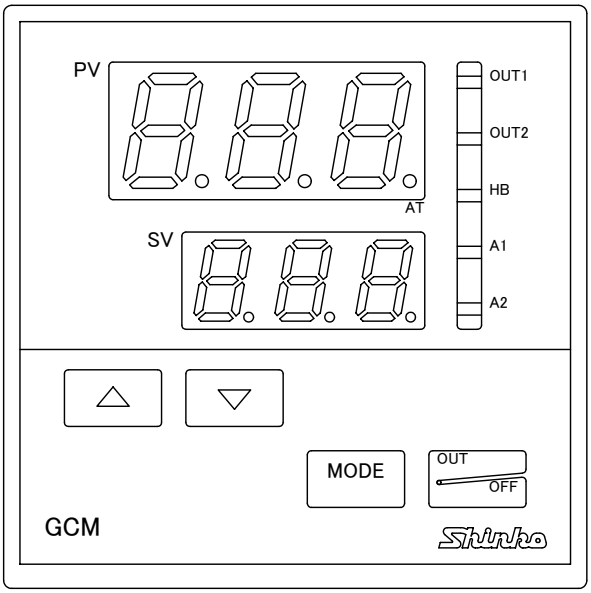
INSTRUCTION MANUAL

FOR

MICROCOMPUTER BASED

TEMPERATURE INDICATING CONTROLLER

GCM-200



Thank you for your purchase of our Microcomputer based Temperature Indicating Controller GCM-200.
This manual contains instructions for the mounting, functions, operations and notes when operating the GCM-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.

***** Note to users *****

Before operating this controller, make sure that you have understood the following.

⚠ 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.

⚠ Caution

- 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. Failure to do so could cause serious injury or malfunction.
- Do not apply a commercial power source to the sensor connected to the input terminal nor allow the power source to come into contact with the sensor.
- Specifications of the GCM-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.
- Be sure to turn the power supplied to the instrunment OFF when cleaning.
- Wipe the instrument using a dry soft 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.
- 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.

⚠ Notice

- It is recommended that PID auto-tuning be performed on the trial run.
- It is advised to provide the protective device against environmental conditions as may cause damage to the device or contribute to the deterioration of its parts.

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1. Model names

1.1 Model names

Standard models

G C M – 2 3 □ – □ /□				GCM-200 type
Control action	3			PID control
Temperature alarm		0		No alarm action
		A		Alarm action is applied *
Output			R	Relay contact
			S	Non-contact voltage
			A	DC current
Input				E Thermocouple K, J, E
				R RTD Pt100, JPt100

8 types of alarm action and no alarm action are selectable by key operation.
Alphanumeric character to represent the functions or type is applied to the □.

[Example]

G C M – 2 3 A – R / E, W

- W: Heater burnout alarm output
- E: Thermocouple input
- R: Relay contact output
- A: Temperature alarm action is applied
- M: 72(W) x 72(H) x 100(D)mm

Optional code

Code	Description
A2	Temperature alarm 2 output
W	Heater burnout alarm output (including sensor burnout alarm)
D□	DR: Relay contact DS: Non-contact voltage DA: Current Heating/Cooling control output Heating output: Main (OUT1) output Cooling output: Sub (OUT2) output
MR	Multi-range
BK	Color: Black
IP	Dust-proof•Drip-proof (IP54), only for front panel
TC	Terminal cover

⚠ Warning

Do not take the inner assembly out nor touch the terminal with the power supply on. Touching the terminal with the power switched ON may result in an Electric Shock which could cause severe injury or death.

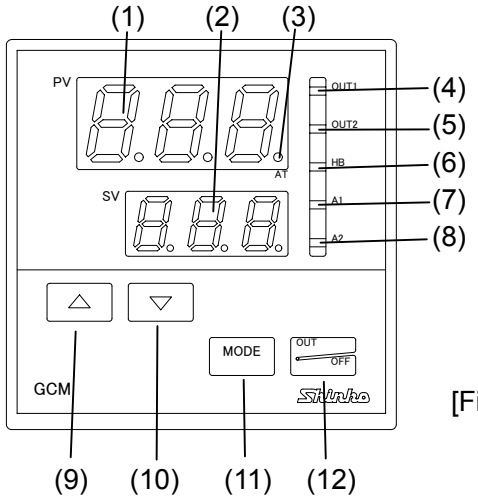
1.2 How to indicate the model nameplate

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

	[Model nameplate]	[Example]
(1)	2 3 A – 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)	0 to 400℃ K	
(4)	N o.	

(1): Model name (2): Option codes
(3): Input (4): Instrument number (Indicated only on the inner assembly)
In the case of Heater burnout alarm output, the specified current value is entered in ( ).

2. Name and functions of the sections



[Fig. 2-1]

(1) PV display
Indicates the Process variable (PV) with the red LED.
(2) SV display
Indicates the Setting value (SV) with the green LED.
(3) Auto-tuning or Auto-reset action indicator (• AT)
The dot AT on the PV display blinks during the auto-tuning or auto-reset.
(4) Main control output or Heating output [option] action indicator (▭ OUT 1)
The green LED is lit when the Control output or Heating output is on.
(5) Cooling output action indicator (▭ OUT 2) [Option]
The yellow LED is lit when the Cooling output is on.
(6) Heater burnout alarm output action indicator (▭ HB) (including sensor burnout alarm) [Option]
The red LED is lit when the Heater burnout alarm or Sensor burnout alarm output is on.
(7) Temperature alarm 1 (A1) output action or Pattern end 1 output indicator (▭ A1)
The red LED is lit when Temperature alarm 1 (A1) output is on.
(8) Temperature alarm 2 (A2) output action or Pattern end 2 output indicator (▭ A2)
[Option]: The red LED is lit when Temperature alarm 2 (A2) output is on.

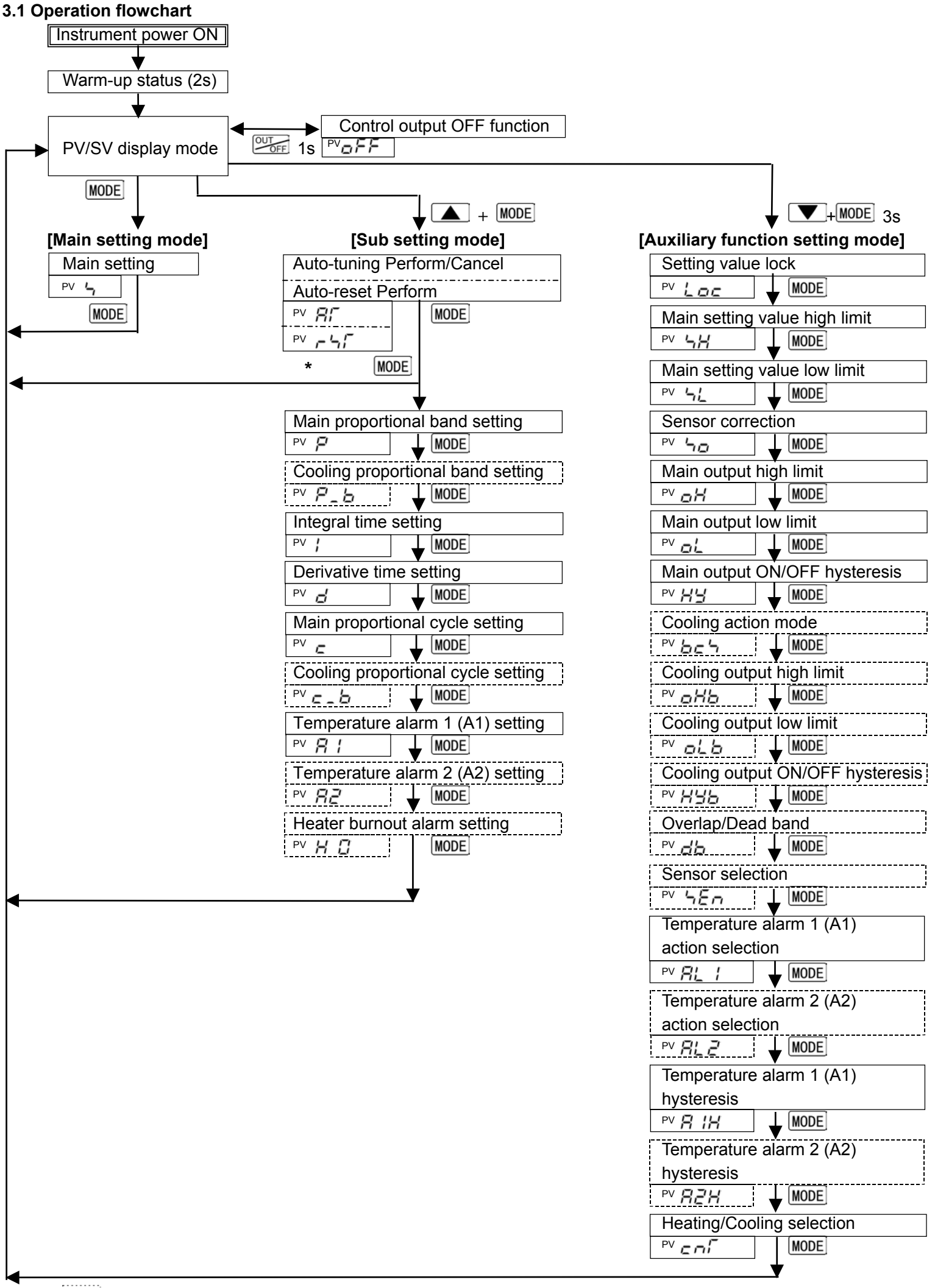
(9) ▲ Increase key : Increases the numeric value on the SV display during setting mode.
Continuous pressing of the key makes the value change faster.
(10) ▼ Decrease key: Decreases the numeric value on the SV display during setting mode.
Continuous pressing of the key makes the value change faster.
(11) MODE Mode key : Selects a setting mode.
(12) OUT/OFF OUT/OFF key : Turns the control output OFF which is the same status as when the power is turned off.

