

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

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

The safety precautions are classified into 2 categories: "Warning" and "Caution". Depending on the circumstances, procedures indicated by ⚠ Caution may be linked to serious results, so be sure to follow the directions for usage.

**⚠ Warning** Procedures which may lead to dangerous conditions and cause death or serious injury, if not carried out properly.

**⚠ Caution** Procedures which may lead to dangerous conditions and cause superficial to medium injury or physical damage or may degrade or damage the product, if not carried out properly.

**⚠ Warning**

- To prevent an electric shock or fire, only Shinko or qualified service personnel may handle the inner assembly.
- To prevent an electric shock, fire or damage to the instrument, parts replacement may only be undertaken by Shinko or other qualified service personnel.

**⚠ Safety precautions**

- To ensure safe and correct use, thoroughly read and understand this manual before using this instrument.
- This instrument is intended to be used for industrial machinery, machine tools and measuring equipment. Verify correct usage after consulting the purpose of use with our agency or main office. (Never use this instrument for medical purposes with which human lives are involved.)
- External protection devices such as protection equipment against excessive temperature rise, etc. must be installed, as malfunction of this product could result in serious damage to the system or injury to personnel. Also proper periodic maintenance is required.
- This instrument must be used under the conditions and environment described in this manual. Shinko Technos Co., Ltd. does not accept liability for any injury, loss of life or damage occurring due to the instrument being used under conditions not otherwise stated in this manual.

**Caution with respect to Export Trade Control Ordinance**

To avoid this instrument from being used as a component in, or as being utilized in the manufacture of weapons of mass destruction (i.e. military applications, military equipment, etc.), please investigate the end users and the final use of this instrument. In the case of resale, ensure that this instrument is not illegally exported.

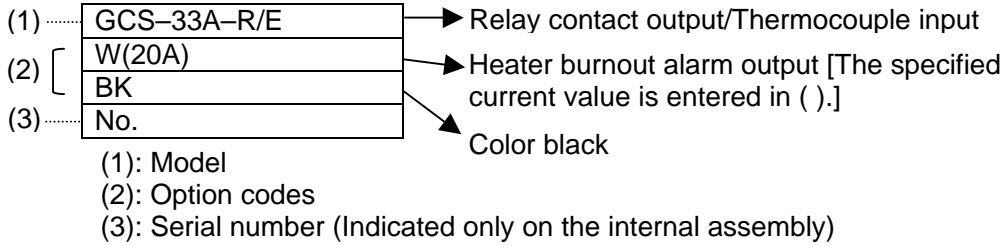
**1. Model**

**1.1 Model**

GCS-3 3 □ - □ / □, □ □ □		Series name: GCS-300 (W48 x H48 x D96.5mm)	
Control action	3		PID
Alarm 1 (A1)	0		No alarm action
	A		Alarm action applied (Selectable by key operation)
Control output (OUT)	R		Relay contact: 1a
	S		Non-contact voltage (for SSR drive): 12 <sup>+2</sup> <sub>0</sub> V DC
	A		DC current: 4 to 20mA DC
Input	E		Thermocouple: K, J, E
	R		RTD: Pt100, JPt100
	M		Multi-range input
Option	A2		Alarm 2 (A2)
	W( 5A)	Heater burnout alarm	CT rated current: 5A
	W(10A)		CT rated current: 10A
	W(20A)		CT rated current: 20A
	W(50A)		CT rated current: 50A
	C5	Serial communication	RS-485
	SM	Set value memory external selection	
	MR	Multi-range input This option is applicable for the thermocouple and RTD input types. For the multi-range input type, this is standard.	
	LA	Loop break alarm	
	BK	Color: Black	
BL	Screw type mounting brackets		
IP	Dust-proof/Drip-proof (IP54)		
TC	Terminal cover		

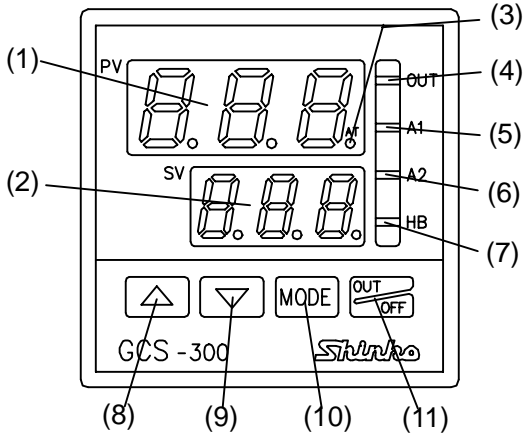
### 1.2 How to read the model label

Model labels are attached to the right side of the case and the bottom of the internal assembly.



## 2. Name and functions of the sections

### Displays and indicators



(Fig. 2-1)

- (1) **PV display:** Indicates the PV (Process variable) or setting characters with a red LED.
- (2) **SV display:** Indicates the SV (Desired value) or each set value with a green LED.
- (3) **AT indicator**  
Flashes while the Auto-tuning or Auto-reset is performing.
- (4) **OUT: Control output (OUT) indicator**  
The green LED lights when the control output (OUT) is ON.
- (5) **A1: Alarm 1 (A1) indicator**  
The red LED lights when Alarm 1 (A1) output is ON.
- (6) **A2: Alarm 2 (A2) indicator (A2 option)**  
The red LED lights when Alarm 2 (A2) output is ON.
- (7) **HB: Heater burnout alarm indicator (including Sensor burnout alarm) (W option)**  
The yellow LED lights when the Heater burnout alarm or Sensor burnout alarm output is ON.

### Key operations

- (8) **Increase key** : Increases the numeric value or selects the set value.
- (9) **Decrease key** : Decreases the numeric value or selects the set value.
- (10) **Mode key** : Selects the setting mode or registers the set value by pressing this key.
- (11) **OUT/OFF key**: Turns the control output ON or OFF.

## 3. Mounting

### 3.1 Site selection

#### **Caution**

- Use within the following temperature and humidity ranges.  
Temperature: 0 to 50°C (32 to 122°F), Humidity: 35 to 85%RH (No icing or condensation)
- Take note that ambient temperature of this unit as well as the control panel must not exceed 50°C (122°F) when mounted through the control panel. Otherwise the life of electronic components (especially electrolytic capacitor) may be shortened.

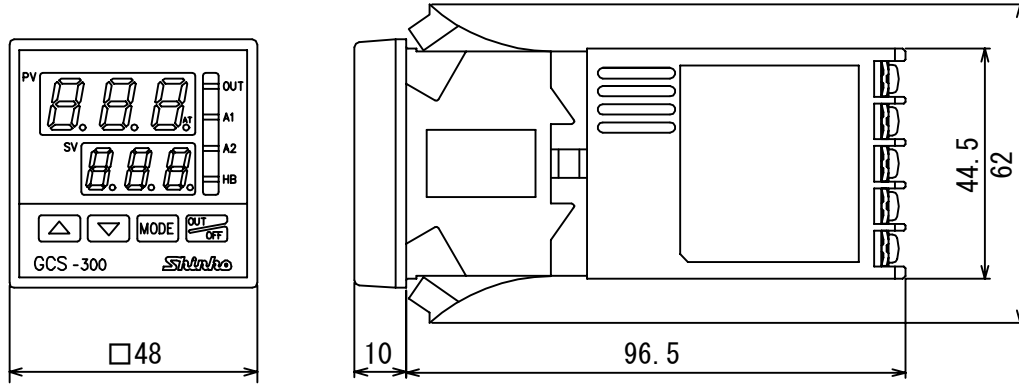
This instrument is intended to be used under the following environmental conditions (IEC61010-1):  
 Overvoltage category II, Pollution degree 2

Ensure the mounting location corresponds to the following conditions:

- (1) A minimum of dust, and an absence of corrosive gases
- (2) No flammable, explosive gases
- (3) No mechanical vibrations or shocks
- (4) No exposure to direct sunlight, an ambient temperature of 0 to 50°C (32 to 122°F) that does not change rapidly, and without icing
- (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 flows
- (7) No water, oil or chemicals or where the vapors of these substances can come into direct contact with the controller

