• • • Inquiry • • •

For any inquiry of this controller, after checking the following as to the controller, please contact your shop where purchased, or our agency.

	[Example]
• Model	GCS-23A-R/E, W
• Type of input	K
• Option	W
• Instrument number	No.□□□□□□

In addition to the above, let us know the details of malfunction, if any, and the operating conditions specifically on job site.

SHINKO TECHNOS CO., LTD.
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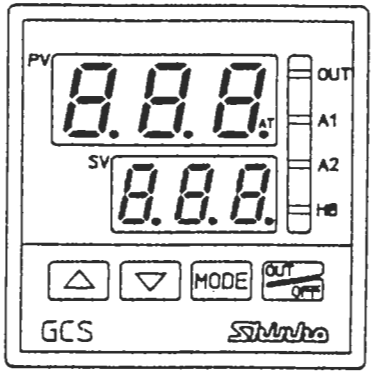
No.G C S 2 1 E 7 2003. 02

INSTRUCTION MANUAL FOR MICROCOMPUTER BASED TEMPERATURE CONTROLLER

GCS-200



Thank you for your purchase of our Microcomputer based Temperature Indicating Controller GCS-200.

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

For your confirmation of the model and specifications of the controller, peruse and understand this instruction manual before starting operation.

To prevent the accident by mis-handling of this controller, please arrange to give this manual into the hands of the operator who actually uses our product.

• • • Notes to users • • •

Before operating this controller, please understand about following matters.

⚠ Warning

Turn the power supplied to the instrument off before wiring or checking. If working or touching the terminal on the power ON status, there is a possibility of Electric Shock which can cause severe injury or death.

⚠ Notices

It is recommended that the PID auto-tuning is performed on the trial run.

During PID auto-tuning, if the OUT/OFF key is pressed, the Control output OFF function works, and if the OUT/OFF key is pressed again, the PID auto-tuning will be released.

It is advised to provide the protective device against unexpected event owing to the using condition and aged change of the parts.

If you start to mount this controller to the control panel or machine, read this manual from the item "8. Mounting to control panel" or "9. Wiring connection" after checking the model name by "1. Model names".

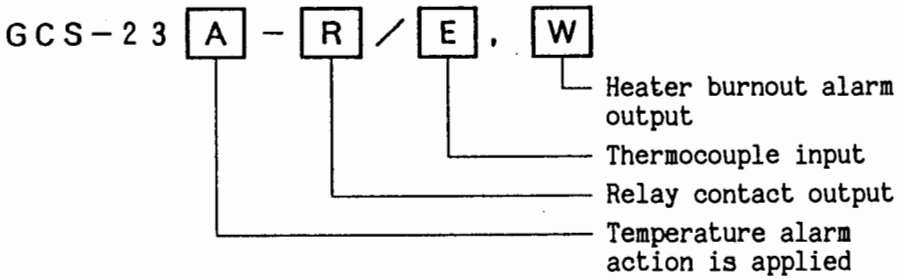
If you operate this controller already mounted, read this manual from the item "2. Name and functions of the sections" or "3. Operations".

1. Model names

1.1 Model names

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

[Example]



- Standard models

GCS-2 3 □-□/□				GCS-200 type
Control action	3			PID control
Temperature alarm	0			No alarm action
	A			Alarm action is applied *
Output		R		Relay contact output
		S		Non-contact voltage output
		A		Current output (DC)
Input			E	Thermocouple K, J, E
			R	RTD Pt100, JPt100

*: With the GCS-23A type, temperature alarm action (8-type) or no alarm action is user selectable by key operation.

Optional code

Code	Description
A 2	Temperature alarm (A2) output
W	Heater burnout alarm output (including Sensor burnout alarm)
MR	Multi-range
BK	Color: Black
BL	Screw type mounting bracket
IP	Dust-proof, Drip-proof (IP54) only panel face
TC	Terminal cover

(See page 47 for the contents of the options in detail.)

⚠ Warning

Do not take the inner assembly out or touch the terminal when the status of power supply is ON. If you touch the terminal, there is possibility of Electric Shock which can cause severe injury or death.

1.2 How to indicate the model nameplate

Model nameplates are put on the right side of the case and the bottom of the inner assembly.

Model nameplate [Example]

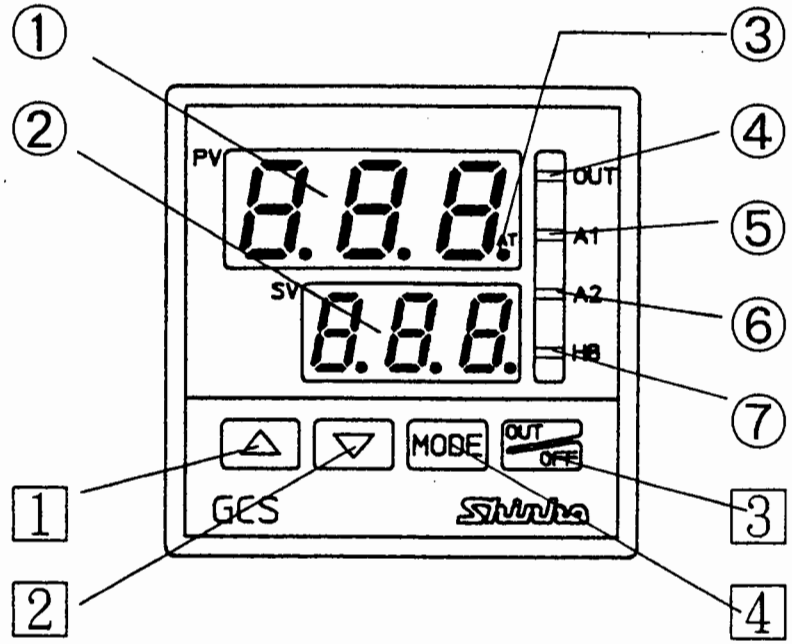
①···	GCS−23A−R/E	Relay output/Thermocouple input
②	A2	Temperature alarm (A2) output
②	W (20A)	Heater burnout alarm output (20A)
③···	No.	

①: Model name
②: Option codes
③: Instrument No. (Indicated only inner assembly)

With Heater burnout alarm output, the specified current value is entered in ( ).

2. Name and functions of the sections

2.1 Names and Displays



[Fig. 2.1]

① Process variable (PV) display
It indicates the Process variable with red LED.

② Setting value (SV) display
It indicates the Setting value with green LED.

③ ● AT PID auto-tuning action indicator or Auto-reset action indicator
During PID auto-tuning or Auto-reset, the decimal point (●) AT on the PV display blinks.

④ □ OUT Control output action indicator
Green LED lights when the control output is ON.

⑤ □ A1 Temperature alarm (A1) output indicator
Red LED lights when Temperature alarm (A1) output is ON.

⑥ □ A2 Temperature alarm (A2) output indicator [Option]
Red LED lights when Temperature alarm (A2) output is ON.

⑦ □ HB Heater burnout alarm output indicator [Option] or
Sensor burnout alarm output indicator [Option]
Yellow LED lights when Heater burnout alarm output or Sensor burnout alarm output is ON.

2.2 Keys

Main functions are described here, however, the key has other functions on the mode.
Refer to the item 3.1 Operating flow chart (page 10 ff)

[1] [▲] Increase key : It increases the setting value (SV) being displayed. Continuous pressing makes the value change faster.

[2] [▼] Decrease key : It decreases the setting value (SV) being displayed. Continuous pressing makes the value change faster.

[3] [OUT/OFF] OUT/OFF key : It performs the control output ON and OFF.

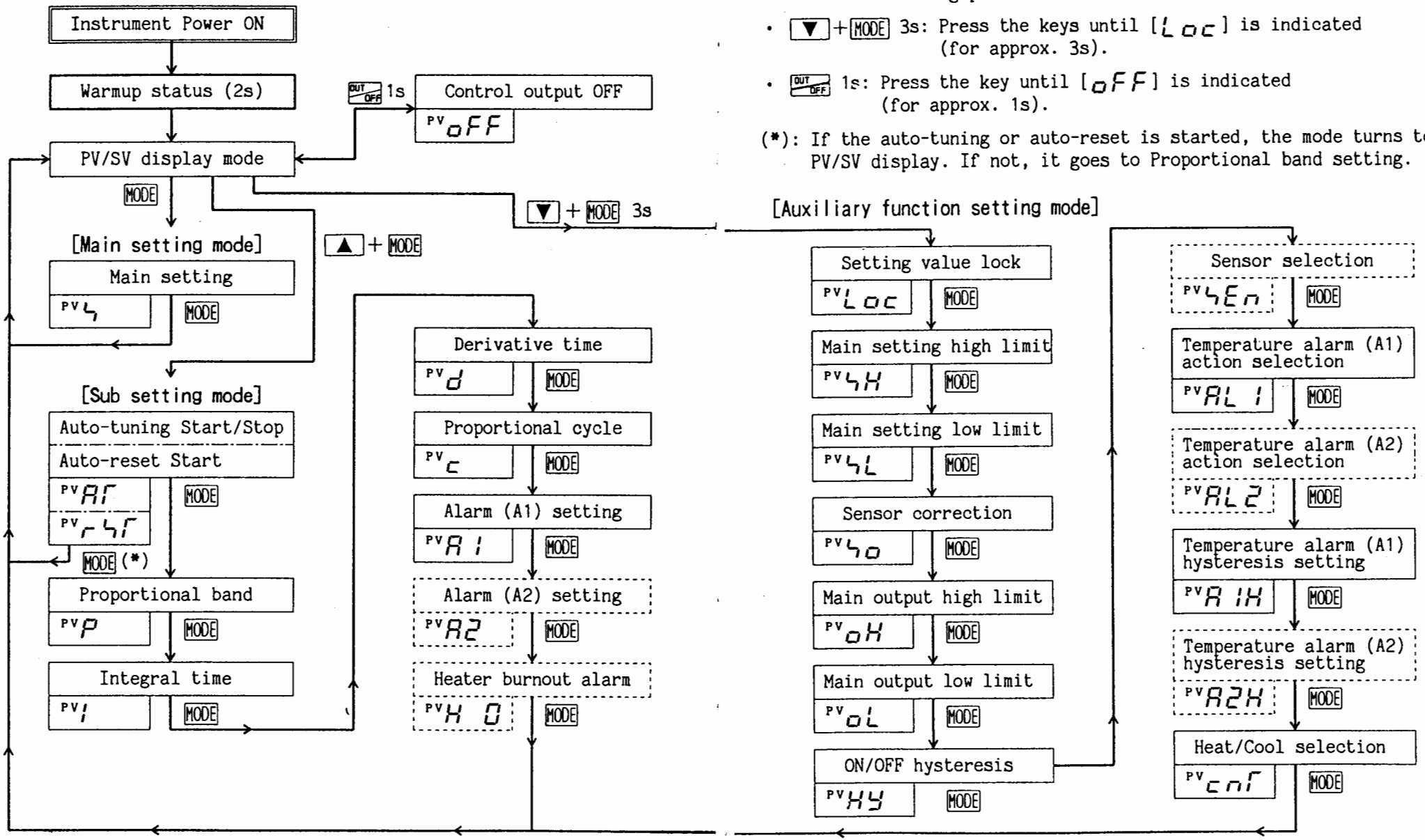
[4] [MODE] Mode key : It selects the setting mode.

