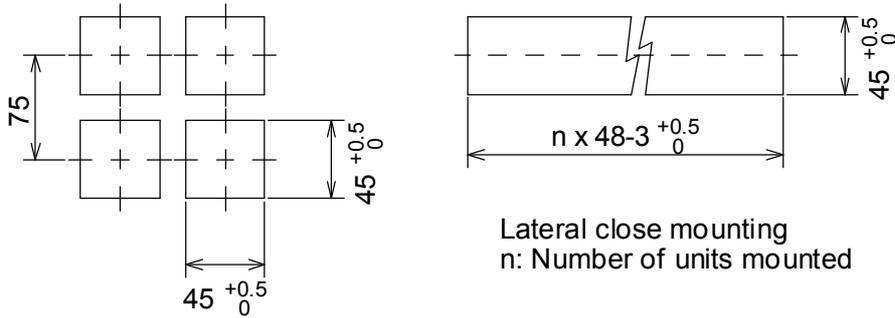
- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gases
- Few mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of 0 to 50°C (32 to 122°F) that does not change rapidly, and no icing
- An ambient non-condensing humidity of 35 to 85%RH
- No large capacity electromagnetic switches or cables through which large current is flowing
- No water, oil or chemicals or where the vapors of these substances can come into direct contact with the controller

### 3.2 External dimensions (Scale: mm)



(Fig. 3.2-1)

### 3.3 Panel cutout (Scale: mm)



(Fig. 3.3-1)

### 3.4 Mounting and removal to/from the control panel

#### How to mount the BCS1

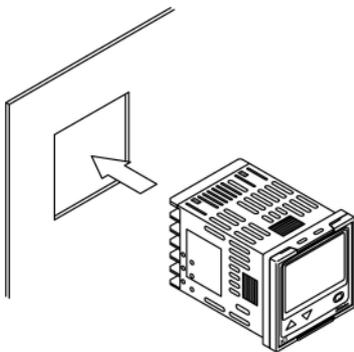
Mount the controller vertically to a flat, rigid panel.

Mountable panel thickness: 1 to 5mm

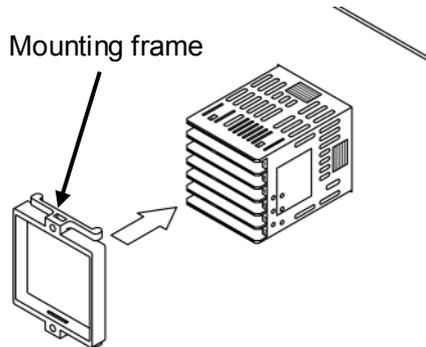
- (1) Insert the controller from the front side of the panel. (Fig. 3.4-1)
- (2) Insert the mounting frame until it comes into contact with the panel. (Fig. 3.4-2)

#### How to remove the mounting frame and unit (Fig. 3.4-3)

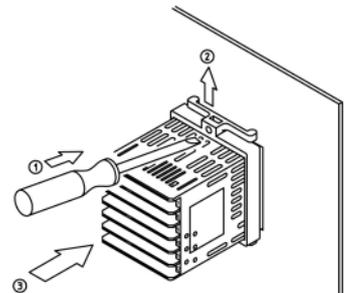
- (1) Turn the power to the unit OFF, and disconnect all wires before removing the mounting frame.
  - (2) Insert a flat blade screwdriver between the mounting frame and unit ①.
  - (3) Slowly push the frame upward using the screwdriver ②, while pushing the unit toward the panel ③.
  - (4) Repeat step (2) and slowly push the frame downward using the screwdriver for the other side.
- The frame can be removed little by little by repeating these steps.