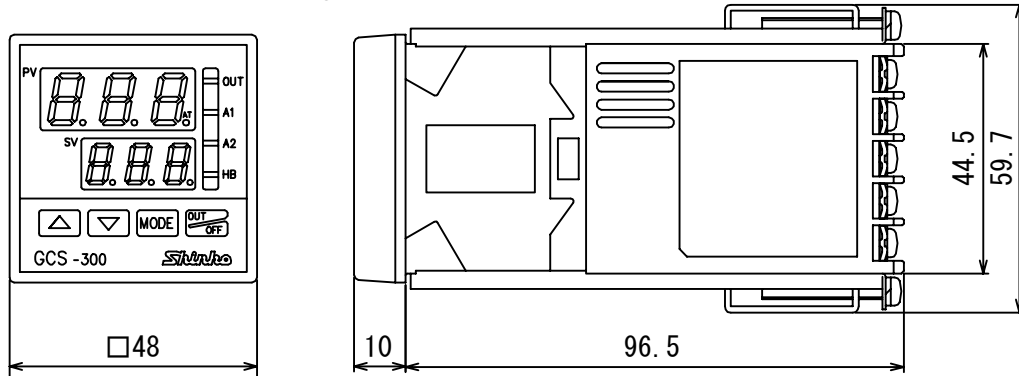
### 3.2 External dimensions (Unit: mm)

When one-touch type mounting brackets are used



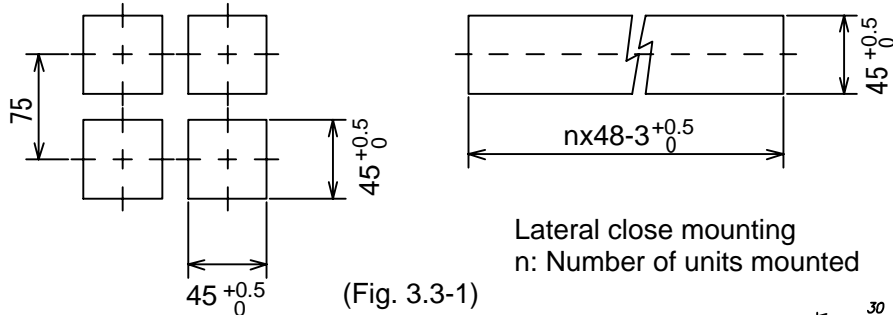
(Fig. 3.2-1)

When screw type mounting brackets are used (BL option)



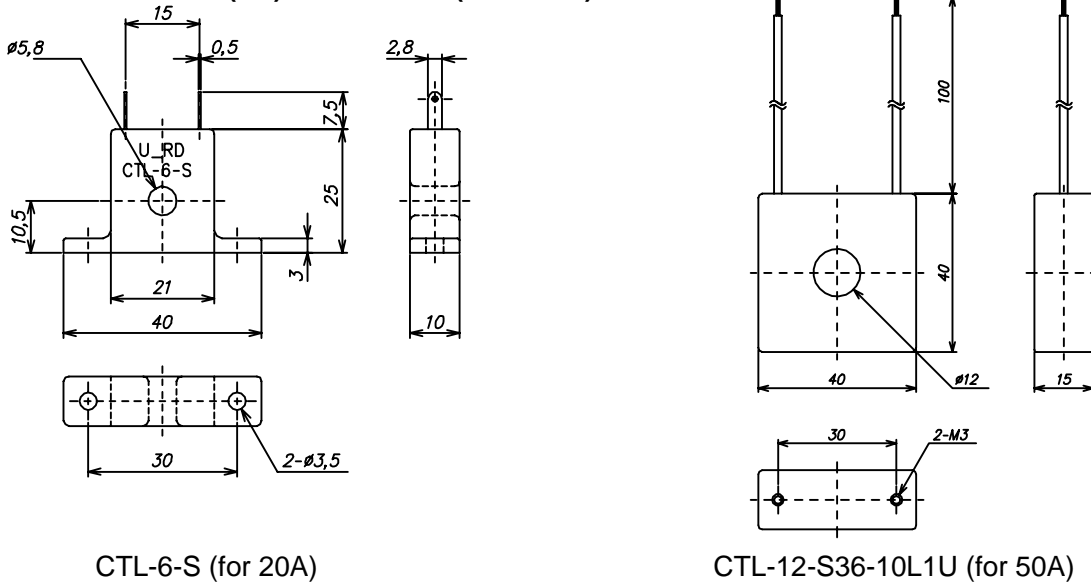
(Fig. 3.2-2)

### 3.3 Panel cutout (Unit: mm)



(Fig. 3.3-1)

### 3.4 Current transformer (CT) dimensions (Unit: mm)



CTL-6-S (for 20A)

CTL-12-S36-10L1U (for 50A)

(Fig. 3.4-1)

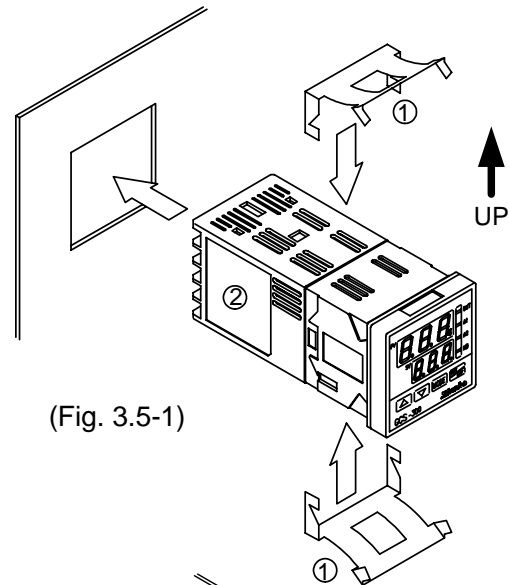
### 3.5 Mounting

#### 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.

#### When the one-touch type mounting brackets are used:

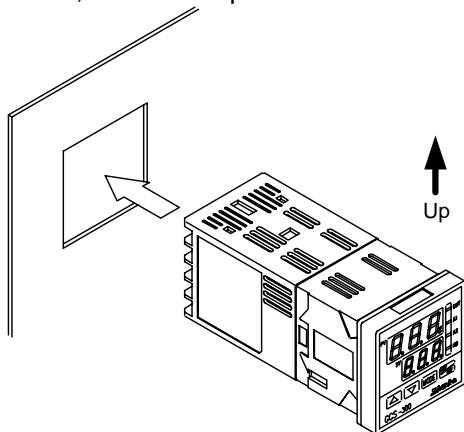
Mountable panel thickness is 1 to 3mm.  
Set the mounting bracket ① to the top and bottom of the instrument first.  
Then, insert the GCS-300 ② from the front of the mounting panel.  
When the Soft-type Front-cover is used, mountable panel thickness is 1 to 2.5mm.



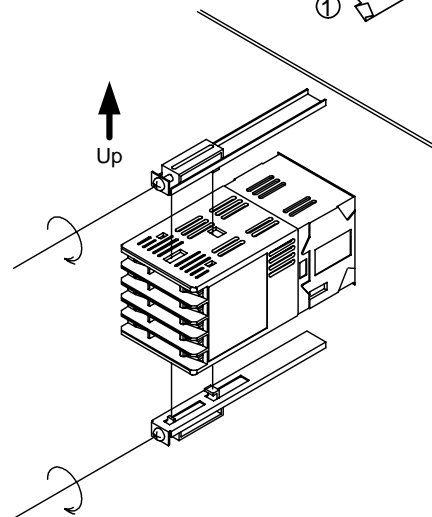
(Fig. 3.5-1)

#### When the screw type mounting brackets (BL option) are used:

Mountable panel thickness is 1 to 15mm.  
Insert the GCS-300 from the front of the panel.  
Attach the mounting bracket by the holes at the top and bottom of the case, and secure the unit in place with the screws.  
When the Soft-type Front-cover (FS-48-S) is used, mountable panel thickness is 1 to 14.5mm.