- In any mode, if the [OUT/OFF] key is pressed for approx. 1 second, the Control output OFF function will work.
When the function works, the function cannot be released even if the instrument power is turned off and on again, and the function is remained.
To release the function, press the [OUT/OFF] key at least 1 second.

- The setting value is registered by pressing the [MODE] key.

3. Operations

3.1 Operating flow chart



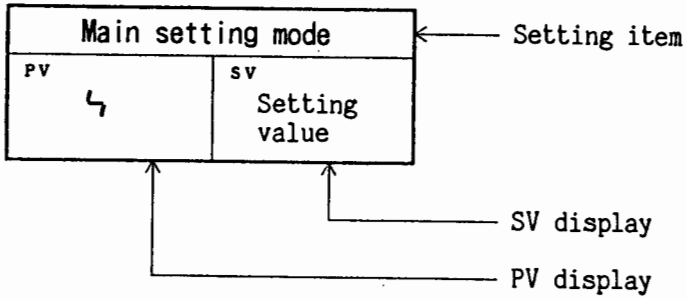
- Dotted line (·····) shows in case of Option designation.
- ▲ + MODE: Press the MODE key while the ▲ key is being pressed.
- ▼ + MODE 3s: Press the keys until [Loc] is indicated (for approx. 3s).
- OUT/OFF 1s: Press the key until [oFF] is indicated (for approx. 1s).

(*): If the auto-tuning or auto-reset is started, the mode turns to PV/SV display. If not, it goes to Proportional band setting.

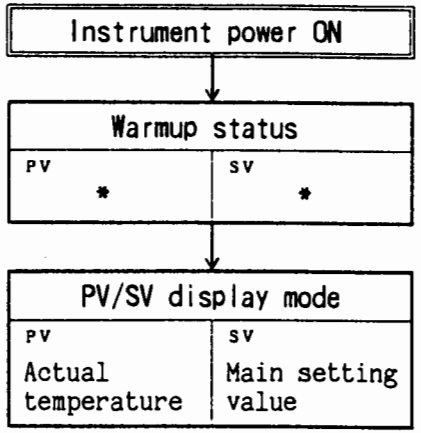
3.2 Operations

- Process variable (PV) display indicates the type of sensor and setting value (SV) display indicates the rated scale maximum value for approx. 2 seconds after the power is turned ON (See page 13). If the Main setting value high limit is set, the SV display indicates the high limit value. During this time, all outputs and LED indicators are in their off status. After that, it displays actual temperature on the PV display, main setting value on the SV display and starts control.
- In case the Control output OFF function is working, [oFF] is displayed on PV display. To release the function, press the OUT/OFF key for approx. 1 second. (See page 28)

In this item, the setting items are represented as follows.



(1) PV/SV display mode



*: See below table

Mode during control

No contents of setting items nor setting values can be changed.

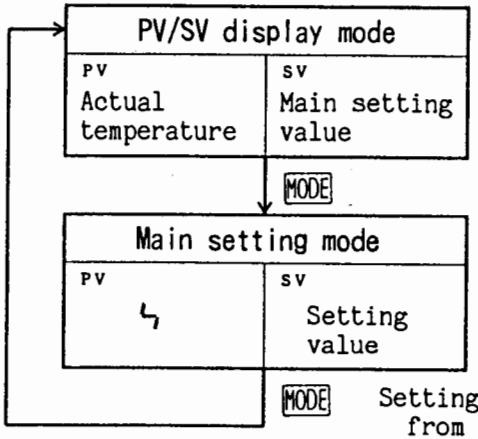
[Table 3.2-1]

Input	℃		℉	
	PV display	SV display	PV display	SV display
K	tC	999	tF	999
J	JC	999	JF	999
E	EC	600	EF	999
Pt100	PtC	400	PtF	999
	PtC	999		
JPt100	JPC	400	JPF	999
	JPC	999		

In case the Main setting value high limit is set in advance, the SV display indicates the high limit value.

(2) Main setting mode

The setting value can be increased or decreased by pressing the ▲ or ▼ key.
If the MODE key is pressed, the setting value is registered and the mode returns to PV/SV display.

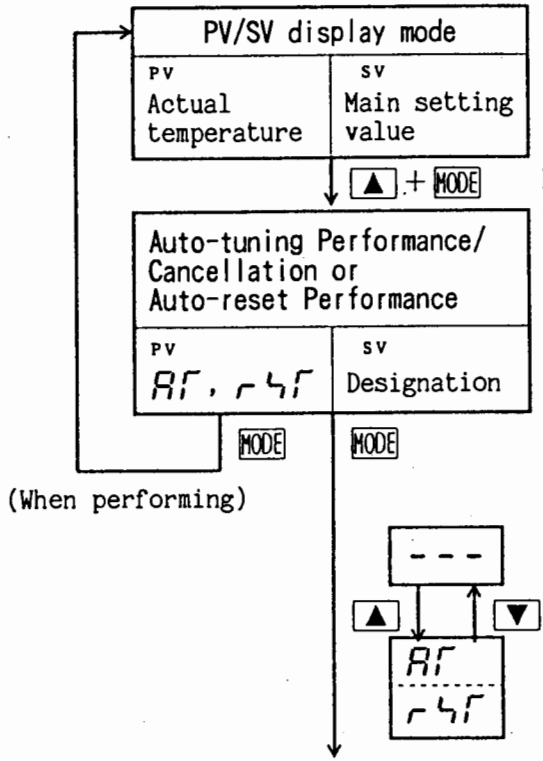


A mode to set the setting value of the main control.

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

(3) Sub setting mode

The setting value can be increased or decreased by pressing the ▲ or ▼ key.
If the MODE key is pressed, the setting value is registered and the setting mode is changed.



Mode to designate the auto-tuning performance/ cancellation or auto-reset (Offset correction) performance.

[Factory adjusted as Auto-tuning, Auto-reset cancellation]

(Auto-tuning or Auto-reset cancellation)

(Auto-tuning performance)

(Auto-reset performance)

- If the auto-tuning performance is designated and the MODE key is pressed, the indication returns to PV/SV display and the decimal point (AT) on the PV display blinks.
- When the auto-tuning is finished, the decimal point (AT) on the PV display will be unlit, and the values P, I, D are set automatically.
- All settings are impossible during auto-tuning.
- In case the auto-tuning is released on the process, the PID value becomes to the former value.

Notes: • The setting item of auto-tuning or auto-reset is not displayed when the action is P, PI or ON/OFF.
• Auto-reset performance can be designated only when PD action.

- If the auto-reset performance is designated and the MODE key is pressed, the indication returns to PV/SV display and the decimal point (AT) on the PV display blinks.
- When the auto-reset is started, it begins the offset correction at once.
- To protect the mis-operation by key, other settings are impossible for 4 minutes after starting auto-reset.
- When the auto-reset is finished, the decimal point (AT) on the PV display will be unlit, and the correction value is set automatically.

From page 15

Proportional band setting mode

PV	SV
P	Setting value

Mode to set proportional band

Setting the value to 0 or 0.0 causes the instrument to act as an ON/OFF controller.

MODE Setting range: 0 to 999℃ (℉)
In case decimal point is applied.
0.0 to 99.9℃
[Factory adjusted as 10℃ (20℉) or 10.0℃]

Integral time setting mode

PV	SV
I	Setting value

Mode to set integral time

Off when set to 0 and it acts PD action.

MODE Setting range: 0 to 999s
[Factory adjusted as 200s]

Derivative time setting mode

PV	SV
d	Setting value

Mode to set derivative time

Off when set to 0 and it acts PI action.

MODE Setting range: 0 to 300s
[Factory adjusted as 50s]

Proportional cycle setting mode

PV	SV
c	Setting value

Mode to set proportional cycle

In case of ON/OFF action or Current output type, this item is not indicated.

MODE Setting range: 1 to 120s
[Factory adjusted as 30s to Relay contact output type, and 3s to Non-contact voltage output type]

With Relay contact output type, if setting the time of Proportional cycle shorter, the number of times of the relay action becomes much, it causes the life of relay contact shorter.

Temperature alarm (A1) setting mode

PV	SV
A 1	Setting value

Mode to set the action point of the alarm (A1) output.

Setting the value to 0 or 0.0 disables the function (except Process value alarm action).

MODE

- With GCS-23A type, if No alarm is selected in [Temperature alarm (A1) action selection], this item is not indicated.
- With GCS-230 type, this item is not indicated.
- Setting range (See page 20)
  [Factory adjusted as 0℃(℉) or 0.0℃]

Temperature alarm (A2) setting mode

PV	SV
A2	Setting value

Mode to set the action point of the alarm (A2) output.

Setting the value to 0 or 0.0 disables the function (except Process value alarm action).

MODE

- In case the option A2 is not applied, or though it is applied, if No alarm is selected in [Temperature alarm (A2) action selection], this item is not indicated.
- Setting range (See page 20)
  [Factory adjusted as 0℃(℉) or 0.0℃]

Heater burnout alarm setting mode

PV	SV
H 0	Setting value

Mode to set the heater current for Heater burnout alarm.

In case the option W is not applied, this item is not indicated.

MODE

- Setting range: W(20A), 0 to 20A
  W(50A), 0 to 50A
  [Factory adjusted as 0A]

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

It is recommended to set approx. 80% of the value considering the voltage fluctuation.