In any mode, if the OUT/OFF key is pressed for approx. 1 second, the Control output OFF function will work. Once the function is enabled, the function cannot be released even if the insrument power is turned off and on again. To release the function, press the OUT/OFF key again for 1 second.

The setting value is registered by pressing the MODE key.

3. Operations

3.1 Operation flowchart



(Dotted lines): Options

▲+MODE : Press the MODE key while the ▲ key is being pressed.

▼+MODE 3s: Press the keys until Loc is indicated for approx. 3 seconds being pressed.

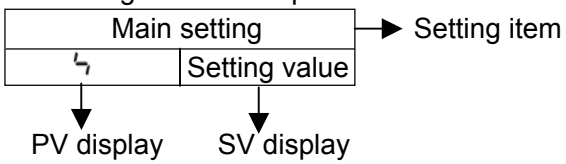
OUT/OFF 1s: Press the key until oFF is indicated for approx. 1 second.

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

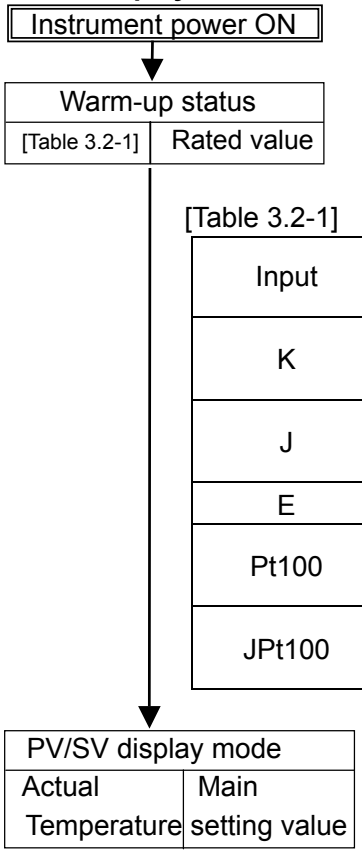
3.2 Operations

The PV display indicates the sensor type 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 display indicates the value.
During this time, all outputs and LED indicators are in their off status.
After that, the actual temperature is displayed on the PV display, main setting value on the SV display and the control starts
If the Control output OFF function is working, oFF is indicated on the PV display.
To cancel the function, press the OUT/OFF key again for approx. 1 second. (page 17)

The setting items are represented as follows.



(1) PV/SV display mode



[Table 3.2-1]

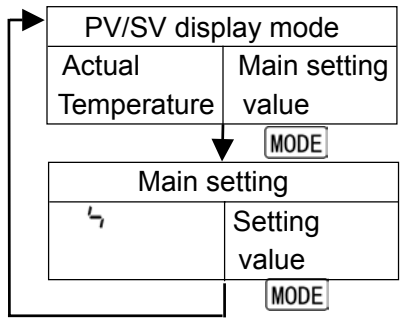
Input	℃		℉	
	PV display	SV display	PV display	SV display
K	tC	400		
	tC	999	tF	999
J	JC	400		
	JC	999	JF	999
E	EC	600	EF	999
Pt100	PrC	400	PrF	999
	PrC	99.9		
JPt100	JPC	400	JPF	999
	JPC	99.9		

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.

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 to set the setting value for the main control.

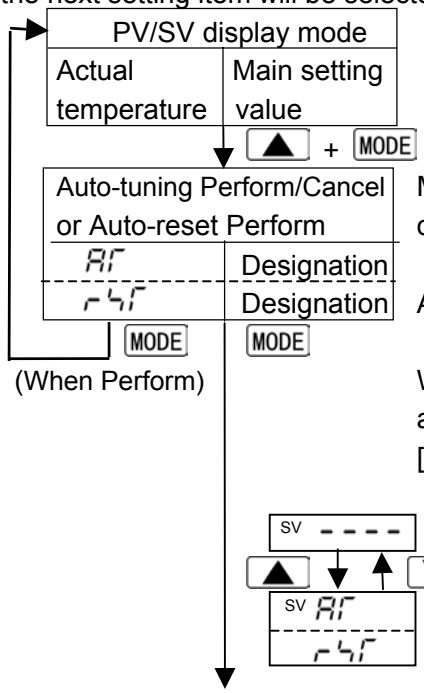
Setting range: From Main setting value low limit to Main setting value high limit

[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.

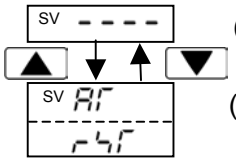


Mode to designate the Auto-tuning Perform/Cancel or Auto-reset (offset correction) Perform

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]

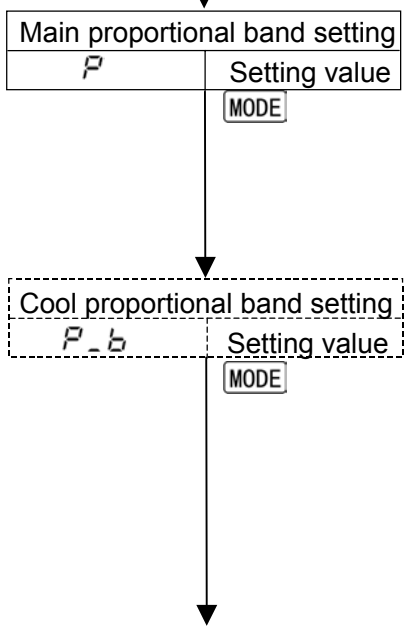


(Auto-tuning, Auto-reset Cancel)

(Auto-tuning, Auto-reset Perform)

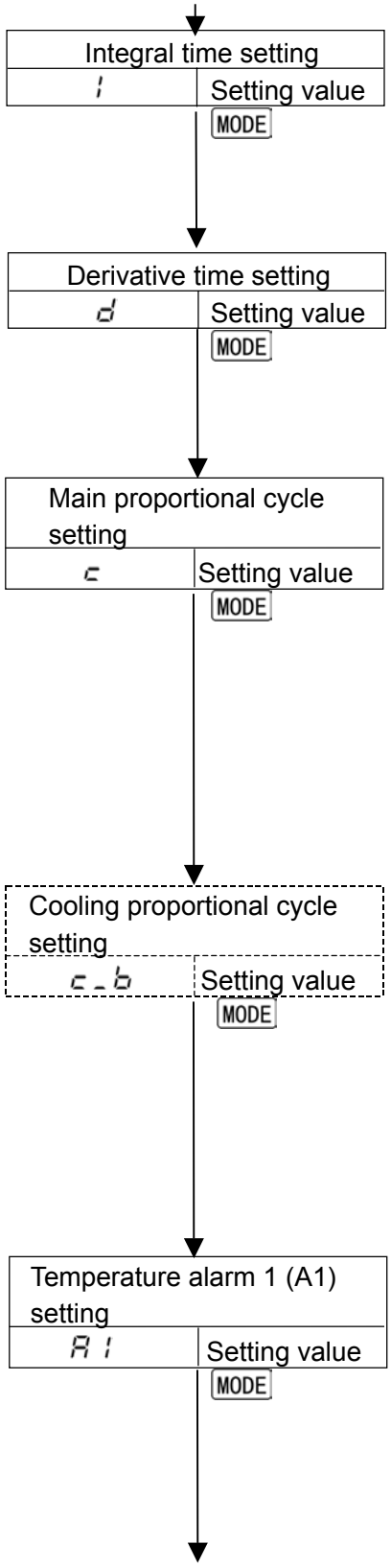
- If the Auto-tuning Perform is designated and the MODE key is pressed, the mode reverts to the PV/SV display and the dot AT on the PV display blinks.
- When the Auto-tuning is finished, the dot AT on the PV display will be unlit, and the P, I and D values are set automatically.
- During the Auto-tuning, 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. When the OUT/OFF key is pressed again, the function will be 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, it begins the offset correction 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.



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℃]

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 (Multiplying factor to the main control proportional band value)
[Factory adjusted as 1.0 times]



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

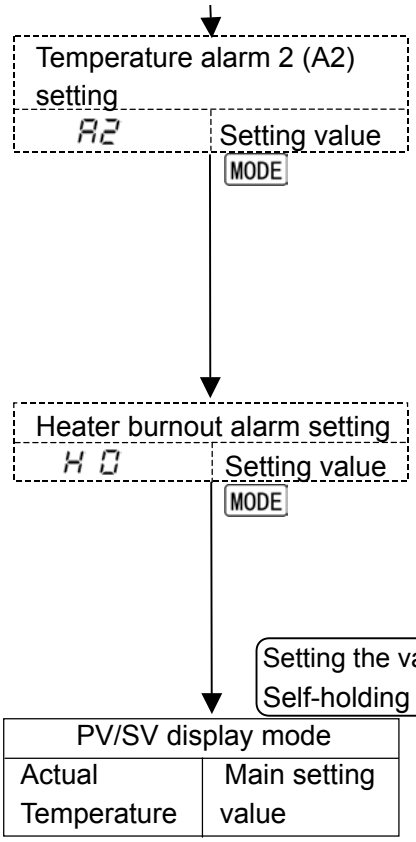
Mode to set the derivative time.
Setting range: 0 to 300s
Setting the value to 0 disables the function and becomes PI action.
[Factory adjusted as 50s]

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.

