Preface

Thank you for purchasing our Digital Deviation Indicating Temperature Controller RC-600.
This manual contains instructions for the mounting, functions, operations and notes when operating the RC-600.
To prevent accidents arising from the misuse of this controller, please ensure the operator receives this manual.

Abbreviations used in this manual

Symbol	Term
PV	Process variable
SV	Desired value

Characters used in this manual

Indication	0	1	2	3	4	5	6	7	8	9	C	F	A	J	t
Number, ℃/℉, Alphabet	0	1	2	3	4	5	6	7	8	9	℃	℉	A	J	K

⚠ Caution

• This instrument should be used in accordance with the specifications described in the manual.
  If it is not used according to the specifications, it may malfunction or cause a fire.
• Be sure to follow the warnings, cautions and notices. If they are not observed, serious injury or malfunction may occur.
• The contents of this instruction manual are subject to change without notice.
• Care has been taken to assure that the contents of this instruction manual are correct, but if there are any doubts, mistakes or questions, please inform our sales department.
• This instrument is designed to be installed through a control panel. If it is not, measures must be taken to ensure that the operator cannot touch power terminals or other high voltage sections.
• Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
• Shinko Technos CO., LTD. is not liable for any damage or secondary damage(s) incurred as a result of using this product, including any indirect damage.

Safety precautions (Be sure to read these precautions before using our products.)

The safety precautions are classified into categories: "Warning" and "Caution". Depending on the circumstances, procedures indicated by ⚠ Caution may be linked to serious results, so be sure to follow the directions for usage.

⚠ **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, 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.)
• External protection devices such as protective 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

RC-6 □ □ - □ / □, □					Series name: RC-600, 48x96x115mm (WxHxD)
Control action (*1)	1				ON/OFF control
	2				PD control
Alarm type (*2)		0			No alarm action
		1			High limit alarm
		1		H	High limit alarm with standby
		2			Low limit alarm
		2		H	Low limit alarm with standby
		4			High/Low limits alarm
		4		H	High/Low limits alarm with standby
		6			High/Low limit range alarm
		8			Process high alarm
		9			Process low alarm
Control output			R		Relay contact: 1a
			S		Non-contact voltage (for SSR drive): 12V DC±15%
			A		DC current: 4 to 20mA DC
Input				E	Thermocouple input (K, J)

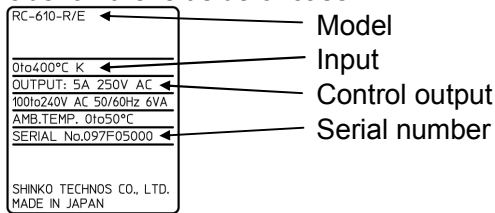(*1): Control action can be selected using the DIP switch.
(*2): If Alarm types other than No alarm action are ordered, the Rotary switch will be equipped, and with which alarm action can be set.
   For Alarms with standby function, "H" is entered at the end of the model.
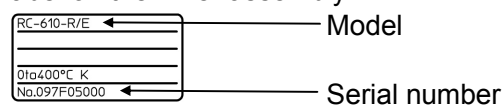
1.2 How to read the model label

The model label is attached to the left side of case and inner assembly.
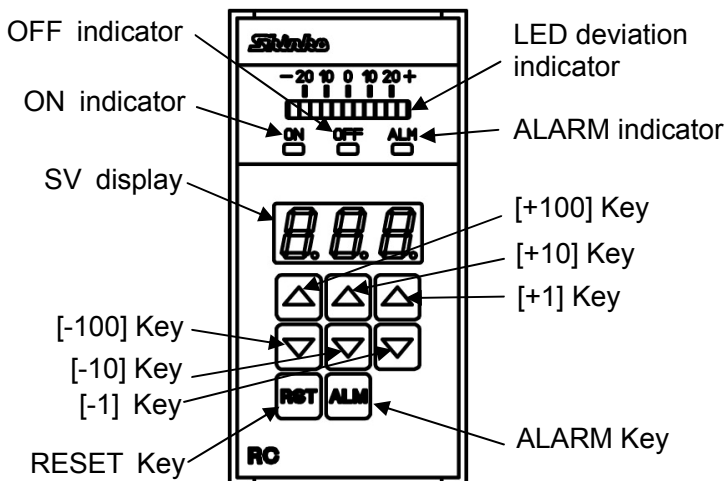• Label on the left side of case

