INSTRUCTION MANUAL

FOR

MICROCOMPUTER BASED

TEMPERATURE INDICATING CONTROLLER

GCD-200, GCR-200

PV

SV

OUT1   OUT2/HB   A1   A2

MODE   OUT / OFF

GCD   Shinko

PV

SV

OUT1 OUT2/HB A1   A2

MODE   OUT / OFF

GCR   Shinko
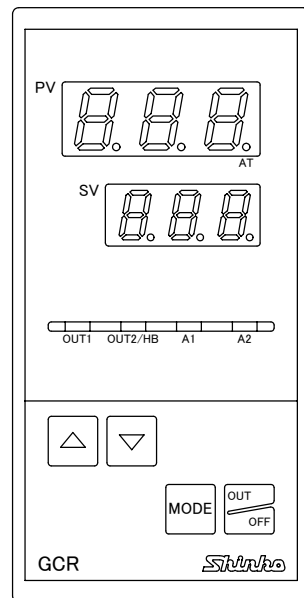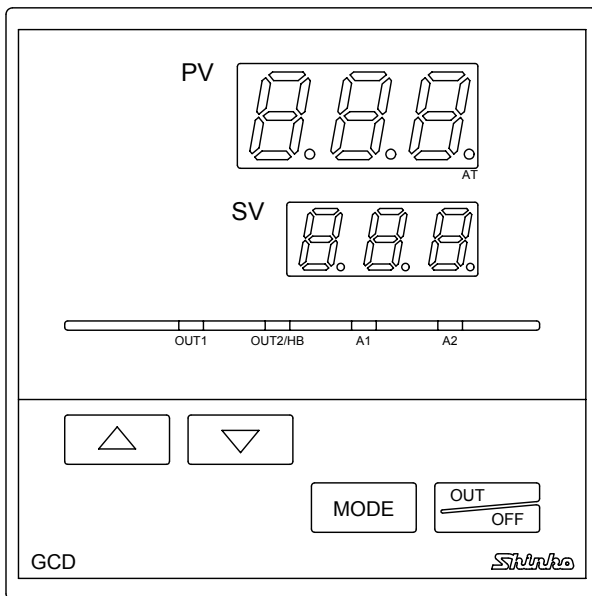
Shinko

Preface

Thank you for the purchase of our Microcomputer based Temperature Indicating Controllers GCD-200 or GCR-200.

This manual contains instructions for the mounting, functions, operations and notes when operating the GCD-200 or GCR-200.

For model confirmation and unit specifications, please read this manual carefully before starting operation.

> **To prevent accidents arising from the use of this controller, please ensure the operator using it receives this manual.**

Notes

- This instrument should be used according to the specifications described in the manual. If it is used outside the specifications, it may malfunction or cause fire.
- Be sure to follow the warnings, cautions and notices. If not, it could cause serious injury or malfunction.
- Specifications of the GCD-200 and GCR-200 and 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.
- Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
- Shinko Technos is not responsible for any damages or secondary damages incurred as a result of using this product, including any indirect damages.

SAFETY PRECAUTIONS

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

The safety precautions are classified into categories: "Warning" and "Caution".

Depending on 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.

1. Installation precautions

⚠ **Caution**

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

Overvoltage category Ⅱ, Pollution degree 2

Mount the controller in a place with:
- **A minimum of dust, and an absense of corrosive gasses**
- **No flammable, expolsive gasses**
- **No mechanical vibrations or shocks**
- **No exposure to direct sunlight, an ambient temperature of 0 to 50℃ (32 to 122℉) that does not change suddenly**
- **An ambient non-condensing humidity of 35 to 85%RH**
- **The units away from large capacity electromagnetic switches or cables**
- **No water, oil or chemicals or where the vapors of these substances can come into direct contact with the unit**

Note: Do not install this instrument near flammable material though the case of this instrument is made of flame resisting resin.
Avoid setting this instrument directly on flammable material.

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

2. Wiring precautions

⚠ **Caution**

- **Use the solderless terminal with an insulation sleeve that fits an M3 screw when wiring the GCD-200 or GCR-200,.**
- **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.**
- **Tighten the terminal screw within the specified torque. If excessive force is applied to the screw when tightening, the screw or case may be damaged.**

⚠ Caution

- 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, as the input circuit may be burnt out.
- This controller has neither a built-in power switch nor a fuse. It is necessary to install them near the controller.
  (Recommended fuse: Time-lag fuse, Rated voltage 250V, Rated current 2A)
- It is recommended that the PID auto-tuning be performed on the trial run.

3. Running and maintenance precautions

⚠ Warning

- Do not touch live terminals. This may cause electric shock or problems in operation.
- Turn the power supplied to the instrunment OFF when retightening the terminal and cleaning
  Working or touching the terminal with the power switched ON may result in an Electric Shock which could cause severe injury or death.
- Wipe the instrument using a soft dry cloth.
  (If the paint thinner is used for wiping, the instrument may be deformed or discolored.)
- The display parts are more easily damaged. Do not strike them with hard objects or press hard on them.

--- CONTENTS ---

1. Model names

1.1 Model names

Standard models

G C□ – 2 3 □– □/ □					Series name: GC□ – 200
Series name	D				GCD-200: 96 (W) x 96 (H) x 100 (D) mm
	R				GCR-200: 48 (W)x 96 (H) x 100 (D) mm
Control action		3			PID control
Temperature alarm (A1)			0		Alarm action is not applied
			A		Alarm action is applied.　*1
Control output (OUT1)				R	Relay contact
				S	Non-contact voltage (for SSR drive)
				A	DC current
Input				E	Thermocouple: K, J, E
				R	RTD: Pt100, JPt100

*1: One alarm action can be selected from 9 types of alarm action (including No alarm action) by keypad operation.

Alphanumeric character to represent the functions or type is applied to the □ .

[Example]

```
G C D – 2 3 A – R / E,  W
```
- Heater burnout alarm output
- Thermocouple input
- Relay contact output
- Temperature alarm action is applied
- 96 (W) x 96 (H) x 100 (D)mm
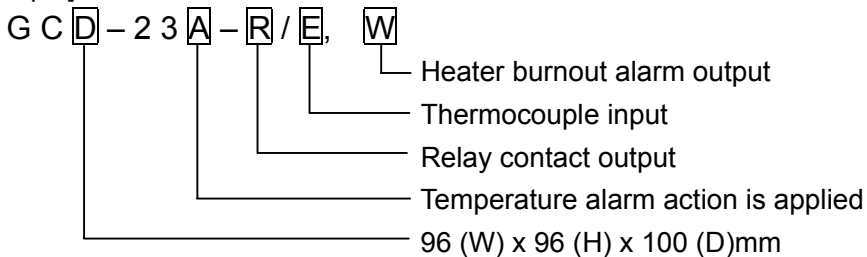
Optional code

Code	Description	
A2	Temperature alarm 2 (A2) output	
W	Heater burnout alarm (including Sensor burnout alarm)	
DR	Control output (OUT2) (Heating/Cooling control output)	Relay contact
DS		Non-contact voltage
DA		DC current
MR	Multi-range	
BK	Color: Black	
BL	Screw type mounting bracket (optional for GCR-200, included with GCD-200)	
IP	Dust-proof•Drip-proof (IP54), Only for front panel	
TC	Terminal cover	

⚠ **Notice**

• If option A2 is applied, either option W or option (DR, DS, DA) can be applied.

• If option W is applied, either option A2 or option (DR, DS, DA) can be applied.

• If option (DR, DS, DA) is applied, either option A2 or option W can be applied.

• For DC current output type, option W cannot be applied.

1.2 Rated scale

Input type	Rated scale	Resolution
K	0 to 400 ℃	1℃
	0 to 999 ℃	
	0 to 999 ℉	1℉
J	0 to 400 ℃	1℃
	0 to 999 ℃	
	0 to 999 ℉	1℉
E	0 to 600 ℃	1℃
	0 to 999 ℉	1℉
Pt100	-199 to 400 ℃	1℃
	-19.9 to 99.9℃	0.1℃
	-199 to 999 ℉	1℉
JPt100	-199 to 400 ℃	1℃
	-19.9 to 99.9℃	0.1℃
	-199 to 999 ℉	1℉

1.3 How to indicate the model nameplate

Model nameplates are attached to the case and the left side of the inner assembly.

[Model nameplate]   [Example]

(1) ········ GCD-23A – R/E ──► Relay contact output/Thermocouple input
(2) ⎰ A 2 ──► Temperature alarm 2 (A2) output
    ⎱ W (2 0 A) ──► Heater burnout alarm output (20A)

(3) ········ No.
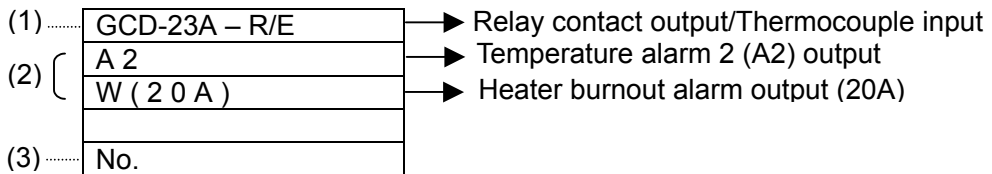
(1): Model name
(2): Option codes
     For Heater burnout alarm output, the specified current value is entered in (   ).
(3): Instrument number (Indicated only on the internal assembly)

2. Name and functions of the sections

[GCD]   **[GCR]**
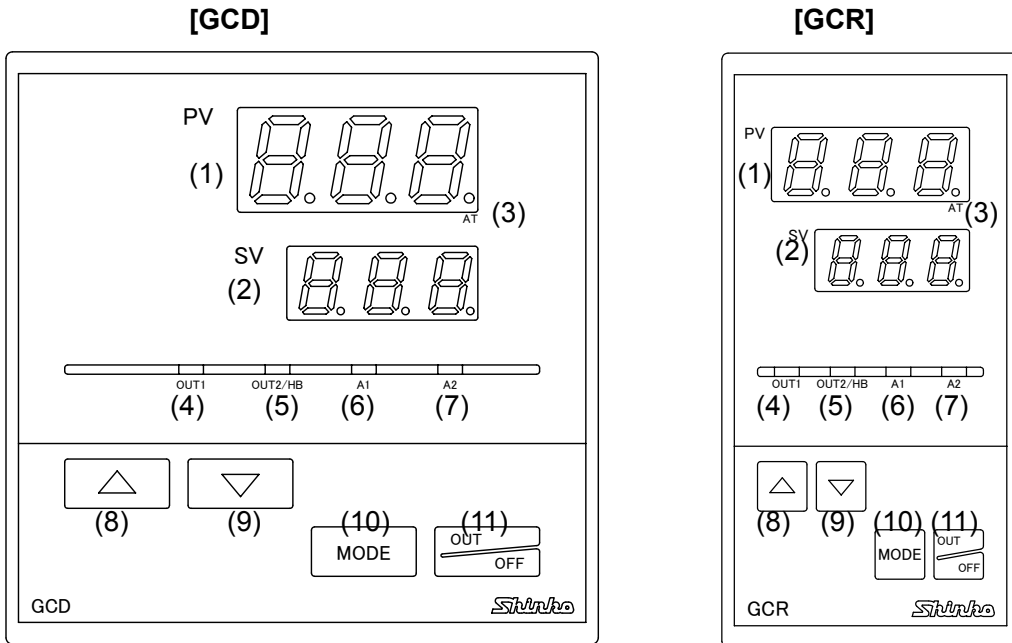
[Fig. 2-1]

(1) PV display: Indicates the Process variable (PV) with a red LED.

(2) SV display

Indicates the Setting value (SV) or Manipulated variable (MV) with a green LED.

(3) ● AT: PID Auto-tuning action indicator or auto-reset indicator

During PID auto-tuning or auto-reset, the dot of the least significant digit on the PV display blinks.

(4) ▢ OUT1: Control output or Heating output action indicator

When the Control output (OUT1) or Heating output is on, a green LED lights up.

(5) ▢ OUT2/HB: Cooling output [option] or Heater burnout alarm output (including Sensor burnout alarm output) [option]

When the Cooling output, Heater burnout alarm or Sensor burnout alarm is on, a yellow LED lights up.

(6) ▢ Temperature alarm 1 (A1) output indicator

When Temperature alarm 1 (A1) output is on, a red LED lights up.

(7) ▢ Temperature alarm 2 (A2) or output indicator [option]

When the Alarm 2 (A2) or Loop break alarm output is on, a red LED lights.

(8) Increase key: Increases the numeric value (SV). To make the value change faster, keep pressing the key.

(9) Decrease key: Decreases the numeric value (SV). To make the value change faster, keep pressing the key.

(10) MODE Mode key: Selects the setting mode or registers the setting value.

