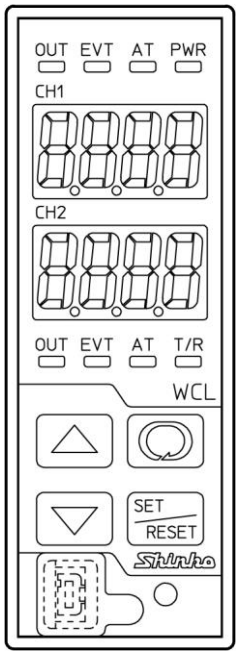
PLUG-IN
2ch DIGITAL INDICATING CONTROLLER

WCL-13A

INSTRUCTION MANUAL



Shinko

Preface

Thank you for purchasing our WCL-13A Plug-in 2ch Digital Indicating Controller.
This manual contains instructions for the mounting, functions, operations and notes when operating the WCL-13A.To ensure safe and correct use, thoroughly read and understand this manual before using this controller.
To prevent accidents arising from the misuse of this controller, please ensure the operator receives this manual.

Abbreviations used in this manual

Symbol	Term
PV	Process Variable
SV	Desired Value
MV	Output Manipulated Variable
AT	Auto-tuning
Alarm	Temperature Alarm

Characters used in this manual

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

⚠ Caution

- This instrument should be used in accordance with the specifications described in the manual. If it is not used according to the specifications, it may malfunction or cause a fire.
- Be sure to follow all of the warnings, cautions and notices. If they are not observed, serious injury or malfunction may occur.
- The contents of this instruction manual are subject to change without notice.
- Care has been taken to assure that the contents of this instruction manual are correct, but if there are any doubts, mistakes or questions, please inform our sales department.
- This instrument is designed to be installed on a DIN rail within 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 2 categories: “Warning” and “Caution”. Depending on the 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. Installation Precautions

⚠ Caution

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

Ensure the mounting location corresponds to the following conditions:

- **A minimum of dust, and an absence of corrosive gases**
- **No flammable, explosive gases**
- **No mechanical vibrations or shocks**
- **No exposure to direct sunlight, an ambient temperature of 0 to 50℃ (32 to 122℉) that does not change rapidly, and no icing**
- **An ambient non-condensing humidity of 35 to 85%RH**
- **No large capacity electromagnetic switches or cables through which large current is flowing.**
- **No water, oil or chemicals or where the vapors of these substances can come into direct contact with the unit**
- **If the WCL-13A is installed within a control panel, the ambient temperature of the unit must be kept to under 50℃. Otherwise the life of electronic parts (especially electrolytic capacitors) of the unit will be shortened.**

Note • Do not install this instrument on or near flammable material even though the case of this instrument is made of flame-resistant resin.

2. Wiring Precautions

⚠ Caution

- **Do not leave wire remnants in the instrument, because they could cause a fire or a malfunction.**
- **Use a solderless terminal with an insulation sleeve in which the M3 screw fits when wiring the WCL-13A.**
- **Tighten the terminal screw using the specified torque. If excessive force is applied to the screw when tightening, the terminal screw may be damaged.**
- **This instrument does not have a 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)**
- **For a 24V AC/DC power source, do not confuse polarity when using direct current (DC).**
- **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.**
- **Use a thermocouple and compensating lead wire according to the sensor input specifications of this controller.**
- **Use the 3-wire RTD according to the sensor input specifications of this controller.**
- **When using a relay contact output type, externally use a relay according to the load capacity to protect the built-in relay contact.**
- **When wiring, keep input wires (thermocouple, RTD, etc.) away from AC sources or load wires.**

3. Operation and Maintenance Precautions

⚠ Caution

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

Contents

1. Model

1.1 Model

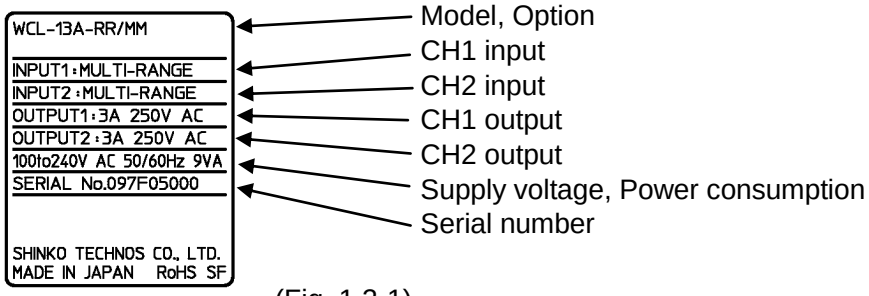
W C L - 1 3 A - □ □ / □ □ □, □□□									Series name: WCL-13A	
Control action	3								PID	
Alarm action		A							Alarm type can be selected by keypad. (*1)	
CH1 control output			R						Relay contact: 1a	
			S						Non-contact voltage (for SSR drive): 12V DC±15%	
			A						DC current: 4 to 20mA DC	
CH2 control output				R					Relay contact: 1a [Timer spec (*2)]	
				S					Non-contact voltage (for SSR drive): 12V DC±15%	
				A					DC current: 4 to 20mA DC	
CH1 input					M				Multi-range (*3)	
					I				Infrared thermocouple (*4)	
CH2 input						M			Multi-range (*3)	
						I			Infrared thermocouple (*4)	
						P			Potentiometer	
						T			Timer spec (*2)	
Supply voltage									100 to 240V AC (standard)	
							1		24V AC/DC (*5)	
Option								W(20A)	Single-phase 20A	Heater burnout alarm (*6)
								W(100A)	Single-phase 100A	
								W3(20A)	3-phase 20A	
								W3(100A)	3-phase 100A	
								AO	Alarm output [2-points open collector output + 4-points status flag (for each channel)] (*7)	
								AW(20A)	Heater burnout alarm (single-phase 20A) + Alarm output [1-point open collector output + 4-points status flag (for each channel)] (*6) (*7) (*8)	
								AW(100A)	Heater burnout alarm (single-phase 100A) + Alarm output [1-point open collector output + 4-points status flag (for each channel)] (*6) (*7) (*8)	
								C5	RS-485	Serial communication

(*1) Alarm types (9 types and No Alarm action) can be selected by keypad.
(*2) If Timer spec is designated for CH2 input, CH2 control output will be Relay contact (Timer spec).
(*3) Thermocouple (10 types), RTD (2 types), DC current (2 types), and DC voltage (4 types) can be selected by keypad.
(*4) 8 types of Infrared thermocouple input (RD-300 series, RD-401) can be selected by keypad.
(*5) Supply voltage 100 to 240V AC is standard. When ordering 24V AC/DC, enter “1” after the CH2 input code.
(*6) Heater burnout alarm cannot be added to the DC current output type.
(*7) If CH2 input is potentiometer or timer spec, this cannot be added.
(*8) Options [W], [W3], [AO], [AW] cannot be added simultaneously.

1.2 How to Read the Model Label

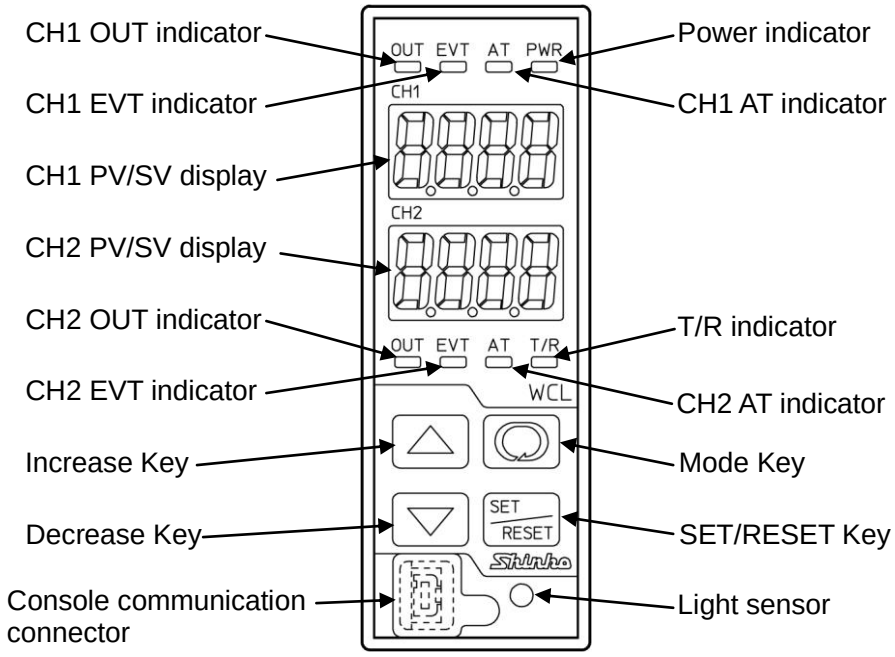
The model label is attached to the left side of case.

• Label on the case



(Fig. 1.2-1)

2. Name and Functions of Sections



(Fig. 2-1)

Displays:

CH1 PV/SV display: PV, SV, MV or setting characters in the setting mode of CH1 are indicated with the red LED.
Indications differ depending on the spec and selections during Display selection.(p.37)

CH2 PV/SV display: PV, SV, MV or set values in the setting mode of CH2 are indicated with the red LED.
Indications differ depending on the spec and selections during Display selection.(p.37)

Indicators:

CH1 OUT indicator: When CH1 control output is ON, the green LED lights.
For DC current output type, indicator flashes corresponding to the MV in 125ms cycles.

CH1 EVT indicator: When Alarm, Loop Break Alarm or Heater Burnout Alarm output (W, W3 option) on CH1 is ON, the red LED lights.

CH1 AT indicator : When CH1 is performing AT or Auto-reset, the yellow LED flashes.

PWR indicator : When power supply to the instrument is turned ON, the yellow LED lights.

CH2 OUT indicator: When CH2 control output is ON, the green LED lights.
For DC current output type, indicator flashes corresponding to the MV in 125ms cycles.
For Timer spec, the green LED lights when timer output is ON.

CH2 EVT indicator: When Alarm, Loop Break Alarm or Heater Burnout Alarm output (W, W3 option) on CH2 is ON, the red LED lights.

CH2 AT indicator : When CH2 is performing AT or Auto-reset, the yellow LED flashes.

T/R indicator : The yellow LED lights during Serial communication (C5 option) TX output (transmitting).

Keys:

Increase Key (△) : Increases the numeric value.

Decrease Key (▽): Decreases the numeric value.
While this key is pressed in the PV/SV display mode, the SV can be indicated when PV is indicated, and vice versa.

Mode Key (◯) : Selects the setting group. If the Mode Key is pressed for 3 sec in the PV/SV display mode, the unit moves to the MV indication mode. The 1st decimal point from the right flashes in 500ms cycles during the MV indication.
By pressing the Mode Key again, the unit reverts to the PV/SV display mode.

SET/RESET Key (SET/RESET): Switches the setting modes, and registers the set value.
For Timer spec, resets the timer action when Control timer is working.

Console communication connector : By connecting to the USB communication cable (CMB-001, sold separately), the following operations can be conducted from an external computer using the Console software SWS-WCL01M: Reading and setting of SV, PID and various set values, Reading of PV and action status, Function change

Light sensor : Automatically measures and controls brightness of the CH1, CH2 PV/SV displays.

⚠ Notice

When setting the specifications and functions of this controller, connect terminals 13 and 14 for power source first, then set them referring from “6. Outline of Key Operation and Setting Groups” to “8. Setup” before performing “3. Mounting to the Control Panel” and “5. Wiring”.