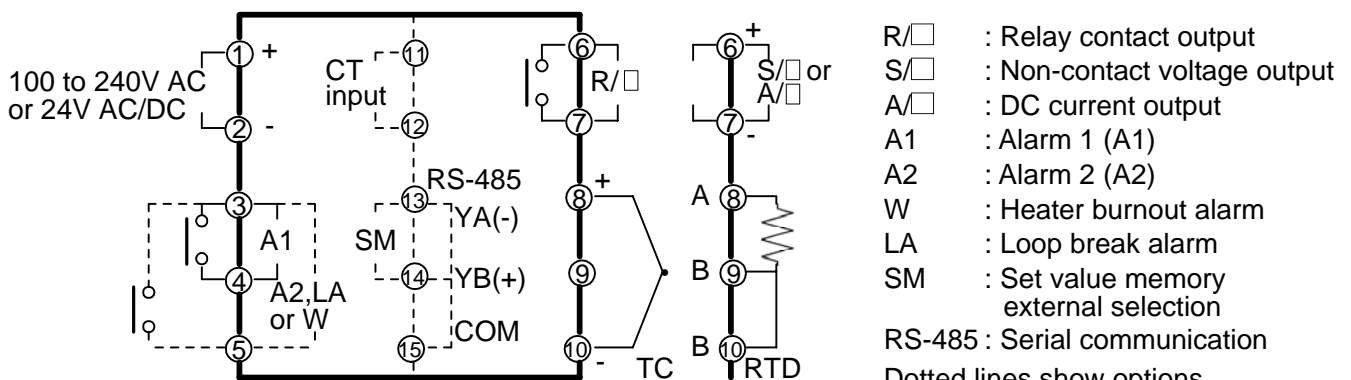
(Fig. 3.5-2)



## 4. Terminal arrangement

#### Warning

Turn the power supply to the instrument OFF before wiring or checking.  
Working or touching the terminal with the power switched ON may result in severe injury or death due to Electric Shock.



(Fig. 4-1)

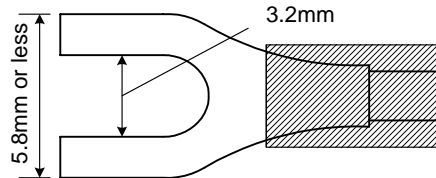
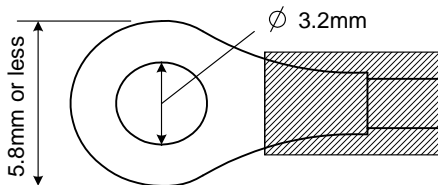
## ⚠ Notice

- The terminal block of the GCS-300 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.
- Use a thermocouple and compensating lead wire in accordance with the input specifications of this controller.
- Use a 3-wire RTD according to the input specifications of this controller.
- This controller does not have a built-in power switch or fuse. Therefore, it is necessary to install them in the circuit near the external controller.  
(Recommended fuse: Time-lag fuse, rated voltage 250V, rated current 2A)
- For a 24V AC/DC power source, do not confuse polarity when using direct current (DC).
- With the relay contact output type, externally use an auxiliary electromagnetic switch in accordance with the capacity of the load to protect the built-in relay contact.
- When wiring, keep input wires (thermocouple, RTD, etc.) away from AC sources and load wires to avoid external interference.

### ● Solderless terminal

Use a solderless terminal with an insulation sleeve in which an M3 screw fits as shown below.

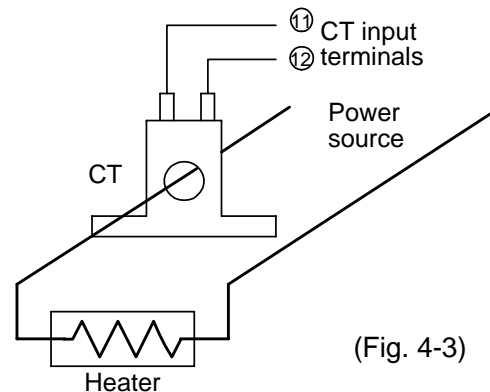
Solderless terminal	Manufacturer	Model	Tightening torque
Y type	Nichifu Terminal Industries CO., LTD.	TMEV1.25Y-3	0.6N·m, Max. 1.0N·m
	Japan Solderless Terminal MFG CO., LTD.	VD1.25-B3A	
Round type	Nichifu Terminal Industries CO., LTD.	TMEV1.25-3	
	Japan Solderless Terminal MFG CO., LTD.	V1.25-3	



(Fig. 4-2)

#### Option: Heater burnout alarm output


- (1) **This alarm is not usable for detecting current under phase control.**
- (2) Use the current transformer (CT) provided, and pass one lead wire of the heater circuit into the hole of the CT.
- (3) When wiring, keep the CT wire away from any AC sources or load wires to avoid the external interference.



(Fig. 4-3)

## 5. Operations

After the power is turned on, the PV display indicates the sensor characters and temperature unit, and the SV display indicates the input range high limit value for approx. 2 seconds. See (Table 5-1). (When any other value has been set during the SV high limit setting, the SV display indicates the value.) During this time, all outputs and LED indicators are in OFF status. Control will then start indicating the PV (process variable) on the PV display and SV (desired value) on the SV display.

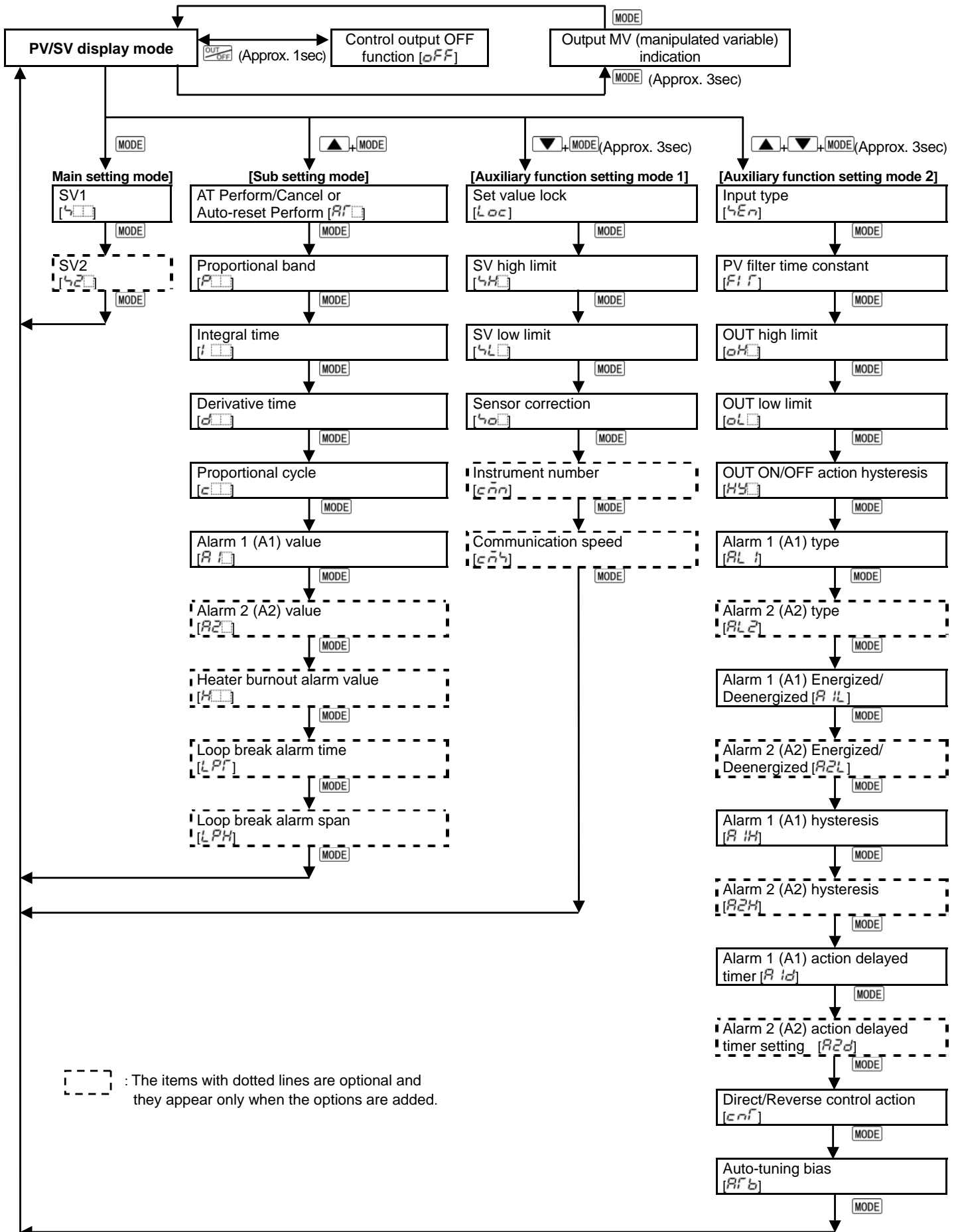
(When the control output OFF function is working, **OFF** is indicated on the PV display. To release the control output OFF function, press the  key for approx. 1 second.)

