Micro-computer based digital indicating controller   **JCS-33A**

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

⚠ 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.

⚠ Caution

- This instrument should be used according to 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. Not doing so could cause serious injury or malfunction.
- Specifications of the JCS-33A and the contents of this instruction manual are subject to change without notice.
- This instrument is designed to be installed in a control panel. If it is not, measures must be taken to ensure that the operator cannot touch power terminals or other high voltage sections.
- Be sure to turn the power supplied to the instrument OFF before cleaning this instrument.
- Use a soft, dry cloth when cleaning the instrument.
  (Alcohol based substances may cause tarnishing or defacement of the unit.)
- As the display section is vulnerable, do not strike or scratch it with a hard object.
- 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.

1. Model name

1.1 Model name

J C S – 3 3 □–□／□ □, □□□					Series name: JCS-33A (W48 x H48 x D95mm)	
Control action	3				PID	
A1		A			Alarm action can be selected by keypad. *1	
OUT1 (Control output 1)		R			Relay contact: 1a	
		S			Non-contact voltage (for SSR drive): 12^{+2}_{0}V DC	
		A			DC current: 4 to 20mA DC	
Input			M		Multi-range *2	
Supply voltage				1	24V AC/DC *3	
Option				A2	Alarm 2 (A2) *1	
				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
				DT	OUT2 (Heating/Cooling control output)	Non-contact relay
				C5	Serial communication (RS-485)	
				SM	SV1/SV2 external selection	
				LA	Loop break alarm	
				BK	Color Black	
				TC	Terminal cover	

*1: Alarm actions (9 types and No alarm action) and Energized/Deenergized can be selected by keypad.
*2: Thermocouple, RTD, DC current, and DC voltage can be selected by key operation.
*3: Supply voltage 100 to 240V AC is standard. When ordering 24V AC/DC, enter "1" after the input code.

1.2 How to read the model name label

Model name labels are attached to the case and the inner assembly. For Heater burnout alarm output, CT rated current is written in the bracket.

(Model name label)   (e.g.)

(1)----- JCS-33A-R/M   Relay contact output/Multi-range input
(2){   A2   Alarm 2 (A2) output
    W(20A)   Heater burnout alarm output (20A)

(3)----- No.
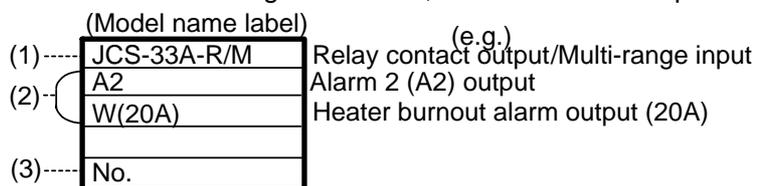
(1): Model name   (2): Option, supply voltage ("1" is entered only for 24V AC/DC)
(3): Serial number (Only on inner assembly)

2. Name and functions of the sections
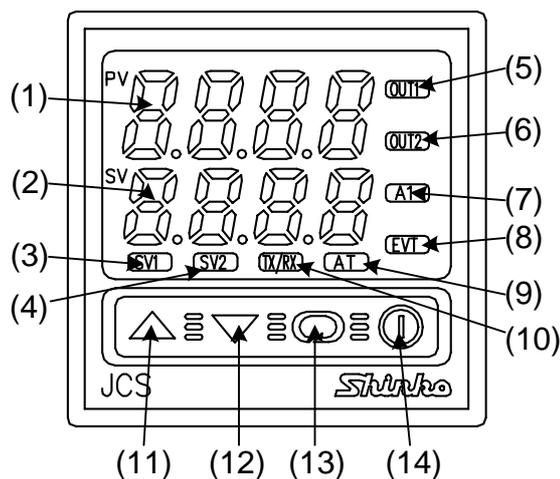
(Fig. 2-1)

(1) **PV display**: Indicates the input value with a red LED.
(2) **SV display**: Indicates the setting value with a green LED.
(3) **SV1 indicator**: A green LED lights up when SV1 is indicated on the SV display.
(4) **SV2 indicator**: A yellow LED lights up when SV2 is indicated on the SV display.
(5) **OUT1 indicator**: When OUT1 or heating output is ON, a green LED lights up. (For A/□ type, it flashes corresponding to the manipulated variable in a 0.25 second cycle)
(6) **OUT2 indicator**: When OUT2 (option DT) is ON, a yellow LED lights up.
(7) **A1 indicator** : When A1 output is ON, a red LED lights up.
(8) **EVT indicator**: When Event output (option: A2, LA or W) is ON, a red LED lights up.
(9) **AT indicator** : When auto-tuning or auto-reset is being performed, a yellow LED flashes.

(10) **TX/RX indicator** : A yellow LED flashes during serial communication output (transmitting).
(11) **Increase key (△)** : Increases the numeric value.
(12) **Decrease key (▽)** : Decreases the numeric value.
(13) **Mode key (◯)** : Selects the setting mode or registers the setting value.
    (By pressing the Mode key, the setting value or selected value can be registered)
(14) **OUT/OFF key (◉)** : The control output ON/OFF function or Auto/Manual control function can be switched. (To cancel the control output ON/OFF function, press the OUT/OFF key again for approx. 1 second.)

⚠ **Notice**

When setting the specifications and functions of this controller, connect terminals 1 and 2 for power source first, then set them referring to Chapter "5. Setup" before performing "3. Mounting to control panel" and "4. Wiring connection".

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3. Mounting to 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:
 • A minimum of dust, and an absence of corrosive gases
 • No flammable, explosive gases
 • Few 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 controller

3.2 External dimensions

(Fig. 3.2-1)

3.3 Panel cutout

75

$45 \, {}^{+0.5}_{0}$

$45 \, {}^{+0.5}_{0}$

$n \times 48\text{-}3 \, {}^{+0.5}_{0}$

$45 \, {}^{+0.5}_{0}$
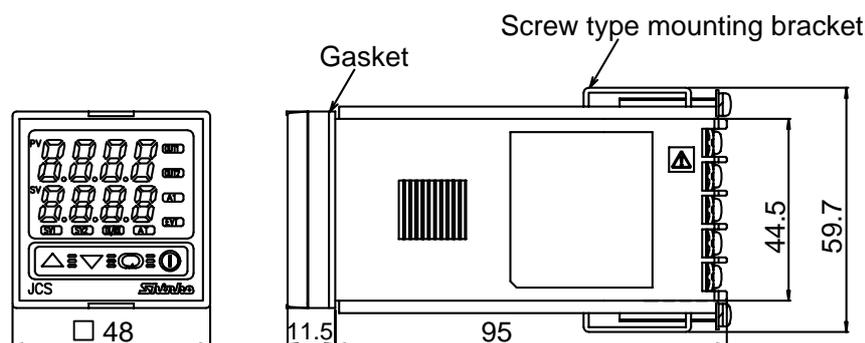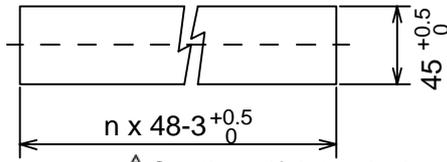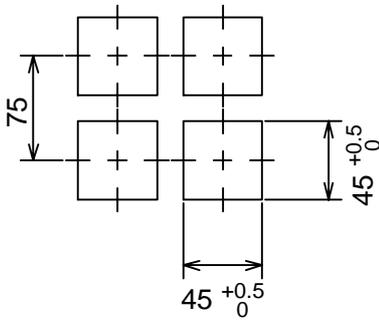
Lateral close mounting
n: Number of units mounted

⚠Caution: If lateral close mounting is used for the controller, IP66 specification will not be fulfilled.

(Fig. 3.3-1)

3.4 CT (Current transformer) external dimensions
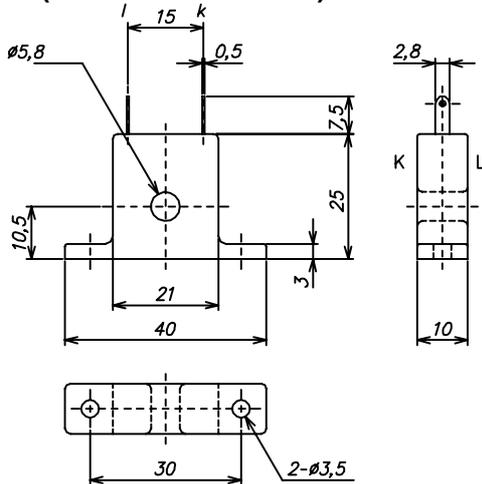
CTL-6S (for 5A, 10A, 20A)
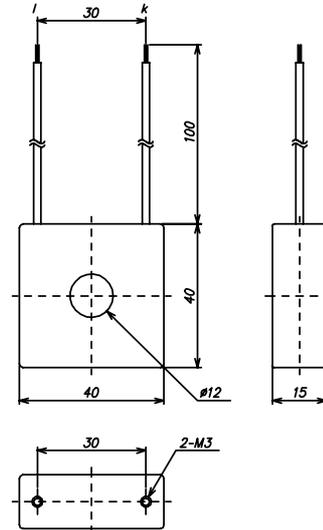
CTL-12-S36-10L1 (for 50A)

(Fig. 3.4-1)

3.5 Mounting

Mount the controller vertically to ensure it adheres to the Dust-proof/Drip-proof specification (IP66).