3. Mounting to the Control Panel

3.1 Site Selection

⚠ Caution

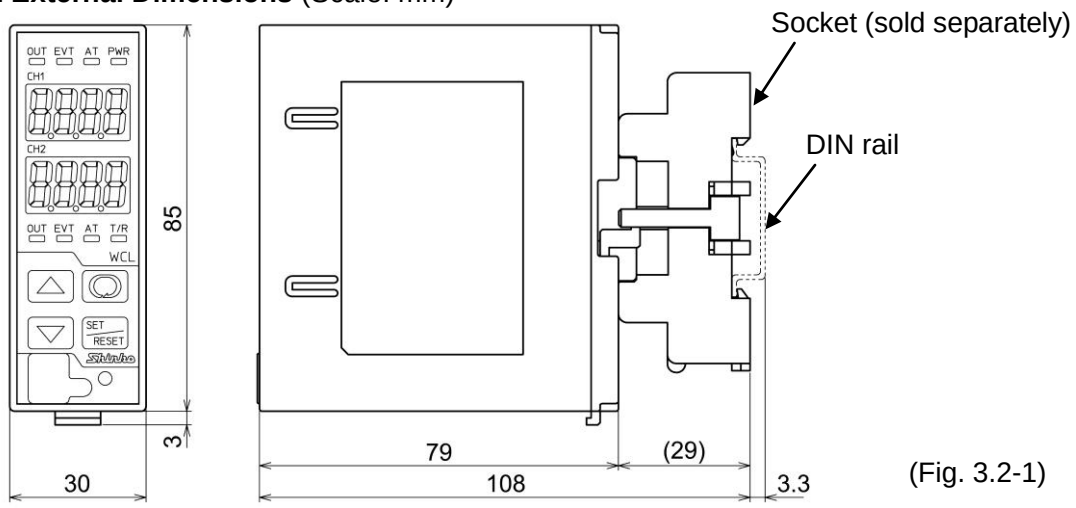
Use within the following temperature and humidity ranges.
Temperature: 0 to 50℃ (32 to 122℉) (No icing), Humidity: 35 to 85%RH (Non-condensing)
If the WCL-13A is installed within a control panel, the ambient temperature of the unit must be kept to under 50℃. Otherwise the life of electronic parts (especially electrolytic capacitors) of the unit will be shortened.

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

Ensure the mounting location corresponds to the following conditions:

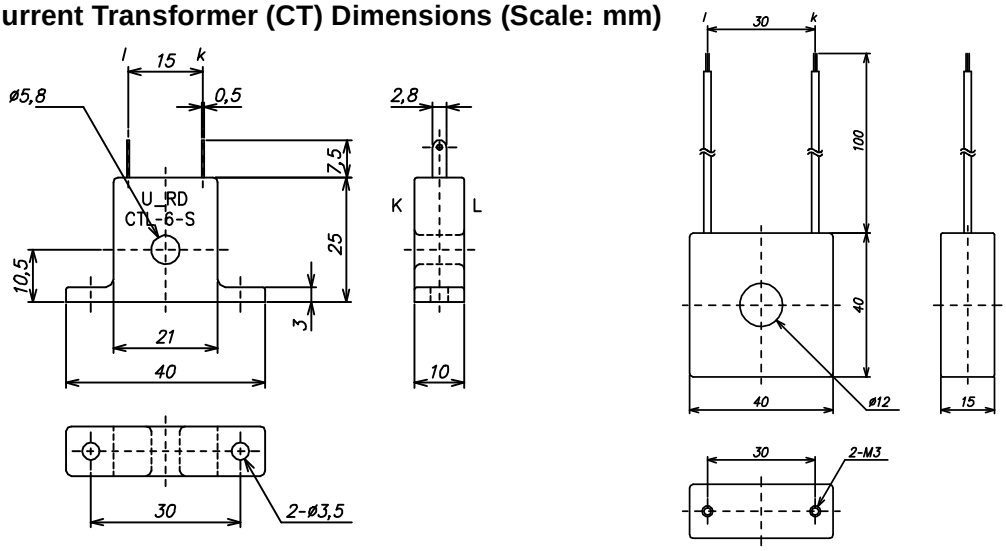
- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gases
- No mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of 0 to 50℃ (32 to 122℉) that does not change rapidly
- An ambient non-condensing humidity of 35 to 85%RH
- No large capacity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

3.2 External Dimensions (Scale: mm)



(Fig. 3.2-1)

3.3 Current Transformer (CT) Dimensions (Scale: mm)



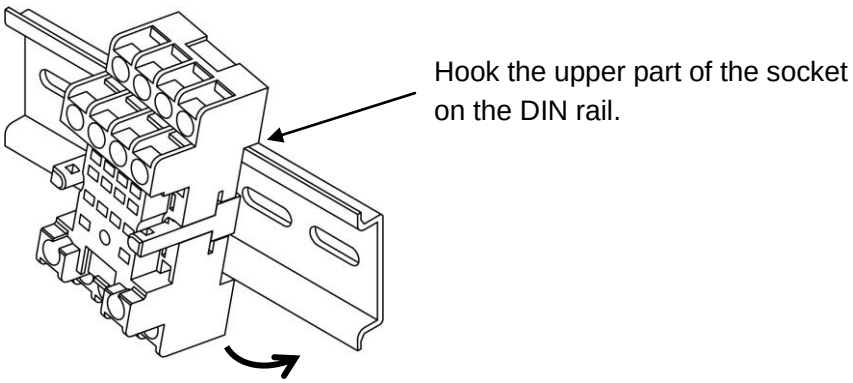
CTL-6S (for 20A)

CTL-12-S36-10L1U (for 100A)

(Fig. 3.3-1)

3.4 Mounting to a DIN Rail

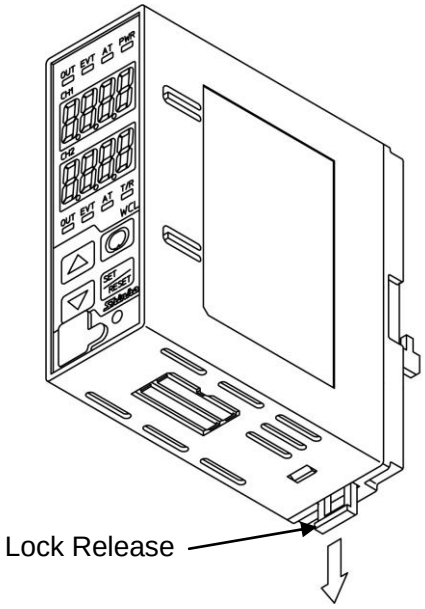
(1) Hook the upper part of the socket on the DIN rail, and mount it (A clicking sound is heard).



(Fig. 3.4-1)

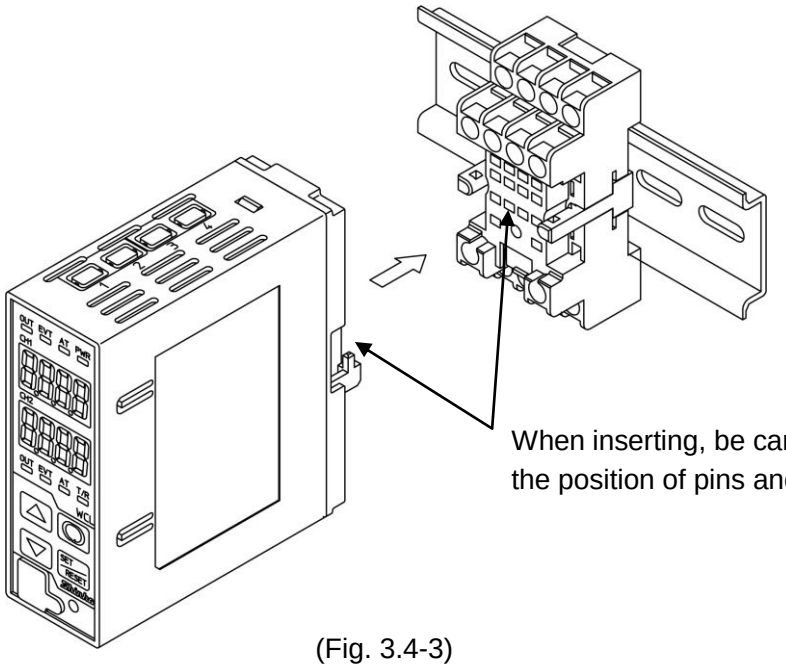
> **⚠ Caution**
>
> Before inserting the WCL-13A into the socket, wire the unit while referring to Section “5. Wiring”.

(2) Check that the Lock Release has been lowered.



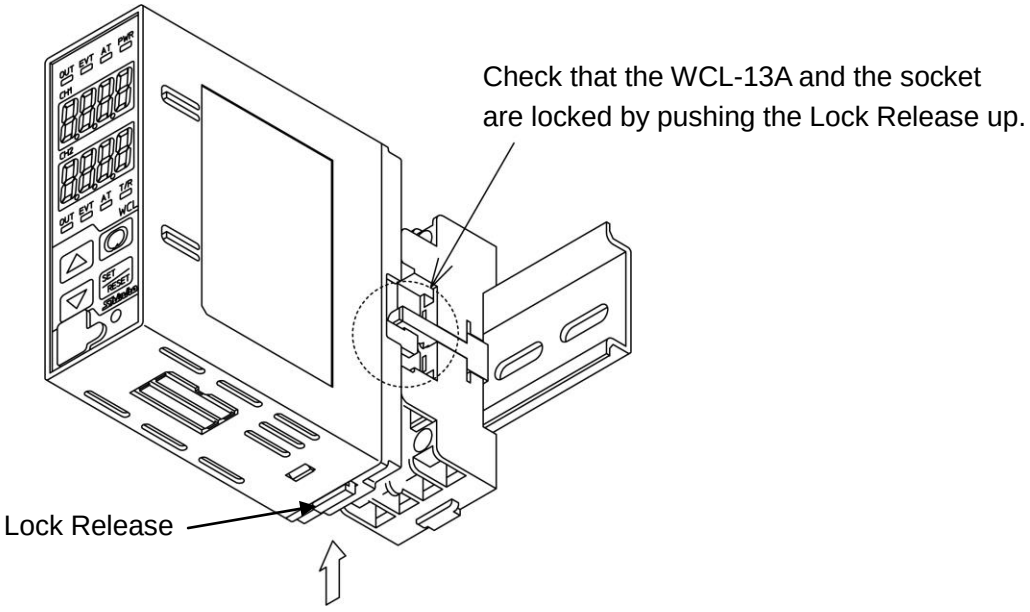
(Fig. 3.4-2)

(3) Insert the WCL-13A into the socket.



(Fig. 3.4-3)

(4) Fix the WCL-13A and the socket by pushing the Lock Release up.

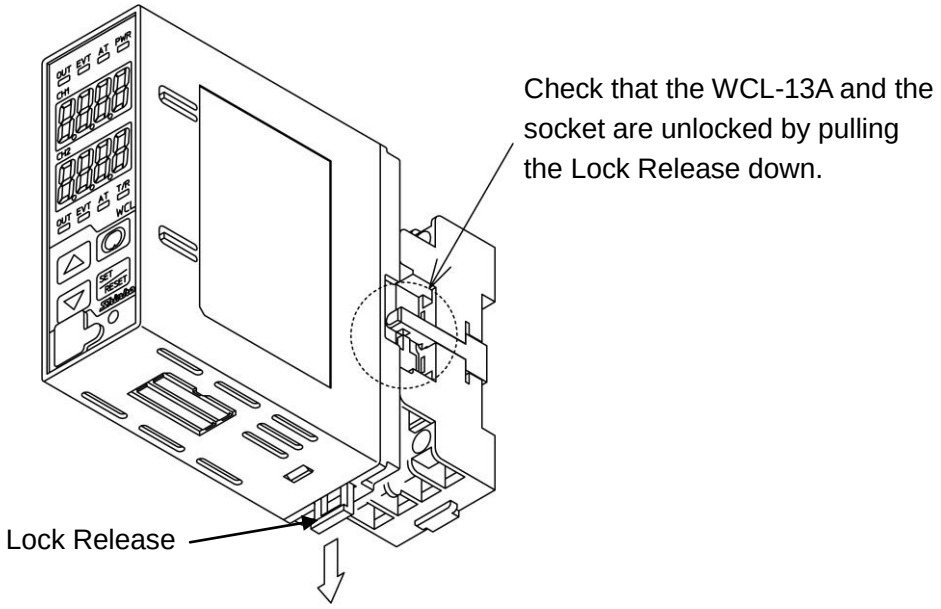


(Fig. 3.4-4)

4. Removal from a DIN Rail

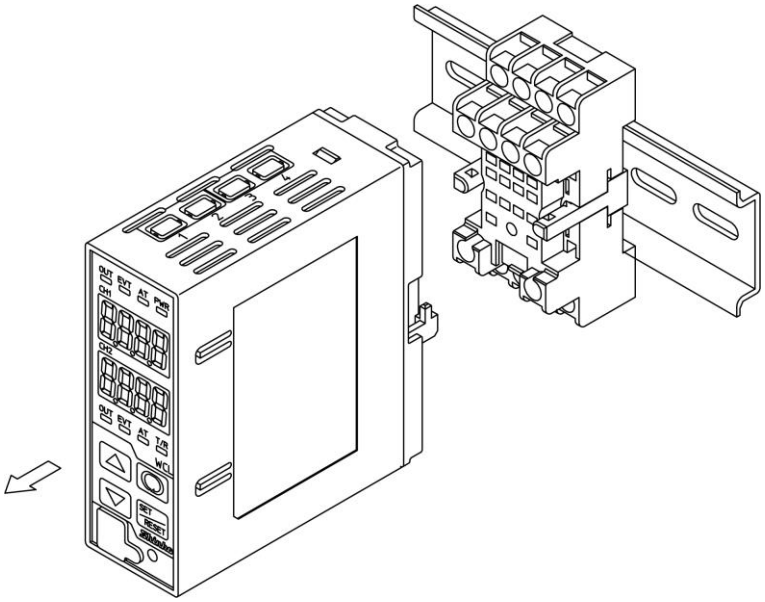
(1) Turn the power supply to the unit OFF.