(Fig. 3.4-1) Mounting



(Fig. 3.4-2) Mounting



(Fig. 3.4-3) Removal

# 4. Wiring

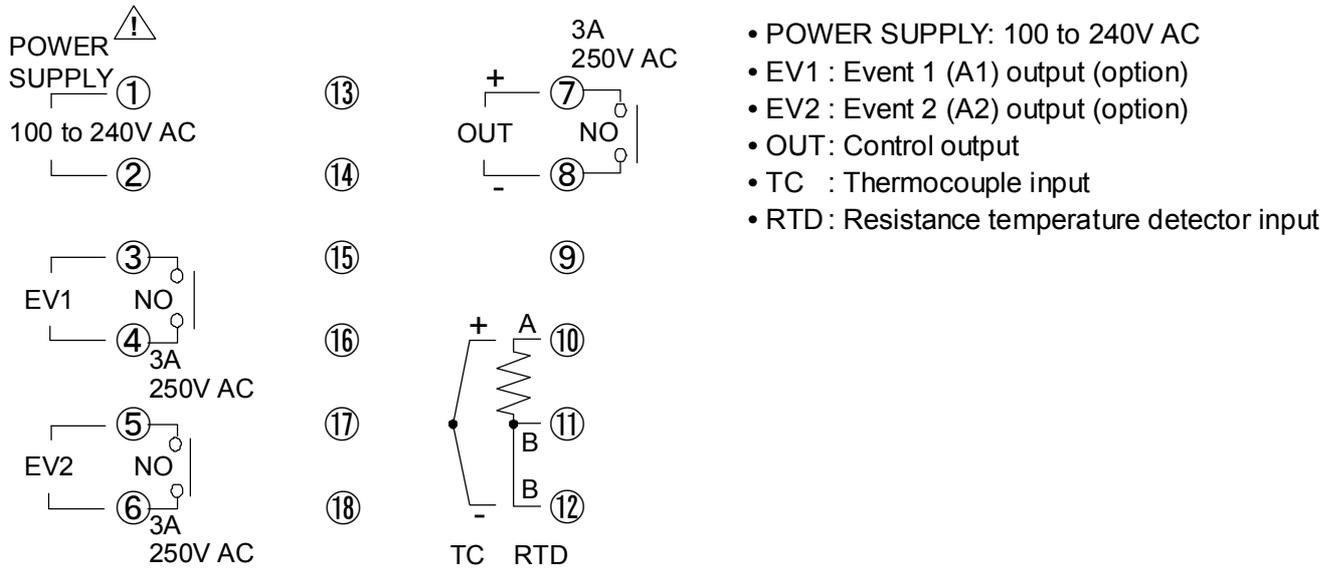
## Warning

Turn the power supply to the instrument off before wiring or checking. Working on or touching the terminal with the power switched on may result in severe injury or death due to Electric Shock.

## Caution

- The terminal block of this instrument is designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw. The torque should be 0.63N•m.
- To extend a thermocouple's lead wire, be sure to use a compensating lead wire in accordance with the sensor input specification. (If any other compensating lead wire is used, a temperature indication error may be caused.)
- Use the 3-wire RTD in accordance with the sensor input specifications of this controller.
- This instrument does not have a built-in power switch, circuit breaker or fuse. It is necessary to install them near the controller. (Recommended fuse: Time-lag fuse, rated voltage 250V AC, rated current 2A)
- When using a relay contact output type, externally use a relay in accordance with the capacity of the load.
- When wiring, keep input wires (thermocouple, RTD, etc.) away from AC sources or load wires.

### 4.1 Terminal arrangement

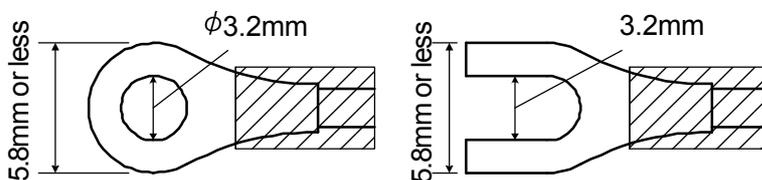


(Fig. 4.1-1)

