和文は裏面をご覧下さい。

# Digital Indicating Controller    JCS-33A

JCS31JE6   2013.09

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

# ⚠ 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 a fire.
- Be sure to follow the warnings, cautions and notices. Not doing so could cause serious injury and/or malfunction.
- Specifications of the JCS-33A and the contents of this instruction manual are subject to change without notice.
- Care has been taken to ensure 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 through the face of 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.
- Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
- Shinko Technos CO., LTD. is not liable for any damage or secondary damage(s) incurred as a result of using this product, including any indirect damage.

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

# ⚠ Safety Precautions

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

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

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

# 1. Model

## 1.1 Model

| JCS–33 □–□／□  □, □□□ | | | | | | Series name: JCS-33A (W48 x H48 x D95mm) | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Control action | 3 | | | | | PID | |
| A1 | | A | | | | Alarm type can be selected by keypad.  **\*1** | |
| Control output (OUT1) | | | 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 | | | | | | 100 to 240V AC (standard) | |
| | | | | | 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 | Heating/Cooling control, Control output (OUT2) | 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 types (9 types and No alarm action) and Energized/De-energized can be selected by keypad.
**\*2**: Thermocouple, RTD, DC current, and DC voltage can be selected by keypad.
**\*3**: Supply voltage 100 to 240V AC is standard. When ordering 24V AC/DC, enter "1" after the input code.
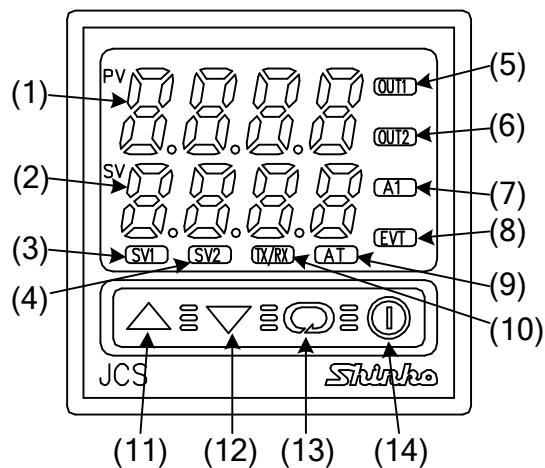
Model labels are attached to the case and the inner assembly. For Heater burnout alarm output, CT rated current is written in the bracket.

| (Model 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    (2) Option, supply voltage ("1" is entered only for 24V AC/DC)
(3) Serial number

# 2. Name and functions



(Fig. 2-1)

(1) **PV display**       : Indicates the PV (process variable) or setting characters in the setting mode with the red LED.
(2) **SV display**       : Indicates the SV (desired value), MV (manipulated variable) or each set value in the setting mode with the green LED.
(3) **SV1 indicator**  : The green LED lights when SV1 is indicated on the SV display.
(4) **SV2 indicator**  : The yellow LED lights when SV2 is indicated on the SV display.
(5) **OUT1 indicator** : When OUT1 is ON, the green LED lights.
[For A/□ type, it flashes corresponding to the MV (manipulated variable) in 250ms cycles.]
(6) **OUT2 indicator** : When OUT2 (DT option) is ON, the yellow LED lights.
(7) **A1 indicator**     : When A1 output is ON, the red LED lights.
(8) **EVT indicator**   : When Event output (A2, LA or W option) is ON, the red LED lights.
(9) **AT indicator**     : When AT (auto-tuning) or auto-reset is performing, the yellow LED flashes.
(10) **TX/RX indicator**    : The 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 set value.
(By pressing the Mode Key, the set value or selected value can be registered.)
(14) **OUT/OFF Key** (◉) : Selects either Control output OFF function (Control output ON/OFF) or Auto/Manual control switching. (To cancel the Control output OFF function, press the OUT/OFF Key again for approx. 1 second.)

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## ⚠ Notice

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

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# 3. Mounting to the control panel

## 3.1 Site selection

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## ⚠ Caution

Use within the following temperature and humidity ranges.
Temperature: 0 to 50℃ (32 to 122℉), Humidity: 35 to 85%RH (No icing, non-condensing)
If the JCS-33A is installed through the face of a control panel, the ambient temperature of the JCS-33A must be kept to under 50℃. Otherwise the life of electronic parts (especially electrolytic capacitors) of the JCS-33A will be shortened.
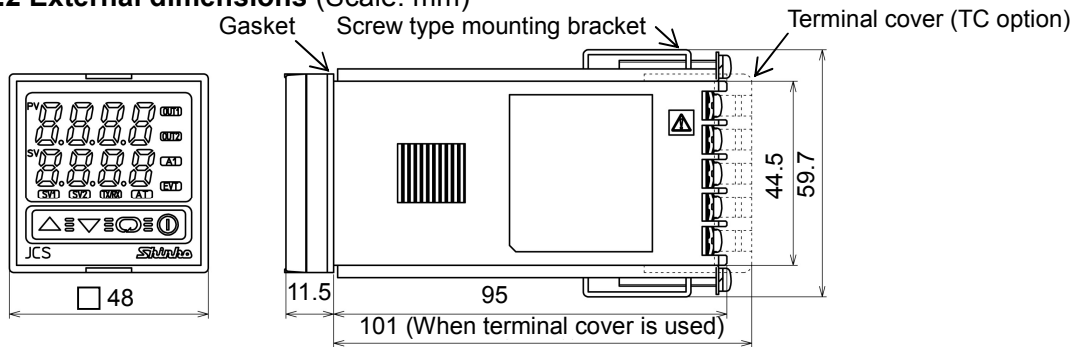
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**This instrument is intended to be used under the following environmental conditions (IEC61010-1): Overvoltage category Ⅱ, Pollution degree 2**
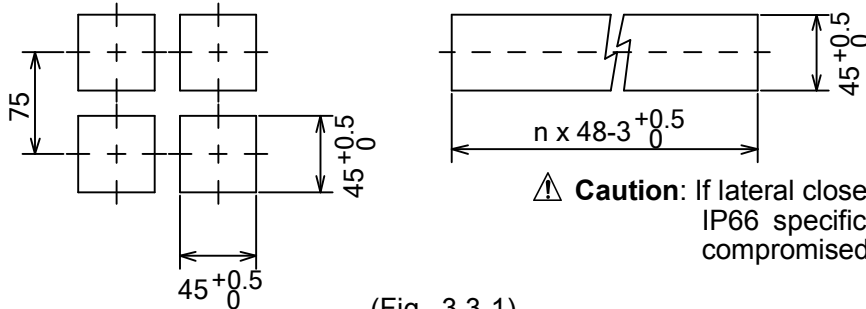Ensure the mounting location corresponds to the following conditions:

• 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 controller

## 3.2 External dimensions (Scale: mm)

Gasket    Screw type mounting bracket    Terminal cover (TC option)

44.5
59.7

□ 48

11.5    95

101 (When terminal cover is used)

(Fig. 3.2-1)