(11) OUT/OFF OUT/OFF key: The control output is turned on or off.

If this key is pressed for 1 second from any mode, control output off function works.

Once the Control output function is enabled, the function cannot be released even if the power to the instrument is turned OFF and turned ON again.

To cancel the function, press the OUT/OFF key again for approx. 1 second.

3. Operations
3.1 Operation flowchart

```
                  ┌─────────────────────────┐
                  │   Instrument power on    │
                  └─────────────────────────┘
                               │
                  ┌─────────────────────────┐
                  │  Warm-up status (2 sec.) │
                  └─────────────────────────┘
                               │
                                        OUT/OFF
   ┌──────────────────────────────────┐          ┌──────────────────────────────┐
   │        PV/SV display mode         │◄───────►│  Control output OFF function  │
   └──────────────────────────────────┘  1 sec.  │           [oFF]              │
                                                  └──────────────────────────────┘
```

MODE	▲ + MODE	▼ + MODE (3 sec.)

[Main setting mode]

Main setting
[ʔ   ]
     MODE

[Sub setting mode]

Auto-tuning Perform/
Cancel [Aʔ]
Auto-reset Perform [r ʔʔ]
  *   MODE   MODE

Main proportional band
setting [P]
   MODE

Cooling proportional band
setting [P‑b]
   MODE

Integral time setting
[i]
   MODE

Derivative time setting
[d]
   MODE

Main proportional cycle
setting [c]
   MODE

Cooling proportional cycle
setting [c‑b]
   MODE

Temperature alarm 1 (A1)
setting [A i]
   MODE

Temperature alarm 2 (A2)
setting [A2]
   MODE

Heater burnout alarm
setting [H 0]
   MODE

[Auxiliary function setting mode]

Setting value lock
[Loc]
   MODE

Main setting value high
limit [ʔH]
   MODE

Main setting value low
limit [ʔL]
   MODE

Sensor correction
[ʔo]
   MODE

Main output high limit
[oH]
   MODE

Main output low limit
[oL]
   MODE

Main output ON/OFF
hysteresis [HY]
   MODE

Cooling action mode
[bcʔ]
   MODE

Cooling output high limit
[oHb]
   MODE

Cooling output low limit
[oLb]
   MODE

Cooling output ON/OFF
hysteresis [HYb]
   MODE

Overlap/Dead band
[db]
   MODE

Sensor selection
[ʔEn]
   MODE

Alarm 1 action selection
[AL i]
   MODE

Alarm 2 action selection
[AL 2]
   MODE

Alarm 1 hysteresis
[A iH]
   MODE

Alarm 2 hysteresis
[A2H]
   MODE

Direct/Reverse action
selection [cnʔ]
   MODE

- OUT/OFF 1sec.: Press the key for approx. 1 second.
- ⌐ ⌐ is optional and is indicated only when the option is applied.
- ▲ + MODE : Press the MODE key while the ▲ key is being pressed.
- ▼ + MODE 3sec.: Press the MODE key for approx. 3 seconds while the ▼ key is being pressed.

  * If the auto-tuning or auto-reset Perform is designated, and if the MODE key is pressed,
   the mode reverts to the PV/SV display mode.

3.2 Operations

The PV display indicates the sensor type and temperature unit, and the SV display indicates the rated scale maximum value for approx. 2 seconds after the power is turned on. See [table 3.2-1].

If the main setting value high limit is set, the SV display indicates the high limit value.

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

After that, the actual temperature is indicated on the PV display, main setting value is indicated on the SV display and the control starts.

[oFF] is indicated on the PV display while control output OFF function is working.

To release the function, press the ⬚ key for approx. 1 second. (See page 21.)

The setting items are represented as follows.

Main setting	➤ Setting item
↳	Setting value

      ⬇   ⬇

  PV display   **SV display**
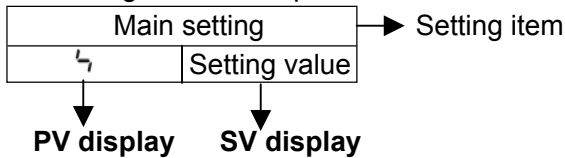
To increase or decrease the setting value or to select the action, use the ▲ or ▼ key.

(1) PV/SV display mode

Instrument power ON

↓

Warm-up status
[Table 3.2-1]	Rated value

[Table 3.2-1]

Input	℃		℉	
	PV display	SV display	PV display	SV display
K	*t C*	*400* *999*	*t F*	*999*
J	*J C*	*400* *999*	*J F*	*999*
E	*E C*	*600*	*E F*	*999*
Pt100	*Prc* *Prc*	*400* *99.9*	*Prf*	*999*
JPt100	*JPc* *JPc*	*400* *99.9*	*JPf*	*999*

When the main setting value high limit is set in advance, the SV display indicates the high limit value.

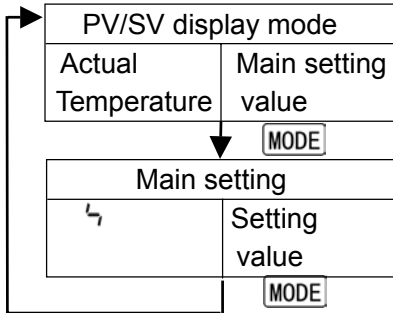| PV/SV display mode |
| --- |
| Actual Temperature | Main setting value |

Mode during the control.
None of the contents of setting items or setting values can be changed.

(2) Main setting mode

In the PV/SV display mode, if the MODE key is pressed, the Main setting mode will be selected.

To increase or decrease the setting value, use the ▲ or ▼ key.

If the MODE key is pressed after the setting, the setting value will be registered and the mode will revert to the PV/SV display mode.

PV/SV display mode	
Actual Temperature	Main setting value

↓ MODE

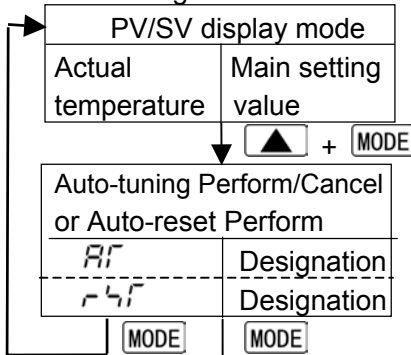| Main setting	
�	Setting value

MODE

Mode to set the setting value for the main control.

Setting range: Main setting value low limit
            to Main setting value high limit
[Factory adjusted as 0℃ (℉) or 0.0℃]

(3) Sub setting mode

In the PV/SV display mode, if the MODE key is pressed while the ▲ key is being pressed, the Sub setting mode will be selected.

If the MODE key is pressed after the setting, the setting value is registered and the next setting item will be selected.

PV/SV display mode	
Actual temperature	Main setting value

↓ ▲ + MODE

Auto-tuning Perform/Cancel or Auto-reset Perform	
Ar	Designation
r-ꓱr	Designation

MODE   MODE

(When Perform)

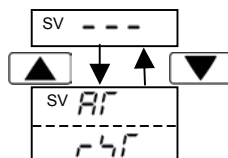Mode to designate the Auto-tuning Perform/Cancel or Auto-reset (offset correction) Perform

Auto-reset can be performed only during PD action.

When the P, PI or ON/OFF action is selected, auto-tuning is not available.
[Factory adjusted as Auto-tuning, Auto-reset Cancel]

SV - - -

▲ ↓ ↑ ▼

SV *Ar*
r-ꓱr

(Auto-tuning, Auto-reset Cancel)

(Auto-tuning, Auto-reset Perform)

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• If the Auto-tuning Perform is designated and the [MODE] key is pressed, the mode reverts to the PV/SV display and the dot AT on the PV display blinks.

• When the Auto-tuning is finished, the dot AT on the PV display is turned off, and the P, I and D values are set automatically.

• During the Auto-tuning, none of the settings can be performed.

• If the Auto-tuning is released in the process, the PID values return to the former values.

• During the auto-tuning, if the [OUT/OFF] key is pressed, the control output OFF function works, and PID auto-tuning is cancelled.
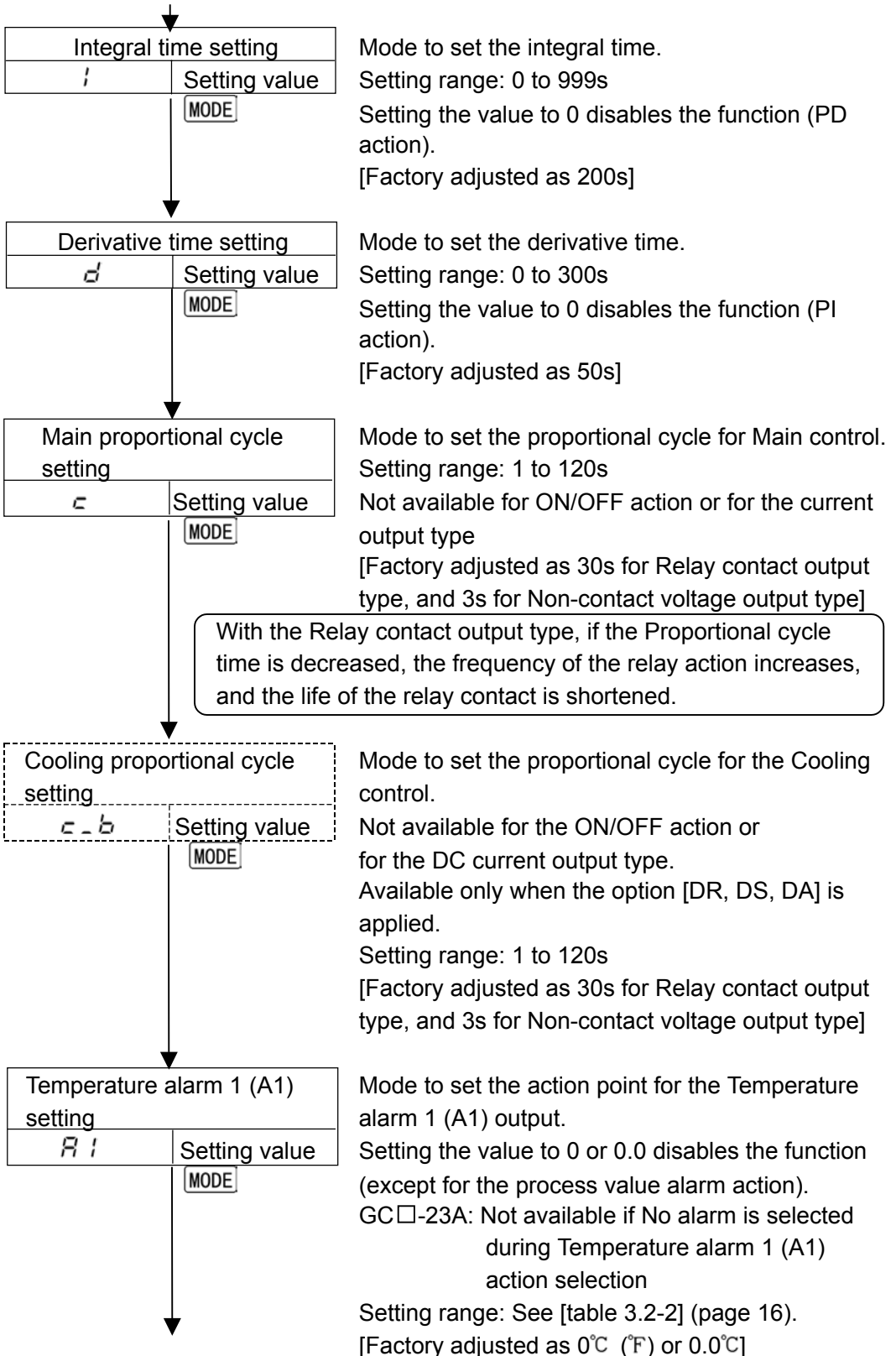

• If the Auto-reset Perform is designated and the [MODE] key is pressed, the mode reverts to the PV/SV display, and the dot AT on the PV display blinks.

• When the Auto-reset is started, the offset correction begins at once.

• In order to avoid mis-operations, other settings can not be performed for 4 minutes after the Auto-reset begins.

• When the Auto-reset is finished, the dot AT on the PV display is turned off, and the corrected value is set automatically.