(2) Pull the Lock Release down, and release the WCL-13A from the socket.



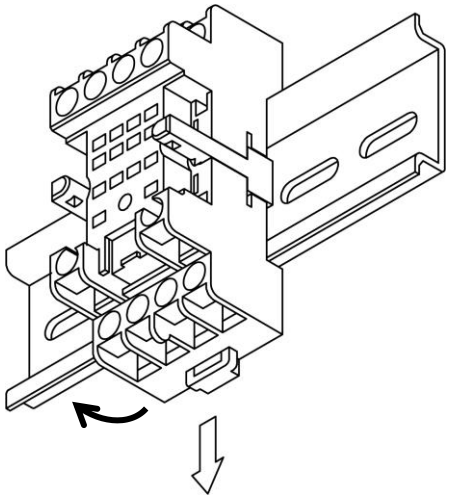
(Fig. 4-1)

(3) Separate the WCL-13A from the socket.



(Fig. 4-2)

(4) Remove the socket from the DIN rail by pulling the Socket Lock Release (at the bottom of the socket) down.



(Fig. 4-3)

5. Wiring

⚠ Warning

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

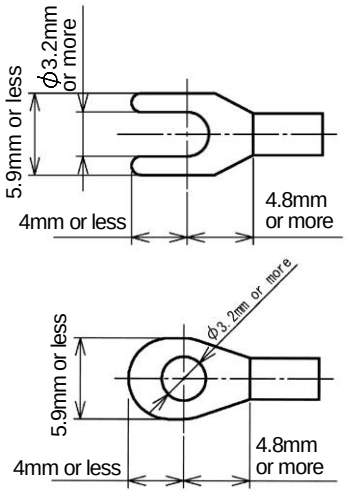
⚠ Caution

- Do not leave wire remnants in the instrument, because they could cause a fire and/or malfunction.
- Use a solderless terminal with an insulation sleeve in which the M3 screw fits when wiring the instrument.
- Tighten the terminal screw using the specified torque. If excessive force is applied to the screw when tightening, the terminal screw may be damaged.
- This controller does not have a built-in power switch, circuit breaker or fuse. Therefore, it is necessary to install them in a circuit near the external controller.
  (Recommended fuse: Time-lag fuse, rated voltage 250V AC, rated current 2A)
- For a 24V AC/DC power source, do not confuse polarity when using direct current (DC).
- Do not apply a commercial power source to the sensor connected to the input terminal nor allow the power source to come into contact with the sensor.
- Use a thermocouple and compensating lead wire that correspond to the sensor input specification of this controller.
- Use the 3-wire RTD corresponding to the input specification of this controller.
- When using a relay contact output type, externally use a relay according to the capacity of the load to protect the built-in relay contact.
- When wiring, keep input wires (thermocouple, RTD, etc.) away from AC sources or load wires.

5.1 Lead Wire Solderless Terminal

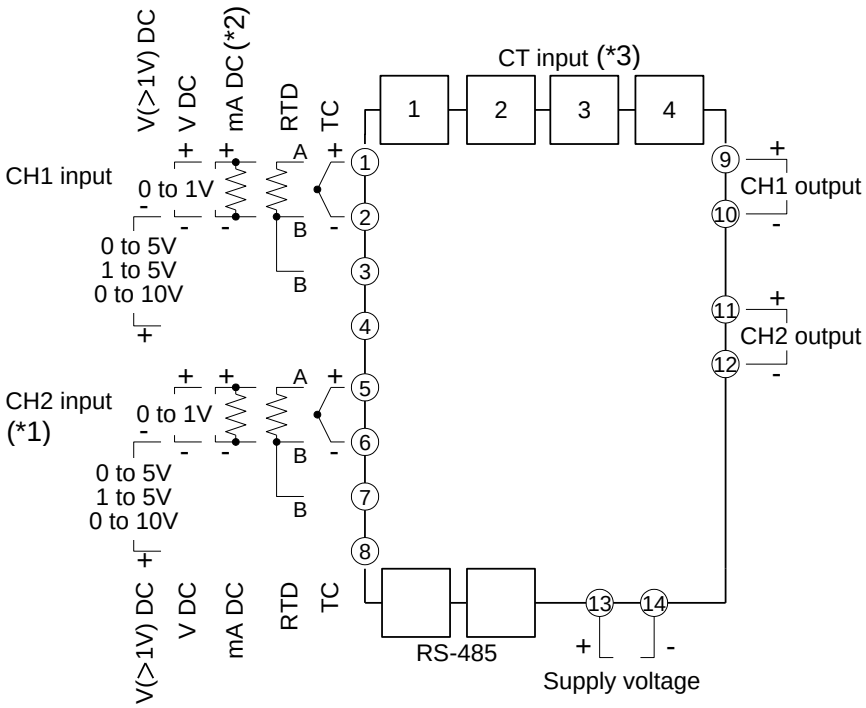
Use a solderless terminal with an insulation sleeve in which an M3 screw fits as follows.
For the sockets with finger-safe & screw fall prevention functions, the ring terminals are unusable.
The tightening torque should be 0.63N•m.

Solderless Terminal	Manufacturer	Model
Y type	Nichifu Terminal Industries CO.,LTD.	TMEV1.25Y-3S
Ring type	Nichifu Terminal Industries CO.,LTD.	TMEV 1.25-3
	Japan Solderless Terminal MFG CO.,LTD.	V1.25-3

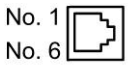


(Fig. 5.1-1)

5.2 2ch Controller Spec.



RS-485
[Serial communication (C5 option)]
Modular jack pin arrangement:



No. 1	COM
No. 2	NC
No. 3	YB(+)
No. 4	YA(−)
No. 5	NC
No. 6	COM

(The above diagram shows controller side arrangement.)

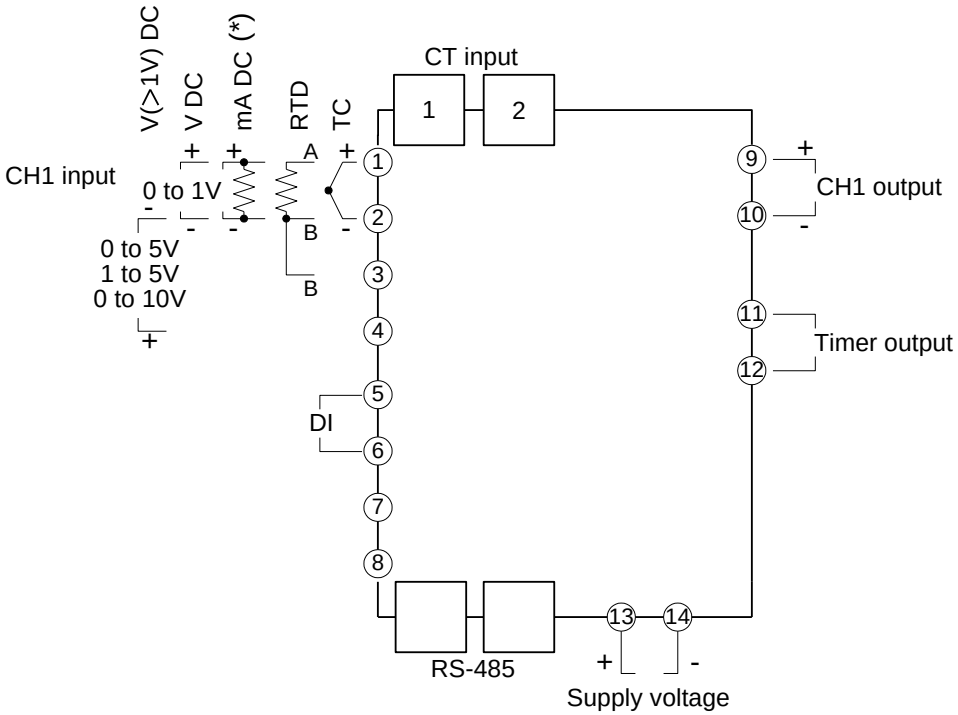
(*1) If “Output 2 output” or “1-input 2-output” is selected for Output 1 block (Console software Block Function), short CH2 input between ⑤ and ⑥.
If nothing is connected to CH2 input, which will be read as an input error, control will be disabled and control output will be turned OFF.

(*2) For DC current input, connect a 50Ω shunt resistor (sold separately) between input terminals.

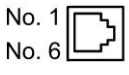
(*3) If Alarm output (AO option) is added, 4-points of Alarm output will be used.
If the AW option [Heater Burnout alarm (Single-phase) + Alarm output] is added, Heater Burnout alarm (CT) input 2-points, and Alarm output will be used.

(Fig. 5.2-1)

5.3 Timer Spec.



RS-485
[Serial communication (C5 option)]
Modular jack pin arrangement:



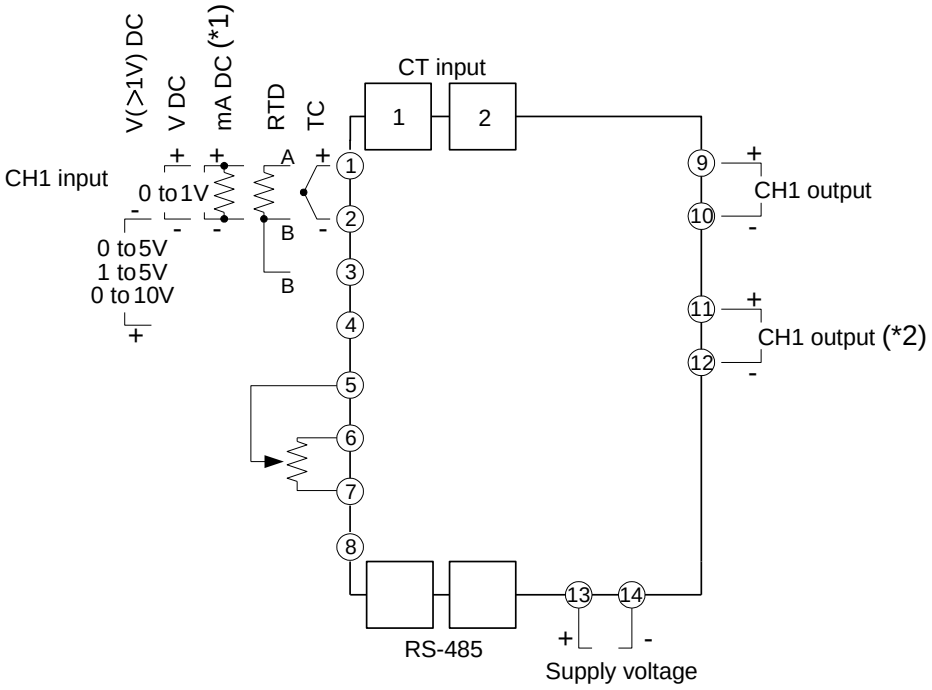
No. 1	COM
No. 2	NC
No. 3	YB(+)
No. 4	YA(−)
No. 5	NC
No. 6	COM

(The above diagram shows controller side arrangement.)