(Table 5-1)

Input	°C		°F	
	PV	SV	PV	SV
K	E4C	400		
K	E0C	999	E0F	999
J	J0C	999	J0F	999
E	E0C	600	E0F	999
Pt100	P1C	400	P1F	999
	P1C	999		
JPt100	J1C	400	J1F	999
	J1C	999		

K (0 to 400°C) type is not available for the MR option.

## 5.1 Operation flowchart



- **▲+MODE**: Press the **MODE** key while holding down the **▲** key.
- **▼+MODE**(Approx. 3sec): Press the **MODE** key for 3 seconds while holding down the **▼** key.
- **▲+▼+MODE**(Approx. 3sec): Press the **MODE** key for 3 seconds while holding down the **▲** and **▼** keys.
- If the **MODE** key is pressed for approx. 3sec, the controller reverts to the PV/SV display mode from any mode.

## 5.2 Main setting mode

Character	Name, Description, Setting range	Default
SV1	<b>SV1</b> <ul style="list-style-type: none"> <li>• Sets the SV1 (Desired value 1).</li> <li>• Setting range: SV low limit to SV high limit</li> </ul>	0°C (°F)
SV2	<b>SV2</b> <ul style="list-style-type: none"> <li>• Sets the SV2 (Desired value 2).</li> <li>• Available only when the SM option is applied.</li> <li>• Setting range: SV low limit to SV high limit</li> </ul>	0°C (°F)

## 5.3 Sub setting mode

Character	Name, Description, Setting range	Default
RT	<b>Auto-tuning Perform/Cancel, or Auto-reset Perform</b> <ul style="list-style-type: none"> <li>• Selects auto-tuning perform/cancel, or auto-reset perform.</li> <li>• Auto-reset will be cancelled in approx. 4 minutes automatically.</li> <li>• ---/ ---: Auto-tuning/Auto-reset Cancel</li> <li>• RT / rT: Auto-tuning/Auto-reset Perform</li> </ul>	---
P	<b>Proportional band value setting</b> <ul style="list-style-type: none"> <li>• Sets the proportional band for the control output (OUT).</li> <li>• ON/OFF action when set to 0 or 0.0.</li> <li>• Setting range: 0 to 999°C(°F), or 0.0 to 99.9°C</li> </ul>	10°C (20°F)
I	<b>Integral time setting</b> <ul style="list-style-type: none"> <li>• Sets the integral time for the control output (OUT).</li> <li>• Setting the value to 0 disables the function.</li> <li>• With PD action ("I" value is set to 0), auto-reset can be performed.</li> <li>• Setting range: 0 to 999 seconds</li> </ul>	200sec
D	<b>Derivative time setting</b> <ul style="list-style-type: none"> <li>• Sets the derivative time for the control output (OUT).</li> <li>• Setting the value to 0 disables the function.</li> <li>• Setting range: 0 to 300 seconds</li> </ul>	50sec
C	<b>Proportional cycle setting</b> <ul style="list-style-type: none"> <li>• Sets the proportional cycle value for the control output (OUT).</li> <li>• Not available for ON/OFF action or current output type.</li> <li>• Setting range: 1 to 120 seconds</li> </ul>	R/√:30sec S/√:3sec
A1	<b>Alarm 1 (A1) value</b> <ul style="list-style-type: none"> <li>• Sets the action point for Alarm 1 (A1) output.</li> <li>• Not available for the GCS-330 type.</li> <li>• Setting the value to 0 or 0.0 disables the function (except Process high and Process low alarm).</li> <li>• Not available if No alarm action is selected during Alarm 1 (A1) type selection.</li> <li>• Setting range: See (Table 5.3-1).</li> </ul>	0°C (°F)
A2	<b>Alarm 2 (A2) value</b> <ul style="list-style-type: none"> <li>• Sets the action point for Alarm 2 (A2) output.</li> <li>• Setting the value to 0 or 0.0 disables the function (except Process high and Process low alarm).</li> <li>• Not available if A2 option is not applied, or No alarm action is selected during Alarm 2 (A2) type selection.</li> <li>• Setting range: See (Table 5.3-1).</li> </ul>	0°C (°F)
H	<b>Heater burnout alarm setting</b> <ul style="list-style-type: none"> <li>• Sets the heater current value for Heater burnout alarm.</li> <li>• Available only when the W option is applied.</li> <li>• Upon returning to set limits, the alarm will stop.</li> <li>• Rated current 5A: 0.0 to 5.0A      Rated current 10A: 0.0 to 10.0A</li> <li>• Rated current 20A: 0.0 to 20.0A      Rated current 50A: 0.0 to 50.0A</li> </ul>	0.0A
LPT	<b>Loop break alarm time setting</b> <ul style="list-style-type: none"> <li>• Sets the time to assess the Loop break alarm.</li> <li>• Available only when the LA option is applied.</li> <li>• Setting range: 0 to 200 minutes</li> </ul>	0 min.
LPH	<b>Loop break alarm span setting</b> <ul style="list-style-type: none"> <li>• Sets the temperature span to assess the Loop break alarm.</li> <li>• Available only when the LA option is applied.</li> <li>• Setting range: 0 to 150°C(°F)</li> </ul>	0°C (°F)

(Table 5.3-1)

Alarm type	Setting range	Setting range (with a decimal point)
High limit alarm	-199 to Input range high limit value°C(°F)	-19.9 to 99.9°C
Low limit alarm	-199 to Input range high limit value°C(°F)	-19.9 to 99.9°C
High/Low limits alarm	±(0 to Input range high limit value)°C(°F)	±(0.0 to 99.9)°C
High/Low limit range	±(0 to Input range high limit value)°C(°F)	±(0.0 to 99.9)°C
Process high alarm	Input range low limit value to Input range high limit value	Input range low limit value to Input range high limit value
Process low alarm	Input range low limit value to Input range high limit value	Input range low limit value to Input range high limit value
High limit with standby	-199 to Input range high limit value°C(°F)	-19.9 to 99.9°C
Low limit with standby	-199 to Input range high limit value°C(°F)	-19.9 to 99.9°C
High/Low limits with standby	±(0 to Input range high limit value)°C(°F)	±(0.0 to 99.9)°C

