INSTRUCTION MANUAL Digital Temperature Indicating Controller BCS3

No.BCS31JE2 2024.11

Thank you for purchasing our Digital Temperature Indicating Controller BCS3.
This manual contains instructions for the mounting, functions, operations and notes when operating the BCS3. To ensure safe and correct use, thoroughly read and understand this manual before using this unit. To prevent accidents arising from the misuse of this unit, 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 2 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 electrical shock or fire, only Shinko or other qualified service personnel may handle the inner assembly.
- To prevent an electrical 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 purpose-of-use consultation with our agency or main office. (Never use this instrument for medical purposes with which human lives are involved.)
- This instrument is designed to be installed through the control panel indoors.
- 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. Proper periodic maintenance is also 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.

Warning on Model Label

⚠ Caution

Failure to handle this instrument properly may result in minor or moderate injury or property damage due to fire, malfunction, malfunction, or electric shock. Please read this manual before using the product to ensure that you fully understand the product.

⚠ 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 weaponsof 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.

Compliance with Safety Standards

⚠ Caution

- Always install the recommended fuse described in this manual externally.
- If the instrument is used in a manner not specified by the manufacturer, the protection provided by the instrument may be impaired.
- Use a device with reinforced insulation or double insulation for the external circuit connected to this product.

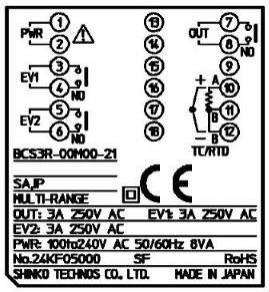
1. Model

1.1 Model

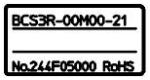
		BCS3	R	-	0	0	M00	-	0	0
Series	BCS3	BCS3								
Control utput (OUT)	Relay contact		R							
	Non-contact voltage		S							
Power supply voltage	100 to 240 V AC					0				
Input	Thermocouple (K, J),RTD (Pt100)						M00			
	Thermocouple (R, S, T)						M01			
Event output (SA option)	No alarm output								0	
	2-points alarm output								2	
Drip-proof / Dust-proof (IP option)	Unavailable									0
	Available									1

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 left side of the inner assembly (Fig.1.2-2).



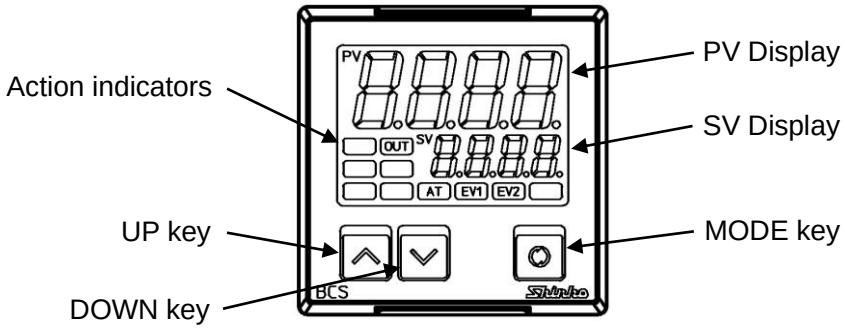
(Fig. 1.2-1)



(Fig. 1.2-2)

(E.g.) Control output (OUT): Relay contact output
Supply voltage: 100 to 240 V AC
Input: Thermocouple (K, J), RTD (Pt100) Multi-input
Event output: 2-points alarm output (SA option)
Drip-proof/Dust-proof (IP option)

2. Name and Functions



(Fig. 2-1)

[Displays]

PV Display (Red): Indicates the PV (process variable) or setting item characters in setting mode.
SV Display (Green): Indicates the SV (desired value), output MV (manipulated variable) or each set value in setting mode.

[Action indicators]

OUT indicator (Green): Lights up when control output (OUT) is ON.
AT indicator (Yellow): Flashes while auto-tuning (AT) or auto-reset is performing.
EV1 indicator (Red): Lights up when Event 1 (A1) output (SA option) is ON.
EV2 indicator (Red): Lights up when Event 2 (A2) output (SA option) is ON.