Main proportional band setting	
P	Setting value
[MODE]	

Mode to set the proportional band for Main control.
ON/OFF action when setting the value to 0 or 0.0
Setting range:
　　For TC or RTD input: 0 to 999℃（℉）
　　RTD input with decimal point: 0.0 to 99.9℃（℉）
[Factory adjusted as 10℃（20℉）or 10.0℃]

Cool proportional band setting	
P_b	Setting value
[MODE]	

Mode to set the proportional band for cooling control.
Cooling control ON/OFF action when setting the value to 0.0
Available only when the option [code: D□] is applied.
Setting range: 0.0 to 10.0 times (Multiplying factor to the main control proportional band value)
[Factory adjusted as 1.0 times]

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Integral time setting	
i	Setting value
	MODE

Mode to set the integral time.
Setting range: 0 to 999s
Setting the value to 0 disables the function (PD action).
[Factory adjusted as 200s]

Derivative time setting	
d	Setting value
	MODE

Mode to set the derivative time.
Setting range: 0 to 300s
Setting the value to 0 disables the function (PI action).
[Factory adjusted as 50s]

Main proportional cycle setting	
c	Setting value
	MODE

Mode to set the proportional cycle for Main control.
Setting range: 1 to 120s
Not available for ON/OFF action or for the current output type
[Factory adjusted as 30s for Relay contact output type, and 3s for Non-contact voltage output type]

> With the Relay contact output type, if the Proportional cycle time is decreased, the frequency of the relay action increases, and the life of the relay contact is shortened.

Cooling proportional cycle setting	
c-b	Setting value
	MODE

Mode to set the proportional cycle for the Cooling control.
Not available for the ON/OFF action or for the DC current output type.
Available only when the option [DR, DS, DA] is applied.
Setting range: 1 to 120s
[Factory adjusted as 30s for Relay contact output type, and 3s for Non-contact voltage output type]

Temperature alarm 1 (A1) setting	
$A1$	Setting value
	MODE

Mode to set the action point for the Temperature alarm 1 (A1) output.
Setting the value to 0 or 0.0 disables the function (except for the process value alarm action).
GC□-23A: Not available if No alarm is selected during Temperature alarm 1 (A1) action selection
Setting range: See [table 3.2-2] (page 16).
[Factory adjusted as 0℃ (℉) or 0.0℃]

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Temperature alarm 2 (A2) setting

     A2 | Setting value

MODE

Mode to set the action point for the Temperature alarm 2 (A2) output.

Setting the value to 0 or 0.0 disables the function (except for the process value alarm action).
Not available if No alarm is selected during Temperature alarm 2 (A2) action selection or when the option [A2] is not applied.
Setting range: See [table 3.2-2] below.
[Factory adjusted as 0℃ (℉) or 0.0℃]

Heater burnout alarm setting

     H 0 | Setting value

MODE

Mode to set the Heater current value for Heater burnout alarm.

Available only when the option [W] is applied.
Setting range: When W (20A), 0 to 20A
                When W (50A), 0 to 50A
[Factory adjusted as 0A]
It is recommended to set approx. 80% of the heater current value (setting value) considering the voltage fluctuation.

Setting the value to 0 disables the Heater burnout alarm function.
Self-holding is not available for the alarm output.

PV/SV display mode	
Actual Temperature	Main setting value

Setting range of Temperature alarm 1 (A1) and 2 (A2)

[Table 3.2-2]

Alarm type	Setting range
High limit alarm	−199 to input range maximum value℃ (℉)
Low limit alarm	−199 to input range maximum value℃ (℉)
High/Low limits alarm	±(0 to input range maximum value)℃ (℉)
High/Low limit range alarm	±(0 to input range maximum value)℃ (℉)
Process high alarm	Input range minimum to input range maximum
High limit alarm with standby	−199 to input range maximum value℃ (℉)
Low limit alarm with standby	−199 to input range maximum value℃ (℉)
High/Low limits alarm with standby	±(0 to input range maximum value)℃ (℉)

RTD input with a decimal point

| Alarm type	Setting range
High limit alarm	−19.9 to 99.9℃
Low limit alarm	−19.9 to 99.9℃
High/Low limits alarm	±(0.0 to 99.9)℃
High/Low limit range alarm	±(0.0 to 99.9)℃
Process high alarm	Input range minimum to input range maximum
High limit alarm with standby	−19.9 to 99.9℃
Low limit alarm with standby	−19.9 to 99.9℃
High/Low limits alarm with standby	±(0.0 to 99.9)℃

(4) Auxiliary function setting mode

In the PV/SV display mode, if the MODE key is pressed for approx. 3 seconds while the ▼ key is being pressed, the Auxiliary function setting mode can be selected. If the MODE key is pressed after the setting, the setting value is registered and the next setting item is selected.

PV/SV display mode	
Actual Temperature	Main setting value

▼ + MODE for approx. 3s

Setting value lock designation		Mode to lock the setting value to prevent errors. The setting item to be locked depends on the designation. [Factory adjusted as Unlock status.]
Loc	Designation	

MODE

When designating Lock status, designate Lock 1 or 2 after setting necessary items in Unlock status.

```
- - - -
```
▲ ▼

Unlock status. All setting values are changeable.

```
Lc1
```
▲ ▼
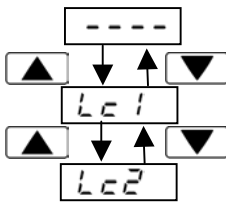
Lock 1: None of the setting items in the Main and Sub setting mode can be changed.

```
Lc2
```

Lock 2: None of the setting items in the Sub setting mode can be changed.

> Though Lock 1 or Lock 2 is designated, they will not work to the setting items in the Auxiliary function setting mode. When Lock 1 or Lock 2 is designated, PID auto-tuning or auto-reset will not function.

Main setting value high limit setting		Mode to set the high limit of main setting value. Setting range: Main setting value low limit to
SH	Setting value	Rated scale maximum value

MODE

[Factory adjusted as Rated scale maximum value]

Main setting value low limit setting		Mode to set the low limit of main setting value. Setting range: Rated scale minimum value to
SL	Setting value	Main setting value high limit

MODE

[Factory adjusted as Rated scale minimum value]

Sensor correction setting		Mode to set the correct value of the sensor.
Sc	Setting value	Setting range: –199 to 200℃ (℉)

MODE

With a decimal point, –19.9 to 20.0℃

[Factory adjusted as 0℃ (℉) or 0.0℃]

Sensor correction function

Corrects the input value from the sensor. When a sensor cannot be set at a location where control is desired, the sensor measuring temperature may deviate from the temperature in the controlled location. When controlling with multiple controllers, the accuracy of sensors has influence on the control. Therefore, sometimes the measuring temperature (input value) does not concur with the same setting value. In such a case, the control can be set with desired temperature by shifting the input value of sensors.

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Main output high limit setting	
oH	Setting value

[MODE]

Mode to set the high limit value of the main output (OUT1).

Setting range: Main output low limit value to 105%
Setting greater than 100% is effective to the Current output type. [Factory adjusted as 100%]
Not available for the ON/OFF action.

Main output low limit setting	
oL	Setting value

[MODE]

Mode to set the low limit value of the main output.
Setting range: –5% to Main output high limit value
Setting less than 0% is effective to the Current output type. [Factory adjusted as 0%]
Not available for the ON/OFF action.

Main output ON/OFF action hysteresis setting	
HY	Setting value

[MODE]

Mode to set the ON/OFF action hysteresis for the main control output.
Setting range: 0.1 to 99.9℃ (℉)
[Factory adjusted as 1.0℃ (℉)]
Available only when the ON/OFF action is designated.

Cooling action mode selection	
bch	Selection

[MODE]

Mode to select the Cooling action,
Air cooling, Oil cooling or Water cooling.
[Factory adjusted as Air cooling]
Not available when the option [DR, DS, DA] is not applied or when cooling output is ON/OFF action.

$RI\ r$

[▲] ↓ ↑ [▼]

Air cooling   (Linear characteristic)

$oi\ L$

[▲] ↓ ↑ [▼]
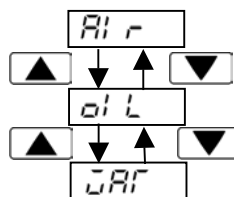
Oil cooling   (The 1.5th power of the Linear characteristic)

$\_RI$

Water cooling (The 2nd power of the Linear characteristic)

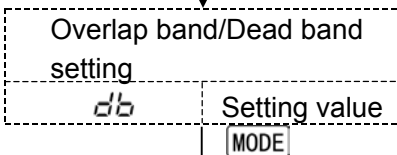| Cooling output high limit setting	
oHb	Setting value

[MODE]

Mode to set the high limit value of the cooling output.
Setting range: Cooling output low limit value to 105%
Setting greater than 100% is effective to the Current output type.
[Factory adjusted as 100%]
Not available when the option [DR, DS, DA] is not applied or when cooling output is ON/OFF action.
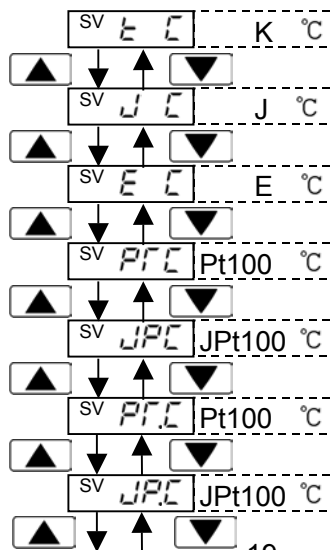
18
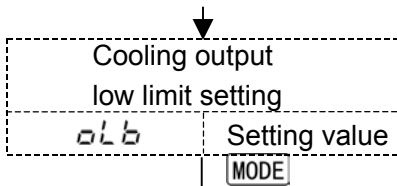
Cooling output low limit setting		Mode to set the low limit value of the cooling output. Setting range: –5% to cooling output high limit value
oLb	Setting value	Setting less than 0% is effective to the Current output type.

[MODE]

[Factory adjusted as 0%]
Not available when the option [DR, DS, DA] is not applied or when cooling output is ON/OFF action.
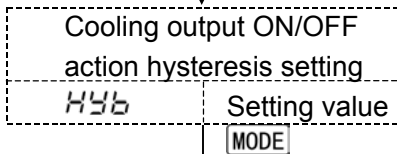
Cooling output ON/OFF action hysteresis setting		Mode to set the ON/OFF action hysteresis for the cooling control output.
HYb	Setting value	Setting range: 0.1 to 99.9℃

[MODE]

[Factory adjusted as 1.0℃ (℉)]
Available only when the option [DR, DS, DA] is applied

Overlap band/Dead band setting		Mode to set the Overlap band and Dead band for the Heating control output and Cooling control output.
db	Setting value	

[MODE]

+ setting value: Dead band,
– setting value: Overlap band
Not available when the option [DR, DS, DA] is not applied or when cooling output is ON/OFF action.
Setting range: ±(0 to 100%) of Heating proportional band
[Factory adjusted as 0%]
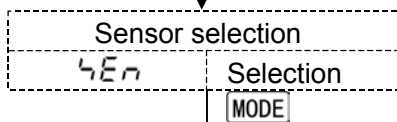
Sensor selection		Mode to select the input type from Thermocouple (6 types) and RTD (6 types), and the unit ℃ or ℉.
$5En$	Selection	Available only when the option [MR] is applied.

[MODE]

SV t C K ℃

[▲] [▼]

SV J C J ℃

[▲] [▼]

SV E C E ℃

[▲] [▼]

SV $Pr C$ Pt100 ℃

[▲] [▼]

SV JPC JPt100 ℃

[▲] [▼]

SV $Pr.C$ Pt100 ℃

[▲] [▼]

SV $JP.C$ JPt100 ℃

[▲] [▼]

19

| SV | t F | K ℉ |

▲ ▼ ▲ ▼

| SV | J F | J ℉ |

▲ ▼ ▲ ▼

| SV | E F | E ℉ |

▲ ▼ ▲ ▼

| SV | PtF | Pt100 ℉ |

▲ ▼ ▲ ▼

| SV | JPF | JPt100 ℉ |
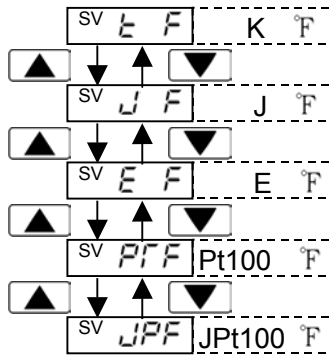
[Factory adjusted as specified range when ordering]