PV/SV display mode

PV	SV
Actual temperature	Main setting value

- Setting ranges of temperature alarms (A1. A2) are as follows

[max. value: Input range maximum value]

[Table 3.2-2]

Type of alarm	Setting range
High limit alarm	−199 to max. value ℃ (℉)
Low limit alarm	−199 to max. value ℃ (℉)
High/Low limits alarm	±(0 to max. value) ℃ (℉)
High/Low limit range alarm	±(0 to max. value) ℃ (℉)
Process high alarm	Input range minimum value to Input range maximum value
High limit alarm w/standby	−199 to max. value ℃ (℉)
Low limit alarm w/standby	−199 to max. value ℃ (℉)
Hi/Lo limits alarm w/standby	±(0 to max. value) ℃ (℉)

In case decimal point is applied to RTD input.

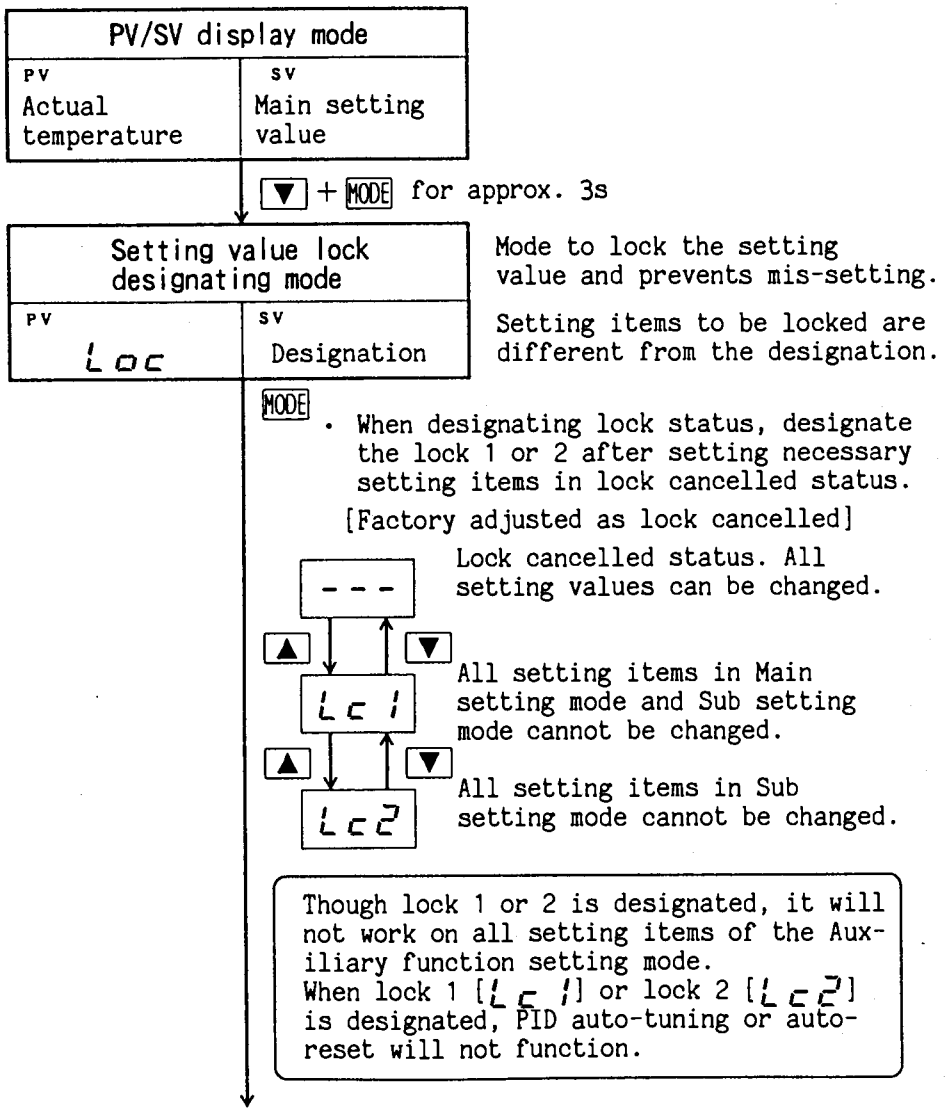
[Table 3.2-3]

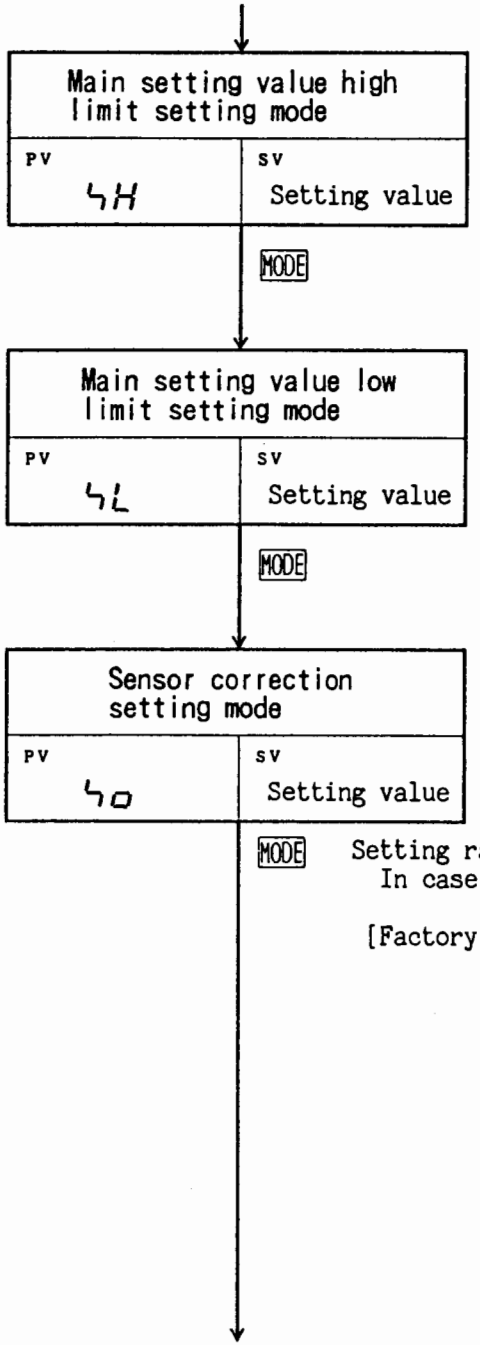
Type of alarm	Setting range
High limit alarm	−19.9 to 99.9℃
Low limit alarm	−19.9 to 99.9℃
High/Low limits alarm	±(0.0 to 99.9)℃
High/Low limit range alarm	±(0.0 to 99.9)℃
Process high alarm	Input range minimum value to Input range maximum value
High limit alarm w/standby	−19.9 to 99.9℃
Low limit alarm w/standby	−19.9 to 99.9℃
Hi/Lo limits alarm w/standby	±(0.0 to 99.9)℃

(4) Auxiliary function setting mode

The setting value can be increased or decreased by pressing the [▲] or [▼] key.

If the [MODE] key is pressed, the setting value is registered and the setting mode is changed.





Mode to set the high limit of the main setting value.

Setting range:
Main setting value low limit to Rated scale maximum value
[Factory adjusted as Rated scale maximum value]

Mode to set the low limit of the main setting value.

Setting range:
Rated scale minimum value to Main setting value high limit
[Factory adjusted as Rated scale minimum value]

Mode to set the correction value of the sensor.

Setting range: −199 to 200℃ (℉)
In case decimal point is applied
−19.9 to 20.0℃ (℉)
[Factory adjusted as 0℃ (℉) or 0.0℃]

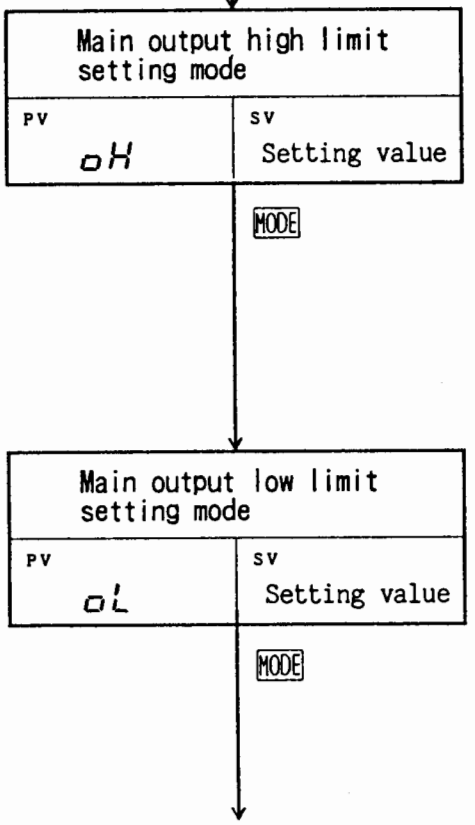
- Sensor correction function

It 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 plural controllers, the accuracy of sensors have influence on the control.

Therefore, sometimes measuring temperature (input value) does not accord with the same setting value.

In such a case, the control can be accorded with desired temperature by shifting the input value of sensors.

From page 22.



Mode to set the high limit of Main output.

In case of ON/OFF action, this setting item is not indicated.

Setting range:
Main output low limit to 105%

Setting more than 100% is effective to Current output type.

[Factory adjusted as 100%]

Mode to set the low limit of Main output.

In case of ON/OFF action, this setting item is not indicated.

Setting range:
−5% to Main output high limit
Setting less than 0% is effective to Current output type.

[Factory adjusted as 0%]

ON/OFF action hysteresis setting mode

PV	SV
HY	Setting value

MODE

Mode to set hysteresis of ON/OFF action.

It is indicated only when ON/OFF action.

Setting range:
0.1 to 99.9℃ (℉)
[Factory adjusted as 1.0℃ (℉)]

Sensor selection mode

PV	SV
SEn	Designation

MODE

Mode to select the input type, scale and ℃ or ℉ within respective input types: Thermocouple (6 types) and RTD (6 types).
This item is indicated only when option MR is applied.

