OBSOLETE

Operating Instructions

Temperature Indicating Controller, Models CS4H and CS4L

WIKA Operating Instructions CS4H / CS4L V1.1 · 07/2006

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Preface

Thank you for the purchase of our microcomputer based temperature indicating controllers CS4H or CS4L. This manual contains instructions for the mounting, functions, operations and notes when operating the CS4H or CS4L.
For model confirmation and unit specifications, please read this manual carefully before starting operation. To prevent accidents arising from the misuse of this controller, please ensure the operator using it receives this manual.

Caution

- This instrument should be used according to the specifications described in the manual. If it is used according to the specifications, it may malfunction or cause fire.
- Be sure to follow the warnings, cautions and notices. If not, it could cause serious injury or malfunction.
- Specifications of the CS4H and CS4L and the contents of this instruction manual are subject to change without notice.
- Care has been taken to assure that the contents of this instruction manual are correct, but if there are any doubts, mistakes or questions, please inform our sales department.
- This instrument is designed to be installed in a control panel. If 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.
- WIKA is not liable for any damages or secondary damages incurred as a result of using this product, including any indirect damages.

SAFETY PRECAUTIONS

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

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

⚠ Warning

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

⚠ Caution

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

1. Installation precautions

⚠ Caution

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

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

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

2. Wiring precautions

⚠ Caution

- **Use the solderless terminal with an insulation sleeve that fits in the M3 screw when wiring the CS4H or CS4L.**
- **The terminal block of this instrument is designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw.**
- **Tighten the terminal screw within the specified torque. If excessive force is applied to the screw when tightening, the screw or case may be damaged.**
- **Do not apply a commercial power source to the sensor which is connected to the input terminal nor allow the power source to come into contact with the sensor, as the input circuit may be burnt out.**
- **This controller has no built-in power switch, circuit breaker or fuse. It is necessary to install them near the controller. (Recommended fuse: Time-lag fuse, rated voltage 250V AC, rated current 2A)**
- **When using a 24V AC/DC for the power source, do not confuse the polarity when it is DC.**

3. Running and maintenance precautions

⚠ Caution

- **It is recommended that PID auto-tuning be performed on the trial run.**
- **Do not touch live terminals. This may cause electric shock or problems in operation.**
- **Turn the power supplied to the instrunment OFF when retightening the terminal and cleaning. Working or touching the terminal with the power switched ON may result in Electric Shock causing severe injury or death.**
- **Use a soft, dry cloth when cleaning the instrument. (If paint thinner is used, it might deform or tarnish the unit.)**
- **As the display section is vulnerable, do not strike or scratch it with a hard object or press hard on them**

List of contents

1. Model informations

1.1 Model name and order code

CS4 ☐ - 3 A ☐ / M - ☐ B ☐ - ☐ - ☐ -...									Series name CS4_
Model	H								CS4H: W48 x H96 x D100mm
	L								CS4L: W96 x H96 x D100mm
Control **characteristic**		3							PID (setable control parameter) (1)
Alarm 1 (A1)			A						Process value monitoring, output relay (2)
Control output				R					Relay
				S					Logic level (DC 0/12 V) for solid state relay
				A					Analogue current signal (4 ... 20 mA)
Input					M				Multi-function input (input configuration setable) (3)
Power supply						H			AC 100 ... 240 V, 50 ... 60 Hz
						L			AC/DC 24 V
Case colour							B		Black
Instrument configuration								B	Factory adjustment
								# (?)	To customers specification

Options	
2AS (4)	Alarm output 2: process value monitoring
2AR (4)	Alarm output 2: control loop monitoring
2AL (4)	Alarm output 2: process value and control loop monitoring with common terminals
W10 (4) (5)	Heater burnout alarm for 1 phase (max. 5 A)
W11 (4) (5)	Heater burnout alarm for 1 phase (max. 10 A)
W12 (4) (5)	Heater burnout alarm for 1 phase (max. 20 A)
W15 (4) (5)	Heater burnout alarm for 1 phase (max. 50 A)
DR2 (4)	2. control output (three step control) relay
DS2 (4)	2. control output (three step control) logic level DC 0/12 V for solid state relay
DA2 (4)	2. control output (three step control) analogue current signal (4 ... 20 mA)
CR5 (6)	Serial interface RS 485
P24 (7)	Transmitter supply DC 24 V max. 30 mA
R50	Shunt resistor 50 Ω for input signals 0/4 ... 20 mA
KAB	Terminal cover

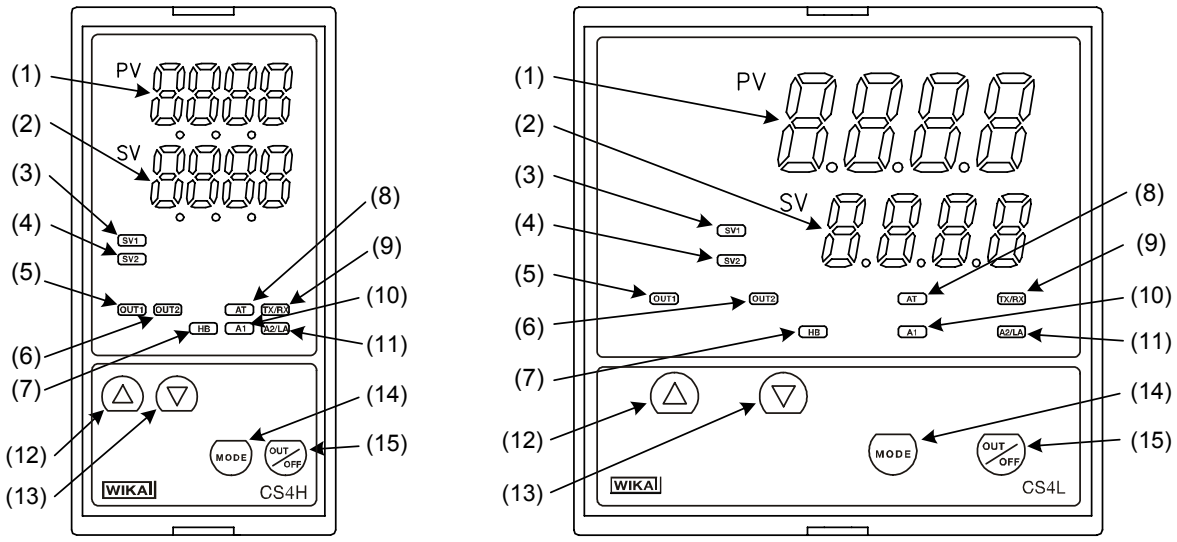
(1) PID, PI, PD, P and ON/OFF action are programmable.
(2) 9 types of alarm action, no alarm action and energized/deenergized are selectable by key operation.
(3) The input configuration can be selected from the user by the front keys.
(4) Only 2 options can be added from Alarm output 2, Heater burnout alarm and 2. control output.
(5) For control output analogue current signal heater burnout alarm cannot be added.
(6) When serial communication is added, SV1/SV2 external selection (standard function) does not work.
(7) 2. control output and heater burnout alarm cannot be added, when transmitter supply DC 24 V is added.

1.2 Rated input

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

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

2. Name and functions of the sections



(Fig. 2-1)

Indications:

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

(2) SV: SV display
Indicates the setting value (SV) or manipulated variable (MV) with a green LED.

(3) SV1: Set value 1 indicator
When set value 1 (SV1) is selected, a green LED lights.

(4) SV2: Set value 2 indicator
When set value 2 (SV2) is selected, a yellow LED lights.

(5) OUT1: Control output 1 (OUT1) indicator
When OUT1 or Heating output is ON, a green LED lights.
(In the case of DC current output type, it blinks in a 0.25 second cycle corresponding to the output manipulated variable.)

(6) OUT2: Control output 2 (OUT2) indicator
When OUT2 is ON, a yellow LED lights.
(In the case of DC current output type, it blinks in a 0.25 second cycle corresponding to the output manipulated variable.)

(7) HB: HB indicator
When Heater burnout alarm output or Sensor burnout alarm output is ON, a red LED lights.
(When Heater burnout Alarm is added, a red LED also lights when the indication is overscale or underscale)

(8) AT: Auto-tuning (AT) indicator
When Auto-tuning or Auto-reset is active, a yellow LED blinks.

(9) TX/RX: TX/RX indicator
When serial communication TX (transmitting) is outputted, a yellow LED lights.

(10) A1: Alarm 1 (A1) indicator
When A1 output is ON, a red LED lights.

(11) A2/LA: Alarm 2 (A2/LA) indicator
When A2 output is ON, a red LED lights.

Keys:

(12) ▲: Increase key
Increases numeric value of the setting value.

(13) ▼: Decrease key
Decreases numeric value of the setting value.

(14) MODE: Mode key
Switches the setting mode and registers the setting value and selected value.
(Setting value and selected value are registered by pressing the mode key.)

(15) $^{OUT}/_{OFF}$: $^{OUT}/_{OFF}$ key

- When $^{OUT}/_{OFF}$ function is selected in the $^{OUT}/_{OFF}$ key function selection, control output can be turned on or off. By pressing $^{OUT}/_{OFF}$ key for approx. 1 second from any mode, control output OFF function works. 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. Control output OFF function keeps working. To cancel the function, press the $^{OUT}/_{OFF}$ key again for approx. 1 second.
- When Auto/Manual control function is selected in the $^{OUT}/_{OFF}$ key function selection, automatic control starts when the power to the controller is turned on. If the $^{OUT}/_{OFF}$ key is pressed again in this status, manual control starts. If the $^{OUT}/_{OFF}$ key is pressed again during manual control, the control reverts to automatic one. However, Auto/Manual function can be switched only in the PV/SV display mode.

⚠ Notice

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

3. Mounting to control panel

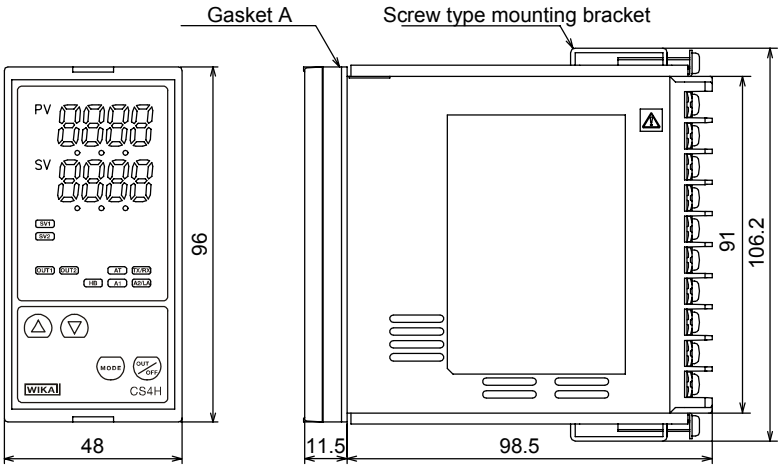
3.1 Site selection

This instrument is intended to be used under the following conditions (IEC61010-1):
Overvoltage category Ⅱ, Pollution degree 2
Mount the controller in a place with:

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

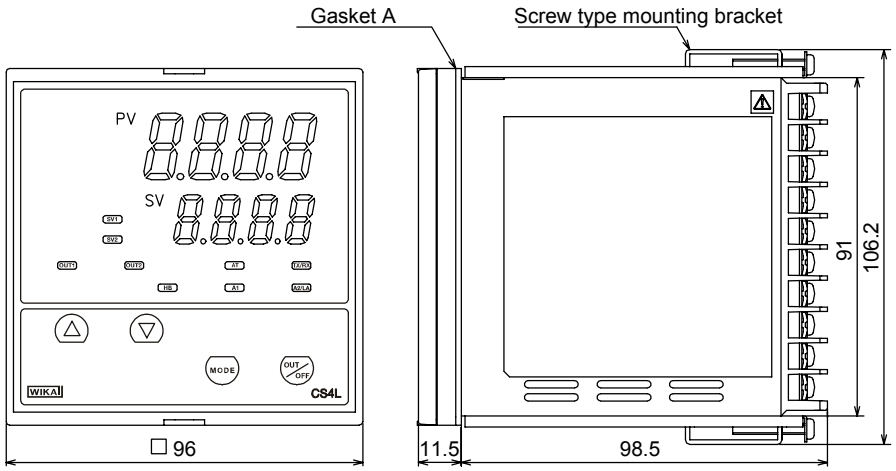
3.2 External dimension

• CS4H



(Fig. 3.2-1)

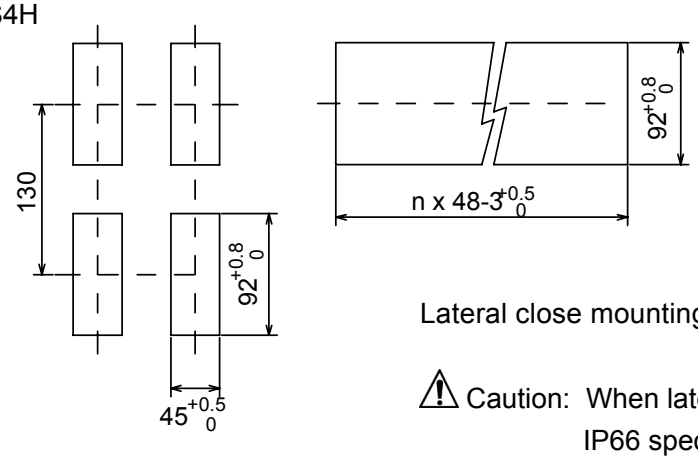
• CS4L



(Fig. 3.2-2)