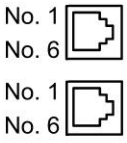
(*) For DC current input, connect a 50Ω shunt resistor (sold separately) between input terminals.

(Fig. 5.3-1)

5.4 Potentiometer Input Spec.



RS-485
[Serial communication (C5 option)]
Modular jack pin arrangement:



No. 1	COM
No. 2	NC
No. 3	YB(+)
No. 4	YA(−)
No. 5	NC
No. 6	COM

(The above diagram shows controller side arrangement.)

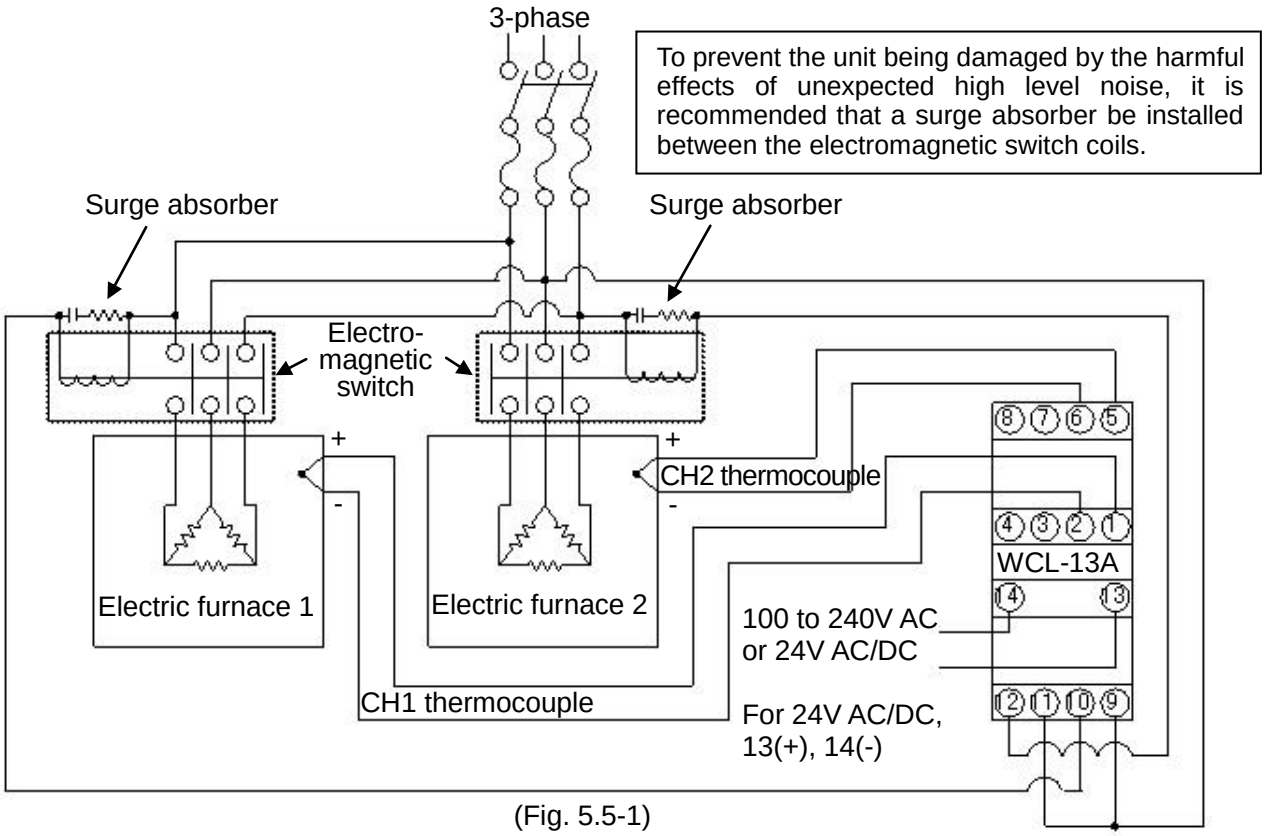
(*1) For DC current input, connect a 50Ω shunt resistor (sold separately) between input terminals.

(*2) Effective when “Heating/Cooling control output” for Control 1 block or “1-input 2-output” for Output 1 block is selected (Console software Block function).

(Fig. 5.4-1)

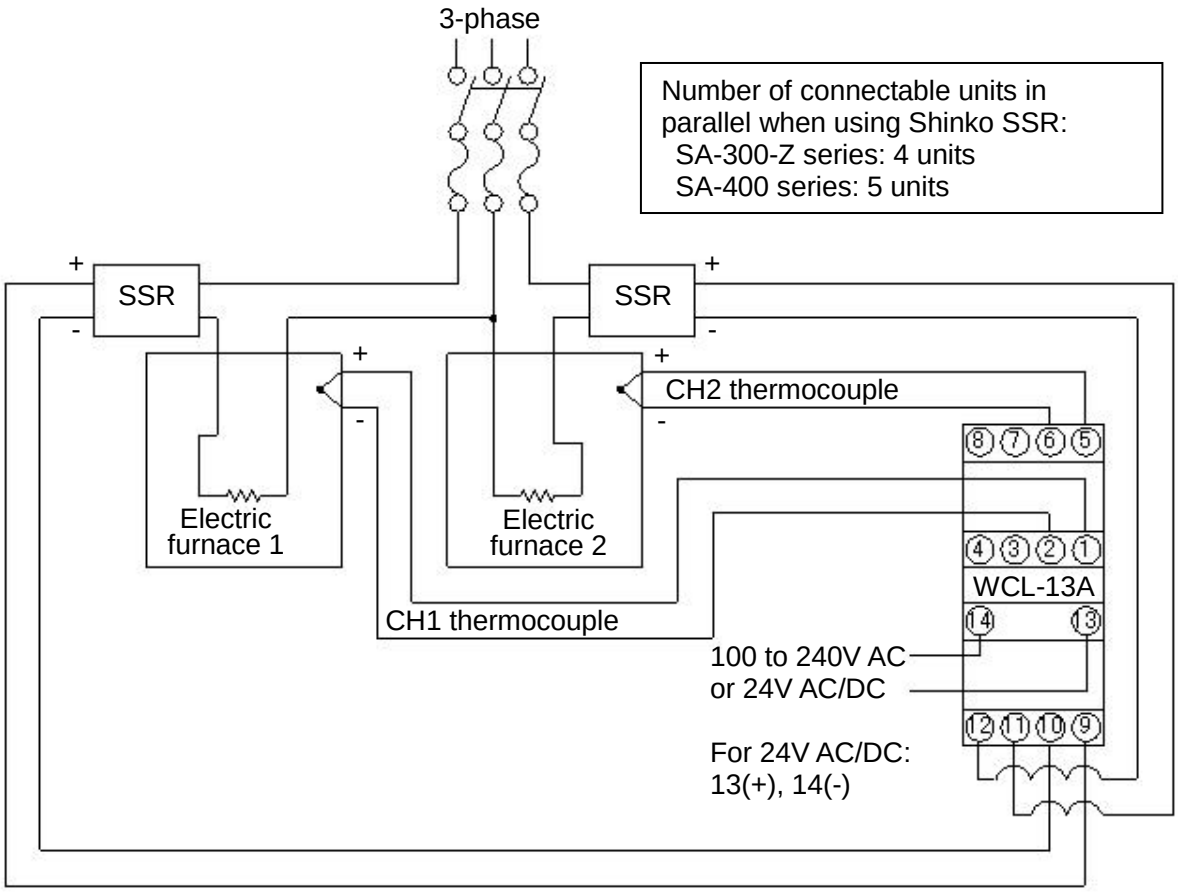
5.5 Wiring Example

• **WCL-13A-RR/MM** (2ch controller spec: Relay contact output and Multi-range input for both CH1 and CH2)



(Fig. 5.5-1)

• **WCL-13A-SS/MM** (2ch controller spec: Non-contact voltage output and Multi-range input for both CH1 and CH2)



(Fig. 5.5-2)

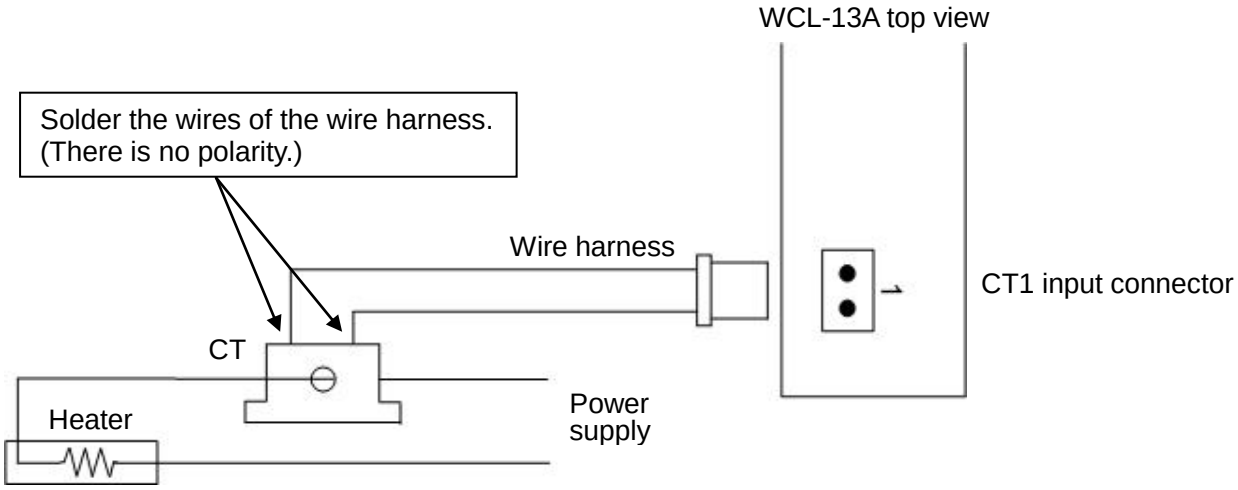
5.6 Wiring Example of Heater Burnout Alarm (W, W3 option)

When Heater burnout alarm (W, W3 option) is added: Heater burnout alarm (CT) input connectors for CH1 and CH2 are equipped on the top of the unit.