Mountable panel thickness: Within 1 to 15mm

Insert the controller from the front side of the panel.

Attach the mounting brackets by the holes at the top and bottom of the case and secure the controller in place with the screws.
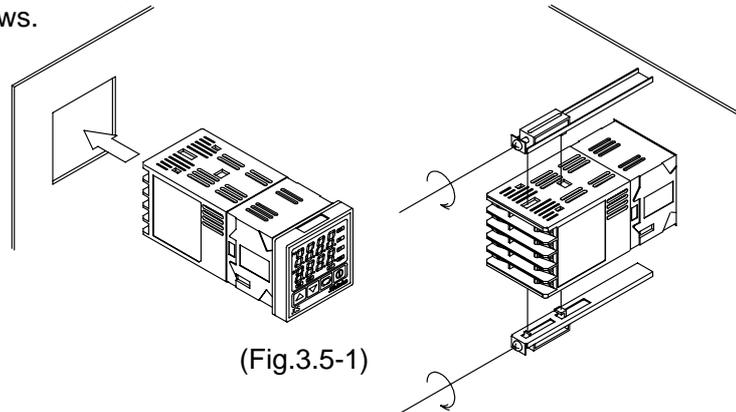
(Fig.3.5-1)

⚠ Caution

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.

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4. Wiring connection

⚠ Warning

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

(Fig. 4-1)

- OUT1 : Control output 1 (Heating output)
- OUT2 : Control output 2 (Cooling output)
- A1 : Alarm 1 output
- EVT : Event output (A2 output, Heater burnout alarm output, Loop break alarm output)
- CT : CT input
- SV2 : Main setting 2 (SV2)
- RS-485: Serial communication (RS-485)
- TC : Thermocouple
- RTD : Resistance temperature detector
- DC : DC current, DC voltage
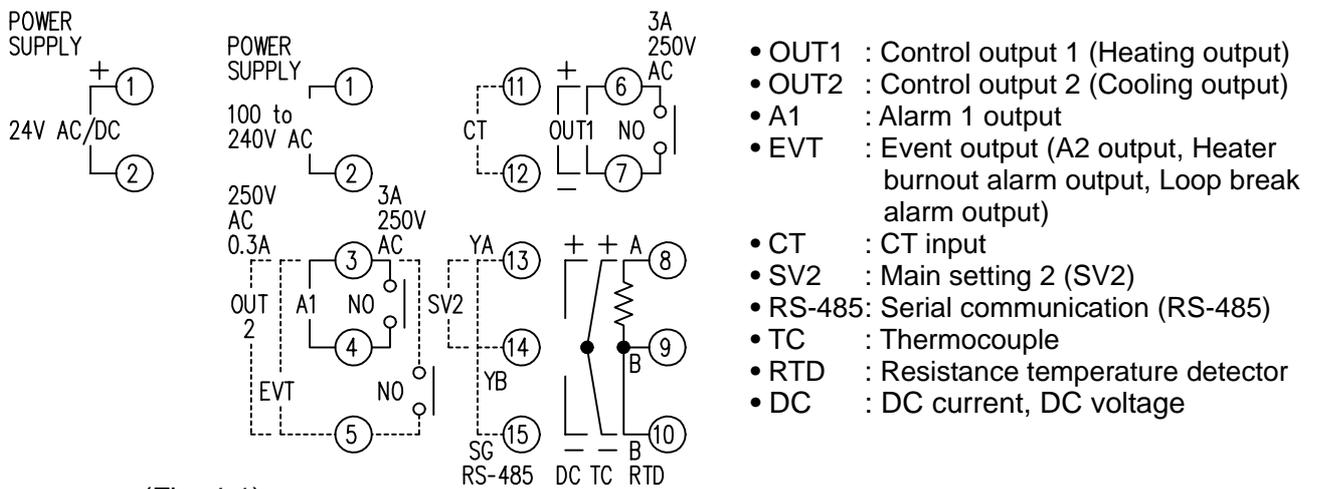
⚠ Notice

- The terminal block of the JCS-33A is designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened by the terminal screw.
- Dotted lines are optional.
- Use a thermocouple and compensating lead wire that correspond to the sensor input specification of this controller.
- Use the 3-wire RTD which corresponds to the input specification of this controller.
- This controller does not have built-in power switch, circuit breaker or fuse. Therefore, 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)
- **For a 24V AC/DC power source, do not confuse polarity when using direct current (DC).**
- When using a relay contact output type, externally use a relay according to the capacity of the load to protect the built-in relay contact.
- When wiring, keep input wires (thermocouple, RTD, etc.) away from AC sources or load wires to avoid external interference.
- Do not apply a commercial power source to the sensor connected to the input terminal nor allow the power source to come into contact with the sensor.

Lead wire solderless terminal

Use a solderless terminal with an insulation sleeve in which an M3 screw fits as shown below. The torque is approximately 0.6N•m to 1.0N•m.

Solderless terminal	Manufacturer	Model name	Tightening torque
Y type	Nichifu Terminal Industries CO.,LTD.	1.25Y-3	0.6N•m Max. 1.0N•m
	Japan Solderless Terminal MFG CO.,LTD.	VD1.25-B3A	
Round type	Nichifu Terminal Industries CO.,LTD.	1.25-3	
	Japan Solderless Terminal MFG CO.,LTD.	V1.25-3	
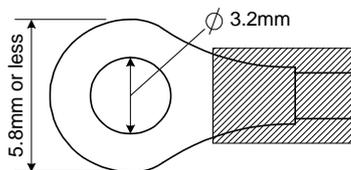
(Fig. 4-2)
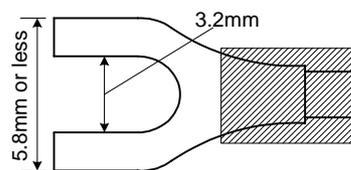
Option: Heater burnout alarm

(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 the CT wire away from AC sources or load wires to avoid the external interference.

(Fig. 4-3)

4
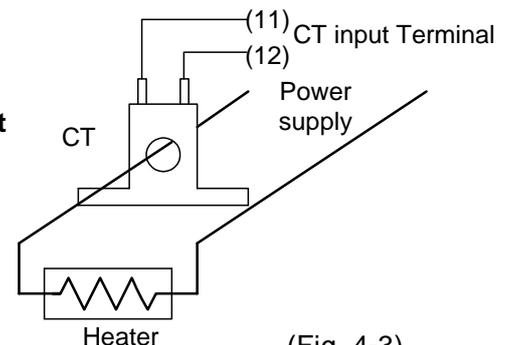
5. Setup

Wire the power terminals only. After the power is turned on, the sensor input characters and temperature unit are indicated on the PV display and the input range high limit value is indicated on the SV display for approximately 3 seconds. (Table 5-1)

(If any other value is set during the scaling high limit setting, the set value is indicated on the SV display)

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

Control will then start and the input value will be indicated on the PV display and main setting value (SV) will be indicated on the SV display. (While control output OFF function is working, oFF is indicated on the PV display.)

(Table 5-1)

Sensor input	℃		℉	
	PV display	SV display	PV display	SV display
K	t C	1370	t F	2500
	t .C	4000	t .F	7500
J	J C	1000	J F	1800
R	r C	1760	r F	3200
S	5 C	1760	5 F	3200
B	b C	1820	b F	3300
E	E C	800	E F	1500
T	r .C	4000	r .F	7500
N	n C	1300	n F	2300
PL-Ⅱ	PL2C	1390	PL2F	2500
C (W/Re5-26)	c C	2315	c F	4200
Pt100	Pr .C	8500	Pr .F	9999
	Pr C	850	Pr F	1500
JPt100	JPr.C	5000	JPr.F	9000
	JPrC	500	JPrF	900
4 to 20mA DC *	420A	Scaling high limit value	420A	Scaling high limit value
0 to 20mA DC *	020A		020A	
0 to 1V DC	0 1U		0 1U	
0 to 5V DC	0 5U		0 5U	
1 to 5V DC	1 5U		1 5U	
0 to 10V DC	0 10U		0 10U	

* 50Ω shunt resistor (sold separately) must be installed between input terminals.