[Keys]

UP key (∧): Increases the numeric value or makes a selection.
DOWN key (∨): Decreases the numeric value or makes a selection.
MODE key (◎): 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

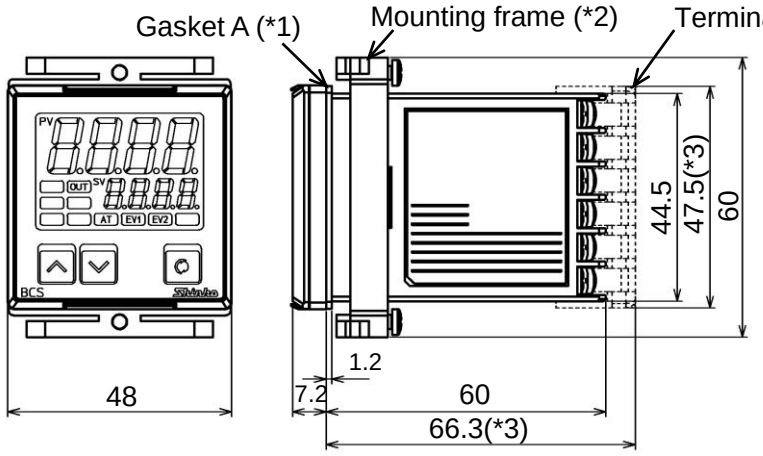
Use within the following temperature and humidity ranges.
Temperature: -10 to 55℃ (14 to 131℉) (No icing), Humidity: 35 to 85 %RH (non-condensing)
If the BCS3 is installed through the face of a control panel, the ambient temperature of the BCS3 - not the ambient temperature of the control panel - must be kept under 55℃, otherwise, the life of electronic parts (especially electrolytic capacitors) of the BCS3 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 -10 to 55℃ (14 to 131℉) 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, chemicals or the vapors of these substances can come into direct contact with the controller

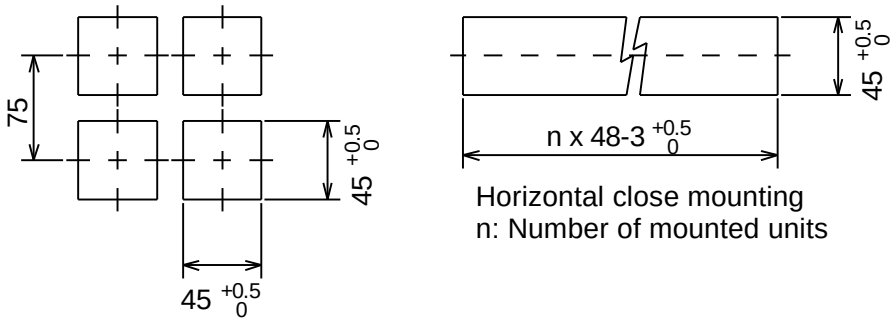
3.2 External Dimensions (Scale: mm)



(*1) Included when Drip-proof/Dust-proof (IP option) is ordered.
(*2) Screws are included when Drip-proof/ Dust-proof (IP option) is ordered.
(*3) When Terminal cover (sold separately) is used.

(Fig. 3.2-1)

3.3 Panel Cutout (Scale: mm)



Horizontal close mounting
n: Number of mounted units

⚠ Caution

If horizontal close mounting is used for the controller, IP66 specification (Drip-proof/Dust-proof) may be compromised, and all warranties will be invalidated.