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

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 during the process value alarm action).
Not available if No alarm is selected in Temperature alarm 1 (A1) action selection
Setting range: See [table 3.2-2] (page 12).
[Factory adjusted as 0℃ (℉) or 0.0℃]



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 during the process value alarm action).
Not available if No alarm is selected in 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℃]

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]

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

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

[Table 3.2-2]

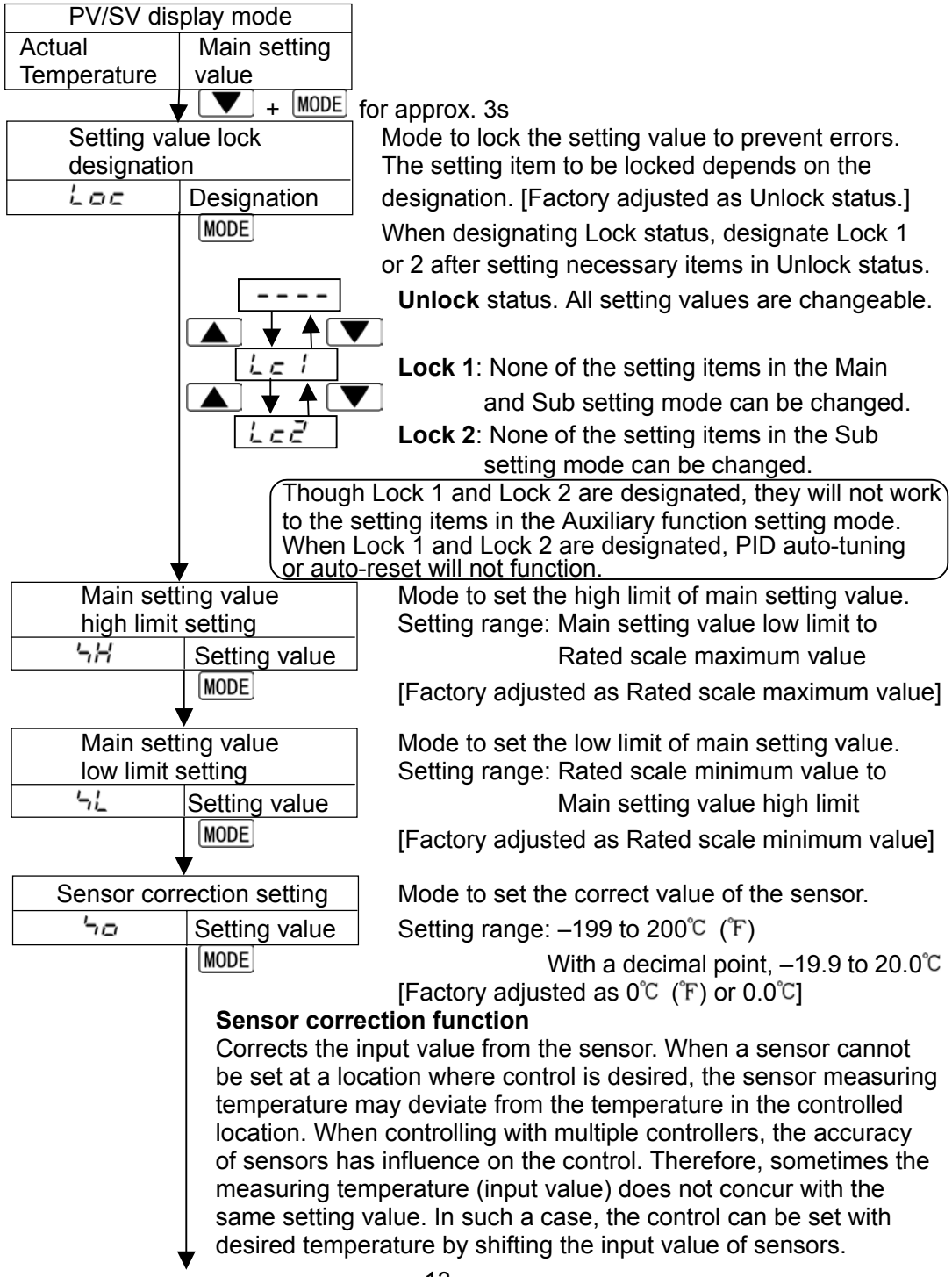
Alarm type	Setting range
High limit alarm	–199 to input range maximum value℃ (℉)
Low limit alarm	–199 to input range maximum value℃ (℉)
High/Low limits alarm	±(0 to input range maximum value)℃ (℉)
High/Low limit range alarm	±(0 to input range maximum value)℃ (℉)
Process high alarm	Input range minimum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

When the decimal point is applied for the RTD input

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.



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.

Main output high limit setting
oH | Setting value
MODE

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

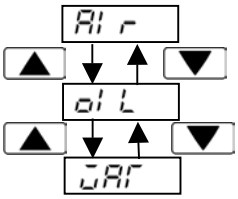
Mode to set the low limit value of the main output.
Setting range: –5% to Main output high limit value
Setting less than 0% is effective to the Current output type. [Factory adjusted as 0%]
Not available for the ON/OFF action.

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]
This display is not available when the option [D □] is not applied or when ON/OFF action.



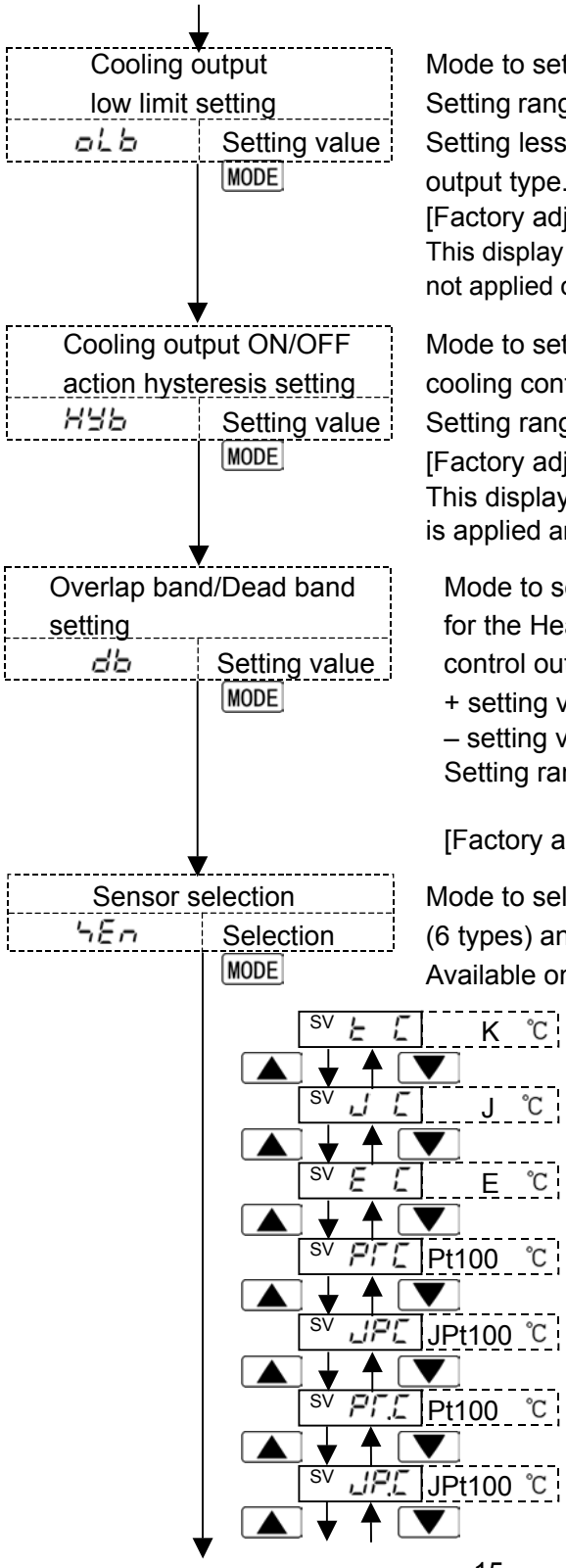
Air cooling (Linear characteristic)

Oil cooling (The 1.5th power of the Linear characteristic)

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%]
This display is not indicated when the option [D □] is is not applied or when ON/OFF action of cooling output.

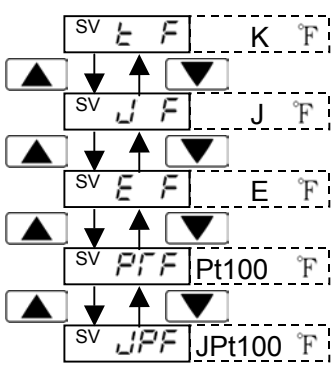


Mode to set the low limit value of the cooling output.
Setting range: –5% to cooling output high limit value
Setting less than 0% is effective to the Current output type.
[Factory adjusted as 0%]
This display is not indicated when the option [D□] is not applied or when ON/OFF action of cooling output.

Mode to set the ON/OFF action hysteresis for the cooling control output.
Setting range: 0.1 to 99.9℃
[Factory adjusted as 1.0℃ (℉)]
This display is indicated only when the option [D □] is applied and when ON/OFF action of cooling output.

Mode to set the Overlap band and Dead band for the Heating control output and Cooling control output.
+ setting value: Dead band
– setting value: Overlap band
Setting range : ±(0 to 100%) of Heating proportional band
[Factory adjusted as ℃]

Mode to select the input type from Thermocouple (6 types) and RTD (6 types), and the unit ℃ or ℉
Available only when the option [MR] is applied.



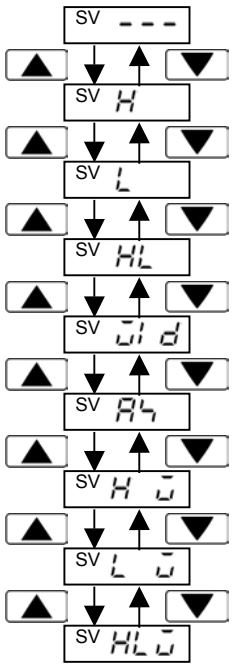
Select a sensor type according to the using input sensor. For example, if J sensor type is selected though K sensor type is used, it will cause an error.