5.2 Main setting mode

Character	Name, Function, Setting range	Default value
५	**SV1** • Sets SV1. • Setting range: SV low limit to SV high limit	0℃
५2	**SV2** • Sets SV2. • Available only when the option SM is applied. • Setting range: SV low limit to SV high limit	0℃

5.3 Sub setting mode

Character	Name, Function, Setting range	Default value
AC r5Er	**AT setting/Auto-reset setting** • Designates auto-tuning Performance or auto-reset Performance. • If the auto-tuning is cancelled during the process, P, I and D values revert to the former value at which AT is performed. • When auto-tuning has not finished after 4 hours, it is cancelled automatically. • Auto-reset is cancelled in approximately 4 minutes.	- - - -
P	**OUT1 proportional band setting** • Sets the proportional band for OUT1. • OUT1 becomes ON/OFF action when set to 0 or 0.0 • 0 to 1000℃(2000℉), 0.0 to 999.9℃(℉) or 0.0 to 100.0%	10℃
P_b	**OUT2 proportional band setting** • Sets the proportional band for OUT2. • OUT2 becomes ON/OFF action when OUT1 proportional band is set to 0 or 0.0. • Not available if option DT is not added or if OUT1 is ON/OFF action. • 0.0 to 10.0 times (multiplying factor to OUT1 proportional band)	1.0 times

5.1 Operation flowchart

Outline of operation procedure
Operation before running

[Step 1   Initial setting] : Set Input type, Alarm action type, control action, etc. in Auxiliary function setting mode 2.

[Step 2   Main setting mode]: Set SV (desired value) in the Main setting mode.

[Step 3   Sub setting mode]: Set PID values and Alarm setting values in the Sub setting mode.

[Step 4   Auxiliary function setting mode 1]: Set Setting value Lock, SV high limit and SV low limit in Auxiliary function setting mode 1. (If Step 4 is not necessary, skip this step.)

Running

Alarm 1 (A1) setting procedure
[Numbers (1) to (5) are indicated on the flowchart.]

(1) [A1 action selection]: Select an alarm type.
[If an alarm type except for ` - - - - ` is selected, items (2) to (5) are indicated and they can be set if necessary.]

(2) [A1 action Energized/Deenergized selection]: Select Alarm 1 contact output ON (Energized: `noñL`) or OFF (Deenergized: `rEьь`).

(3) [A1 hysteresis setting]: Set A1 hysteresis.

(4) [A1 action delayed timer setting]: Set A1 action delayed time. (If input enters alarm action range and setting time has passed, the alarm is activated.)

(5) [A1 setting]: Set action point of A1 output.

[Note] If an alarm action is changed, the alarm setting value becomes 0 (0.0). Therefore it is necessary to reset it.

Control output OFF function or Auto/Manual control function	Press ① (OUT/OFF) key for approx. 1s.	**PV/SV display**	Press the ◯ key.	**Output manipulated variable (MV) indication**

Press the ◯ key for approx. 3s.

Press the ◯ key. **[Main setting mode]**	Press the ◯ key while holding down the △ key. **[Sub setting mode]**	Press the ◯ for approx. 3s while holding down ▽. **[Auxiliary function setting mode 1]**

[Main setting mode]

SV1 (Desired value)
| PV ь | SV Set value |

SV2 (Desired value)
| PV ь2 | SV Set value |

Reverts to PV/SV display.

Explanation of the ◯ key
◯: If the ◯ key is pressed, the set value is saved, and the controller proceeds to the next setting item.

[Sub setting mode]

AT/Auto-reset setting
| PV AΓ rьEΓ | SV Selected value |
- If AT is cancelled during the process, PID values revert to previous value.
- Auto-reset is automatically cancelled in 4 minutes.

OUT1 proportional band
| PV P | SV Set value |
- Set the value with the △, ▽ keys.
- ON/OFF action when set to 0 or 0.0

OUT2 proportional band
| PV P_b | SV Set value |
- Set the value with the △, ▽ keys.
- Available when Heating/Cooling control (OUT2) is added

Integral time setting
| PV ι | SV Set value |
- Set the value with the △, ▽ keys.
- PD action when set to 0, and auto-reset can be performed.

Derivative time setting
| PV d | SV Set value |
- Set the value with the △, ▽ keys.
- Setting the value to 0 disables the function.

ARW setting
| PV ñ | SV Set value |
- Set the value with △, ▽ keys.
- Available for PID action

OUT1 proportional cycle setting
| PV ς | SV Set value |
- Set the value with △, ▽ keys.
- Not available for DC current output or when OUT1 is ON/OFF action

OUT2 proportional cycle setting
| PV ς_b | SV Set value |
- Set the value with △, ▽ keys.
- Not available when OUT2 is ON/OFF action

(5) A1 setting
| PV A1 | SV Set value |
- Set the value with △, ▽ keys.
- Not available if ` - - - - ` is selected during A1 action selection

A2 setting
| PV A2 | SV Set value |
- Set the value with △, ▽ keys.
- Not available if ` - - - - ` is selected during A2 action selection

Heater burnout alarm
| PV H | SV Set value |
- Set the value with △, ▽ keys.
- OFF when set to 0.0

Loop break alarm time
| PV LP_Γ | SV Set value |
- Set the value with △, ▽ keys.
- Available only when option LA is added.

Loop break alarm span
| PV LP_H | SV Set value |
- Set the value with △, ▽ keys.
- Available only when option LA is added.

Reverts to the PV/SV display.

[Auxiliary function setting mode 1]

Setting value Lock selection
| PV Loсь | SV Selected value |
- Make a selection with the △, ▽ keys.
- If Lock 1 or Lock 2 is designated, AT or Auto-reset does not work.
- Be sure to designate Lock 3 when using Serial communication.

SV high limit setting
| PV ьH | SV Set value |
- Set the value with △, ▽ keys.

SV low limit setting
| PV ьL | SV Set value |
- Set the value with △, ▽ keys.

Sensor correction
| PV ьo | SV Set value |
- Set the value with △, ▽ keys.

Communication protocol
| PV сñьL | SV Selected value |
- Make a selection with △, ▽ keys.
- Not available for `noñL` indication

Instrument number
| PV сñno | SV Set |
- Set the value with △, ▽ keys.

Communication speed
| PV сñьP | SV Selected value |
- Make a selection with △, ▽ keys.

Parity selection
| PV сñPr | SV Selected value |
- Make a selection with △, ▽ keys.
- Not available if `noñL` is selected during Communication protocol selection

Stop bit selection
| PV сñьΓ | SV Set value |
- Set the value with △, ▽ keys.
- Not available if `noñL` is selected during Communication protocol selection

Reverts to the PV/SV display.

Setting items with dotted lines are optional and they appear only when the options are added.

6

i	**Integral time setting** • Sets integral time for OUT1. • Setting the value to 0 disables the function. • Not available when OUT1 is ON/OFF action. • Auto-reset can be performed when PD is control action (I=0). • Setting range: 0 to 1000 seconds	200 seconds
d	**Derivative time setting** • Sets derivative time for OUT1. • Setting the value to 0 disables the function. • Not available when OUT1 is ON/OFF action. • Setting range: 0 to 300 seconds	50 seconds
$\sqcap$	**ARW setting** • Sets ARW for OUT1. • Available only when PID is the control action. • Setting range: 0 to 100%	50%
c	**OUT1 proportional cycle setting** • Sets proportional cycle for OUT1. • Not available when OUT1 is DC current output type or ON/OFF action. • Setting range: 1 to 120 seconds	30 seconds or 3 seconds
c_b	**OUT2 proportional cycle setting** • Sets proportional cycle for OUT2. • Not available if the option DT is not applied or when OUT2 is ON/OFF action. • Setting range: 1 to 120 seconds	3 seconds
$A1$	**A1 setting** • Sets action point for A1 output. • Not available if No alarm action is selected during A1 action selection • Refer to (Table 5.3-1).	0℃
$A2$	**A2 setting** • Sets action point for A2 output. • Not available if option A2 is not applied or if No alarm action is selected during A2 action selection. • Refer to (Table 5.3-1).	0℃
H☐☐☐, ☐XX.X indicated in turn	**Heater burnout alarm setting** • Sets the heater current value for Heater burnout alarm. • Self-holding is not available for the alarm output. • Available only when the option W is added. • 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	0.0A
LP_r	**Loop break alarm time setting** • Sets the time to assess the Loop break alarm. • Available only when the option LA is applied. • Setting range: 0 to 200 minutes	0 minutes
LP_H	**Loop break alarm span setting** • Sets the temperature to assess the Loop break alarm. • Available only when the option LA is applied. • Setting range: 0 to 150℃ (℉), 0.0 to 150.0℃ (℉) or 0 to 1500	0℃

(Table 5.3-1)

Alarm action	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 value to input range high limit value *2
Process low alarm	Input range low limit value to input range high limit value *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 input has a decimal point, the negative lower limit value is –199.9, and the positive upper limit value is 999.9.
• All alarm actions except process value alarms are ±deviation setting from the main setting.
*1: For DC input, the input span is the same as the scaling span.
*2: For DC input, input range low (or high) limit value is the same as scaling low (or high) limit value.