RC-610-R/E ← Model
0to400℃ K ← Input
OUTPUT: 5A 250V AC ← Control output
100to240V AC 50/60Hz 6VA
AMB.TEMP. 0to50℃
SERIAL No.097F05000 ← Serial number

SHINKO TECHNOS CO., LTD.
MADE IN JAPAN

(Fig. 1.2-1)

• label on the Inner assembly

RC-610-R/E ← Model
0to400℃ K
No.097F05000 ← Serial number

(Fig. 1.2-2)

2. Name and functions of sections

OFF indicator
ON indicator
SV display
[-100] Key
[-10] Key
[-1] Key
RESET Key
LED deviation indicator
ALARM indicator
[+100] Key
[+10] Key
[+1] Key
ALARM Key

(Fig. 2-1)

LED deviation indicator:
   Deviation (between SV and PV) from the SV is shown with one single bar being lit from -20 to +20℃ (℉) (Red/Orange/Green LED bar graph).
   For a deviation smaller than -20℃ (℉), the last bar (red) at the left end will light.
   For a deviation greater than +20℃ (℉), the last bar (red) at the right end will light.
   Flashes while auto-reset is performing.
   The left (- side) 4 bars (orange, red) flashes in underscale.
   The right (+ side) 4 bars (orange, red) flashes in overscale.
SV display:
   Indicates SV with the green LED.
   In the alarm setting mode, setting characters and alarm value are alternately indicated.
ON indicator:
   The green LED lights when control output is ON.
   (For DC current output type, it flashes corresponding to the output manipulated variable in 250ms cycles.)

OFF indicator   : The red LED lights when control output is OFF. (Unlit in the case of DC current output type)
ALARM indicator   : The red LED lights when alarm output is ON.
[+100], [+10], [+1] Keys: Increases the numerical value by 100, 10 and 1.
[-100], [-10], [-1] Keys : Decreases the numerical value by 100, 10 and 1.
RESET Key   : Performs auto-reset by pressing for 3 seconds in PD control.
ALARM Key   : Moves to the Alarm setting mode by pressing for 3 seconds.

3. Setup

Setup should occur before using this controller, to set the Control action and Alarm type according to the users' conditions, using the DIP switch (SW302) and Rotary switch (SW301).
Default values: PD control, No alarm action
If the users' specification is the same as the default value of the RC-600, it is not necessary to set up the controller.

3.1 Taking the internal assembly out

Before the power supply to this instrument is turned on, take the internal assembly out from the case in the direction indicated by the arrow by holding the latches (top and bottom of the instrument).
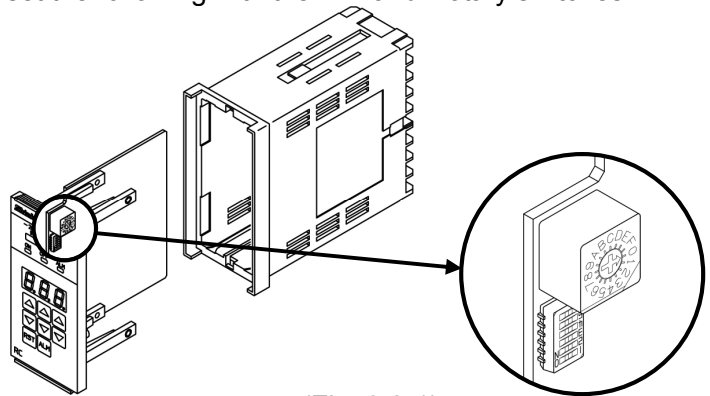
3.2 Switches setting

A control action can be selected with the DIP switch (SW302).
When Alarm types other than No alarm action are ordered, Rotary switch (SW301) will be equipped, and alarm action can be selected.
Using a small flat blade screwdriver and tweezers, set the following with the DIP and Rotary switches.
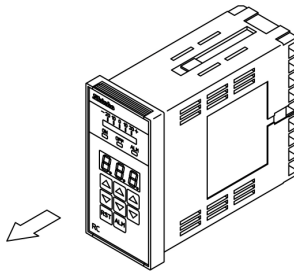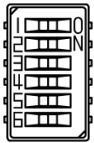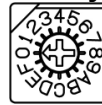
(Fig. 3.1-1)   (Fig. 3.2-1)

• Control action selection: DIP switch (SW302)

Switch		Control action
No.	ON/OFF	
1	OFF	PD control
	ON	ON/OFF control
2	OFF	Not used. (Keep in OFF status.)
3		
4		
5		
6		

• Alarm type selection: Rotary switch (SW301)

Switch No.	Alarm type
0	No alarm action
1	High limit alarm
2	High limit alarm with standby
3	Low limit alarm
4	Low limit alarm with standby
5	H/L limits alarm
6	H/L limits alarm with standby
7	H/L limit range alarm
8	Process high alarm
9	Process low alarm
A to F	Not used

3.3 Inserting the inner assembly into the case.

By holding the latches (top and bottom of the instrument), insert the inner assembly into the case.