### 4.2 Lead wire solderless terminal

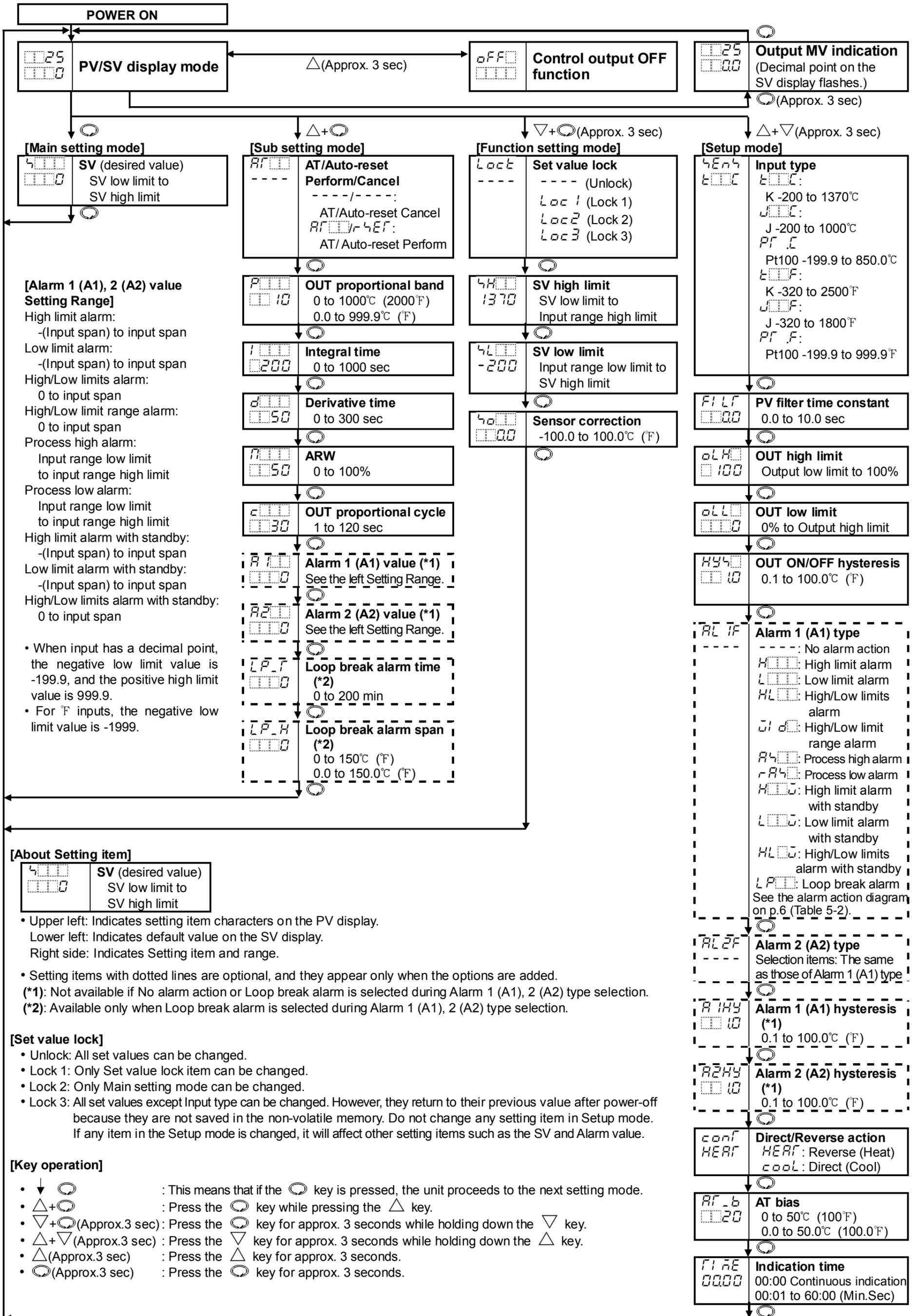
Use a solderless terminal with an insulation sleeve in which an M3 screw fits as shown below. (Fig. 4.2-1) The torque should be 0.63N•m.

Solderless terminal	Manufacturer	Model	Torque
Y type	Nichifu Terminal Industries CO.,LTD.	TMEV1.25Y-3	0.63N•m
	Japan Solderless Terminal MFG CO.,LTD.	VD1.25-B3A	
Ring type	Nichifu Terminal Industries CO.,LTD.	TMEV1.25-3	
	Japan Solderless Terminal MFG CO.,LTD.	V1.25-3	



(Fig. 4.2-1)

# 5. Operation flowchart



● Characters used in this manual:

Indication	-	0	1	2	3	4	5	6	7	8	9	°C	°F
Number, °C/°F	-1	0	1	2	3	4	5	6	7	8	9	°C	°F
Indication	A	B	C	D	E	F	G	H	I	J	K	L	M
Alphabet	A	B	C	D	E	F	G	H	I	J	K	L	M
Indication	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Alphabet	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

● Indication after power-on

After the power is turned on, the PV display indicates the input type characters and temperature unit, and the SV display indicates the input range high limit value for approximately 3 seconds. See (Table 5-1).

(Table 5-1)

Input	°C		°F	
	PV display	SV display	PV display	SV display
K	K °C	1370	K °F	2500
J	J °C	1000	J °F	1800
Pt100	Pt °C	8500	Pt °F	9999

During this time, all outputs and the LED indicators are in OFF status.

Control will then start indicating the PV (process variable) on the PV display and SV (desired value) on the SV display.

While control output OFF function is working, the PV display indicates OFF.

To cancel the control output OFF function, press the  $\Delta$  key for approximately 3 seconds.

● Alarm 1 (A1), 2 (A2) action

(Table 5-2) Alarm 1 (A1), 2 (A2) type selection [AL1F, AL2F] (Default: - - - - : No alarm action)

	H $\square$ $\square$ $\square$ High limit alarm	L $\square$ $\square$ $\square$ Low limit alarm	HL $\square$ $\square$ High/Low limits alarm
Alarm action			
Alarm action			
Alarm action			

: Standby functions.

- A1: Alarm 1  
For Alarm 2 (A2), Read "A2" for "A1".

## 6. Unit operation

After the unit is mounted to the control panel and wiring is completed, operate the unit following the procedures below.

(1) **Turn the power supply to the BCS1 ON.**

(2) **Input each set value.**

Refer to "5. Operation flowchart".

(3) **Turn the load circuit power ON.**

Control action starts so as to keep the control target at the SV (desired value).

## 7. Basic settings

Basic setting method for the Main setting mode and Auto-tuning Perform/Cancel will be described.