Input type (character indication) and range		
K	−200 to 1370℃: ヒ し	K	−320 to 2500 ℉: ヒ F
	−199.9 to 400.0℃: ヒ .し		−199.9 to 750.0℉: ヒ .F
J	−200 to 1000 ℃: ﾉ し	J	−320 to 1800 ℉: ﾉ F
R	0 to 1760 ℃: ﾚ し	R	0 to 3200 ℉: ﾚ F
S	0 to 1760 ℃: �

Input type (character indication) and range	
K −200 to 1370℃: ヒ し −199.9 to 400.0℃: ヒ .し J −200 to 1000 ℃: ﾉ し R 0 to 1760 ℃: ﾚ し S 0 to 1760 ℃: ﾐ し B 0 to 1820 ℃: ﾋ し E −200 to 800 ℃: E し T −199.9 to 400.0℃: ﾄ .し N −200 to 1300 ℃: ﾝ し PL-Ⅱ 0 to 1390 ℃: PL2し C(W/Re5-26)0 to 2315 ℃: ﾋ し	K −320 to 2500 ℉: ヒ F −199.9 to 750.0℉: ヒ .F J −320 to 1800 ℉: ﾉ F R 0 to 3200 ℉: ﾚ F S 0 to 3200 ℉: ﾐ F B 0 to 3300 ℉: ﾋ F E −320 to 1500 ℉: E F T −199.9 to 750.0℉: ﾄ .F N −320 to 2300 ℉: ﾝ F PL-Ⅱ 0 to 2500 ℉: PL2F C(W/Re5-26) 0 to 4200 ℉: ﾋ F
Pt100 −199.9 to 850.0℃: Pﾄ .し JPt100 −199.9 to 500.0 ℃: ﾉPﾄ.し Pt100 −200 to 850 ℃: Pﾄ し JPt100 −200 to 500 ℃: ﾉPﾄし	Pt100 −199.9 to 999.9℉: Pﾄ .F JPt100 −199.9 to 900.0℉: ﾉPﾄ.F Pt100 −300 to 1500℉: Pﾄ F JPt100 −300 to 900℉: ﾉPﾄF
4 to 20mA DC −1999 to 9999: 420A 0 to 20mA DC −1999 to 9999: 020A 0 to 1V DC −1999 to 9999: 0 1ﾋ 0 to 5V DC −1999 to 9999: 0 5ﾋ 1 to 5V DC −1999 to 9999: 1 5ﾋ 0 to 10V DC −1999 to 9999: 010ﾋ	

Alarm action type

High limit alarm: The alarm action is ±deviation setting from the SV. The alarm is activated if the input value reaches the high limit setting value. Character indication: H

Low limit alarm: The alarm action is ±deviation setting from the SV. The alarm is activated if the input value goes under the low limit setting value. Character indication: L

High/Low limits alarm: Combines High limit and Low limit alarm actions. When input value reaches high limit setting value or goes under the low limit setting value, the alarm is activated. Character indication: HL

High/Low limit range alarm: When input value is between the high limit setting value and low limit setting value, the alarm is activated. Character indication: ﾋ d

Process value alarm: Within the scale range of the controller, alarm action points can be set at random and if the input reaches the randomly set action point, the alarm is activated.
Character indication: Process high alarm Aﾋ, Process low alarm rAﾋ

Alarm with standby function: When the power to the controller is turned on, even if the input enters the alarm action range, the alarm is not activated. (If the controller is allowed to keep running, once the input exceeds the alarm action point, the standby function will be released.)
Character indication:
High limit alarm with standby : H ﾋ
Low limit alarm with standby : L ﾋ
High/Low limits alarm with standby : HL ﾋ

Press the ◯ key for approx. 3s while holding down the △ and ▽ keys.

[Auxiliary function setting mode 2]

Input type selection PV ﾋEnﾋ SV Selected value	• Make a selection with the △, ▽ keys. • Default value: ヒ し

Scaling high limit PV ﾋﾚLH SV Set value	• Set the value with the △, ▽ keys. • Available for DC current, DC voltage input

Scaling low limit PV ﾋﾚLL SV Set value	• Set the value with the △, ▽ keys. • Available for DC current, DC voltage input

Decimal point place PV dP SV Selected value	• Make a selection with the △, ▽ keys. • Available for DC current, DC voltage input

PV filter time constant setting PV FiLﾚ SV Set value	• Set the value with the △, ▽ keys.

OUT1 high limit PV oLH SV Set value	• Set the value with the △, ▽ keys. • Not available for ON/OFF action

OUT1 low limit PV oLL SV Set value	• Set the value with the △, ▽ keys. • Not available for ON/OFF action

OUT1 ON/OFF action hysteresis PV HYﾋ SV Set value	• Set the value with the △, ▽ keys. • Not available for ON/OFF action

OUT2 action mode PV cAcﾚ SV Selected value	• Make a selection with the △, ▽ keys. • Available if Heat/Cool control (OUT2) is added

OUT2 high limit setting PV oLHb SV Set value	• Set the value with the △, ▽ keys. • Available if Heat/Cool control (OUT2) is added

OUT2 low limit setting PV oLLb SV Set value	• Set the value with the △, ▽ keys. • Available if Heat/Cool control (OUT2) is added

Overlap/Dead band setting PV db SV Set value	• Set the value with the △, ▽ keys. • Available only when Heat/Cool control (OUT2) is added

OUT2 ON/OFF action hysteresis setting PV HYﾋb SV Set value	• Set the value with △, ▽ keys. • Available only when Heat/Cool control (OUT2) is added

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(1)	A1 action selection PV AL 1F SV Selected value	• Make a selection with the △, ▽ keys. • Default value: − − − −

	A2 action selection PV AL2F SV Selected value	• Make a selection with the △, ▽ keys. • Available when A2 is added

(2)	A1 action Energized/Deenergized setting PV A 1Lﾐ SV Selected value	• Make a selection with the △, ▽ keys. • Not available if − − − − is selected in A1 action selection

	A2 action Energized/Deenergized setting PV A2Lﾐ SV Selected value	• Make a selection with the △, ▽ keys. • Not available if − − − − is selected in A2 action selection

(3)	A1 hysteresis setting PV A 1HY SV Set value	• Set the value with the △, ▽ keys. • Not available if − − − − is selected in A1 action selection

	A2 hysteresis setting PV A2HY SV Set value	• Set the value with the △, ▽ keys. • Not available if − − − − is selected in A2 action selection

(4)	A1 action delayed timer setting PV A 1dY SV Set value	• Set the value with the △, ▽ keys. • Not available if − − − − is selected in A1 action selection

	A2 action delayed timer setting PV A2dY SV Set value	• Set the value with the △, ▽ keys. • Not available if − − − − is selected in A2 action selection

Direct/Reverse control PV conﾚ SV Selected value	• Make a selection with the △, ▽ keys. • Default value: HEAﾚ

AT bias setting PV Aﾚ_b SV Set value	• Set the value with the △, ▽ keys. • Available for thermocouple, RTD input

SVTC bias setting PV ﾋﾋ_b SV Set value	• Set the value with the △, ▽ keys. • Available only when option C5 is added.

SV2 indication selection PV ﾋﾋ□2 SV Selected value	• Make a selection with the △, ▽ keys. • Available only when option SM is added.

Output status selection when input abnormal PV EoUﾚ SV Selected value	• Make a selection with the △, ▽ keys. • Available only when input is DC current and DC voltage with DC current output.

OUT/OFF key function PV ﾐAnU SV Selected value	• Make a selection with the △, ▽ keys.

Reverts to the PV/SV display.

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5.4 Auxiliary function setting mode 1

Character	Name, Function, Setting range	Default value
Lock	**Setting value lock selection**	Unlock

	• Locks the setting values to prevent setting errors. The setting item to be locked depends on the designation.
	• When Lock 1 or Lock 2 is designated, PID Auto- tuning and Auto-reset cannot be carried out.
	• Be sure to select Lock 3 when changing the setting value frequently via communication function considering the life of non-volatile memory.
	• – – – – (Unlock): All setting values can be changed.
	  Loc 1 (Lock 1): None of the setting values can be changed.
	  Loc2 (Lock 2): Only main setting value can be changed.
	  Loc3 (Lock 3): All setting values except for Input type selection can be changed. However, changed values revert to their former value after 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 the SV and Alarm setting.	

