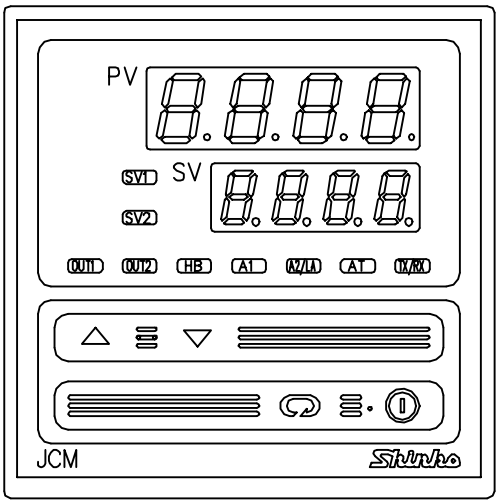
MICRO-COMPUTER BASED

DIGITAL INDICATING CONTROLLER

JCM-33A

INSTRUCTION MANUAL



Shinko

Preface

Thank you for the purchase of Micro-computer based Digital Indicating Controller JCM-33A.
This manual contains instructions for the mounting, functions, operations and notes when operating the JCM-33A.
For model confirmation and unit specifications, please read this manual carefully before starting operation.

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

Notes

- This instrument should be used in accordance with the specifications described in the manual. If it is not used according to the specifications, it may malfunction or cause fire.
- Be sure to follow the warnings, cautions and notices. If they are not observed, serious injury or malfunction may occur.
- Specifications, external appearance of the JCM-33A 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.
- This instrument is designed to be installed on a DIN rail. If it is not, measures must be taken to ensure that the operator does not touch power terminals or other high voltage sections.
- Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
- Shinko Technos CO., LTD. is not liable for any damages or secondary damages incurred as a result of using this product, including any indirect damages.

SAFETY PRECAUTIONS (Be sure to read these precautions before using our products.)
The safety precautions are classified into categories: “Warning” and “Caution”.
Depending on circumstances, procedures indicated by ⚠ Caution may be linked to serious results, so be sure to follow the directions for usage.

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

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

⚠ 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 instrument, parts replacement may only be undertaken by Shinko or 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 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. Installation precautions

⚠ Caution

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

- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gases
- No mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of 0 to 50℃ (32 to 122℉) that does not change rapidly
- An ambient non-condensing humidity of 35 to 85%RH
- No large capacity electromagnetic switches or cables through which large current is flowing
- No water, oil or chemicals or where the vapors of these substances can come into direct contact with the unit

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

2. Wiring precautions

⚠ Caution

- Use the solderless terminal with an insulation sleeve in which the M3 screw fits when wiring the JCM-33A Series.
- The terminal block of this instrument is designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw.
- Tighten the terminal screw within the specified torque. If excessive force is applied to the screw when tightening, the terminal screw or case may be damaged.
- Do not apply a commercial power source to the sensor which is connected to the input terminal nor allow the power source to come into contact with the sensor.
- This controller does not have built-in power switch, circuit breaker or fuse. It is necessary to install them near the controller. (Recommended fuse: Time-lag fuse, rated voltage 250V AC, rated current 2A)
- 24V AC or DC is usable as a power source, however, do not confuse polarity when using direct current (DC).

3. Running and maintenance precautions

⚠ Warning

- It is recommended that the PID auto-tuning be performed on the trial run.
- Do not touch live terminals. This may cause electric shock or problems in operation.
- Turn the power supply to the instrunment OFF before retightening the terminal and cleaning. Working or touching the terminal with the power switched ON may result in severe injury or death due to Electric Shock.
- Use a soft, dry cloth when cleaning the instrument. (Alcohol based substances may tarnish or deface the unit)
- As the display section is vulnerable, do not strike or scratch it with a hard object.

--- CONTENTS ---

1. Model

1.1 Explanation of model

The series name, control output (OUT1), input and option codes are entered where underlined.

e.g.) J C M – 3 3 A – R / M A2

Specifications

J C M – 3 3 A– □ /□ □					
Alarm 1 (A1)	A				Alarm action can be selected by keypad. *1
Control output (OUT1)	R				Relay contact
	S				Non-contact voltage (for SSR drive)
	A				DC current
Input		M			Multi-range *2
Supply voltage					100 to 240V AC (standard)
			1		24V AC/DC *3
Options				A2	Alarm 2 (A2) *4
				W	Heater burnout alarm *5
				D□	Heating/Cooling control (OUT2): DR: Relay contact output
					Heating/Cooling control (OUT2): DS: Non-contact voltage output
					Heating/Cooling control (OUT2): DA: DC current output
				C5	Serial communication (RS-485)
				LA	Loop break alarm *4
				SM	SV1/SV2 external selection
				P24	Insulated power output
				BK	Color: Black
				TC	Terminal cover
				IP	Dust-proof/Drip-proof (IP54)

*1: 10 types of alarm action (including No alarm action) and Energized/Deenergized are selectable by keypad.

*2: An input type (10 thermocouple, 2 RTD, 2 DC current and 4 DC voltage types) can be selected by keypad. For DC current input, 50Ω shunt resistor must be connected between input terminals.

*3: For the supply voltage, 100 to 240V AC is standard. When ordering 24V AC/DC, enter “1” after the input code.

*4 If A2 output and LA output are applied together, they utilize common output terminals.

*5 For DC current output, Heater burnout alarm output is not available.

Option combinations

	A2	LA	W	D□	P24	C5	SM	BK	TC	IP
Combination 1	O	O	O	–	–	O	–	O	O	O
Combination 2	O	O	–	O	–	O	–	O	O	O
Combination 3	–	–	O	O	–	O	–	O	O	O
Combination 4	O	O	–	–	O	O	–	O	O	O
Combination 5	O	O	O	–	–	–	O	O	O	O
Combination 6	O	O	–	O	–	–	O	O	O	O
Combination 7	–	–	O	O	–	–	O	O	O	O
Combination 8	O	O	–	–	O	–	O	O	O	O

D□: DR, DS, DA

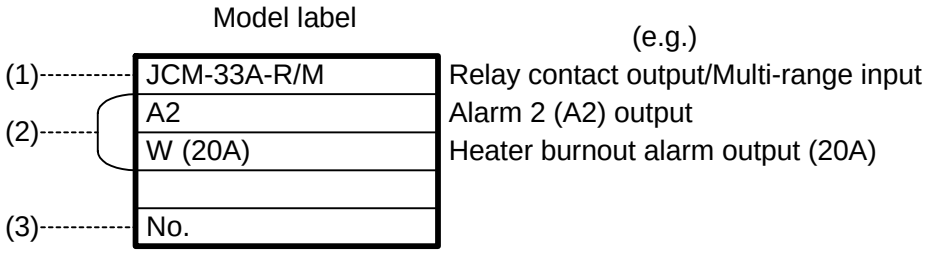
1.2 Rated input

Input type	Input range		Resolution
K	–200 to 1370 ℃	–320 to 2500 ℉	1℃(℉)
	–199.9 to 400.0 ℃	–199.9 to 750.0 ℉	0.1℃(℉)
J	–200 to 1000 ℃	–320 to 1800 ℉	1℃(℉)
R	0 to 1760 ℃	0 to 3200 ℉	1℃(℉)
S	0 to 1760 ℃	0 to 3200 ℉	1℃(℉)
B	0 to 1820 ℃	0 to 3300 ℉	1℃(℉)
E	–200 to 800 ℃	–320 to 1500 ℉	1℃(℉)
T	–199.9 to 400.0 ℃	–199.9 to 750.0 ℉	0.1℃(℉)
N	–200 to 1300 ℃	–320 to 2300 ℉	1℃(℉)
PL-Ⅱ	0 to 1390 ℃	0 to 2500 ℉	1℃(℉)
C (W/Re5-26)	0 to 2315 ℃	0 to 4200 ℉	1℃(℉)
Pt100	–199.9 to 850.0 ℃	–199.9 to 999.9 ℉	0.1℃(℉)
	–200 to 850 ℃	–300 to 1500 ℉	1℃(℉)
JPt100	–199.9 to 500.0 ℃	–199.9 to 900.0 ℉	0.1℃(℉)
	–200 to 500 ℃	–300 to 900 ℉	1℃(℉)
4 to 20mA DC	–1999 to 9999 *1, *2		1
0 to 20mA DC	–1999 to 9999 *1, *2		1
0 to 1V DC	–1999 to 9999 *1		1
0 to 5V DC	–1999 to 9999 *1		1
1 to 5V DC	–1999 to 9999 *1		1
0 to 10V DC	–1999 to 9999 *1		1

*1: For DC input, input range and decimal point place can be changed.
*2: Connect 50Ω shunt resistor (sold separately) between input terminals.

1.3 How to read the model label

Model labels are attached to the case and the inner assembly.
When the supply voltage is 24V AC/DC, “1” is entered before the option code.

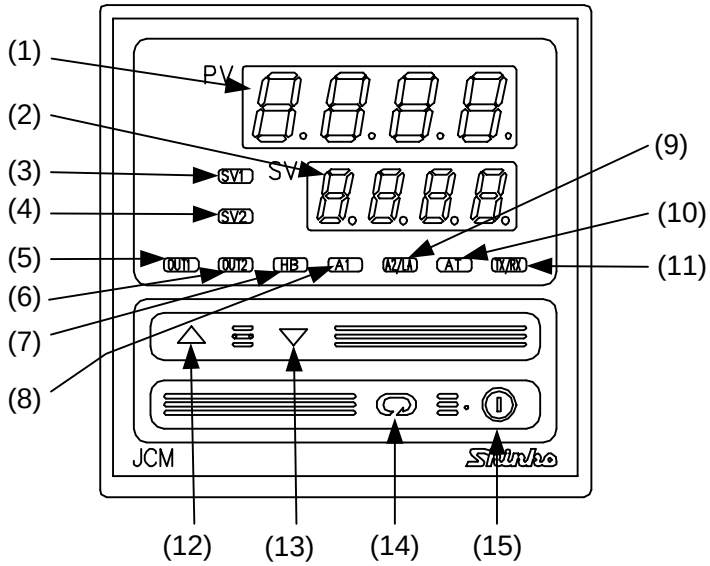


(1): Model
(2): Option name
(3): Serial number

Characters used in this manual

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

2. Name and functions of the sections



(Fig. 2-1)

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

(2) SV display
Indicates the SV (Set value) or MV (Manipulated variable) with a green LED.

(3) SV1 indicator
Lights up with a green LED when SV1 is selected.

(4) SV2 indicator
Lights up with a yellow LED when SV2 is selected.

(5) OUT1 indicator
When OUT1 or Heating output is on, a green LED lights up.
(For the DC current output type, this flashes corresponding to the output manipulated variable in 0.25 second cycles)

(6) OUT2 indicator
When OUT2 is on, a yellow LED lights up.
(For the DC current output type, this flashes corresponding to the output manipulated variable in 0.25 second cycles)

(7) HB indicator
When Heater burnout alarm output or sensor burnout alarm output is on, a red LED lights up.
(When Heater burnout alarm is added and if indication is overscale or underscale, a red LED lights up as well)

(8) A1 indicator
When A1 output is on, a red LED lights up.

(9) A2/LA indicator
When A2 or LA output is on, a red LED lights up.

(10) AT indicator
A yellow LED flashes during auto-tuning or auto-reset.

(11) TX/RX indicator
A yellow LED lights during serial communication TX output (transmission).
(12) Increase key (△): Increases the numeric value.
(13) Decrease key (▽): Decreases the numeric value.
(14) Mode key (◎): Selects the setting mode or registers the set value.
(By pressing the Mode key, the set value or selected value can be registered.)
(15) OUT/OFF key (⏻)

- If OUT/OFF function is selected from OUT/OFF function selection, the control output is turned on or off.
  Once the control output OFF function is enabled, the function cannot be released even if the power to the instrument is turned OFF and turned ON again.
  To cancel the function, press the OUT/OFF key again for approx. 1 second.
- If Auto/Manual control function is selected from OUT/OFF function selection, automatic control is performed when the power to the controller is turned on. In this status, if the OUT/OFF key is pressed, the automatic control output is switched to manual control output and vice versa. However, this function can be switched only in the PV/SV display mode.

⚠ Notice

When setting the specifications and functions of this controller, connect terminals 2 and 4 for power source first, then set them referring to “5. Setup” before performing “3. Mounting to the control panel” and “4. Wiring”.
(Be sure to perform input specification change at this time.)