4. Mounting to the control panel

4.1 Site selection

> ### ⚠ Caution
>
> Use within the following temperature and humidity ranges.
> Temperature: 0 to 50℃ (32 to 122℉) (No icing), Humidity: 35 to 85%RH (Non-condensing)
> If the RC-600 is installed within a control panel, the ambient temperature of the unit must be kept to under 50℃. Otherwise the life of electronic parts (especially electrolytic capacitors) of the unit 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
• No mechanical vibrations or shocks
• No exposure to direct sunlight, an ambient temperature of 0 to 50℃ (32 to 122℉) that does not change rapidly
• 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 unit

4.2 External dimensions (Scale: mm)

Screw type mounting bracket
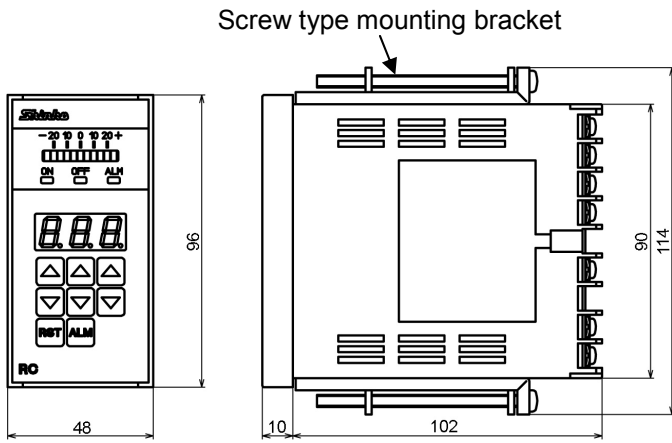
(Fig. 4.2-1)

4.3 Panel cutout (Scale: mm)

Lateral close mounting
n: Number of units mounted
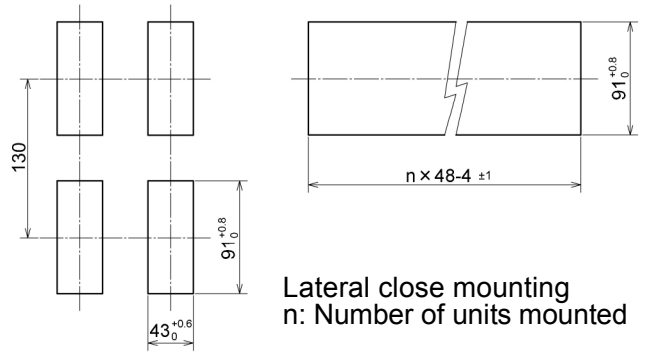
(Fig. 4.3-1)

4.4 Mounting and removal
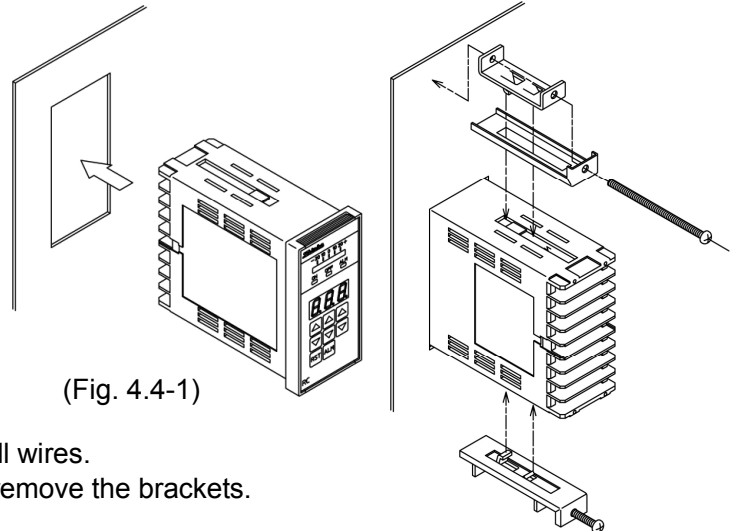
⚠ Caution

As the case is made of resin, do not use excessive force while screwing in the mounting bracket, or the case could be damaged.
The torque should be 0.12N•m.