## 3.3 Panel cutout (Scale: mm)

75

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

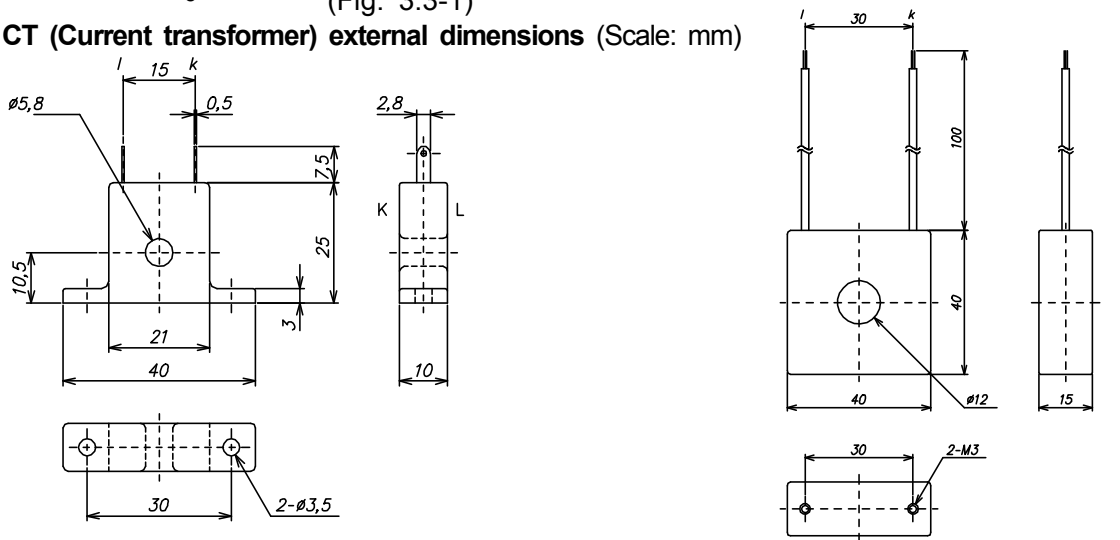$45^{+0.5}_{0}$

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

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

Lateral close mounting
n: Number of units mounted

⚠ **Caution**: If lateral close mounting is used for the controller, IP66 specification (Drip-proof/Dust-proof) may be compromised, and all warranties will be invalidated.

(Fig. 3.3-1)

## 3.4 CT (Current transformer) external dimensions (Scale: mm)

l    15    k

ø5,8    0,5

2,8

7,5

25

10,5

3

21

40

10

30

2-ø3,5

K    L

l    30    k

100

40

40    ø12    15

30    2-M3

CTL-6S (for 5A, 10A, 20A)    CTL-12-S36-10L1U (for 50A)

(Fig. 3.4-1)

## 3.5 Mounting

⚠ # 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 should be 0.12N•m.**

Mount the controller vertically to ensure it adheres to the Drip-proof/Dust-proof specification (IP66).
Mountable panel thickness: 1 to 8mm
Insert the controller from the front side of the panel.
Attach the mounting brackets to the slots at the top and bottom of the case, and secure the controller in place with the screws provided.
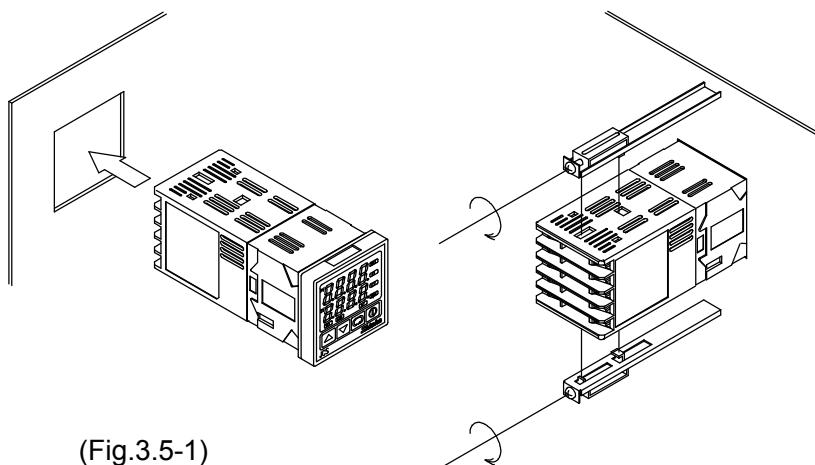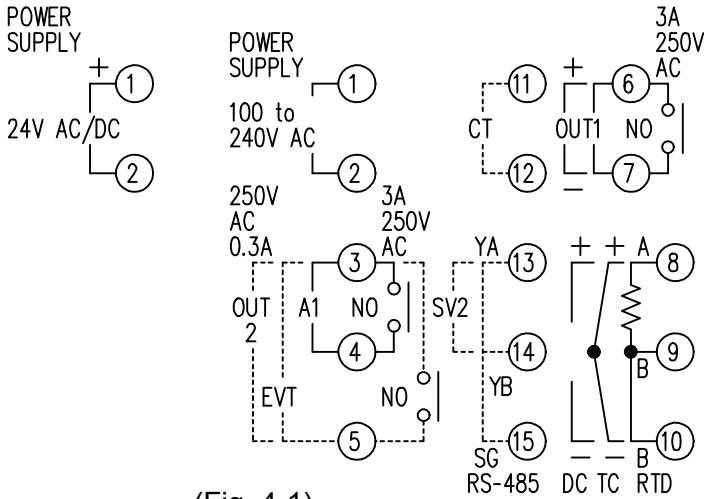
(Fig.3.5-1)

3

# 4. Wiring

(Fig. 4-1)

- OUT1 : Control output 1
- OUT2 : Control output 2
- A1 : Alarm 1 output
- EVT : Event output (A2 output, Heater burnout alarm output, Loop break alarm output)
- CT : CT input
- SV2 : SV1/SV2 external selection
- RS-485: Serial communication (RS-485)
- TC : Thermocouple input
- RTD : Resistance temperature detector input
- DC : DC current, DC voltage input
  **For DC current input, a 50Ω shunt resistor (sold separately) must be connected between input terminals**.

## Lead wire solderless terminal

Use a solderless terminal with an insulation sleeve in which an M3 screw fits as shown below.
The torque should be 0.63N•m.

| Solderless terminal | Manufacturer | Model | Torque |
|---|---|---|---|
| Y-type | Nichifu Terminal Industries CO.,LTD. | TMEV1.25Y-3 | 0.63N•m |
| | Japan Solderless Terminal MFG CO.,LTD. | VD1.25-B3A | |
| Ring-type | Nichifu Terminal Industries CO.,LTD. | TMEV1.25-3 | |
| | Japan Solderless Terminal MFG CO.,LTD. | V1.25-3 | |
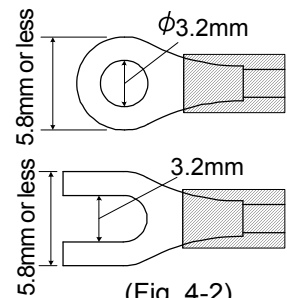
(Fig. 4-2)

## Heater burnout alarm option

(1) **This alarm is not usable 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 external interference.
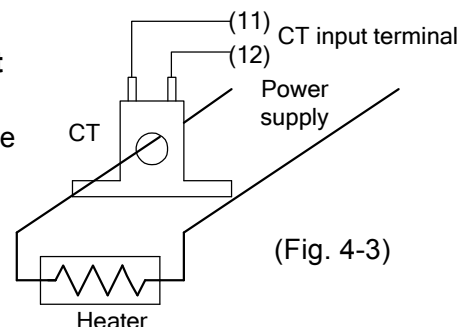
(Fig. 4-3)