Temperature alarm 1 (A1) action selection
AL 1 Selection

MODE

Mode to select Temperature alarm 1 (A1) action.
Not available for the GC☐-230 type.
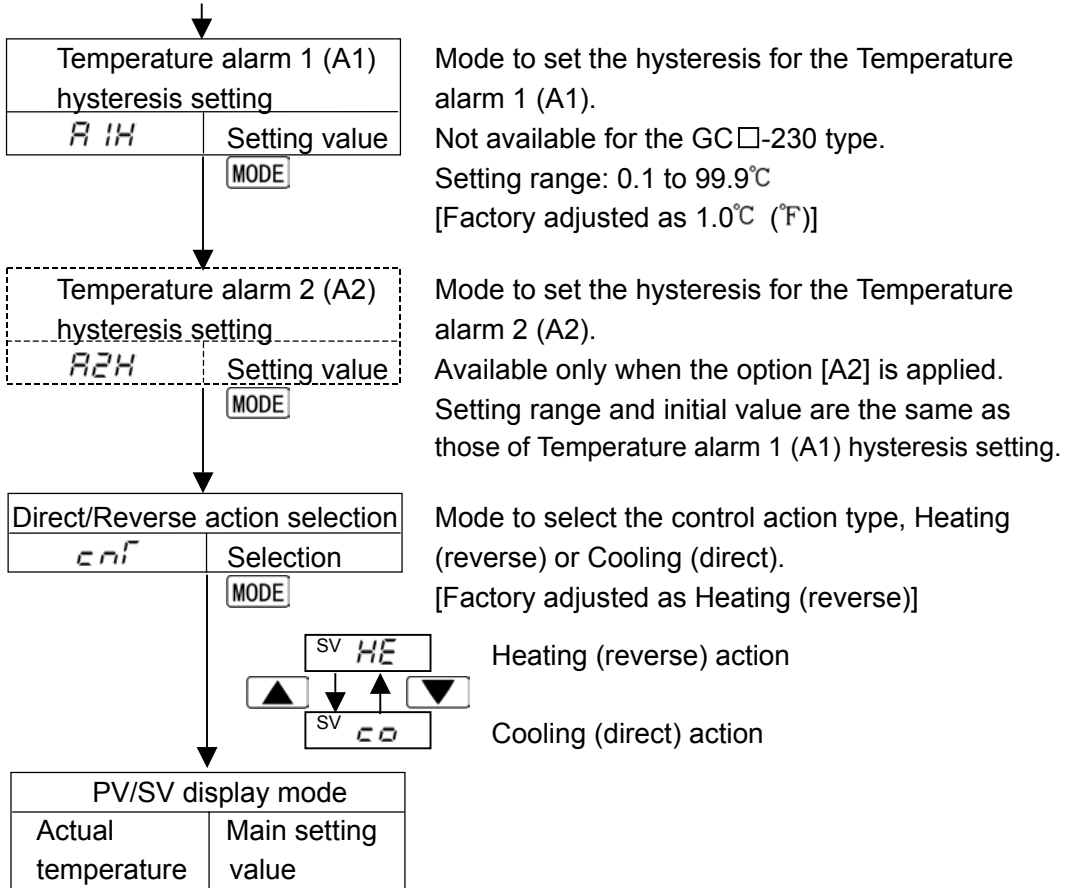[Factory adjusted as No alarm action]

| SV | $- - -$ | No alarm action

▲ ▼ ▲ ▼

| SV | H | High limit alarm action

▲ ▼ ▲ ▼

| SV | L | Low limit alarm action

▲ ▼ ▲ ▼

| SV | HL | High/Low limits alarm action

▲ ▼ ▲ ▼

| SV | $\bar{u}i$ d | High/Low limit range alarm action

▲ ▼ ▲ ▼

| SV | $A4$ | Process high alarm action

▲ ▼ ▲ ▼

| SV | H $\bar{u}$ | High limit alarm action with standby

▲ ▼ ▲ ▼

| SV | L $\bar{u}$ | Low limit alarm action with standby

▲ ▼ ▲ ▼

| SV | $HL\bar{u}$ | High/Low limits alarm action with standby
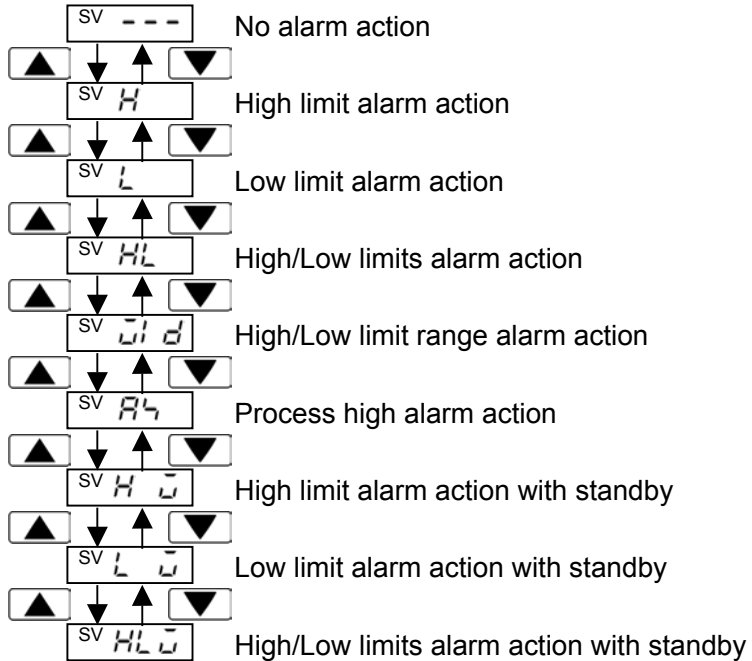
Temperature alarm 2 (A2) action selection
AL 2 Selection

MODE

Mode to select Temperature alarm 2 (A2) action.
Available only when the option [A2] is applied.
Action selection and initial value are the same as
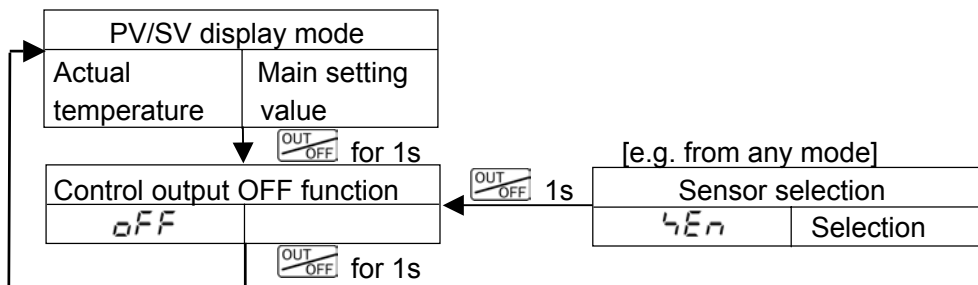those of Temperature alarm 1 (A1).

Temperature alarm 1 (A1) hysteresis setting	
$R\ IH$	Setting value
MODE	

Mode to set the hysteresis for the Temperature alarm 1 (A1).
Not available for the GC□-230 type.
Setting range: 0.1 to 99.9℃
[Factory adjusted as 1.0℃（℉)]

Temperature alarm 2 (A2) hysteresis setting	
$R2H$	Setting value
MODE	

Mode to set the hysteresis for the Temperature alarm 2 (A2).
Available only when the option [A2] is applied.
Setting range and initial value are the same as those of Temperature alarm 1 (A1) hysteresis setting.

Direct/Reverse action selection	
cnr	Selection
MODE	

Mode to select the control action type, Heating (reverse) or Cooling (direct).
[Factory adjusted as Heating (reverse)]

| SV | HE |

Heating (reverse) action

▲ ▼

| SV | co |

Cooling (direct) action

PV/SV display mode	
Actual temperature	Main setting value

(5) Control output OFF function

A function to pause the control action or turn the control output of the unused instrument of the plural units OFF even if the power to the instrument is supplied.
[oFF] is indicated on the PV display while the function is working.
Pressing the [OUT OFF] key for approx. 1 second from any mode turns the control output OFF.
Once the Control output OFF function is enabled, the function cannot be released even if the power to the instrument is turned OFF and turned ON again.
To cancel the function, press the [OUT OFF] key again for approx. 1 second.

PV/SV display mode	
Actual temperature	Main setting value

[OUT OFF] for 1s

Control output OFF function	
oFF	

[OUT OFF] for 1s

[OUT OFF] 1s

[e.g. from any mode]

Sensor selection	
SEn	Selection

4. Running

After the controller has been mounted to the control panel and wiring is completed, it can be started in the following manner.

(1) Turn the power supply to the GC☐ ON.

For approx. 2s after the power is switched ON, the type of sensor will be indicated on the PV display, and the rated scale maximum value will be indicated on the SV display. See [table 4-1] below.

If the Main setting value high limit is set, the value is indicated on the SV display.

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

After that, the actual temperature is indicated on the PV display and Main setting value on the SV display.

While the Control output OFF function is working, oFF is indicated on the PV display. To cancel this function, press the [OUT/OFF] key again for approx. 1 second.

[Table 4-1]

Input	℃		℉	
	PV display	SV display	PV display	SV display
K	$t\ C$	400 999	$t\ F$	999
J	$J\ C$	400 999	$J\ F$	999
E	$E\ C$	600	$E\ F$	999
Pt100	$Pr C$ $Pr C$	400 99.9	$Pr F$	999
JPt100	$JP C$ $JP C$	400 99.9	$JP F$	999

(2) Input the setting value, referring to Chapter "3. Operations".

(3) Turn the load circuit power ON.

Starts the control action so as to keep the controlled object at the main setting value.

5. Action explanations

5.1 Standard action

	Heating (reverse) action	Cooling (direct) action
Control action	ON ———————⟍ OFF ⟍△ SV setting Proportional band	OFF ⟋——— ON △ SV setting ⟋ Proportional band
R/□	H④ C⑤ L⑥ H④ C⑤ L⑥ H④ C⑤ L⑥ Cycle action is performed according to deviation.	H④ C⑤ L⑥ H④ C⑤ L⑥ H④ C⑤ L⑥ Cycle action is performed according to deviation.
S/□	+⑤ 12V DC +⑤ 12/0V DC +⑤ 0V DC -⑥ –⑥ –⑥ Cycle action is performed according to deviation.	+⑤ 0V DC +⑤ 0/12V DC +⑤ 12V DC –⑥ –⑥ –⑥ Cycle action is performed according to deviation.
A/□	+⑤ 20mA DC +⑤ 20 to 4mA DC +⑤ 4mA DC –⑥ –⑥ –⑥ Changes continuously according to deviation.	+⑤ 4mA DC +⑤ 4 to 20mA DC +⑤ 20mA DC –⑥ –⑥ –⑥ Changes continuously according to deviation.
Indication (OUT1) Green	▓▓▓▓ ▒▒▒▒ ░░░░ Lit Unlit	░░░░ ▒▒▒▒ ▓▓▓▓ Unlit Lit

▒▒▒▒ : Acts ON (lit) or OFF (unlit).

5.2 Heater burnout alarm action

ON ——————⌐
OFF·············|····—————
         △ Setting
Small ←— Load current —→ Large

⑨   ⑨
⑩   ⑩
▓▓▓▓ ░░░░
Lit   Unlit
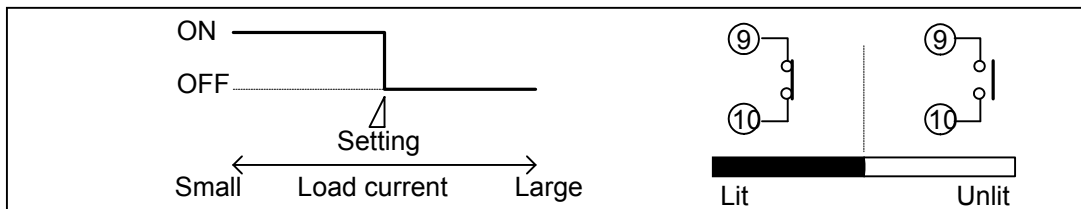
5.3 ON/OFF action

	Heating (reverse) action		Cooling (direct) action	
Control action	ON ———— ⟵ Hysteresis ⟶ OFF ———— △ SV setting		⟵ Hysteresis ⟶ △ SV setting	——— ON ——— OFF
R/□	H④ ○ | C⑤ ● L ⑥ ○	H④ ○ C⑤ ● L ⑥ ○ |	H④ ○ C⑤ ● L ⑥ ○ |	H④ ○ | C⑤ ● L ⑥ ○
S/□	+⑤ 12V DC −⑥	+⑤ 0V DC −⑥	+⑤ 0V DC −⑥	+⑤ 12V DC −⑥
A/□	+⑤ 20mA DC −⑥	+⑤ 4mA DC −⑥	+⑤ 4mA DC −⑥	+⑤ 20mA DC −⑥
Indication (OUT1) Green	███ ░░░ ▢ Lit Unlit		▢ ░░░ ███ Unlit Lit	

░░░ : Acts ON (lit) or OFF (unlit).