Temperature alarm 1 (A1) action selection

AL 1 Selection

MODE

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



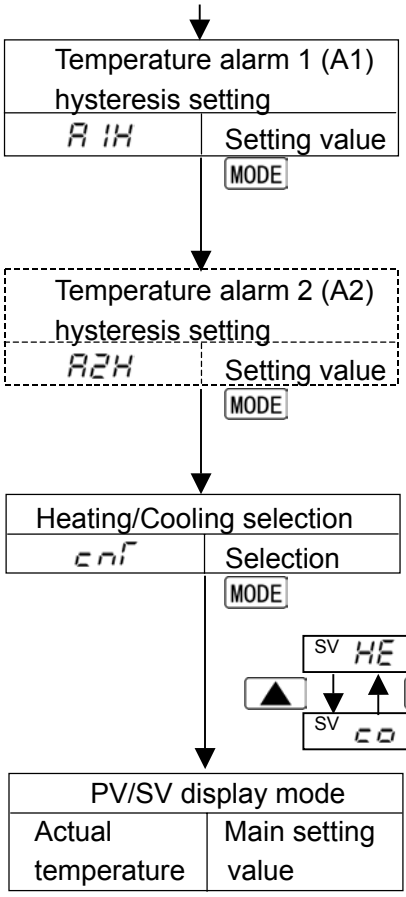
No alarm action
High limit alarm action
Low limit alarm action
High/Low limits alarm action
High/Low limit range alarm action
Process high alarm action
High limit alarm action with standby
Low limit alarm action with standby
High/Low limits alarm action with standby

Temperature alarm 2 (A2) action selection

AL2 Selection

MODE

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



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

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.

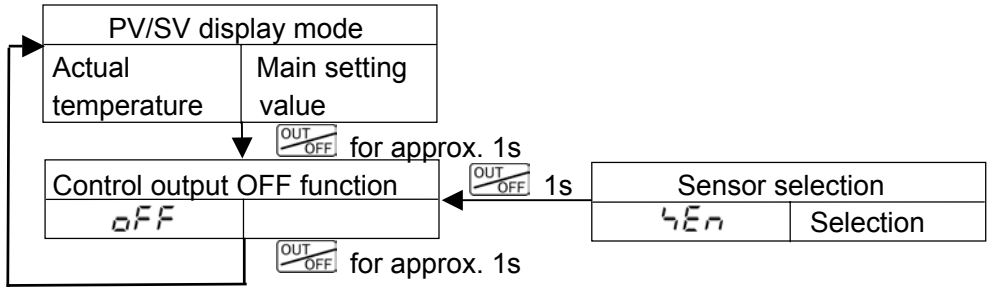
Mode to select the control action type Heating (reverse) or Cooling (direct).
[Factory adjusted as Heating (reverse)]

Heating (reverse) action

Cooling (direct) action

(5) Control output OFF function

A function to turn the control output OFF even if the power to the instrument is supplied. The function is used when required to halt the control action or when the GCM-200 is not being used in multiple controllers.
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 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.

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 GCM-200 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 their 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.

[Table 4-1]

Input	℃		℉	
	PV display	SV display	PV display	SV display
K	t C	400		
	t C	999	t F	999
J	J C	400		
	J C	999	J F	999
E	E C	600	E F	999
Pt100	PtC	400	PtF	999
	PtC	99.9		
JPt100	JPC	400	JPF	999
	JPC	99.9		

(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.

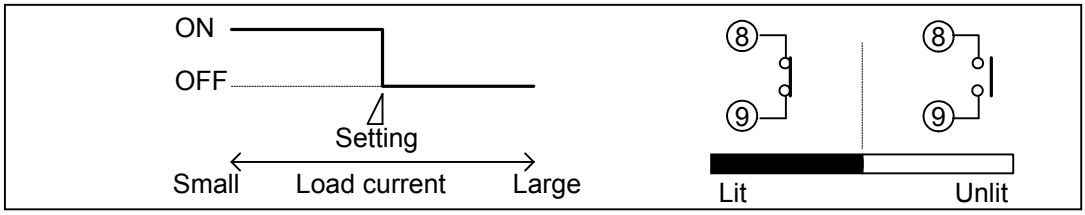
5. Action explanations

5.1 Standard action

Action		Heating (reverse) action			Cooling (direct) action		
Control action		Proportional band ON OFF Setting			Proportional band ON OFF Setting		
Output	Relay contact	H ⑤ C ⑥ L ⑦	H ⑤ C ⑥ L ⑦ (*1)	H ⑤ C ⑥ L ⑦	H ⑤ C ⑥ L ⑦	H ⑤ C ⑥ L ⑦ (*1)	H ⑤ C ⑥ L ⑦
	Non-contact voltage	⑥ + 12Vdc ⑦ –	⑥ + 12/0Vdc ⑦ – (*1)	⑥ + 0Vdc ⑦ –	⑥ + 0Vdc ⑦ –	⑥ + 0/12Vdc ⑦ – (*1)	⑥ + 12Vdc ⑦ –
	Current	⑥ + 20mAdc ⑦ –	⑥ + 20 to 4mAdc ⑦ – (*2)	⑥ + 4mAdc ⑦ –	⑥ + 4mAdc ⑦ –	⑥ + 4 to 20mAdc ⑦ – (*2)	⑥ + 20mAdc ⑦ –
Indicator [OUT1] Green		Lit		Unlit	Unlit		Lit

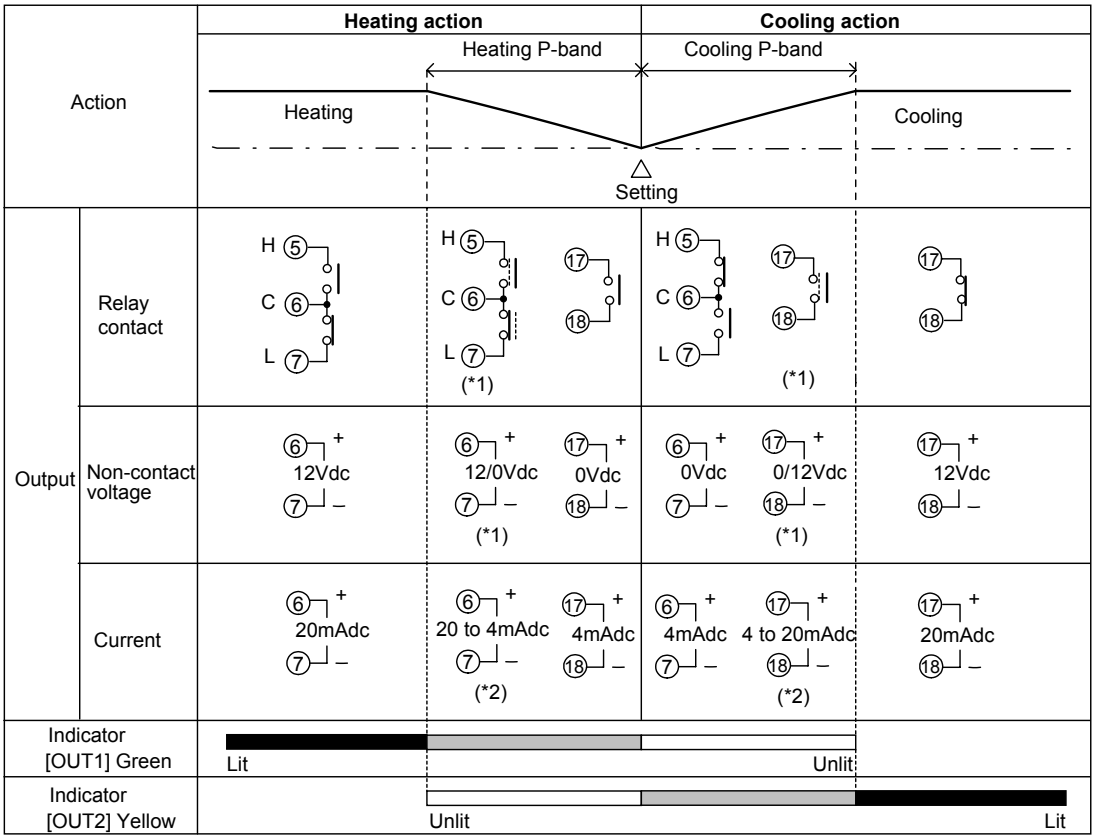
(*1) Cycle action is performed according to deviation.
(*2) Changes continuously according to deviation.

5.2 Heater burnout alarm action



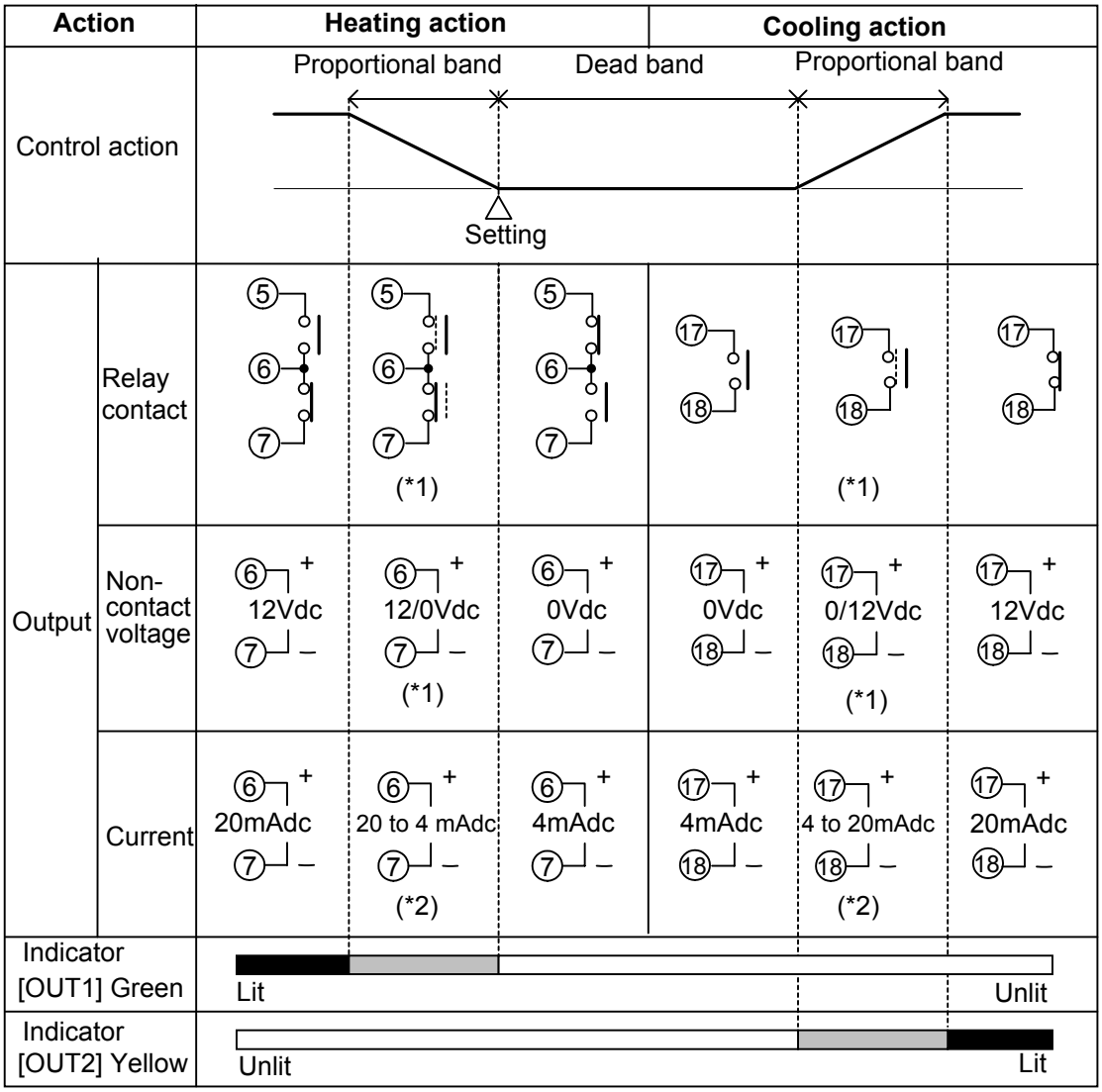
5.3 Heating and Cooling actions [Option D ☐]