Single-phase 20A, 100A: CT1 (CT input for CH1), CT3 (CT input for CH2)
3-phase 20A, 100A: CT1, CT2 (CT input for CH1), CT3, CT4 (CT input for CH2)

Single-phase Heater:

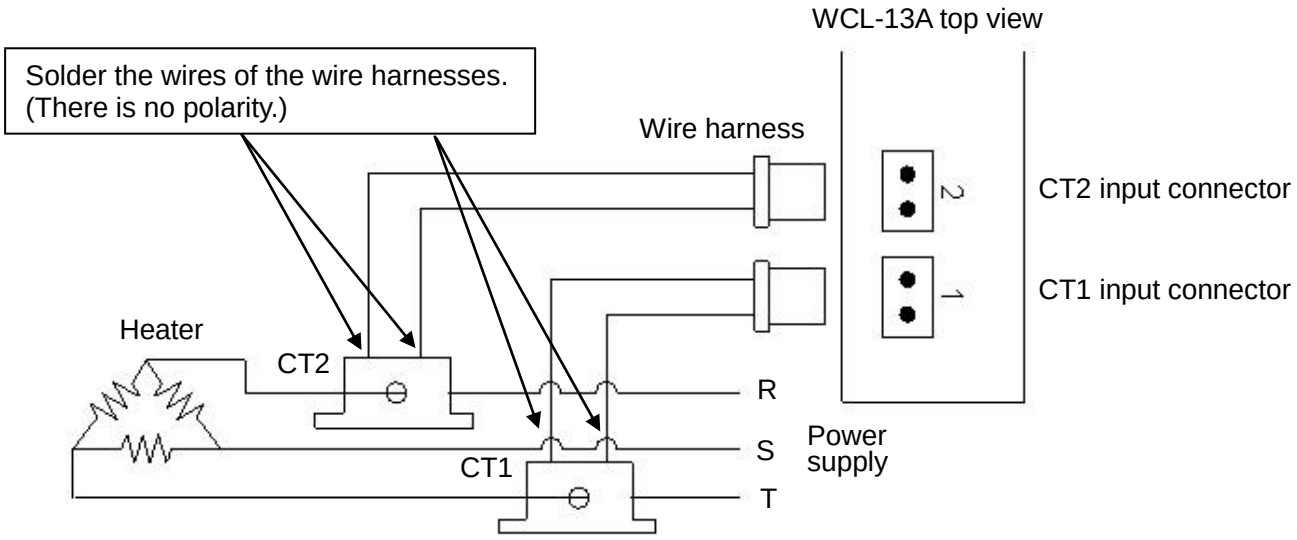
(1) Pass the Heater wire into the CT hole, and solder the wires of the wire harness provided.
(2) CH1: Insert the wire harness into the CT1 input connector.
CH2: Insert the wire harness into the CT3 input connector.



(Fig. 5.6-1)

3-phase Heater:

(1) Pass any 2 heater wires of R, S and T into the holes of CT1 and CT2, and solder the wires of the wire harness provided.
(2) CH1: Insert the wire harness into the CT1 and CT2 input connectors.
CH2: Insert the wire harness into the CT3 and CT4 input connectors.



(Fig. 5.6-2)

5.7 Wiring Example of Alarm Output (AO option)

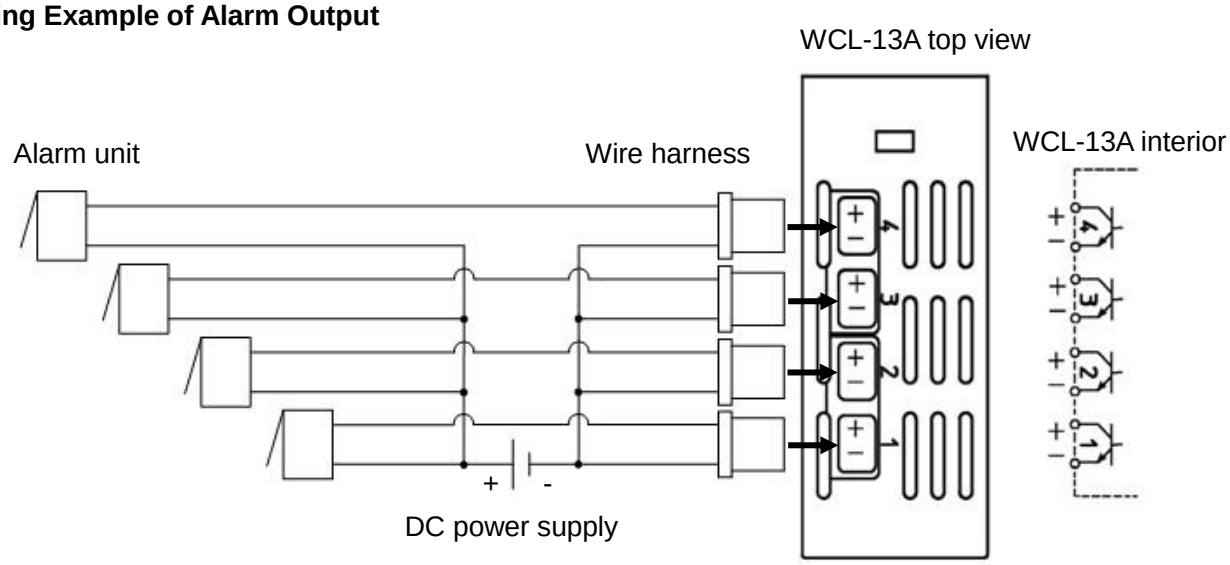
If Alarm output (AO option) is added, Alarm output connectors will be equipped on the top of the unit.

The following shows connector numbers and corresponding Alarm output.
(Table 5.7-1)

Connector No.	Alarm Output
1	CH1 Alarm 1 output
2	CH1 Alarm 2 output
3	CH2 Alarm 1 output
4	CH2 Alarm 2 output

Output specifications are shown below.
Open collector: Control capacity, 0.1A 24V DC

Wiring Example of Alarm Output



(Fig. 5.7-1)

5.8 Wiring Example of Heater Burnout Alarm (single-phase) + Alarm Output (AW option)

If the AW option [Heater burnout alarm (single-phase) + Alarm output] is added, connectors for the Heater burnout alarm (CT) input and Alarm output will be equipped on the top of the unit.

The following shows connector numbers and corresponding Heater burnout alarm (CT) input and Alarm output.

(Table 5.8-1)

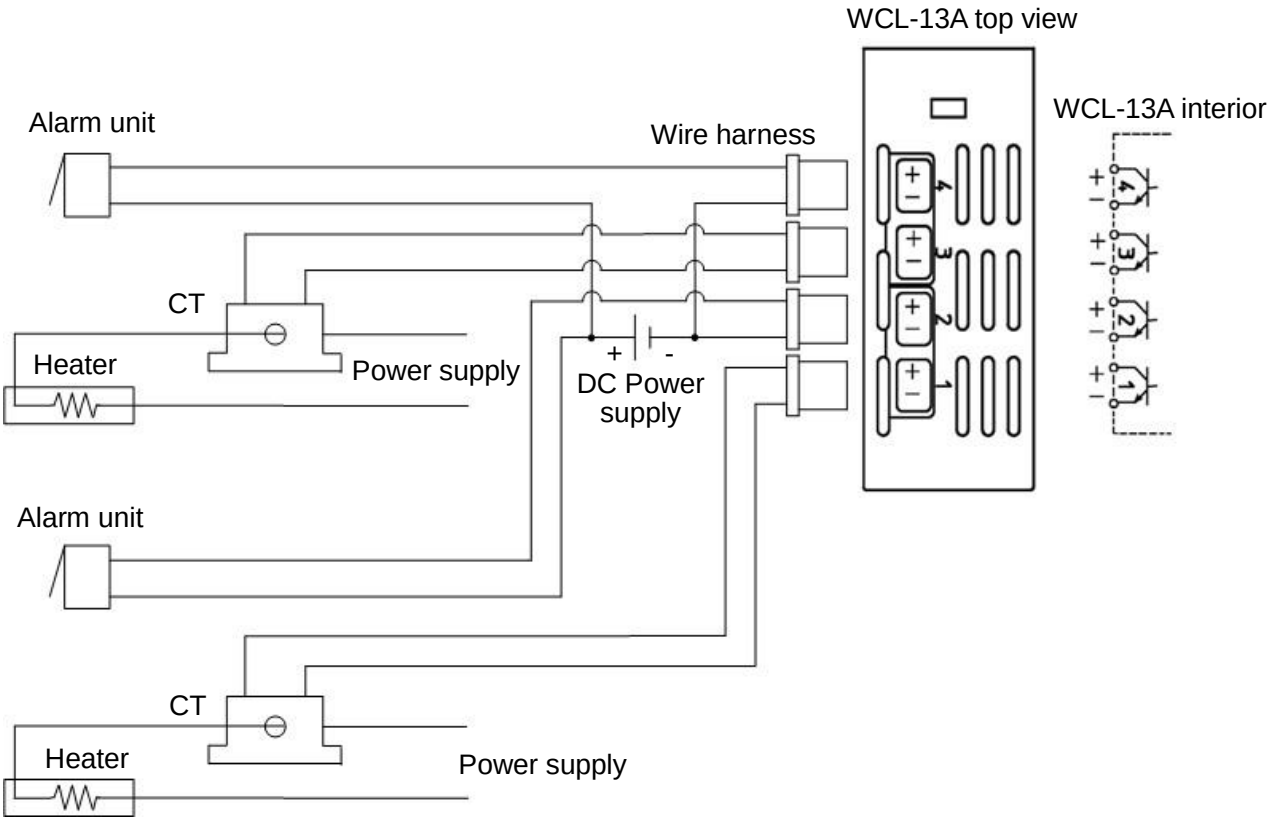
Connector No.	CT Input, Alarm Output
1	CH1 CT input
2	CH1 Alarm output
3	CH2 CT input
4	CH2 Alarm output

Output specifications are shown below.
Open collector: Control capacity, 0.1A 24V DC

Wiring Method of CT

(1) Pass the heater wire into the hole of CT, and solder the wires of the wire harness provided. There is no polarity.
(2) CH1: Insert the wire harness into the CH1 CT input connector.
CH2: Insert the wire harness into the CH2 CT input connector.

Wiring Example of Heater Burnout Alarm (CT) input and Alarm Output



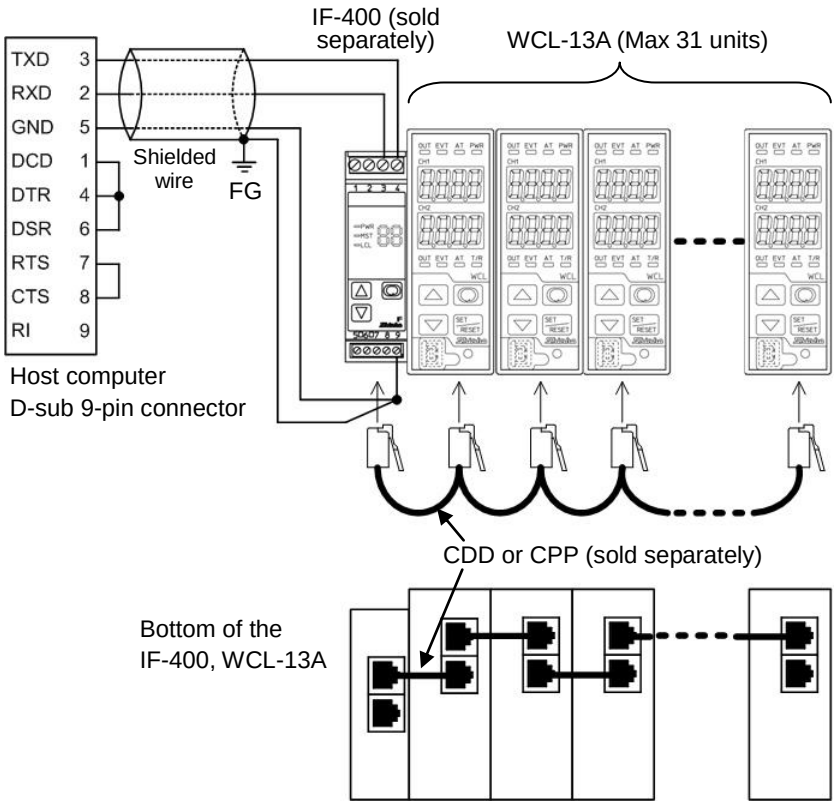
(Fig. 5.8-1)

5.9 Wiring Example of Serial Communication (C5 option)

When the Serial Communication (C5 option) is added, a modular jack is equipped at the bottom of the controller.