3.3 Panel cutout

• CS4H

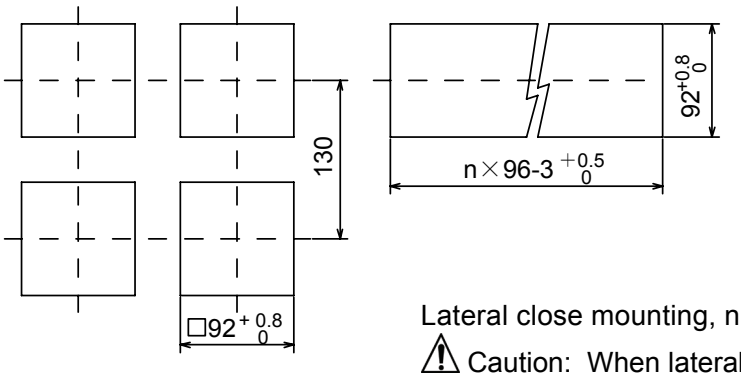


Lateral close mounting, n: Number of units mounted

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

(Fig. 3.3-1)

• CS4L



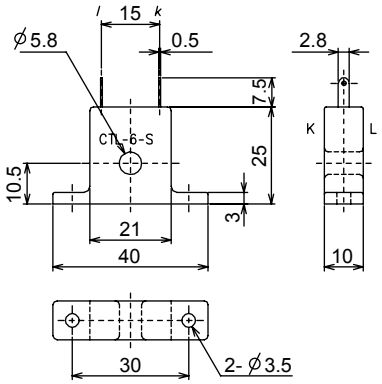
Lateral close mounting, n: Number of units mounted

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

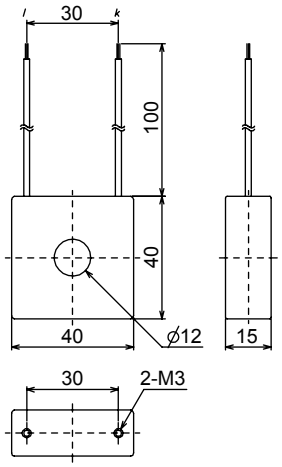
(Fig. 3.3-2)

3.4 CT (Current transformer) external dimension

CTL-6S (for 5A, 10A, 20A)



CTL-12-S36-10L1 (for 50A)



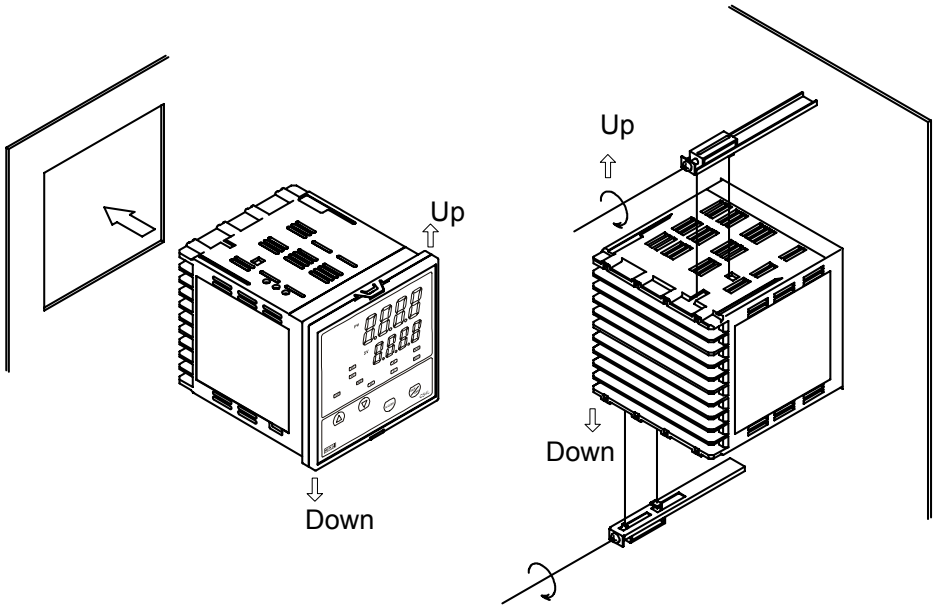
(Fig. 3.4-1)

3.5 Mounting (both CS4H and CS4L)

⚠ Warning

As the case is made of resin, do not use excessive force while screwing in the mounting bracket, or the case could be damaged.
The torque is approximately 0.12 Nm.

To fulfill the Dust-proof/Drip-proof IP66 specification, mount this unit vertically and check the rigidity of the panel where this unit is mounted. If rigidity is not enough, Dust-proof/Drip-proof IP66 specification may not be guaranteed.
Mounting panel thickness: Within 1 ... 15 mm
Insert this unit 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.



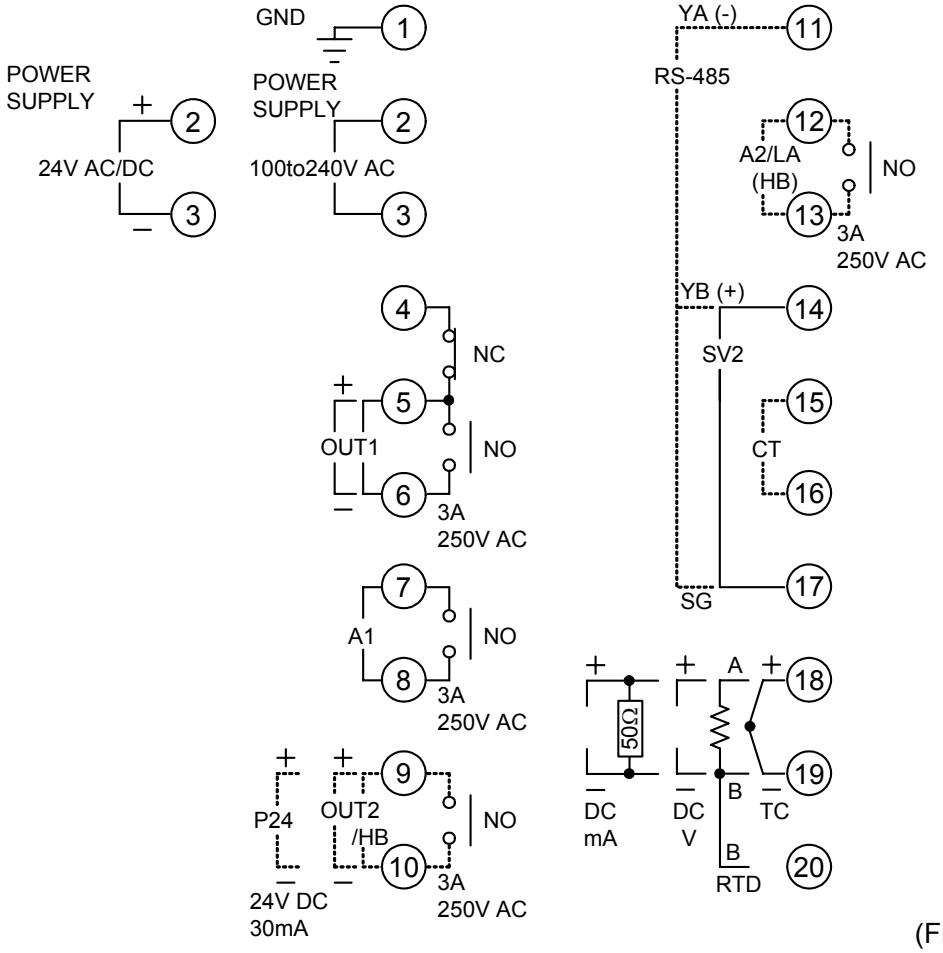
(Fig. 3.5-1)

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 Electric Shock causing severe injury or death.
Moreover, the instrument must be grounded before the power supply to the instrument is turned on.

4.1 Terminal arrangement



(Fig. 4.1-1)

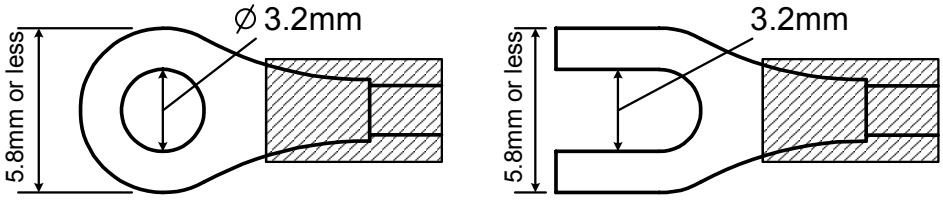
- OUT1 : Control output 1 (Heating)
- OUT2 : Control output 2 (Cooling)
- A1 : Alarm 1 output
- A2/LA : Alarm 2/Loop break alarm output
- HB : Heater burnout alarm output
- P24 : Transmitter supply output
- RS-485 : Serial communication (RS-485)
- SV2 : Second set value (external selection)
- CT : CT input
- TC : Thermocouple
- RTD : Resistance temperature detector
- DC : DC voltage (DC V) or DC current (DC mA)
- 50 Ω : Shunt resistor 50 Ω for input DC current

⚠ Caution

- The terminal blocks of the CS4H and CS4L are designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw.
- Dotted lines show options. If the option is not designated, there are no terminals.
- When A2 (option) and Heater burnout alarm (option) are applied together, use terminals 12-13 for A2, and 9-10 for Heater burnout alarm.
- When Heating/Cooling control (option) and Heater burnout Alarm (option) are applied together, use terminals 9-10 for the Heating/Cooling control and 12-13 for the Heater burnout alarm.
- When A2 (option) and LA (option) are applied, they use common output terminals.
- When Isolated power output (option) is applied, Heating/Cooling control (option) and Heater burnout Alarm (option) cannot be applied with it.

Lead wire solderless terminal

Use a solderless terminal with isolation sleeve that fits in the M3 screw as shown below.
Designate the torque 0.6 Nm to 1.0 Nm.



(Fig. 4.1-2)

4.2 Wiring connection example

⚠ Caution

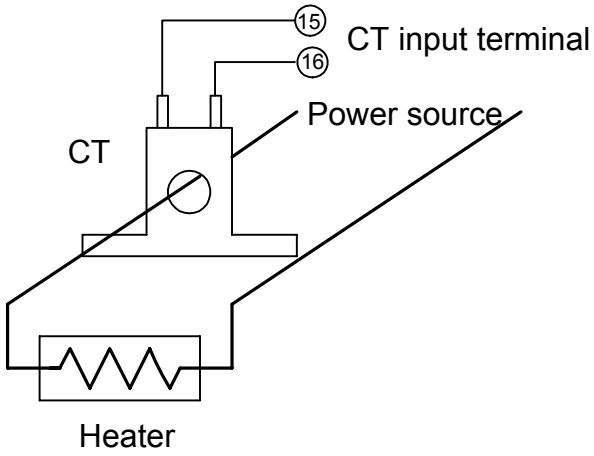
- **Use a thermocouple and compensating lead wire according to the sensor input specifications of this controller.**
- **Use a 3-wire RTD system according to the sensor input specifications of this controller.**
- **This controller has no built-in power switch or fuse. It is necessary to install them in the circuit near the external controller.**
  (Recommended fuse: Time-lag fuse, rated voltage AC 250V, rated current 2A)
- **When using a AC/DC 24V for the power source, do not confuse the polarity when it is DC.**
- **When using a relay contact output type, 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.**
- **Use a thick wire (1.25 … 2.0 mm^2) for the earth ground.**

[Heater burnout alarm output]

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

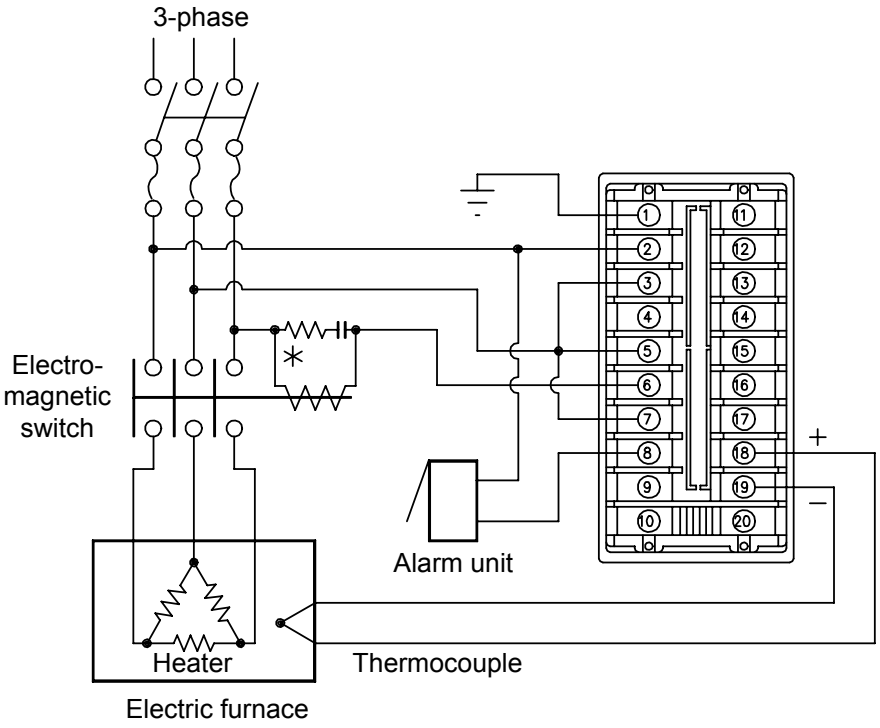
(2) Use current transformer (CT) provided, and pass one lead wire of heater circuit into the hole of the CT.

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



(Fig. 4.2-1)

[CS4H-R/M]



(Fig. 4.2-2)

- To prevent the unit from harmful effects of unexpected high level noise, it is recommended that a surge absorber be installed between the electromagnetic switch coils.

- AC or DC is available to supply voltage 24 V. Do not confuse the polarity when it is DC.

5. Setup

For the thermocouple and RTD inputs, 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 after the power is turned on (Table 5-1).