SV tC	K	0 to 999℃
SV JC	J	0 to 999℃
SV EC	E	0 to 600℃
SV PtC	Pt100	−199 to 400℃
SV JPC	JPt100	−199 to 400℃

SV Pt.C	Pt100	−19.9 to 99.9℃
SV JP.C	JPt100	−19.9 to 99.9℃
SV tF	K	0 to 999°F
SV JF	J	0 to 999°F
SV EF	E	0 to 999°F
SV PtF	Pt100	−199 to 999°F
SV JPF	JPt100	−199 to 999°F

Temperature alarm (A1) action selection

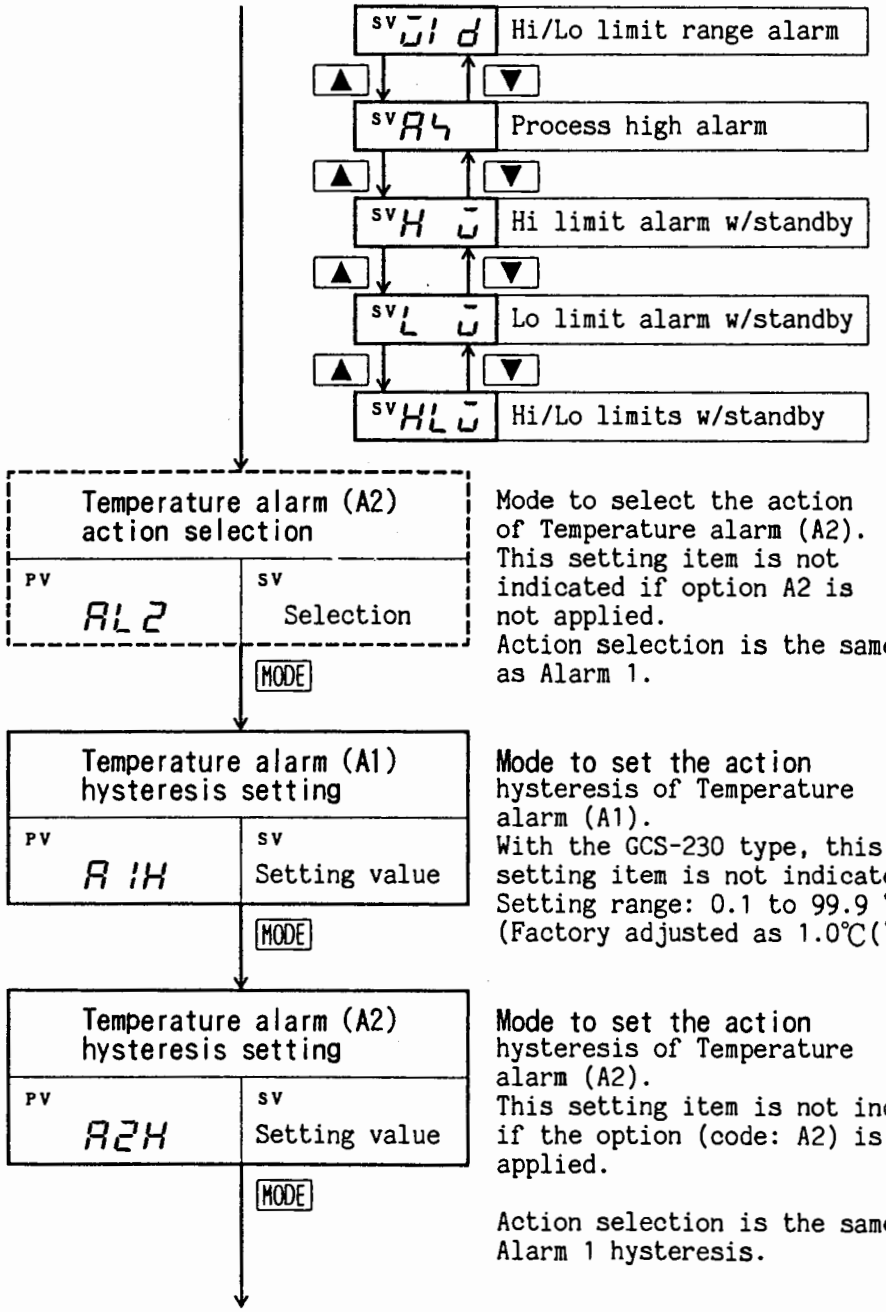
PV	SV
AL 1	Selection

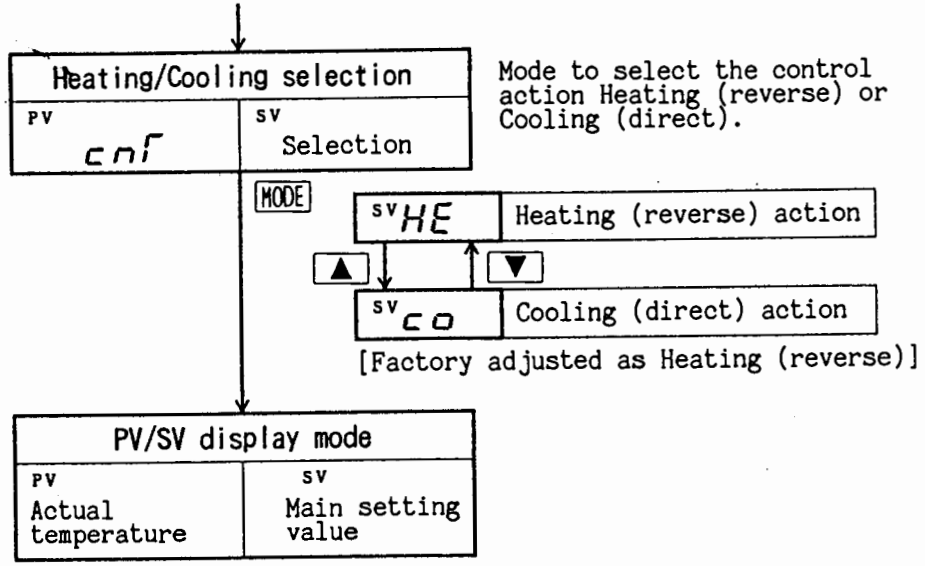
MODE

Mode to select the action of Temperature alarm (A1).

With the GCS-230 type, this setting item is not indicated.

SV ---	No alarm action
SV H	High limit alarm action
SV L	Low limit alarm action
SV HL	High/low limits alarm

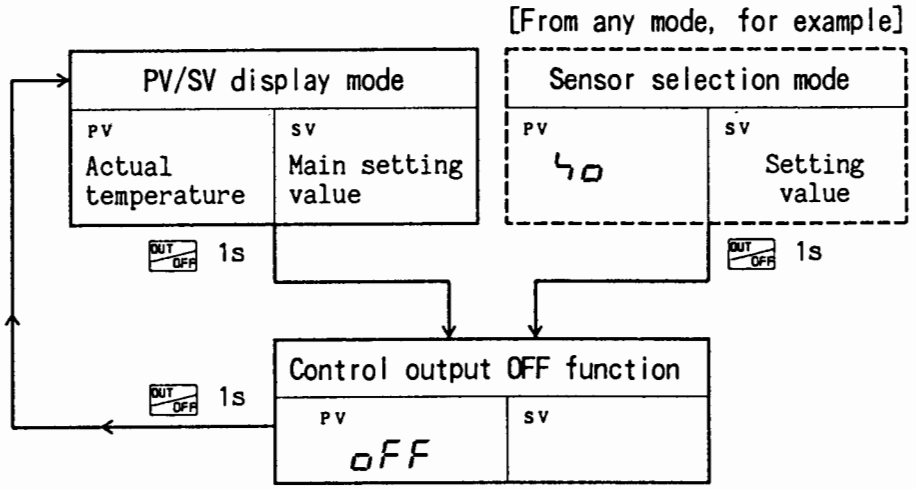

SV oI d
Hi/Lo limit range alarm
SV AH
Process high alarm
SV H o
Hi limit alarm w/standby
SV L o
Lo limit alarm w/standby
SV HLo
Hi/Lo limits w/standby
Temperature alarm (A2) action selection
PV
AL2
SV
Selection
MODE
Mode to select the action of Temperature alarm (A2). This setting item is not indicated if option A2 is not applied.
Action selection is the same as Alarm 1.
Temperature alarm (A1) hysteresis setting
PV
A 1H
SV
Setting value
MODE
Mode to set the action hysteresis of Temperature alarm (A1).
With the GCS-230 type, this setting item is not indicated
Setting range: 0.1 to 99.9 ℃
(Factory adjusted as 1.0℃(℉)
Temperature alarm (A2) hysteresis setting
PV
A2H
SV
Setting value
MODE
Mode to set the action hysteresis of Temperature alarm (A2).
This setting item is not indicate if the option (code: A2) is not applied.
Action selection is the same as Alarm 1 hysteresis.


Heating/Cooling selection
PV
cnF
SV
Selection
Mode to select the control action Heating (reverse) or Cooling (direct).
MODE
SV HE
Heating (reverse) action
SV co
Cooling (direct) action
[Factory adjusted as Heating (reverse)]
PV/SV display mode
PV
Actual temperature
SV
Main setting value

(5) Control output OFF function

A function to make the control output OFF even the power to the instrument is supplied. The function is used when required to halt the control action or the GCS-200 is not used in plural controllers. When the function is working, PV display indicates [oFF].

Control output OFF function can be selected from any mode by pressing the OUT/OFF key for approx. 1 second.



⚠ Notice

Once the Control output OFF function is worked, the function is not 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.

4. Running

After completion of the mounting to the control panel and wiring connections, start running in the following manner.

(1) GCS-200 power ON

Turn the power supplied to this instrument GCS-200 ON.

- Process variable (PV) display indicates the type of sensor and setting value (SV) display indicates the rated scale maximum value for approx. 2 seconds after the power is turned ON (Warm-up status, see page 13).

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

  During this time, all outputs and LED indicators are in their off status.
- After that, it displays actual temperature on the PV display, main setting value on the SV display.
- In case the Control output OFF function is working, [oFF] is displayed on PV display.

(2) Setting

Input the setting values, referring to item "3. Operation".

(3) Load power ON

Turn the load circuit power ON.
It starts the control action so as to maintain the controlled object at the main setting value.