3. Mounting to the control panel

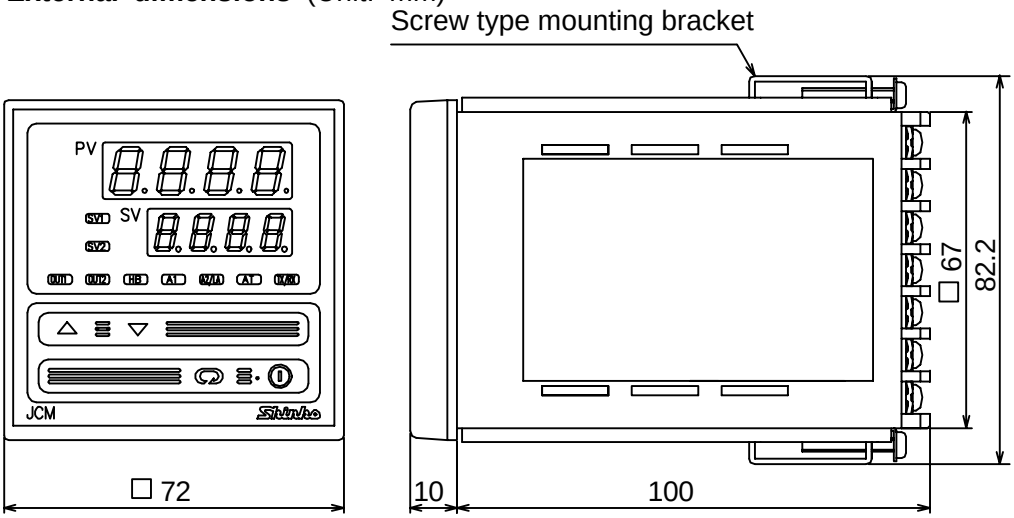
3.1 Site selection

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:

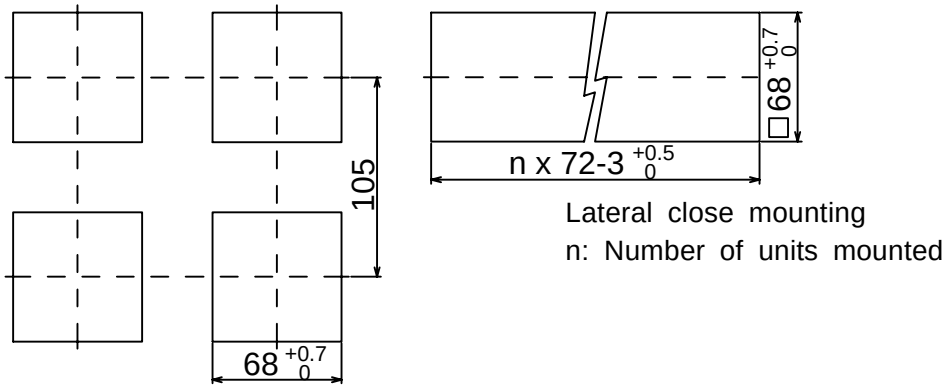
(1) A minimum of dust, and an absence of corrosive gases
(2) No flammable, explosive gases
(3) No mechanical vibrations or shocks
(4) No exposure to direct sunlight, an ambient temperature of 0 to 50℃ (32 to 122℉) that does not change suddenly
(5) An ambient non-condensing humidity of 35 to 85%RH
(6)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

3.2 External dimensions (Unit: mm)



(Fig. 3.2-1)

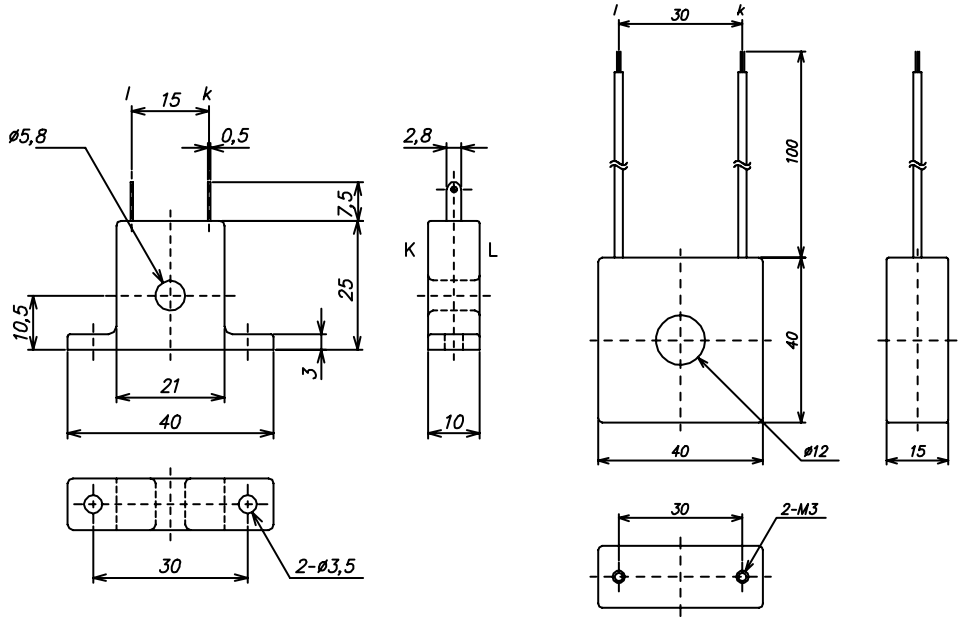
3.3 Panel cutout (Unit: mm)



Lateral close mounting
n: Number of units mounted

(Fig. 3.3-1)

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



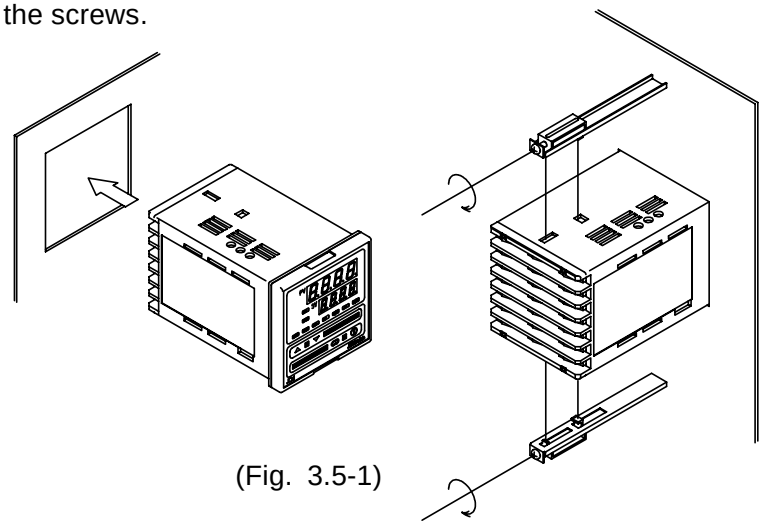
CTL-6-S (for 5A, 10A and 20A) CTL-12-S36-10L1 (for 50A)

(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, or the case or screw type mounting bracket could be damaged. The torque is approximately 0.12N•m.

Mounting panel thickness is within 1 to 15mm.
Insert the instrument from the front side of the panel.
Attach the mounting bracket by the holes at the top and bottom of the case and secure in place with the screws.



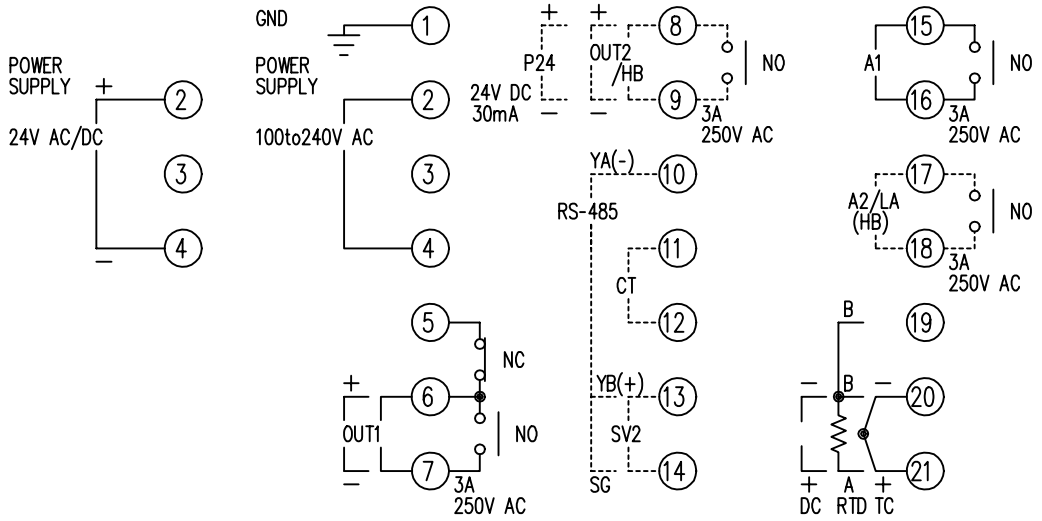
(Fig. 3.5-1)

4. Wiring

⚠ Warning

Turn the power supply to the instrument off before wiring or checking. Working or touching the terminal with the power switched on may result in severe injury or death due to Electric Shock.
Moreover, the instrument must be grounded before the power supply to the instrument is turned on.

4.1 Terminal arrangement



(Fig. 4.1-1)

- OUT1 : Control output 1 (Heating output)
- OUT2 : Control output 2 (Cooling output)
- A1 : Alarm 1 output
- A2 : Alarm 2 output
- LA : Loop break alarm output
- HB : Heater burnout alarm output
- P24 : Insulated power output
- RS-485: Serial communication (RS-485)
- SV2 : 2nd main set value
- CT : CT input
- TC : Thermocouple
- RTD : Resistance temperature detector
- DC : DC current or DC voltage

Notice

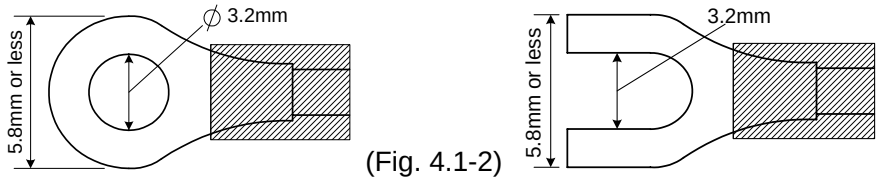
- The terminal block of JCM-33A series is designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw.
- Terminals with dotted lines are optional, and they are equipped only when the options are added.
- If A2 (option) and Heater burnout alarm (option) are applied together, use terminals 17-18 for A2, and 8-9 for the Heater burnout alarm.
- If the Heating/Cooling control (option) and Heater burnout alarm (option) are applied together, use terminals 8-9 for the Heating/Cooling control, and 17-18 for the Heater burnout alarm.
- When A2 (option) and LA (option) are added together, they utilize common output terminals.
- If the Insulated power output (option) is added, Heating/Cooling control (option) and Heater burnout alarm (option) cannot be applied.

● **Lead wire solderless terminal**

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

The tightening torque should be 0.6N•m to 1.0N•m.

Solderless terminal	Manufacturer	Model	Tightening torque
Y type	Nichifu Terminal Industries CO.,LTD.	1.25Y-3	0.6N•m Max. 1.0N•m
	Japan Solderless Terminal MFG CO.,LTD.	VD1.25-B3A	
Round type	Nichifu Terminal Industries CO.,LTD.	1.25-3	
	Japan Solderless Terminal MFG CO.,LTD.	V1.25-3	



(Fig. 4.1-2)

4.2 Wiring examples

Notice

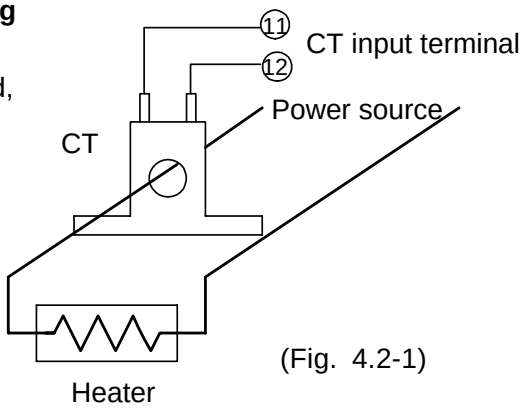
- Use a thermocouple and compensating lead wire according to the sensor input specifications of this controller.
- Use the 3-wire RTD according to the sensor input specifications of this controller.
- This controller does not have built-in power switch, circuit breaker or fuse. It is necessary to install them in the circuit near the external controller. (Recommended fuse: Time-lag fuse, rated voltage 250V AC, rated current 2A)
- 24V AC or DC is usable as a power source, however, do not confuse polarity when using direct current (DC).
- When using a relay contact output type, use a relay externally 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 sources or load wires to avoid external interference.
- Use a thick wire (1.25 to 2.0mm^2) for the earth ground.

[Heater burnout alarm output]

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

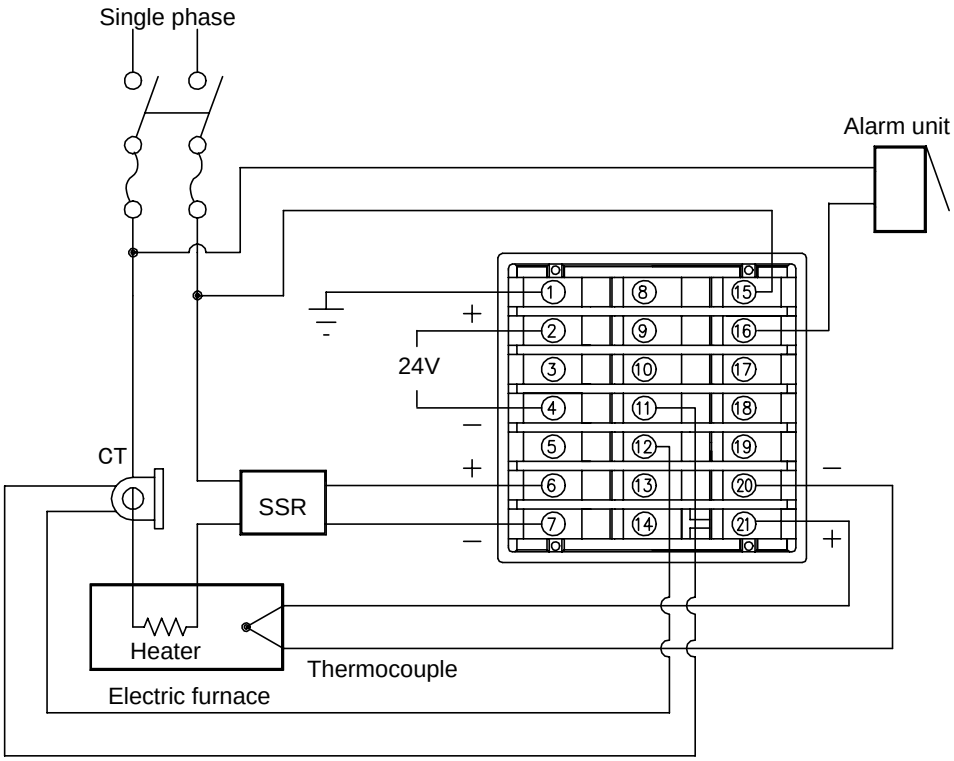
(2) Use the current transformer (CT) provided, and pass one lead wire of the heater circuit into the hole of the CT.