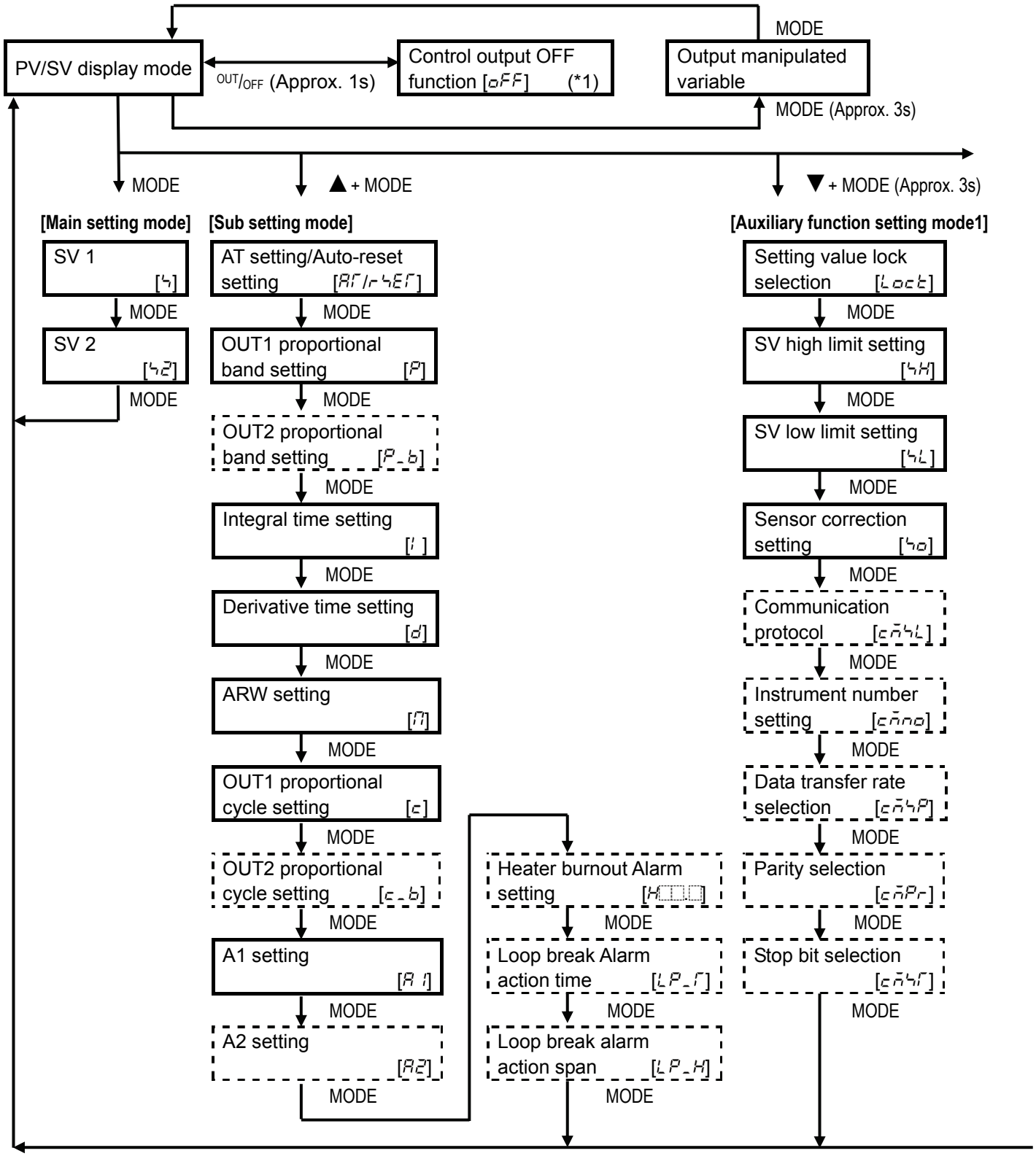
For DC input, the sensor input characters are indicated on the PV display and the scaling high limit value is indicated on the SV display for approximately 3 seconds after the power is turned on (Table 5-1).
If any other value is set in the scaling high limit setting, the set value is indicated on the 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 will be indicated on the SV display. While control output OFF function is working, oFF is indicated on the PV display. To cancel control output OFF function, press the $^{OUT}/_{OFF}$ key for approximately 1 second.

(Table. 5-1)

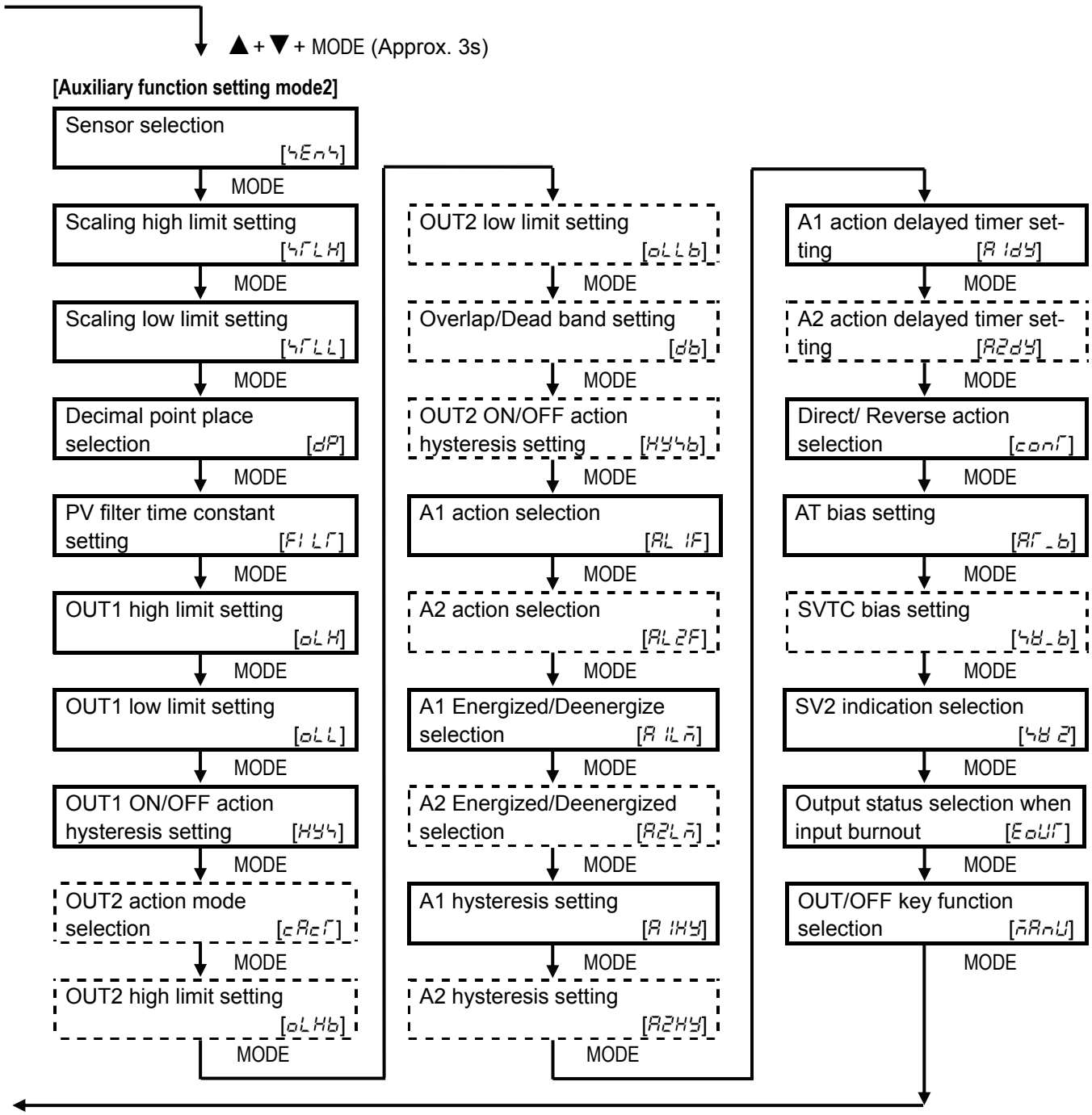
Sensor input	°C		°F	
	PV display	SV display	PV display	SV display
K	k C	1370	k F	2500
	k .C	400.0	k .F	750.0
J	J C	1000	J F	1800
R	r C	1760	r F	3200
S	S C	1760	S F	3200
B	b C	1820	b F	3300
E	E C	800	E F	1500
T	t .C	400.0	t .F	750.0
N	n C	1300	n F	2300
PL-Ⅱ	PL2C	1390	PL2F	2500
C (W/Re5-26)	c C	2315	c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

5.1 Setup flow chart



- ▲ + MODE: Press the MODE key, while the ▲ key is being pressed.
- ▼ + MODE (Approx. 3s): Press the MODE key for approx. 3s, while the ▼ key is being pressed.
- ▲ + ▼ + MODE (Approx. 3s): Press the MODE key for approx. 3s, while the ▲ and ▼ keys are being pressed.
- Dotted lines show options, which are indicated only when the options are applied.

(*1) If Auto/Manual control function is selected in the $^{OUT}/_{OFF}$ key function selection, even though the $^{OUT}/_{OFF}$ key is pressed, control output OFF function does not work, but manual control is selected.


▲+▼+ MODE (Approx. 3s)
[Auxiliary function setting mode2]
Sensor selection [SEnS]
MODE
Scaling high limit setting [SCLH]
MODE
Scaling low limit setting [SCLL]
MODE
Decimal point place selection [dP]
MODE
PV filter time constant setting [FILT]
MODE
OUT1 high limit setting [oLH]
MODE
OUT1 low limit setting [oLL]
MODE
OUT1 ON/OFF action hysteresis setting [HYS]
MODE
OUT2 action mode selection [cAct]
MODE
OUT2 high limit setting [oLHb]
MODE
OUT2 low limit setting [oLLb]
MODE
Overlap/Dead band setting [db]
MODE
OUT2 ON/OFF action hysteresis setting [HYSb]
MODE
A1 action selection [AL 1F]
MODE
A2 action selection [AL2F]
MODE
A1 Energized/Deenergize selection [A 1LA]
MODE
A2 Energized/Deenergized selection [A2LA]
MODE
A1 hysteresis setting [A 1HY]
MODE
A2 hysteresis setting [A2HY]
MODE
A1 action delayed timer setting [A 1dY]
MODE
A2 action delayed timer setting [A2dY]
MODE
Direct/ Reverse action selection [conT]
MODE
AT bias setting [AT_b]
MODE
SVTC bias setting [SV_b]
MODE
SV2 indication selection [SV 2]
MODE
Output status selection when input burnout [EoUT]
MODE
OUT/OFF key function selection [AAnU]
MODE

5.2 Main setting mode

If the MODE key is pressed, main setting mode is selected.
The setting value (numeric value) can be increased or decreased by pressing the ▲ or ▼key.
If the MODE key is pressed, the setting value is registered and the controller will revert to the PV/SV display mode.

SV1 [SV1]
- Sets SV1.
- Setting range: SV low limit to SV high limit or
  Scaling low limit value to Scaling high limit value
- Default: 0 °C

SV2 [SV2]
- Sets SV2.
- Setting range: SV low limit to SV high limit or
  Scaling low limit value to Scaling high limit value
- Default: 0 °C

5.3 Sub setting mode

By pressing the MODE key while holding down the ▲ key, Sub setting mode can be selected.
The ▲ or ▼ key increases or decreases the setting value (numeric value).
By pressing the MODE key, setting value is registered and the next setting item is selected.

AT setting/ Auto-reset setting [AT/r-SET]
- Sets AT (Auto-tuning) or Auto-reset (offset correction).
- Auto-reset can be performed only during PD and P action.
  (Not available for PID, PI and ON/OFF action)
- Default: Both Auto-tuning and Auto-reset Cancellation

[Auto-tuning]
- If the auto-tuning performance is designated, AT indicator blinks and the controller reverts to the PV/SV display mode.
- After auto-tuning ends, AT indicator is turned off and P, I, D and ARW values are automatically set.
- During auto-tuning, none of the settings can be performed.
- If the auto-tuning is released during the process, P, I, D and ARW values revert to their former value.
- If the OUT/OFF key is pressed during auto-tuning, control output OFF function is activated, and if the OUT/OFF key is pressed again, PID auto-tuning is cancelled.

[Auto-reset]
- If the auto-reset is performed, offset correction immediately starts and the controller reverts to the PV/SV display mode. (The corrected value is automatically set and AT indicator blinks)
- During 4 minutes of auto-reset performing, other settings cannot be performed to prevent key misoperations.
- After auto-reset ends, AT indicator is turned off and all settings can be carried out.

OUT1 proportional band setting [P]
- Sets OUT1 proportional band.
  ON/OFF action when set to 0 or 0.0.
- Setting range: 0 … 1000 °C (0 … 2000 °F)
  With a decimal point: 0.0 … 999.9 °C (0.0 … 999.9 °F)
  DC input: 0.0 … 100.0 %
- Default: 10 °C

OUT2 proportional band setting [P_b]
- Sets OUT2 proportional band.
  ON/OFF action when set to 0 or 0.0.
- Not available when 2. control output (option) is not applied or when OUT1 is ON/OFF action
- Setting range: 0.0 … 10.0 times (multiplying factor to OUT1 proportional band)
- Default: 1.0 times

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

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

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

OUT1 proportional cycle setting [c]
- Sets OUT1 proportional cycle.
  Not available for ON/OFF action and DC current output type
- **For the relay contact output type, if the proportional cycle time is decreased, the frequency of the relay action increases and the life of the relay contact is shortened.**
- Setting range: 1 … 120 seconds
- Default: 30 seconds for Relay contact output type,
  3 seconds for Non-contact voltage output type

OUT2 proportional cycle setting [c_b]
- Sets OUT2 proportional cycle.
  Not available for ON/OFF action and DC current output type
- Not available when 2. control output (option) is not added or when OUT2 is ON/OFF action
- Setting range: 1 … 120 seconds
- Default: 30 seconds for Relay contact output type,
  3 seconds for Non-contact voltage output type

A1 setting [A 1]
- Sets the action point of A1 output.
  Setting the value to 0 or 0.0 disables the function.
  (Excluding process high alarm and process low alarm)
- Not available when No alarm action is selected in the A1 action selection
- Setting range: Refer to (Table 5.3-1).
- Default: 0 °C

A2 setting [A2]
- Sets the action point of A2 output.
  Setting the value to 0 or 0.0 disables the function.
  (Excluding process high alarm and process low alarm)
- Not available when option [2AS] or [2AL] is not added or when No alarm action is selected in the A2 action selection
- Setting range and default value are the same as those of A1 setting.