Heating (reverse) and Cooling (direct) actions



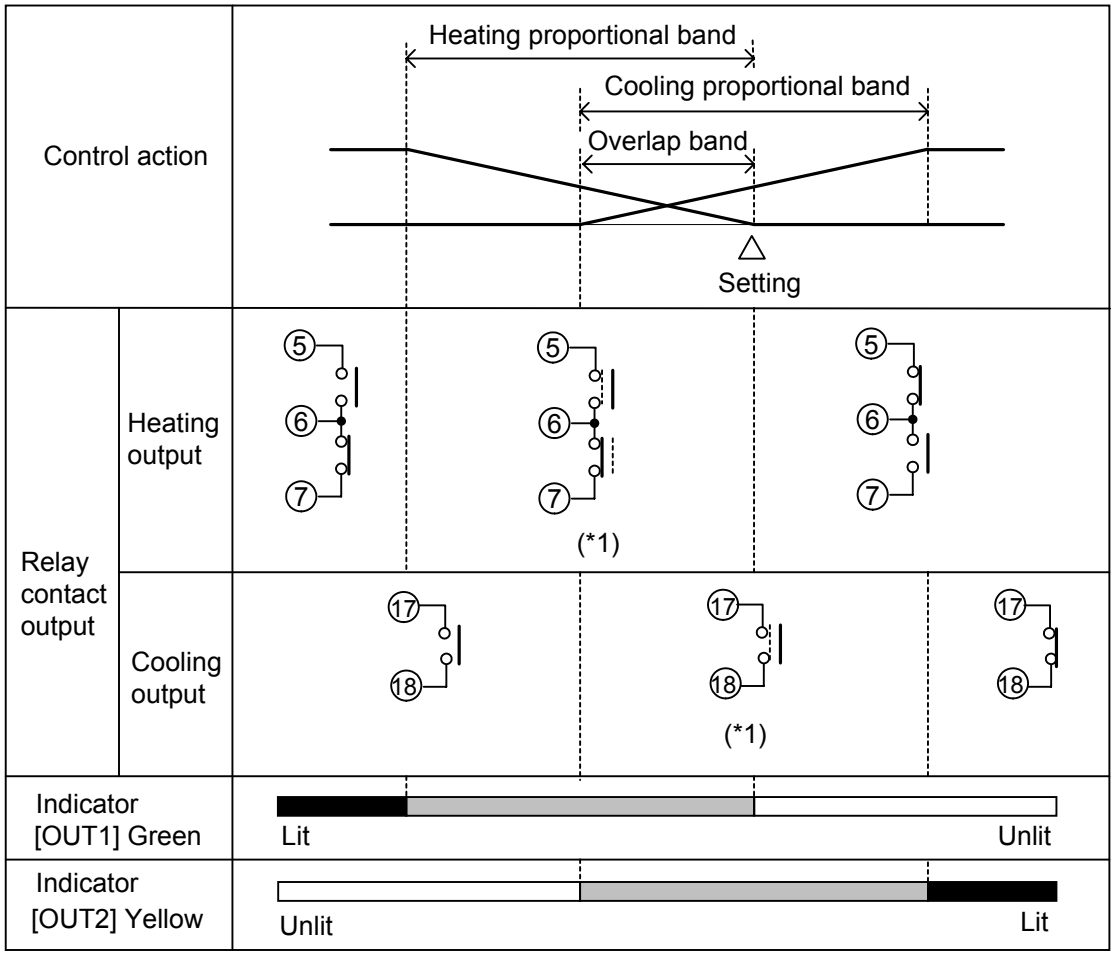
(*1) Cycle action is performed according to deviation.
(*2) Changes continuously according to deviation.

When setting Dead band



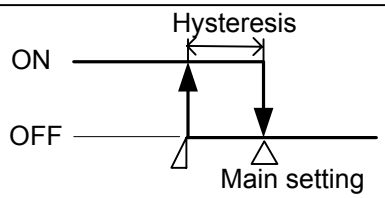
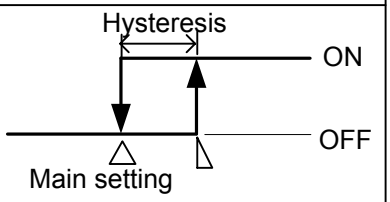
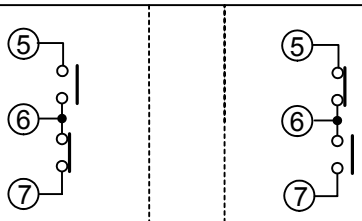
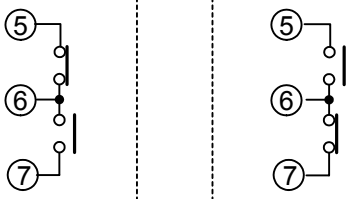
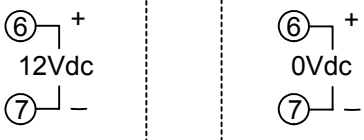
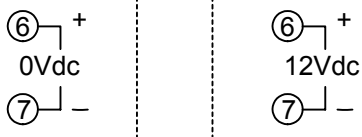
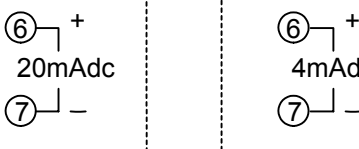
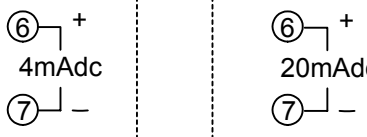
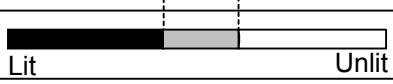
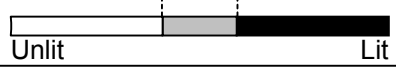
(*1) Cycle action is performed according to deviation.
(*2) Changes continuously according to deviation.

When setting Overlap band with Relay contact output.



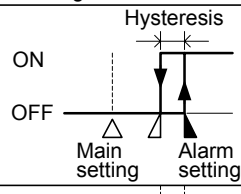
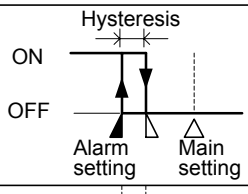
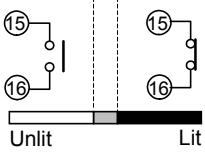
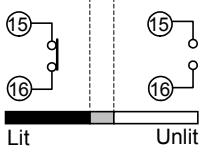
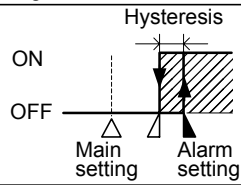
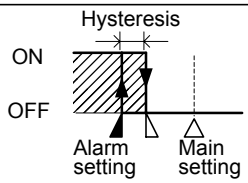
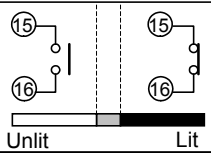
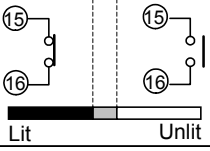
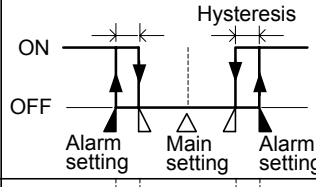
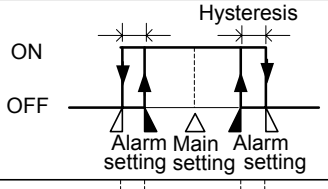
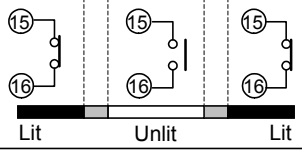
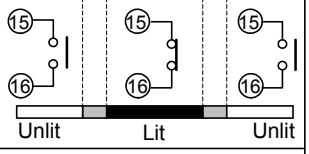
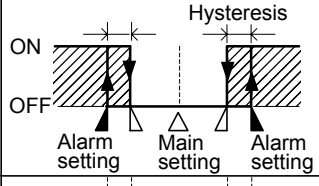
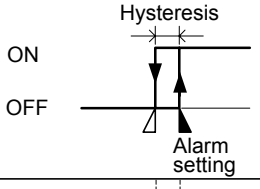
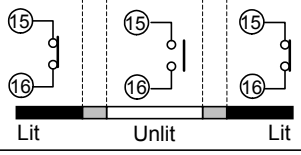
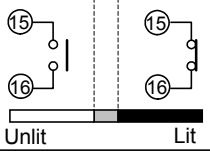
(*1) Cycle action is performed according to deviation.