5.4 Heating/Cooling action (option DR, DS, DA)

Control action	Heating P-band (Cooling P-band) diagram			
	ON — Heaing action / OFF ----- / SV setting / (Cooling action) ON / OFF			
R/□	H④ C⑤ L⑥	H④ C⑤ L⑥	H④ C⑤ L⑥	
	Cycle action is performed according to deviation.			
DR		⑨ ⑩	⑨ ⑩	⑨ ⑩
		Cycle action is performed according to deviation.		
S/□	+⑤ 12V DC −⑥	+⑤ 12/0V DC −⑥	+⑤ 0V DC −⑥	
	Cycle action is performed according to deviation.			
DS		+⑨ 0V DC −⑩	+⑨ 0/12V DC −⑩	+⑨ 12V DC −⑩
		Cycle action is performed according to deviation.		
A/□	+⑤ 20mA DC −⑥	+⑤ 20 to 4mA DC −⑥	+⑤ 4mA DC −⑥	
	Changes continuously according to deviation.			
DA		+⑨ 4mA DC −⑩	+⑨ 4 to 20mA DC −⑩	+⑨ 20mA DC −⑩
		Changes continuously according to deviation.		
Indication (OUT1) Green	Lit Unlit			
Indication (OUT2) Yellow	Unlit Lit			

▨▨▨ : Acts ON (lit) or OFF (unlit).

———— : Represents Heating control action.

– – – – : Represents Cooling control action.

When setting Dead band

Control action	Heating P-band · Dead band · (Cooling P-band); ON — Heating action — OFF — SV setting — (Cooling action) — ON/OFF
R/□	H④ C⑤ L⑥ (three diagrams) Cycle action is performed according to deviation.
DR	⑨⑩ (three diagrams on right) Cycle action is performed according to deviation.
S/□	+⑤ 12V DC / 12/0V DC / 0V DC −⑥ Cycle action is performed according to deviation.
DS	+⑨ 0V DC / 0/12V DC / 12V DC −⑩ Cycle action is performed according to deviation.
A/□	+⑤ 20mA DC / 20 to 4mA DC / 4mA DC −⑥ Changes continuously according to deviation.
DA	+⑨ 4mA DC / 4 to 20mA DC / 20mA DC −⑩ Changes continuously according to deviation.
Indication (OUT1) Green	Lit ▨▨▨ Unlit
Indication (OUT2) Yellow	Unlit ▨▨▨ Lit

▨ : Acts ON (lit) or OFF (unlit).

——— : Represents Heating control action.

– – – – : Represents Cooling control action.

When setting Overlap band with Relay contact output.

Control action	Heating P-band / Cooling P-band / Overlap band — ON / OFF — Heating action / (Cooling action) — SV setting
R/ □	H④ C⑤ L⑥ (three diagrams) — Cycle action is performed according to deviation.
DR	⑨ ⑩ (three diagrams) — Cycle action is performed according to deviation.
Indication (OUT1) Green	Lit ... Unlit
Indication (OUT2) Yellow	Unlit ... Lit

▨ : Acts ON (lit) or OFF (unlit).
——— : Represents Heating control action.
– – – – : Represents Cooling control action.

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5.5 Temperature alarm 1 (A1) and 2 (A2) action

	High limit alarm	Low limit alarm
Alarm action		
Alarm output	+ side / − side	+ side / − side
	High/Low limits alarm	High/Low limit range alarm
Alarm action		
Alarm output		
	Process high alarm	
Alarm action		
Alarm output		
	High limit alarm with standby	Low limit alarm with standby
Alarm action		
Alarm output	+ side / − side	+ side / − side
	High/Low limits alarm with standby	
Alarm action		
Alarm output		

▉ : A1 output terminals 7 and 8 are connected.

▧ : A1 output terminals 7 and 8 are connected or disconnected.

☐ : A1 output terminals 7 and 8 are disconnected.

▨ : Standby functions.

For Temperature alarm 2 (A2) output, use terminals 12 and 13.

Temperature alarm 1 (A1) and 2 (A2) indicator light when their output terminals are connected and go out when their output terminals are disconnected.

6. Control actions
6.1 Explanations of PID
(1) Proportional band (P)

Proportional action is the action which the control output varies in proportion
to the deviation between the setting value and the processing temperature.
If the proportional band is narrowed, even if the output changes by a slight
variation of the processing temperature, better control results can be obtained
as the offset decreases.
However, if when the proportional band is narrowed too much, even slight
disturbances may cause variation in the processing temperature, and control
action changes to ON/OFF action and the so called hunting phenomenon occurs.
Therefore, when the processing temperature comes to the balanced position
near the setting value and a constant temperature is maintained, the most
suitable value is selected by gradually narrowing the proportional band
while observing the control results.

(2) Integral time (I)

Integral action is used to eliminate offset. When the integral time is shortened,
the returning speed to the setting point is accelerated. However, the cycle
of oscillation is also accelerated and the control becomes unstable.

(3) Derivative time (D)

Derivative action is used to restore the change in the processing temperature
according to the rate of change. It reduces the amplitude of overshoot and
undershoot width.
If the derivative time is shortened, restoring value becomes small, and if the
derivative time is adjusted to be longer, a phenomenon of excessive returning
may occur and the control system may be oscillated.

6.2 PID auto-tuning of this controller

In order to decide each value of P, I, D and ARW automatically, this system forcibly makes the controlled object's temperature fluctuate.

(1) When the difference between setting value and processing temperature is large as the temperature rises.

Fluctuation is applied at the temperature 20℃ lower than the setting value.

Temperature 20℃ (℉) lower than the setting value

(1) PID calculation
(2) PID decided
(3) Controlling action is performed with the values set by PID auto-tuning.

[Fig. 6.2-1]
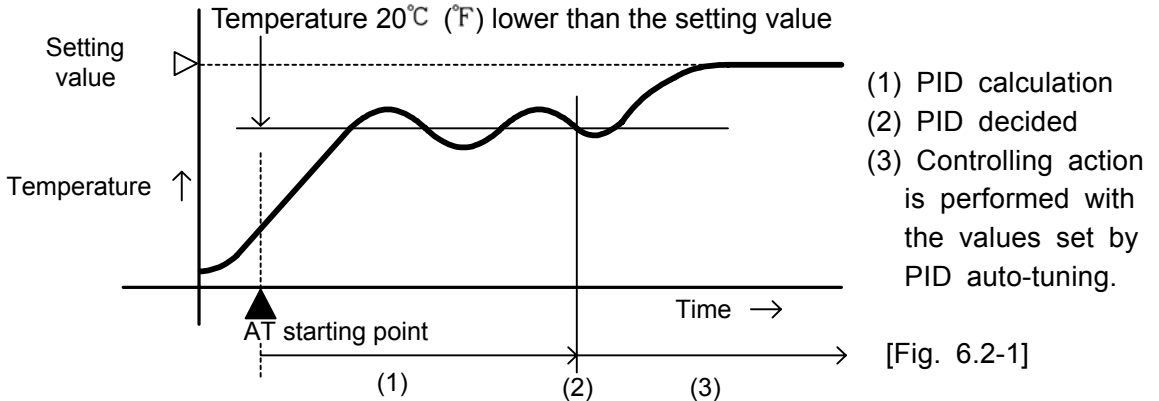
(2) When the control is stable or when control temperature is within ±20℃ (℉) of setting value.

Fluctuation is applied at the setting value.

(1) PID calculation
(2) PID decided
(3) Controlling action is performed with the values set by PID auto-tuning.

[Fig. 6.2-2]
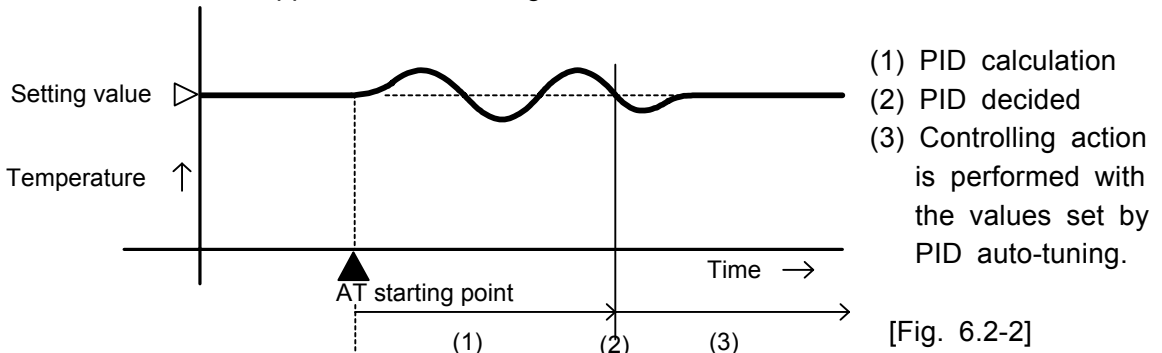
(3) When the control temperature is 20℃ (℉) or higher than the setting value as the temperature falls

Fluctuation is applied at the temperature 20℃ (℉) higher than the setting value.
Temperature 20℃ (℉) higher than the setting value

(1) PID calculation
(2) PID decided
(3) Controlling action is performed with the values set by PID auto-tuning.

[Fig. 6.2-3]

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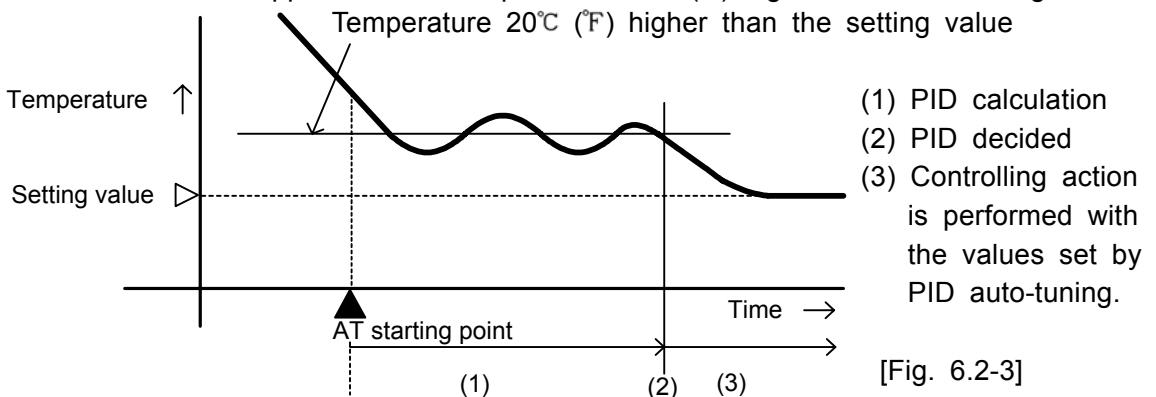
6.3 Auto-reset (offset correction)

Auto-reset is performed to correct the offset at the point at which PV indication is stabilized within the proportional band during the PD action.
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. However,
when the proportional band is set to 0, the corrected value is cleared.
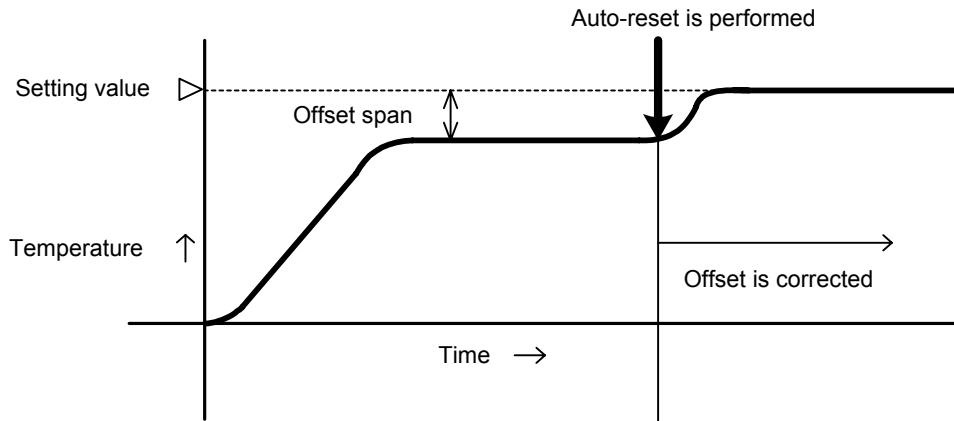
[Fig. 6.3-1]

7. Other functions

(1) Sensor burnout (Burnout)

(Overscale)

When the thermocouple or RTD is burnt out or when the input value rises to the [Rated scale maximum value +1℃(℉) (or 99.9+0.1℃)] or greater, the control output is turned OFF (main output low limit value for DC current output type) and the PV display blinks [‾ ‾ ‾].

(Underscale)

For the thermocouple input, if the input value falls to [Rated scale minimum value –50℃ (℉)] or less, the control output is turned OFF (main output low limit value for DC current output type), and the PV display blinks [₋ ₋ ₋].
For the RTD input, if the input falls to [Rated scale minimum value –1℃ (℉) (or –19.9–0.1℃)] or less, the control output is turned OFF (main output low limit value for DC current output type), and the PV display blinks [₋ ₋ ₋].