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

LA (Loop break alarm) action time setting [LP_T]
- Sets the action time to assess the Loop break alarm.
- Available only when option [2AR] or [2AL] is added
- Setting range: 0 … 200 minutes
- Default: 0 minutes

LA (Loop break alarm) action span setting [LP_H]
- Sets the action span to assess the Loop break alarm.
- Available only when option [2AS] or [2AL] is added
- Setting range: 0 … 150 °C (°F), however, with a decimal point 0.0 … 150.0 °C (°F)
  For DC input, 0 … 1500 (The placement of the decimal point follows the selection.)
- Default: 0 °C

[A1, A2 setting range]

(Table 5.3-1)

Alarm action	Setting range	
High limit alarm	–Input span to Input span °C (°F)	*1
Low limit alarm	–Input span to Input span °C (°F)	*1
High/Low limits alarm	0 to Input span °C (°F)	*1
High/Low limit range alarm	0 to Input span °C (°F)	*1
Process high alarm	Input range low limit to Input range high limit	*2
Process low alarm	Input range low limit to Input range high limit	*2
High limit alarm with standby	–Input span to Input span °C (°F)	*1
Low limit alarm with standby	–Input span to Input span °C (°F)	*1
High/Low limits alarm with standby	0 to Input span °C (°F)	*1

- When the input has a decimal point, the negative low limit value is –199.9, and the positive high limit value is 999.9.

*1: For DC input, the Input span is the same as the Input range scaling span.

*2: For DC input, Input range low (high) limit value is the same as the Input range scaling low (high) limit value.

5.4 Auxiliary function setting mode 1

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

Setting value lock selection [Loc.L]
- Mode to lock the setting value to prevent setting errors.
  The setting item to be locked depends on the designation.
- When designating Lock, designate Lock 1, 2 or 3 after setting the necessary items in the status Unlock.
- Selection item:
  - - - - (Unlock): All setting values can be changed.
  Loc 1 (Lock 1): None of setting values can be changed.
  Loc2 (Lock 2): Only main setting value can be changed.
  Loc3 (Lock 3): All setting values can be changed. However, **do not change the setting items in the Auxiliary function setting mode 2.**
  The changed value returns to the former value after the power is turned off because the value is not written in the non-volatile memory.
  Since it has no relation to the memory life, this is suitable when used with WIKA programmable controller (with SVTC).
- Default: Unlock

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

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

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

Communication protocol selection [cnSL]
- Selects communication protocol of this instrument.
- Available only when the option Serial interface [CR5] is applied
- Selection item: nonL (WIKA protocol)
  nodA (Modbus ASCII mode)
  nodr (Modbus RTU mode)
- Default: WIKA protocol

Instrument number setting [cnno]
- Sets the instrument number of this unit. (The instrument number should be set individually when communicating by connecting plural instruments in serial communication, otherwise it is impossible to communicate)
- Available only when the option Serial interface [CR5] is applied
- Setting range: 0 … 95
- Default: 0

Data transfer rate selection [cr5P]
- Selects the data transfer rate of this unit. (The data transfer rate of this unit must be equal to the rate of the host computer, otherwise it is impossible to communicate)
- Available only when the option Serial interface [CR5] is applied
- Selection items: 24 (2400 bps)
  48 (4800 bps)
  96 (9600 bps)
  192 (19200 bps)
- Default: 9600 bps

Parity selection [crPr]
- Selects the parity of this unit.
- Not available when the option Serial interface [CR5] is not applied or when WIKA protocol is selected in the Communication protocol selection
- Selection item: nonE (WIKA protocol)
  EvEn (Modbus RTU mode)
  odd (Modbus ASCII mode)
- Default: WIKA protocol

Stop bit selection [cr5r]
- Selects the stop bit of this unit.
- Not available when the option Serial interface [CR5] is not applied or when WIKA protocol is selected in the Communication protocol selection
- Selection item: 1 (1)
  2 (2)
- Default: 1

5.5 Auxiliary function setting mode 2

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

The setting value can be increased or decreased by pressing the ▲ or ▼ key.

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

If Lock 3 is selected in the Setting value lock selection, release Lock 3 to Unlock, and then change each setting value in the Auxiliary function setting mode 2.

Sensor selection [SEn S]

- An input type from thermocouple (10 types), RTD (2 types), DC current (2 types), DC voltage (4 types) and the unit °C/°F can be selected.
- **When changing the input from DC voltage to other inputs, remove the sensor connected to this controller, then change for the input. If the input is changed with the sensor connected, the input circuit may be broken.**
- Default: K (–200 … 1370 °C)

Input type	Input range	
K	–200 … 1370 °C: K C	–320 … 2500 °F: K F
	–199.9 … 400.0 °C: K .C	–199.9 … 750.0 °F: K .F
J	–200 … 1000 °C: J C	–320 … 1800 °F: J F
R	0 … 1760 °C: r C	0 … 3200 °F: r F
S	0 … 1760 °C: S C	0 … 3200 °F: S F
B	0 … 1820 °C: b C	0 … 3300 °F: b F
E	–200 … 800 °C: E C	–320 … 1500 °F: E F
T	–199.9 … 400.0 °C: T .C	–199.9 … 750.0 °F: T .F
N	–200 … 1300 °C: n C	–320 … 2300 °F: n F
PL-Ⅱ	0 … 1390 °C: PL2C	0 … 2500 °F: PL2F
C(W/Re5-26)	0 … 2315 °C: c C	0 … 4200 °F: c F
Pt100	–199.9 … 850.0 °C: Pt .C	–199.9 … 999.9 °F: Pt .F
Pt100	–200 … 850 °C: Pt C	–300 … 1500 °F: Pt F
JPt100	–199.9 … 500.0 °C: JPt.C	–199.9 … 900.0 °F: JPt.F
JPt100	–200 … 500 °C: JPtC	–300 … 900 °F: JPtF
4 … 20 mA DC	–1999 … 9999: 420A	
0 … 20 mA DC	–1999 … 9999: 020A	
0 … 1 V DC	–1999 … 9999: 0 1V	
0 … 5 V DC	–1999 ... 9999: 0 5V	
1 … 5 V DC	–1999 … 9999: 1 5V	
0 … 10 V DC	–1999 … 9999: 0 10V	

Scaling high limit setting [SCLH]

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

Scaling low limit setting [SCLL]

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

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

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

OUT1 high limit setting [oLH]
- Sets the high limit value for OUT1.
  Not available for ON/OFF action
- Setting range: OUT1 low limit value to 100 % (Control output Relay or Logic level DC 0/12 V)
  OUT1 low limit value to 105 % (Control output Analogue current signal (4 ... 20 mA))
- Default: 100 %

OUT1 low limit setting [oLL]
- Sets low limit value for OUT1.
  Not available for ON/OFF action
- Setting range: 0 % to OUT1 high limit value (Control output Relay or Logic level DC 0/12 V)
  –5 % to OUT1 high limit value (Control output Analogue current signal (4 ... 20 mA))
- Default: 0 %

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

OUT2 action mode selection [cACT]
- Selects OUT2 cooling action from air cooling, oil cooling and water cooling.
  Not available when 2. control output (option) is not added or when OUT2 is ON/OFF action
- Selection item: AIr (Air cooling, linear characteristic)
  oIL (Oil cooling, 1.5th power of the linear characteristic)
  WAT (Water cooling, 2nd power of the linear characteristic)
- Default: Air cooling

OUT2 high limit setting [oLHb]
- Sets the high limit value for OUT2.
- Not available when 2. control output (option) is not added or when OUT2 is ON/OFF action
- Setting range: OUT2 low limit value to 100 % (2. control output Relay or Logic level DC 0/12 V)
  OUT2 low limit value to 105 % (2. control output Analogue current signal (4 ... 20 mA))
- Default: 100 %

OUT2 low limit setting [oLLb]
- Sets the low limit value for OUT2.
- Not available when 2. control output (option) is not added or when OUT2 is ON/OFF action
- Setting range: 0 % to OUT2 high limit value (2. control output Relay or Logic level DC 0/12 V)
  –5 % to OUT2 high limit value (2. control output Analogue current signal (4 ... 20 mA))
- Default: 0 %

Overlap band/Dead band setting [db]
- Sets Overlap band/Dead band for OUT1 and OUT2.
  + setting value: Dead band
  – setting value: Overlap band
- Not available for ON/OFF action or when 2. control output (option) is not added
- Setting range: –100.0 … 100.0 °C (°F)
  for DC input, 1 … 1000
  (the placement of the decimal point follows the selection)
- Default: 0.0 °C

OUT2 ON/OFF action hysteresis setting [HY2b]
- Sets ON/OFF hysteresis for OUT2.
- Available only when 2. control output (option) is added
- Setting range: 0.1 … 100.0°C (°F)
  For DC input, 1 … 1000
  (the placement of the decimal point follows the selection)
- Default: 1.0 °C

A1 action selection [AL 1F]
- Selects A1 action.
- Selection item:

No alarm action	: ----	Process high alarm	: Ph
High limit alarm	: H	Process low alarm	: rPh
Low limit alarm	: L	High limit alarm with standby	: H d
High/Low limits alarm	: HL	Low limit alarm with standby	: L d
High/Low limit range alarm	: d i d	High/Low limits alarm with standby	: HL d

- Default: No alarm action

A2 action selection [AL2F]
- Selects A2 action.
- Available only when option [2AS] or [2AL] is added
- Selection item, default value are the same as those of A1 action selection.

A1 action Energized/Deenergized selection [A 1Ln]
- Selects A1 action Energized/Deenergized.
- Not available when No alarm action is selected in the A1 action selection
- Selection item: nonL (Energized)
  rEVh (Deenergized)
- Default: Energized

A2 action Energized/Deenergized selection [A2Ln]
- Selects Energized or Deenergized for A2 action.
- Not available when No alarm action is selected in the A2 action selection or when option [2AS] or [2AL] is not added
- Selection item and default value are the same as those of A1 action Energized/ Deenergized selection.

A1 hysteresis setting [A 1HY]
- Sets A1 hysteresis.
- Not available when No alarm action is selected in the A1 action selection
- Setting range: 0.1 … 100.0 °C (°F)
  For DC input, 1 … 1000
  (the placement of the decimal point follows the selection)
- Default: 1.0 °C

A2 hysteresis setting [A2HY]
- Sets A2 hysteresis.
- Not available when No alarm action is selected in the A2 action selection or when option [2AS] or [2AL] is not added
- Setting range and default value are the same as those of A1 hysteresis setting.

A1 action delayed timer setting [A 1dY]
- Sets the 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 the A1 action selection
- Setting range: 0 … 9999 seconds
- Default: 0 seconds

A2 action delayed timer setting [A2dY]
- Sets the 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 No alarm action is selected in the A2 action selection or if option [2AS] or [2AL] is not applied
- Setting range and default value are the same as those of A1 action delayed timer setting.

Direct/Reverse action selection [conF]
- Selects Reverse (Heating) or Direct (Cooling) action.
- Selection item: HEAT (Reverse)
  cooL (Direct)
- Default: Reverse (Heating)

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

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

SV2 indication selection [SV 2]
- Selects whether SV2 is indicated or not.
- Available only when serial interface (option) is added
- Selection item: on (Indication)
  oFF (No indication)
- Default: Indication

Output status selection when input burnout [EoUT]
- Selects output status when input is burnt out.
  Available only for control output analogue current signal (4 ... 20 mA) with DC inputs
- Selection item: oFF (Output OFF)
  on (Output ON)
- Default: Output OFF

OUT/OFF key function selection [AMnU]
- Selects the $^{OUT}/_{OFF}$ key function.
- Selection item: oFF (OUT/OFF function)
  AMnU (Auto/Manual control function)
- Default: 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 temperatures measured (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. However, it is effective within the input rating range regardless of the sensor correction value.

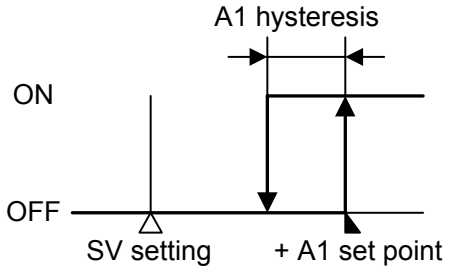
[Loop break alarm]

The alarm will be activated when the process variable (PV) does not **rise** as much as the span or greater within the time it takes to assess the loop break alarm after the manipulated variable has reached 100 % or the output high limit value.
The alarm will also be activated when the process variable (PV) does not **fall** as much value as the span or greater within the time it takes to assess loop break alarm after the manipulated variable has reached 0 % or the output low limit value.
When the control action is Direct (Cooling), read "**fall**" for "**rise**" and vice versa.