SH	**SV high limit setting**	Input range high limit value
	• Sets the SV high limit. • Setting range: SV low limit to input range high limit value or SV low limit to scaling high limit value	
SL	**SV low limit setting**	Input range low limit value
	• Sets the SV low limit. • Setting range: Input range low limit value to SV high limit or scaling low limit value to SV high limit	
So	**Sensor correction setting**	0.0℃
	• Sets the correction value for the sensor. PV= Current actual temperature + Sensor correction value • Setting range: –100.0 to 100.0℃（℉), or –1000 to 1000	
cMSL	**Communication protocol selection**	Shinko protocol
	• Selects communication protocol. • Available only when the option C5 is applied. • Shinko protocol : *noML*, Modbus ASCII mode : *ModA*, Modbus RTU mode : *Modr*	
cMno	**Instrument number setting**	0
	• Sets the instrument number individually to each instrument when communicating by connecting plural instruments in serial communication. • Available only when option C5 is added. • Setting range: 0 to 95	
cMSP	**Communication speed selection**	9600bps
	• Selects a communication speed equal to that of the host computer. • Available only when option [C5] is added. • 2400bps: *24*, 4800bps: *48*, 9600bps: *96*, 19200bps: *192*	
cMPr	**Parity selection**	Even parity
	• Selects the parity. • Not available when the option C5 is not added or when Shinko protocol is selected in the Communication protocol selection. • No parity: *nonE*, Even parity: *EUEn*, Odd parity: *odd*	
cMSr	**Stop bit selection**	1
	• Selects the stop bit. • Not available when option C5 is not added or when Shinko protocol is selected in the Communication protocol selection. • Setting range: 1, 2	

5.5 Auxiliary function setting mode 2

Character	Name, Function, Setting range	Default value
SEnS	**Input type selection**	K (–200 to 1370℃) ℃/℉
	• The input type can be selected from thermocouple (10 types), RTD (2 types), DC current (2 types) and DC voltage (4 types), and the unit ℃/℉ can be selected as well. • When changing the input from DC voltage to other inputs, remove the sensor connected to this controller first, then change for the input. If the input is changed with the sensor connected, the input circuit may be broken.	

K	–200 to 1370℃: *t L*	K	–320 to 2500 ℉: *t F*	
	–199.9 to 400.0℃: *t .L*		–199.9 to 750.0℉: *t .F*	
J	–200 to 1000 ℃: *J L*	J	–320 to 1800 ℉: *J F*	
R	0 to 1760 ℃: *r L*	R	0 to 3200 ℉: *r F*	

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	S 0 to 1760 ℃: `5 C` B 0 to 1820 ℃: `b C` E −200 to 800 ℃: `E C` T −199.9 to 400.0℃: `r .C` N −200 to 1300 ℃: `n C` PL-Ⅱ 0 to 1390 ℃: `PL2C` C (W/Re5-26) 0 to 2315 ℃: `c C` Pt100 −199.9 to 850.0℃: `Pr .C` JPt100 −199.9 to 500.0℃: `JPr.C` Pt100 −200 to 850 ℃: `Pr C` JPt100 −200 to 500 ℃: `JPrC` 4 to 20mA −1999 to 9999: `420A` 0 to 20mA −1999 to 9999: `020A` 0 to 1V −1999 to 9999: `0 1U` 0 to 5V −1999 to 9999: `0 5U` 1 to 5V −1999 to 9999: `1 5U` 0 to 10V −1999 to 9999: `0 10U`	S 0 to 3200 ℉: `5 F` B 0 to 3300 ℉: `b F` E −320 to 1500 ℉: `E F` T −199.9 to 750.0℉: `r .F` N −320 to 2300 ℉: `n F` PL-Ⅱ 0 to 2500 ℉: `PL2F` C (W/Re5-26) 0 to 4200 ℉: `c F` Pt100 −199.9 to 999.9℉: `Pr .F` JPt100 −199.9 to 900.0℉: `JPr.F` Pt100 −300 to 1500℉: `Pr F` JPt100 −300 to 900 ℉: `JPrF`

`5rLH`	**Scaling high limit setting** • Sets scaling high limit value. • Available only for DC inputs • Setting range: Scaling low limit value to input range high limit value	9999
`5rLL`	**Scaling low limit setting** • Sets scaling low limit value. • Available only for DC inputs • Setting range: Input range low limit value to scaling high limit value	−1999
`dP`	**Decimal point place selection** • Selects decimal point place. • Available only for DC inputs • 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`	No decimal point
`FILr`	**PV filter time constant setting** • 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	0.0 seconds
`oLH`	**OUT1 high limit setting** • Sets the high limit value of OUT1. • Not available when OUT1 is ON/OFF action • Setting range: OUT1 low limit value to 105% (Setting greater than 100% is effective to DC current output)	100%
`oLL`	**OUT1 low limit setting** • Sets the low limit value of OUT1. Not available when OUT1 is ON/OFF action. • Setting range: −5% to OUT1 high limit value (Setting less than 0% is effective to DC current output)	0%
`HY5`	**OUT1 ON/OFF action hysteresis setting** • Sets ON/OFF action hysteresis for OUT1. • Available only when OUT1 is ON/OFF action • Setting range: 0.1 to 100.0℃ (℉), or 1 to 1000	1.0℃
`cAcr`	**OUT2 action mode selection** • Selects OUT2 action from air, oil and water cooling. • Not available when the option DT is not added or when OUT2 is ON/OFF action • Air cooling: `Ai r`, oil cooling: `oi L`, water cooling: `uAr`	Air cooling
`oLHb`	**OUT2 high limit setting** • Sets the high limit value of OUT2. • Not available when the option DT is not added or when OUT2 is ON/OFF action • Setting range: OUT2 low limit value to 105% (Setting greater than 100% is effective to DC current output)	100%
`oLLb`	**OUT2 low limit setting** • Sets the low limit value of OUT2. • Not available when the option DT is not added or when OUT2 is ON/OFF action • Setting range: −5% to OUT2 high limit value (Setting less than 0% is effective to DC current output)	0%

db	**Overlap band/Dead band setting**	0℃
	• Sets the overlap band or dead band for OUT1 and OUT2. 　+ setting value: Dead band,　－ setting value: Overlap band • Available only when the option DT is added • Setting range: –100.0 to 100.0℃（℉）, or 1 to 1000	
HY5b	**OUT2 ON/OFF action hysteresis setting**	1.0℃
	• Sets ON/OFF action hysteresis for OUT2. • Available only when the option DT is added • Setting range: 0.1 to 100.0℃（℉）, or 1 to 1000	
AL 1F	**A1 action selection**	No alarm action
	• Selects an action for A1. 　No alarm action　　: `----`　Process high alarm　　　: *A5* 　High limit alarm　　: *H*　　Process low alarm　　　 : *rA5* 　Low limit alarm　　 : *L*　　High limit alarm with standby: *H ꞈ* 　H/L limits alarm　　 : *HL*　Low limit alarm with standby : *L ꞈ* 　H/L limit range alarm: *ꞈ d*　H/L limits alarm with standby: *HL ꞈ*	
AL 2F	**A2 action selection**	No alarm action
	• Selects an action for A2. • Available only when alarm A2 is added • Action selection and default value are the same as those of A1 action selection.	
A 1Lꞎ	**A1 action Energized/Deenergized selection**	Energized
	• Selects Energized/Deenergized for A1. • Not available if No alarm action is selected in A1 action selection • Energized: *noꞎL*　　Deenergized: *rE85*	
A2Lꞎ	**A2 action Energized/Deenergized selection**	Energized
	• Selects Energized/Deenergized for A2. • Not available if alarm A2 is not added or if No alarm action is selected during A2 action selection • Action selection and default value are the same as those of A1 action Energized/Deenergized selection.	
A 1HY	**A1 hysteresis setting**	1.0℃
	• Sets hysteresis for A1. • Not available if No alarm action is selected in A1 action selection • Setting range: 0.1 to 100.0℃（℉）, or 1 to 1000	
A2HY	**A2 hysteresis setting**	1.0℃
	• Sets hysteresis for A2. • Not available if alarm A2 is not added or if No alarm action is selected during A2 action selection • Setting range: 0.1 to 100.0℃（℉）, or 1 to 1000	
A 1dY	**A1 action delayed timer setting**	0 seconds
	• Sets action delayed timer for A1. 　When setting time has passed after the input enters the alarm output range, the alarm is activated. • Not available if No alarm action is selected in A1 action selection • Setting range: 0 to 9999 seconds	
A2dY	**A2 action delayed timer setting**	0 seconds
	• Sets action delayed timer for A2. 　When setting time has passed after the input enters the alarm output range, the alarm is activated. • Not available if alarm A2 is not added or if No alarm action is selected during A2 action selection • Setting range: 0 to 9999 seconds	
conꞋ	**Direct/ Reverse action selection**	Reverse (Heating) action
	• Selects Reverse (Heating) or Direct (Cooling) action. • Reverse (Heating): *HEAꞋ*　　Direct (Cooling): *cooL*	
AꞋ_b	**AT bias setting**	20℃
	• Sets bias value during PID auto-tuning. • Not available for DC inputs • Setting range: 0 to 50℃(0 to 100℉), or 0.0 to 50.0℃(0.0 to100.0℉)	
58_b	**SVTC bias setting**	0
	• Control desired value adds SVTC bias value to the value received by the SVTC command. • Available only when option C5 is added • Converted value of ±20% of the rated value or ±20% of the scaling range	

५४२	**SV2 indication selection** • Selects either Indication or No indication of SV2. • Available only when the option SM is added. • oFF (No indication), on (Indication)	Indication
EoUr	**Output status selection when input abnormal** • Selects the output status when DC input is overscale or underscale. Refer to "Input abnormality indication" on page 17. • Available only for DC current output with DC input • oFF: OFF(4mA) or OUT1(OUT2) low limit on : Outputs a value between OFF(4mA) and ON(20mA) or between OUT1(OUT2) low limit value and OUT1(OUT2) high limit value, depending on a deviation.	Output OFF
ⅿAnU	**OUT/OFF key function selection** • Selects the OUT/OFF key function if it is used for control output OUT/OFF function or for Auto/Manual control function. • oFF (OUT/OFF function), ⅿAnU (Auto/Manual control function)	OUT/OFF function

Sensor correction function

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

Energized/Deenergized

When [alarm action Energized] is selected, the alarm output (between 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.