# 5. Settings

## 5.1 Operation flowchart
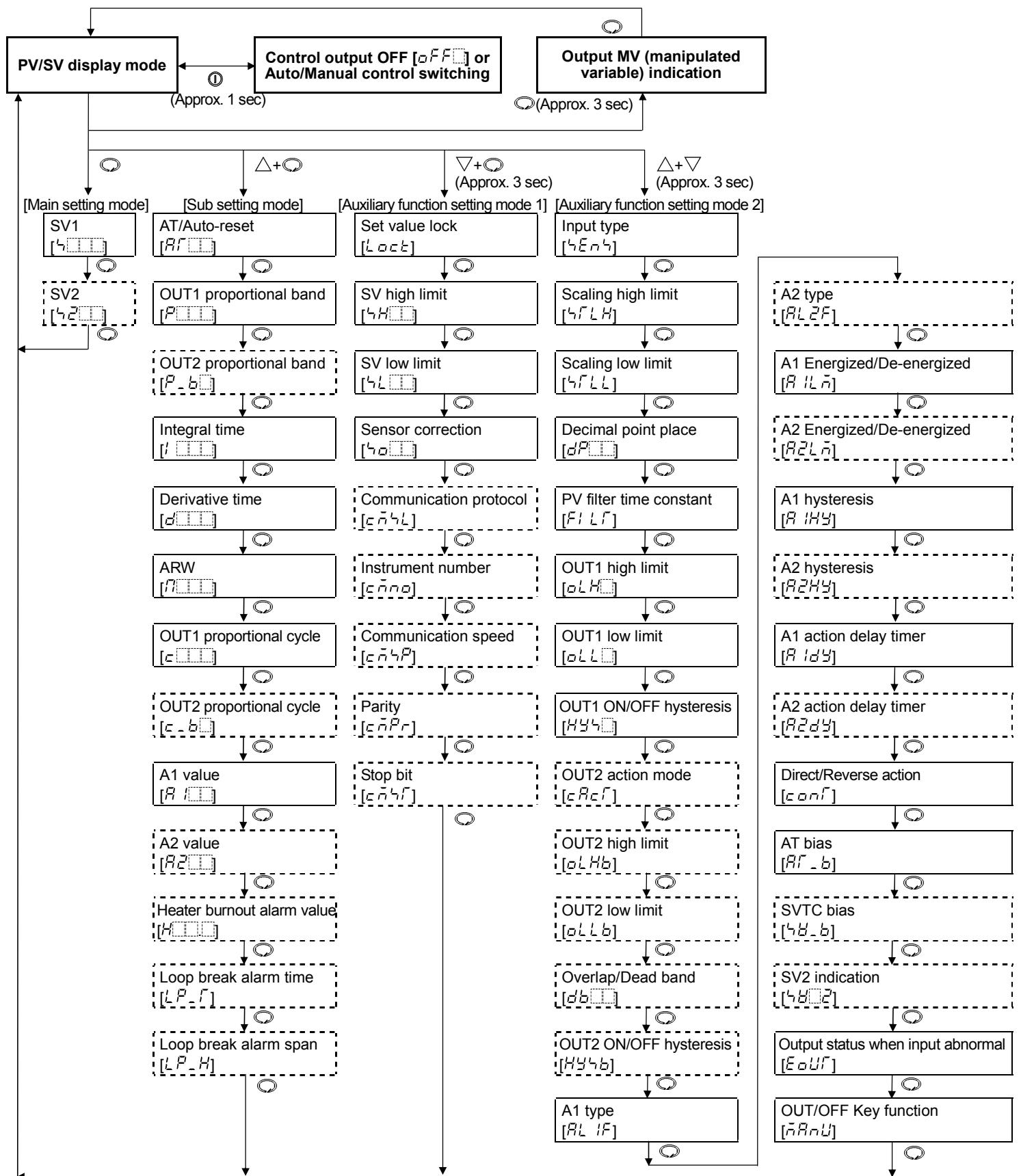


**[Explanation of the ⟳ key]**

- ↓⟳ : If the ⟳ key is pressed, the set value is saved, and the controller proceeds to the next setting item.
- If the ⟳ key is pressed for approx. 3 sec, the controller reverts to the PV/SV display mode from any mode.

**[Key operation]**

- △+⟳　　　　　　　　 : Press the ⟳ while pressing the △ key.
- ▽+⟳ (Approx. 3 sec) : Press the ⟳ for approx. 3 sec while holding down the ▽ key.
- △+▽ (Approx. 3 sec) : Press the ▽ for approx. 3 sec while holding down the △ key.
- Dotted lines are optional, and they appear only when the options are added.

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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. (For DC current and voltage input, the scaling high limit value is indicated.) (Table 5.1-1)
During this time, all outputs and the LED indicators are in OFF status.
Control will then start, indicating PV (process variable) on the PV display and SV (desired value) on the SV display. (While Control output OFF function is working, ⌐FF⌐ is indicated on the PV display.)

**(Table 5.1-1)**

| Sensor input | ℃ | | | ℉ | | |
|---|---|---|---|---|---|---|
| | PV display | SV display (Default) | Setting range | PV display | SV display (Default) | Setting range |
| K | ⊢⊓⊏ | 1370 | −200 to 1370℃ | ⊢⊓⊢ | 2500 | −320 to 2500℉ |
| | ⊢⊓.⊏ | 400.0 | −199.9 to 400.0℃ | ⊢⊓.⊢ | 750.0 | −199.9 to 750.0℉ |
| J | ⌐⊓⊏ | 1000 | −200 to 1000℃ | ⌐⊓⊢ | 1800 | −320 to 1800℉ |
| R | ⌐⊓⊏ | 1760 | 0 to 1760℃ | ⌐⊓⊢ | 3200 | 0 to 3200℉ |
| S | ⊶⊓⊏ | 1760 | 0 to 1760℃ | ⊶⊓⊢ | 3200 | 0 to 3200℉ |
| B | ⊣⊓⊏ | 1820 | 0 to 1820℃ | ⊣⊓⊢ | 3300 | 0 to 3300℉ |
| E | ⊑⊓⊏ | ⊓800 | −200 to 800℃ | ⊑⊓⊢ | 1500 | −320 to 1500℉ |
| T | ⌐⊓.⊏ | 400.0 | −199.9 to 400.0℃ | ⌐⊓.⊢ | 750.0 | −199.9 to 750.0℉ |
| N | ⌐⊓⊏ | 1300 | −200 to 1300℃ | ⌐⊓⊢ | 2300 | −320 to 2300℉ |
| PL-Ⅱ | PL2C | 1390 | 0 to 1390℃ | PL2F | 2500 | 0 to 2500℉ |
| C (W/Re5-26) | ⊏⊓⊏ | 2315 | 0 to 2315℃ | ⊏⊓⊢ | 4200 | 0 to 4200℉ |
| Pt100 | Pⲅ.⊏ | 850.0 | −199.9 to 850.0℃ | Pⲅ.⊢ | 999.9 | −199.9 to 999.9℉ |
| JPt100 | JPⲅ.⊏ | 500.0 | −199.9 to 500.0℃ | JPⲅ.⊢ | 900.0 | −199.9 to 900.0℉ |
| Pt100 | Pⲅ⊓⊏ | ⊓850 | −200 to 850℃ | Pⲅ⊓⊢ | 1500 | −300 to1500℉ |
| JPt100 | JPⲅ⊏ | ⊓500 | −200 to 500℃ | JPⲅ⊢ | ⊓900 | −300 to 900℉ |
| 4 to 20mA DC | 420A | | | 420A | | |
| 0 to 20mA DC | 020A | | | 020A | | |
| 0 to 1V DC | 0⊓1Ꮙ | 9999 | −1999 to 9999 | 0⊓1Ꮙ | 9999 | −1999 to 9999 |
| 0 to 5V DC | 0⊓5Ꮙ | | | 0⊓5Ꮙ | | |
| 1 to 5V DC | 1⊓5Ꮙ | | | 1⊓5Ꮙ | | |
| 0 to 10V DC | 010Ꮙ | | | 010Ꮙ | | |