5.4 ON/OFF action

<table>
<tr><th colspan="2">Action</th><th>Heating (reverse) action</th><th>Cooling (direct) action</th></tr>
<tr><td colspan="2">Control action</td><td> 
</td><td> 
</td></tr>
<tr><td rowspan="3">Output</td><td>Relay contact</td><td> 
</td><td> 
</td></tr>
<tr><td>Non-contact voltage</td><td> 
</td><td> 
</td></tr>
<tr><td>Current</td><td> 
</td><td> 
</td></tr>
<tr><td colspan="2">Indicator
[OUT1] Green</td><td> 
</td><td> 
</td></tr>
</table>

part: Acts ON or OFF.

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

	High limit alarm	Low limit alarm
Temperature alarm action		
Output Indicator		
	High limit alarm with standby	Low limit alarm with standby
Temperature alarm action		
Output Indicator		
	High/Low limits alarm	High/Low limit range alarm
Temperature alarm action		
Output Indicator		
	High/Low limits alarm with standby	Process high alarm
Temperature alarm action		
Output Indicator		

Standby function works at ▨ part.

Output terminals for Temperature alarm 2: ⑰– ⑱

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 a 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 quickened. However, the cycle of oscillation is also quickened 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.

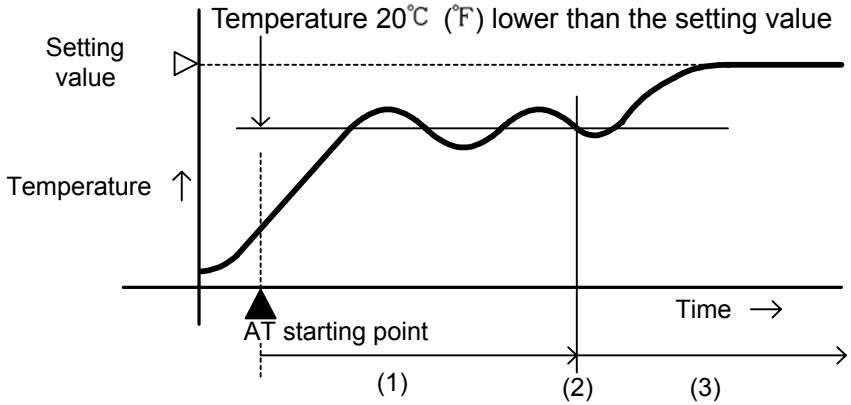
If the derivative time is shortened, restoring value becomes small, and if the derivative time is made longer, an excessive returning phenomenon may occur and the control system may be oscillated.

6.2 PID auto-tuning of this controller

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

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

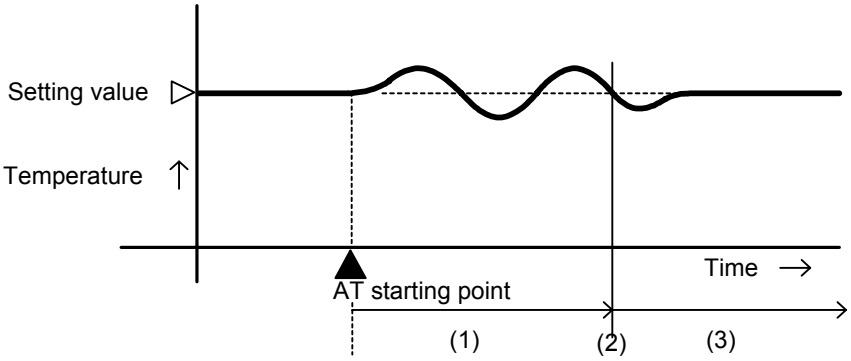
Fluctuation is applied at the temperature 20℃ lower than the setting value.



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

(2) When the control is stable or when control temperature is within ±20℃ (℉) of setting value.

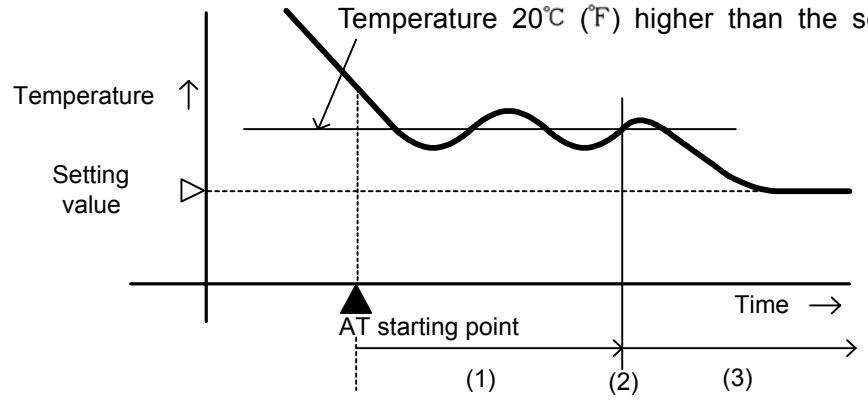
Fluctuation is applied at the setting value.



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

(3) When the control temperature is 20℃ (℉) or higher than the setting value

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

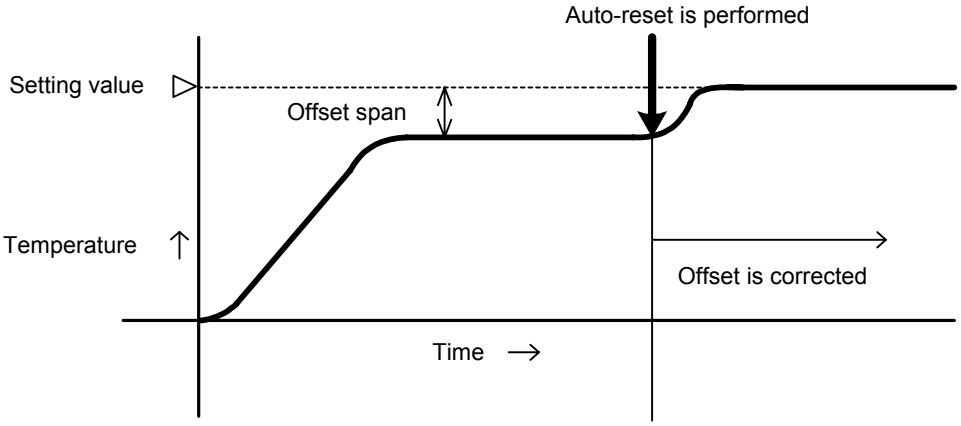


(1) PID calculation
(2) PID decided
(3) Controlling action is performed with the value set by PID auto-tuning.

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.



7. Other functions

(1) Burnout alarm

(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 the current output type) and the PV display blinks [ ].

(* In the case the scale has a decimal point.)

(Underscale)

When the input value falls to [Rated scale minimum value –50] or less, the control output is turned OFF (main output low limit value for the 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, and the PV display blinks [- - -] (main output low limit value for the current output type).

(* In the case the scale has a decimal point.)

(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 keeps it set to the same status at which the reference junction is located at 0℃ [32℉].

8. Mounting to control panel

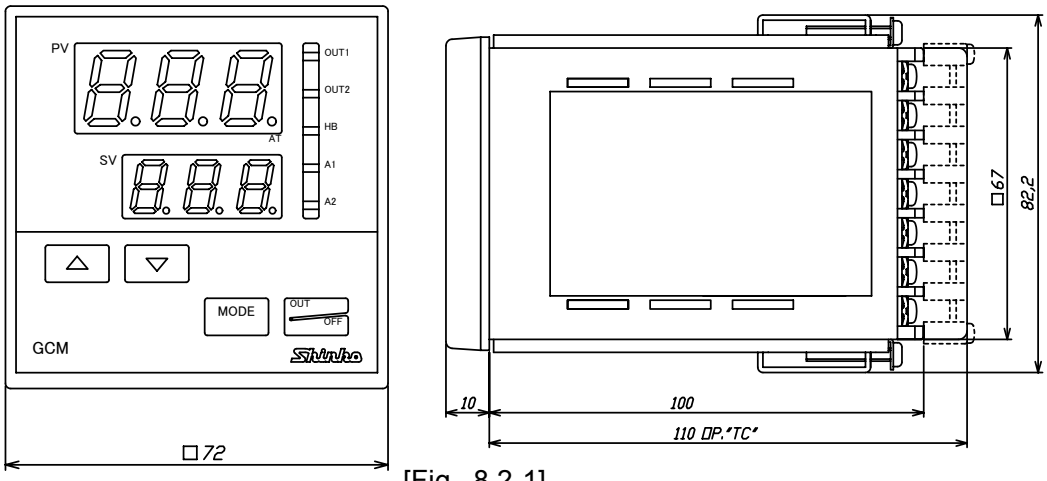
8.1 Site selection

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:

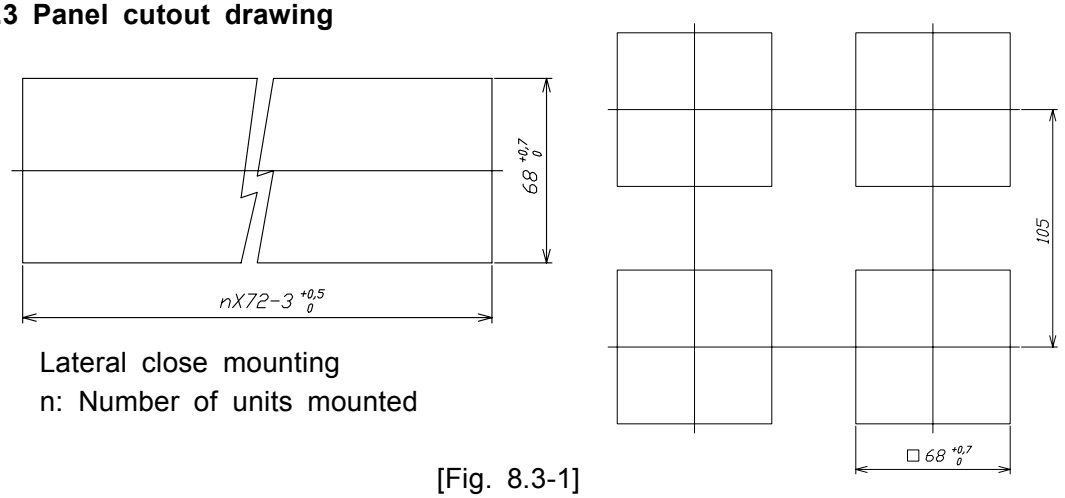
(1) A minimum of dust, and an absence of corrosive gases
(2) No flammable, explosive gasses
(3) No mechanical vibrations or shocks
(4) No exposure to direct sunlight, an ambient temperature of 0 to 50℃ (32 to 122℉) that does not change suddenly
(5) An ambient non-condensing humidity of 35 to 85%RH
(6) 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 drawing