When [alarm action Deenergized] is selected, the alarm output (between 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.

High limit alarm (when Energized is set)   **High limit alarm (when Deenergized is set)**
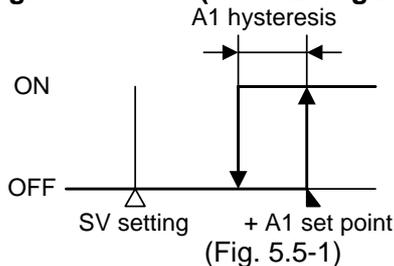
(Fig. 5.5-1)   (Fig. 5.5-2)
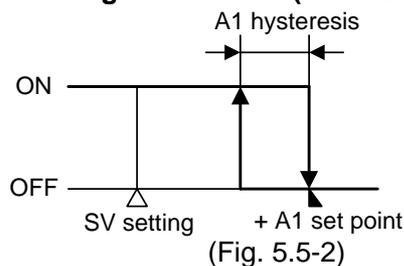
5.6 Auto/Manual control function

Name, Functions
Auto/Manual control function • If Auto/Manual control function is selected in the OUT/OFF key function selection, Automatic or Manual control function can be switched by pressing the Ⓞ key in the PV/SV display mode. If control action is switched from automatic to manual or vice versa, balanceless-bumpless function works to prevent sudden change of manipulated variable. When automatic control is switched to manual control, the 1st dot from the right on the SV display flashes, and the output manipulated variable (MV) can be increased or decreased by pressing △ or ▽ key to perform the control. By pressing the Ⓞ key again, the mode reverts to the PV/SV display mode (automatic control). (Whenever the power to the controller is turned on, automatic control starts.)

5.7 Control output OFF function

Character	Name, Functions
oFF	**Control output OFF function** • A function to pause the control action or turn the control output of the unused instrument of the plural units OFF even if the power to the instrument is supplied. [oFF] is indicated on the PV display while the function is working. • 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.

5.8 Output manipulated variable (MV) indication

Name, Functions
Output manipulated variable indication • **In the PV/SV display mode, press the ◎ key for approx. 3 seconds.** Keep pressing the ◎ key until the output manipulated variable appears, though the main setting mode appears temporarily during the process. (The SV display indicates output manipulated variable and the decimal point flashes at a cycle of every 0.5 second). If the ◎ key is pressed again, the mode reverts to the PV/SV display.

6. Running

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

(1) Switch power supply to the JCS-33A ON.

Switch power supply to the JCS-33A ON.

- For approx. 3s after the power is switched ON, the sensor input character and the temperature unit are indicated on the PV display and input range high limit value is indicated on the SV display. See (Table 5-1). (If any other value has been set in the scaling high limit setting, the set value is indicated on the SV display.) During this time, all outputs and LED indicators are in OFF status.
- After that, control starts indicating input value on the PV display, and main setting value on the SV display.
- While the Control output OFF function is working, oFF is indicated on the PV display.

(2) Input each setting value. Input each setting 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 setting value.

7. Action explanation

7.1 OUT1 action

part : Acts ON or OFF.

7.2 EVT (Heater burnout alarm) action

7.3 OUT1 ON/OFF action

part: Acts ON or OFF.

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7.4 Temperature alarm action

	High limit alarm	Low limit alarm	High/Low limits alarm
Alarm action	ON / OFF — A1 hysteresis; −A1 set point, SV setting, +A1 set point	ON / OFF — A1 hysteresis; −A1 set point, SV setting, A1 set point	ON / OFF — A1 hysteresis; A1 set point, SV setting, A1 set point
	High/Low limit range alarm	**Process high alarm**	**Process low alarm**
Alarm action	ON / OFF — A1 hysteresis; A1 set point, SV setting, A1 set point	ON / OFF — A1 hysteresis; A1 set point	ON / OFF — A1 hysteresis; A1 set point
	High limit alarm with standby	**Low limit alarm with standby**	**High/Low limit alarm with standby**
Alarm action	ON / OFF — A1 hysteresis; −A1 set point, SV setting, +A1 set point	ON / OFF — A1 hysteresis; −A1 set point, SV setting, +A1 set point	ON / OFF — A1 hysteresis; A1 set point, SV setting, A1 set point

▨ : Standby functions in this section.

A1 indicator lights up when A1 output terminals 3 and 4 are connected, and goes out when they are disconnected.

7.5 OUT2 (Heating/Cooling control) action

	Heating P-band / (Cooling P-band)		
Control action	Heating action — ON/OFF	SV setting	(Cooling action) — ON/OFF
Relay contact output (OUT1)	⑥—⑦	⑥—⑦	⑥—⑦ — Cycle action is performed according to deviation.
Non-contact voltage output (OUT1)	+ ⑥ 12V DC − ⑦	+ ⑥ 12/0V DC − ⑦	+ ⑥ 0V DC − ⑦ — Cycle action is performed according to deviation.
DC current output (OUT1)	+ ⑥ 20mA DC − ⑦	+ ⑥ 20 to 4mA DC − ⑦	+ ⑥ 4mA DC − ⑦ — Changes continuously according to deviation.
Non-contact relay output (OUT2)	③—⑤	③—⑤	③—⑤ — Cycle action is performed according to deviation.
Indicator (OUT1) Green	Lit		Unlit
Indicator (OUT2) Yellow	Unlit		Lit

▨ : Acts ON (lit) or OFF (unlit).

—— : Represents Heating control action.

‑ ‑ ‑ : Represents Cooling control action.

7.6 OUT2 (Heating/Cooling control) action (When setting Dead band)

	Heating P-band / Dead band / (Cooling P-band)		
Control action	Heating action — ON/OFF	SV setting	(Cooling action) — ON/OFF
Relay contact output (OUT1)	⑥—⑦	⑥—⑦	⑥—⑦ — Cycle action is performed according to deviation.
Non-contact voltage output (OUT1)	+ ⑥ 12V DC − ⑦	+ ⑥ 12/0V DC − ⑦	+ ⑥ 0V DC − ⑦ — Cycle action is performed according to deviation.
DC current output (OUT1)	+ ⑥ 20mA DC − ⑦	+ ⑥ 20 to 4mA DC − ⑦	+ ⑥ 4mA DC − ⑦ — Changes continuously according to deviation.
Non-contact relay output (OUT2)		③—⑤	③—⑤ ③—⑤ — Cycle action is performed according to deviation.
Indicator (OUT1) Green	Lit		Unlit
Indicator (OUT2) Yellow	Unlit		Lit

▨ : Acts ON (lit) or OFF (unlit).

—— : Represents Heating control action.

‑ ‑ ‑ : Represents Cooling control action.

7.7 OUT2 (Heating/Cooling control) action (When setting Overlap band)
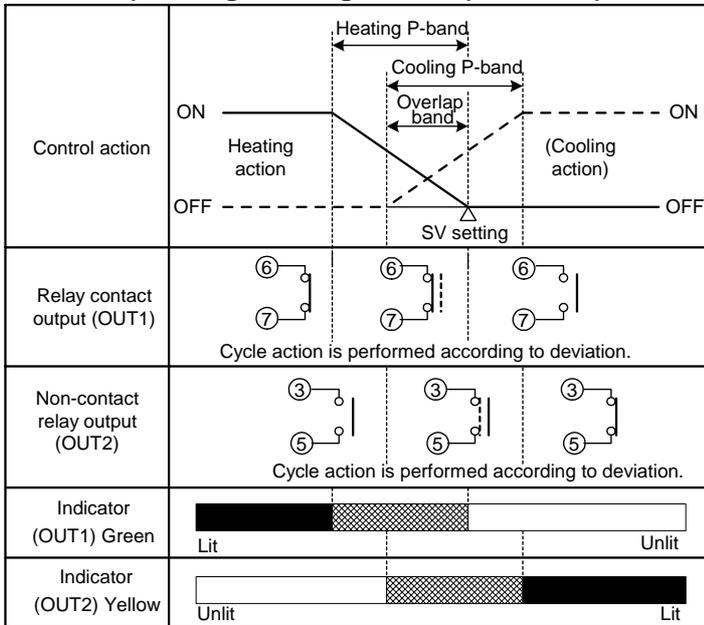
Control action	Heating P-band / Cooling P-band / Overlap band / ON — Heating action — (Cooling action) — ON / OFF — SV setting — OFF	
Relay contact output (OUT1)	⑥ ⑦ (×3) Cycle action is performed according to deviation.	
Non-contact relay output (OUT2)	③ ⑤ (×3) Cycle action is performed according to deviation.	
Indicator (OUT1) Green	Lit ▓▓▓ Unlit	
Indicator (OUT2) Yellow	Unlit ▓▓▓ Lit	

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

8. PID auto-tuning of this controller

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. One of 3 types of fluctuation below is automatically selected.