(Fig. 3.3-1)

3.4 Mounting to, and Removal from the Control Panel

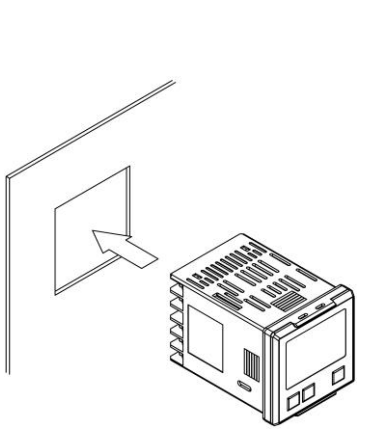
How to mount the BCS3

Mount the controller vertically to a flat, rigid panel.
Mountable panel thickness: 1 to 5 mm

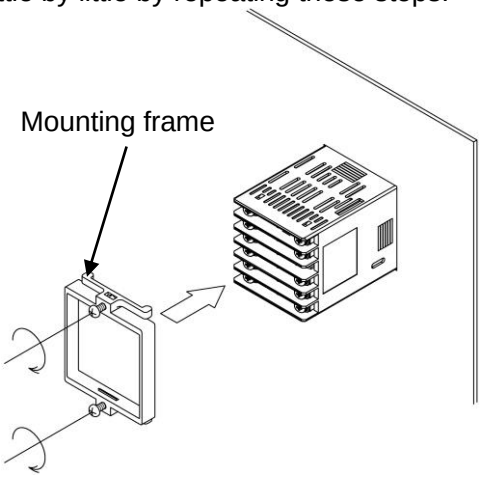
(1) Insert the controller from the front side of the panel. (Fig. 3.4-1)
(2) Insert the mounting frame until it comes into contact with the panel, and fasten with screws.
Tighten screws with one rotation upon the screw tips touching the panel.
The torque is 0.05 to 0.06 N•m. (Fig. 3.4-2)
[Mounting frame screws are included only when Drip-proof/Dust-proof (IP option) is ordered.]

How to remove the mounting frame and the BCS3 (Fig. 3.4-3)

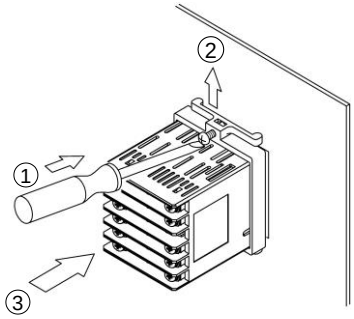
(1) Turn the power to the unit OFF, and disconnect all wires before removing the mounting frame and unit.
(2) Insert a flat blade screwdriver between the mounting frame and unit ①.
(3) Slowly push the frame upward using the screwdriver ②, while pushing the unit toward the panel ③.
(4) Repeat step (2) 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

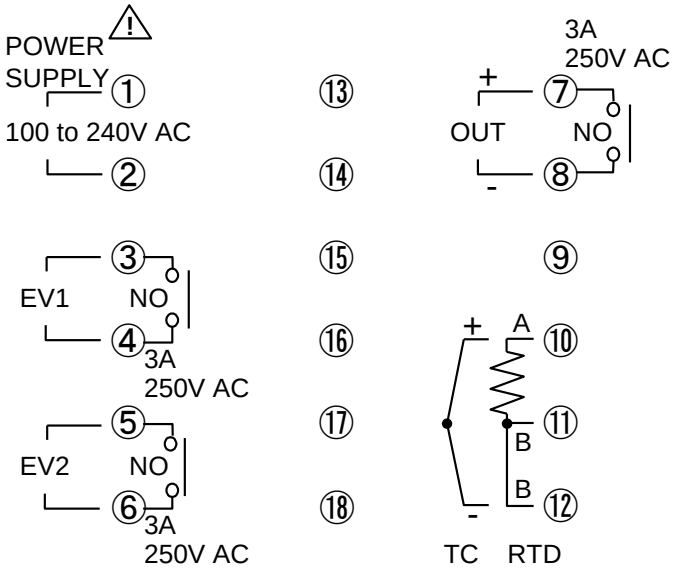
⚠ Warning

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 electrical 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 0.63 N•m.
- To extend a thermocouple's lead wire, be sure to use a compensating lead wire in accordance with the sensor input specifications.
  (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 and fuse. It is necessary to install a power switch, circuit breaker and fuse near the controller.
  (Recommended fuse: Time-lag fuse, rated voltage 250 V AC, rated current 2 A)
- 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 controller AC sources or load wires.