[Fig. 8.2-1]

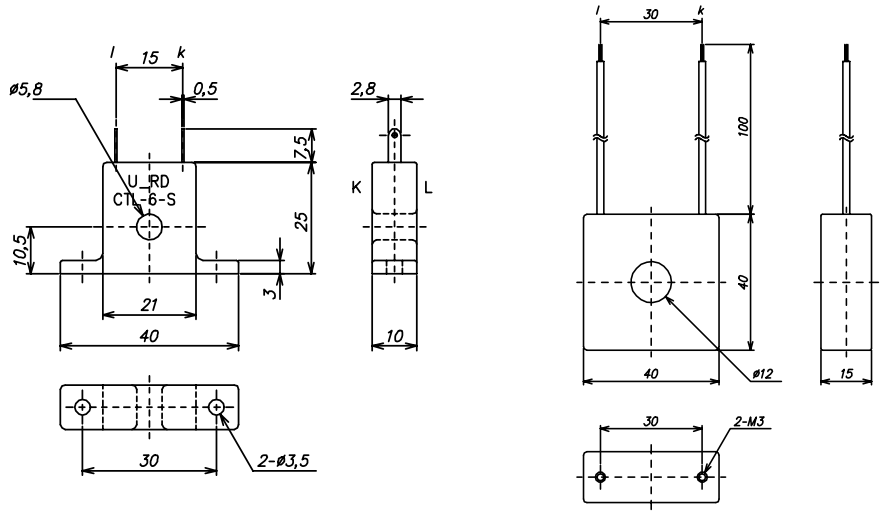
8.3 Panel cutout drawing



Lateral close mounting
n: Number of units mounted

[Fig. 8.3-1]

8.4 Current transformer (CT) dimension drawing



CTL-6-S (for 20A) **CTL-12-S36-10L1 (for 50A)**

[Fig. 8.4-1]

8.5 Mounting

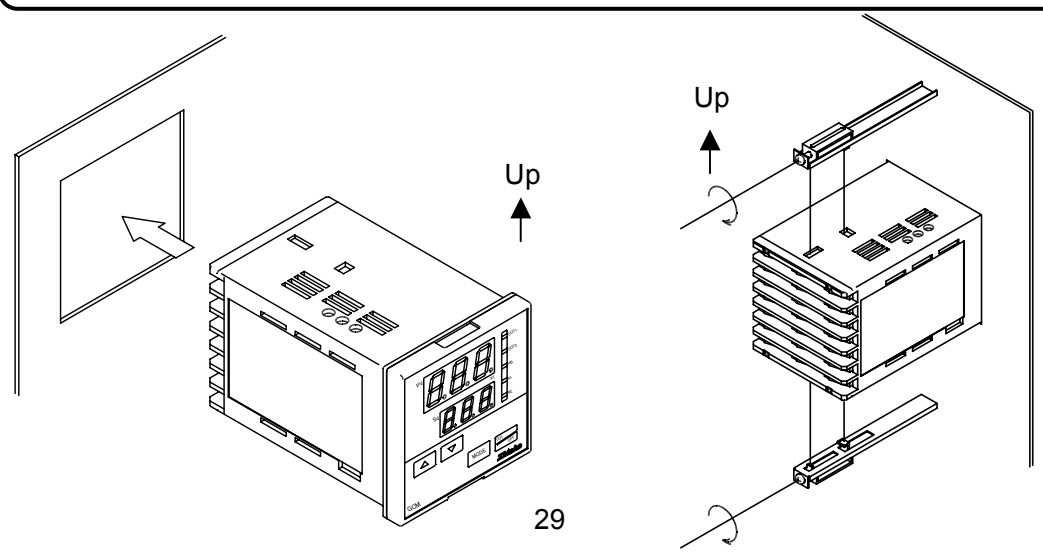
Mounting panel thickness is 1 to 15mm.

Insert the GCM-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.

⚠ 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.

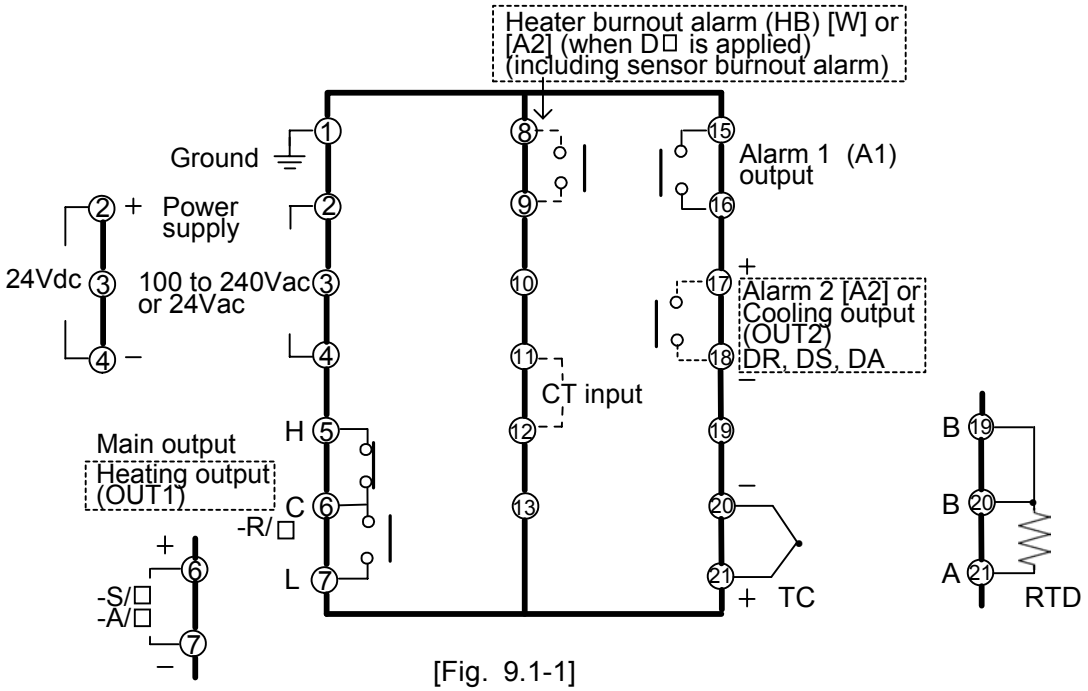


9. Wiring connection

⚠ 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 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



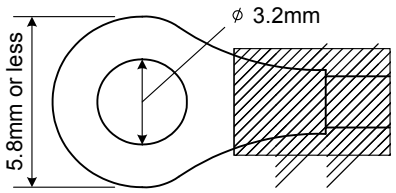
[Fig. 9.1-1]

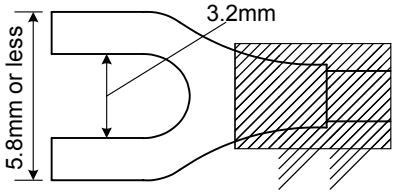
The terminal block of this instrument is designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw.
Dotted lines shows options, no terminal is equipped if it is not specified.

Use terminals 17-18 when only the option [A2] is applied.
When the option [A2] and [W] are applied together, use terminals 17-18 for the option [A2] and terminals 8-9 for the option [W].
When the option [D□] and [A2] are applied together, use terminals 17-18 for the option [D□] and terminals 8-9 for the option [A2].

● **Solderless terminal**

Use a solderless terminal with insulation sleeve to fit 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 (6kgf•cm) Max. 1.0N•m (10kgf•cm)
	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

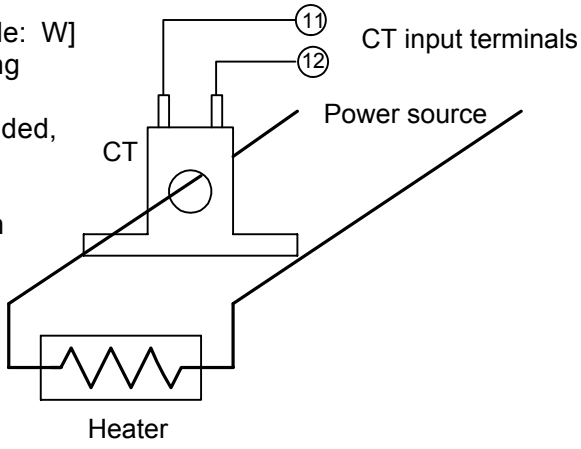
- Use a thermocouple and compensating lead wire according to the sensor input specifications of this controller.
- Use a 3-wire RTD system according to the sensor input specifications of this controller.
- This controller has neither built-in power switch nor fuse. Therefore it is necessary to install them in the circuit near the external controller. (Recommended fuse: Time-lag fuse, rated voltage 250V, rated current 2A)
- When using 24Vdc 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]

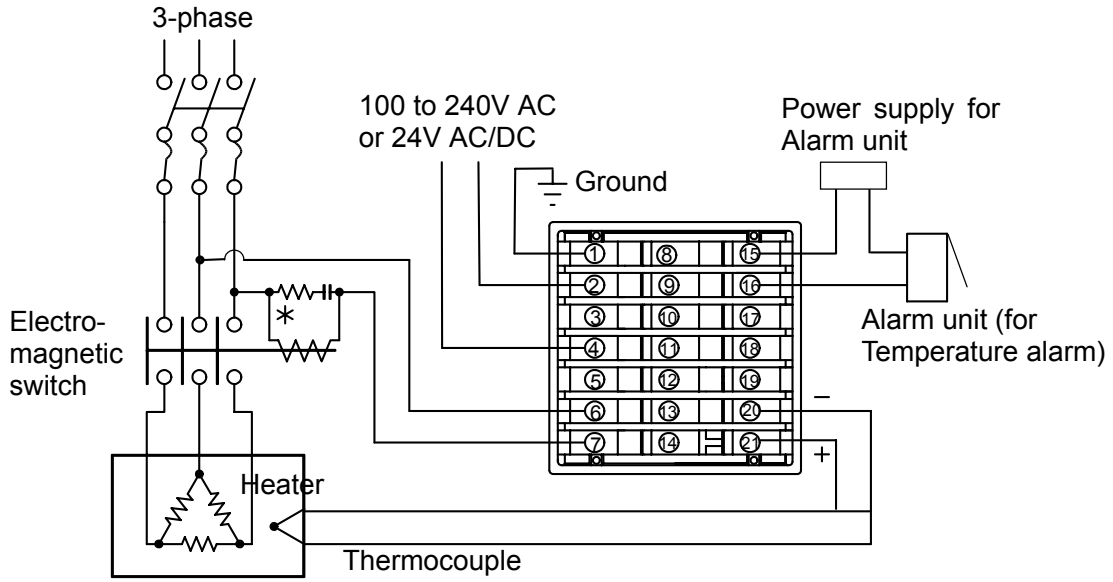
(1) This alarm is not available for detecting heater current under phase control.