Mounting

Mount the controller vertically to a flat, rigid panel.
Mountable panel thickness: 1 to 15mm
(1) Insert the unit from the front of the panel. (Fig. 4.4-1)
(2) Attach the mounting brackets to the slots at the top and bottom of the case, and secure the controller in place with the screws provided. (Fig. 4.4-2)

Removal

(1) Turn the power to the unit OFF, and disconnect all wires.
(2) Unfasten screws of the mounting brackets, and remove the brackets.
(3) Pull the unit out from the front of the panel.

(Fig. 4.4-1)

(Fig. 4.4-2)

5. Wiring

⚠ Warning

Turn the power supply to the instrument off before wiring or checking.
Working 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 by the terminal screw. The torque should be 0.63N•m.
• Use a thermocouple and compensating lead wire according to 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 according to the capacity of the load to protect the built-in relay contact.
• When wiring, keep input wires (thermocouple, RTD, etc.) away from AC sources or load wires.
• Do not apply a commercial power source to the sensor which is connected to the input terminal nor allow the power source to come into contact with the sensor.

5.1 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 0.63N•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	
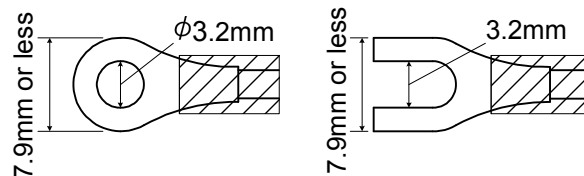
(Fig. 5.1-1)

5.2 Terminal arrangement
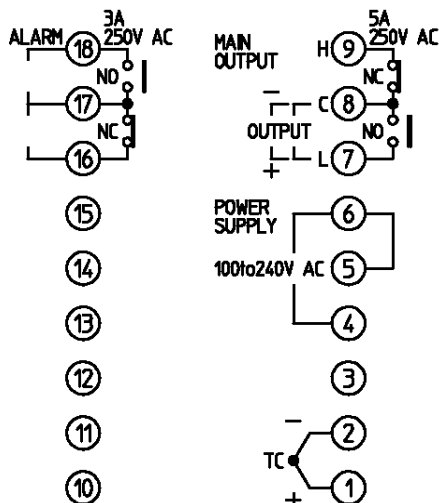
TC : Thermocouple input
100 to 240V AC : Supply voltage
MAIN OUTPUT : Control output
ALARM : Alarm output

(Fig. 5.2-1)

5.3 Wiring example

RC-620-S/E
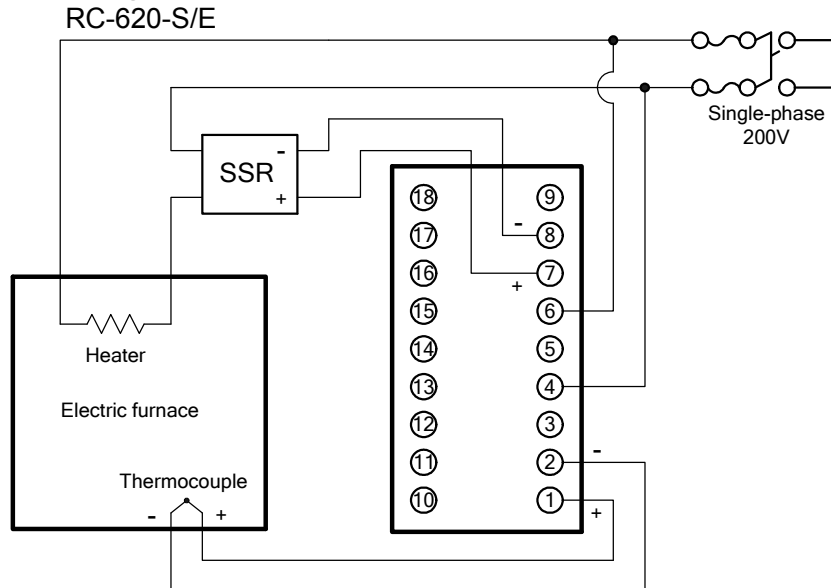
• Number of units when connecting Shinko SSR in parallel:
   SA-300-Z series: 4 units,   SA-400 series: 5 units
• For Relay contact output, to prevent the unit being damaged by the harmful effects of unexpected high level noise, it is recommended that a surge absorber be installed between the electromagnetic switch coils.

(Fig. 5.3-1)

6. Operation

6.1 Starting operation

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

(1) Switch power supply to the RC-600 ON.