(1) In the case of a large difference between the setting value 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 setting value.

Temperature 20℃ lower than the setting value

Setting value ▷

(4)

Temperature ↑

AT starting point

Time →

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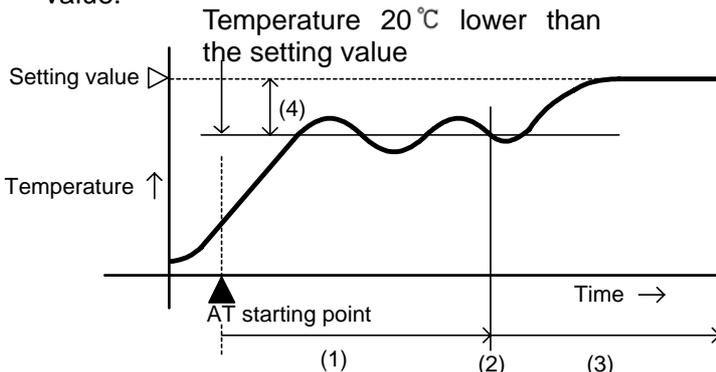
(1) Calculating PID constant
(2) PID constant calculated
(3) Controlled by the PID constant set by auto-tuning.
(4) AT bias value

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

The AT process will fluctuate around the setting value.
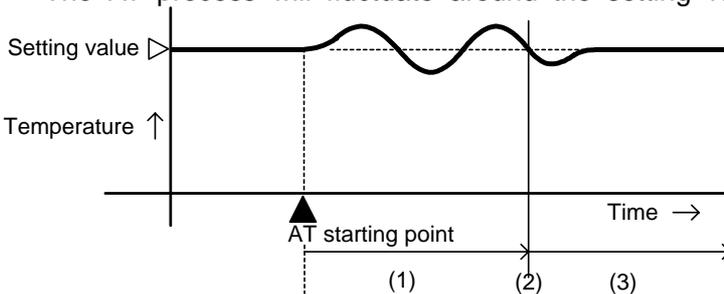
Setting value ▷

Temperature ↑

AT starting point

Time →

(1)　　(2)　　(3)

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

(3) In the case of a large difference between the setting value 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 setting value.

Temperature 20℃ higher than the setting value

Temperature ↑

(4)

Setting value ▷

AT starting point

Time →

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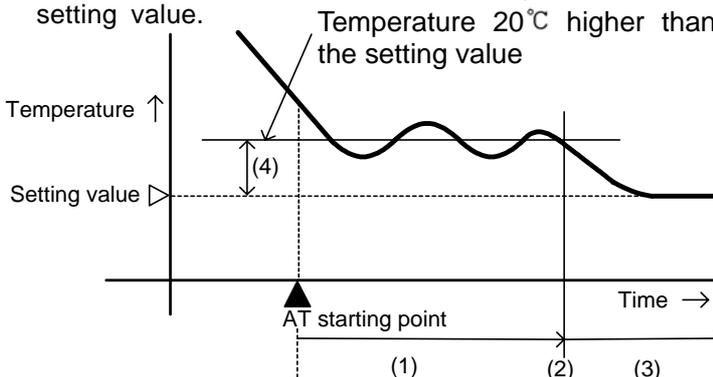
(1) Calculating PID constant
(2) PID constant calculated
(3) Controlled by the PID constant set by auto-tuning.
(4) AT bias value

For DC input, the AT process will fluctuate around the setting value for conditions of (1), (2) and (3) above.

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9. Specifications

9.1 Standard specifications

Mounting method : Flush
Setting method : Input system using membrane sheet key
Display PV display : Red LED 4 digits, character size 10.2 x 4.9 mm (H x W)
  SV display : Green LED 4 digits, character size 8.8 x 4.9 mm (H x W)
Accuracy (Setting and Indication):
  Thermocouple : Within ±0.2% of each input span ±1digit, or within ±2℃ (4℉),
   whichever is greater
   However R, S inputs, 0 to 200℃ (400℉): Within ±6℃ (12℉)
   B input, 0 to 300℃ (600℉): Accuracy is not guaranteed.
   K, J, E, T, N inputs, less than 0℃ (32℉): Within ±0.4% of input span ±1digit
  RTD : Within ±0.1% of each input span ±1digit, or
   within ±1℃ (2℉), whichever is greater
  DC current : Within ±0.2% of each input span ±1digit
  DC voltage : Within ±0.2% of each input span ±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, B input: External resistance, 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
   installed between input terminals.] Allowable input current, 50mA or less
  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)

OUT1 output
  Relay contact : 1a, Control capacity 3A 250V AC (resistive load)
    1A 250V AC (inductive load cosø=0.4)
   Electrical life, 100,000 times
  Non-contact voltage (For SSR drive): 12^{+2}_{0}V DC maximum 40mA (short-circuit protected)
  DC current : 4 to 20mA DC, Load resistance, maximum 550Ω
A1 output
  Action : ON/OFF action
  Hysteresis : 0.1 to 100.0℃ (℉), or 1 to 1000
  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 derivative and integral times are set to 0.
 ON/OFF action: When proportional band is set to 0 or 0.0
 OUT1 proportional band : 0 to 1000℃ (2000℉), 0.0 to 999.9℃ (℉) or 0.0 to 100.0%
   (ON/OFF action when set to 0 or 0.0)
 Integral time : 0 to 1000s (OFF when set to 0)
 Derivative time : 0 to 300s (OFF when set to 0)
 OUT1 proportional cycle : 1 to 120s (Not available for DC current output type)
 ARW : 0 to 100%
 OUT1 ON/OFF action hysteresis: 0.1 to 100.0℃ (℉), or 1 to 1000
 OUT1 high limit setting : 0 to 100% (DC current output type: –5 to 105%)
 OUT1 low limit setting : 0 to 100% (DC current output type: –5 to 105%)
Circuit insulation configuration
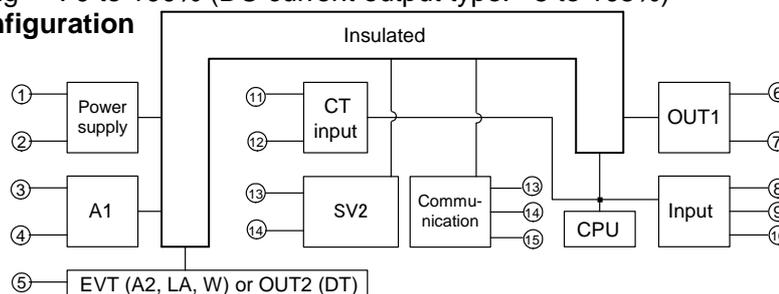
 When OUT1 is non-contact voltage output or DC current output, OUT1 and Communication are not
insulated, and OUT1 and SV2 are not insulated, and insulation test **must not** be carried out between them.

Insulation resistance : 10MΩ or more, at 500V DC

Dielectric strength : 1.5kV AC for 1minute between input terminal and power terminal
1.5kV AC for 1minute between output terminal and power terminal

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℃ (32 to 122℉)

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

Weight : Approx. 200g

External dimension : 48 x 48 x 95mm (W x H x D)

Material : Flame resistant resin (Case)

Color : Light gray (Case)

Attached functions : **[Setting value lock], [Sensor correction], [Auto/manual control selection], [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 or OUT2 low limit value	ON or OUT2 high limit value
oFF□		OFF (4mA) or OUT1 low limit value			OFF 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 or OUT2 high limit value	OFF or OUT2 low limit value
oFF□			OFF (4mA) or OUT1 low limit value	OFF or OUT2 low limit value	

Only for DC input and DC current output type, [Output status selection when input abnormal] is available. For other inputs and outputs except for DC input and DC current output, the output status will be the same one 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 input

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, "‾ ‾ ‾ ‾" or "_ _ _ _" flashes when a range of −1999 to 9999 is exceeded.