4.1 Terminal Arrangement



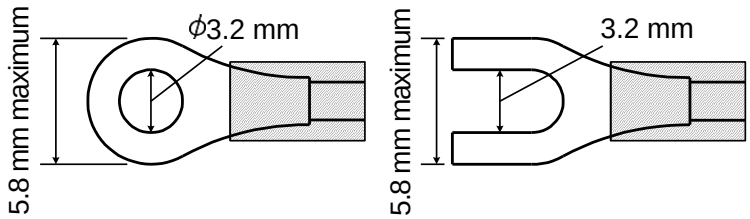
- POWER SUPPLY: 100 to 240 V AC
- EV1: Event 1 (A1) output (SA option)
- EV2: Event 2 (A2) output (SA option)
- OUT: Control output
- TC: Thermocouple input
- RTD: RTD input

(Fig. 4.1-1)

4.2 Lead Wire Solderless Terminal

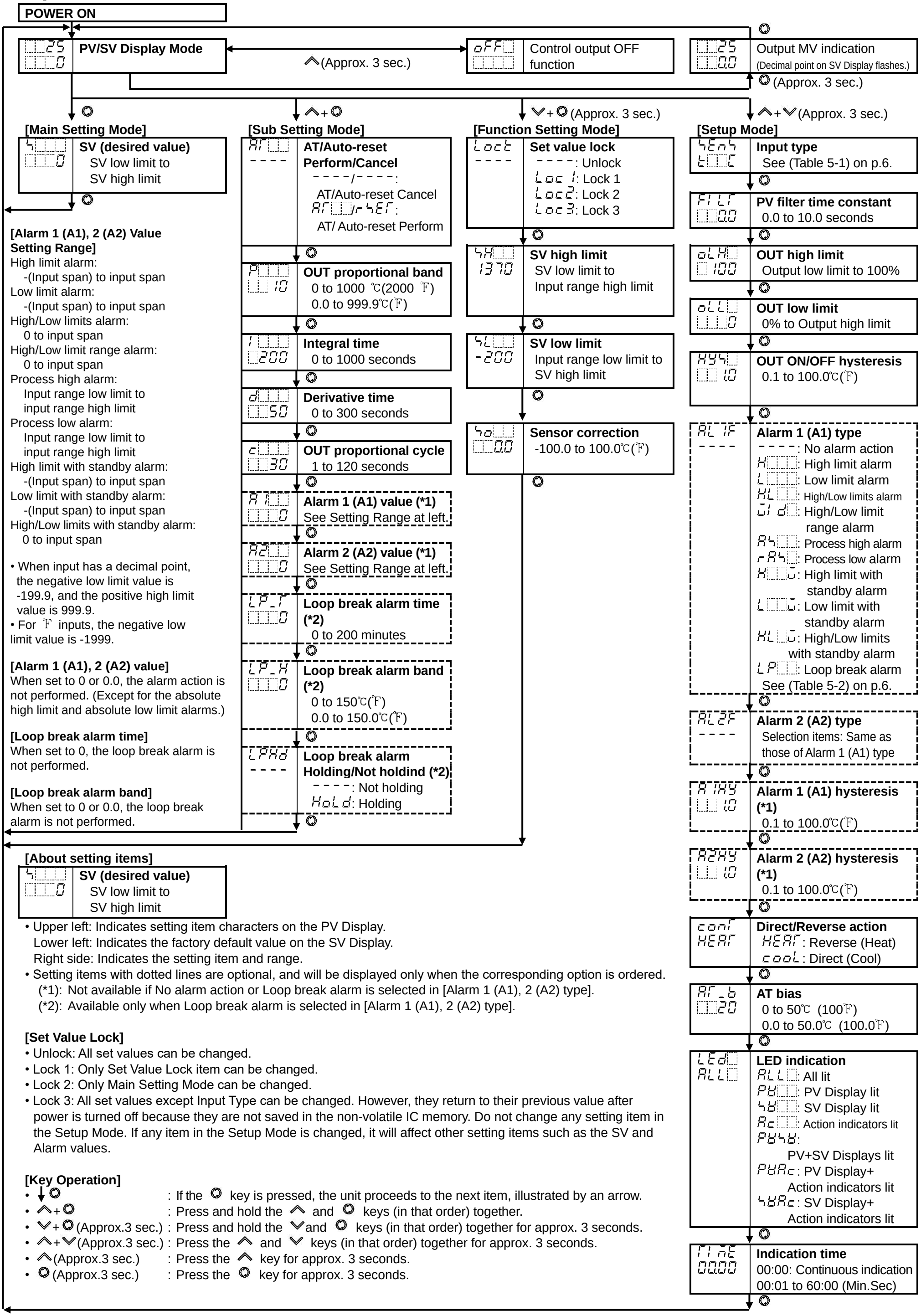
Use a solderless terminal with an insulation sleeve in which an M3 screw fits as shown below.
The torque should be 0.63 N•m.