For approx. 3sec after power-on, sensor input character and temperature unit [K: t C, t F, J: J C, J F] are indicated on the SV display. During this time, all outputs and LED indicators are in OFF status. After that, SV is indicated on the SV display.

(2) Input each set value.

① **SV setting**

Set the SV using the [+100], [+10], [+1], [-100], [-10] and [-1] Keys.

② **Alarm value setting**

Set alarm values.
The alarm action point is set by ±deviation from the SV (except Process alarm). When the PV goes outside the range, the alarm output turns ON.
By pressing the ALARM Key for 3 sec, the unit enters the Alarm setting mode, and the SV display alternately indicates [A] and the alarm value.
Set values using the [+100], [+10], [+1], [-100], [-10], [-1] Keys. For the setting range, see (Table 6.1-1).
Even though alarm value is set to "0", alarm will be activated. If the ALARM Key is pressed in the Alarm setting mode, the alarm value will be registered and the Alarm setting mode will end. If No alarm action is selected during Alarm type selection, the Alarm setting mode will not appear.
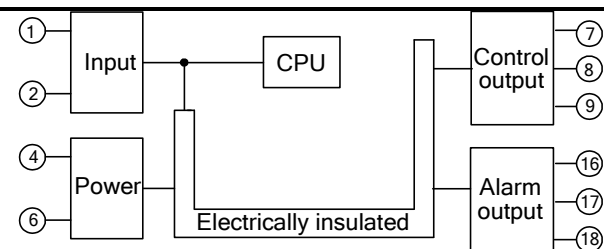
(Table 6.1-1)

Alarm type	Setting range
High limit alarm	-199 to input span℃ (℉)
High limit alarm with standby	-199 to input span℃ (℉)
Low limit alarm	-199 to input span℃ (℉)
Low limit alarm with standby	-199 to input span℃ (℉)
H/L limits alarm	0 to input span℃ (℉)
H/L limits alarm with standby	0 to input span℃ (℉)
H/L limit range alarm	0 to input span℃ (℉)
Process high alarm	0 to input span℃ (℉)
Process low alarm	0 to input span℃ (℉)

(3) Turn the load circuit power ON.   Control action starts so as to keep the control target at the SV.

6.2 Performing Auto-reset (offset correction)

Auto-reset can be performed in PD control.
It cannot be performed in ON/OFF control.
When PV is stabilized (stable indication of the PV) within the proportional band, press the RESET Key for 3 sec. Auto-reset will be performed, and offset will be automatically corrected.
While auto-reset is performing, one bar of the LED deviation indicator flashes depending on deviation between SV and PV.
Since the corrected value is internally memorized,
it is not necessary to perform the auto-reset again as long as the process is the same.
Auto-reset is finished in approximately 4 minutes. It cannot be released while performing this function.

(Fig. 6.2-1)

7. Action explanation

7.1 Control output action

: ON or OFF   ?

For DC current output, the OFFindicator is unlit.

7.2 Alarm action

: Standby functions.

• Alarm output: Use terminals 17, 18.
• ALARM indicator: Lights when alarm output terminals 17 and 18 are connected (ON), and goes off when they are disconnected (OFF).

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8. Specifications

Rating	Rated input	Input	Input range		Resolution
		K	0 to 400℃	0 to 999℉	1℃ (℉)
		J	0 to 400℃	0 to 999℉	1℃ (℉)
	Input type	Thermocouple: K, J,　External resistance: 100Ω or less			
	Supply voltage	100 to 240V AC　50/60Hz			
	Allowable voltage fluctuation range	85 to 264V AC			
General structure	Dimensions	48 x 96 x 115mm (W x H x D)			
	Mounting	Flush			
	Case	Material: Flame-resistant resin　　Color: Dark gray			
	Front panel	Membrane sheet			
Indication structure	Display	Deviation indicator: Red/Orange/Green LED bar graph, 11-bars　Size 3.5 x 25mm (H x W)　SV display: Green LED 3-digit, Character size: 10.16 x 5.59mm (H x W)			
Setting structure	Setting method	Membrane sheet key			
Indication performance	Indication accuracy	Within 1 bar [Resolution 5℃ (℉)]			
	Input sampling period	250ms			
Control performance	Setting accuracy	Within ±0.3% of each input span±1digit or within 2℃(4℉), whichever is greater			
	Control action	PD control (with Auto-reset function, DIP switch No.1: OFF)　ON/OFF control (DIP switch No.1: ON)			