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



(Fig. 4.2-1)

[JCM-33A-S/E]



(Fig. 4.2-2)

- To prevent the unit from harmful effects of unexpected high level noise, it is recommended that a surge absorber be installed between the electromagnetic switch coils.
- 24V AC or DC is usable as a power source, however, do not confuse polarity when using direct current (DC).

5. Setup

For the thermocouple and RTD input, the sensor input character and temperature unit are indicated on the PV display and the input range high limit value is indicated on the SV display for approx. 3 seconds after the power is turned on. See (Table 5-1).

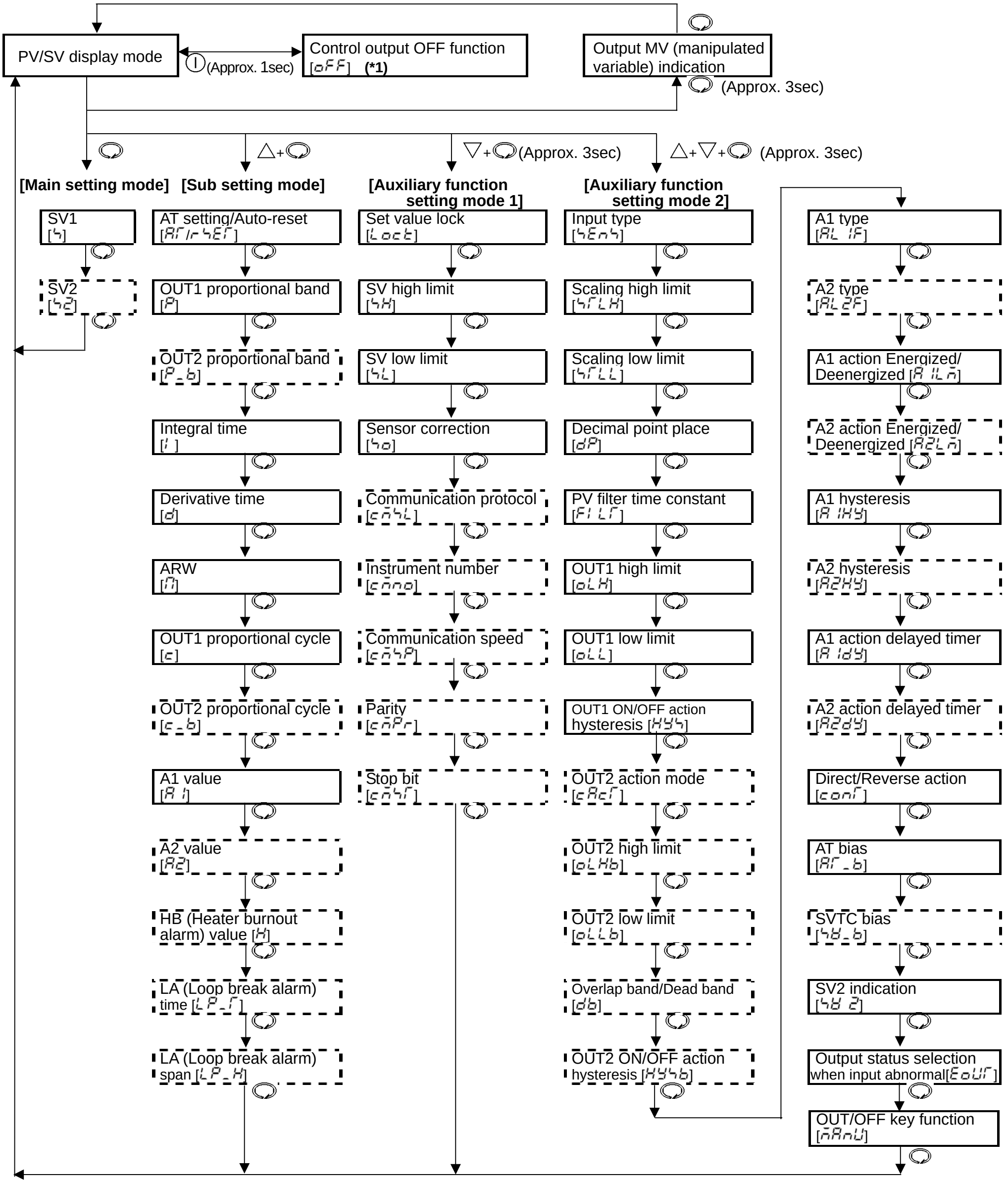
For DC input, the sensor input character is indicated on the PV display and the scaling high limit value is indicated on the SV display. See (Table 5-1).
If any other value is set during the scaling high limit setting, the value is indicated on the SV display.

During this time, all outputs and the LED indicators are in OFF status.
Control will start indicating the process variable on the PV display and SV1 or SV2 on the SV display.
While control output OFF function is working, oFF is indicated on the PV display.
To release the function, press the OUT/OFF key for approx. 1 second.

(Table 5-1)

Sensor input	℃		℉	
	PV display	SV display	PV display	SV display
K	t C	1370	t F	2500
	t.C	400.0	t.F	750.0
J	J C	1000	J F	1800
R	r C	1760	r F	3200
S	S C	1760	S F	3200
B	b C	1820	b F	3300
E	E C	800	E F	1500
T	T.C	400.0	T.F	750.0
N	n C	1300	n F	2300
PL-Ⅱ	PL2C	1390	PL2F	2500
C (W/Re5-26)	c C	2315	c F	4200
Pt100	Pt.C	850.0	Pt.F	999.9
	Pt C	850	Pt F	1500
JPt100	JPt.C	500.0	JPt.F	900.0
	JPtC	500	JPtF	900
4 to 20mA DC	420A	Scaling high limit value		
0 to 20mA DC	020A			
0 to 1V DC	0 1V			
0 to 10V DC	0 10V			
1 to 5V DC	1 5V			
0 to 5V DC	0 5V			

5.1 Operation flowchart



- △ + ⟲: Press the ⟲ key while pressing the △ key.
- ▽ + ⟲ (Approx. 3sec): Press the ⟲ key for approx. 3 seconds while holding down the ▽ key.
- △ + ▽+ ⟲ (Approx. 3sec): Press the ⟲ key for approx. 3 seconds while holding down the △ and ▽ keys.
- Setting items with lines are optional, and they appear only when the options are added.

(*1): When Auto/Manual control function is selected during OUT/OFF key function selection, the control output OFF function does not initiate even if the ⏻ key is pressed, but manual control is selected.

5.2 Main setting mode

The main setting mode can be selected by pressing the ◎ key.
The set value can be increased or decreased by pressing the △ or ▽ key.
The set value is registered by pressing the ◎ key, and the mode reverts to the PV/SV display mode.

SV1 [SV1]
- Sets SV1.
- Setting range: SV low limit to SV high limit, or
  scaling low limit value to scaling high limit value
- Default value: 0℃

SV2 [SV2]
- Sets SV2.
- Available only when SV1/SV2 external selection (option) is applied.
- Setting range: SV low limit to SV high limit, or
  scaling low limit value to scaling high limit value
- Default value: 0℃

5.3 Sub setting mode

The sub setting mode can be selected by pressing the ◎ key while the △ key is being pressed.
The set value can be increased or decreased by pressing the △ or ▽ key.
The set value is registered by pressing the ◎ key, then the next setting item is selected.

AT setting/Auto-reset setting [AT/rSET]
- Sets AT (auto-tuning) or Auto-reset (offset correction).
- Auto-reset can be performed only in PD or P action.
  (Auto-reset cannot be performed when the control action is PID, PI, ON/OFF action)
- Default value: AT cancellation, Auto-reset cancellation.

[Auto-tuning]
- If Auto-tuning performance is designated, the AT indicator flashes and the mode reverts to the PV/SV display mode.
  When Auto-tuning is finished, the AT indicator is turned off and P, I, D, ARW values are automatically set.
- During auto-tuning, none of the settings can be carried out.
- If Auto-tuning is cancelled during the process, P, I, D, ARW values return to the former values.
- If ⏻ key (OUT/OFF key) is pressed during auto-tuning, control output OFF function works, and pressing the ⏻ key again cancels the PID auto-tuning.
- If PID auto-tuning does not finish in 4 hours after it is started, PID auto-tuning is cancelled automatically.

[Auto-reset]
- If auto-reset performance is designated, the offset correction immediately starts, (correction value is automatically set, and AT indicator flashes) and the mode reverts to the PV/SV display mode.
- To prevent key misoperation, other settings cannot be performed for 4 minutes after auto-reset starts.
  After auto-reset is completed, AT indicator is turned off and all settings can be performed.

OUT1 proportional band setting [P]
• Sets OUT1 proportional band.
The control action becomes ON/OFF action when set to 0 or 0.0.
• Setting range: 0 to 1000℃ (0 to 2000℉)
With a decimal point, 0.0 to 999.9℃ (0.0 to 999.9℉)
With DC input, 0.0 to 100.0%
• Default value: 10℃

OUT2 proportional band setting [P_b]
• Sets OUT2 proportional band.
The control action becomes ON/OFF action for OUT2 when set to 0.0.
• Not available if Heating/Cooling control (option) is not added or if OUT2 is ON/OFF action.
• Setting range: 0.0 to 10.0 times (multiplying factor to OUT1 proportional band)
• Default value: 1.0 times

Integral time setting [I]
• Sets the integral time.
Setting the value to 0 disables the function (PD action).
• Not available if OUT1 is ON/OFF action.
• Setting range: 0 to 1000 seconds
• Default value: 200 seconds

Derivative time setting [d]
• Sets the derivative time.
Setting the value to 0 disables the function (PI action).
• Not available if OUT1 is ON/OFF action.
• Setting range: 0 to 300 seconds
• Default value: 50 seconds

ARW (Anti-reset windup) setting [An]
• Sets the anti-reset windup.
• Available only for PID action.
• Setting range: 0 to 100%
• Default value: 50%

OUT1 proportional cycle setting [c]
• Sets OUT1 proportional cycle.
(Not available for ON/OFF action and DC current 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.**
• Setting range: 1 to 120 seconds
• Default value: 30 seconds (relay contact output)
3 seconds (non-contact voltage output)

OUT2 proportional cycle setting [c_b]
• Sets OUT2 proportional cycle.
Not available for ON/OFF action and DC current output type
• Not available if Heating/Cooling control (option) is not added or if OUT2 is ON/OFF action.
• Setting range: 1 to 120 seconds
• Default value: 30 seconds (relay contact output),
3 seconds (non-contact voltage output)

A1 value setting [A1]
• Sets the action point for A1 output.
Setting the value to 0 or 0.0 disables the function.
(excluding Process high and Process low alarms)
• Not available when No alarm action is selected during A1 type selection.
• Setting range: See page 19 (Table 5.3-1).
• Default value: 0℃

A2 value setting [A2]
• Sets the action point for A2 output.
Setting the value to 0 or 0.0 disables the function.
(excluding Process high and low alarms)
• Not available when A2 (option) is not added or when No alarm action is selected during A2 type selection.
• Setting range and default value are the same as those of A1 setting.

HB (Heater burnout alarm) value setting
[H□□□ and □□X.X are alternately displayed]
• Sets the heater current value for Heater burnout alarm.
Setting the value to 0.0 disables the function.
• Available only when the Heater burnout alarm option is added.
• When OUT1 is off, heater current value shows the former value as when OUT1 was ON.
• It is recommended to set approx. 80% of the heater current value (set value) considering the voltage fluctuation.
• Self-holding is not available for the alarm output.
• Setting range: Rating 5A: 0.0 to 5.0A Rating 10A: 0.0 to 10.0A
Rating 20A: 0.0 to 20.0A Rating 50A: 0.0 to 50.0A
• Default value: 0.0A

LA (Loop break alarm) time setting [LP_T]
• Sets the time to assess the Loop break alarm.
• Available only when Loop break alarm (option) is applied.
• Setting range: 0 to 200 minutes
• Default value: 0 minutes

LA (Loop break alarm) span setting [LP_H]
• Sets the temperature to assess the Loop break alarm.
• Available only when Loop break alarm (option) is applied.
• Setting range: 0 to 150℃ (℉), however, with decimal point, 0.0 to 150.0℃ (℉)
For DC input, 0 to 1500 (The placement of the decimal point follows the selection)
• Default value: 0 ℃

Setting range of A1 and A2
(Table 5.3-1)

Alarm type	Setting range	
High limit alarm	–Input span to input span ℃ (℉)	*1
Low limit alarm	–Input span to input span ℃ (℉)	*1
High/Low limits alarm	0 to input span ℃ (℉)	*1
High/Low limit range alarm	0 to input span ℃ (℉)	*1
Process high alarm	Input range low limit to input range high limit	*2
Process low alarm	Input range low limit to input range high limit	*2
High limit alarm with standby	–Input span to input span ℃ (℉)	*1
Low limit alarm with standby	–Input span to input span ℃ (℉)	*1
High/Low limits alarm with standby	0 to input span ℃ (℉)	*1

When the input has a decimal point, the negative lower limit value is –199.9, and the positive upper limit value is 999.9.
*1: For DC input, the input span is the same as the input range scaling span.
*2: For DC input, input range low (or high) limit value is the same as the input range scaling low (or high) limit value.

5.4 Auxiliary function setting mode 1

In the PV/SV display mode, if the key is pressed for approx. 3 seconds while the ▽ key is being pressed, Auxiliary function setting mode 1 can be selected.
The set value can be increased or decreased by pressing the △ or ▽ key.
If the key is pressed, the set value is registered and the next setting item is selected.