5. Action explanations

5.1 Standard action drawings

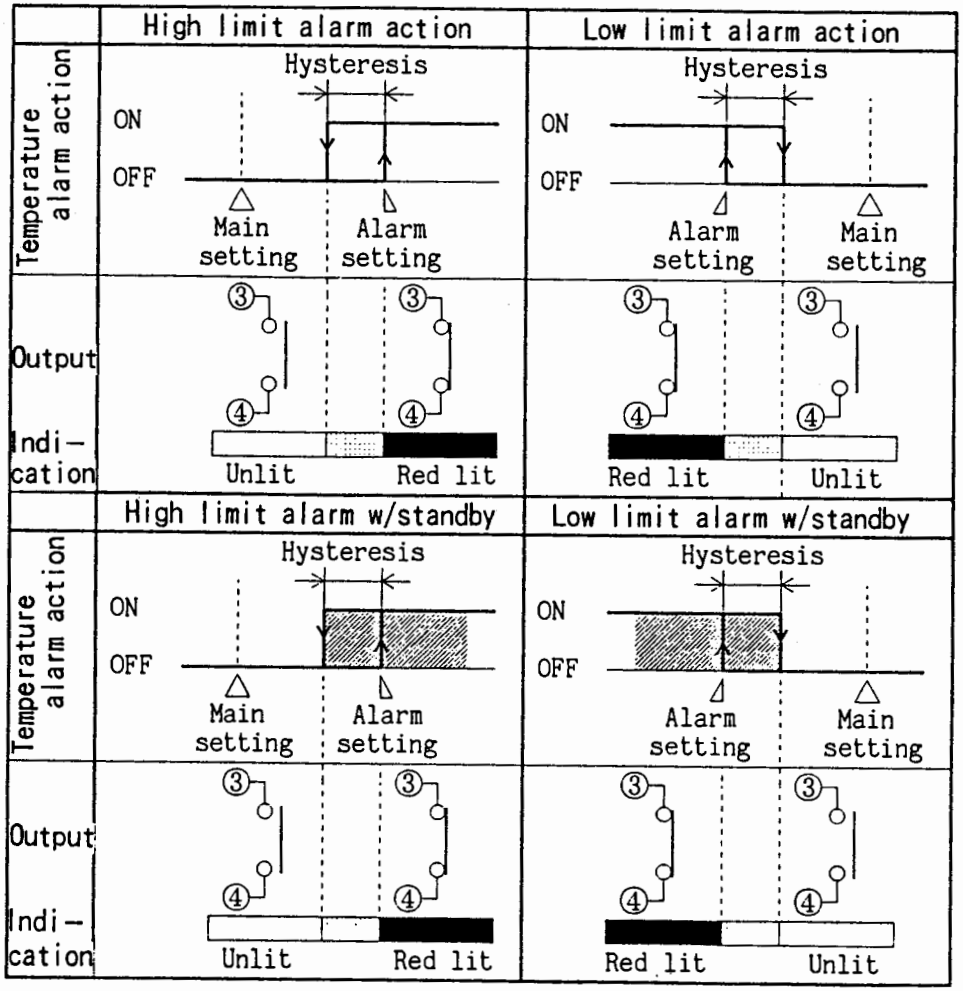
Action		Heating (reverse)	Cooling (direct)
Main control action		P. band, Setting △	P. band, △ Setting
Relay contact	Output	⑥ ⑦ Cycle action is performed according to deviation	⑥ ⑦ Cycle action is performed according to deviation
	Indication (OUT)	Green lit / Unlit	Unlit / Green lit
Non-contact voltage	Output	⑥ + 12Vdc 12/0Vdc 0Vdc ⑦ − Cycle action is performed according to deviation	⑥ + 0Vdc 0/12Vdc 12Vdc ⑦ − Cycle action is performed according to deviation
	Indication (OUT)	Green lit / Unlit	Unlit / Green lit
Current	Output	⑥ + 20mAdc 20-4mAdc 4mAdc ⑦ − Continuously changes according to deviation	⑥ + 4mAdc 4-20mAdc 20mAdc ⑦ − Continuously changes according to deviation
	Indication (OUT)	Green lit / Unlit Blinks according to output	Unlit / Green lit Blinks according to output

5.2 ON/OFF action drawings

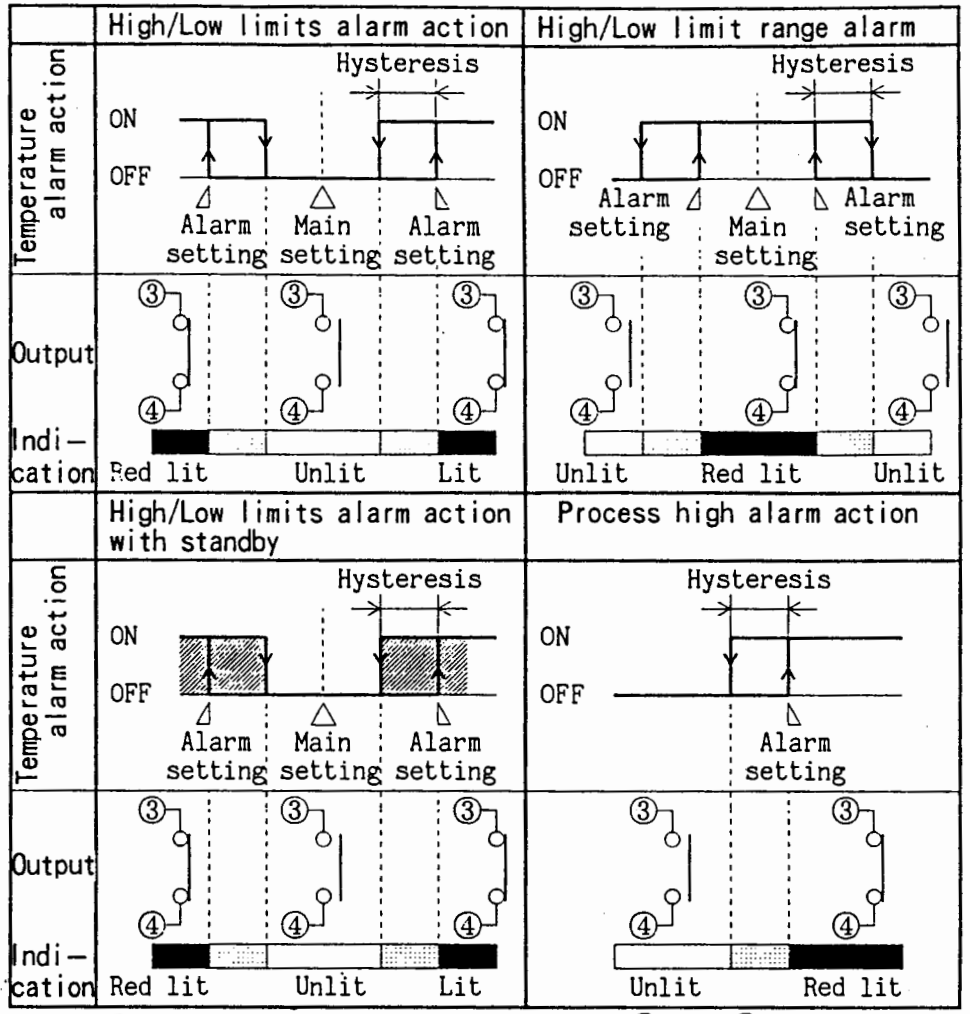
Action	Heating (reverse)	Cooling (direct)
Main control action	Hysteresis, ON, OFF, Setting △	Hysteresis, ON, OFF, △ Setting
Relay contact Output	⑥ ⑦	⑥ ⑦
Relay contact Indication (OUT)	Green lit / Unlit	Unlit / Green lit
Non-contact voltage Output	⑥ + 12Vdc 0Vdc ⑦ −	⑥ + 0Vdc 12Vdc ⑦ −
Non-contact voltage Indication (OUT)	Green lit / Unlit	Unlit / Green lit
Current Output	⑥ + 20mAdc 4mAdc ⑦ −	⑥ + 4mAdc 20mAdc ⑦ −
Current Indication (OUT)	Green lit / Unlit	Unlit / Green lit

In the range ▒▒▒, controller acts ON or OFF.

5.3 Temperature alarm (A1, A2) action drawing

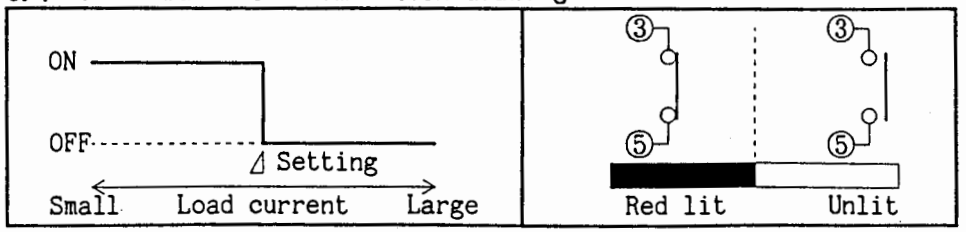


In case of A2, the terminal number: ③ and ⑤
Standby function works at ▨ part.



In case of A2, the terminal number: ③ and ⑤
Standby function works at ▨ part.

5.4 Heater burnout alarm action drawing



6. Control actions

6.1 Explanations of PID

(1) Proportional band (P)

Proportional action is the action of which the control output varies in proportion to the deviation between setting value and processing temperature. If the proportional band is narrowed, the output changes according to even by a slight variation of the processing temperature, and better control result can be obtained as the offset decreases. However, if when the proportional band is extremely far too narrowed, it may cause variation in the processing temperature even by slight disturbance, and turns into control such as ON/OFF action of the so called hunting phenomenon. 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 to eliminate offset. When the integral time is shortened, the returning speed to the setting point is quickened. However, the cycle of oscillation is also quickened and stability becomes unfavorable.

(3) Derivative time (D)

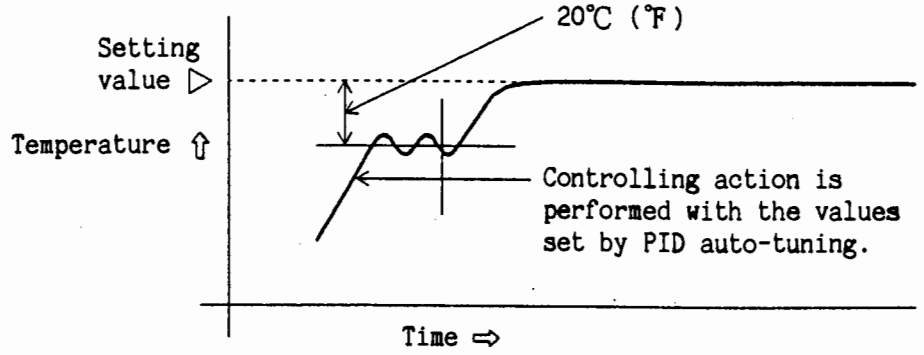
Derivative action is to restore the change of processing temperature according to the changing rate. It reduces the amplitude of overshoot and undershoot width. If the derivative time is shortened, restoring value comes small, and if the derivative time is adjusted longer, a phenomenon of returning too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

6.2 PID auto-tuning of this controller

In order to set the optimum point of each value for P, I and D automatically, this system gives the fluctuation to the control object by force.