## 5.2 Main setting mode

| Character | Name, Function, Setting range | Default value |
|---|---|---|
| ⊶1⊓⊓ | **SV1** • Sets SV1. • Setting range: SV low limit to SV high limit value | 0℃ |
| ⊶2⊓⊓ | **SV2** • Sets SV2. • Available only when the SM option is applied. • Setting range: SV low limit to SV high limit value | 0℃ |

## 5.3 Sub setting mode

| Character | Name, Function, Setting range | Default value |
|---|---|---|
| Aⲅ⊓⊓ | **AT/Auto-reset** • Selects AT (auto-tuning) Perform/Cancel or Auto-reset Perform/Cancel. • If the AT is cancelled during the process, P, I, D and ARW values revert to the previous value at which AT was performed. • When AT has not finished 4 hours after starting, it is automatically cancelled. • Auto-reset ends 4 minutes after starting. It cannot be released while performing this function. • – – – – : AT/Auto-reset Cancel   Aⲅ⊓⊓ / ⌐⊶⊑ⲅ : AT/Auto-reset Perform | – – – – |
| P⊓⊓⊓ | **OUT1 proportional band** • Sets the proportional band for OUT1. • OUT1 becomes ON/OFF control when set to 0 or 0.0. • Setting range: 0 to 1000℃(2000℉), 0.0 to 999.9℃(℉) or 0.0 to 100.0% | 10℃ |
| P⊔⊣⊓ | **OUT2 proportional band** • Sets the proportional band for OUT2. • OUT2 becomes ON/OFF control when OUT1 proportional band is set to 0 or 0.0. • Not available if DT option is not added or if OUT1 is in ON/OFF control. • Setting range: 0.0 to 10.0 times (multiplying factor to OUT1 proportional band) | 1.0 times |

| | | |
|---|---|---|
| ∣ ⬚⬚⬚ | **Integral time**<br>• Sets integral time for OUT1.<br>• Setting the value to 0 disables the function.<br>• Not available if OUT1 is in ON/OFF control.<br>• Auto-reset can be performed when PD is control action (I=0).<br>• Setting range: 0 to 1000 seconds | 200 seconds |
| d⬚⬚⬚ | **Derivative time**<br>• Sets derivative time for OUT1.<br>• Setting the value to 0 disables the function.<br>• Not available if OUT1 is in ON/OFF control.<br>• Setting range: 0 to 300 seconds | 50 seconds |
| ⊓⬚⬚⬚ | **ARW**<br>• Sets ARW for OUT1.<br>• Available only when PID is the control action.<br>• Setting range: 0 to 100% | 50% |
| c⬚⬚⬚ | **OUT1 proportional cycle**<br>• Sets proportional cycle for OUT1.<br>• Not available for DC current output type or if OUT1 is in ON/OFF control.<br>• Setting range: 1 to 120 seconds | 30 seconds,<br>3 seconds |
| c_b⬚ | **OUT2 proportional cycle**<br>• Sets proportional cycle for OUT2.<br>• Not available if the DT option is not added or if OUT2 is in ON/OFF control.<br>• Setting range: 1 to 120 seconds | 3 seconds |
| A1⬚⬚ | **A1 value**<br>• Sets A1 output action point.<br>  **Setting the value to 0 or 0.0 disables the function** (except Process high and Process low alarm).<br>• Not available if No alarm action is selected during A1 type selection.<br>• Setting range: Refer to (Table 5.3-1). | 0℃ |
| A2⬚⬚ | **A2 value**<br>• Sets A2 output action point.<br>  **Setting the value to 0 or 0.0 disables the function** (except Process high and Process low alarm).<br>• Not available if A2 option is not added or if No alarm action is selected during A2 type selection.<br>• Setting range: Refer to (Table 5.3-1). | 0℃ |
| H⬚⬚⬚,<br>⬚XX.X<br>alternating<br>display | **Heater burnout alarm value**<br>• Sets the heater current value for Heater burnout alarm.<br>• Upon returning to set limits, the alarm will stop.<br>• Available only when the W option is added.<br>• Rated current: 5A (0.0 to 5.0A),　　10A (0.0 to 10.0A)<br>　　　　　　20A (0.0 to 20.0A),　50A (0.0 to 50.0A) | 0.0A |
| LP_r | **Loop break alarm time**<br>• Sets the time to assess the Loop break alarm.<br>• Available only when the LA option is added.<br>• Setting range: 0 to 200 minutes | 0 minutes |
| LP_H | **Loop break alarm span**<br>• Sets the temperature to assess the Loop break alarm.<br>• Available only when the LA option is added.<br>• Setting range: 0 to 150℃(℉), 0.0 to 150.0℃(℉) or 0 to 1500 | 0℃ |

**(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 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 low limit value is –199.9, and the positive high limit value is 999.9.
• All alarm actions except process alarm are the ±deviation setting from the SV (desired value).
*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.

## 5.4 Auxiliary function setting mode 1

| Character | Name, Function, Setting range | Default value |
|---|---|---|
| $Lock$ | **Set value lock** | Unlock |
| | • Locks the set values to prevent setting errors. The setting item to be locked depends on the selection.<br>• When Lock 1 or Lock 2 is selected, AT (auto-tuning) and Auto-reset cannot be carried out.<br>• $----$ (Unlock): All set values can be changed.<br>$Loc1$ (Lock 1): None of the set values can be changed.<br>$Loc2$ (Lock 2): Only main setting mode can be changed.<br>$Loc3$ (Lock 3): All set values except input type can be changed. However, they return to their previous value after power is turned off because they are not saved in the non-volatile memory. Be sure to select Lock 3 when changing the set value frequently via communication function. (If the value set by the communication function is the same as the value before the setting, the value will not be written in the non-volatile memory.) Do not change any setting item in Auxiliary function setting mode 2. If any item in the mode is changed, it will affect other setting items such as the SV and Alarm value. | |
| $5H\square$ | **SV high limit**<br>• Sets the SV (desired value) high limit value.<br>• Setting range: SV low limit to input range high limit value, or SV low limit to scaling high limit value | Input range high limit value |
| $5L\square$ | **SV low limit**<br>• Sets the SV (desired value) low limit value.<br>• Setting range: Input range low limit to SV high limit value, or scaling low limit to SV high limit value | Input range low limit value |
| $5o\square$ | **Sensor correction**<br>• Sets the correction value for the sensor.<br>• Setting range: −100.0 to 100.0℃ (℉), or −1000 to 1000 | 0.0℃ |
| $cm5L$ | **Communication protocol**<br>• Selects communication protocol.<br>• Available only when the C5 option is added.<br>• $nonL$: Shinko protocol, $modA$: Modbus ASCII mode, $modr$: Modbus RTU mode | Shinko protocol |
| $cmno$ | **Instrument number**<br>• Sets the instrument number individually to each instrument when communicating by connecting plural instruments in Serial communication.<br>• Available only when C5 option is added.<br>• Setting range: 0 to 95 | 0 |
| $cm5P$ | **Communication speed**<br>• Selects a communication speed equal to that of the host computer.<br>• Available only when C5 option is added.<br>• $\square24$: 2400bps, $\square48$: 4800bps, $\square96$: 9600bps, $\square192$: 19200bps | 9600bps |
| $cmPr$ | **Parity**<br>• Selects the parity.<br>• Not available if the C5 option is not added or if Shinko protocol is selected during the Communication protocol selection.<br>• $nonE$: No parity, $EuEn$: Even parity, $odd\square$: Odd parity | Even parity |
| $cm5r$ | **Stop bit**<br>• Selects the stop bit.<br>• Not available if the C5 option is not added or if Shinko protocol is selected during the Communication protocol selection.<br>• $\square1$: Stop bit 1, $\square2$: Stop bit 2 | 1 |