Set value lock selection [Loct]
- Mode to lock the set value to prevent setting errors
  The setting item to be locked depends on the designation.
  When designating Lock, designate Lock 1, 2 or 3 after setting the necessary items in the status Unlock.
- Selecting item
  - ---- (Unlock): All set values are changeable.
  - Loc 1 (Lock 1): None of the set values can be changed.
  - Loc2 (Lock 2): Only main set value is changeable.
  - Loc3 (Lock 3): All set values can be changed, however, changed values return to their former 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 Auxiliary function setting mode 2 is changed, it will affect other setting items such as SV and Alarm setting.**
- Default value: Unlock

SV high limit setting [SH]
- Sets SV high limit.
- Setting range: SV low limit to input range high limit value
  For DC input, SV low limit to scaling high limit value
  (The placement of the decimal point follows the selection)
- Default value: 1370℃

SV low limit setting [SL]
- Sets SV low limit.
- Setting range: Input range low limit value to SV high limit
  For DC input, Scaling low limit value to SV high limit
  (The placement of the decimal point follows the selection)
- Default value: –200℃

Sensor correction setting [So]
- Sets correction value for the sensor.
  (Effective within the input rating value regardless of the sensor correction value)
- Setting range: –100.0 to 100.0℃ (℉)
  For DC input, –1000 to 1000 (The placement of the decimal point follows the selection)
- Default value: 0.0℃

Communication protocol selection [cSL]
- Selects the communication protocol.
- Available only when Serial communication (option) is applied.
- Selecting item : noAL (Shinko protocol), AodA (Modbus ASCII mode)
  Aodr (Modbus RTU mode)
- Default value: Shinko protocol

Instrument number setting [cno]
- Sets the instrument number. (Communication cannot be carried out unless an instrument number is individually set when communicating by connecting plural instruments in serial communication.)
- Available only when Serial communication (option) is added.
- Setting range: 0 to 95
- Default value: 0

Communication speed selection [cmsP]
- Selects a speed to be equal to the speed of the host computer. Otherwise communication is impossible.
- Available only when Serial communication (option) is added.
- Selecting item: 24 (2400bps), 48 (4800bps), 96 (9600bps), 192 (19200bps)
- Default value: 9600bps

Parity selection [cmPr]
- Selects the parity.
- Not available when Serial communication (option) is not added or when Shinko protocol is selected during the Communication protocol selection.
- Selecting item: nonE (No parity), EvEn (Even parity), odd (Odd parity)
- Default value: Even parity

Stop bit selection [cmsT]
- Selects the stop bit.
- Not available when Serial communication (option) is not added or when Shinko protocol is selected during the Communication protocol selection.
- Selecting item: 1 (1), 2 (2)
- Default value: 1

5.5 Auxiliary function setting mode 2

In the PV/SV display mode, if the ◎ key is pressed for approx. 3 seconds while the △ and ▽ keys are being pressed, Auxiliary function setting mode 2 can be selected.

The set value can be increased or decreased by pressing the △ or ▽ key.

If the ◎ key is pressed, the set value is registered and the next setting item is selected.

If Lock 3 is selected during Set value lock selection, release Lock 3 (Unlock) first, then change desired setting items in Auxiliary function setting mode 2.

Input type selection [insh]
- An input type from thermocouple (10 types), RTD (2 types), DC current (2 types) and DC voltage (4 types) and the unit ℃/℉ can be selected.
- **Each time the input is changed from DC voltage to another type, remove the sensor connected to the controller first, then change to the input desired. Changing the input while the sensor is connected will cause malfunction of the input circuit**.
- Default value: K (–200 to 1370℃)

Input type	Input range	
K	–200 to 1370 ℃: tC	–320 to 2500 ℉: tF
	–199.9 to 400.0 ℃: t.C	–199.9 to 750.0 ℉: t.F
J	–200 to 1000 ℃: JC	–320 to 1800 ℉: JF
R	0 to 1760 ℃: rC	0 to 3200 ℉: rF
S	0 to 1760 ℃: sC	0 to 3200 ℉: sF
B	0 to 1820 ℃: bC	0 to 3300 ℉: bF
E	–200 to 800 ℃: EC	–320 to 1500 ℉: EF
T	–199.9 to 400.0 ℃: T.C	–199.9 to 750.0 ℉: T.F
N	–200 to 1300 ℃: nC	–320 to 2300 ℉: nF
PL-Ⅱ	0 to 1390 ℃: PL2C	0 to 2500 ℉: PL2F
C(W/Re5-26)	0 to 2315 ℃: cC	0 to 4200 ℉: cF
Pt100	–199.9 to 850.0 ℃: Pt.C	–199.9 to 999.9 ℉: Pt.F
	–200 to 850 ℃: PtC	–300 to 1500 ℉: PtF

JPt100	–199.9 to 500.0 ℃: JPT.C	–199.9 to 900.0 ℉: JPT.F
	–200 to 500 ℃: JPTC	–300 to 900 ℉: JPTF
4 to 20mA DC	–1999 to 9999: 420A	
0 to 20mA DC	–1999 to 9999: 020A	
0 to 1V DC	–1999 to 9999: 0 1V	
0 to 5V DC	–1999 to 9999: 0 5V	
1 to 5V DC	–1999 to 9999: 1 5V	
0 to 10V DC	–1999 to 9999: 0 10V	

Scaling high limit setting [SCLH]
- Sets scaling high limit value.
- Available only for the DC input
- Setting range: Scaling low limit value to input range high limit value
  (The placement of the decimal point follows the selection)
- Default value: 9999

Scaling low limit setting [SCLL]
- Sets scaling low limit value.
- Available only for the DC input
- Setting range: Input range low limit value to scaling high limit value
  (The placement of the decimal point follows the selection)
- Default value: –1999

Decimal point place selection [dP]
- Selects a decimal point place
- Available only for the DC input
- No decimal point : 0000 1 digit after decimal point : 000.0
  2 digits after decimal point : 00.00 3 digits after decimal point : 0.000
- Default value: No decimal point

PV filter time constant setting [FILT]
- Sets PV filter time constant.
  If the value is set too large, it affects control result due to the delay of response.
- Setting range: 0.0 to 10.0 seconds
- Default value: 0.0 seconds

OUT1 high limit setting [oLH]
- Sets the high limit value for OUT1.
  Not available for ON/OFF action
- Setting range: OUT1 low limit value to 100% (relay contact output, non-contact voltage output)
  OUT1 low limit value to 105% (DC current output)
- Default value: 100%

OUT1 low limit setting [oLL]
- Sets the low limit value for OUT1.
  Not available for ON/OFF action
- Setting range: 0% to OUT1 high limit value (relay contact output, Non-contact voltage output)
  –5% to OUT1 high limit value (DC current output)
- Default value: 0%

OUT1 ON/OFF action hysteresis setting [HYS]
- Sets ON/OFF action hysteresis for OUT1.
- Available only for ON/OFF action
- Setting range: 0.1 to 100.0℃ (℉) For DC input, 1 to 1000
  (The placement of the decimal point follows the selection)
- Default value 1.0℃

OUT2 action mode selection [cAcr]
• Selects a cooling action from Air cooling, Oil cooling and Water cooling. Not available when OUT2 is ON/OFF action or when the Heating/Cooling control option is not applied
• Air : Air cooling (Linear characteristic)
oil : Oil cooling (The 1.5th power of the linear characteristic)
wAtr : Water cooling (The 2nd power of the linear characteristic)
• Default value: Air cooling

OUT2 high limit setting [oLHb]
• Sets the high limit value for OUT2.
• Not available when OUT2 is ON/OFF action or when the Heating/Cooling control option is not applied
• Setting range: OUT2 low limit value to 100% (relay contact output, non-contact voltage output)
OUT2 low limit value to 105% (DC current output)
• Default value: 100%

OUT2 low limit setting [oLLb]
• Sets the low limit value for OUT2.
• Not available when OUT2 is ON/OFF action or when the Heating/Cooling control option is not applied
• Setting range: 0% to OUT2 high limit value (relay contact output, Non-contact voltage output)
–5% to OUT2 high limit value (DC current output)
• Default value: 0%

Overlap band/Dead band setting [db]
• Sets overlap band and dead band value for OUT1 and OUT2.
+ set value: Dead band
– set value: Overlap band
• Available only when the Heating/Cooling control option is applied
• Setting range: –100.0 to 100.0℃ (℉)
For DC input, –1000 to 1000 (The placement of the decimal point follows the selection)
• Default value: 0.0℃

OUT2 ON/OFF action hysteresis setting [HYSb]
• Sets ON/OFF action hysteresis for OUT2.
• Not available when OUT2 is PID, PD or PI action or when the Heating/Cooling control option is not applied
• Setting range: 0.1 to 100.0℃ (℉)
For DC input, 1 to 1000 (The placement of the decimal point follows the selection)
• Default value: 1.0℃

A1 type selection [AL 1F]
• Selects A1 action type.
• Selecting item:

No alarm action	: ----	Process high alarm	: PH
High limit alarm	: H	Process low alarm	: rPH
Low limit alarm	: L	High limit alarm with standby	: H (with standby)
High/Low limits alarm	: HL	Low limit alarm with standby	: L (with standby)
High/Low limit range alarm	: oid	High/Low limits alarm with standby	: HL (with standby)

• Default value: No alarm action

A2 type selection [AL2F]
• Selects A2 action type.
• Available only when the A2 option is applied
• The selecting item and default value are the same as those of A1 type selection.

A1 action Energized/Deenergized selection [A1LA]
• Selects A1 action Energized/Deenergized.
• Not available when No alarm action is selected during A1 type selection
• Selecting item:
nonL (Energized), rEVS (Deenergized)
• Default value: Energized

A2 action Energized/Deenergized selection [A2LA]
• Selects A2 action Energized/Deenergized.
• Not available when No alarm action is selected during A2 type selection or when A2 (option) is not added
• The selecting item and default value are the same as those of A1 action Energized/ Deenergized selection.

A1 hysteresis setting [A1HY]
• Sets A1 hysteresis.
• Not available when No alarm action is selected during A1 type selection
• Setting range: 0.1 to 100.0℃ (℉)
For DC input, 1 to 1000 (The placement of the decimal point follows the selection)
• Default value: 1.0℃

A2 hysteresis setting [A2HY]
• Sets A2 hysteresis.
• Not available when No alarm action is selected during A2 type selection or when A2 option is not added
• The setting range and default value are the same as those of A1 hysteresis setting.

A1 action delayed timer setting [A1dY]
• Sets the action delayed timer for A1.
The alarm is activated when the setting time has elapsed after the input enters the alarm output range.
• Not available when No alarm action is selected during A1 type selection
• Setting range: 0 to 9999 seconds
• Default value: 0 seconds

A2 action delayed timer setting [A2dY]
• Sets the action delayed timer for A2.
The alarm is activated when the setting time has elapsed after the input enters the alarm output range.
• Not available when No alarm action is selected during A2 type selection or when A2 (option) is not added
• The setting range and default value are the same as those of A1 action delayed timer setting.

Direct/Reverse action selection [conF]
• Sets either Direct (Cooling) or Reverse (Heating) action.
• Selecting item
Reverse (Heating): HEAT Direct (Cooling): cooL
• Default value: Reverse (Heating)

AT bias setting [AT_b]
- Sets the bias value when PID auto-tuning is performing.
- Not available for DC input
- Setting range: 0 to 50℃ (0 to 100℉)
  With a decimal point, 0.0 to 50.0℃ (0.0 to 100.0℉)
- Default value: 20℃

SVTC bias setting [SV_b]
- Control desired value adds SVTC bias value to the value received by the digital transmission.
- Available only when Serial communication (option) is added
- Setting range: Converted value of ±20% of the rated value
  For DC input, ±20% of the scaling span (The placement of the decimal point follows the selection) However, the negative minimum value is –1999, –199.9, –19.99 or –1.999.
- Default value: 0

SV2 indication selection [SV 2]
- Selects whether SV2 is indicated or not.
- Not available when Serial communication (option) is added
- Selecting item:
  on (Indication) oFF (No indication)
- Default value: Indication

Output status selection when input abnormal [EoUT]
- Selects the output status when input is overscale or underscale.
- Available only for DC current output with DC input
- Selecting item:
  oFF (Output OFF) on (Output ON)
- Default value: Output OFF

OUT/OFF key function selection [AMnU]
- Selects the OUT/OFF key function.
- Selecting item:
  oFF (OUT/OFF function), AMnU (Auto/Manual control function)
- Default value: OUT/OFF function

Sensor correction function

This corrects the input value from the sensor. When a sensor cannot be set at the exact location where control is desired, the sensor measured temperature may deviate from the temperature in the controlled location. When controlling with plural controllers, sometimes the measured temperatures (input value) do not concur with the same set value. In such a case, the control can be set at the desired temperature by adjusting the input value of sensors.

Loop break alarm

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

When the control action is Direct (Cooling), read "**fall**" for "**rise**" and vice versa.

SV1/SV2 external selection

SV1 or SV2 can be selected by the external operation.
- Terminals between 13 and 14 open: SV1 can be selected.
- Terminals between 13 and 14 closed: SV2 can be selected.
- Set value memory number cannot be changed during setting mode or PID auto-tuning.

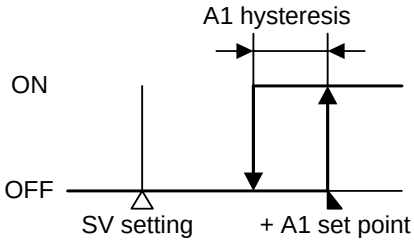
Energized/Deenergized function

[If the alarm action Energized is selected]

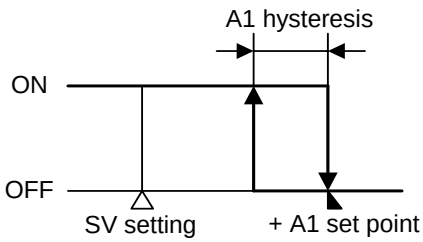
When the alarm output indicator is lit, the alarm output (terminals 15-16 or 17-18) is conducted (ON). When the alarm output indicator is unlit, the alarm output is not conducted (OFF). See (Fig. 5.5-1).

[If the alarm action Deenergized is selected]

When the alarm output indicator is lit, the alarm output (terminals 15-16 or 17-18) is not conducted (OFF). When the alarm output indicator is unlit, the alarm output is conducted (ON). See (Fig. 5.5-2).