(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.



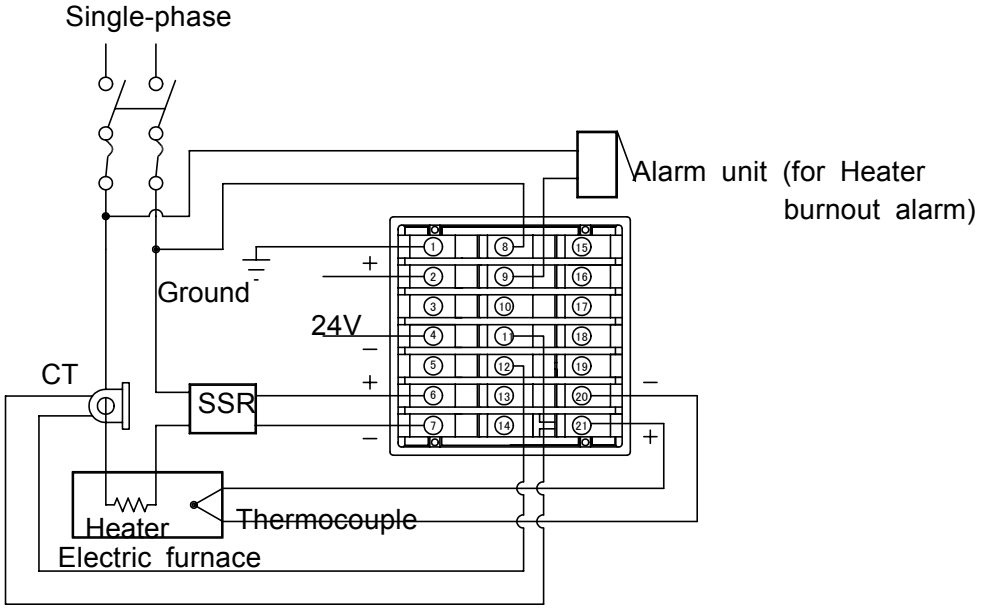
[GCM-23A-R/E]



[Fig. 9.2-1]

* 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.

[GCM-23A-S/E, W]



[Fig. 9.2-2]

The connectable SSRs in parallel are 4 units if the Shinko SSRs (SA-200 series) are used.

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

10. Specifications

10.1 Standard specifications

Mounting method : Flush

Setting : Input system using membrane sheet key

Display

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

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

Accuracy (Indication and setting):

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

Input sampling period : 0.25 seconds

(When the option [W] is applied, 0.5 seconds)

Input

Thermocouple : K, J or E

External resistance, 100Ω or less

RTD : Pt100, JPt100, 3-wire system

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

Control output

Relay contact : 1a1b

Control capacity,

250Vac 3A (resistive load)

250Vac 1A (inductive load cosø=0.4)

Non-contact voltage : For SSR drive

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

Current : 4 to 20mAdc

Load resistance, maximum 550Ω

Temperature alarm 1 (A1) output

Action : ON/OFF action

Hysteresis setting range: 0.1 to 99.9℃ (℉)

Output : Relay contact 1a

Control capacity, 250Vac 3A (resistive load)

250Vac 1A (inductive load cosø =0.4)

Controlling 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 (PD action when set to 0)

Derivative time (D) : 0 to 300s (PI action when set to 0)

Proportional cycle : 1 to 120s

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 (P action when set to 0)
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
100 to 240Vac : 85 to 264Vac
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
(When the type of main output or cooling output is current or non-contact voltage output, insulation 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, 1.5kVac for 1 minute
Between input terminal and power terminal, 1.5kVac for 1 minute
Between power terminal and ground terminal, 1.5kVac for 1 minute
Between output terminal and ground terminal, 1.5kVac for 1 minute
Between output terminal and power terminal, 1.5kVac for 1 minute

Weight : Approx. 250g

External dimension: 72 x 72 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 limiting function
Sensor correction function
Power failure countermeasure
Self-diagnosis function
Automatic cold junction temperature compensating function
Sensor burnout function [overscale, underscale]

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

10.2 Optional specifications

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

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

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
Control capacity, 250Vac 3A (resistive load)
250Vac 1A (inductive load cosø=0.4)

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

Watches the heater current with CT (current transformer), and detects the burnout. (**This option cannot be applied to the current output type**.)
When the option [W] is applied, the input sampling period is 0.5 seconds.

Rating : 20A [Option W (20A)] or
50A [Option W (50A)], Must be specified
Setting accuracy : ±5%
Action point : Setting value
Action : ON/OFF action
Output : Relay contact 1a (No self-holding)
Control capacity, 250Vac 3A (resistive load)
250Vac 1A (inductive load, cosø=0.4)

Heating/Cooling control output [option code: D ☐]

The specifications of heating side are the same as those of the Main output.
Cooling side proportional band: Multiplying factor to the heating side proportional band is 0.0 to 10.0.
(ON/OFF action when setting the value to 0.0.)
Cooling side proportional cycle: 1 to 120s
Overlap/Dead band setting range: ±(0 to 100%) of the Heating proportional band
Output [DR] Relay contact 1a
Control capacity, 250Vac 3A (resistive load)
250Vac 1A (inductive load cosø=0.4)
[DS] Non-contact voltage (for SSR drive)
12^{+2}_{0}Vdc maximum 40mAdc (short circuit protected)
[DA] Current
4 to 20mAdc
Load resistance: Maximum 550Ω

Cooling action mode selection function:
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, and the unit ℃ or ℉ is selectable.

Color black [option code: BK]

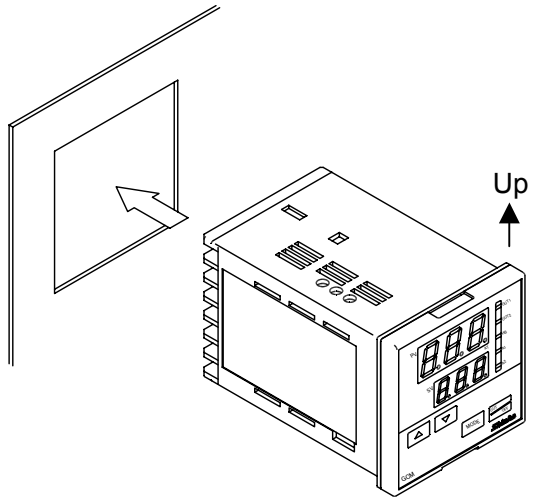
Front panel : Dark gray
Case : Black

Terminal cover [option code: TC]

Electrical shock protecting 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-72-S (soft type, sold separately) is recommended to strengthen the Dust-proof and Drip-proof specification.



Designated specifications

Scale range : Shipped as designated scale range
Alarm action : Shipped as designated alarm action (A1, A2)
Cooling action : Shipped as cooling action
Control action : Shipped as PD or ON/OFF 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>

Phenomena	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 17)
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 8). • Temperature unit (℃ or ℉) is mistaken. • Sensor correcting value is unsuitable. → Set the value suitably. (page 13) • Specification of the Thermocouple or RTD is improper. • AC may be leaking into thermocouple or the RTD circuit. • There may be an equipment producing an inductive fault or noise near the controller.

<Key operation>

Phenomena	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 13) • During PID auto-tuning →Cancel the tuning if necessary. (page 9) • 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 in the Auxiliary function setting mode.

<Control>

Phenomena	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 14)
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 15)
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 14)
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 14)

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
SP	Main setting	0℃ (℉) or 0.0℃	

[Sub setting mode]

Character	Description	Initial value	Data
AT	Auto-tuning Perform/Cancel	Cancel	
rSt	Auto-reset	Available for PD action	
P	Main proportional band	10℃ (20℉) or 10.0℃	
P_b	Cooling proportional band	1.0 times	
I	Integral time setting	200s	
d	Derivative time setting	50s	
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℃	
HO	Heater burnout alarm setting	0A	

[Auxiliary setting mode]

Character	Description	Initial value	Data
Loc	Setting value lock designation	Unlock	
SH	Main setting value high limit	Rated scale max. value	
SL	Main setting value low limit	Rated scale min. value	
So	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℃ (℉)	
bcS	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	℃	
SEn	Sensor selection	Specified input	
AL1	Temperature alarm 1 (A1)	No alarm action	
AL2	Temperature alarm 2 (A2)	No alarm action	
A1H	Temperature alarm 1 (A1) hysteresis	1.0℃ (℉)	
A2H	Temperature alarm 2 (A2) hysteresis	1.0℃ (℉)	
cnF	Heating/Cooling selection	Heating (reverse)	

***** Inquiry *****

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

	[Example]
• Model ----------	GCM-200-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.

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OVERSEAS DIVISION

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