(2) Self-diagnosis

The CPU is monitored by a watchdog timer, and when any abnormal status is found on the CPU, the controller is switched to warm-up status.

(3) Automatic cold junction temperature compensation (Thermocouple input type)

This detects the temperature at the connecting terminal between the thermocouple and the instrument, and always maintains it at the same status at which the reference junction is located at 0℃ [32℉].

(4) Power failure countermeasure

The setting data is backed up in non-volatile IC memory.

8. Mounting to control panel
8.1 Site selection
This instrument is intended to be used under the following environmental conditions (IEC61010-1): Overvoltage category II, Pollution degree 2

Mount the controller in a place with:
(1) A minimum of dust, and an absence of corrosive gases
(2) No flammable, explosive gases
(3) No mechanical vibrations or shocks
(4) No exposure to direct sunlight, an ambient temperature of 0 to 50℃ (32 to 122℉) that does not change suddenly
(5) An ambient non-condensing humidity of 35 to 85%RH
(6) The controller away from large capacity electromagnetic switches or cables through which large current is flowing
(7) No water, oil or chemicals or where the vapors of these substances can come into direct contact with the controller

8.2 External dimension (GCD-200 type)

PV

SV

OUT1 OUT2/HB A1 A2

MODE OUT/OFF

GCD

□ 96   10   100   □ 91   106.2
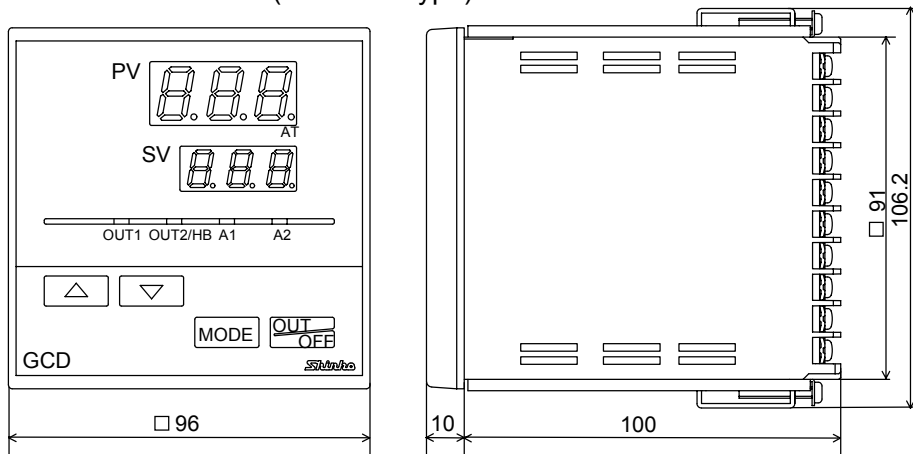
[Fig. 8.2-1]

8.3 Panel cutout (GCD-200 type)

130

$92^{+0.8}_{0}$

$n \times 96\text{-}3^{+0.5}_{0}$

$92^{+0.8}_{0}$

Lateral close mounting
n: Number of units mounted
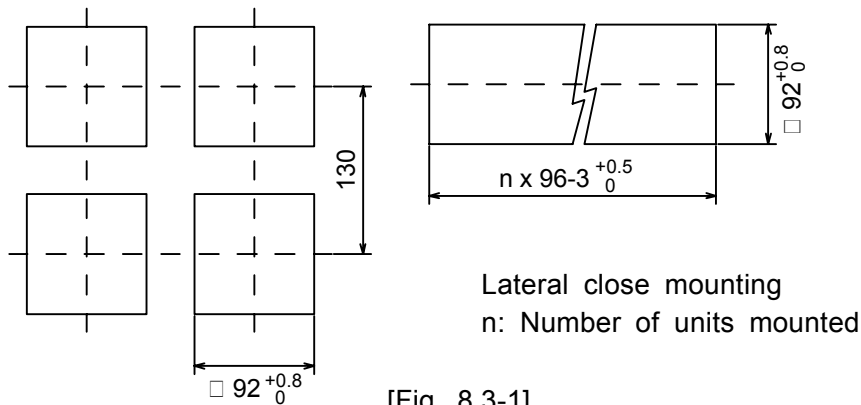
[Fig. 8.3-1]

8.4 External dimension (GCR-200 type)

• **One-touch type mounting bracket**
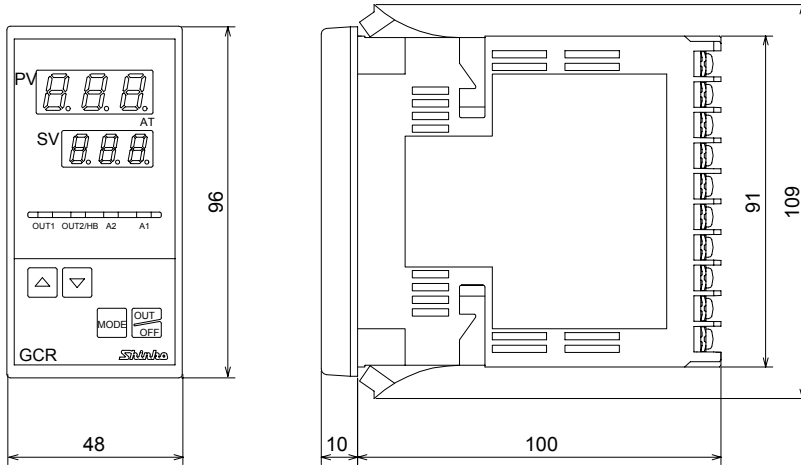
[Fig. 8.4-1]

• **Screw type mounting bracket** [Option: BL]
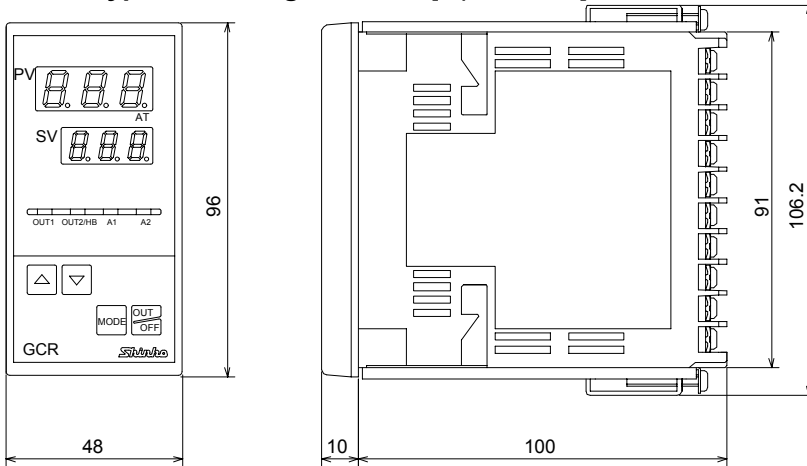
[Fig. 8.4-2]

8.5 Panel cutout (GCR-200 type)
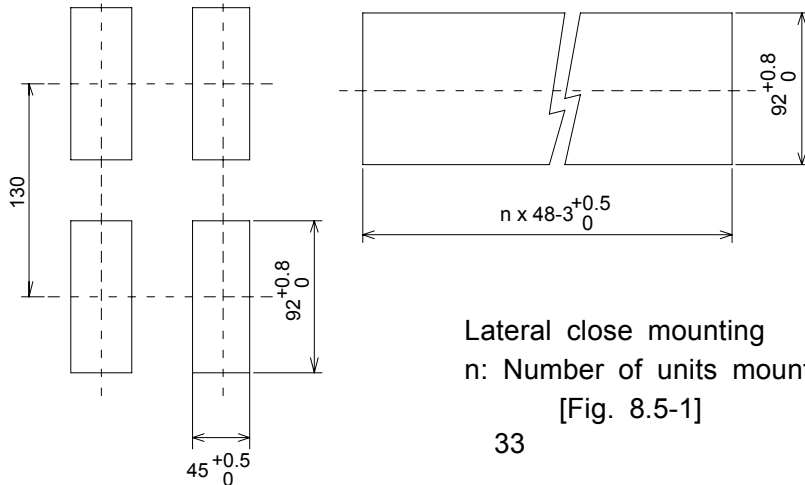
Lateral close mounting
n: Number of units mounted
[Fig. 8.5-1]

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8.6 Current transformer (CT) dimension (Common to GCD-200 and GCR-200)
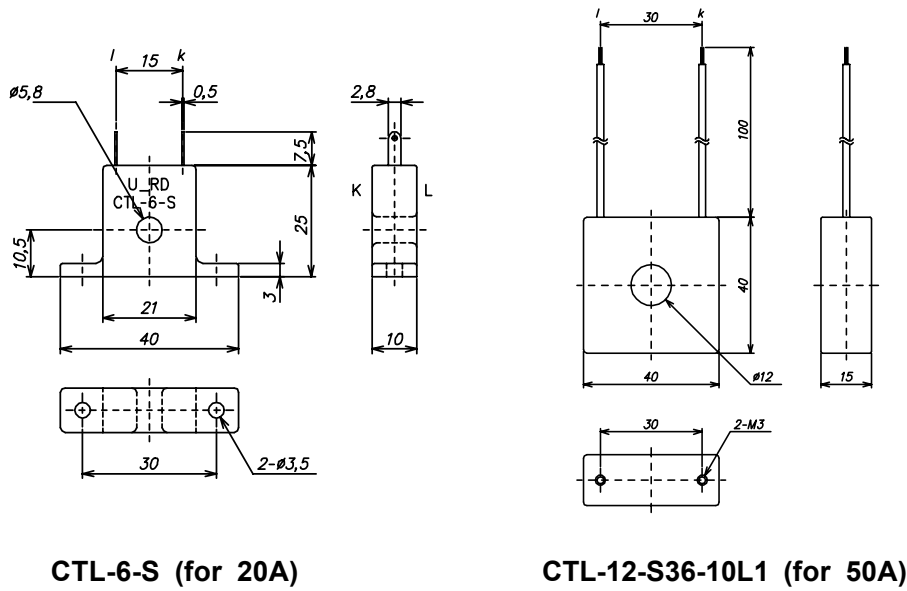
CTL-6-S (for 20A)   **CTL-12-S36-10L1 (for 50A)**

[Fig. 8.6-1]

8.7 Mounting

[GCD-200 type]

Mounting panel thickness is 1 to 15mm.

Insert the GCD-200 from the front of the panel.

Slot the mounting bracket to the holes at the top and bottom of the case, and screw in place.

When using the Soft front cover (FC-96-S), the panel thickness is 1 to 14.5mm.

[Fig. 8.7-1]

34
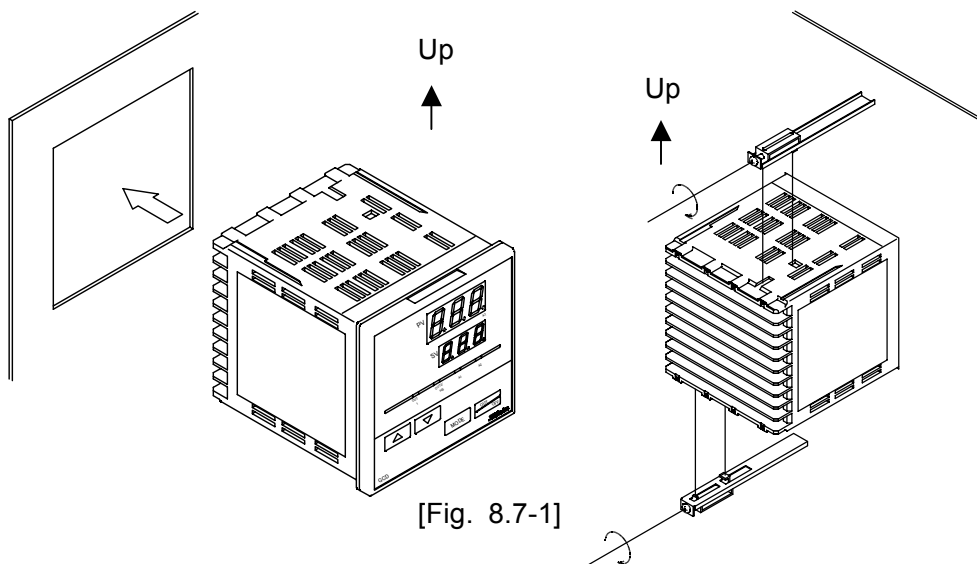
[GCR-200 type]

When using One-touch type mounting bracket

Mounting panel thickness is 1 to 3mm.
Mount the one-touch type mounting
brackets (1) to the body in advance,
and next insert the GCR-200 (2) from
the front of the panel.
When using the Soft front cover (FC-R-S),
the panel thickness is 1 to 2.5mm.
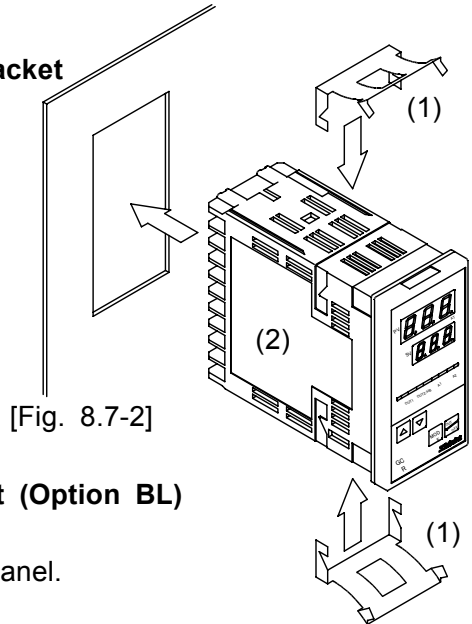
[Fig. 8.7-2]

When using Screw type mounting bracket (Option BL)

Mounting panel thickness is 1 to 15mm.
Insert the GCR-200 from the front of the panel.