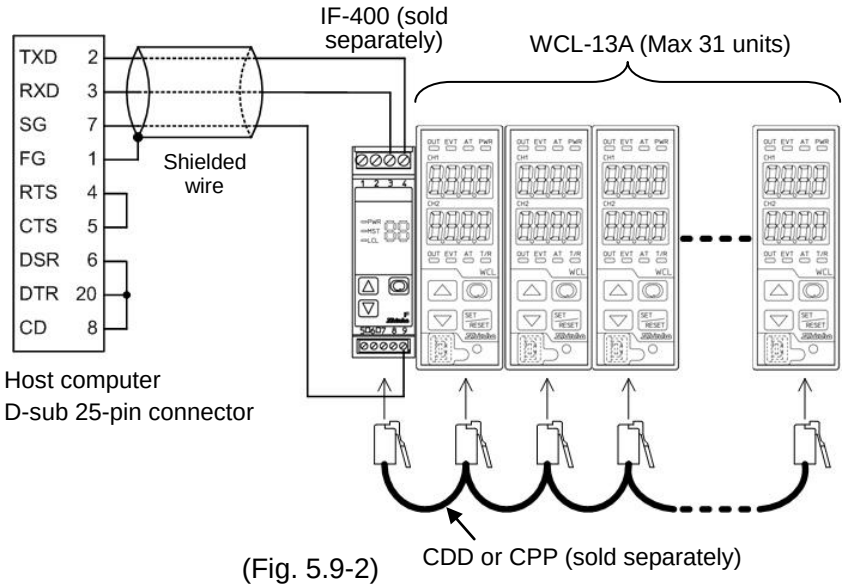
Wiring example using the IF-400 communication converter

• **D-sub 9-pin Connector**



(Fig. 5.9-1)

• **D-sub 25-pin Connector**



(Fig. 5.9-2)

Shielded Wire

Connect only one side of the shielded wire so that current cannot flow to the shielded wire. If both sides of the shielded wire are connected, the circuit will be closed between the shielded wire and the ground. As a result, current will run through the shielded wire and this may cause noise.

Recommended cable: OTSC-VB 2PX0.5SQ (made by Onamba Co., Ltd.) or equivalent (Use a twisted pair cable.)

Terminator (Terminal Resistor)

The terminator is mounted at the end of the wire when connecting a personal computer with multiple peripheral devices. The terminator prevents signal reflection and disturbance.

Do not connect the terminator with the communication line because the WCL-13A has built-in pull-up and pull-down resistors instead of a terminator.

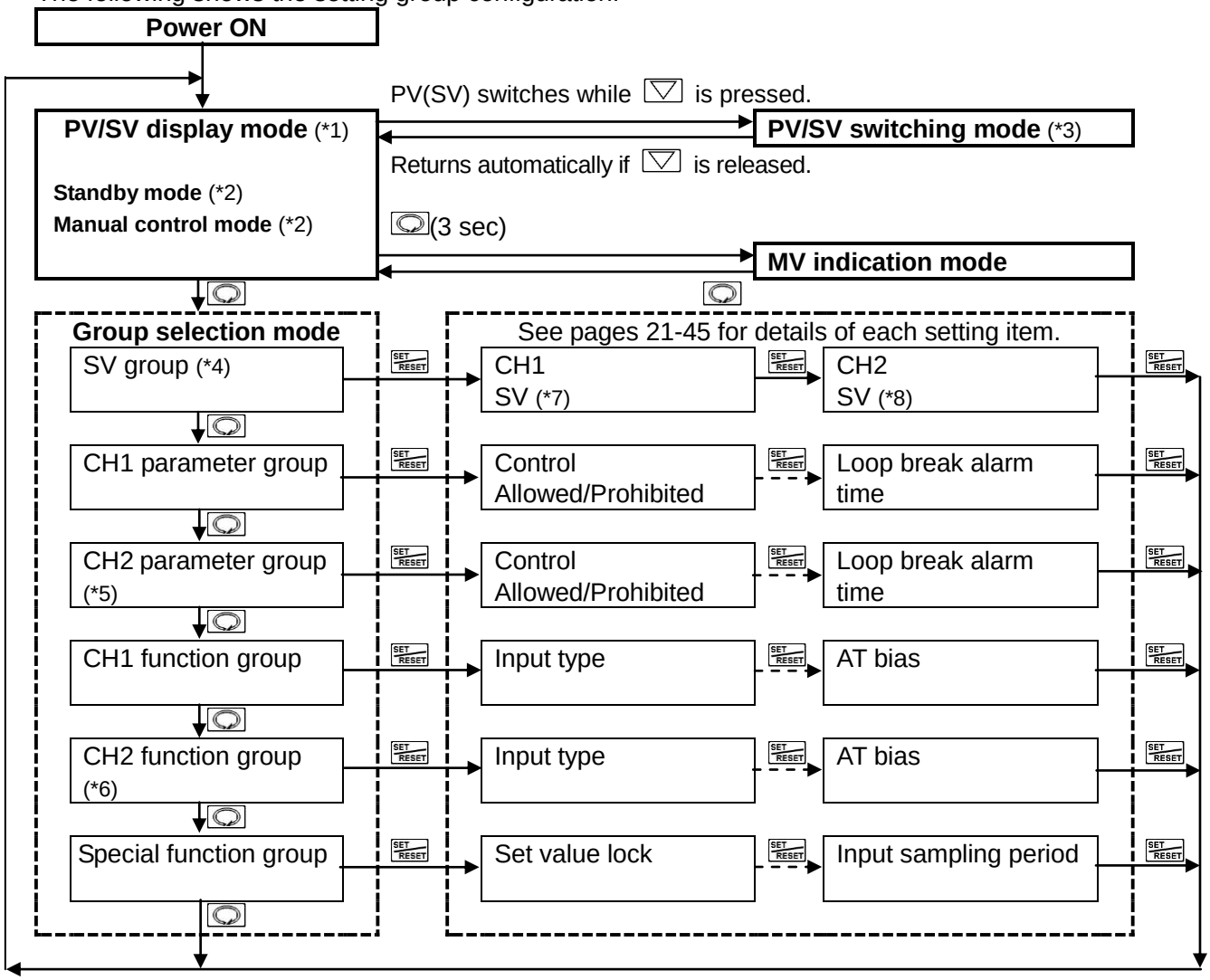
6. Outline of Key Operation and Setting Groups

6.1 Outline of Key Operation

Setting items are divided into groups, and group selection has to be made with keypads.
Press the [◎] key in the PV/SV display mode. The unit enters the Group selection mode.
Select a group with the [◎], and press the [SET/RESET]. The unit enters each setting item.
To set each setting item, use the [△] or [▽] key, and register the value with the [SET/RESET] key.

6.2 Setting Groups

The following shows the setting group configuration.



- ↓◎, SET/RESET→: This means that if the ◎ or SET/RESET key is pressed, the unit proceeds to the next setting item.
- SET/RESET ⇢ : This means "Press the SET/RESET key until the desired setting mode appears".

(*1) In the PV/SV display mode, indicates a setting item selected in the Display selection.
(*2) Indications differ depending on the selection in the CH1, CH2 parameter group.
(*3) In the PV/SV display mode, the PV/SV indications will switch.
PV(SV) does not switch if a CH1, CH2 difference or addition inclusive item is selected during Display selection in the Special function group.
(*4) Not available for Potentiometer input spec.
(*5) Not available for Timer spec, Potentiometer input spec or if Heating/Cooling control or External setting input is selected from the Block function (Console software).
(*6) Not available for Timer spec, Potentiometer input spec or if Heating/Cooling control is selected from the Block function (Console software).
(*7) If Cascade control spec is selected from the Block function (Console software), CH1 SV will become the AT point of the slave side.
(*8) Not available for Timer spec or if Heating/Cooling control or External setting input is selected from the Block function (Console software).

6.3 Basic Operation Procedures

Basic operation procedures are shown below.

Setting Example

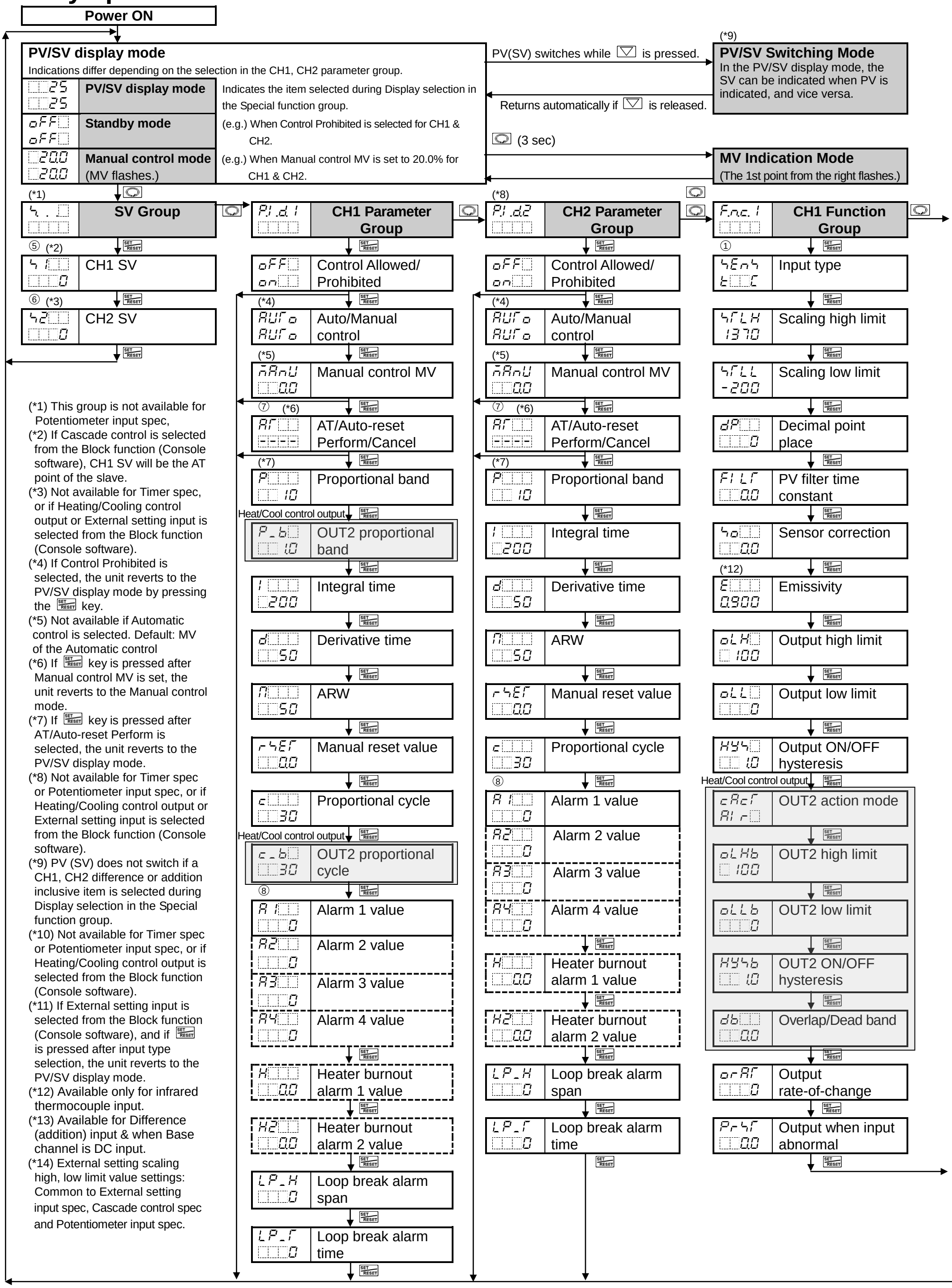
CH2 function : Used as a CH2 controller (2ch controller spec).
Input : Pt100: -199.9 to 850.0℃ (for CH1, CH2)
Control action : PID control (P, I, D and ARW values are automatically set by performing AT) (for CH1, CH2)
Alarm 1 type : High limit alarm (for CH1, CH2)
Alarm 1 value : 10.0℃ (for CH1, CH2)
SV : CH1: 200.0℃
CH2: 210.0℃

Operation Procedures

1. Operation before running	Turn the load circuit power OFF, and turn the power supply to the controller ON.
2. CH1 function group CH2 function group	Select each input type, Alarm 1 type, etc. in the CH1, CH2 function groups. ① Select [PT .C: Pt100 -199.9 to 850.0℃] during the [5En5: Input type] selection. ② Select [H□□□: High limit alarm] during the [A 1Fn: Alarm 1 type] selection. Setting items ③ and ④ will be indicated. Set them as needed. **[Note]** **When an Alarm type is changed, the Alarm value reverts to the default value 0 (0.0). Therefore set it again.** ③ Set the Alarm 1 hysteresis during the [A 1HY: Alarm 1 hysteresis] setting. ④ Set the Alarm 1 action delay timer during the [A 1dY: Alarm 1 action delay timer] setting.
3. SV group	Set the SV in the SV group. ⑤ Set to 200.0℃ during the [5 1□□: CH1 SV] setting. ⑥ Set to 210.0℃ during the [52□□: CH2 SV] setting.
4. Start the controller	Turn the load circuit power ON. Control action starts so as to keep the control target at the SV.
5. AT Perform	Perform AT in the CH1, CH2 parameter groups respectively. ⑦ Select [AT □□: AT Perform] during [AT □□: AT/Auto-reset Perform/Cancel] selection. The AT indicator flashes while AT is performing. The AT indicator goes off after AT is finished. **[Note]** After AT is finished, P, I, D and ARW values are automatically set. Since these values are internally memorized, it is not necessary to perform AT again as long as the process is the same.
6. CH1 parameter group CH2 parameter group	Set each Alarm value in the CH1, CH2 parameter groups after AT is finished. ⑧ Set the value to 10.0℃ during the [A 1□□: Alarm 1 value] setting.