## 5.5 Auxiliary function setting mode 2

| Character | Name, Function, Setting range | Default value |
|---|---|---|
| $5En5$ | **Input type**<br>• 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. (Table 5.1-1)<br>• **When changing the input from DC voltage to other inputs, remove the sensor connected to this controller first, then change the input. If the input is changed with the sensor connected, the input circuit may break.** | K (−200 to 1370℃) |
| $5rLH$ | **Scaling high limit**<br>• Sets scaling high limit value.<br>• Available only for DC input.<br>• Setting range: Scaling low limit value to input range high limit value | 9999 |
| $5rLL$ | **Scaling low limit**<br>• Sets scaling low limit value.<br>• Available only for DC input.<br>• Setting range: Input range low limit value to scaling high limit value | −1999 |

| | | |
|---|---|---|
| $dP$ | **Decimal point place** <br> • Selects decimal point place. <br> • Available only for DC input. <br> • $\square\square\square0$: No decimal point $\qquad$ $\square\square0.0$: 1 digit after decimal point <br> $\square0.00$: 2 digits after decimal point $\qquad$ $0.000$: 3 digits after decimal point | No decimal point |
| $FILr$ | **PV filter time constant** <br> • Sets PV filter time constant. (If the value is set too large, it affects control results due to the delay of response.) <br> • Setting range: 0.0 to 10.0 seconds | 0.0 seconds |
| $oLH$ | **OUT1 high limit** <br> • Sets OUT1 high limit value. <br> • Not available if OUT1 is in ON/OFF control. <br> • Setting range: OUT1 low limit value to 100% <br> $\qquad$ (DC current output type: OUT1 low limit value to 105%) | 100% |
| $oLL$ | **OUT1 low limit** <br> • Sets OUT1 low limit value. <br> $\quad$ Not available if OUT1 is in ON/OFF control. <br> • Setting range: 0% to OUT1 high limit value <br> $\qquad$ (DC current output type: –5% to OUT1 high limit value) | 0% |
| $HYS$ | **OUT1 ON/OFF hysteresis** <br> • Sets ON/OFF hysteresis for OUT1. <br> • Available only when OUT1 is in ON/OFF control. <br> • Setting range: 0.1 to 100.0℃ （℉）, or 1 to 1000 | 1.0℃ |
| $cAcr$ | **OUT2 action mode** <br> • Selects OUT2 action from air, oil and water cooling. <br> • Not available if the DT option is not added or if OUT2 is in ON/OFF control. <br> • $AIr$: Air cooling, $\quad oIL$: Oil cooling, $\quad \overline{c}Ar$: Water cooling | Air cooling |
| $oLHb$ | **OUT2 high limit** <br> • Sets OUT2 high limit value. <br> • Not available if the DT option is not added or if OUT2 is in ON/OFF control. <br> • Setting range: OUT2 low limit value to 100% | 100% |
| $oLLb$ | **OUT2 low limit** <br> • Sets OUT2 low limit value. <br> • Not available if the DT option is not added or if OUT2 is in ON/OFF control. <br> • Setting range: 0% to OUT2 high limit value | 0% |
| $db$ | **Overlap band/Dead band** <br> • Sets the overlap band or dead band for OUT1 and OUT2. <br> $\quad$ + set value: Dead band, $\quad$ – set value: Overlap band <br> • Available only when the DT option is added. <br> • Setting range: -100.0 to 100.0℃ （℉）, or -1000 to 1000 | 0℃ |
| $HYSb$ | **OUT2 ON/OFF hysteresis** <br> • Sets ON/OFF hysteresis for OUT2. <br> • Available when the DT option is added and when OUT2 is in ON/OFF control. <br> • Setting range: 0.1 to 100.0℃ （℉）, or 1 to 1000 | 1.0℃ |
| $AL\ 1F$ | **A1 type** <br> • Selects A1 action type. <br> **Note: If an alarm type is changed, the alarm set value becomes 0 (0.0).** <br> $----$: No alarm action $\qquad$ $AH$: Process high alarm <br> $H\square\square$: High limit alarm $\qquad$ $rAH$: Process low alarm <br> $L\square\square$: Low limit alarm $\qquad$ $H\square\square\overline{c}$: High limit alarm with standby <br> $HL\square$: High/Low limits alarm $\qquad$ $L\square\square\overline{c}$: Low limit alarm with standby <br> $\overline{c}I\ d$: High/Low limit range alarm $\qquad$ $HL\square\overline{c}$: High/Low limits alarm with standby | No alarm action |
| $AL\ 2F$ | **A2 type** <br> • Selects A2 action type. <br> **Note: If an alarm type is changed, the alarm set value becomes 0 (0.0).** <br> • Available only when A2 option is added. <br> • Types and action are the same as those of A1 type selection. | No alarm action |
| $A\ 1L\overline{n}$ | **A1 action Energized/De-energized** <br> • Selects Energized/De-energized for A1. <br> • Not available if No alarm action is selected during A1 type selection. <br> • $no\overline{n}L$: Energized, $\quad rEH\overline{\phantom{}}$: De-energized | Energized |