#### 5.4 Auxiliary function setting mode 1

Character	Name, Description, Setting range	Default
<i>Lc</i>	<p><b>Set value lock</b></p> <ul style="list-style-type: none"> <li>Locks the set value to prevent setting errors. The setting item to be locked differs depending on the selection.</li> <li>PID auto-tuning or auto-reset will not function if Lock 1 or Lock 2 is selected.</li> <li>--- (Unlock): All set values can be changed.</li> <li><i>Lc1</i> (Lock 1): None of the set values can be changed.</li> <li><i>Lc2</i> (Lock 2): Only SV (desired value) can be changed.</li> <li><i>Lc3</i> (Lock 3): All set values can be changed. However, they return to their previous value after the power is turned off because they are not saved in the non-volatile memory. Do not change any setting item in Auxiliary function Setting mode 2. If any item in the mode is changed, it will affect other setting items such as the SV and Alarm value. Be sure to select Lock 3 when changing the set value frequently via communication function. (If the value set by the communication function is the same as the value before the setting, the value will not be written in the non-volatile memory.)</li> </ul>	Unlock
<i>4H</i>	<p><b>SV high limit setting</b></p> <ul style="list-style-type: none"> <li>Sets the SV high limit value.</li> <li>Setting range: SV low limit to Input range high limit value</li> </ul>	Input range high limit value
<i>4L</i>	<p><b>SV low limit setting</b></p> <ul style="list-style-type: none"> <li>Sets the SV low limit value.</li> <li>Setting range: Input range low limit value to SV high limit</li> </ul>	Input range low limit value
<i>40</i>	<p><b>Sensor correction setting</b></p> <ul style="list-style-type: none"> <li>Sets sensor correction value of the sensor.</li> <li>Setting range: -199 to 200°C(°F), or -19.9 to 20.0°C</li> </ul>	0°C (°F) or 0.0°C
<i>cn</i>	<p><b>Instrument number setting</b></p> <ul style="list-style-type: none"> <li>Sets the instrument number individually to each instrument when communicating by connecting multiple instruments in serial communication.</li> <li>Available only when the C5 option is applied.</li> <li>Setting range: 0 to 95</li> </ul>	0
<i>cn4</i>	<p><b>Communication speed selection</b></p> <ul style="list-style-type: none"> <li>Selects the communication speed equal to that of the host computer.</li> <li>Available only when the C5 option is applied.</li> <li><input type="checkbox"/>24 : 2400bps</li> <li><input type="checkbox"/>48 : 4800bps</li> <li><input type="checkbox"/>96 : 9600bps</li> <li><input type="checkbox"/>192 : 19200bps</li> </ul>	9600bps



## 5.5 Auxiliary function setting mode 2

Character	Name, Description, Setting range	Default
4En	<b>Input type selection</b> <ul style="list-style-type: none"> <li>For the multi-range input type (MR option), one input type can be selected from thermocouple (3 types) and RTD (2 types), and the unit °C or °F can be selected as well. However, K (0 to 400°C) type is not usable.</li> <li>The following ranges can be selected when the MR option is applied to the thermocouple or RTD input type. <ul style="list-style-type: none"> <li>tcC: K 0 to 999°C</li> <li>tcJ: J 0 to 999°C</li> <li>tcE: E 0 to 600°C</li> <li>PtC: Pt100 -199 to 400°C</li> <li>JPtC: JPt100 -199 to 400°C</li> <li>PtF: Pt100 -19.9 to 99.9°C</li> <li>JPtF: JPt100 -19.9 to 99.9°C</li> <li>tcF: K 0 to 999°F</li> <li>tcJ: J 0 to 999°F</li> <li>tcE: E 0 to 999°F</li> <li>PtF: Pt100 -199 to 999°F</li> <li>JPtF: JPt100 -199 to 999°F</li> </ul> </li> </ul>	K (0 to 999°C)
FIT	<b>PV filter time constant setting</b> <ul style="list-style-type: none"> <li>Sets PV filter time constant value.</li> <li>If the value is set too large, it affects control result due to the delay of response.</li> <li>Setting range: 0.0 to 10.0 seconds</li> </ul>	0.0sec
oH□	<b>OUT high limit setting</b> <ul style="list-style-type: none"> <li>Sets the control output (OUT) high limit value.</li> <li>Not available for ON/OFF action.</li> <li>Setting range: OUT low limit value to 100% (DC current output type: OUT low limit value to 105%)</li> </ul>	100%
oL□	<b>OUT low limit setting</b> <ul style="list-style-type: none"> <li>Sets the control output (OUT) low limit value.</li> <li>Not available for ON/OFF action.</li> <li>Setting range: 0% to OUT high limit value (DC current output type: -5% to OUT high limit value)</li> </ul>	0%
HY□	<b>OUT ON/OFF action hysteresis setting</b> <ul style="list-style-type: none"> <li>Sets the ON/OFF action hysteresis for the control output (OUT).</li> <li>Available only for ON/OFF action.</li> <li>Setting range: 0.1 to 99.9°C</li> </ul>	1.0°C
AL1	<b>Alarm 1 (A1) type selection</b> <ul style="list-style-type: none"> <li>Selects Alarm 1 (A1) type.</li> <li>Not available for the GCS-330 type. <ul style="list-style-type: none"> <li>--- : No alarm action</li> <li>H□□ : High limit alarm</li> <li>L□□ : Low limit alarm</li> <li>HL□ : High/Low limits alarm</li> <li>o l d : High/Low limit range alarm</li> <li>RA□ : Process high alarm</li> <li>rRA□ : Process low alarm</li> <li>H□□ : High limit alarm with standby</li> <li>L□□ : Low limit alarm with standby</li> <li>HL□ : High/Low limits alarm with standby</li> </ul> </li> </ul>	No alarm action
AL2	<b>Alarm 2 (A2) type selection</b> <ul style="list-style-type: none"> <li>Selects Alarm 2 (A2) type.</li> <li>Available only when the A2 option is applied.</li> <li>Alarm types are the same as those of Alarm 1 (A1).</li> </ul>	No alarm action

<i>A1L</i>	<b>Alarm 1 (A1) Energized/Deenergized selection</b> <ul style="list-style-type: none"> <li>• Selects Alarm 1 (A1) output Energized or Deenergized.</li> <li>• Not available for the GCS-330 type.</li> <li>• Not available if No alarm action is selected during Alarm 1 (A1) type selection.</li> <li>• <i>noñ</i>: Energized</li> <li>• <i>rEB</i>: Deenergized</li> </ul>	Energized
<i>A2L</i>	<b>Alarm 2 (A2) Energized/Deenergized selection</b> <ul style="list-style-type: none"> <li>• Selects Alarm 2 (A2) Energized or Deenergized.</li> <li>• Not available if the A2 option is not applied, or if No alarm action is selected during Alarm 2 (A2) type selection.</li> <li>• Selection items are the same as those of Alarm 1 (A1) Energized/Deenergized selection.</li> </ul>	Energized
<i>A1H</i>	<b>Alarm 1 (A1) hysteresis setting</b> <ul style="list-style-type: none"> <li>• Sets hysteresis value for Alarm 1 (A1) output.</li> <li>• Not available for the GCS-330 type.</li> <li>• Not available if No alarm action is selected during Alarm 1 (A1) type selection.</li> <li>• Setting range: 0.1 to 99.9°C (°F)</li> </ul>	1.0°C (°F)
<i>A2H</i>	<b>Alarm 2 (A2) hysteresis setting</b> <ul style="list-style-type: none"> <li>• Sets hysteresis value for Alarm 2 (A2) output.</li> <li>• Not available if A2 option is not applied, or if No alarm action is selected during Alarm 2 (A2) type selection.</li> <li>• Setting range: 0.1 to 99.9°C(°F)</li> </ul>	1.0°C (°F)
<i>A1d</i>	<b>Alarm 1 (A1) action delayed timer setting</b> <ul style="list-style-type: none"> <li>• Sets Alarm 1 (A1) action delayed timer.</li> <li>The alarm is activated when the setting time has passed after the input enters alarm output range.</li> <li>• Not available for the GCS-330 type.</li> <li>• Not available if No alarm action is selected during Alarm 1 (A1) type selection.</li> <li>• Setting range: 0 to 999 seconds</li> </ul>	0sec
<i>A2d</i>	<b>Alarm 2 (A2) action delayed timer setting</b> <ul style="list-style-type: none"> <li>• Sets Alarm 2 (A2) action delayed timer.</li> <li>The alarm is activated when the setting time has passed after the input enters alarm output range.</li> <li>• Not available if A2 option is not applied, or if No alarm action is selected during Alarm 2 (A2) type selection.</li> <li>• Setting range: 0 to 999 seconds</li> </ul>	0sec
<i>cnf</i>	<b>Direct/Reverse control action</b> <ul style="list-style-type: none"> <li>• Selects Reverse (Heating) or Direct (Cooling) control action.</li> <li>• <i>HE</i>: Reverse (Heating) action</li> <li>• <i>co</i>: Direct (Cooling) action</li> </ul>	Reverse (Heating) action
<i>ATb</i>	<b>Auto-tuning bias setting</b> <ul style="list-style-type: none"> <li>• Sets auto-tuning bias value during PID auto-tuning.</li> <li>• Setting range: 0 to 50°C (0 to 100°F), or 0.0 to 5.0°C</li> </ul>	20°C (40°F)