Slot the mounting bracket to the holes at the top and bottom of the case,
and screw in place.
When using the Soft front cover (FC-R-S), the panel thickness is 1 to 14.5mm.

Up

Up
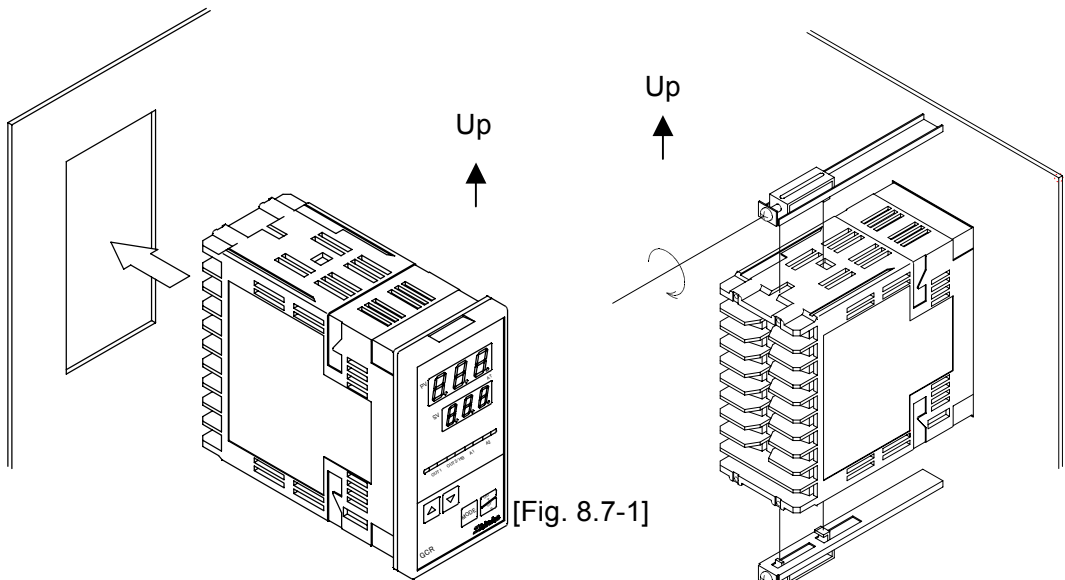
[Fig. 8.7-1]

⚠ **Notice**

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

9. Wiring connection

⚠ **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 an Electric Shock which could cause severe injury or death.
Moreover, the instrument must be grounded before the power supply to the
instrument is turned on.

9.1 Terminal arrangement

[GCD-200]

Ground

100 to 240Vac
or 24Vac/dc

H

Main output
(Heating)
Relay contact output

C

L

Temperature alarm
1 (A1) output

(Cooling output)
Relay contact output,
Heater burnout alarm
output or Sensor
burnout alarm output

Temperature alarm 2(A2) or
Heater burnout alarm output

CT input

RTD

TC

Main output
(Heating)
Non-contact
voltage output or
Current output

(Cooling output)
Non-contact
voltage output or
Current output

Dotted line: Option

[Fig. 9.1-1]

[GCR-200]

Ground

100 to 240Vac or 24Vac/dc

Main output (Heating) Relay contact output

Temperature alarm 1 (A1) output

(Cooling output) Relay contact output, Heater burnout alarm output or Sensor burnout alarm output

Temperature alarm 2(A2) or Heater burnout alarm output

CT input

Main output (Heating) Non-contact voltage output or Current output

(Cooling output) Non-contact voltage output or Current output

Dotted line: Option

[Fig. 9.1-2]

- The terminal block of GCD-200 and GCR-200 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.
- Dotted lines are optional and no terminal is equipped if the option is not specified.
- When option A2 and option W are applied together, use terminals 12-13 for the option A2 and terminals 9-10 for the option W.
- When option A2 and option [DR, DS, DA] are applied together, use terminals 12-13 for the option A2, and terminals 9-10 for the option [DR, DS, DA].
- When option [DR, DS, DA] and option W are applied together, use terminals 9-10 for the option [DR, DS, DA], and terminals 12-13 for the option W.

● **Solderless terminal**

Use a solderless terminal with an isolation sleeve that fits to the M3 screw as shown below.
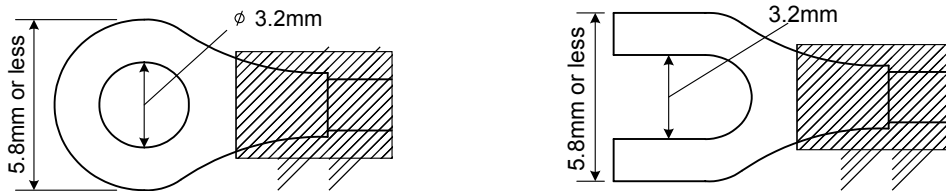
Solderless terminal	Manufacturer	Model name	Tightening torque
Y type	Nichifu Terminal Industries CO.,LTD.	1.25Y-3	0.6N•m Max. 1.0N•m
	Japan Solderless Terminal MFG CO.,LTD.	VD1.25-B3A	
Round type	Nichifu Terminal Industries CO.,LTD.	1.25-3	
	Japan Solderless Terminal MFG CO.,LTD.	V1.25-3	

9.2 Wiring connection examples

⚠ **Notices**

• Use a thermocouple and compensating lead wire according to the sensor input specifications of this controller.
• Use a 3-wire RTD according to the sensor input specifications of this controller.
• This controller has neither built-in power switch nor fuse. Therefore it is necessary to install them in the circuit near the external controller.
  (Recommended fuse: Time-lag fuse, rated voltage 250V, rated current 2A)
• For the power source, 24V of AC or DC is available.
  However, when using 24V DC of power source, do not confuse the polarity.
• For the relay contact output type, externally use an auxiliary electromagnetic switch according to the capacity of the load to protect the built-in relay contact.
• When wiring, keep the input wire (Thermocouple, RTD, etc.) away from AC source and the load wire to avoid external interference.
• Use a thick wire (1.25 to 2.0mm^2) for the earth ground.

Heater burnout alarm output [Option code: W]
(1) This alarm is not available for detecting heater current under phase control.
(2) Use the current transformer (CT) provided, and pass one lead wire of heater circuit into the hole of the CT.
(3) When wiring, keep CT wire away from AC source and load wire to avoid the interference from external.

[Fig. 9.2-1]

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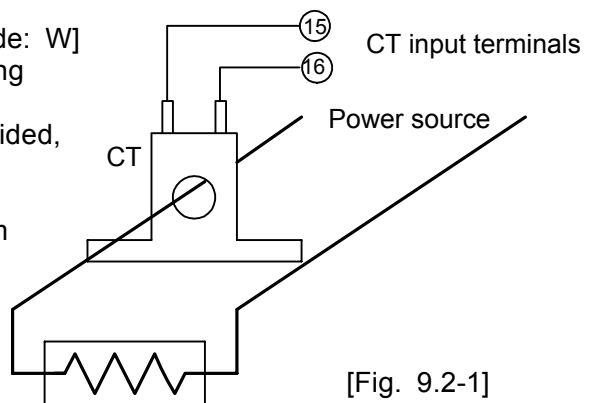
[GCR-23A-R/E]
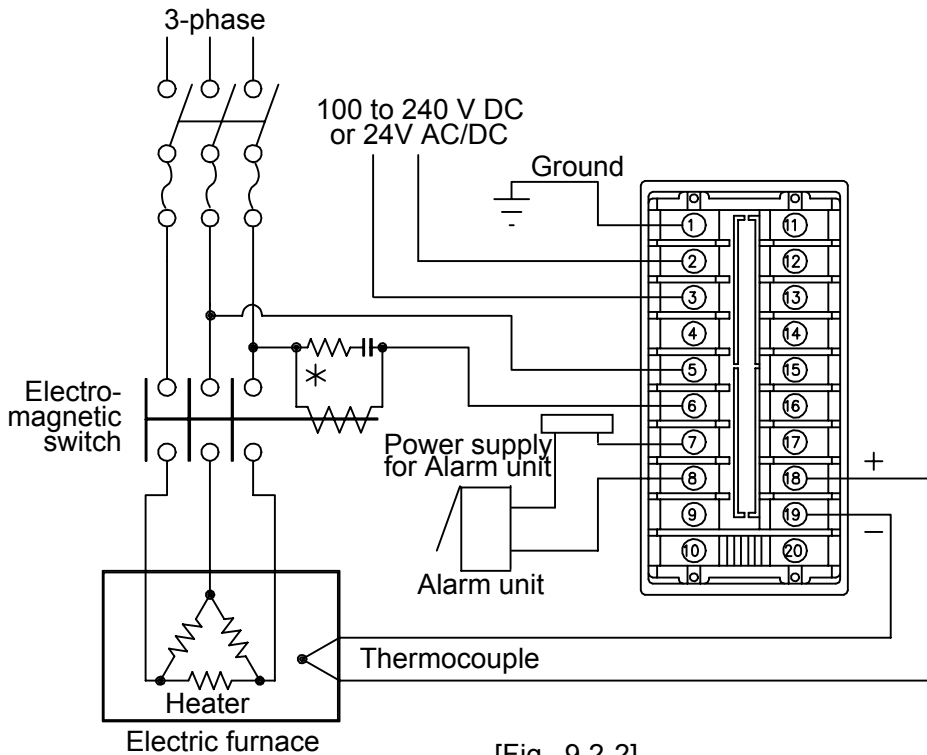
[Fig. 9.2-2]

* To prevent the unit from harmful effects of unexpected level noise, it is recommended that a surge absorber be installed between the electromagnetic switch coils.

AC or DC is available for supply voltage 24V, however, do not confuse the polarity when DC is applied.

10. Specifications

10.1 Standard specifications (common to GCD-200, GCR-200)

Mounting method   : Flush

Setting   : Membrane sheet key

Display

     [GCD-200 type]

       PV display   : Red LED, 3 digits, character size 14.3(H) x 8(W) mm

       SV display   : Green LED, 3 digits, character size 10(H) x 5.5(W) mm

     [GCR-200 type]

       PV display   : Red LED, 3 digits, character size 10(H) x 5.5(W) mm

       SV display   : Green LED, 3 digits, character size 8(H) x 4(W) mm

Accuracy (Indication and setting):

                            Within $\pm$0.3% of maximum scale range $\pm$1digit, or

                            within $\pm$2℃ (4℉), whichever is greater

Rated scale

Input type	Rated scale	Resolution
K, J	0 to 400 ℃	1℃
	0 to 999 ℃	
	0 to 999 ℉	1℉
E	0 to 600 ℃	1℃
	0 to 999 ℉	1℉
Pt100, JPt100	-199 to 400 ℃	1℃
	-19.9 to 99.9℃	0.1℃
	-199 to 999 ℉	1℉

Input sampling period   : 0.25 seconds

                          (When the option W is applied, 0.5 seconds)

Input

      Thermocouple   : K, J, E,   External resistance, 100Ω or less

      RTD   : Pt100, JPt100, 3-wire system

                        Allowable input lead wire resistance, 10Ω or less per wire

Control output (OUT1)

      Relay contact   : 1a1b

                     Control capacity, 3A   250V AC (resistive load)

                               1A   250V AC (inductive load cosø=0.4)

                     Electric life, 100,000 times

      Non-contact voltage : For SSR drive

                      12^{+2}_{0}V DC   maximum 40mA (short-circuit protected)

                     If Shinko SSR (SA-200 series) is used, 4 units of SSR

                     can be connected in parallel.

      DC current   : 4 to 20mA DC,   Load resistance, maximum 550Ω

Temperature alarm 1 (A1) output

The alarm action point is set by $\pm$deviation to main setting (except Process value alarm). When the input goes out of the range, the output turns ON or OFF(in the case of High/Low limit range alarm).