High limit alarm (When Energized is set)
(Fig. 5.5-1)



High limit alarm (When Deenergized is set)
(Fig. 5.5-2)

5.6 Control output OFF function

Control output OFF function [oFF]

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

5.7 Auto/Manual control function

PV/SV display mode (manual control)

- To use this function, it is necessary to select Auto/Manual control function during the OUT/OFF key function selection.
  First, press the ⏻ key.
  The control can be performed by increasing or decreasing the MV (manipulated variable) on the SV display with the △ and ▽ keys.
- The 1st decimal point from the right on the SV display flashes.
- By pressing the ⏻ key again, the mode reverts to the PV/SV display (automatic control) mode.
  (When the power supply to the instrument is turned on, automatic control starts)
- When control is changed from automatic to manual or vice versa, the balanceless-bumpless function works to prevent sudden change of MV (manipulated variable).
- If Auto/Manual control function is selected, control output OFF function does not work.

5.8 Output MV (manipulated variable) indication

Output manipulated variable indication

- If pressing the ◎ key for approx. 3 seconds during PV/SV display mode, Output manipulated variable can be indicated on the SV display. During MV indication, the 1st decimal point from the right on the SV display flashes at a cycle of 0.5 second. By pressing the ◎ key again, the mode reverts to the PV/SV display mode.

6. Operation

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

(1) Turn the power supply to the JCM-33A Series ON.

With thermocouple and RTD input, sensor input character and temperature unit are indicated on the PV display and the input range high limit value is indicated on the SV display for approx. 3 seconds after the power is switched ON. See (Table 6-1).
With the DC input, sensor input character is indicated on the PV display and scaling high limit value is indicated on the SV display for approx. 3 seconds after the power is switched ON. See (Table 6-1).
However, if the scaling high limit value has been changed during the Scaling high limit setting, the changed value is indicated on the SV display.)
(During this time, all outputs and the LED indicators are in OFF status)
After that, control starts indicating the process variable on the PV display and SV1 or SV2 on the SV display.
(When the Control output OFF function is working, [oFF] is indicated on the PV display)

(Table 6-1)

Sensor input	℃		℉	
	PV display	SV display	PV display	SV display
K	E C	1370	E F	2500
	E .C	400.0	E .F	750.0
J	J C	1000	J F	1800
R	r C	1760	r F	3200
S	S C	1760	S F	3200
B	b C	1820	b F	3300
E	E C	800	E F	1500
T	T .C	400.0	T .F	750.0
N	n C	1300	n F	2300
PL-Ⅱ	PL2C	1390	PL2F	2500
C (W/Re5-26)	c C	2315	c F	4200
Pt100	Pt .C	850.0	Pt .F	999.9
	Pt C	850	Pt F	1500
JPt100	JPt.C	500.0	JPt.F	900.0
	JPtC	500	JPtF	900
4 to 20mA DC	420A	Scaling high limit value		
0 to 20mA DC	020A			
0 to 1V DC	0 1V			
0 to 5V DC	0 5V			
1 to 5V DC	1 5V			
0 to 10V DC	0 10V			

(2) Input each set value.

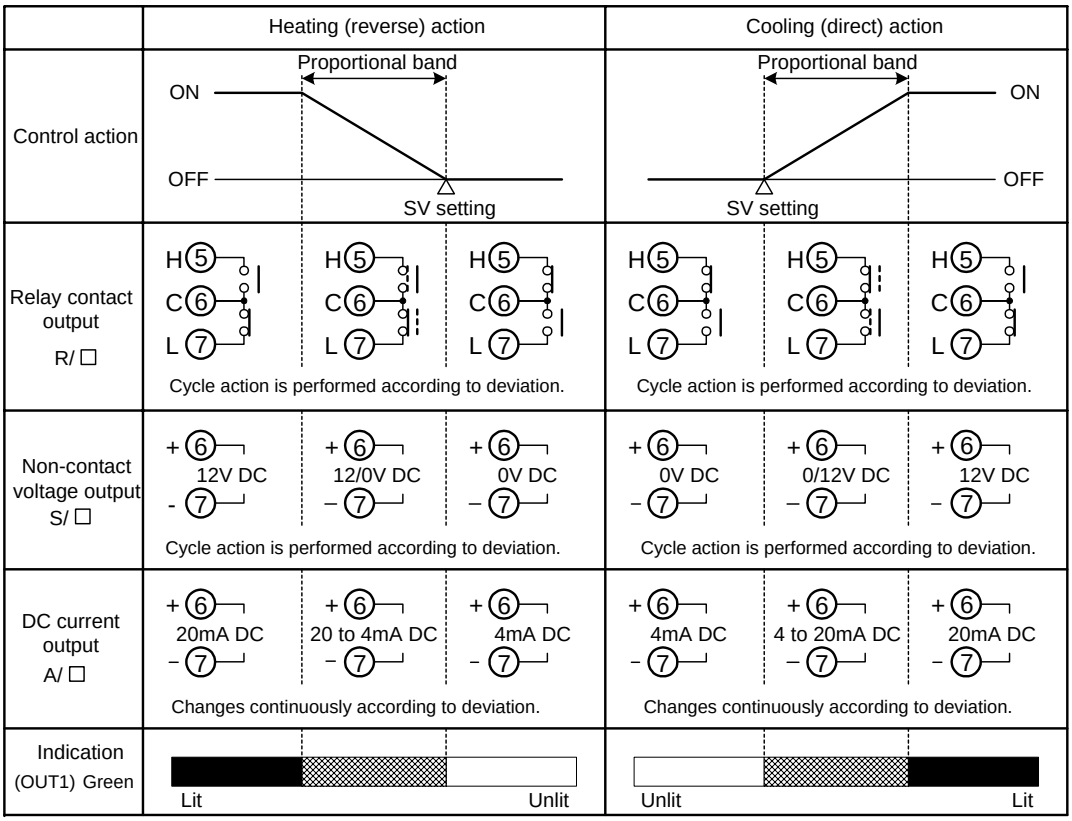
Input each set value, referring to “5. Setup”.

(3) Turn the load circuit power ON.

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

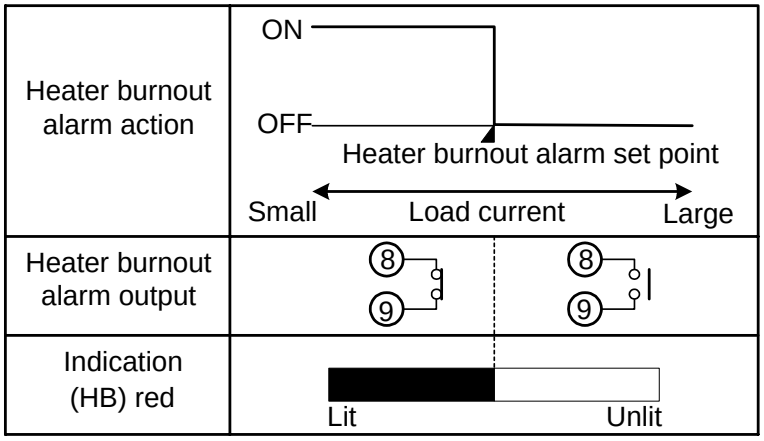
7. Action explanation

7.1 OUT1 action



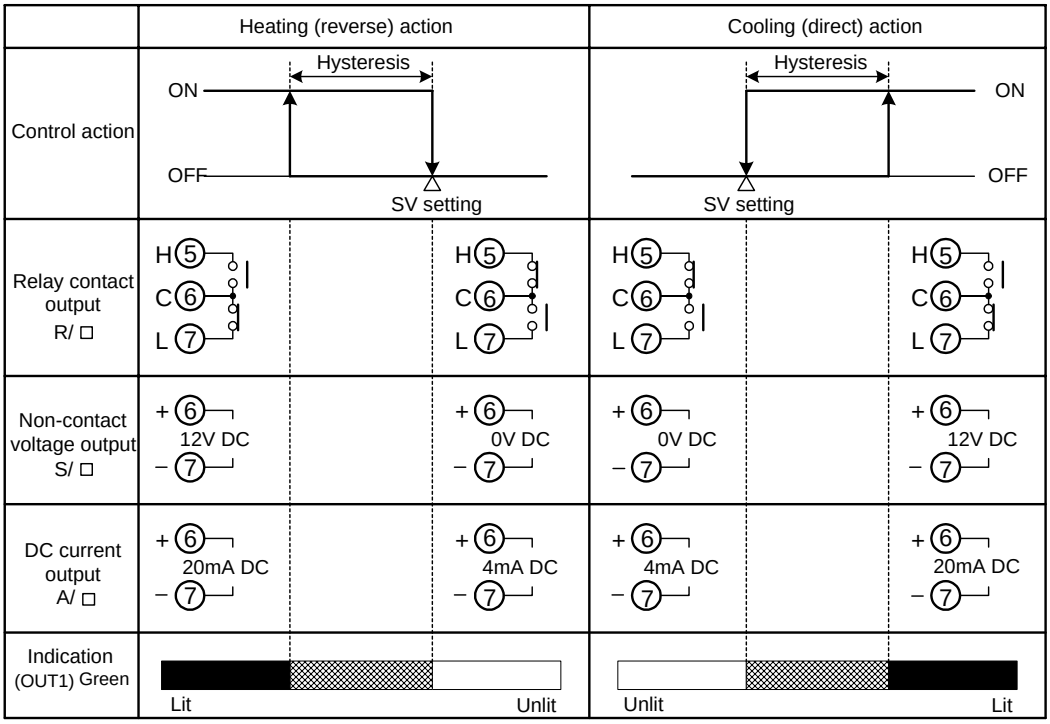
: Acts ON (lit) or OFF (unlit).

7.2 Heater burnout alarm action (option)



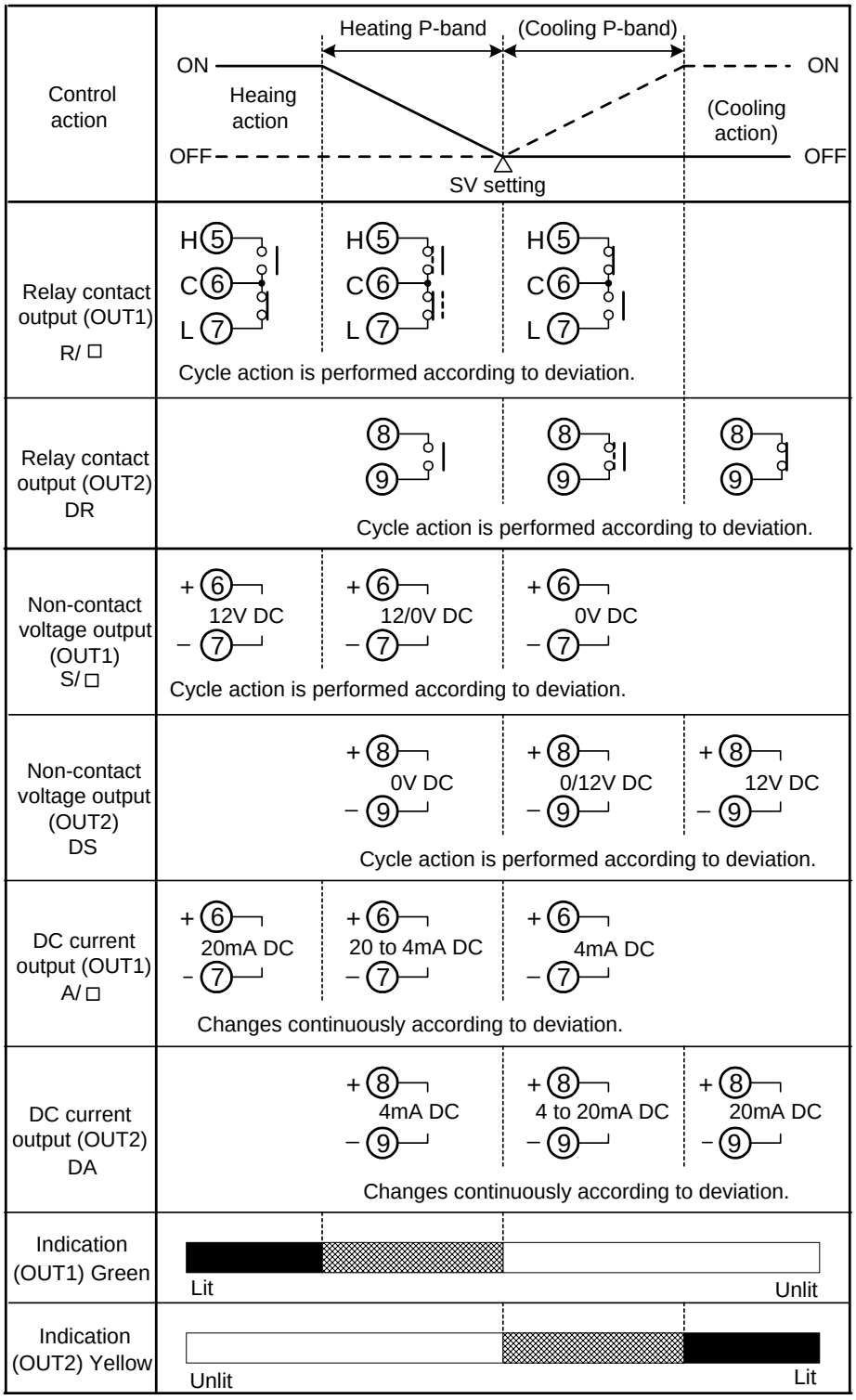
When Heating/Cooling control (option) is applied, use terminals 17 and 18 for the Heater burnout alarm. When A2 output (option) is applied, use terminals 8 and 9 for the Heater burnout alarm.

7.3 OUT1 ON/OFF action



▨ : Acts ON (lit) or OFF (unlit).