[Energized/Deenergized]

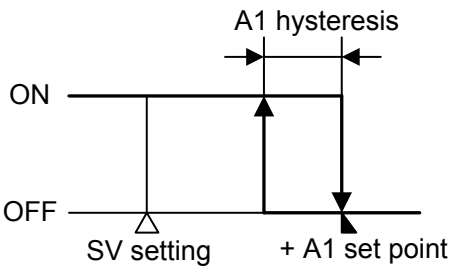
When alarm action energized is selected, the alarm output (between terminals 7-8, or 12-13) is conducted (ON) while the alarm output indicator is lit.
The alarm output is not conducted (OFF) while the alarm output indicator is not lit. See (Fig. 5.5-1).

When alarm action deenergized is selected, the alarm output (between terminals 7-8, or 12-13) 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. See (Fig. 5.5-2).



High limit alarm (when Energized is set)

(Fig. 5.5-1)



High limit alarm (when Deenergized is set)

(Fig. 5.5-2)

[SV1/SV2 external selection]

SV1 or SV2 can be selected by the external operation.
Terminals between 14 and 17 open: SV1 can be selected.
Terminals between 14 and 17 closed: SV2 can be selected.
SV1 or SV2 cannot be changed during setting mode or PID auto-tuning.

5.6 Control output OFF function

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

5.7 Auto/Manual control function

PV/SV display mode (Manual control)
- To use manual control function, Auto/Manual control function must be selected in the OUT/OFF key function selection.
  First, press the OUT/OFF key. Control can be performed by increasing or decreasing the output manipulated variable (MV) using the ▲ or ▼ key.
- The 1st decimal point from the right on the SV display blinks.
- By pressing the OUT/OFF key again, the mode reverts to the PV/SV display (automatic control) mode. Whenever the power to the controller is turned on, automatic control starts.
- If control action is switched from automatic to manual or vice versa, balanceless-bumpless function works to prevent sudden change of manipulated variable.
- If Auto/Manual control function is selected, control output OFF function is disabled.

5.8 Output manipulated variable indication

Output manipulated variable indication
- Output manipulated variable is indicated on the SV display by pressing the MODE key for approx. 3 seconds in the PV/SV display mode.
  While output manipulated variable is being indicated, the 1st decimal point from the right on the SV display blinks at a cycle of every 0.5 second. When the MODE 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) Turn the power supply to the CS4H, CS4L ON.

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

(Table 6-1)

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

(2) Input each setting value.

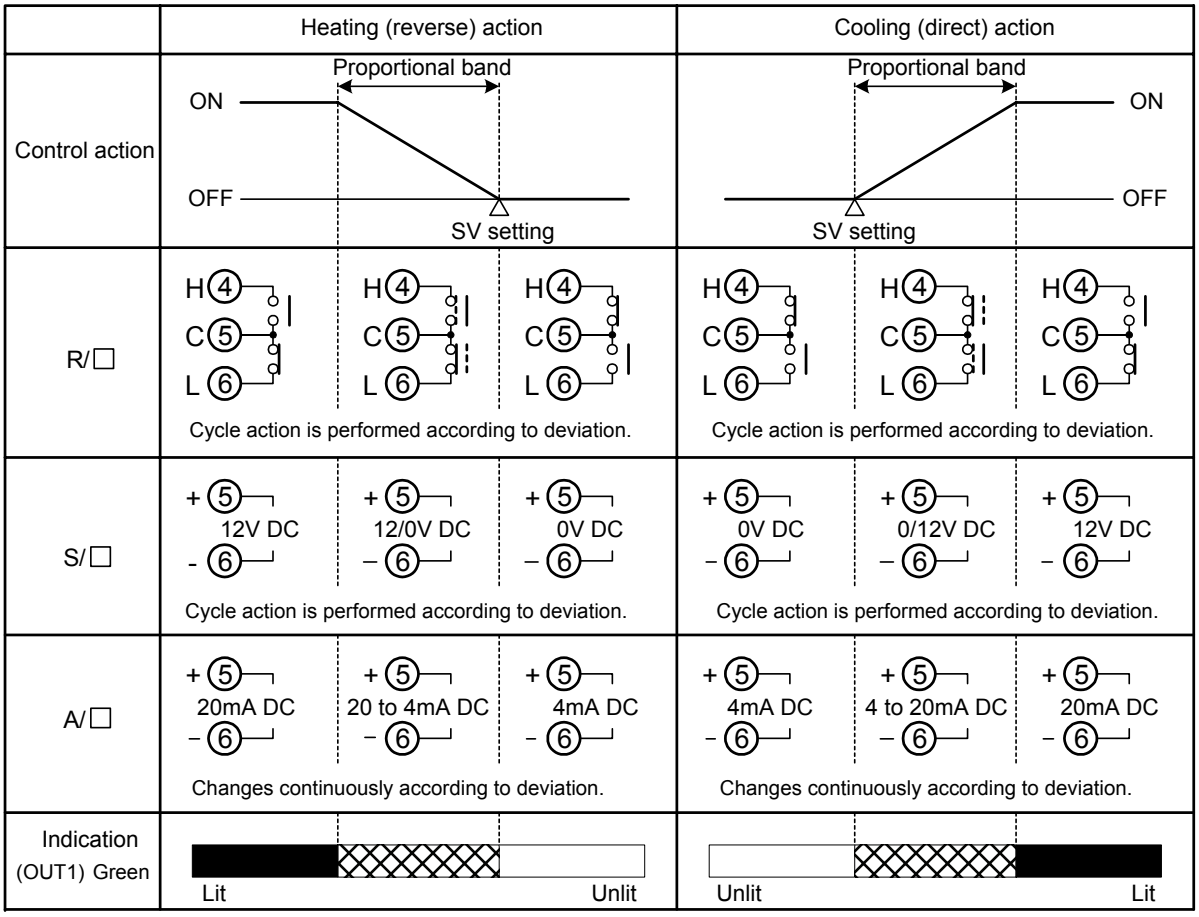
Input each setting value, referring to “5. Setup”.

(3) Turn the load circuit power ON.

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

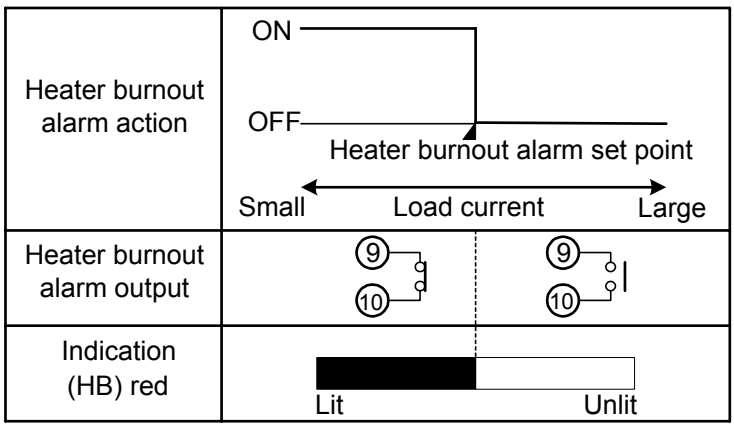
7. Action explanation

7.1 OUT1 action



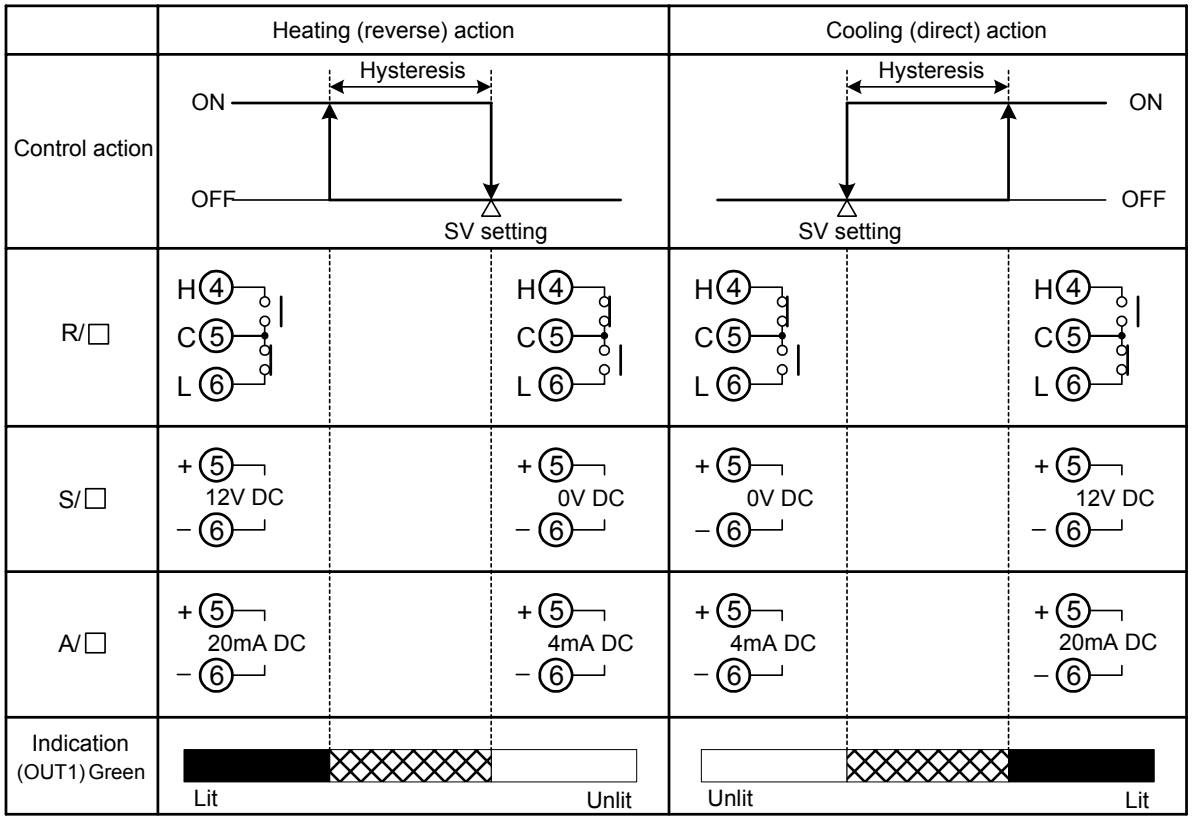
: Acts ON (lit) or OFF (unlit).

7.2 Heater burnout alarm action (option)



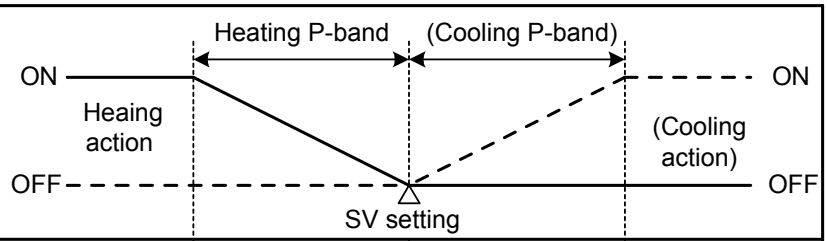
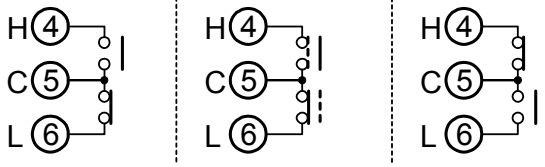
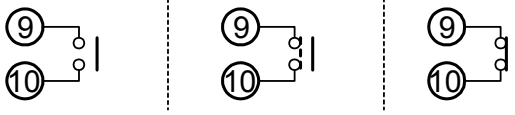
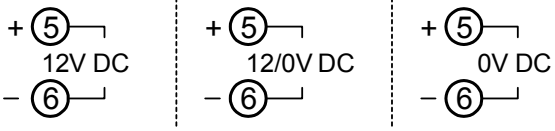
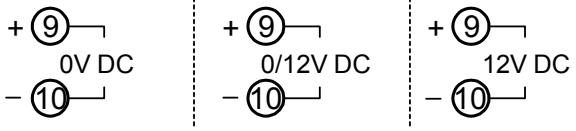
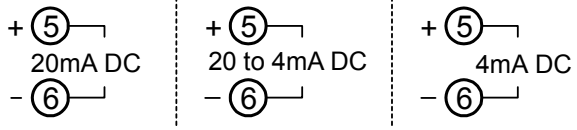
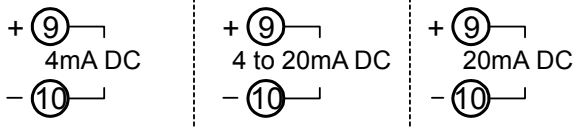
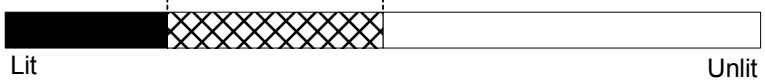
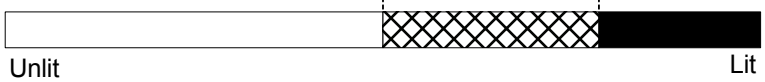
When the 2. control output (option) is applied, terminals 12 and 13 are used for the Heater burnout alarm.