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 corresponding value with which 0mA or 0V is inputted.

[Burnout]

When the thermocouple or RTD input is burnt out, OUT1 and OUT2 are turned off (for DC current output type, OUT1 low limit value, OUT2 low limit value) and 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] (Only thermocouple input type)

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

[Power failure countermeasure]

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

[Warm-up indication]

After the power supply to the instrument is turned on, the sensor input character and temperature unit are indicated on the PV display and rated scale high limit value is indicated on the SV display for 3 seconds.

For DC current and voltage input, the scaling high limit value is indicated.

Accessories: Screw type mounting bracket 1 set,
　　　　　　　　Instruction manual 1 copy
　　　　　　　　CT (Current transformer)　CTL-6S　　　　　　　1 piece (for rating 5A, 10A, 20A)
　　　　　　　　　　　　　　　　　　　　　CTL-12-S36-10L1　1 piece (for rating 50A)

9.2 Optional specifications

Alarm 2 (A2) (Option code: A2)

Options [A2], [W] and [LA] utilize common output terminals.
Action　　　: ON/OFF action
Hysteresis: 0.1 to 100.0℃ (℉), or 1 to 1000
Output　　　: Relay contact　1a
　　　　　　　　Control capacity, 3A　250V AC (Resistive load)
　　　　　　　　Electrical life, 100,000 times

Loop break alarm (Option code: LA)

When MV (manipulated variable) is maximum or minimum and when the PV does not change as much as the preset span within the Loop break alarm assessment time, the alarm is activated.
This also detects the breaking status on the loop such as heater burnout, sensor burnout or actuator trouble.
Options [LA], [A2] and [W] utilize common 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℃(℉), 0 to 1500
Output　　　　: Relay contact　1a
　　　　　　　　Control capacity, 3A　250V AC (Resistive load)
　　　　　　　　Electrical life, 100,000 times

Heater burnout alarm (including sensor burnout alarm) (Option code: W)

Monitors heater current with CT (current transformer), and detects burnout.
Options [W], [A2] and [LA] utilize common output terminals.
This option cannot be applied to DC current output type.
Rating　　　　　: 5A [W(5A)], 10A [W(10A)], 20A [W(20A)], 50A [W(50A)] (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 ±5% of the rated value
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: DT)

The specification of Heating side is the same as that of OUT1.
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 setting range:
　　Thermocouple, RTD input: –100.0 to 100.0℃ (℉)
　　DC current, DC voltage input: –1000 to 1000 (The placement of the decimal point follows the
　　　　　　　　　　　　　　　　　　　　selection)
Output: Non-contact relay output, 0.3A　250V AC
Cooling action mode selection function:
　　One cooling action can be selected from Air cooling (linear characteristic), Oil cooling (1.5th power of the linear characteristic) and Water cooling (2nd power of the linear characteristic) by keypad.

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Serial communication (Option code: C5)
When this option is added, the option [SM] cannot be added with it.
The following operations can be carried out from the external computer.
(1) Reading and setting of the main setting value, PID values and each setting value
(2) Reading of the input value and action status   (3) Change of the functions

Cable length	: Maximum communication distance 1.2km Cable resistance: Within 50Ω (Terminator is not necessary or 120Ω or more on one side.)
Communication interface	: Based on EIA RS-485
Communication method	: Half-duplex communication start-stop synchronous
Communication speed	: 2400, 4800, 9600, 19200bps (Selectable by keypad)
Parity	: Even, Odd and No (Selectable by keypad)
Stop bit	: 1 and 2 (Selectable by keypad)
Communication protocol	: Shinko protocol, Modbus RTU, Modbus ASCII (Selectable by keypad)
Number of units connectable	: Maximum 31 units to 1 host computer
Communication error detection	: Double detection by parity and checksum
Digital external setting	: The SV from the programmable controller (with the option SVTC) can be digitally transmitted to the JCS-33A (with the option C5). (The Setting value lock of the JCS-33A must be set to Lock 3) When the data from the programmable controller is out of the SV high limit or low limit value, the JCS-33A ignores the value, and performs the control with the former value. The control desired value adds SVTC bias value to the value received by the SVTC command.

For Modbus protocol, please use the communication converter IF-400.
SV1/SV2 external selection (Option code: SM)
SV1 or SV2 can be selected by the external contact.
When this option is added, the option [C5] cannot be added with it.
Contact Open between terminals 13-14: SV1,   Contact Closed between terminals 13-14: SV2
Contact current: 6mA
Color Black (Option code: BK) Front panel frame and case: Black
Terminal cover (Option code: TC): Electrical shock protection terminal cover

10. Troubleshooting

If any malfunctions occur, refer to the following items after checking the power supply to the controller.
10.1 Indication

Problem	Presumed cause and solution
PV display is indicating [oFF].	• Control output OFF function is working. Press the ⓘ key for approx. 1 second to release the function.

[‾ ‾ ‾ ‾] is flashing on the PV display.	• Thermocouple, RTD or DC voltage (0 to 1V DC) is burnt out. Change each sensor.
	  How to check whether the sensor is burnt out
	   [Thermocouple]
	    If the input terminal of the instrument is 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.
	   [RTD]
	    If approx. 100Ω of resistance is connected to the input terminals between A-B of the instrument and between B-B is shorted, and if approximate 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 a 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 terminals of thermocouple, RTD or DC voltage (0 to 1V DC) are securely mounted to the instrument input terminal. Connect the sensor terminals to the instrument input terminals securely.

[_ _ _ _] is flashing on the PV display.	• Check whether input signal source for DC voltage (1 to 5V DC) or DC current (4 to 20mA DC) is disconnected.
	  How to check whether the input signal wire is disconnected
	   [DC voltage (1 to 5V DC)]
	    If the input to the input terminals of the instrument is 1V DC and if a scaling low limit value is indicated, the instrument 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 terminals of the instrument is 4mA DC and if a scaling low limit value is indicated, the instrument is likely to be operating normally, however, the signal wire may be disconnected.
	• Check whether input signal wire for DC voltage (1 to 5V DC) or DC current (4 to 20mA DC) is securely connected to the instrument input terminals.
	• Check if polarity of thermocouple or compensating lead wire is correct.
	• Check whether codes (A, B, B) of RTD agree with the instrument terminals.

The PV display keeps indicating the value which was set during Scaling low limit setting.	• Check whether the input signal source for DC voltage (0 to 5V DC, 0 to 10V DC) and DC current (0 to 20mA DC) is disconnected. **How to check whether the input signal wire is disconnected** [DC voltage (0 to 5V DC, 0 to 10V DC)] If the input to the input terminals of the instrument is 1V DC and if a value corresponding to 1V DC is indicated, the instrument is likely to be operating normally, however, the signal wire may be disconnected. [DC current (0 to 20mA DC)] If the input to the input terminals of the instrument is 1mA DC and if a value corresponding to 1mA DC is indicated, the instrument is likely to be operating normally, however, the signal wire may be disconnected. • Check whether the input lead wire terminals for DC voltage (0 to 5V DC, 0 to 10V DC) or DC current (0 to 20mA DC) are securely mounted to the instrument input terminals.
The indication of PV display is abnormal or unstable.	• Check whether sensor input or temperature unit (℃ or ℉) is correct. Select the sensor input and temperature unit (℃ or ℉) properly. • Sensor correcting value is unsuitable. Set it to a suitable value. • Check whether the specification of the sensor is correct. • AC leaks into the sensor circuit. Use an ungrounded type sensor. • 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.
The PV display is indicating [$Err\ 1$].	• Internal memory is defective. Contact our agency or us.

10.2 Key operation

Problem	Presumed cause and solution
• Unable to set the SV, P, I, D, proportional cycle or alarm setting • The values do not change by $\triangle$, $\triangledown$ keys.	• Setting value lock (Lock 1 or Lock 2) is designated. Release the lock designation. • During PID auto-tuning or auto-reset. In the case of PID auto-tuning, cancel auto-tuning. It takes approximately 4 minutes until auto-reset is finished.
The setting indication does not change in the input range even if the $\triangle$, $\triangledown$ keys are pressed, and unable to set the value.	• SV high or low limit value in Auxiliary function setting mode 1 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.

10.3 Control

Problem	Presumed cause and solution
Temperature does not rise.	• Sensor is out of order. Replace the sensor. • Check whether the Sensor or control output terminals are securely mounted to the instrument input terminals. Ensure that the sensor or control output terminals are mounted to the instrument input terminals securely. • Check whether the wiring of sensor or control output terminals is correct.
The control output remains in an ON status.	• OUT1 or OUT2 low limit value is set to 100% or higher in Auxiliary function setting mode 2. Set it to a suitable value.
The control output remains in an OFF status.	• OUT1 or OUT2 high limit value is set to 0% or less in Auxiliary function setting mode 2. Set it to a suitable value.

• If you have any inquiries, please consult our agency or the shop where you purchased the unit.