| | | |
|---|---|---|
| *R2Lñ* | **A2 action Energized/De-energized** | Energized |
| | • Selects Energized/De-energized for A2.<br>• Not available if A2 option is not added or if No alarm action is selected during A2 type selection.<br>• *noñL*: Energized,   *rEɑ'*: De-energized | |
| *R1HY* | **A1 hysteresis** | 1.0℃ |
| | • Sets A1 hysteresis.<br>• Not available if No alarm action is selected during A1 type selection.<br>• Setting range: 0.1 to 100.0℃(℉), or 1 to 1000 | |
| *R2HY* | **A2 hysteresis** | 1.0℃ |
| | • Sets A2 hysteresis.<br>• Not available if A2 option is not added or if No alarm action is selected during A2 type selection.<br>• Setting range: 0.1 to 100.0℃(℉), or 1 to 1000 | |
| *R1dY* | **A1 action delay timer** | 0 seconds |
| | • Sets A1 action delay timer.<br>  When setting time has passed after the input enters the alarm output range, the alarm is activated.<br>• Not available if No alarm action is selected during A1 type selection.<br>• Setting range: 0 to 9999 seconds | |
| *R2dY* | **A2 action delay timer** | 0 seconds |
| | • Sets A2 action delay timer.<br>  When setting time has passed after the input enters the alarm output range, the alarm is activated.<br>• Not available if A2 option is not added or if No alarm action is selected during A2 type selection.<br>• Setting range: 0 to 9999 seconds | |
| *conr* | **Direct/ Reverse action**<br>• Selects Reverse (Heating) or Direct (Cooling) control action.<br>• *HERr*: Reverse (Heating) action,   *cooL*: Direct (Cooling) action | Reverse (Heating) action |
| *Rr_b* | **AT bias** | 20℃ |
| | • Sets bias value during AT (auto-tuning).<br>• Not available for DC input.<br>• Setting range: 0 to 50℃ (0 to 100℉), or 0.0 to 50.0℃ (0.0 to100.0℉) | |
| *4ʊ_b* | **SVTC bias** | 0 |
| | • Desired value (SV) adds SVTC bias value to the value received by the SVTC command.<br>• Available only when C5 option is added.<br>• Setting range: Converted value of ±20% of the rated value or ±20% of the scaling range | |
| *4ʊ☐2* | **SV2 indication** | Indication |
| | • Selects either Indication or No indication of SV2.<br>• Available only when the SM option is added.<br>• *on☐*: Indication,   *oFF☐*: No indication | |
| *Eoʊr* | **Output status when input abnormal**<br>• Selects OUT1, OUT2 (DT option) status when DC input is overscale or underscale.<br>• Available only for DC current output with DC input.<br>• *oFF☐*: Outputs OFF (4mA) or OUT1 (OUT2) low limit value.<br>  *on☐*: Outputs a value between OFF (4mA) and ON (20mA) or between OUT1 (OUT2)<br>     low limit value and OUT1 (OUT2) high limit value, depending on a deviation. | Outputs OFF (4mA) or OUT1 (OUT2) low limit value. |
| *ñRnʊ* | **OUT/OFF Key function**<br>• Selects the OUT/OFF Key function if it is used for Control output OFF function or<br>  for Auto/Manual control switching.<br>• *oFF☐*: Control output OFF function,   *ñRnʊ*: Auto/Manual control switching | Control output 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 measured temperature may deviate from the temperature in the controlled location.

When controlling with plural controllers, sometimes the measured temperatures (PV) do not concur due to differences 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.

However, it is effective within the input rated range regardless of the sensor correction value.

PV after sensor correction = Current PV+ (Sensor correction value)

**Alarm Energized/De-energized**

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 De-energized] 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)**

A1 hysteresis

ON

OFF

SV    +A1 value

(Fig. 5.5-1)
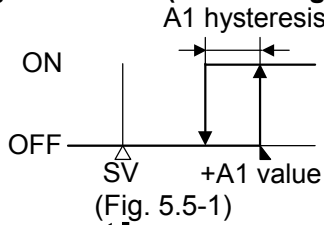
**High limit alarm (when De-energized is set)**

A1 hysteresis

ON

OFF

SV    +A1 value

(Fig. 5.5-2)

# 6. Operation

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

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

- For approx. 3 sec after the power is switched ON, the sensor input characters and the temperature unit ℃/℉ are indicated on the PV display, and input range high limit value is indicated on the SV display.
  (For DC current and voltage input, scaling high limit value is indicated.) See (Table 5.1-1).
  During this time, all outputs and LED indicators are in OFF status.
- Control will then start, indicating PV (process variable) on the PV display, and SV (desired value) on the SV display.
- While the Control output OFF function is working, $oFF$ is indicated on the PV display.

**(2) Input each set value.** Refer to "5. Settings".

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

Control action starts so as to keep the control target at the SV (desired value).

# 7. Action explanation

## 7.1 OUT1 action

| | Heating ( Reverse ) action | Cooling ( Direct ) action |
|---|---|---|
| Control action | Proportional band — ON / OFF sloping down to SV | Proportional band — OFF / ON sloping up from SV |
| Relay contact output | ⑥⑦ Cycle action is performed according to deviation | ⑥⑦ Cycle action is performed according to deviation |
| Non-contact voltage output | +⑥ 12V DC / 12/0V DC / 0V DC –⑦  Cycle action is performed according to deviation | +⑥ 0V DC / 0/12V DC / 12V DC –⑦  Cycle action is performed according to deviation |
| DC current output | +⑥ 20mA DC / 20 to 4mA DC / 4mA DC –⑦  Changes continuously according to deviation | +⑥ 4mA DC / 4 to 20mA DC / 20mA DC –⑦  Changes continuously according to deviation |
| Indicator (OUT1) Green | Lit     Unlit | Unlit     Lit |

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

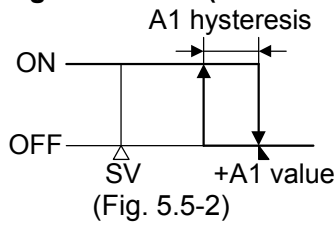## 7.2 OUT1 ON/OFF control action

| | Heating ( Reverse ) action | Cooling (Direct) action |
|---|---|---|
| Control action | Hysteresis — ON / OFF around SV | Hysteresis — OFF / ON around SV |
| Relay contact output | ⑥⑦ / ⑥⑦ | ⑥⑦ / ⑥⑦ |
| Non-contact voltage output | +⑥ 12V DC –⑦ / +⑥ 0V DC –⑦ | +⑥ 0V DC –⑦ / +⑥ 12V DC –⑦ |
| DC current output | +⑥ 20mA DC –⑦ / +⑥ 4mA DC –⑦ | +⑥ 4mA DC –⑦ / +⑥ 20mA DC –⑦ |
| Indicator (OUT1) Green | Lit     Unlit | Unlit     Lit |

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

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## 7.3 EVT (Heater burnout alarm) action

| Alarm action | ON / OFF chart: Heater burnout alarm value — Small ← Load current → Large | Output / Indicator | ③—⑤ Lit / ③—⑤ Unlit |
|---|---|---|---|

## 7.4 Alarm action

| | High limit alarm | Low limit alarm | High/Low limits alarm |
|---|---|---|---|
| Alarm action | A1 hysteresis — ON/OFF — -A1 value, SV, +A1 value | A1 hysteresis — ON/OFF — -A1 value, SV, +A1 value | A1 hysteresis — ON/OFF — A1 value, SV, A1 value |
| | High/Low limit range alarm | Process high alarm | Process low alarm |
| Alarm action | A1 hysteresis — ON/OFF — A1 value, SV, A1 value | A1 hysteresis — ON/OFF — A1 value | A1 hysteresis — ON/OFF — A1 value |
| | High limit alarm with standby | Low limit alarm with standby | High/Low limits alarm with standby |
| Alarm action | A1 hysteresis — ON/OFF — -A1 value, SV, +A1 value | A1 hysteresis — ON/OFF — -A1 value, SV, +A1 value | A1 hysteresis — ON/OFF — A1 value, SV, A1 value |

▒ : Standby functions.