7.3 OUT1 ON/OFF action



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

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

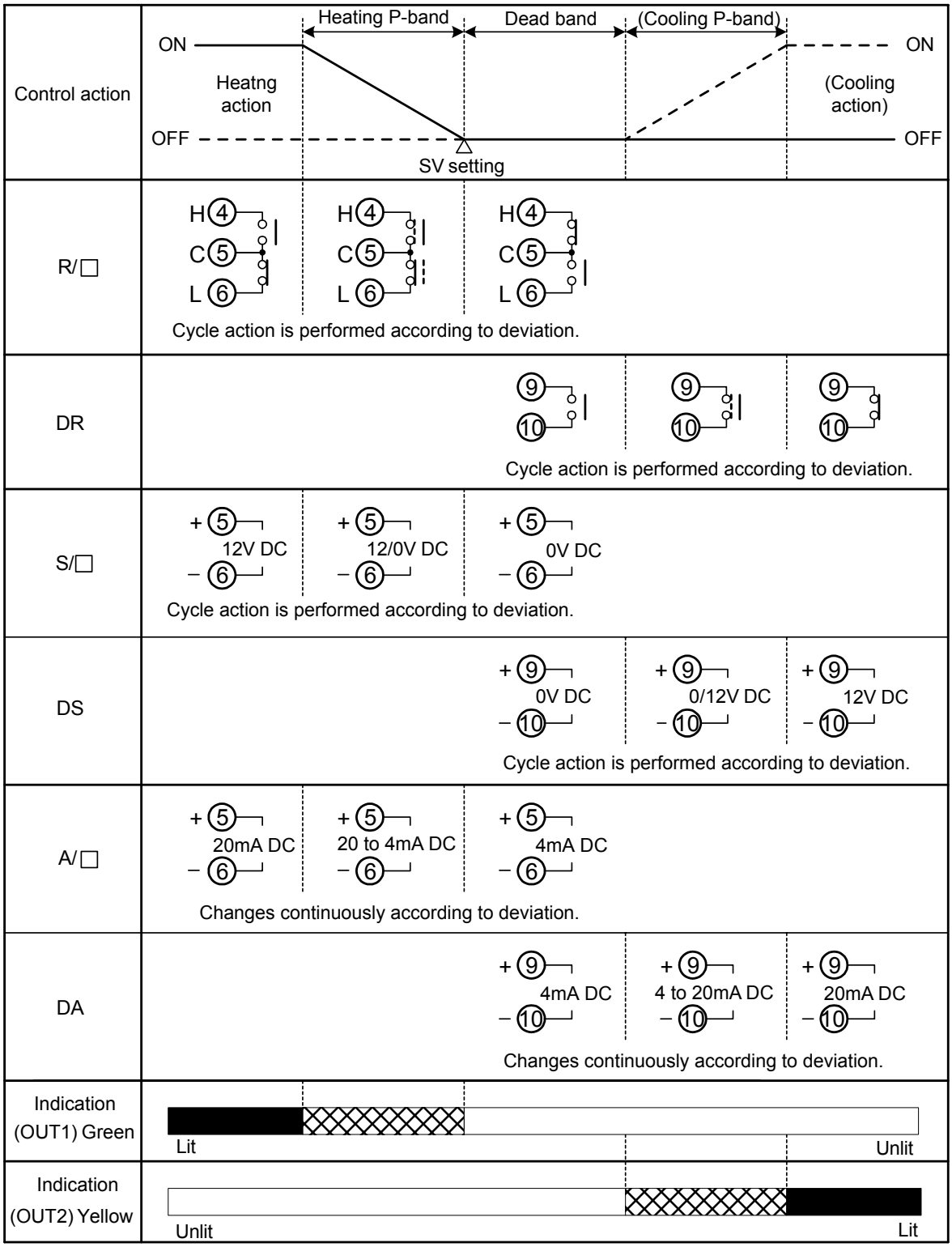
Control action	
R/□	 Cycle action is performed according to deviation.
DR	 Cycle action is performed according to deviation.
S/□	 Cycle action is performed according to deviation.
DS	 Cycle action is performed according to deviation.
A/□	 Changes continuously according to deviation.
DA	 Changes continuously according to deviation.
Indication (OUT1) Green	
Indication (OUT2) Yellow	

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

——— : Represents Heating control action.

– – – – : Represents Cooling control action.

When setting Dead band

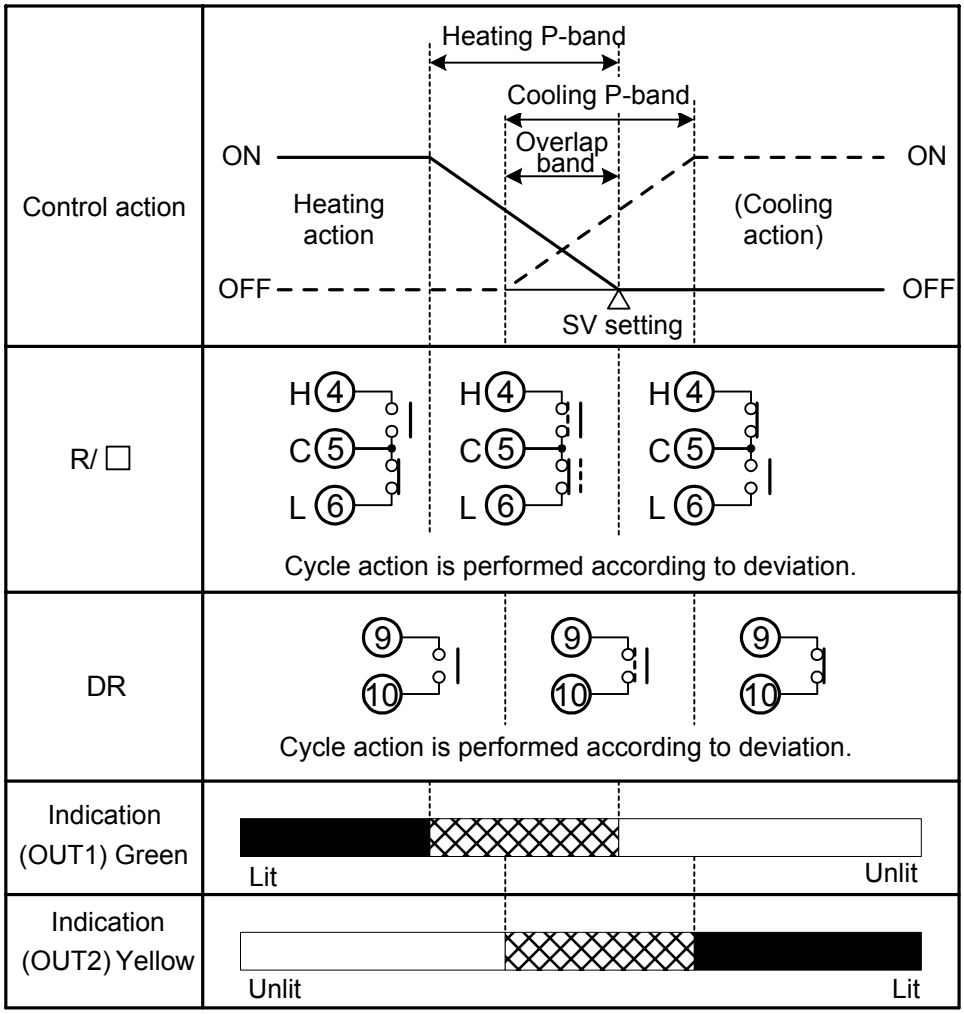


: Acts ON (lit) or OFF (unlit).

——— : Represents Heating control action.

– – – – : Represents Cooling control action.

When setting Overlap band with Relay contact output.

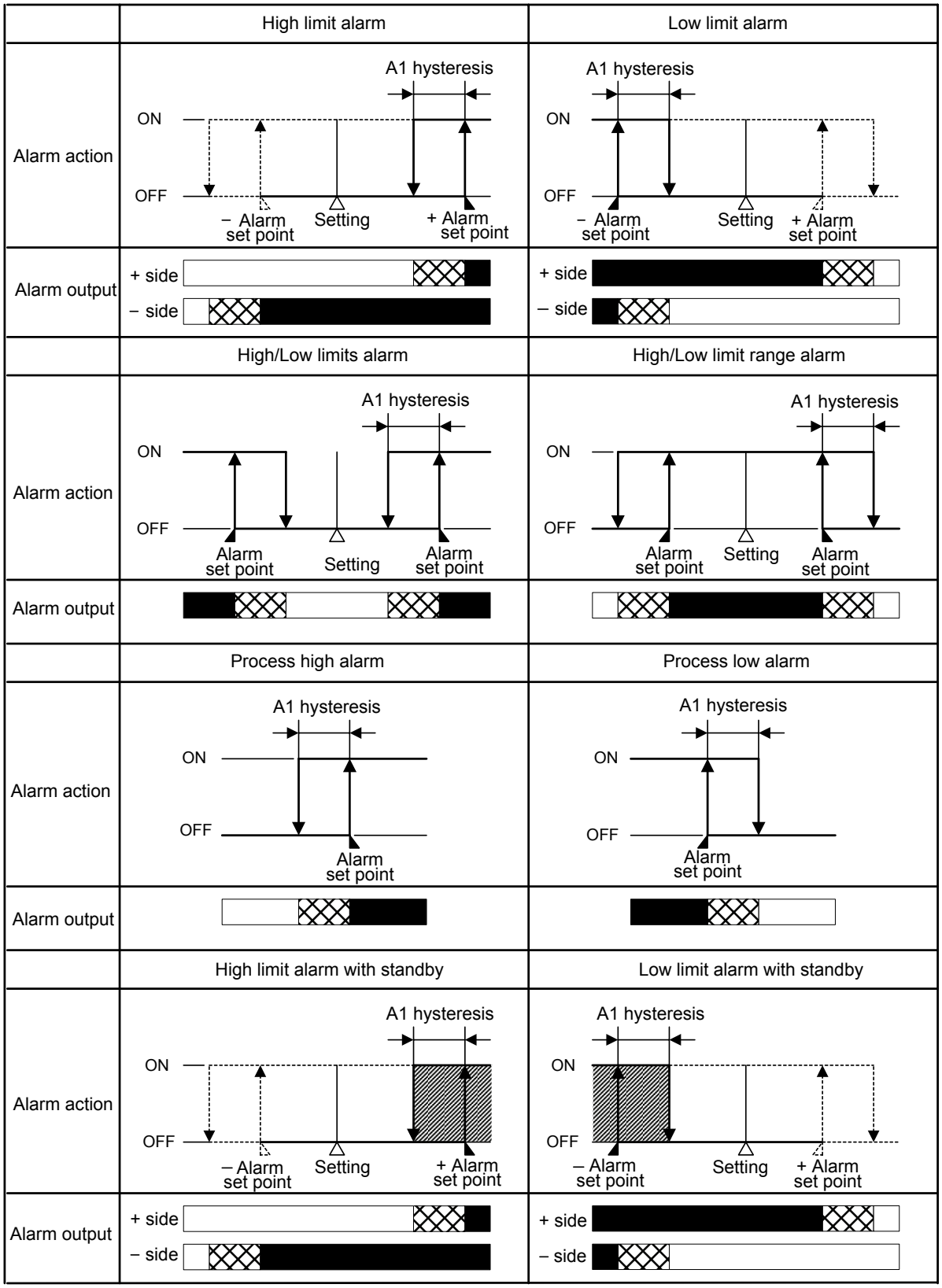


: Acts ON (lit) or OFF (unlit).

——— : Represents Heating control action.

– – – – : Represents Cooling control action.

7.5 A1 and A2 actions

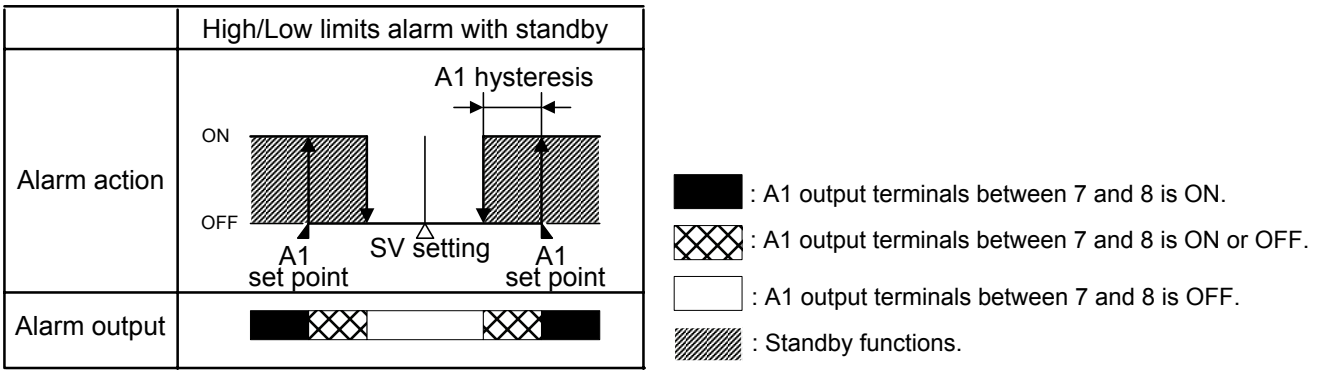


: A1 output terminals between 7 and 8 is ON.

: A1 output terminals between 7 and 8 is ON or OFF.

: A1 output terminals between 7 and 8 is OFF.

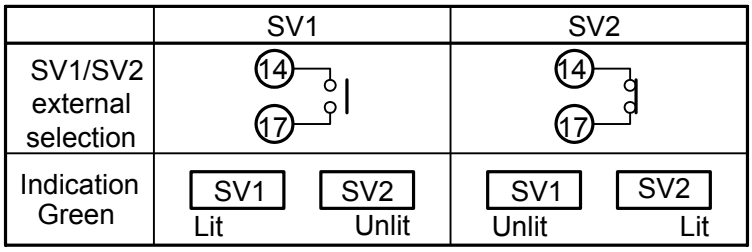
: Standby functions.



For A2 output, terminals 12 and 13 are used.

A1 and A2 indicators light up when between the output terminals is ON, and goes out when between them is OFF.

7.6 SV1/SV2 external selection action



If the serial communication is applied, this function is disabled.

8. Control action explanations

8.1 PID

(1) Proportional band (P)

Proportional action is the action which the control output varies in proportion to the deviation between the setting value and the processing temperature.

If the proportional band is narrowed, even if the output changes by a slight variation of the processing temperature, better control results can be obtained as the offset decreases.

However, if the proportional band is narrowed too much, even slight disturbances may cause variation in the processing temperature, control action changes to ON/OFF action and the so called hunting phenomenon occurs.