(1) In case the difference between setting value and processing temperature is large when the temperature rises.

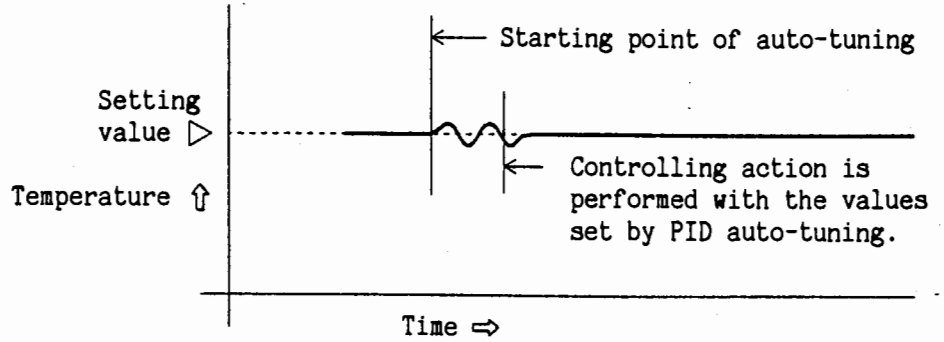
Fluctuation is given at the temperature 20℃ (℉) lower than the setting value.



[Fig. 6.2-1]

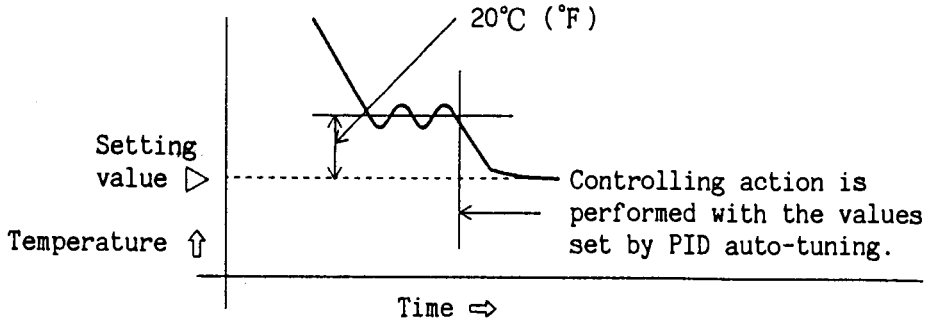
(2) In case of the stable situation during control or when the control temperature is within ±20℃ (℉).

Fluctuation is given at the setting value.



[Fig. 6.2-2]

(3) In case control temperature is 20℃ (℉) higher than the setting value.
Fluctuation is given at the temperature 20℃ (℉) higher than the setting value.

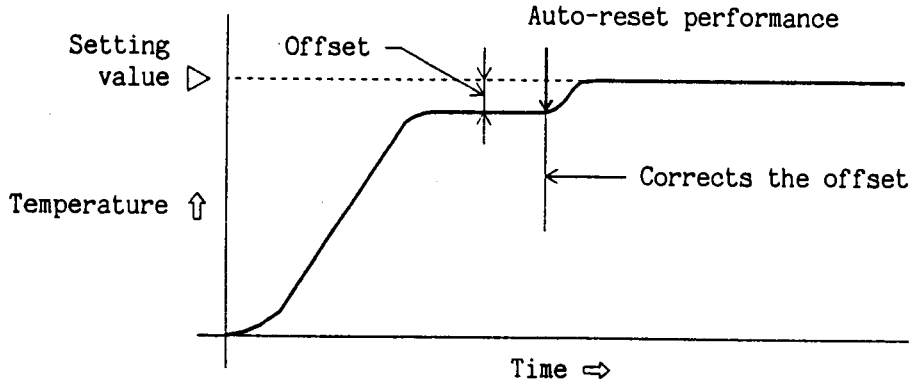


[Fig. 6.2-3]

6.3 Auto-reset (Offset correction)

In PD action, offset is corrected by performing the auto-reset when stabilized in proportional band (PV display is stabilized). This corrected value is internally memorized, therefore, auto-reset is not required from the next time unless the process is changed. However, if setting the proportional band to 0, the corrected value will be cleared.

- Auto-reset



[Fig. 6.3]

7. Other functions

(1) Burnout alarm

(Upscale)

When the thermocouple or RTD is burnt out or the input value becomes [Rated scale maximum value +1] or greater, or [99.9+0.1] or greater, PV display blinks [‾ ‾ ‾] and it makes the control output off.
In case of the Current output type, it blinks [‾ ‾ ‾] on the PV display and the controlling output corresponds to the Main output low limit value.

(Downscale)

- In case of Thermocouple:
  When the input value becomes [Rated scale minimum value −50] or less, PV display blinks [_ _ _] and it makes the control output off.
- In case of RTD:
  When the input value becomes [Rated scale minimum value −1] or less, or [−19.9 −0.1] or less, PV display blinks [_ _ _] and it makes the control output off.
  In case of the Current output type, it blinks [_ _ _] on the PV display and the controlling output corresponds to the Main output low limit value.

(2) Self-diagnostic function

It watches the CPU by watchdog timer, and when any abnormal status is found on the CPU, it makes the controller to warm-up status by making all output off.

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

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

8. Mounting to control panel

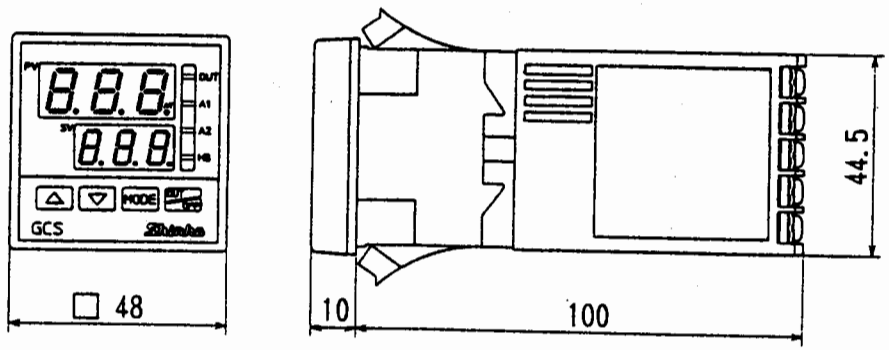
8.1 Site selection

Mount the controller in a place with:

(1) A minimum of dust, and an absence of corrosive gases.
(2) No mechanical vibrations or shocks.
(3) No exposure to direct sunlight, an ambient temperature is 0 to 50℃ (32 to 122℉) and it does not change suddenly.
(4) An ambient humidity is 85%RH or less, and non-condensing.
(5) The controller should be away from the electromagnetic switch of large capacity or cables through which large current flows.
(6) No water, oil or chemicals and their vapor directly splash.

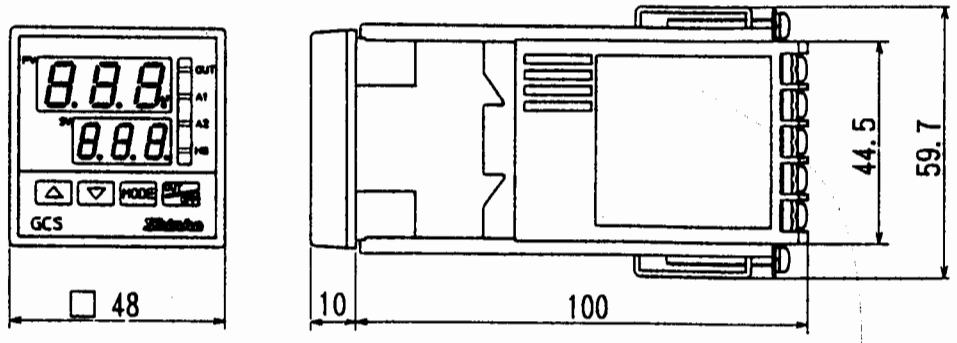
8.2 External dimension drawing

- One-touch type mounting bracket



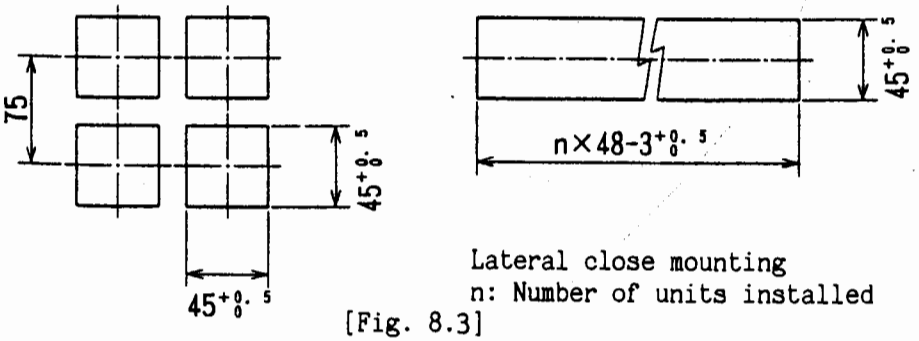
[Fig. 8.2-1]

- Screw type mounting bracket (Option: BL)



[Fig. 8.2-2]

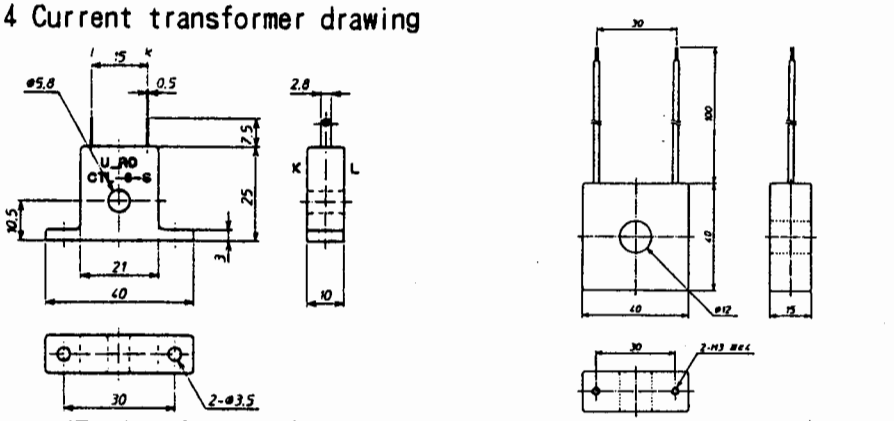
8.3 Panel cutout drawing



Lateral close mounting
n: Number of units installed

[Fig. 8.3]