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

## 7.5 OUT2 (Heating/Cooling control) action

| Control action | ON — Heating action — OFF ⟨Cooling P-band⟩ (Cooling action) — SV | Heating P-band | |
|---|---|---|---|
| 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 12/0 V DC −⑦ | +⑥ 0 V 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 Overlap band)
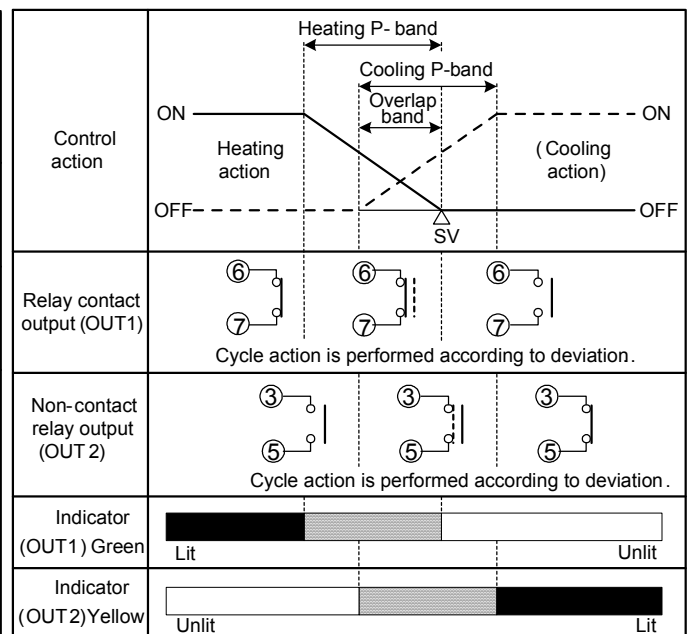
| Control action | ON — Heating action — OFF / (Cooling action) — SV / Heating P-band / Cooling P-band / Overlap band | | |
|---|---|---|---|
| Relay contact output (OUT1) | ⑥—⑦ | ⑥—⑦ | ⑥—⑦ — Cycle action is performed according to deviation. |
| Non-contact relay output (OUT2) | ③—⑤ | ③—⑤ | ③—⑤ — Cycle 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 Dead band)



| Control action | Heating action / Heating P-band | Dead band | (Cooling P-band) / (Cooling action) |
|---|---|---|---|
| | ON ── Heating action ── OFF (at SV) | | ON ── (Cooling action) ── 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 / +⑥ 12/0V DC / +⑥ 0V DC  — Cycle action is performed according to deviation. | | |
| DC current output (OUT1) | +⑥ 20mA DC / +⑥ 20 to 4mA DC / +⑥ 4mA DC  — 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 | | |

Legend:
▬ : Acts ON (lit) or OFF (unlit).
─── : Represents Heating control action.
----- : Represents Cooling control action.

# 8. AT of this controller

In order to set each value of P, I, D and ARW automatically, the AT (auto-tuning) process should be made to fluctuate to obtain an optimal value. One of 3 types of fluctuation below is automatically selected.

For DC input, the AT process will fluctuate around the SV for conditions of (A), (B) and (C) below.

**Sometimes the AT process will not fluctuate if AT is performed at or near room temperature.**
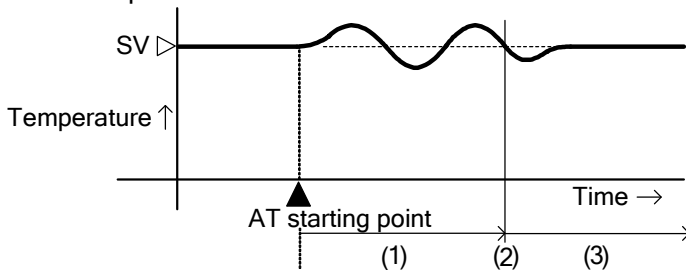**Therefore AT might not finish normally.**

**(A) In the case of a large difference between the SV and PV (process variable) as the temperature is rising**
When AT bias is set to 20℃, the AT process will fluctuate at a temperature 20℃ lower than the SV.
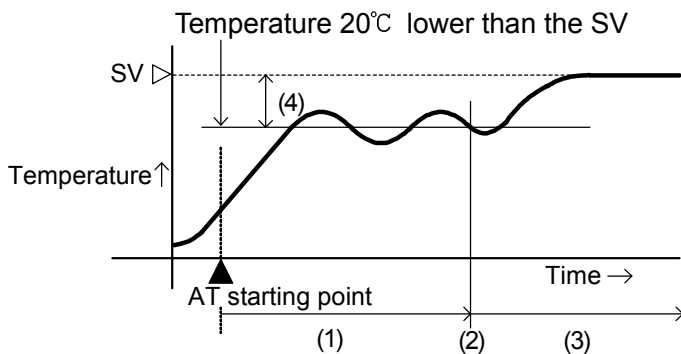


(1) Calculating PID constant
(2) PID constant calculated
(3) Controlled by the PID constant set by AT (auto-tuning).
(4) AT bias value

**(B) When the control is stable**
The AT process will fluctuate around the SV.



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

**(C) In the case of a large difference between the SV and PV (process variable) as the temperature is falling**
When AT bias is set to 20℃, the AT process will fluctuate at a temperature 20℃ higher than the SV.



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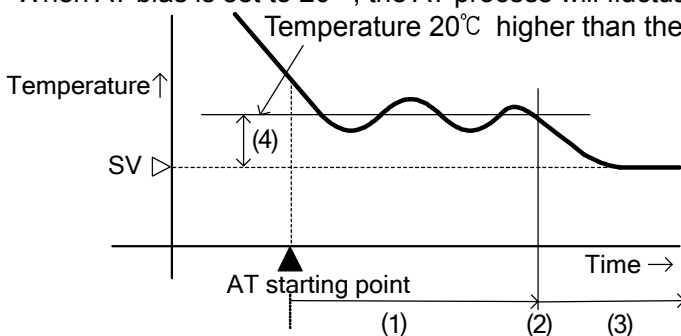(3) Controlled by the PID constant set by AT (auto-tuning).
(4) AT bias value

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# 9. Specifications

## 9.1 Standard specifications

**Mounting** : Flush
**Setting** : 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 $\pm0.2\%$ of each input span $\pm1$digit, or within $\pm2℃$ $(4℉)$,
               whichever is greater
               However R, S inputs, 0 to 200℃ (400℉): Within $\pm6℃$ $(12℉)$
               B input, 0 to 300℃ (600℉): Accuracy is not guaranteed.
               K, J, E, T, N inputs, less than 0℃ (32℉): Within $\pm0.4\%$ of each input span $\pm1$digit
          RTD : Within $\pm0.1\%$ of each input span $\pm1$digit, or
               within $\pm1℃$ $(2℉)$, whichever is greater
          DC current : Within $\pm0.2\%$ of each input span $\pm1$digit
          DC voltage : Within $\pm0.2\%$ of each input span $\pm1$digit
**Input sampling period** : 250ms
**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 DC 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 DC 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 cos$\phi$=0.4)
                 Electrical life: 100,000 cycles
          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 cycles
**Control action**
  PID control (with AT function)
  PI control: When derivative time is set to 0
  PD control (with auto-reset function): When integral time is set to 0
  P control (with auto-reset function): When derivative and integral times are set to 0
  ON/OFF control: 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 control when set to 0 or 0.0)
  Integral time        : 0 to 1000 sec (OFF when set to 0)
  Derivative time     : 0 to 300 sec (OFF when set to 0)
  OUT1 proportional cycle : 1 to 120 sec (Not available for DC current output type)
  ARW               : 0 to 100%
  OUT1 ON/OFF hysteresis: 0.1 to 100.0℃ (℉), or 1 to 1000
  OUT1 high limit     : 0 to 100% (DC current output type: –5 to 105%)
  OUT1 low limit     : 0 to 100% (DC current output type: –5 to 105%)
**Circuit insulation configuration**
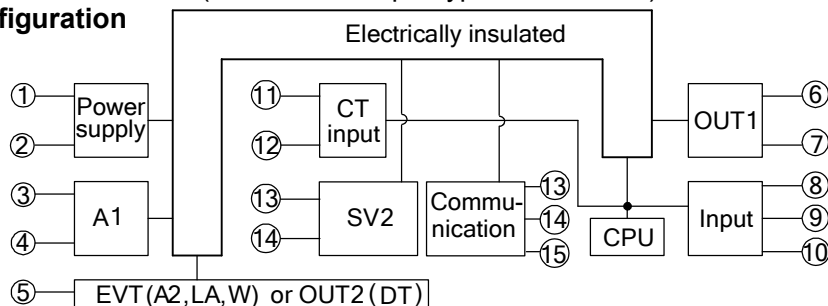


When OUT1 is non-contact voltage output or DC current output, OUT1 is not insulated from Communication, and OUT1 is not insulated from SV2. So an insulation test **must not** be carried out between them.