### Characters used in this manual

Indication	<i>-</i>	<i>0</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>C</i>	<i>F</i>
Number, °C/°F	-1	0	1	2	3	4	5	6	7	8	9	°C	°F
Indication	<i>A</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>	<i>I</i>	<i>J</i>	<i>k</i>	<i>L</i>	<i>ñ</i>
Alphabet	A	B	C	D	E	F	G	H	I	J	K	L	M
Indication	<i>n</i>	<i>o</i>	<i>P</i>	<i>q</i>	<i>r</i>	<i>s</i>	<i>T</i>	<i>U</i>	<i>B</i>	<i>v</i>	<i>y</i>	<i>z</i>	<i>z</i>
Alphabet	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

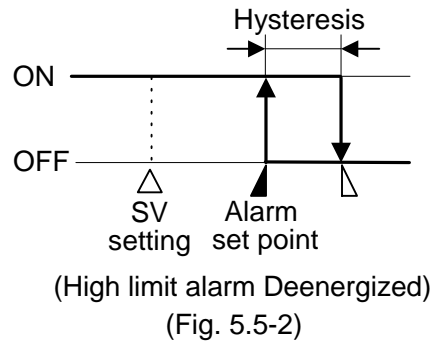
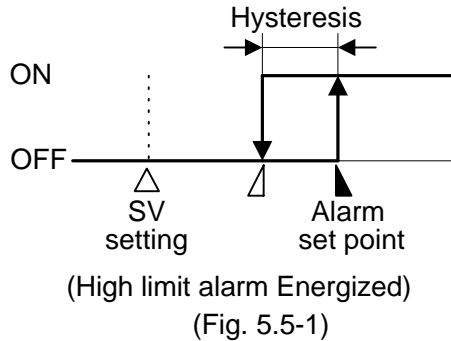
**Energized/Deenergized function**

[If alarm action Energized is selected]

The alarm output (terminals 3-4, or 3-5) is conducted (ON) while the alarm output indicator is lit  
 The alarm output is not conducted (OFF) while the alarm output indicator is not lit.

[If alarm action Deenergized is selected]

The alarm output (terminals 3-4, or 3-5) is not conducted (OFF) while the alarm output indicator is lit.  
 The alarm output is conducted (ON) while the alarm output indicator is not lit.



**Set value memory external selection (SM option)**



If the SM option is applied, the SV1 or SV2 can be selected by external contact.

Terminals between 13 and 14 Open : SV1




Terminals between 13 and 14 Closed: SV2

However, the SV1 or SV2 cannot be changed during setting mode or PID auto-tuning.

**5.6 Control output OFF function**

Character	Name, Description
OFF	<p><b>Control output OFF function</b></p> <ul style="list-style-type: none"> <li>This is a function to pause the control action or turn the control output of the unused instrument of the plural units OFF even if the power to the instrument is supplied.                      [OFF] is indicated on the PV display while the function is working.</li> <li>This function can be selected from any mode or from any setting item by pressing the  key for approx. 1 second.</li> <li>Once this function is enabled, the function cannot be released even if the power to the instrument is turned off and on again.  <b>To cancel the function, press the  key again for approx. 1 second.</b></li> </ul>

**5.7 Output MV (manipulated variable) indication**

Name, Description
<p><b>Output MV (manipulated variable) indication</b></p> <ul style="list-style-type: none"> <li>Press the  key for 3 seconds on the PV/SV display mode.                      The main setting mode appears during the process, however, if the  key is pressed continuously, the output MV is indicated on the SV display, and the decimal point flashes every 0.5 seconds.                      By pressing the  key again, the unit reverts to the PV/SV display mode.</li> </ul>

## 6. Running

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

### (1) Turn the power supply to the GCS-300 ON.

For approx. 2 seconds after the power on, the sensor type characters and temperature unit are indicated on the PV display, and the input range high limit value is indicated on the SV display. See (Table 3.1-1). (If any other value is set during the SV high limit setting, SV display indicates the value.)

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

After that, the PV display indicates the current temperature, and the SV display indicates the SV (desired value).

While the Control output OFF function is working, [FF] is indicated on the PV display.

### (2) Input each set value.

Input each set value referring to Chapter "5 Operations".

### (3) Turn the load circuit power ON.

Control action starts so as to maintain the control target at the SV.

## 7. Other functions

### (1) Input abnormality indication

When the input value exceeds 999 (99.9), 3 digits on the PV display flash.

When the input value exceeds [Input range high limit value + 50°C (100°F)], the control output is turned OFF (for DC current output type, OUT low limit value), and the PV display flashes [ - - - ].

When the input falls below -199 (-19.9), 3 digits on the PV display flash.

When the thermocouple input value falls below -50°C (-100°F), the control output is turned OFF (for DC current output type, OUT low limit value), and the PV display flashes [ - - - ].

For the RTD input, when Input range low limit value is -19.9, if the input value falls below -50°C (-100°F), the control output is turned OFF (for the current output type, OUT low limit value), and the PV display flashes [ - - - ].

For the RTD input, when Input range low limit value is -199, if the input value falls below [-199°C - 1% of the input span], the control output is turned OFF (for DC current output type, OUT low limit value), and the PV display flashes [ - - - ].

### (2) Sensor burnout (Burnout)

When the thermocouple or RTD is burnt out, the control output is turned OFF (for DC current output type, OUT low limit value), and the PV display flashes [ - - - ].

### (3) Self-diagnosis

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

### (4) Automatic cold junction temperature compensation (thermocouple input type)

This detects the temperature at the connection terminal between thermocouple and the instrument, and always keeps it at the same status as when the reference junction is located at 0°C (32°F).

# 8. Action explanation

## 8.1 Standard control action

	Heating (Reverse) action	Cooling (Direct) action
Control action		
Relay contact output	<p>Cycle action is performed according to deviation</p>	<p>Cycle action is performed according to deviation</p>
Non-contact voltage output	<p>Cycle action is performed according to deviation</p>	<p>Cycle action is performed according to deviation</p>
DC current output	<p>Changes continuously according to deviation</p>	<p>Changes continuously according to deviation</p>
Indicator (OUT) Green		

: Acts ON or OFF.

## 8.2 ON/OFF action

	Heating (Reverse) action	Cooling (Direct) action
Control action		
Relay contact output		
Non-contact voltage output		
DC current output		
Indicator (OUT) Green		

: Acts ON or OFF.

### 8.3 Alarm action

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

: Acts ON or OFF.

: The standby functions.  
Use terminals ③ and ⑤ for Alarm 2 (A2).

### 8.4 Heater burnout alarm action

	Heater burnout alarm action
Alarm action	
Output	
Indicator	

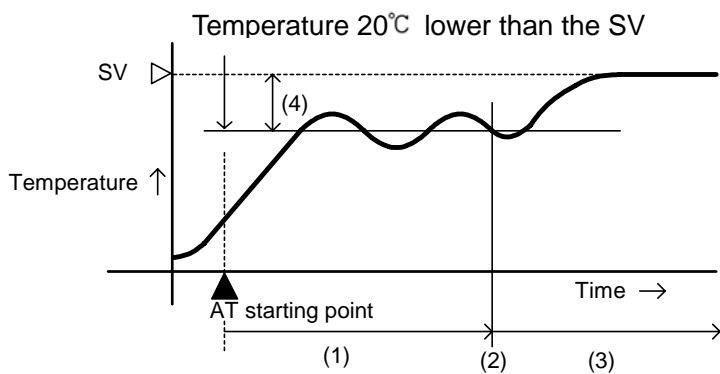
# 9. PID auto-tuning

In order to set each value of P, I, D and ARW automatically, the auto-tuning process should be made to fluctuate to obtain an optimal value.

**Note: Sometimes the auto-tuning process will not fluctuate if auto-tuning is performed at or near room temperature. Therefore auto-tuning might not finish normally.**

- **In the case of a large difference between the SV and processing temperature as the temperature is rising**

When AT bias is set to 20°C, the AT process will fluctuate at the temperature 20°C lower than the SV.