Setting items ① to ⑧ are indicated in Section “7. Key Operation Flowchart” (Pages 22, 23).

7. Key operation flowchart



(*1) This group is not available for Potentiometer input spec,

(*2) If Cascade control is selected from the Block function (Console software), CH1 SV will be the AT point of the slave.

(*3) Not available for Timer spec, or if Heating/Cooling control output or External setting input is selected from the Block function (Console software).

(*4) If Control Prohibited is selected, the unit reverts to the PV/SV display mode by pressing the SET/RESET key.

(*5) Not available if Automatic control is selected. Default: MV of the Automatic control

(*6) If SET/RESET key is pressed after Manual control MV is set, the unit reverts to the Manual control mode.

(*7) If SET/RESET key is pressed after AT/Auto-reset Perform is selected, the unit reverts to the PV/SV display mode.

(*8) Not available for Timer spec or Potentiometer input spec, or if Heating/Cooling control output or External setting input is selected from the Block function (Console software).

(*9) PV (SV) does not switch if a CH1, CH2 difference or addition inclusive item is selected during Display selection in the Special function group.

(*10) Not available for Timer spec or Potentiometer input spec, or if Heating/Cooling control output is selected from the Block function (Console software).

(*11) If External setting input is selected from the Block function (Console software), and if SET/RESET is pressed after input type selection, the unit reverts to the PV/SV display mode.

(*12) Available only for infrared thermocouple input.

(*13) Available for Difference (addition) input & when Base channel is DC input.

(*14) External setting scaling high, low limit value settings: Common to External setting input spec, Cascade control spec and Potentiometer input spec.

[About Setting Items]

1 1□□ □□□0	CH1 SV

- Upper left (CH1 PV/SV display): Indicates setting item characters.
  Lower left (CH2 PV/SV display): Indicates default value.
  Right side: Indicates the Setting item.
- Setting items with dotted lines are optional, and they appear only when the options are added.
- ☐ : Available when each spec is selected from the Block function (Console software).

[Key Operation]

- ↓◎, ↓SET/RESET : If the ◎ or SET/RESET key is pressed, the unit proceeds to the next setting item.
- If the ◎ key is pressed for 3 sec at any setting item, the unit reverts to the PV/SV display mode.

(*10)

CH2 Function Group

① Input type
(*11) Scaling high limit (1370)
Scaling low limit (-200)
Decimal point place (0)
PV filter time constant (0.0)
Sensor correction (0.0)
(*12) Emissivity (0.900)
Output high limit (100)
Output low limit (0)
Output ON/OFF hysteresis (1.0)
Output rate-of-change (0)
Output when input abnormal (0.0)

② Alarm 1 type
Alarm 2 type
Alarm 3 type
Alarm 4 type

③ Alarm 1 hysteresis (1.0)
Alarm 2 hysteresis (1.0)
Alarm 3 hysteresis (1.0)
Alarm 4 hysteresis (1.0)

④ Alarm 1 action delay timer (0)
Alarm 2 action delay timer (0)
Alarm 3 action delay timer (0)
Alarm 4 action delay timer (0)

Event output 1
Event output 2
SV rise rate (0)
SV fall rate (0)
Direct/Reverse action
AT bias (20)
(*13) Difference (addition) indication high limit (9999)
(*13) Difference (addition) indication low limit (-999)

Special Function Group

Set value lock
Communication protocol
Instrument number (0)
Communication speed (96)
Data bit/Parity (7Ebn)
Stop bit (1)

④ Alarm 1 action delay timer (0)
Alarm 2 action delay timer (0)
Alarm 3 action delay timer (0)
Alarm 4 action delay timer (0)
Event output 1
Event output 2
SV rise rate (0)
SV fall rate (0)
Direct/Reverse action
AT bias (20)
(*13) Difference (addition) indication high limit (9999)
(*13) Difference (addition) indication low limit (-999)

Reverts to the PV/SV display mode.

External setting input spec
Remote/Local (LocL)
(*14) External setting scaling high limit (1370)
(*14) External setting scaling low limit (-200)
Remote bias (0)

Transmission output spec
Transmission output (PV)
Transmission output high limit (1370)
Transmission output low limit (-200)

Timer spec
Timer action (rtAE)
Timer action time unit (Min)
ON delay timer (0)
OFF delay timer (0)
Control timer start temperature (0)
Control timer time (0)

Auto-light function
Display selection (dsPV)
Indication time (00.00)
Input sampling period (125)

Potentiometer input spec
Potentiometer input zero adjustment (1370)
Potentiometer input span adjustment (-200)

8. Setup

Setup should be done before using this controller, to set the input type, Alarm type, and control action, etc. of CH1 and CH2 according to the users' conditions.

Setup can be conducted in the CH1, CH2 function groups and Special function group.

If the users' specification is the same as the default value of the WCL-13A, it is not necessary to set up the controller. Proceed to Chapter "9. Settings".

8.1 Turn the Power Supply to the WCL-13A ON.

- For approx. 4 seconds after the power is switched ON, the sensor input characters and temperature unit are indicated on the PV/SV display of CH1 and CH2. (Table. 8.1-1) (Table. 8.1-2)
  During this time, all outputs and LED indicators are in OFF status.
- After that, the item selected during Display selection is indicated.

(Table. 8.1-1) Multi-range Input

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

(Table 8.1-2) Infrared Thermocouple (Infrared TC) Input

RD-300 Series, RD-401	PV/SV Display	Setting Range
-18 to 25℃	I 10C	-50 to 500℃
5 to 45℃	I 27C	-50 to 500℃
25 to 80℃	I 60C	-50 to 500℃
70 to 105℃	I 90C	-50 to 500℃
90 to 120℃	I 12C	-50 to 500℃
115 to 155℃	I 14C	-50 to 500℃
145 to 190℃	I 17C	-50 to 500℃
180 to 250℃	I 22C	-50 to 500℃
-18 to 25℃	I 10F	-58 to 932℉
5 to 45℃	I 27F	-58 to 932℉
25 to 80℃	I 60F	-58 to 932℉
70 to 105℃	I 90F	-58 to 932℉
90 to 120℃	I 12F	-58 to 932℉
115 to 155℃	I 14F	-58 to 932℉
145 to 190℃	I 17F	-58 to 932℉
180 to 250℃	I 22F	-58 to 932℉

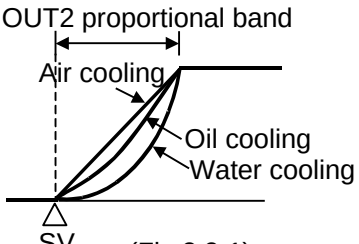
8.2 CH1 Function Group

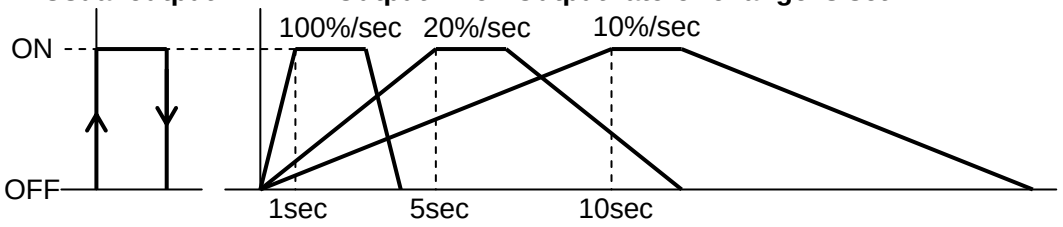
To enter the CH1 function group, follow the procedures below.

(1) F.nc. 1 Press the ◎ key in the PV/SV display mode until the left characters appear.

(2) inty Press the SET/RESET key. The CH1 input type will appear.

Character	Name, Function, Setting Range	Default Value
inty	**Input type** • Selects an input type. • **Multi-range input**: Selects an input type from thermocouple (10 types), RTD (2 types), DC current (2 types) and DC voltage (4 type), and the unit ℃/℉. Setting range: Refer to (Table 8.1-1) on p.24. • **Infrared thermocouple (TC) input**: Selects an input type from 8 types of Infrared thermocouple (RD-300 series, RD-401) and the unit ℃/℉. Setting range: Refer to (Table 8.1-2) on p.24.	Multi-range input: K (-200 to 1370℃) Infrared TC input: 180 to 250℃
rtLH	**Scaling high limit** • Sets Scaling high limit value. • For thermocouple, RTD, Infrared TC inputs, this matches SV high limit value. • Setting range: Scaling low limit to Input range high limit value **[Note] If CH difference input is selected for Input 1 block (Block function of Console software), set the Scaling high limit to Span value, and set the Scaling low limit to 0 (zero).** (e.g. 1) 1 to 5V DC input, 0 to 100 Scaling high limit: 100 Scaling low limit: 0 0 (Span: 100) 100 (e.g. 2) 1 to 5V DC input, -100 to 100 Scaling high limit: 200 Scaling low limit: 0 -100 (Span: 200) 100	Multi-range input: 1370℃ Infrared TC input: 500℃
rtLL	**Scaling low limit** • Sets Scaling low limit value. • For thermocouple, RTD, Infrared TC inputs, this matches SV low limit value. • Setting range: Input range low limit to Scaling high limit value	Multi-range input: -200℃ Infrared TC input: -50℃
dP□□	**Decimal point place** • Selects decimal point place. Available for DC current, voltage input • □□□0: No decimal point □□0.0: 1 digit after the decimal point □0.00: 2 digits after the decimal point 0.000: 3 digits after the decimal point	No decimal point
FILT	**PV filter time constant** • Sets PV filter time constant. If the value is set too high, it affects control results due to the delay of response. • Setting range: 0.0 to 10.0 seconds	0.0 sec
so□□	**Sensor correction** • Sets the correction value for the sensor. • Setting range: -100.0 to 100.0℃ (℉) DC current, voltage input:-1000 to 1000 (The placement of the decimal point follows the selection.) **[Sensor correction function]** This corrects the input value from the sensor. When a sensor cannot be set at the exact location where control is desired, temperatures measured by the sensor may deviate from the temperature in the controlled location. When controlling with plural controllers, sometimes the measured temperatures (input value) 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. PV after sensor correction= Current PV+ (Sensor correction value) (e.g.) When PV is 198℃: If sensor correction value is set to 2.0℃, the PV will be 198+(2.0)=200.0℃. If sensor correction value is set to -2.0℃, the PV will be 198+(-2.0)=196.0℃.	0.0℃