Solderless Terminal	Manufacturer	Model	Tightening Torque
Y-type	NICHIFU TERMINAL INDUSTRIES CO., LTD.	TMEX1.25Y-3	0.63 N•m
	J.S.T.MFG.CO.,LTD.	VD1.25-B3A	
Ring-type	NICHIFU TERMINAL INDUSTRIES CO., LTD.	TMEX1.25-3	
	J.S.T.MFG.CO.,LTD.	V1.25-3	



(Fig. 4.2-1)

5. Operation Flowchart



● Indication after the power is turned 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).

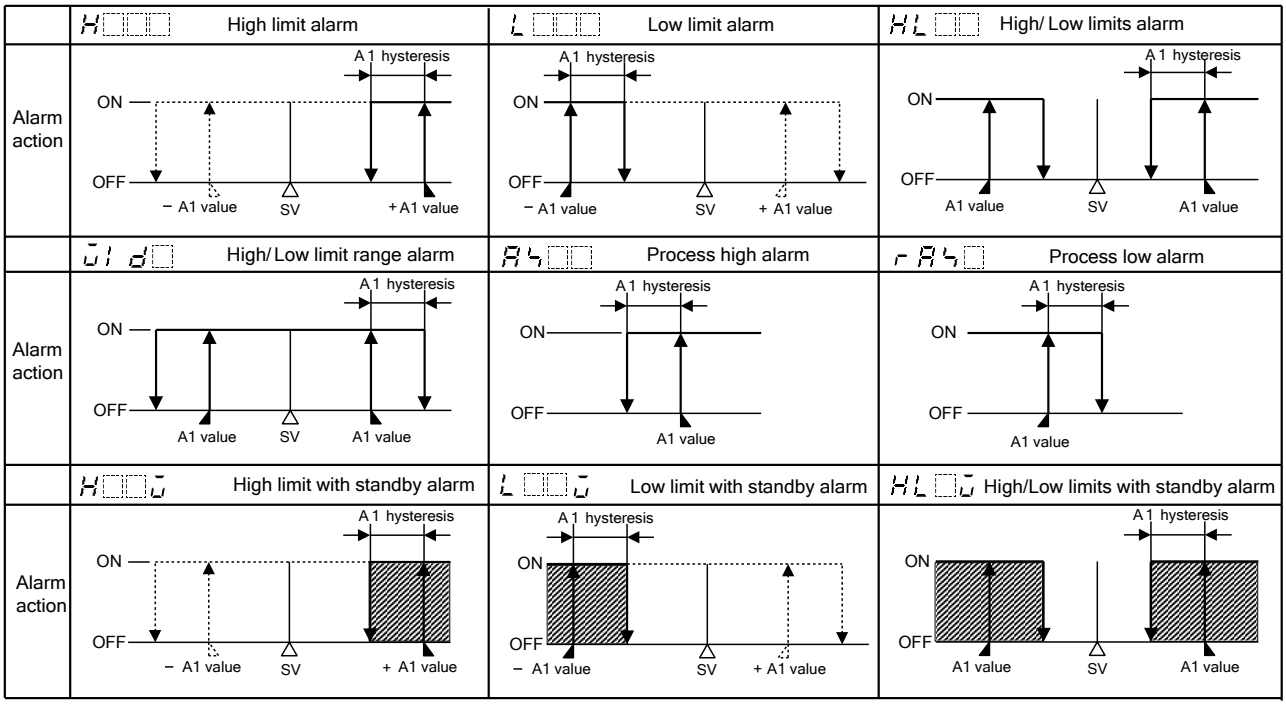
(Table 5-1)