**Insulation resistance** : 10MΩ or more, at 500V DC
**Dielectric strength** : 1.5kV AC for 1 minute between input terminal and power terminal
        1.5kV AC for 1 minute 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 (non-condensing)
**Weight** : Approx. 200g
**External dimensions** : 48 x 48 x 95mm (W x H x D)
**Material** : Flame-resistant resin (Case)
**Color** : Light gray (Case)
**Drip-proof/Dust-proof** : IP66 for the front panel
**Attached functions** : **[Set value lock], [Sensor correction], [Auto/manual control switching],**
   **[Input error indication]**

| Output status when input abnormal (*1) | 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 (*2) | OFF (4mA) or OUT1 low limit value | OFF or OUT2 low limit value | ON or OUT2 high limit value (*2) |
| 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 (*2) | ON or OUT2 high limit value (*2) | OFF or OUT2 low limit value |
| oFF☐ | | | OFF (4mA) or OUT1 low limit value | OFF or OUT2 low limit value | |

**(*1)** This is only available for DC input and when OUT1 is DC current output type.
If OUT1 is not DC current output, the output status will be the same one as when oFF☐ is selected during "Output status when input abnormal".
For manual control, the preset manipulated variable (MV) is outputted.

**(*2)** Outputs a value between OFF (4mA) and ON (20mA) or between OUT1 (or OUT2) low limit value and OUT1 (or OUT2) high limit value, depending on deviation.

**Thermocouple, 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, the 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.

**[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 the PV display flashes "   ".

**[Self-diagnosis]**

The CPU is monitored by a watchdog timer, and if an 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 it at the same status as if the reference junction location was 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 input range 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 brackets: 1 set

Instruction manual: 1 copy

CT (Current transformer):  CTL-6S          : 1 piece (for rated current 5A, 10A, 20A)

CTL-12-S36-10L1U: 1 piece (for rated current 50A)

## 9.2 Optional specifications

### Alarm 2 (A2) (Option code: A2)

[A2], [W] and [LA] options 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 cycles

### 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.

[LA], [A2] and [W] options utilize common output terminals.

Setting range : Loop break alarm time: 0 to 200 minutes

Loop break alarm 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 cycles

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

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

This alarm is also activated when indication is overscale or underscale.

[W], [A2] and [LA] options utilize common output terminals.

This option cannot be applied to DC current output type.

Rated current    : 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 cycles

### 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 control 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

OUT2 high limit setting  : 0 to 100%

OUT2 low limit setting    : 0 to 100%

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:

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.

### Serial communication (Option code: C5)

When this option is added, the [SM] option cannot be added.
The following operations can be carried out from an external computer.
(1) Reading and setting of the SV, PID values and each set value
(2) Reading of the PV and action status  (3) Function change

| | |
|---|---|
| Cable length | : Maximum communication distance: 1.2km |
| | Cable resistance: Within 50Ω (Terminators are not necessary, but if used, use 120Ω or more on one side.) |
| Communication line | : EIA RS-485 |
| Communication method | : Half-duplex communication |
| Synchronization method | : Start-stop synchronization |
| Communication speed | : 2400, 4800, 9600, 19200bps (Selectable by keypad) |
| Parity | : Even, Odd, No parity (Selectable by keypad) |
| Stop bit | : 1, 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 controllers (with the SVTC option) can be digitally transmitted to the JCS-33A (with the C5 option). |

(The Set value lock of the JCS-33A must be set to Lock 3.)
When the data from the programmable controllers is out of the SV high limit or low limit value, the JCS-33A ignores the value, and performs the control with the previous value.
The control desired value adds SVTC bias value to the value received by the SVTC command.

### SV1/SV2 external selection (Option code: SM)

SV1 or SV2 can be selected by the external contact.
When this option is added, the [C5] option cannot be added.
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 |
|---|---|
| The PV display is indicating [$oFF$]. | • Control output OFF function is working.<br>  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.<br>  Change each sensor.<br>  **How to check whether the sensor is burnt out**<br>  [Thermocouple]<br>   If the input terminals of the instrument are shorted, and if a value around room temperature is indicated, the instrument is likely to be operating normally, however, the sensor may be burnt out.<br>  [RTD]<br>   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.<br>  [DC voltage (0 to 1V DC)]<br>   If the input terminals of the instrument are 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.<br>• Check whether the input terminals of thermocouple, RTD or DC voltage (0 to 1V DC) are securely mounted to the instrument input terminals.<br>  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.<br>  **How to check whether the input signal wire is disconnected**<br>  [DC voltage (1 to 5V DC)]<br>   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.<br>  [DC current (4 to 20mA DC)]<br>   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.<br>• 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.<br>• Check if polarity of thermocouple or compensating lead wire is correct.<br>• Check whether codes (A, B, B) of RTD match 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.<br>**How to check whether the input signal wire is disconnected**<br>[DC voltage (0 to 5V DC, 0 to 10V DC)]<br> 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.<br>[DC current (0 to 20mA DC)]<br> If the input to the input terminals of the instrument is 4mA DC and if a value corresponding to 4mA DC is indicated, the instrument is likely to be operating normally, however, the signal wire may be disconnected.<br>• 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.<br> Select the sensor input and temperature unit (℃ or ℉) properly.<br>• Sensor correction value is unsuitable. Set it to a suitable value.<br>• Check whether the specification of the sensor is correct.<br>• AC leaks into the controller input circuit from the sensors.<br> Use an ungrounded type sensor.<br>• There may be equipment that interferes with or makes noise near the controller.<br> Keep equipment that interferes with or makes noise away from the controller. |
| The PV display is indicating [*Err 1*]. | • Internal memory is defective.<br> Contact our agency or us. |

## 10.2 Key operation

| Problem | Presumed cause and solution |
|---|---|
| • Unable to set the SV (desired value), P, I, D, proportional cycle or alarm value.<br>• The values do not change by △, ▽ keys. | • Set value lock (Lock 1 or Lock 2) is selected.<br> Release the lock selection.<br>• During AT or auto-reset.<br> Cancel AT if required.<br> It takes approximately 4 minutes until auto-reset is finished. |
| The setting indication does not change in the input range even if the △, ▽ keys are pressed, and new values are unable to be set. | • SV high or low limit value in Auxiliary function setting mode 1 may be set at the point where the value does not change.<br> 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.<br>• Check whether the Sensor or control output terminals are securely mounted to the instrument input terminals.<br> Ensure that the sensor or control output terminals are mounted to the instrument input terminals securely.<br>• 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.<br> 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.<br> Set it to a suitable value. |

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

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