7.4 OUT2 (Heating/Cooling control) action (Option)

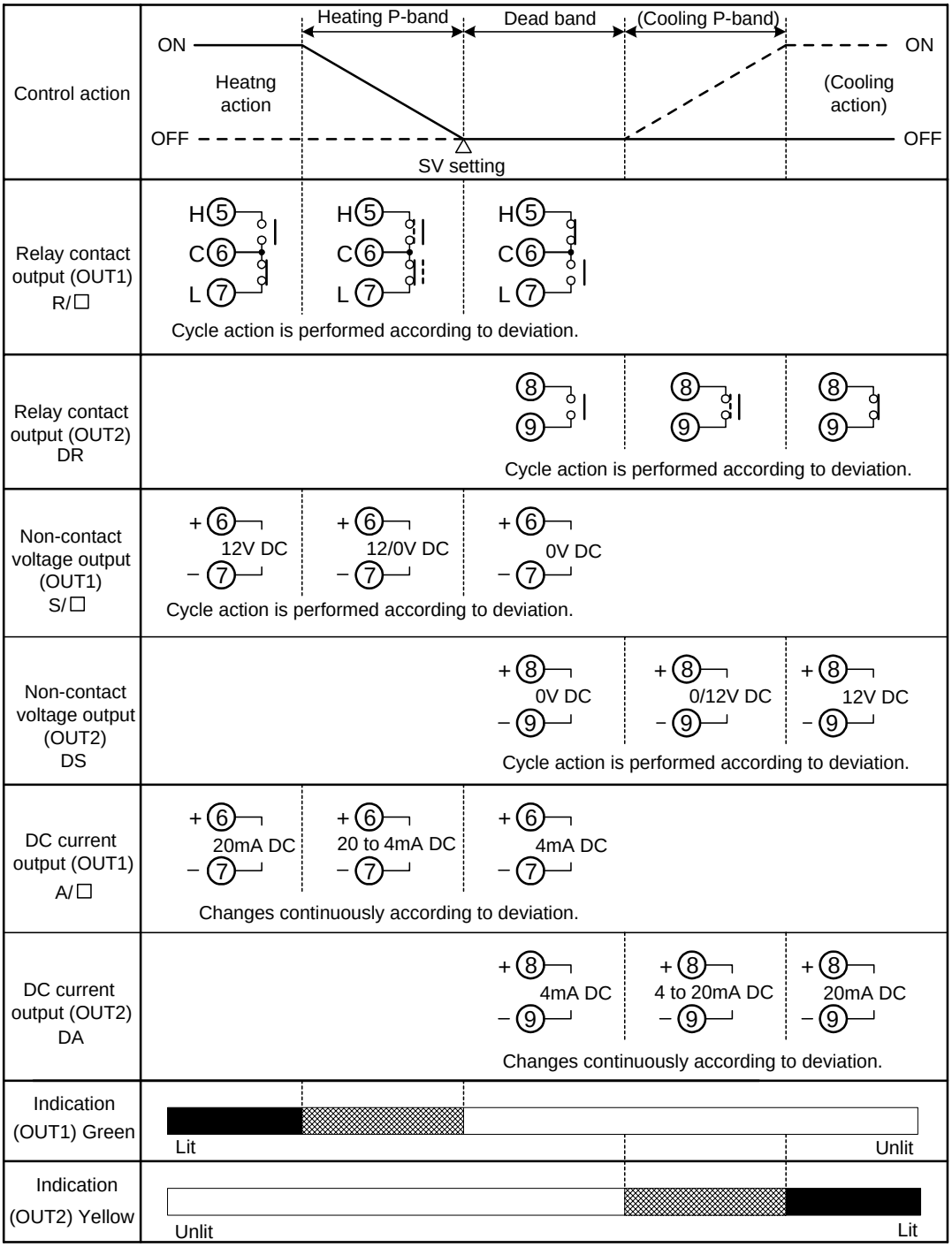


: Acts ON (lit) or OFF (unlit).

——— : Represents Heating control action.

– – – – : Represents Cooling control action.

When setting Dead band

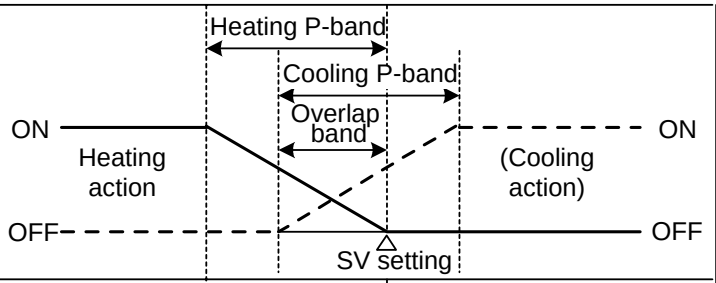
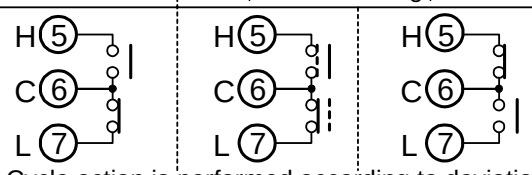
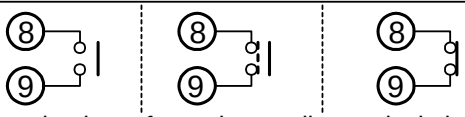
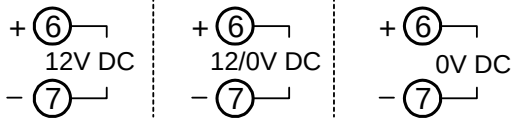
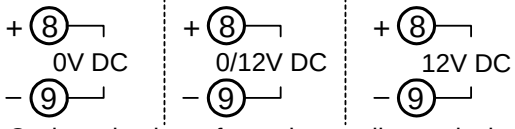
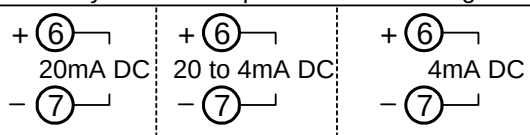
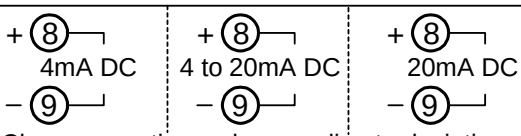
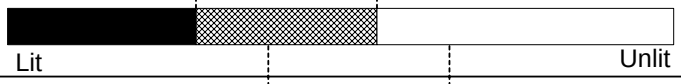
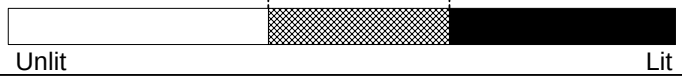


: Acts ON (lit) or OFF (unlit).

——— : Represents Heating control action.

– – – – : Represents Cooling control action.

When setting Overlap band

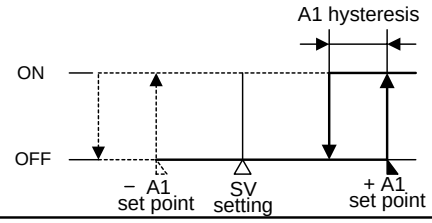
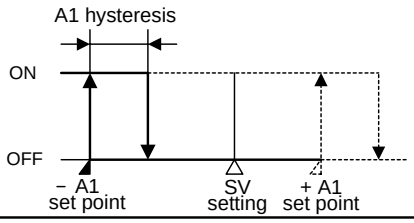
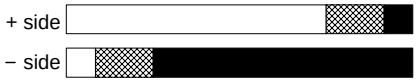
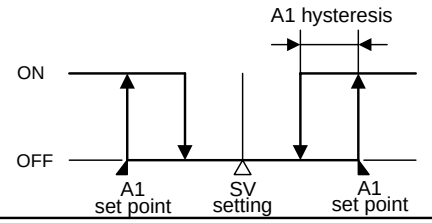
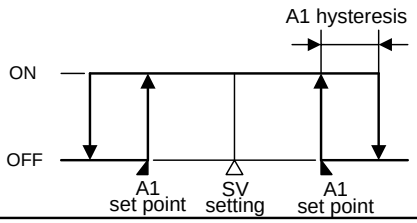
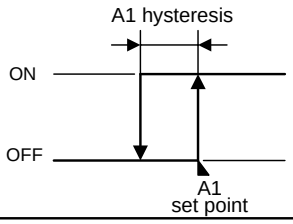
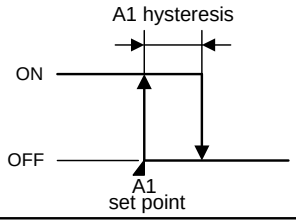
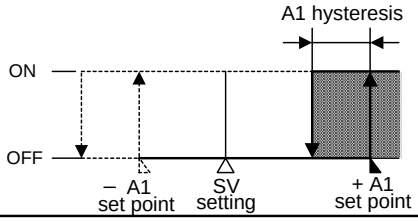
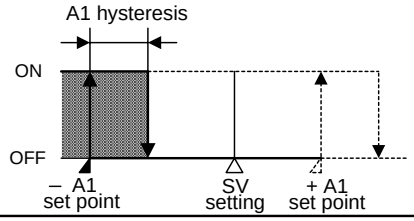
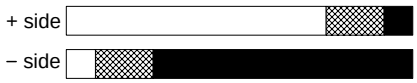
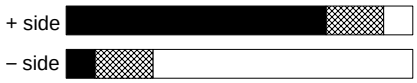
Control action	
Relay contact output (OUT1) R/□	 Cycle action is performed according to deviation.
Relay contact output (OUT2) DR	 Cycle action is performed according to deviation.
Non-contact voltage output (OUT1) S/□	 Cycle action is performed according to deviation.
Non-contact voltage output (OUT2) DS	 Cycle action is performed according to deviation.
DC current output (OUT1) A/□	 Changes continuously according to deviation.
DC current output (OUT2) DA	 Changes continuously according to deviation.
Indication (OUT1) Green	
Indication (OUT2) Yellow	

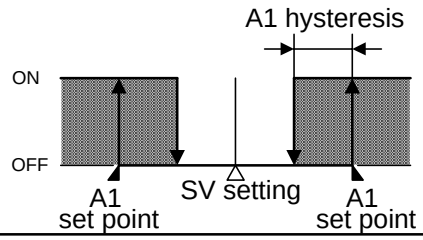
: Acts ON (lit) or OFF (unlit).

——— : Represents Heating control action.

– – – – : Represents Cooling control action.

7.5 A1 and A2 actions

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

	High/Low limits alarm with standby
Alarm action	
Alarm output	

: A1 output terminals 15 and 16 are connected (ON).

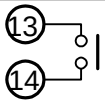
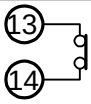
: A1 output terminals 15 and 16 are connected (ON) or disconnected (OFF).

: A1 output terminals 15 and 16 are disconnected (OFF).

: Standby functions.

For A2 output, terminals 17 and 18 are used.
A1 and A2 indicators light up when their output terminals are connected (ON), and go off when their output terminals are disconnected (OFF).

7.6 SV1/SV2 external selection action

	SV1	SV2
setting value memory external selection		
Indication Green	SV1 Lit SV2 Unlit	SV1 Unlit SV2 Lit

This function is not available if Serial communication (option) is applied.

8. Control action explanations

8.1 PID

(1) Proportional band (P)

Proportional action is the action which the control output varies in proportion to the deviation between the set 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 the proportional band is narrowed too much, even slight disturbances may cause variation in the processing temperature, control action changes to ON/OFF action and the so-called hunting phenomenon occurs.

Therefore, when the processing temperature comes to the balanced position near the set 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 set point is accelerated. However, the cycle of oscillation is also accelerated and the control becomes unstable.

(3) Derivative time (D)

Derivative action is used to restore the change in the processing temperature according to the rate of change. It reduces the amplitude of overshoot and undershoot width.

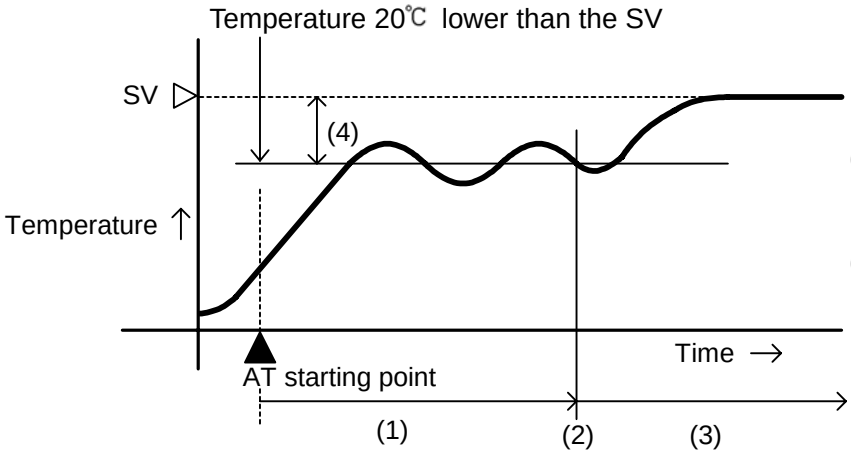
If the derivative time is shortened, restoring value becomes small, and if the derivative time is extended longer, an excessive returning phenomenon may occur and the control system may oscillate.

8.2 PID auto-tuning of this controller

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

[1] 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℃, the AT process will fluctuate at the temperature 20℃ lower than the SV.

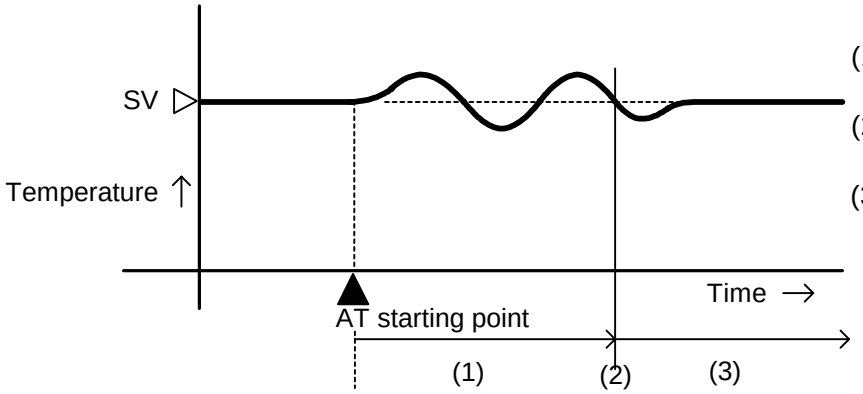


(1) Calculating PID constant
(2) PID constant calculated
(3) Controlled by the PID constant set by auto-tuning.
(4) AT bias value

(Fig. 8.2-1)

[2] In the case of stable control or when control temperature is within ±20℃ of the SV.