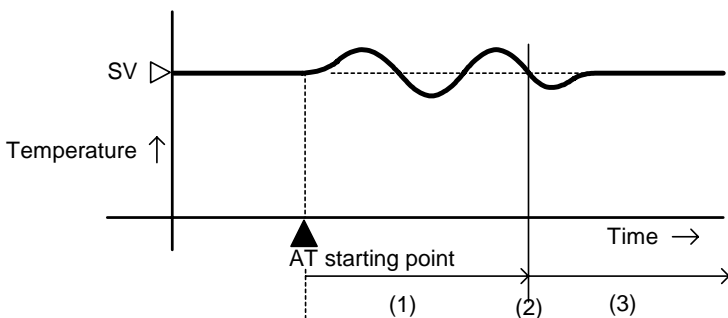


(Fig. 9-1)

- (1) Calculating PID constant
- (2) PID constant calculated
- (3) Controlled by the PID constant set by auto-tuning.
- (4) AT bias value

- **In the case of a stable control**

The AT process will fluctuate around the SV.

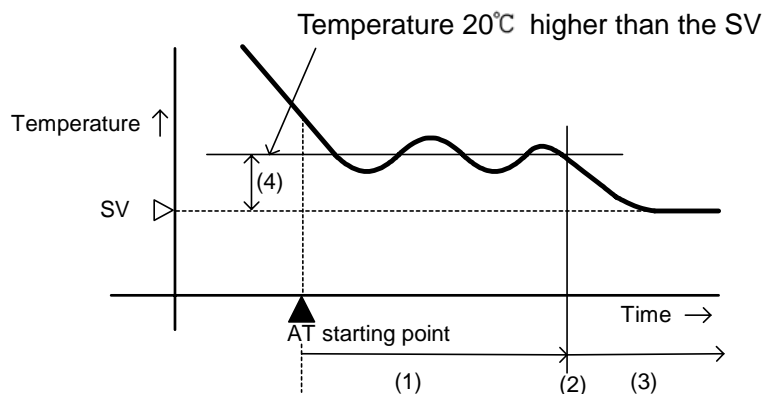


(Fig. 9-2)

- (1) Calculating PID constant
- (2) PID constant calculated
- (3) Controlled by the PID constant set by auto-tuning.

- **In the case of a large difference between the SV and processing temperature as the temperature is falling**

When AT bias is set to 20°C, the AT process will fluctuate at the temperature 20°C higher than the SV.



(Fig. 9-3)

- (1) Calculating PID constant
- (2) PID constant calculated
- (3) Controlled by the PID constant set by auto-tuning.
- (4) AT bias value

# 10. Specifications

## 10.1 Standard specifications

- Mounting** : Flush
- Setting** : Input system using membrane sheet key
- Display**
  - PV display : Red LED display 3 digits, size, 10(H) x 5.5(W) mm
  - SV display : Green LED display 3 digits, size, 8(H) x 4(W) mm

### Accuracy (Setting and Indication)

- Thermocouple : Within  $\pm 0.3\%$  of each input span  $\pm 1$  digit, or within  $2^{\circ}\text{C}(4^{\circ}\text{F})$ , whichever is greater
- RTD : Within  $\pm 0.2\%$  of each input span  $\pm 1$  digit, or within  $1^{\circ}\text{C}(2^{\circ}\text{F})$ , whichever is greater

**Input sampling period:** 0.25 seconds

### Input

- Thermocouple : K, J, E
  - External resistance,  $100\Omega$  or less
  - When input is burnt out: Overscale
- RTD : Pt100, JPt100 3-wire system
  - Allowable input lead wire resistance,  $10\Omega$  or less per wire
  - When input is burnt out: Overscale

### Control output (OUT)

- Relay contact : 1a
  - Control capacity, 3A 250V AC (resistive load)
  - 1A 250V AC (inductive load  $\cos\phi=0.4$ )
- Non-contact voltage : For SSR drive
  - $12^{\circ}\text{V}$  DC Maximum 40mA (short circuit protected)
  - If Shinko SSR (SA-300 series) is used, 4 units are connectable in parallel.
- Current : 4 to 20mA DC
  - Load resistance, maximum  $550\Omega$

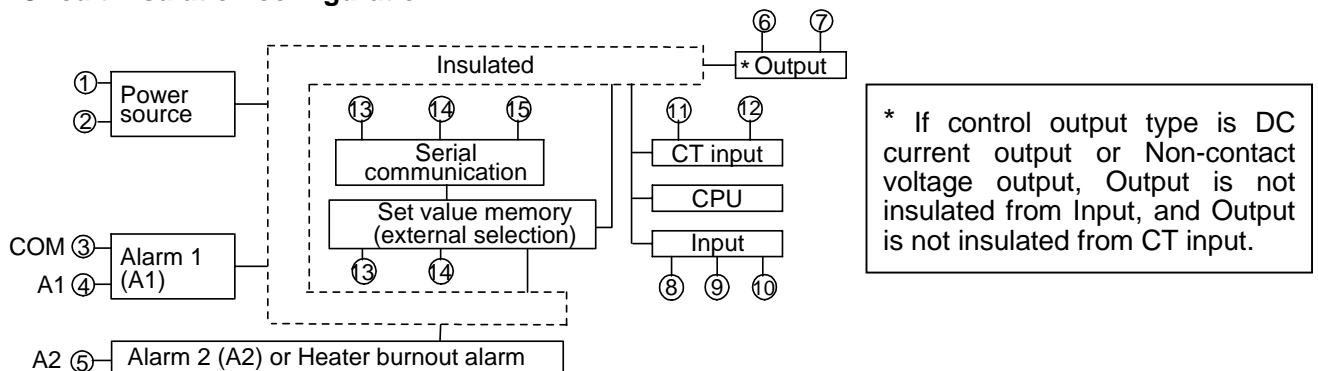
### Alarm 1 (A1) output

- Action : ON/OFF action
  - Hysteresis,  $0.1$  to  $99.9^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )
- Output : Relay contact, 1a
  - Control capacity, 3A 250V AC (resistive load)
  - 1A 250V AC (inductive load  $\cos\phi=0.4$ )

### Control action

- PID action (with auto-tuning function)
- PD action (with auto-reset function) (When integral time is set to 0.)
- P action (with auto-reset function) (When Integral time and Derivative time are set to 0.)
- ON/OFF action (When proportional band value is set to 0 or 0.0.)
- Proportional band :  $0$  to  $999^{\circ}\text{C}$  ( $^{\circ}\text{F}$ ) or  $0.0$  to  $99.9^{\circ}\text{C}$  (ON/OFF action when set to 0 or 0.0)
- Integral time :  $0$  to  $999\text{sec}$  (off when set to 0)
- Derivative time :  $0$  to  $300\text{sec}$  (off when set to 0)
- Proportional cycle :  $1$  to  $120\text{sec}$  (not available for DC current output type)
- ARW : Automatic
- Hysteresis :  $0.1$  to  $99.9^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )
- Output limit :  $0$  to  $100\%$  ( $-5$  to  $105\%$  for DC current output type)

### Circuit insulation configuration





### Insulation resistance

10M $\Omega$  or more, at 500V DC

In the case of the above circuit insulation configuration (\*), the resistance insulation test **must not** be carried out between Output and Input, and between Output and CT input, because Output is not insulated from Input, and Output is not insulated from CT input.

### Dielectric strength

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

**Power supply voltage:** 100 to 240V AC, 50/60Hz,  
24V AC/DC, 50/60Hz

### Allowable voltage fluctuation:

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

**Power consumption** : Approx. 8VA

**Ambient temperature** : 0 to 50°C (32 to 122°F)

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

**Weight** : Approx. 130g

**External dimensions** : 48 x 48 x 96.5mm (W x H x D)

**Material** : Flame-resistant resin (case)

**Color** : Light gray (case)

**Attached functions** : Control output OFF function  
Set value lock  
Sensor correction  
Power failure countermeasure  
Self-diagnosis  
Automatic cold junction temperature compensation  
Sensor burnout  
Input abnormality indication

**Accessories** : One-touch type mounting brackets 1 set  
(When the BL option is applied, Screw type mounting brackets 1 set)  
Instruction manual 1 copy  
Terminal cover 1 piece (when TC option is applied)  
CT (Current transformer) 1 piece  
CTL-6S : When W (5A, 10A, 20A) option is applied  
CTL-12-S36-10L1U: When W (50A) option is applied

## 10.2 Optional specifications

### Alarm 2 (A2) output [Option code: A2]

The SM or W option cannot be applied in conjunction with this option.