Setting accuracy : The same as the Indication accuracy
Action   : ON/OFF action,
                   Hysteresis, 0.1 to 99.9℃ (℉)
Output   : Relay contact, 1a
                   Control capacity, 3A   250V AC (resistive load)
                                    1A   250V AC (inductive load cosø=0.4)
                   Electric life, 100,000 times

Control action

PID action (with auto-tuning function)
  Proportional band (P)   : 0 to 999℃ (℉) (ON/OFF action when set to 0)
                            0.0 to 99.9℃ (ON/OFF action when set to 0.0)
  Integral time (I)   : 0 to 999s (Off when set to 0)
  Derivative time (D)   : 0 to 300s (Off when set to 0)
  Proportional cycle   : 1 to 120s (Unavailable for DC current output type)
PD action (with auto-reset function)
  Proportional band (P)   : 0 to 999℃ (℉) (ON/OFF action when set to 0)
                            0.0 to 99.9℃ (ON/OFF action when set to 0.0)
  Derivative time (D)   : 0 to 300s (Off when set to 0)
  Proportional cycle   : 1 to 120s (Unavailable for DC current output type)
ON/OFF action   : Hysteresis, 0.1 to 99.9℃ (℉)

Supply voltage   : 100 to 240V AC   50/60Hz,   24V AC/DC   50/60Hz

Allowable voltage fluctuation

          100 to 240V AC : 85 to 264V AC
          24V AC/DC   : 20 to 28V AC/DC

Ambient temperature   : 0 to 50℃ (32 to 122℉)
Ambient humidity   : 35 to 85%RH (non-condensing)
Power consumption   : Approx. 8VA
Isolation resistance   : 10MΩ or greater at 500V DC

(When the type of main output or cooling output is DC current or non-contact voltage output (for SSR drive), isolation test **must not** be carried out between output terminal and input terminal or between output terminal and CT input terminal.)

Dielectric strength

Between input terminal and ground terminal,   1.5kV AC for 1 minute
Between input terminal and power terminal,   1.5kV AC for 1 minute
Between power terminal and ground terminal, 1.5kV AC for 1 minute
Between output terminal and ground terminal, 1.5kV AC for 1 minute
Between output terminal and power terminal,   1.5kV AC for 1 minute

Weight   : GCD-200 type, Approx. 360g
                         GCR-200 type, Approx. 210g

External dimension: GCD-200 type, 96 x 96 x 100mm (W x H x D)
                         GCR-200 type 48 x 96 x 100mm (W x H x D)

Material   : Base and Case, Flame-resistant resin

Color   : Base and Case, Light gray

Attached functions : Control output OFF function, Setting value lock function
                         Setting value limit, Sensor correction function
                         Power failure countermeasure, Self-diagnosis function
                         Automatic cold junction temperature compensation
                         Burnout function (overscale, underscale)

Accessories   : Mounting bracket   1 set
                         Instruction manual   1 copy
                         Current transformer   1 piece
                           (CTL-6S)   [When the option W (20A) is applied.]
                           (CTL-12-S36-10L1) [When the option W (50A) is applied.]
                         Terminal cover   2 pieces (GCD-200 type)
                                              1 piece   (GCR-200 type)
                                              [When the option TC is applied.]

10.2 Optional specifications (common to GCD-200, GCR-200)

Temperature alarm 2 (A2) output [Option code: A2]

The alarm action point is set by $\pm$deviation to main setting (except Process value alarm). When the input goes out of the range, the output turns ON or OFF (in the case of High/Low limit range alarm).
When the option [DR, DS, DA] and option [W] are applied together, this option cannot be added.

Setting accuracy : The same as the Indication accuracy

Action   : ON/OFF action,

Hysteresis   : 0.1 to 99.9℃ (℉)

Output   : Relay contact 1a
                       Control capacity, 250V AC 3A (resistive load)
                                 250V AC 1A (inductive load cosø=0.4)
                       Electric life, 100,000 times

Heater burnout alarm output (Including sensor burnout alarm)[Option code: W]

Watches the heater current with CT (current transformer), and detects the burnout.
When the option [DR, DS, DA] and option [A2] are applied together, this option cannot be added.
Option [W] cannot be applied to the DC current output type.
When the option [W] is applied, the input sampling period is 0.5 seconds.
Heater burnout alarm is also activated during overscale and underscale.

Rating   : 20A [Option W (20A)] or 50A [Option W (50A)],
                                 Must be specified.
Setting accuracy : Within $\pm$5%
Action   : ON/OFF action
Output   : Relay contact,   1a
                          Control capacity, 3A   250V AC (resistive load)
                                     1A   250V AC (inductive load, cosø=0.4)

Heating/Cooling control output [Option code: D□]

 When the option [A2] and [W] are applied together, this option cannot be added.

The specifications of heating side are the same as those of the Main output (OUT1).

Cooling side proportional band: Multiplying factor to the heating side proportional
                                   band is 0.0 to 10.0 times.
                                   (ON/OFF action when setting the value to 0.0.)

Cooling side integral time: The same as the Heating side integral time

Cooling side derivative time: The same as the Heating side derivative time

Cooling side proportional cycle: 1 to 120s

Overlap/Dead band setting range: $\pm$(0 to 100)% of the Heating proportional band

Output   [DR]   Relay contact 1a
                         Control capacity, 3A   250V AC (resistive load)
                                     1A   250V AC (inductive load cosø=0.4)
            [DS]   Non-contact voltage (for SSR drive)
                    12^{+2}_{0}V DC   maximum 40mA (short-circuit protected)
            [DA]   DC current
                    4 to 20mA DC
                    Load resistance: Maximum 550Ω

   Cooling action mode selection:
                   Key selectable, Air cooling (Linear characteristic), Oil cooling (1.5th power
                   of the linear characteristic) or Water cooling (2nd power of the linear
                   characteristic).

Multi-range [Option code: MR]

 A sensor type can be selected from K, J, E, Pt100 or JPt100.

The temperature unit ℃ or ℉ can be selected.

Screw type mounting bracket [Option code: BL] (Only for GCR-200 type)

 Panel thickness: 1 to 15mm

(Optional for GCR-200, included with GCD-200)

Color black [Option code: BK]

 Front panel : Dark gray

Case   : Black

Terminal cover [Option code: TC]

 Electrical shock protection terminal cover

Dust-proof•Drip-proof [option code: IP]

Dust-proof and Drip-proof specification (IP54)

Effective for only panel surface, case part is excluded.

To protect the controller from water leak between the control panel and controller, take note of the following.

(1) Use the screw type mounting bracket.

(2) The panel cutout dimension should be proper and have no burrs.

(3) The control panel surface to be mounted should be vertical.

Front cover FC-96-S for GCD and FC-R-S for GCR (soft type, sold separately) are recommended to strengthen the Dust-proof and Drip-proof specification.

Designated specifications

Input, Scale range : Shipped as designated input and scale range

Alarm action   : Shipped as designated alarm action (A1, A2)

Cooling action   : Shipped as cooling (direct) action

Control action   : Shipped as PD or ON/OFF control action)

Hysteresis   : Shipped as designated hysteresis

11. Troubleshooting

If any malfunctions occur, refer to the following items after checking the power and the 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 an Electric Shock which could cause severe injury or death.

<Indication>

Phenomenon	Presumed cause and solution
If the PV display is indicating [oFF].	• Control output OFF function is working. Press the [OUT OFF] key for approx. 1s to release the function. (page 21)
If [‾ ‾ ‾] is blinking on the PV display.	• Thermocouple or RTD is burnt out. [In the case of Thermocouple] If the input terminal of the instrument is shorted, and if nearby room temperature is indicated, the instrument should be normal and the sensor may be burnt out. [In the case of RTD] If approx. 100Ω of resistance is connected to the input terminal between A-B of the instrument and between B-B is shorted, and if nearby 0℃ (32℉) is indicated, the instrument should be normal and the sensor may be burnt out. • Lead wire of thermocouple or RTD is not securely mounted to the instrument terminal.
If [_ _ _] is blinking on the PV display.	• Polarity of thermocouple or compensating lead wire is reversed. • Codes (A, B, B) of RTD do not agree with the instrument terminal.
If indication of PV display is abnormal or unstable.	• Designation of the Sensor input is improper. ➤ Set the Sensor input properly (page 19). • Temperature unit (℃ or ℉) is mistaken. • Sensor correcting value is unsuitable. ➤ Set the value suitably. (page 17) • Specification of the Thermocouple or RTD is improper. • AC may be leaking into thermocouple or the RTD circuit. • There may be equipment producing an inductive fault or noise near the controller.

<Key operation>

Phenomenon	Presumed cause and solution
If settings are impossible. If the value does not change by the ▲, ▼ keys.	• Setting value lock (mode 1 or 2) is designated. ➡️Release the lock designation. (page 17) • During PID auto-tuning ➡️Cancel the tuning if necessary. (page 13) • During auto-reset (It takes approx. 4 minutes until auto-reset is finished.)
If the setting indication does not change in the rated scale range even if the ▲, ▼ keys are pressed, and settings are impossible.	• Main setting value high limit or low limit may be set at the point the value does not change. ➡️Set it again while in the Auxiliary function setting mode. (page 17)

<Control>

Phenomenon	Presumed cause and solution
If process variable (temperature) does not rise.	• Thermocouple or RTD is burnt out. [In the case of Thermocouple] If the input terminal of the instrument is connected, and if nearby room temperature is indicated, the instrument should be normal and sensor may be burnt out. [In the case of RTD] If approx. 100Ω of resistance is connected to the input terminals between A-B of the instrument and between B-B is shorted, and if nearby 0℃ (32℉) is indicated, the instrument should be normal and sensor may be burnt out. • Lead wire of thermocouple or RTD is not securely mounted to the instrument terminal.
If the main output remains in ON status.	• Main output low limit setting value is set to 100% or greater. ➡️ Set the value appropriately. (page 18)
If the cooling output remains in ON status.	• Cooling output low limit setting value is set to 100% or greater. ➡️ Set the value appropriately. (page 19)
If the main output remains in OFF status.	• Main output high limit setting value is set to 0% or less. ➡️ Set the value appropriately. (page 18)
If the cooling output remains in OFF status.	• Cooling output high limit setting value is set to 0% or less ➡️ Set the value appropriately. (page 18)

If any unexplained malfunctions occur other than the above mentioned, make inquiries at our agency or the shop where you purchased the unit.

12. Character table

[Main setting mode]

Character	Description	Initial value	Data
५	Main setting	0℃ (℉) or 0.0℃	

[Sub setting mode]

Character	Description	Initial value	Data
AΓ	Auto-tuning Perform/Cancel	Cancel	
⌐५Γ	Auto-reset Perform		
P	Main proportional band	10℃ (20℉) or 10.0℃	
P_b	Cooling proportional band	1.0 times	
i	Integral time setting	200 seconds	
d	Derivative time setting	50 seconds	
c	Main proportional cycle	R/□: 30s, S/□: 3s	
c_b	Cooling proportional cycle	R/□: 30s, S/□: 3s	
A1	Alarm 1 (A1) setting	0℃ (℉) or 0.0℃	
A2	Alarm 2 (A2) setting	0℃ (℉) or 0.0℃	
H0	Heater burnout alarm setting	0A	

[Auxiliary setting mode]

Character	Description	Initial value	Data
Loc	Setting value lock designation	Unlock	
५H	Main setting value high limit	Rated scale max. value	
५L	Main setting value low limit	Rated scale min. value	
५o	Sensor correction setting	0℃ (℉) or 0.0℃	
oH	Main output high limit setting	100%	
oL	Main output low limit setting	0%	
HY	Main output ON/OFF action hysteresis	1.0℃ (℉)	
bc५	Cooling action mode selection	Air cooling (Linear)	
oHb	Cooling output high limit	100%	
oLb	Cooling output low limit	0%	
HYb	Cooling output ON/OFF action hysteresis	1.0℃ (℉)	
db	Overlap band/Dead band setting	0%	
५En	Sensor selection (Multi-range input)	Specified input	
AL1	Alarm 1 (A1) action selection	No alarm action	
AL2	Alarm 2 (A2) action selection	No alarm action	
A1H	Alarm 1 (A1) hysteresis	1.0℃ (℉)	
A2H	Alarm 2 (A2) hysteresis	1.0℃ (℉)	
cnΓ	Direct/Reverse action selection	Reverse (Heating)	

***** Inquiry *****

For any inquiries about this unit, please contact the shop
where you purchased the unit after checking the following.

                                                   [Example]
    • Model   --------------------------- GCD-23A-R/E
    • Type of input ------------------ K
    • Option   --------------------------- A2, W(20A)
    • Instrument number ---------- No. xxxxxx

In addition to the above, please let us know the details of the
malfunction, if any, and the operating conditions.