8.4 Current transformer drawing

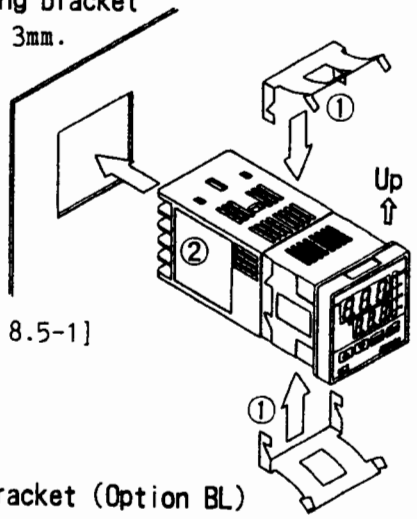


CTL-6-S (for 20A)

[Fig. 8.4] CTL-12-S36-10LI (for 50A)

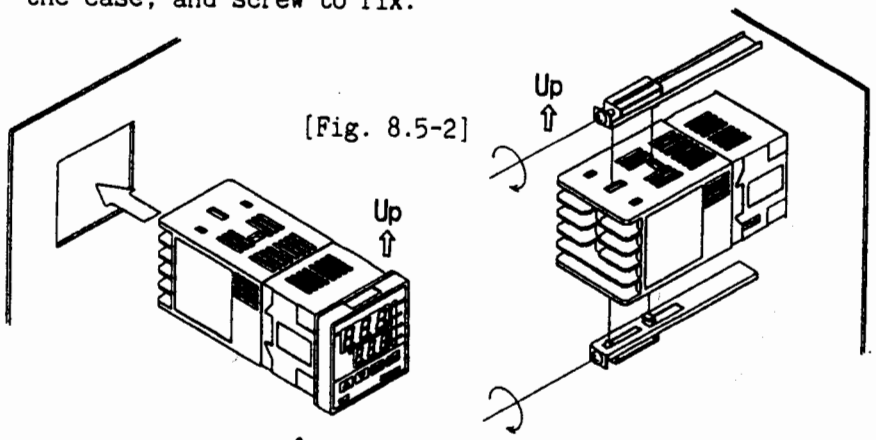
8.5 Mounting

- **When using One-touch type mounting bracket**
  Mounting panel thickness is 1 to 3mm.
  - Mount the one-touch mounting bracket ① to the body in advance, and next insert the GCS-200 ② from the front of panel.
  - When using the Soft front cover, the panel thickness to be mounted is 1 to 2.5mm.



[Fig. 8.5-1]

- **When using Screw type mounting bracket (Option BL)**
  Mounting panel thickness is 1 to 15mm
  - Insert the GCS-200 from the front of panel. Catch the mounting brackets to the holes top and bottom of the case, and screw to fix.



[Fig. 8.5-2]

⚠ Notice

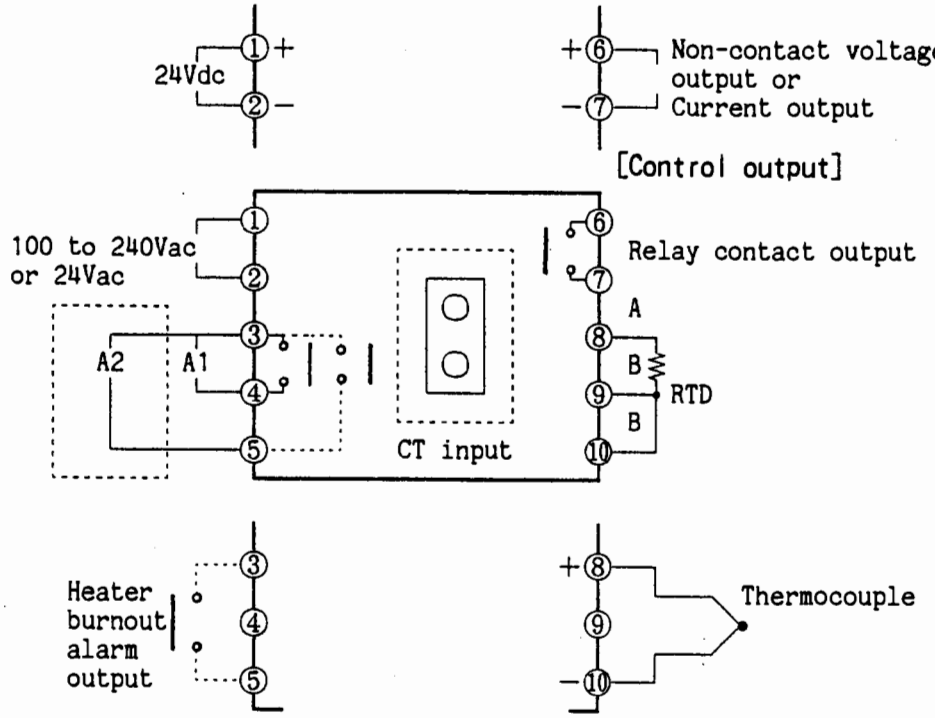
Do not screw with excessive force, or the case may be bent, since it is made of resin.
Torque to screw is approximately 0.12N·m.

9. Wiring connection

⚠ Warning

Turn the power supplied to the instrument OFF before wiring or checking. If working or touching the terminal on the power ON status, there is a possibility of Electric Shock which can cause severe injury or death.

9.1 Terminal arrangements



[Fig. 9.1-1]

- A1: Temperature alarm (A1) output
- A2: Temperature alarm (A2) output
- Dotted line shows the case the option is designated.

⚠ Notices

- Use a thermocouple and compensating lead wire applicable to the input specifications of this controller.
- Use a 3-wire system of RTD applicable to the input specifications of this controller.
- This controller has no built-in power switch nor fuse. It is therefore recommended that these unit be provided in the circuit near the external controller.
- With relay output type of controller, it is advised to provide the applicable relay to protect the built-in relay contact.
- When wiring, keep input wire (Thermocouple, RTD, etc.) away from AC source and load wire to avoid external interference.

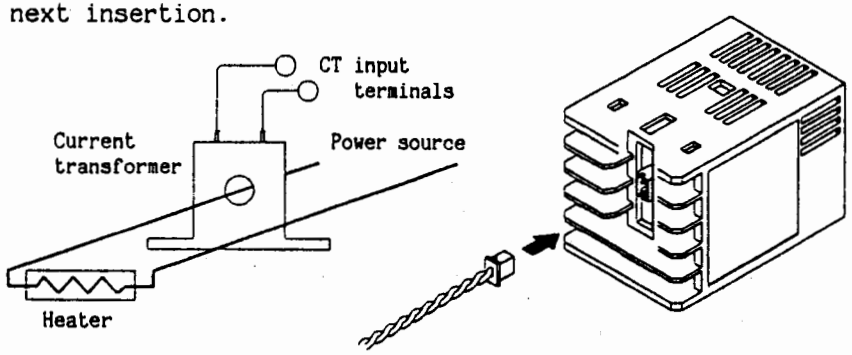
In case of Heater burnout alarm function (Option code: W)

① This alarm is not available for detecting current under phase control.

② Use current transformer (CT) an accessory one, and pass a lead wire of heater circuit into the hole of the CT.

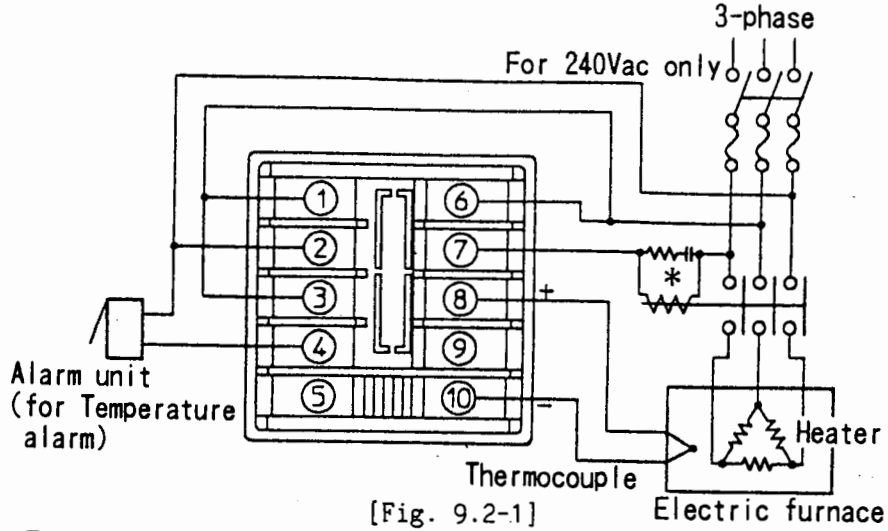
③ When wiring, keep CT wire away from AC source and load wire to avoid the interference from external.

④ With the type option W is applied, when drawing the internal assembly out, remove the connector at the CT input terminal, then pull the internal assembly. If the assembly is pulled with the connector, the lead wire follows into. It disturbs next insertion.



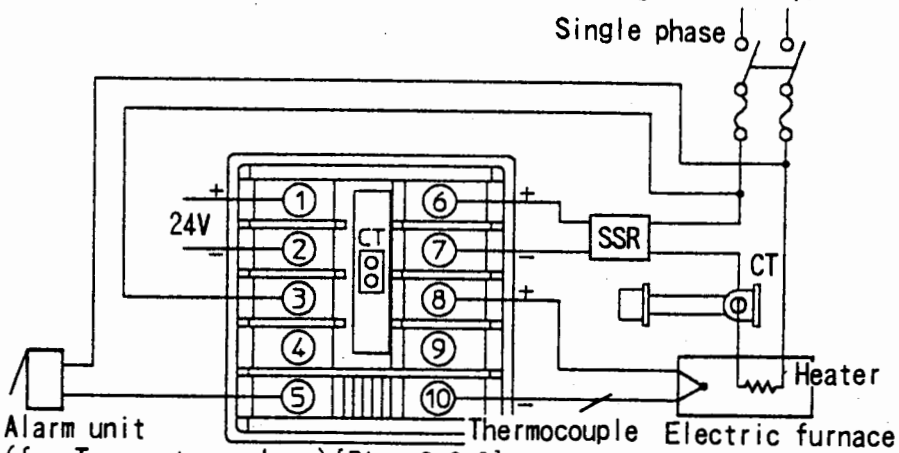
[Fig. 9.1-2]

9.2 Wiring connection examples



[Fig. 9.2-1]

* To prevent from a bad influence to the instrument owing to the unexpected level noise, it is recommended that the surge absorber be provided between the coil of the electromagnetic relay.