Control action sub-table:

Proportional band	10℃ (20℉)
Derivative time	50sec
Proportional cycle	Relay contact output: 30sec,　Non-contact voltage output: 3sec,　DC current output: Not available
ON/OFF hysteresis	1℃ (2℉)

Control output:

Relay contact, 1c	Control capacity: 5A 250V AC (resistive load)　2A 250V AC (inductive load, cosφ=0.4)　Electrical life: 100,000 cycles
Non-contact voltage (for SSR drive)	12V DC±15%, Max. 40mA DC (short circuit protected)
DC current	4 to 20mA DC (Resolution: 12000)　Load resistance, max. 600Ω

Alarm function — Alarm output:

Setting accuracy	The same as that of Control performance
Action	ON/OFF action
Hysteresis	1℃ (2℉)
Output	Relay contact, 1c　Control capacity: 3A 250V AC (resistive load)　1A 250V AC (inductive load, cosφ=0.4)　Electrical life: 100,000 cycles

Insulation/ Dielectric strength	Circuit insulation configuration	

	Insulation resistance	10MΩ or more, at 500V DC (between each terminal)
	Dielectric strength	1.5kV AC for 1minute, Between input terminal and power terminal,　Between output terminal and power terminal
Attached functions	Power failure countermeasure	The setting data is backed up in the non-volatile IC memory.
	Self-diagnosis	The CPU is monitored by a watchdog timer, and if an abnormal status is found on the CPU, the controller is switched to warm-up status.
	Automatic cold junction temperature compensation	This detects the temperature at the connecting terminal between the thermocouple and the instrument, and always maintains it at the same status as if the reference junction location temperature was at 0℃ (32℉).

Attached functions	Burnout	If the thermocouple input is burnt out, control output is turned OFF (for DC current output type, 4mA), and the LED bar graph [+ side 4 bars (orange, red)] flashes.
	Warm-up indication	Sensor input character and temperature unit [K: K: ヒ□℃, ヒ□℉, J: J□℃, J□℉] are indicated on the SV display for approximately 3 seconds after power-on.
	User specified	Input range : Shipped as specified input range. 　　　　　　　　Specified range: 0 to 999℃ (℉) ON/OFF hysteresis : Shipped as specified ON/OFF hysteresis. 　　　　　　　　Specified range: 0.1 to 100.0℃ (℉)
Other	Power consumption	Approx. 6VA
	Ambient temperature	0 to 50℃ (32 to 122℉)
	Ambient humidity	35 to 85%RH (non-condensing)
	Weight	Approx. 280g
	Accessories included	Mounting brackets (1 set), Instruction manual (1 copy)

9. Troubleshooting

If any malfunctions occur, refer to the following items after checking the power is being supplied to the controller.

Problem	Controller status LED deviation & other indicators	Presumed cause and solution
Temperature does not rise.	LED deviation indicator (+ side) flashes.	• Disconnection of thermocouple or compensating lead wire • Imperfect connection at the input terminal section
	LED deviation indicator (- side) flashes.	• Burnout or imperfect connection of heater • Malfunction of the control equipment such as electromagnetic switch, SSR. • Fuse burnout
	LED deviation indicator 0 (zero) position unchanged	• Burnout or imperfect connection at the power circuit • Specified voltage has not been applied.
Temperature rises too much.	LED deviation indicator (+ side) flashes.	• Malfunction of electromagnetic switch contact • Malfunction of control equipment such as SSR
	LED deviation indicator (- side) flalshes.	• Short circuit of thermocouple • Improper mounting (insertion) of thermocouple • Reversed polarity of thermocouple or compensating lead wire
	LED deviation indicator indicates near 0 (zero) position. ON and OFF indicators work normally.	• Electrically imperfect insulation in the input circuit • Incorrect mounting (insertion) of the input circuit
────────	LED deviation indicator fluctuates or is unstable.	• There may be equipment that interferes with or makes noise near the controller. • Imperfect connection at the terminal section.
No alarm output	LED deviation indicator is normal. ALARM indicator (red) lights.	• Alarm output control circuit is malfunctioning.
SV and alarm value cannot be set.	────────────	• Auto-reset is performing. It is finished in approx. 4 minutes.

***** Inquiry *****
For any inquiries about this unit, please contact our agency or the vendor where you purchased the unit after checking the following.

[Example]
• Model ------------------------- RC-620-R/E
• Serial number ----------------- No. 097F05000
In addition to the above, please let us know the details of the malfunction, if any, and the operating conditions.