The AT process will fluctuate around the SV.

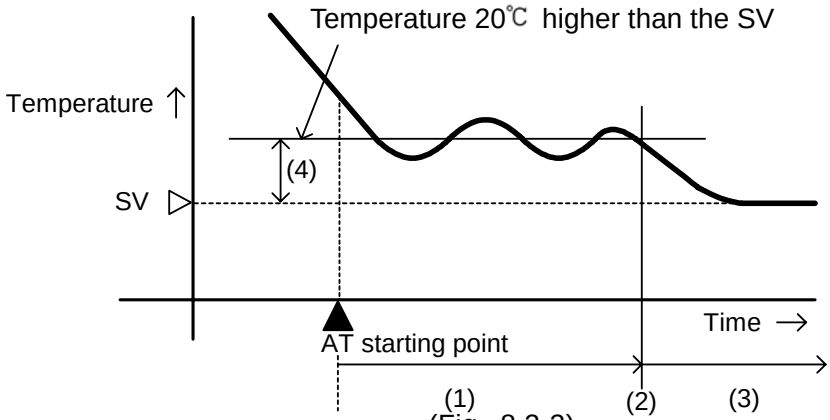


(1) Calculating PID constant
(2) PID constant calculated
(3) Controlled by the PID constant set by auto-tuning.

(Fig. 8.2-2)

[3] 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℃, the AT process will fluctuate at the temperature 20℃ higher than the SV.



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

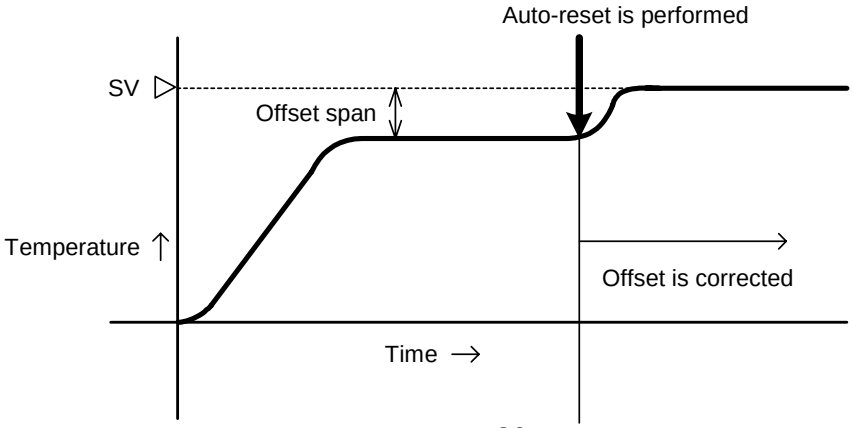
(Fig. 8.2-3)

8.3 Auto-reset (offset correction)

Auto-reset is performed to correct the offset at the point at which PV indication is stabilized within the proportional band during the PD action.

Since the corrected value is internally memorized, it is not necessary to perform the auto-reset again as long as the process is the same.

However, when the proportional band is set to 0, the corrected value is cleared.



(Fig. 8.3-1)

9. Specifications

9.1 Standard specifications

Mounting method : Flush

Setting method : Membrane sheet key

Display

PV display : Red LED 4 digits, character size, 14.3 x 8 (H x W)mm

SV display : Green LED 4 digits, character size, 10 x 5.5 (H x W)mm

Accuracy (Setting, indication)

Thermocouple : Within ±0.2% of input range full scale ±1digit or within ±2℃ (4℉), whichever is greater
However, R, S input, 0 to 200℃ (0 to 400℉): Within ±6℃(12℉)
B input, 0 to 300℃ (0 to 600℉): Accuracy is not guaranteed.
K, J, E, T, N input, less than 0℃ (32℉): Within ±0.4% of input range full scale ±1digit

RTD : Within ±0.1% of input range full scale ±1digit or within ±1℃ (2℉), whichever is greater

DC current and voltage: Within ±0.2% of input range full scale ±1digit

Input sampling period : 0.25 seconds

Input

Thermocouple : K, J, R, S, B, E, T, N, PL-Ⅱ, C (W/Re5-26)
External resistance, 100Ω or less, however, for B, 40Ω or less

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

DC current : 0 to 20mA DC, 4 to 20mA DC
Input impedance, 50Ω
[50Ω shunt resistor (sold separately) must be connected between input terminals]
Allowable input current, 50mA or less
[When 50Ω shunt resistor (sold separately) is used]

DC voltage : 0 to 1V DC
Input impedance, 1MΩ or more
Allowable input voltage, 5V or less
Allowable signal source resistance, 2kΩ or less
0 to 5V DC, 1 to 5V DC, 0 to 10V DC
Input impedance, 100kΩ or more
Allowable input voltage, 15V or less
Allowable signal source resistance, 100Ω or less

Control output (OUT1)

Relay contact : 1a1b
Control capacity, 3A 250V AC (resistive load)
1A 250V AC (inductive load cosø=0.4)
Electrical life, 100,000 times

Non-contact voltage: 12^{+2}_{0}V DC maximum 40mA (short circuit protected)
The connectable SSRs in parallel are 4 units if Shinko SSRs (SA-200 series) are used.

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

A1 output

When A1 action is set as Energized, the alarm action point is set by ±deviation from the SV (except Process alarm).
When the input goes outside the range, the output turns ON or OFF (in the case of High/Low limit range alarm).
When the alarm action is set as Deenergized, the output acts conversely.
Setting accuracy : The same as the Indicating accuracy
Action : ON/OFF action
Hysteresis : Thermocouple and RTD input, 0.1 to 100.0℃ (℉)
DC current and DC voltage input, 1 to 1000
(The placement of the decimal point follows the selection)
Output : Relay contact 1a
Control capacity, 3A 250V AC (resistive load)
Electrical life, 100,000 times

Control action

- PID action (with auto-tuning function)
- PI action: When derivative time is set to 0
- PD action (with auto-reset function): When integral time is set to 0
- P action (with auto-reset function): When integral and derivative times are set to 0
- ON/OFF action: When OUT1 proportional band is set to 0

OUT1 proportional band (P):
Thermocouple, 0 to 1000℃ (0 to 2000℉)
RTD, 0.0 to 999.9℃ (0.0 to 999.9℉)
DC current and voltage, 0.0 to 100.0%
(ON/OFF action when set to 0℃(℉), 0.0℃(℉) or 0.0%)
Integral time (I) : 0 to 1000s (off when set to 0)
Derivative time (D) : 0 to 300s (off when set to 0)
OUT1 proportional cycle : 1 to 120s (Not available for DC current output)
ARW : 0 to 100%
OUT1 hysteresis : Thermocouple and RTD input, 0.1 to 100.0℃ (℉)
DC current and voltage input, 1 to 1000
(The placement of the decimal point follows the selection)

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

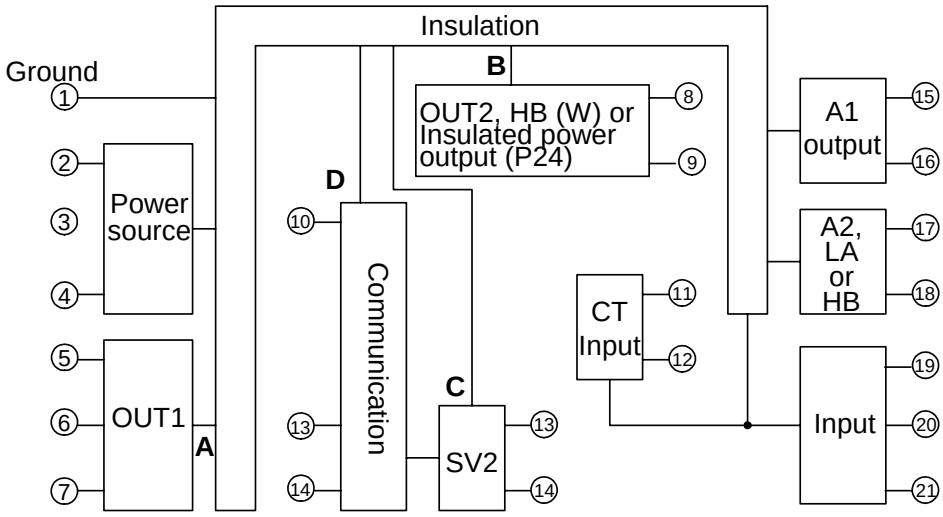
Allowable voltage fluctuation range
100 to 240V AC : 85 to 264V AC
24V AC/DC : 20 to 28V AC/DC

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

Ambient humidity : 35 to 85%RH (no condensation)

Power consumption : Approx. 8VA

Circuit insulation configuration



- When OUT1 is non-contact voltage or DC current output and when OUT2 is Non-contact voltage or DC current output, A is not insulated from B.
- When OUT1 is non-contact voltage or DC current output, A is not insulated from C, and A is not insulated from D.
  When OUT2 is non-contact voltage or DC current output, B is not insulated from C, and B is not insulated from D.

Insulation resistance

10MΩ or more, at 500V DC for other combinations except the above mentioned

Dielectric strength

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

Weight : Approx. 300g

External dimension: 72 x 72 x 100mm (W x H x D)

Material : Case, Flame resistant resin

Color : Case, Light gray

Attached function

[Sensor correction function]

[Set value lock function]

[Burnout]

When the thermocouple or RTD input is burnt out, OUT1 is turned off (for DC current output type, OUT1 low limit value) and the PV display flashes " ‾ ‾ ‾ ‾ ".

[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.

[Automatic cold junction temperature compensation](Thermocouple input type)

This detects the temperature at the connecting terminal between the thermocouple and the instrument, and always maintains the same status as when the reference junction is located at 0℃ (32℉).

[Input abnormality indication]

Output status selection when input abnormal	Contents and Indication	Output status			
		OUT1		OUT2	
		Direct action	Reverse action	Direct action	Reverse action
on	Overscale Measured value has exceeded Indication range high limit value. "- - - -" flashes.	ON (20mA) or OUT1 high limit value	OFF(4mA) or OUT1 low limit value	OFF(4mA) or OUT2 low limit value	ON(20mA) or OUT2 high limit value
oFF		OFF (4mA) or OUT1 low limit value			OFF(4mA) or OUT2 low limit value
on	Underscale Measured value has dropped below Indication range low limit value. "- - - -" flashes.	OFF (4mA) or OUT1 low limit value	ON (20mA) or OUT1 high limit value	ON (20mA) or OUT2 high limit value	OFF(4mA) or OUT2 low limit value
oFF			OFF(4mA) or OUT1 low limit value	OFF(4mA) or OUT2 low limit value	

[Output status selection when input abnormal] is available only for DC input and DC current output. For other inputs and outputs except for DC input and DC current output, the output status will be the same as when OFF is selected during [Output status selection when input abnormal].

For manual control, the preset manipulated variable (MV) is outputted.

Thermocouple and RTD inputs

Input	Input range	Indication range	Control range
K, T	–199.9 to 400.0℃	–199.9 to 450.0℃	–205.0 to 450.0℃
	–199.9 to 750.0℉	–199.9 to 850.0℉	–209.0 to 850.0℉
Pt100	–199.9 to 850.0℃	–199.9 to 900.0℃	–210.0 to 900.0℃
	–200 to 850℃	–210 to 900℃	–210 to 900℃
	–199.9 to 999.9℉	–199.9 to 999.9℉	–211.0 to 1099.9℉
	–300 to 1500℉	–318 to 1600℉	–318 to 1600℉
JPt100	–199.9 to 500.0℃	–199.9 to 550.0℃	–206.0 to 550.0℃
	–200 to 500℃	–207 to 550℃	–207 to 550℃
	–199.9 to 900.0℉	–199.9 to 999.9℉	–211.0 to 999.9℉
	–300 to 900℉	–312 to 1000℉	–312 to 1000℉

Indication range and Control range for thermocouple inputs other than the above:
Input range low limit value –50℃ (100℉) to Input range high limit value +50℃ (100℉)

- **DC input**
  Indication range : [Scaling low limit value – Scaling span x 1%] to [Scaling high limit value + Scaling span x 10%]
  However, if the input value is out of the range –1999 to 9999, the PV display flashes "- - - -" or "- - - -".
  Control range : [Scaling low limit value – Scaling span x 1%] to [Scaling high limit value + Scaling span x 10%]
- **DC input disconnection**: When DC input is disconnected, PV display flashes "- - - -" for 4 to 20mA DC and 1 to 5V DC inputs, and "- - - -" for 0 to 1V DC input.
  For 0 to 20mA DC, 0 to 5V DC and 0 to 10V DC inputs, the PV display indicates the value corresponding with 0mA or 0V input.

[Power failure countermeasure]

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

[Warm-up indication]

With thermocouple and RTD input, for approx. 3 seconds after the power is switched ON, sensor input character and temperature unit are indicated on the PV display, and the input range high limit value is indicated on the SV display.

With the DC input, for approx. 3 seconds after the power is switched ON, sensor input character is indicated on the PV display, and scaling high limit value is indicated on the SV display.

(However, if the scaling high limit value has been changed during the Scaling high limit setting, the changed value will be indicated on the SV display.)

[Auto/Manual control switching]

If Auto/Manual control function is selected during OUT/OFF key function selection, automatic control can be switched to manual control or vice versa by pressing the OUT/OFF key.

When the control action is changed from automatic to manual control and vice versa, the balanceless-bumpless function works to prevent sudden change of manipulated variable.

When the control action is changed from automatic to manual control, the 1st decimal point from the right on the SV display flashes.