[Fig. 9.2-2]

- Connectable SSRs in parallel are 4 units if the Shinko SSRs (SA-200 type) are used.
- Whichever AC or DC is available to supply voltage 24V, however, do not make a mistake on the polarity when DC is applied.

10. Specifications

10.1 Standard specifications

Mounting system: Flush

Setting : Input system using membrane sheet key

Display (PV) : Red LED, 3 digits, Size 8(H)×4(W)mm
(SV) : Green LED, 3 digits, Size 8(H)×4(W)mm

Accuracy (Indication) : Within ±0.3% of maximum scale range ±1digit or within ±2℃ (4℉), whichever is greater.

Accuracy (Setting) : Within ±0.3% of maximum scale range ±1digit or within ±2℃ (4℉), whichever is greater.

Input sampling period : 0.25s (When the option [code: W] is applied, it is 0.5s)

Input

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

RTD : Pt100, JPt100 (3-wire system)
Allowable input lead wire resistance, per wire 10Ω or less

Scale range : K, J : 0 to 400℃, 0 to 999℃, 0 to 999℉
E : 0 to 600℃, 0 to 999℉
Pt100,JPt100: −19.9 to 99.9℃, −199 to 400℃
−199 to 999℉

Control output : Relay contact 1a

Control capacity

250Vac 3A (resistive load)
250Vac 1A (inductive load $\cos\phi$=0.4)

Non-contact voltage (for SSR drive)

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

Current

4 to 20mAdc, load resistance maximum 550Ω

Alarm action : ON/OFF action
Hysteresis, 0.1 to 99.9℃ (℉)

Alarm output : Relay contact 1a

Control capacity
250Vac 3A (resistive load)
250Vac 1A (inductive load $\cos\phi$=0.4)

Control action : PID action (with auto-tuning function)

Proportional band, 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, 0 to 999s
(PD action when set to 0)

Derivative time, 0 to 300s

Proportional cycle, 1 to 120s

PD action (with auto-reset function)

Proportional band, 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, 0 to 300s

Proportional cycle, 1 to 120s

ON/OFF action

Hysteresis, 0.1 to 99.9℃ (℉)

Supply voltage : 100 to 240Vac, 50/60Hz. 24Vac/dc, 50/60Hz.

Allowable voltage fluctuation : In case of 100 to 240Vac, 85 to 264Vac
In case of 24Vac/dc, 20 to 28Vac/dc

Ambient temperature : 0 to 50℃ (32 to 122℉)

Ambient humidity : 35 to 85%RH (non-condensing)

Power consumption : Approx. 8VA

Insulation resistance : 10MΩ or greater at 500Vdc

(In case the type of main output is Current or Non-contact voltage, do not measure the resistance between these output terminal and input terminal or CT input terminal.)

Dielectric strength

Between

- Input terminal and Ground at 1.5kVac for 1min
- Power terminal and Ground at 1.5kVac for 1min
- Output terminal and Power terminal at 1.5kVac for 1min

Weight : Approx. 130 g

Dimension : 48×48×100mm (W×H×D)

Material : Case, Flame resisting resin

Color : Case, Light gray

Attached functions : Control output OFF function
Setting value lock function
Setting value limiting function
Sensor correcting function
Power failure compensation
Self-diagnostic function
Automatic cold junction temperature compensation
Sensor burnout function [upscale, downscale]

Accessories : Mounting brackets 1set
Instruction manual 1copy
Current transformer 1 piece
(CTL-6-S)
[When option: W 20A is applied.]
(CTL-12-S36-10LI)
[When option: W 50A is applied.]
Terminal cover 1 piece
[When option: TC is applied.]

10.2 Optional functions

Temperature alarm (A2) output (Option code: A2)

Deviation setting by ± to main setting (excepting Process value alarm), and when the input exceeds the range the output turns ON or OFF (in case of High/Low limit range alarm).

One of the alarm is selectable by key operation from 9 types of alarms: High limit alarm, Low limit alarm, High/Low limits alarm, High/Low limit range alarm, Process high alarm and the standby function is applied to High limit alarm, Low limit alarm and High/Low limits alarm, besides No alarm.

When option Heater burnout alarm output (code: W) is applied together, the output terminal is common.

Setting accuracy: Within ±0.3% of maximum scale range
±1digit or within ±2℃ (4℉),
whichever is greater.

Action : ON/OFF action
Hysteresis, 0.1 to 99.9℃ (℉)

Output : Relay contact 1a (Common to Heater burnout alarm output)

Control capacity
250Vac 3A (resistive load)
250Vac 1A (inductive load $\cos\phi$=0.4)
However, A1 and A2 common terminal ③ is 3A maximum.

Heater burnout alarm output (Including Sensor burnout alarm)
(Option code: W)

It watches the heater current with CT (current transformer), and detects the burnout.

This option cannot be applied to the type Current output. When option Alarm output (code: A2) is applied together, the output terminals are common.

Rating : 20A (Option W20A) or
50A (Option W50A) specified

Setting accuracy : ±5%

Action : ON/OFF action

Output : Relay contact 1a
(Common to A2 output)
Control capacity
250Vac 3A (resistive load)
250Vac 1A (inductive load $\cos\phi$=0.4)
However, A1 and W common terminal ③ is 3A maximum.

Multi-range (Option code: MR)

Sensor selection: Thermocouple K, J or E is selected when Thermocouple input type.
RTD Pt100 or JPt100 is selected when RTD input type.

℃/℉ change

Screw type mounting bracket (Option code: BL)

Panel thickness, 1 to 15mm

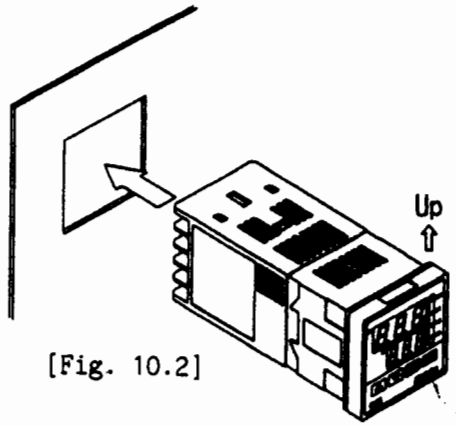
Color black (Option code: BK)

Panel: Dark gray
Case : Black

Drip-proof•Dust-proof (Option code: IP)

Drip-proof•Dust-proof specification (IP54)

- Effective only front panel surface, case part is excluded.
- To protect the controller from water leak between control panel and controller,
  ① Use the Screw type mounting bracket
  ② Panel cutout dimension should be proper and no burrs
  ③ Control panel surface to be mounted should be vertical.



[Fig. 10.2]

Terminal cover (Option code: TC)

Electrical shock protecting terminal cover

Specified specification

Input and Scale range: Shipped as specified Input and Scale range
Alarm action : Shipped as specified Alarm action
Control action : Shipped as specified Control action
Hysteresis : Shipped as specified Hysteresis
Cooling action : Shipped as Cooling action (Direct action)

11. When troubled

When troubled, refer to the following items after checking the power and the wiring.

⚠ Warning

Turn the power supplied to the instrument off before wiring or checking. If working or touching the terminal on the power ON status, there is a possibility of Electric Shock which can cause severe injury or death.

Phenomenon	Presumed cause
If [oFF] is indicated on the PV display.	Control output OFF function is working. Press the OUT/OFF key for approx. 1s to release the function. (See page 27)
If setting mode cannot be selected.	During PID auto-tuning or Auto-reset. (See page 15)
If the ▲, ▼ keys are ineffective.	Setting value lock function (mode 1 or mode 2) is designated. (See page 21) The setting is out of the setting value limit. (See page 22)
If process variable (Temperature) does not rise.	• Burnout or improper connection of thermocouple, compensation lead wire or RTD. • The connection at input terminal is wrong. • Heater is burnt out or improper connection. • Trouble on electromagnetic switch, etc.

To be continued on the next page.

Continued from page 50.

Phenomenon	Presumed cause
If PV display blinks [– – –].	• Thermocouple or RTD is burnt out. • Lead wire of thermocouple or RTD is not surely mounted to the instrument terminal.
If PV display blinks [– – –].	• Polarity of thermocouple or RTD is reverse. • Codes (A, B, B) of RTD does not agree with the instrument terminal. • Specification of thermocouple or RTD is improper.
If PV display is instability.	• AC leaks into thermocouple or RTD circuit. • There is an equipment to send out inductive fault or noise near the controller.

- If happened unclear phenomenon other than above mentioned, make inquiries at our agency or your shop where purchased about the matters.

12. Character table

Main setting mode

Character	Description
SV	Main setting value

Sub setting mode

AT	Auto-tuning performance/Cancellation
rST	Auto-reset performance (*)
P	Proportional band setting
I	Integral time setting
d	Derivative time setting
c	Proportional cycle setting
A1	Temperature alarm (A1) setting
A2	Temperature alarm (A2) setting
HB	Heater burnout alarm setting

Auxiliary function setting mode

Loc	Setting value lock designation
SVH	Main setting value high limit setting
SVL	Main setting value low limit setting
SVo	Sensor correction setting
oH	Main output high limit setting
oL	Main output low limit setting
HY	ON/OFF action hysteresis setting
SEn	Sensor selection
AL1	Temperature alarm (A1) action selection
AL2	Temperature alarm (A2) action selection
A1H	Temperature alarm (A1) hysteresis setting
A2H	Temperature alarm (A2) hysteresis setting
cnT	Heating/Cooling action selection

Write your data down.

Character	Initial value	Data
SL	0℃ (℉), 0.0℃	
AT	Cancelled	
rST	Only PD action	
P	10℃ (20℉), 10.0℃	
I	200s	
d	50s	
c	R/□: 30s, S/□: 3s	
A1	0℃ (℉), 0.0℃	
A2	0℃ (℉), 0.0℃	
HO	0A	
Loc	Unlock	
SH	Rated scale max.	
SL	Rated scale min.	
So	0℃ (℉), 0.0℃	
oH	100%	
oL	0%	
HY	1.0℃ (℉),	
SEn	Specified input	
AL1	No alarm action	
AL2	No alarm action	
A1H	1.0℃ (℉),	
A2H	1.0℃ (℉),	
cnT	Heating (reverse)	