Alarm 2 (A2) and LA option utilize common output terminals.

Action : ON/OFF action  
Hysteresis, 0.1 to 99.9°C (°F)

Output : Relay contact, 1a  
Control capacity, 3A 250V AC (resistive load)  
1A 250V AC (inductive load  $\cos\phi = 0.4$ )

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

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

The A2, SM or C5 option cannot be applied in conjunction with this option.

This option cannot be applied to the current output type.

Rating : 5A [W(5A) option], 10A [W(10A) option],  
20A [W(20A) option], 50A [W(50A) option] (Must be specified)

Setting range : 5A [W(5A)], 0.0 to 5.0A (off when set to 0.0)  
10A [W(10A)], 0.0 to 10.0A (off when set to 0.0)  
20A [W(20A)], 0.0 to 20.0A (off when set to 0.0)  
50A [W(50A)], 0.0 to 50.0A (off when set to 0.0)

Setting accuracy: Within  $\pm 5\%$  of the rated value  
Action : ON/OFF action  
Output : Relay contact, 1a  
Control capacity, 3A 250V AC (resistive load)  
1A 250V AC (inductive load  $\cos\phi = 0.4$ )

#### **Serial communication [Option code: C5]**

The SM, LA or W option cannot be applied in conjunction with this option.

The following operations can be executed from the external computer.

- (1) Reading and setting of the SV, PID values and various set values
- (2) Reading of the input value and action status
- (3) Change of the functions

Communication line : EIA RS-485

Communication method: Half-duplex communication start-stop synchronization

Communication speed : 2400, 4800, 9600 and 19200bps (selectable by keypad)

Data format : Start bit 1

Data bit 7

Parity Even

Stop bit 1

Digital external setting : Receives digital set values from the PC-900 with the SVTC option.

The Set value lock of the GCS should be set to Lock 3.

#### **Set value memory external selection [Option code: SM]**

SV1 or SV2 can be selected by external contact.

The A2, C5, LA or W option cannot be applied in conjunction with this option.

Terminals between 13 and 14 Open : SV1

Terminals between 13 and 14 Closed : SV2

#### **Multi-range input [Option code: MR]**

Thermocouple K (0 to 400°C) type is not available for the MR option.

Sensor: Thermocouple (K, J, E), RTD (Pt100, JPt100)

Temperature unit: °C or °F

#### **Loop break alarm [Option code: LA]**

The alarm will be activated when the PV (process variable) does not rise as much as the span or more within the time it takes to assess the loop break alarm after the MV (manipulated variable) has reached 100% or the output high limit value.

The alarm will also be activated when the PV (process variable) does not fall as much as the span or more within the time it takes to assess the loop break alarm after the MV (manipulated variable) has reached 0% or the output low limit value.

This detects heater burnout, sensor burnout and actuator trouble.

The C5, SM or W option cannot be applied in conjunction with this option.

LA and Alarm 2 (A2) option utilize common output terminals.

Setting range:

Loop break alarm time: 0 to 200 minutes

Loop break alarm span: 0 to 150°C (°F)

Output: Relay contact, 1a

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

1A 250V AC (inductive load,  $\cos\phi = 0.4$ )

#### **Color black [Option code: BK]**

Front panel : Dark gray

Base and case : Black

#### **Screw type mounting bracket [Option code: BL]**

Mountable panel thickness: 1 to 15mm

#### **Dust-proof/Drip-proof [Option code: IP]**

Dust-proof and Drip-proof specification (IP54)

Effective only for panel surface, case part is excluded.

The Front cover (soft type, sold separately) is recommended to strengthen the Dust-proof/Drip-proof specification.

To protect the controller from water leak between the control panel and controller, the control panel surface to be mounted should be vertical.

#### **Terminal cover [Option code: TC]**

Electrical shock protection terminal cover


### Designated specifications

- Input, scale range : Shipped as specified input and scale range
- Alarm type : Shipped as specified alarm type
- Control action : Shipped as specified control action (e.g. Shipped as PD action)
- Hysteresis : Shipped as specified hysteresis
- Cooling (Direct) action: Shipped as Cooling (Direct) action





## 11. Troubleshooting

If any malfunctions occur, refer to the following items after checking the power supply and wiring.

### 11.1 Indication

Problem	Presumed cause and solution
[OFF] is indicated on the PV display.	<ul style="list-style-type: none"> <li>• Control output OFF function is working.</li> <li>To release the function, press the  key for approx. 1 second.</li> </ul>
[---] is flashing on the PV display.	<ul style="list-style-type: none"> <li>• Thermocouple or RTD is burnt out.</li> <li>[Thermocouple] If the input terminals of the instrument are shorted, and if a value around room temperature is indicated, the instrument is likely to be operating normally, however, the sensor may be burnt out.</li> <li>[RTD] If approximate 100Ω of resistance is connected to the input terminals between A-B of the instrument and between B-B are shorted, and if a value around 0°C (32°F) is indicated, the instrument is likely to be operating normally, however, the sensor may be burnt out.</li> <li>• Check whether the lead wire of thermocouple or RTD is securely connected to the instrument terminal.</li> </ul>
[- - -] is flashing on the PV display.	<ul style="list-style-type: none"> <li>• Check whether the polarity of thermocouple or compensating lead wire is correct.</li> <li>• Check whether codes (A, B, B) of RTD agree with the instrument terminals.</li> </ul>
The indication of the PV display is abnormal or unstable.	<ul style="list-style-type: none"> <li>• Check whether the sensor input is selected properly.</li> <li>• Check whether the temperature unit (°C or °F) is correct.</li> <li>• Check whether the sensor correction value is suitable.</li> <li>• Check whether the specification of the thermocouple or RTD is correct.</li> <li>• AC leaks into the thermocouple or RTD circuit.</li> <li>• There may be equipment that interferes with or makes noise near the controller.</li> </ul>

### 11.2 Key operation

Problem	Presumed cause and solution
Unable to set the SV, P, I, D, proportional cycle, alarm value, etc. The values do not change by the  or  key.	<ul style="list-style-type: none"> <li>• Set value lock (Lock 1 or Lock 2) has been selected. Release the lock mode.</li> <li>• PID auto-tuning or auto-reset is performing. In the case of PID auto-tuning, cancel auto-tuning. In the case of Auto-reset, it takes approximate 4 minutes until the auto-reset is finished.</li> </ul>
The setting indication does not change within the input range even if the  or  key is pressed, and new values are unable to be set.	<ul style="list-style-type: none"> <li>• SV high limit or low limit may be set at the point where the value does not change. Set it to a suitable value while in Auxiliary function setting mode 1.</li> </ul>

### 11.3 Control

Problem	Presumed cause and solution
The PV (process variable) does not rise.	<ul style="list-style-type: none"><li>• Check whether thermocouple or RTD is burnt out.</li><li>• Check whether the lead wire of thermocouple or RTD is securely connected to the instrument terminals.</li><li>• Check whether the wiring of output terminals is correct.</li></ul>
The control output remains in an ON status.	<ul style="list-style-type: none"><li>• OUT low limit value is set to 100% or higher in Auxiliary function setting mode 2. Set it to a suitable value.</li></ul>
The control output remains in an OFF status.	<ul style="list-style-type: none"><li>• OUT high limit value is set to 0% or less in Auxiliary function setting mode 2. Set it to a suitable value.</li></ul>

For all other malfunctions, please contact our main office or dealers.

**SHINKO TECHNOS CO.,LTD.**  
**OVERSEAS DIVISION**

Reg. Office : 2-5-1, Senbahigashi, Minoo, Osaka, Japan

URL : <http://www.shinko-technos.co.jp>

E-mail : [overseas@shinko-technos.co.jp](mailto:overseas@shinko-technos.co.jp)

Tel : 81-72-727-6100

Fax: 81-72-727-7006