The control can be performed by increasing or decreasing the MV (manipulated variable) with the △ or ▽ key.

(When the power supply to the instrument is turned on, automatic control starts)

Accessories:

Instruction manual 1 copy
Screw type mounting bracket 1 set
CT (current transformer)
CTL-6S [W (5A, 10A, 20A) option] 1 piece
CTL-12-S36-10L1 [W (50A) option] 1 piece
Terminal cover 1 piece (when TC option is added)

9.2 Optional specifications

Alarm 2 (option code: A2)

When A2 action is set as Energized, the alarm action point is set by ±deviation from the SV (except Process alarm).

When the input goes outside the range, the output turns ON or OFF (in the case of High/Low limit range alarm).

When the alarm action is set as Deenergized, the output acts conversely.

• When A2 and LA option are added together, they utilize common output terminals.

Setting accuracy: The same as the Indicating accuracy
Action : ON/OFF action
Hysteresis : For thermocouple and RTD input, 0.1 to 100.0℃ (℉)
For DC current and voltage input, 1 to 1000
(The placement of the decimal point follows the selection)
Output : Relay contact 1a
Control capacity, 3A 250V AC (resistive load)
Electrical life, 100,000 times

Heater burnout alarm (option code: W)

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

Heater burnout alarm is activated when sensor is burnt out or when indication is overscale or underscale.

• This option cannot be applied to DC current output.

Heater rated current: 5A, 10A, 20A, 50A, Must be specified
Setting accuracy : Within ±5% of heater rated current
Action : ON/OFF action
Output : Relay contact 1a
Control capacity, 3A 250V AC (resistive load)
Electrical life, 100,000 times

Heating/Cooling control (option code: DR, DS, DA)

OUT2 proportional band : 0.0 to 10.0 times OUT1 proportional band
(ON/OFF action when set to 0.0)
OUT2 integral time : The same as that of OUT1
OUT2 derivative time : The same as that of OUT1
OUT2 proportional cycle : 1 to 120 seconds
Overlap band/Dead band:
Thermocouple, RTD input: –100.0 to 100.0℃ (℉)
DC current, voltage input: –1000 to 1000
(The placement of the decimal point follows the selection)
OUT2 ON/OFF action hysteresis
Thermocouple, RTD input: 0.1 to 100.0℃ (℉)
DC current, voltage input: 1 to 1000
(The placement of the decimal point follows the selection)
Output Relay contact output 1a
Control capacity, 3A 250V AC (resistive load)
1A 250V AC (inductive load cosø=0.4)
Electrical life, 100,000 times
Non-contact voltage output
12^{+2}_{0}V DC maximum 40mA (short circuit protected)
DC current output, 4 to 20mA DC
Load resistance, maximum 550Ω
OUT2 action mode selection function:
One cooling mode can be selected by keypad from the following.
Air cooling (Linear characteristic)
Oil cooling (1.5th power of the linear characteristic)
Water cooling (2nd power of the linear characteristic)

SV1/SV2 external selection (option code: SM)

SV1 and SV2 can be selected by external contact.
Contact open between terminals 13 and 14 : SV1
Contact closed between terminals 13 and 14: SV2
Contact current: 6mA

Serial communication (option code: C5)

If Serial communication is added, SV1/SV2 external selection function does not work.
The following operations are performed from the external computer.
(1) Reading and setting of the main set value, PID and various other set values
(2) Reading of the input value and action status
(3) Function change
Cable length : Maximum communication distance 1.2km
Cable resistance: Within 50Ω(Terminator is not necessary or 120Ω or more on one side.)
Communication line : EIA RS-485
Communication method : Half-duplex start-stop synchronous
Communication speed : 2400/4800/9600/19200bps(Selectable by keypad)
Parity : Even/Odd/No (Selectable by keypad)
Stop bit : 1 or 2 (Selectable by keypad)

Data format

Communication protocol	Shinko protocol	Modbus ASCII	Modbus RTU
Start bit	1	1	1
Data bit	7	7	8
Parity	Even	Selectable (Even)	Selectable (No)
Stop bit	1	Selectable (1)	Selectable (1)

Data bit is automatically switched by the selection of the communication protocol.
( ) shows basic set value.
Digital external setting:
Receives digital set value from Shinko programmable controller (with SVTC option).
[Set value lock of the JCM-33A must be set to Lock 3.]
When SV data from Shinko programmable controller is larger than SV high limit or smaller than SV low limit, JCM-33A ignores the value and controls with the SV high limit or SV low limit.

Loop break alarm (option code: LA)
Detects the breaking status on the loop such as heater burnout, sensor burnout or actuator trouble.
If [LA] and [A2] options are applied together, they utilize the same output terminals.
Setting range : Loop break alarm action time, 0 to 200minutes
Loop break alarm action span, 0 to 150℃(℉), 0.0 to 150.0℃(℉),
DC input: 0 to 1500 (The placement of the decimal point follows the selection)
Output : Relay contact 1a, 3A 250V AC (Resistive load)
Electrical life, 100,000 times

Insulated power output (option code: P24)
Output voltage: 24±3V DC (when load current is 30mA)
Ripple voltage: Within 200mV (when load current is 30mA)
Maximum load current: 30mA

Color Black (option code: BK)
Front panel frame and case: Black

Terminal cover (option code: TC)
Electrical shock protection terminal cover

Dust-proof/Drip-proof (option code: IP)
Dust-proof/Drip-proof specification, IP54

9.3 Option combinations

	A2	LA	W	D□	P24	C5	SM	BK	TC	IP
Combination 1	O	O	O	–	–	O	–	O	O	O
Combination 2	O	O	–	O	–	O	–	O	O	O
Combination 3	–	–	O	O	–	O	–	O	O	O
Combination 4	O	O	–	–	O	O	–	O	O	O
Combination 5	O	O	O	–	–	–	O	O	O	O
Combination 6	O	O	–	O	–	–	O	O	O	O
Combination 7	–	–	O	O	–	–	O	O	O	O
Combination 8	O	O	–	–	O	–	O	O	O	O

D□: DR, DS, DA

10. Troubleshooting

If any malfunctions occur, refer to the following items after checking the power of the controller.

⚠ 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.

Indication

Problem	Presumed cause and solution
The PV display is indicating [oFF].	• Control output OFF function is working. Press the ⏻ key (OUT/OFF key) for approx. 1 second to release the function.
[- - - -] is flashing on the PV display.	• Burnout of thermocouple, RTD or disconnection of DC voltage (0 to 1V DC) Replace each sensor. **How to check sensor burnout** [Thermocouple] If the input terminal of the instrument is shorted, and if approximate room temperature is indicated, the instrument is likely to be operating normally, however, the sensor may be burnt out. [RTD] If approximate 100Ω resistance is connected to the input terminal between A-B of the instrument and between B-B is shorted, and if a value around 0℃ (32℉) is indicated, the instrument is likely to be operating normally, however, the sensor may be burnt out. [DC voltage (0 to 1V DC)] If the input terminal of the instrument is shorted, and if scaling low limit value is indicated, the instrument is likely to be operating normally, however, the signal wire may be disconnected. • Check whether the input terminal of thermocouple, RTD or DC voltage (0 to 1V DC) is securely mounted to the controller terminals. Ensure that the sensor terminals are securely connected to the controller terminals.
[- - - -] is flashing on the PV display.	• The input signal wire for DC voltage (1 to 5V DC) or DC current (4 to 20mA DC) may be disconnected. Replace each input signal. **How to check input signal wire disconnection** [DC voltage (1 to 5V DC)] If the input to the input terminal of this controller is 1V DC, and if scaling low limit value is indicated, the controller is likely to be operating normally, however, the signal wire may be disconnected. [DC current (4 to 20mA DC)] If the input to the input terminal of this controller is 4mA DC, and if scaling low limit value is indicated, the controller is likely to be operating normally, however, the signal wire may be disconnected.

[- - - -] is flashing on the PV display.	• Check whether the input signal wire for DC voltage (1 to 5V DC) or DC current (4 to 20mA DC) is securely connected to the input terminal of this controller. Ensure that the input signal wire is connected to the controller input terminals securely. • Check whether the polarity of thermocouple or compensating lead wire is correct. Check whether codes (A, B, B) of RTD agree with the controller input terminals. Ensure that they are wired properly.
The value set during the Scaling low limit setting remains on the PV display.	• Check whether the input signal wire for DC voltage (0 to 5V DC, 0 to 10V DC) or DC current (0 to 20mA DC) is disconnected. Replace each individual input signal wire. **How to check input signal wire disconnection** [DC voltage (0 to 5V DC, 0 to 10V)] If the input to the input terminals of this controller is 1V DC, and if a corresponding value is indicated, the controller is likely to be operating normally, however, the input signal wire may be disconnected. [DC current (0 to 20mA DC)] If the input to the input terminal of this controller is 1mA DC and if a corresponding value is indicated, the controller is likely to be operating normally, however, the signal wire may be disconnected. • Check whether the input terminal for DC voltage (0 to 5V DC, 0 to 10V DC) or DC current (0 to 20mA DC) is securely connected to the controller input terminals. Ensure that the signal wire is securely connected to the controller input terminals.
The indication of PV display is abnormal or unstable.	•The sensor input or temperature unit (℃ or ℉) setting is improper. Set the sensor input and the temperature unit properly. • Sensor correcting value is unsuitable. Set it to a suitable value. • Sensor specification is improper. Set the sensor specification properly. • AC may be leaking into the sensor circuit. Change the sensor for the ungrounded type. • There may be equipment that interferes with or makes noise near the controller. Keep equipment that interferes with or makes noise away from the controller.
[Err 1] is indicated on the PV display.	The internal memory is defective. Please contact our main office or dealers.

Key operation

Problem	Presumed cause and solution
Settings (main set value, P, I, D, proportional cycle, alarm, etc.) are impossible. The value does not change by the △, ▽ keys.	• Set value lock (Lock 1 or Lock 2) is designated. Release the lock designation. • During PID auto-tuning or auto-reset. Cancel auto-tuning if required. Auto-reset will end in 4 minutes after starting.

The setting indication does not change within the rated input range even if the △, ▽ keys are pressed, and settings are impossible.	• SV high limit or low limit may be set at the point where the value does not change. Set it again during Auxiliary function setting mode 1.

Control

Problem	Presumed cause and solution
Process variable (temperature) does not rise.	• The sensor is out of order. Replace the sensor. • Sensor is not securely mounted to the instrument input terminals, or control output terminal is not securely mounted to the actuator input terminal. Mount the sensor or control output terminal securely. • Ensure that wiring of sensor terminals or control output terminals is correct.
The control output remains in an ON status.	• OUT1 low limit value is set to 100% or higher during Auxiliary function setting mode 2. Set it to a suitable value.
If the control output remains in an OFF status.	• OUT1 high limit value is set to 0% or less during Auxiliary function setting mode 2. Set it to a suitable value.

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

11. Character table

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[Main setting mode]

Character	Setting item	Default value	Data
SV	SV1	0℃	
SV2	SV2	0℃	

[Sub setting mode]

Character	Setting item	Default value	Data
AT	AT setting	----	
rSET	Auto-reset setting		
P	OUT1 proportional band setting	10℃	
P_b	OUT2 proportional band setting	1.0 times	
I	Integral time setting	200sec	
d	Derivative time setting	50sec	
rn	ARW setting	50%	
c	OUT1 proportional cycle setting	30sec or 3sec	
c_b	OUT2 proportional cycle setting	30sec or 3sec	
A1	A1 value setting	0℃	
A2	A2 value setting	0℃	
H	HB (Heater burnout alarm) value	0.0A	
LP_T	LA (Loop break alarm) time	0 minutes	
LP_H	LA (Loop break alarm) span	0℃	

[Auxiliary function setting mode 1]

Character	Setting item	Default value	Data
Lock	Set value lock selection	Unlock	
SH	SV high limit setting	Input range high limit value	
SL	SV low limit setting	Input range low limit value	
So	Sensor correction setting	0.0℃	
cSPL	Communication protocol selection	Shinko protocol	
cAdd	Instrument number setting	0	
cSPd	Communication speed selection	9600bps	
cPAr	Parity selection	Even	
cSPt	Stop bit selection	1	

[Auxiliary function setting mode 2]

Character	Setting item	Default value	Data
SEnS	Input type selection	K: –200 to 1370℃	
SrLH	Scaling high limit setting	9999	
SrLL	Scaling low limit setting	–1999	
dP	Decimal point place selection	No decimal point	
FILT	PV filter time constant setting	0.0 seconds	
oLH	OUT1 high limit setting	100%	
oLL	OUT1 low limit setting	0%	
HYS	OUT1 ON/OFF action hysteresis	1.0℃	
cAct	OUT2 action mode selection	Air cooling	
oLHb	OUT2 high limit setting	100%	
oLLb	OUT2 low limit setting	0%	
db	Overlap band/Dead band setting	0.0℃	
HYSb	OUT2 ON/OFF action hysteresis	1.0℃	
AL 1F	A1 type selection	No alarm	
AL2F	A2 type selection	No alarm	
A1LA	A1 action Energized/Deenergized	Energized	
A2LA	A2 action Energized/Deenergized	Energized	
A1HY	A1 hysteresis setting	1.0℃	
A2HY	A2 hysteresis setting	1.0℃	
A1dY	A1 action delayed timer setting	0 seconds	
A2dY	A2 action delayed timer setting	0 seconds	
conF	Direct (Cooling)/Reverse (Heating) action selection	Reverse (Heating) action	
AT_b	AT bias setting	20℃	
SV_b	SVTC bias setting	0	
SV2	SV2 indication selection	Indication	
EoUT	Output status selection when input abnormal	Output OFF	
AMnU	OUT/OFF key function selection	OUT/OFF function	

***** Inquiry *****

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

[Example]

- Model ---------- JCM-33A-R/M
- Input type ---------- K
- Option ---------- A2, C5
- Serial number ---------- No. xxxxxx

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