Upper characters indicate setting item characters on the PV display.

Lower characters indicate default value on the SV display.

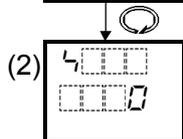
### ● Main setting mode (When setting SV to 100°C)



**Proceed to the Main setting mode.**

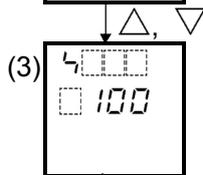
Press the key in the PV/SV display mode.

The unit proceeds to the Main setting mode.



**Set SV (desired value).**

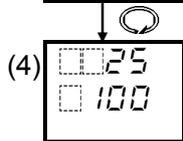
Set SV with the or key.



**Register the SV.**

Register the SV by pressing the key.

The unit reverts to the PV/SV display mode.



**Control starts.**

Control starts so as to keep the measuring temperature at 100°C.

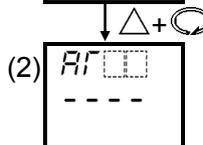
### ● Auto-tuning (AT) Perform/Cancel (PID control)



**Proceed to the Sub setting mode.**

Press the key while pressing the key in the PV/SV display mode.

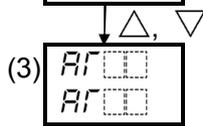
The unit proceeds to the Sub setting mode.



**Select AT/Auto-reset Perform/Cancel.**

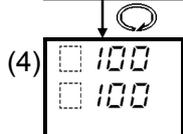
Select AT Perform with the key, or

select AT Cancel with the key.



**Confirm AT Perform/Cancel.**

Press the key. The unit reverts to the PV/SV display mode.



**AT Perform/Cancel**

While AT is performing, the AT indicator flashes, and it goes off if AT is cancelled.

- In order to decide each P, I, D and ARW value automatically, the auto-tuning (AT) process has been made to fluctuate to get an optimal value.
- Sometimes the auto-tuning (AT) process will not fluctuate if auto-tuning is performed at or near room temperature. Therefore auto-tuning (AT) might not finish normally.
- Auto-reset is available for P or PD control action. Auto-reset is cancelled in approx. 4 minutes. It cannot be released while performing this function.

# 8. Specifications

<b>Supply voltage</b>	100 to 240V AC 50/60Hz
<b>Allowable voltage fluctuation</b>	85 to 264V AC
<b>Accuracy (Setting, Indication)</b>	Thermocouple: Within $\pm 0.3\%$ of each input span $\pm 1$ digit, Less than 0°C (32°F): Within $\pm 0.4\%$ of each input span $\pm 1$ digit
	RTD : Within $\pm 0.2\%$ of input span $\pm 1$ digit
<b>Input sampling period</b>	0.5 sec
<b>Control output (OUT)</b>	Relay contact: 1a Control capacity: 3A 250V AC (resistive load) 1A 250V AC (inductive load $\cos\phi=0.4$ ) Electrical life : 100,000 cycles
	Non-contact voltage (for SSR drive): 10 <sup>+</sup> V DC (Max. 20mA DC) Short circuit protected
<b>Circuit insulation configuration</b>	<p>The diagram shows a central vertical bus labeled 'Insulated' with terminals 13 through 18. To the left, terminals 1-6 are connected to Power supply, EV1, and EV2. To the right, terminals 7-12 are connected to OUT (Output) and TC RTD (Input). Terminal 13 is the top of the insulated bus, 14 is the bottom, 15 is the CPU input, 16 is the CPU output, 17 is the TC RTD input, and 18 is the TC RTD output. A note *1 indicates electrical insulation between input and output for the relay contact output, and note *2 indicates no insulation for the non-contact voltage output.</p> <p>*1: For Relay contact output, Input is electrically insulated from Output. *2: For Non-contact voltage output, Input is not electrically insulated from Output.</p>
<b>Insulation resistance</b>	10MΩ or more, at 500V DC
<b>Dielectric strength</b>	Between input terminal and power terminal : 1.5kV AC for 1 minute Between output terminal and power terminal: 1.5kV AC for 1 minute
<b>Power consumption</b>	Approx. 7VA
<b>Ambient temperature</b>	0 to 50°C (32 to 122°F)
<b>Ambient humidity</b>	35 to 85%RH (No icing, Non-condensing)
<b>Weight</b>	Approx. 120g
<b>Accessories included</b>	Mounting frame 1 piece Instruction manual 1 copy
<b>Accessories sold separately</b>	Terminal cover
<b>2 Alarm outputs</b>	Relay contact: 1a Control capacity: 3A 250V AC (resistive load), Electrical life : 100,000 cycles

If you have any inquiries, please consult our agency or the vendor where you purchased the unit.

## SHINKO TECHNOS CO., LTD. OVERSEAS DIVISION

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