Input		℃			℉		
		PV Display	SV Display	Setting Range	PV Display	SV Display	Setting Range
M00	K	tC	1370	-200 to 1370℃	tF	2500	-320 to 2500℉
	J	JC	1000	-200 to 1000℃	JF	1800	-320 to 1800℉
	Pt100	Pt.C	850.0	-199.9 to 850.0℃	Pt.F	999.9	-199.9 to 999.9℉
M01	R	rC	1760	0 to 1760℃	rF	3200	0 to 3200℉
	S	SC	1760	0 to 1760℃	SF	3200	0 to 3200℉
	T	TC	400.0	-199.9 to 400.0℃	TF	750.0	-199.9 to 750.0℉

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 the Control output OFF function is working, the PV Display indicates oFF□.
To cancel the Control output OFF function, press the ∧ key for approximately 3 seconds.

● Alarm 1 (A1), 2 (A2) Action

(Table 5-2) Alarm 1 (A1), 2 (A2) type [AL 1F, AL2F] (Factory default: ----: No alarm action)



: Alarm output is in standby.

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

● Loop Break Alarm

The alarm will be activated when the PV does not **rise** as much as, or more than the band within the time it takes to assess the loop break alarm after the output manipulated variable has reached 100% or the output high limit value. The alarm will also be activated when the PV does not **fall** as much as, or more than the band within the time it takes to assess the loop break alarm after the output manipulated variable has reached 0% or the output low limit value.

For the Direct (Cooling) control action, read “**fall**” for “**rise**” and vice versa.

● **Characters Used in this Manual**:

Indication	-1	0	1	2	3	4	5	6	7	8	9	℃	℉
Number, ℃/℉	-1	0	1	2	3	4	5	6	7	8	9	℃	℉
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

6. Operation

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

(1) Turn the power supply to the BCS3 ON.

(2) Input each set value.

Refer to “5. Operation Flowchart”.

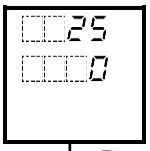
(3) Turn the load circuit power ON.

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

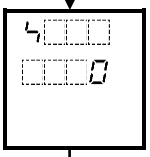
7. Basic Settings

Basic setting method for the Main Setting Mode and AT Perform/Cancel are described below.
Upper characters indicate setting item characters on the PV Display.
Lower characters indicate factory default value on the SV Display.

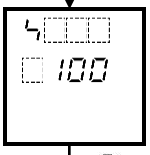
● **Main Setting Mode** (When setting SV to 100℃)

(1) 

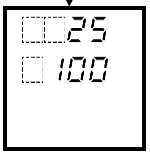
Enter the Main Setting Mode.
Press the (O) key in the PV/SV Display Mode. The unit enters the Main Setting Mode.

(2) 

Set SV (desired value).
Set SV with the ^ or v key.

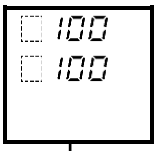
(3) 

Register the SV.
Register the SV by pressing the (O) key. The unit reverts to the PV/SV Display Mode.

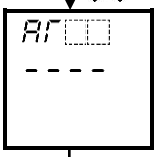
(4) 

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

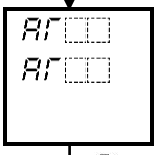
● **AT Perform/Cancel (in PID control)**

(1) 

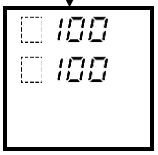
Enter the Sub Setting Mode.
Press the (O) key while pressing the ^ key in the PV/SV Display Mode. The unit enters the Sub Setting Mode.