Therefore, when the processing temperature comes to the balanced position near the setting value and a constant temperature is maintained, the most suitable value is selected by gradually narrowing the proportional band while observing the control results.

(2) Integral time (I)

Integral action is used to eliminate offset. When the integral time is shortened, the returning speed to the setting point is accelerated. However, the cycle of oscillation is also accelerated and the control becomes unstable.

(3) Derivative time (D)

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

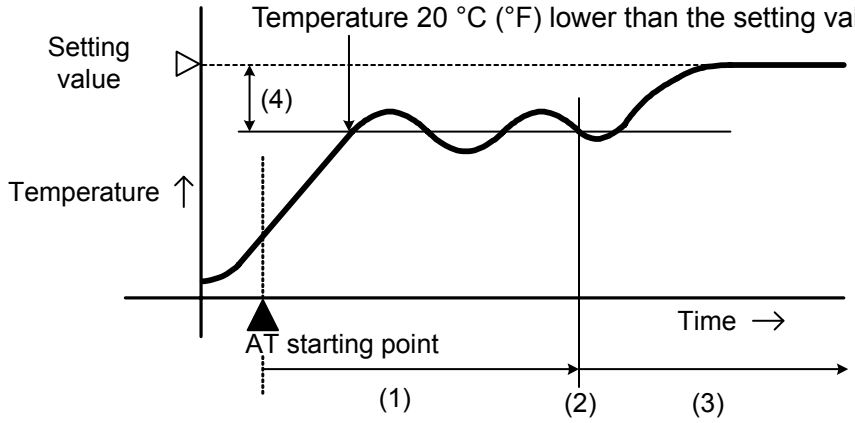
If the derivative time is shortened, restoring value becomes small, and if the derivative time is made longer, an excessive returning phenomenon may occur and the control system may be oscillated.

8.2 PID auto-tuning of this controller

In order to decide each value of P, I, D and ARW automatically, this system forcibly fluctuates the object being controlled.

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

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

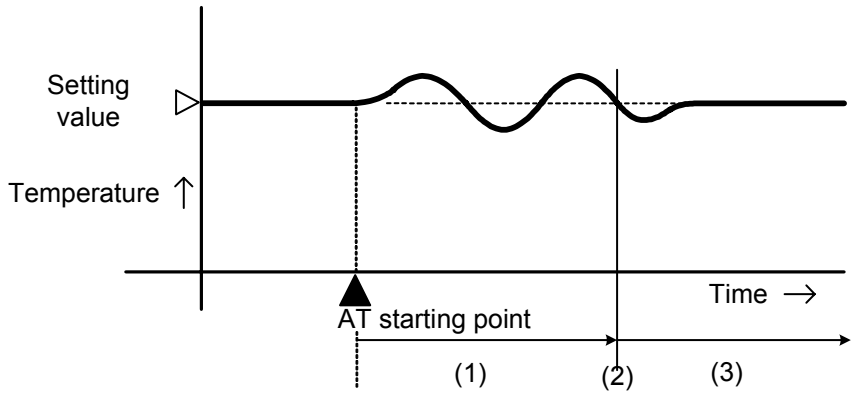


(1) Calculating PID constant
(2) PID constant calculated
(3) Controlled by the PID constant set by auto-tuning.
(4) AT bias value

(Fig. 8.2-1)

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

Fluctuation is applied at the setting value.

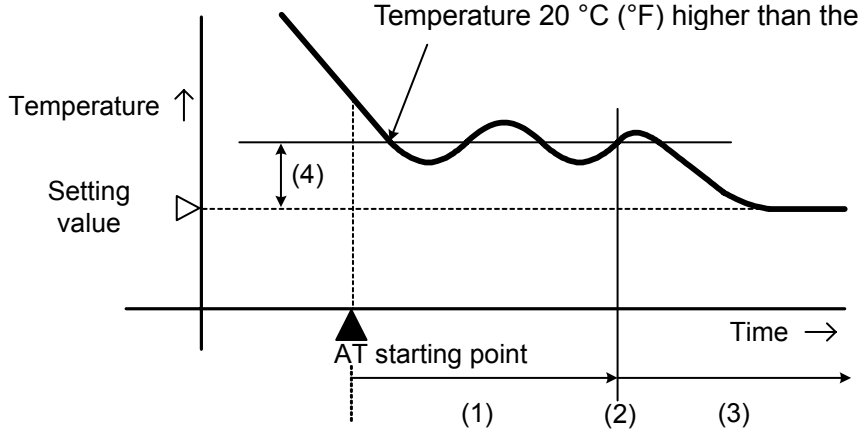


(1) Calculating PID constant
(2) PID constant calculated
(3) Controlled by the PID constant set by auto-tuning.

(Fig. 8.2.2)

(3) When the control temperature is 20 °C (°F) or higher than the setting value.

Fluctuation is applied at the temperature 20 °C (°F) higher than the setting value.



(1) Calculating PID const ant
(2) PID constant calculat ed
(3) Controlled by the PID constant set by auto-t uning.
(4) AT bias value

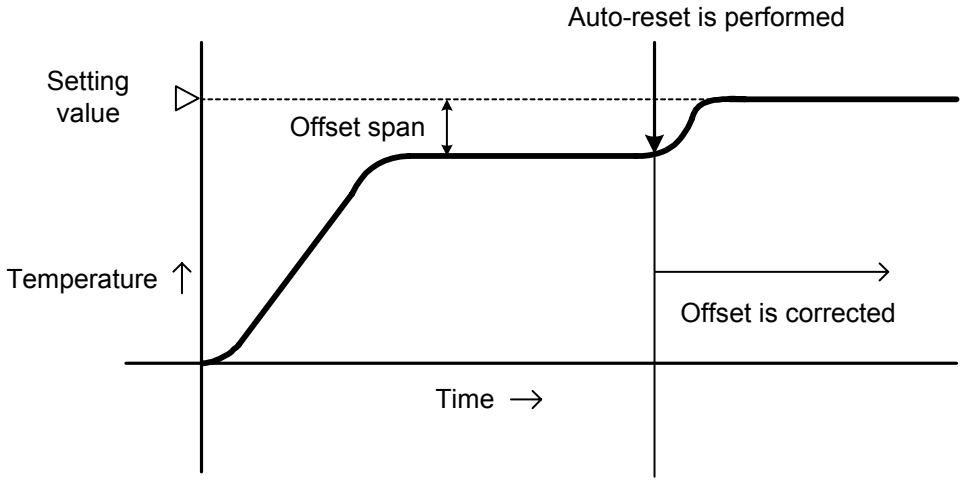
(Fig. 8.2.3)

8.3 Auto-reset (offset correction)

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

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

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



(Fig. 8.3-1)

9. Specifications

9.1 Standard specifications

Mounting method : Flush

Setting method : Membrane sheet key

Display

CS4H PV display : Red LED 4 digits, character size, 11.2 x 5.4 (H x W) mm
SV display : Green LED 4 digits, character size, 11.2 x 5.4 (H x W) mm
CS4L PV display : Red LED 4 digits, character size, 18 x 8 (H x W) mm
SV display : Green LED 4 digits, character size, 12.6 x 6(H x W) mm

Input

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

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

DC current : 0 … 20 mA DC, 4 … 20 mA DC
Input impedance, 50 Ω
[50 Ω Shunt resistor (sold optionaly) must be connected between input terminals]
Allowable input current 50 mA or less
[If 50 Ω Shunt resistor (sold optionaly) is used]

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

Rated input

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

*1: For DC input, input range and decimal point place are changeable.
*2: 50 Ω Shunt resistor (sold optionally) must be connected between input terminals.

Accuracy (Setting, indication)

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

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

DC Voltage and Current:
Within ±0.2 % of input range full scale ±1digit

Input sampling period : 0.25 seconds

Control output (OUT1)

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

Logic level DC 0/12 V for solid state relay:
12^{+2}_{-0} V DC maximum 40 mA (short circuit protected)

Analogue current signal : 4 … 20 mA DC
Load resistance, maximum 550 Ω

A1 output

When A1 action is set as energized, the alarm action point is set by ±deviation to the main setting (except Process alarm).
When the input exceeds the range, the output turns ON or OFF (in the case of High/Low limit range alarm).
When the alarm action is set as deenergized, the output acts conversely.

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

Control action

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

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

SV1/SV2 external selection: SV1 and SV2 can be selected by external contact.
Contact open between terminals 14 and 17 : SV1
Contact closed between terminals 14 and 17 : SV2
Contact current: 6mA

Supply voltage : 100 ... 240 V AC 50/60Hz or
24 V AC/DC 50/60Hz

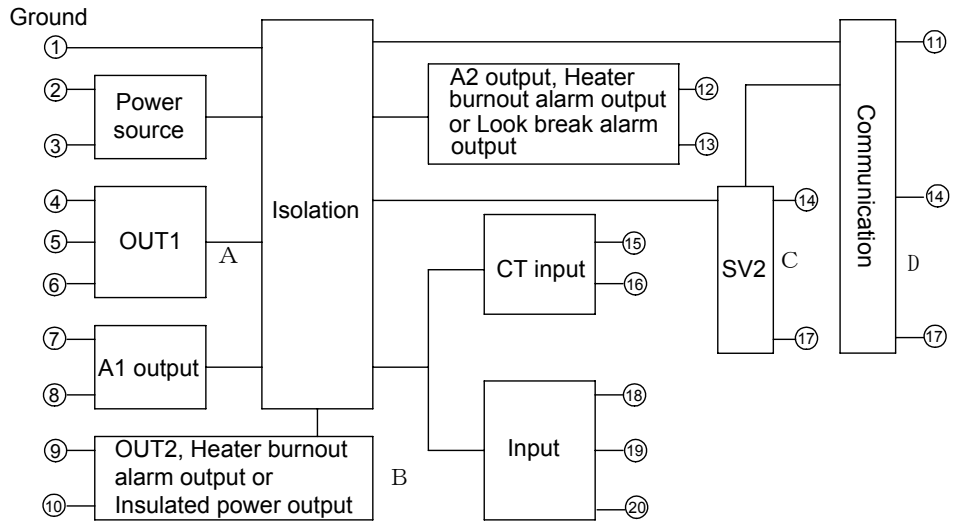
Allowable voltage fluctuation range
100 ... 240 V AC : 85 ... 264 V AC
24 V AC/DC : 20 ... 28V AC/DC

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

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

Power consumption : Approx. 8 VA or 8 W

Circuit Isolation configuration



- When OUT1 is Logic level DC 0/12 V or Analogue current signal (4 ... 20 mA) and OUT2 is Logic level DC 0/12 V or Analogue current signal (4 ... 20 mA), between A to B is non-isolated.
- When OUT1 is Logic level DC 0/12 V or Analogue current signal (4 ... 20 mA), between A to C and A to D are non-isolated.
  When OUT2 is Logic level DC 0/12 V or Analogue current signal (4 ... 20 mA), between B to C and B to D are non-isolated.

Isolation resistance

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

Dielectric strength

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

Mass : CS4H (approx. 250 g), CS4L, (approx. 370 g)

External dimension : CS4H, 48 x 96 x 100 mm (W x H x D)
CS4L, 96 x 96 x 100 mm (W x H x D)

Material : Case, Flame resistant resin

Color : Case, black

Drip-proof/Dust-proof : IP66 for the front part

Attached functions

[Sensor correction function]

[Setting value lock function]

[Input burnout indication]

- For thermocouple or RTD input, if the input value exceeds the Indication range high limit value, the PV display blinks "‾ ‾ ‾ ‾" and if the input value exceeds Indication range low limit value, the PV display blinks "_ _ _ _".
  If the input value exceeds the Control range, OUT1 and OUT2 are turned OFF (for control output Analogue current signal (4 ... 20 mA), OUT1 low limit value, OUT2 low limit value).
  (However, for manual control, it outputs the preset manipulated variable)

Input	Input range	Indication range	Control range
K, T	–199.9 ... 400.0 °C	–199.9 ... 450.0 °C	–205.0 ... 450.0 °C
	–199.9 ... 750.0 °F	–199.9 ... 850.0 °F	–209.0 ... 850.0 °F
K	–200 ... 1370 °C	–250 ... 1420 °C	–250 ... 1420 °C
	–320 ... 2500 °F	–370 ... 2550 °F	–370 ... 2550 °F
J	–200 ... 1000 °C	–250 ... 1050 °C	–250 ... 1050 °C
	–320 ... 1800 °F	–370 ... 1850 °F	–370 ... 1850 °F
R, S	0 ... 1760 °C	–50 ... 1810 °C	–50 ... 1810 °C
	0 ... 3200 °F	–50 ... 3250 °F	–50 ... 3250 °F
B	0 ... 1820 °C	–50 ... 1870 °C	–50 ... 1870 °C
	0 ... 3300 °F	–50 ... 3350 °F	–50 ... 3350 °F
E	–200 ... 800 °C	–250 ... 850 °C	–250 ... 850 °C
	–320 ... 1500 °F	–370 ... 1550 °F	–370 ... 1550 °F
N	–200 ... 1300 °C	–250 ... 1350 °C	–250 ... 1350 °C
	–320 ... 2300 °F	–370 ... 2350 °F	–370 ... 2350 °F
PL-Ⅱ	0 ... 1390 °C	–50 ... 1440 °C	–50 ... 1440 °C
	0 ... 2500 °F	–50 ... 2550 °F	–50 ... 2550 °F
C(W/Re5-26)	0 ... 2315 °C	–50 ... 2365 °C	–50 ... 2365 °C
	0 ... 4200 °F	–50 ... 4250 °F	–50 ... 4250 °F
Pt100	–199.9 ... 850.0 °C	–199.9 ... 900.0 °C	–210.0 ... 900.0 °C
	–200 ... 850 °C	–210 ... 900 °C	–210 ... 900 °C
	–199.9 ... 999.9 °F	–199.9 ... 999.9 °F	–211.0 ... 1099.9 °F
	–300 ... 1500 °F	–318 ... 1600 °F	–318 ... 1600 °F
JPt100	–199.9 ... 500.0 °C	–199.9 ... 550.0 °C	–206.0 ... 550.0 °C
	–200 ... 500 °C	–206 ... 550 °C	–206 ... 550 °C
	–199.9 ... 900.0 °F	–199.9 ... 999.9 °F	–211.0 ... 999.9 °F
	–300 ... 900 °F	–312 ... 1000 °F	–312 ... 1000 °F

- For DC current and voltage inputs, if the input value exceeds the Indication range high limit value, the PV display blinks "‾ ‾ ‾ ‾" and if the input value exceeds Indication range low limit value, the PV display blinks "_ _ _ _".
  If the input value exceeds the Control range, OUT1 and OUT2 are turned ON or OFF which has been selected in [Output status selection when input burnout] (for control output Analogue current signal (4 ... 20 mA), OUT1 high or low limit value, OUT2 high or low limit value).
  (However, for manual control, it outputs the preset manipulated variable)

  Indication range : [Scaling low limit value – Scaling span x 1 %] to
  [Scaling high limit value + Scaling span x 10 %]
  However, if the input value exceeds the range –1999 ... 9999,
  the PV display blinks "‾ ‾ ‾ ‾" or "_ _ _ _".