(2) 

Select AT/Auto-reset Perform/Cancel.
Select “AT Perform” with the ^ key, or select “AT Cancel” with the v key.

(3) 

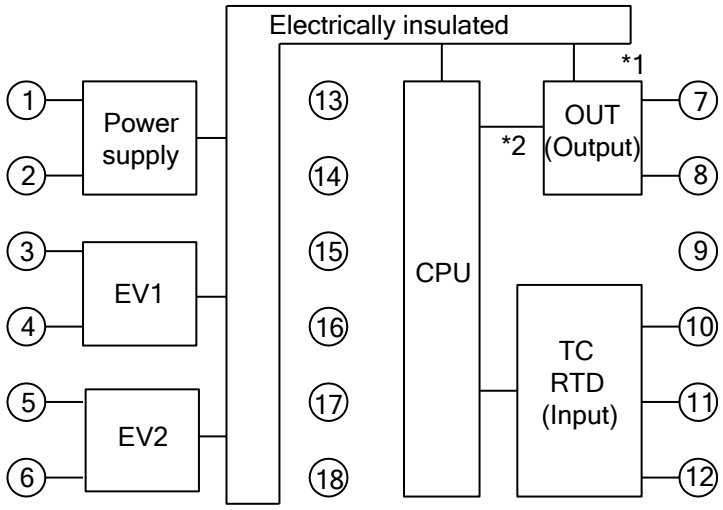
Confirm AT Perform/Cancel.
Press the (O) key. The unit reverts to the PV/SV Display Mode.

(4) 

AT Perform/Cancel
While AT is performing, the AT indicator flashes. It goes off if AT is cancelled.

- In order to decide each P, I, D value automatically, the auto-tuning (AT) process has been made to fluctuate in order to achieve 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) may 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

Power supply voltage	100 to 240 V AC 50/60 Hz
Allowable voltage fluctuation	85 to 264 V AC
Accuracy (Setting, Indication)	Thermocouple: Within ±0.3% of each input span±1 digit, Less than 0℃ (32℉): Within ±0.4% of each input span±1 digit However, R, S inputs, 0 to 200℃ (32 to 392℉): Within ±8℃ (46℉)
	RTD: Within ±0.2% of input span±1 digit
Input sampling period	500 ms
Control output (OUT)	Relay contact: 1a Control capacity: 3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load cosϕ=0.4) Electrical life: 100,000 cycles
	Non-contact voltage (for SSR drive): 10^{+3}_{0} V DC (Max. 20 mA DC)
Circuit insulation configuration	 *1: For Relay contact output, Input is electrically insulated from Output. *2: For Non-contact voltage output, Input is not electrically insulated from Output.
Insulation resistance	10 MΩ minimum, at 500 V DC
Dielectric strength	Between input terminal and power terminal: 1.5 kV AC for 1 minute Between output terminal and power terminal: 1.5 kV AC for 1 minute
Power consumption	Approx. 8 VA
Ambient temperature	-10 to 55℃ (14 to 131℉)
Ambient humidity	35 to 85 %RH (Non-condensing)
Altitude	2,000 m or less
Weight	Approx. 94 g
Accessories included	Mounting frame: 1 piece [Screws are included only when the Drip-proof/Dust-proof (IP option) is ordered.] Instruction manual: 1 copy Gasket A (Front mounted to the BCS3): 1 piece [when Drip-proof/Dust-proof (IP option) is ordered.]
Accessories sold separately	Terminal cover
Environmental specification	RoHS directive compliant
Event output (2-points) (SA option)	Relay contact: 1a Control capacity: 3 A 250 V AC (resistive load), Electrical life: 100,000 cycles
Drip-proof/ Dust-proof (IP option)	IP65 for the front panel, IP20 for the rear case, IP00 for the terminals

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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