  Control range : [Scaling low limit value – Scaling span x 1 %] to
  [Scaling high limit value + Scaling span x 10 %]

- **DC input burnout**: When DC input is burnt out, PV display blinks "_ _ _ _" for 4 ... 20 mA DC and 1 ... 5 V DC inputs, and "‾ ‾ ‾ ‾" for 0 ... 1 V DC input.
  For 0 ... 20 mA DC, 0 ... 5 V DC and 0 ... 10 V DC inputs, the PV display indicates the corresponding value for which 0 mA or 0 V is inputted.

[Burnout]
When the thermocouple or RTD input is burnt out, OUT1 is turned off (for control output Analogue current signal (4 ... 20 mA), OUT1 low limit value) and the PV display blinks "- - - -".

[Self-diagnosis]
The CPU is monitored by a watchdog timer, and when any abnormal status is found on the CPU, the controller is switched to warm-up status.

[Automatic cold junction temperature compensation] (Thermocouple input type)
This detects the temperature at the connecting terminal between thermocouple and the instrument, and always keeps it on the same status as when the reference junction is located at 0 °C [32 °F].

[Power failure countermeasure]
The setting data is backed up in non-volatile IC memory.

[Warm-up indication]
With thermocouple and RTD inputs, for approx. 3 seconds after the power is switched ON, sensor input character and temperature unit are indicated on the PV display, and the input range high limit value is indicated on the SV display.
With the DC input, for approx. 3 seconds after the power is switched ON, sensor input character is indicated on the PV display, and scaling high limit value is indicated on the SV display.
(However, if the scaling high limit value has been changed in the Scaling high limit setting, the changed value will be indicated on the SV display.)

[Auto/Manual control switching]
If Auto/Manual control function is selected during $^{OUT}/_{OFF}$ key function selection, automatic control can be switched to manual control or vice versa by pressing the $^{OUT}/_{OFF}$ key.
When the control action is changed from automatic to manual control and vice versa, the balanceless-bumpless function works to prevent sudden change of manipulated variable.
When the control action is changed from automatic to manual control, the 1st decimal point from the right on the SV display blinks.
The manipulated variable (MV) on the SV display can be increased or decreased by pressing the ▲ or ▼ keys and the control is performed. (When the power supply to the instrument is turned on, automatic control starts)

Accessories: Instruction manual 1 copy
Screw type mounting bracket 1 set
CT (current transformer)
CTL-6S 1 piece [when option W10/W11/W12 is added]
CTL-12-S36-10L1 1 piece [when option W15 is added]
Terminal cover
CS4H 1 piece (when the option KAB is added)
CS4L 2 pieces (when the option KAB is added)

9.2 Optional specifications

Alarm output 2 (A2) process value monitoring [option codes: 2AS or 2AL]

When A2 action is set as Energized, the alarm action point is set by ±deviation to OUT1 setting (except Process alarm).
When the input exceeds the range, the output turns ON or OFF (in the case of High/Low limit range alarm).
When the alarm action is set as Deenergized, the output acts conversely.
When option Alarm output 2 is added, one more option Heater burnout alarm or 2. control output can be added.
When the option [2AL] process value and loop monitoring is selected, the output terminal is common.

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

Alarm output 2 (LA) Loop break alarm [option codes: 2AR or 2AL]

Detects the breaking status on the loop such as heater burnout, sensor burnout or actuator trouble.
When option Alarm output 2 is added, one more option Heater burnout alarm or 2. control output can be added.
When the option [2AL] process value and loop monitoring is selected, the output terminal is common.

Setting range : Loop break alarm action time: 0 ... 200 minutes
Loop break alarm action span: 0 ... 150 °C (°F), 0.0 ... 150.0 °C (°F),
For DC input, 0 ... 1500 (The placement of the decimal point follows the selection)
Output : Relay contact 3 A, 250 V AC (Resistive load)
Electrical life 100,000 times

Heater burnout alarm [option codes: W10, W11, W12, W15]

Watches the heater current with CT (current transformer), and detects the heater burnout.
Heater burnout alarm is activated when sensor is burnt out or when indication is overscale or underscale.
When the option Heater burnout alarm is applied, one more option Alarm output 2 or 2. control output can be added.
This option cannot be applied to control output Analogue current signal (4 ... 20 mA).

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

Heating/Cooling control [option codes: DR2, DS2, DA2]

When the option 2. control output is added, one more option Alarm output 2 or Heater burnout alarm can be added.

OUT2 proportional band : 0.0 ... 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 ... 120 seconds
Overlap band/Dead band : For thermocouple and RTD inputs, –100.0 ... 100.0 °C (°F)
For DC current and voltage inputs, –1000 ... 1000
(The placement of the decimal point follows the selection)
OUT2 ON/OFF action hysteresis
For thermocouple and RTD inputs, 0.1 ... 100.0 °C (°F)
For DC current and voltage inputs, 1 ... 1000
(The placement of the decimal point follows the selection)
Output Relay contact output [DR2]
Control capacity 3 A, 250 V AC (resistive load)
1 A, 250 V AC (inductive load cos ø = 0.4)
Electrical life 100,000 times
Logic level DC 0/12 V [DS2]
12^{+2}_{-0} V DC maximum 40 mA (short circuit protected)
Analogue current signal (4 ... 20 mA) [DA2]
Load resistance, maximum 550 Ω
OUT2 action mode selection function:
One cooling mode can be selected by the key operation from the following.
• Air cooling (Linear characteristic)
• Oil cooling (1.5th power of the linear characteristic)
• Water cooling (2nd power of the linear characteristic)

Serial communication [option code: CR5]

When this option is added, SV1/SV2 external selection function is disabled.
The following operations can be carried out from the external computer.
(1) Reading and setting of SV, PID values and each setting value
(2) Reading of PV and action status
(3) Change of the functions
Communication circuit : Based on EIA RS-485
Communication method : Half-duplex communication start stop synchronous
Data transfer rate : 2400, 4800, 9600, 19200 bps (Selectable by key)
Parity : Even, Odd and None (Selectable by key)
Stop bit : 1 and 2 (Selectable by key)
Data format

Communication protocol	WIKA protocol	Modbus ASCII	Modbus RTU
Start bit	1	1	1
Data bit	7	7	8
Parity	Even	Selection (Even)	Selection (None)
Stop bit	1	Selection (1)	Selection (1)

( ): Basic setting value

Data bit is automatically changed depending on the selection of communication protocol.

Digital external setting:

Receives digital setting value from WIKA programmable controller (with option SVTC).
(It is necessary to set the Setting value lock function to Lock 3 for the CS4H and CS4L.)
When the data from WIKA programmable controller exceeds SV high limit or SV low limit, the CS4H or CS4L ignores the value, and performs the control with SV high limit or SV low limit.

Transmitter supply (isolated power output) [option code: P24]

Output voltage : 24 ±3 V DC (when load current is 30 mA)
Ripple voltage : Within 200 mV (when load current is 30 mA)
Maximum load current : 30 mA

Terminal cover [option code: KAB]

Electrical shock protecting terminal cover

10. Troubleshooting

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

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

10.1 Indication

Problem	Presumed cause and solution
The PV display is indicating [oFF].	• Control output OFF function is working. Press the OUT/OFF key for approx. 1 second to release the function.
[- - - -] is blinking on the PV display.	• The sensor for thermocouple, RTD and DC voltage (0 ... 1 V DC) input may be burnt out. Replace each sensor. **How to check sensor burnout** [Thermocouple] If the input terminal of the instrument is shorted, and if nearby room temperature is indicated, the instrument should be normal and the sensor may be burnt out. [RTD] If approx. 100 Ω resistance is connected to the input terminals between A-B of the instrument and between B-B is shorted, and if nearby 0 °C (32 °F) is indicated, the instrument should be normal and the sensor may be burnt out. [DC voltage (0 ... 1 V DC)] If the input terminal of the instrument is shorted, and if scaling low limit value is indicated, the instrument should be normal and the signal wire may be burnt out. • Is the input terminal of thermocouple, RTD or DC voltage (0 ... 1 V DC) securely mounted to the instrument terminal? Connect the sensor terminal to the instrument terminal securely.
[_ _ _ _] is blinking on the PV display.	• The sensor for DC voltage (1 ... 5 V DC) or DC current (4 ... 20 mA DC) input may be burnt out. Replace each sensor. **How to check sensor burnout** [DC voltage (1 ... 5 V DC)] If the input to the input terminal of this controller is 1 V DC and if scaling low limit value is indicated, the controller should be normal and the signal wire may be burnt out. [DC current (4 ... 20 mA DC)] If the input to the input terminal of this controller is 4 mA DC and scaling low limit value is indicated, the controller should be normal and the sensor may be burnt out. • Is the input terminal of DC voltage (1 ... 5 V DC) and DC current (4 ... 20 mA DC) securely connected to the input terminal of this controller? Connect the sensor terminal to the controller terminal securely. • Polarity of thermocouple or compensating lead wire is reversed? Do codes (A, B, B) of RTD agree with the controller terminal? Wire them properly.

Problem	Presumed cause and solution
The value set during the Scaling low limit setting remains on the PV display.	• Is the sensor for DC voltage (0 ... 5 V DC, 0 ... 10 V DC) or DC current (0 ... 20 mA DC) input burnt out? Replace each sensor. **[How to check sensor burnout]** [DC voltage (0 ... 5 V DC, 0 ... 10 V)] If the input to the input terminal of this controller is 1 V DC and if the value corresponding to1 V DC is indicated, the controller should be normal and the sensor may be burnt out. [DC current (0 ... 20 mA DC)] If the input to the input terminal of this controller is 1 mA DC and if the value corresponding to 1mA DC is indicated, the controller should be normal and the sensor may be burnt out. • Is the input terminal for DC voltage (0 ... 5 V DC, 0 ... 10 V DC) and DC current (0 ... 20 mA DC) securely connected to the controller terminal? Connect the sensor terminal to the controller terminal securely.
The indication of PV display is abnormal or unstable.	• Designation of the sensor input or temperature unit (°C or °F) is improper. Set the sensor input and the temperature unit properly. • Sensor correcting value is unsuitable. Set the value suitably. • Sensor specification is improper. Set the sensor specification properly. • AC may be leaking into the sensor circuit. Change the sensor for the ungrounded type. • There may be equipment which produces an inductive fault or noise near the controller. Keep equipment which produces an inductive fault or noise away from the controller.
PV display blinks [Err 1].	The internal memory is defective. Please contact our main office or dealers.

10.2 Key operation

Problem	Presumed cause and solution
Settings (main setting value, P, I, D, proportional cycle, alarm, etc.) are impossible. The value does not change by the ▲ or ▼- key.	• Setting value lock (Lock 1 or Lock 2) is designated. Release the lock designation. • During PID auto-tuning or auto-reset. Cancel the auto-tuning if necessary. Auto-reset ends in 4 minutes after started.
The setting indication does not change in the rated input even if the ▲ or ▼- key is pressed, and settings are impossible.	• SV high limit or low limit may be set at the point the value does not change. Set it again during Auxiliary function setting mode 1.

10.3 Control

Problem	Presumed cause and solution
Process variable (temperature) does not rise.	• The sensor is out of order. Replace the sensors. • Is sensor terminal or control output terminal securely mounted to the instrument terminal? Mount them securely. • Is wiring of sensor terminal or control output terminal correct? Wire them correctly.
If the control output remains ON status.	• OUT1 low limit value is set to 100 % or greater in Auxiliary function setting mode 2. Set the value appropriately.
If the control output remains OFF status.	• OUT1 high limit value is set to 0 % or less in Auxiliary function setting mode 2. Set the value appropriately.

If any unexplained malfunctions occur, make inquiries at our agency or us.

11. Character table

[Main setting mode]

Character	Setting item	Default value	Data
SV	SV1	0 °C	
SV2	SV2	0 °C	

[Sub setting mode]

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

[Auxiliary function setting mode 1]

Character	Setting item	Default value	Data
LocK	Setting value lock selection	Unlock	
SH	SV high limit setting	Input range high limit value	
SL	SV low limit setting	Input range low limit value	
So	Sensor correction setting	0.0 °C	
cōSL	Communication protocol selection	WIKA protocol	
cōno	Instrument number setting	0	
cōSP	Data transfer rate selection	9600 bps	
cōPr	Parity selection	Even	
cōSt	Stop bit selection	1	

[Auxiliary function setting mode 2]

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