Character	Name, Function, Setting Range	Default Value
E□□□	**Emissivity** • Sets infrared emissivity. Setting characters and PV are alternately indicated on the CH1 PV/SV display. Available only for Infrared thermocouple input. • Setting range: 0.100 to 1.000 times	0.900 times
oLH□	**Output high limit** • Sets the output high limit value. Not available if output is in ON/OFF control. If Heating/Cooling control output is selected from the Block function (Console software), CH1 output will be OUT1, and CH2 output will be OUT2. • Setting range: Output low limit value to 100% (DC current output: Output low limit value to 105%)	100%
oLL□	**Output low limit** • Sets the output low limit value. Not available if output is in ON/OFF control. If Heating/Cooling control output is selected from the Block function (Console software), CH1 output will be OUT1, and CH2 output will be OUT2. • Setting range: 0% to Output high limit value (DC current output: -5% to Output high limit value)	0%
HY4□	**Output ON/OFF hysteresis** • Sets the output ON/OFF hysteresis. Available only when output is in ON/OFF control If Heating/Cooling control output is selected from the Block function (Console software), CH1 output will be OUT1, and CH2 output will be OUT2. • Setting range: 0.1 to 100.0℃ (℉), DC current, voltage input: 1 to 1000 (The placement of the decimal point follows the selection.)	1.0℃
cAcF	**OUT2 action mode** • Selects OUT2 action from air, oil and water cooling. • Available when Heating/Cooling control output is selected from the Block function (Console software). Not available if OUT2 is in ON/OFF control. • AIr□: Air cooling (linear characteristic) oIL□: Oil cooling (1.5th power of the linear characteristic) WAr□: Water cooling (2nd power of the linear characteristic)  (Fig.8.2-1)	Air cooling
oLHb	**OUT2 high limit** • Sets OUT2 high limit value. • Available when Heating/Cooling control output is selected from the Block function (Console software). Not available if OUT2 is in ON/OFF control. • Setting range: OUT2 low limit value to 100% (DC current output: OUT2 low limit value to 105%)	100%
oLLb	**OUT2 low limit** • Sets OUT2 low limit value. • Available when Heating/Cooling control output is selected from the Block function (Console software). Not available if OUT2 is in ON/OFF control. • Setting range: 0% to OUT2 high limit value (DC current output: -5% to OUT2 high limit value)	0%
HY4b	**OUT2 ON/OFF hysteresis** • Sets ON/OFF hysteresis for OUT2. Available when Heating/Cooling control output is selected from the Block function (Console software), and when OUT2 is in ON/OFF control. • Setting range: 0.1 to 100.0℃ (℉), DC current, voltage input: 1 to 1000 (The placement of the decimal point follows the selection.)	1.0℃

Character	Name, Function, Setting Range	Default Value
db	**Overlap band/Dead band** • Sets the overlap band or dead band for OUT1 and OUT2. + Set value: Dead band, –Set value: Overlap band • Available when Heating/Cooling control output is selected from the Block function (Console software). • Setting range: -100.0 to 100.0℃(℉), DC current, voltage input: -1000 to 1000 (The placement of the decimal point follows the selection.)	0.0℃
orAr	**Output rate-of-change** • Sets the change value of output MV for 1 second. • Setting the value to 0 disables the function. Not available if the output is in ON/OFF control. • Setting range: 0 to 100%/second **[Output rate-of-change]** For Heating control, if PV is lower than SV, output is generally turned from OFF to ON as shown (Fig. 8.2-2). If Output rate-of-change is set, the output can be changed by the rate-of-change (Fig. 8.2-3). This control is suitable for high temperature heaters (which are made from molybdenum, tungsten or platinum, etc., and used at approx. 1500 to 1800℃) which are easily burnt out from turning on electricity rapidly. ● **Usual output** ● **Output when Output rate-of-change is set**  (Fig. 8.2-2) (Fig. 8.2-3)	0%/second
PrSt	**Output when input abnormal** • Sets the output MV when input is abnormal. Available only for DC current output type. • Setting range: Output low limit to Output high limit value	0.0%
A1Fn	**Alarm 1 type** • Selects an Alarm 1 type. **Note: If an Alarm type is changed, the Alarm set value becomes 0 (0.0).** ----: No Alarm action H□□□: High limit alarm L□□□: Low limit alarm HL□□: High/Low limits alarm oI d□: High/Low limit range alarm AH□□: Process high alarm rAH□: Process low alarm H□□□: High limit alarm with standby L□□□: Low limit alarm with standby HL□□: High/Low limits alarm with standby	No Alarm action
A2Fn	**Alarm 2 type** • Selects an Alarm 2 type. (Refer to Alarm 1 type.) • Available only when the AO or AW option is added.	No Alarm action
A3Fn	**Alarm 3 type** • Selects an Alarm 3 type. (Refer to Alarm 1 type.) • Available only when the AO option is added.	No Alarm action

Character	Name, Function, Setting Range	Default Value
A4Fn	**Alarm 4 type** • Selects an Alarm 4 type. (Refer to Alarm 1 type.) • Available only when the AO option is added.	No Alarm action
A1HY	**Alarm 1 hysteresis** • Sets Alarm 1 hysteresis. • Not available if No Alarm action is selected during Alarm type selection • Setting range: 0.1 to 100.0℃ (℉) DC current, voltage input: 1 to 1000 (The placement of the decimal point follows the selection.)	1.0℃
A2HY	**Alarm 2 hysteresis** • Sets Alarm 2 hysteresis. (Refer to Alarm 1 hysteresis.) • Available only when the AO or AW option is added.	1.0℃
A3HY	**Alarm 3 hysteresis** • Sets Alarm 3 hysteresis. (Refer to Alarm 1 hysteresis.) • Available only when the AO option is added.	1.0℃
A4HY	**Alarm 4 hysteresis** • Sets Alarm 4 hysteresis. (Refer to Alarm 1 hysteresis.) • Available only when the AO option is added.	1.0℃
A1dY	**Alarm 1 action delay timer** • Sets Alarm 1 action delay timer. When setting time has elapsed after the input enters the Alarm output range, the Alarm is activated. • Not available if No Alarm action is selected during Alarm type selection • Setting range: 0 to 9999 seconds	0 sec
A2dY	**Alarm 2 action delay timer** • Sets Alarm 2 action delay timer. (Refer to Alarm 1 action delay timer.) • Available only when the AO or AW option is added.	0 sec
A3dY	**Alarm 3 action delay timer** • Sets Alarm 3 action delay timer. (Refer to Alarm 1 action delay timer.) • Available only when the AO option is added.	0 sec
A4dY	**Alarm 4 action delay timer** • Sets Alarm 4 action delay timer. (Refer to Alarm 1 action delay timer.) • Available only when the AO option is added.	0 sec
E1Fn	**Event output 1** • Selects Event output 1. Available only when the AO option is added. • ALA□: Alarm LP□□: Loop break alarm ALLP: Alarm + Loop break alarm	Alarm
E2Fn	**Event output 2** • Selects Event output 2. Available only when the AO or AW option is added. • ALA□: Alarm LP□□: Loop break alarm ALLP: Alarm + Loop break alarm Hb□□: Heater burnout alarm ALHb: Alarm + Heater burnout alarm LPHb: Loop break alarm + Heater burnout alarm ALL□: Alarm+ Loop break alarm + Heater burnout alarm	Alarm

Character	Name, Function, Setting Range	Default Value
rRTU	**SV rise rate** • Sets SV rise rate (rising value for 1 minute). Setting to 0 or 0.0 disables the function. • Setting range: 0 to 9999℃/min. (℉/min.) Thermocouple, RTD input with a decimal point: 0.0 to 999.9℃/min. (℉/min.) DC current, voltage input: 0 to 9999/min. (The placement of the decimal point follows the selection.)	0℃/min.
rRTd	**SV fall rate** • Sets SV fall rate (falling value for 1 minute). Setting to 0 or 0.0 disables the function. • Setting range: 0 to 9999℃/min. (℉/min.) Thermocouple, RTD input with a decimal point: 0.0 to 999.9℃/min. (℉/min.) DC current, voltage input: 0 to 9999/min. (The placement of the decimal point follows the selection.)	0℃/min.
conF	**Direct/Reverse action** • Selects either Reverse (Heating) or Direct (Cooling) control action. • HEAF: Reverse action (Heating) cooL: Direct action (Cooling)	Reverse action
AT_b	**AT bias** • Sets bias value for the AT. (See p.53.) • Available for PID control Not available for DC current, voltage input. • Setting range: 0 to 50℃ (0 to 100℉) Thermocouple, RTD input with a decimal point: 0.0 to 50.0℃ (0.0 to 100.0℉)	20℃
dFLH	**Difference (addition) indication high limit** • Sets difference (addition) indication high limit value. • Available for Difference (addition) input & when Base channel (*) is DC input. • Setting range: Difference (addition) indication low limit to Input range high limit	9999
dFLL	**Difference (addition) indication low limit** • Sets difference (addition) indication low limit value. • Available for Difference (addition) input & when Base channel (*) is DC input. • Setting range: Input range low limit to Difference (addition) indication high limit	-1999

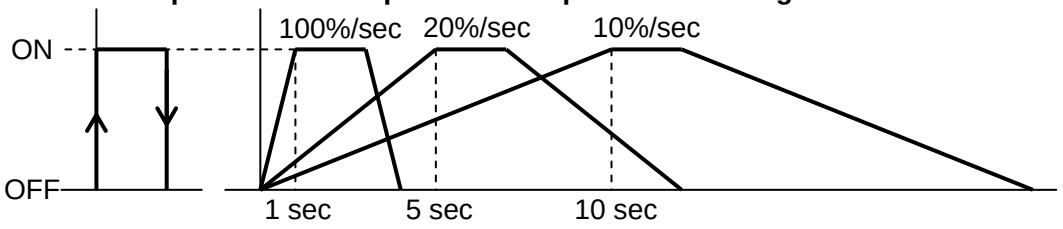
(*) If Difference (addition) input is selected for Input 1 block (Console software), CH1 (Input 1) will be the Base channel.
If Difference (addition) input is selected for Input 2 block (Console software), CH2 (Input 2) will be the Base channel.

8.3 CH2 Function Group

Not available for Timer spec or Potentiometer input spec.
Not available if Heating/Cooling control output is selected from the Block function (Console software).
To enter the CH2 function group, follow the procedures below.

(1) F.n.c.2. Press the ◎ key in the PV/SV display mode until the left characters appear.
(2) InS Press the SET/RESET key. CH2 input type will appear.

Character	Name, Function, Setting Range	Default Value
InS	**Input type** • Selects an input type.	Multi-range input: K (-200 to 1370℃) Infrared TC input: 180 to 250℃
	If External setting input spec is selected from the Block function (Console software), and if the SET/RESET key is pressed after selecting an input type, the unit reverts to the PV/SV display mode. • **Multi-range input**: Selects an input type from thermocouple (10 types), RTD (2 types), DC current (2 types) and DC voltage (4 type), and the unit ℃/℉. See (Table 8.1-1) on p.24. • **Infrared thermocouple (TC) input**: Selects an input type from 8 types of Infrared thermocouple (RD-300 series, RD-401) and the unit ℃/℉. See (Table 8.1-2) on p.24.	
rLH	**Scaling high limit** • Sets Scaling high limit value.	Multi-range input: 1370℃ Infrared TC input: 500℃
	• For thermocouple, RTD, Infrared TC inputs, this matches SV high limit value. • Setting range: Scaling low limit to Input range high limit value **[Note] If CH difference input is selected for Input 2 block (from the Block function of Console software), set the scaling high limit to span value, and set the scaling low limit to 0 (zero).** (e.g. 1) 1 to 5V DC input, 0 to 100 Scaling high limit: 100 Scaling low limit: 0 0 (Span: 100) 100 (e.g. 2) 1 to 5V DC input, -100 to 100 Scaling high limit: 200 Scaling low limit: 0 -100 (Span: 200) 100	
rLL	**Scaling low limit** • Sets Scaling low limit value.	Multi-range input: -200℃ Infrared TC input: -50℃
	• For thermocouple, RTD, Infrared TC inputs, this matches SV low limit value. • Setting range: Input range low limit to Scaling high limit value	
dP□□	**Decimal point place** • Selects decimal point place. Available for DC current, voltage input • □□□0: No decimal point □□0.0: 1 digit after decimal point □0.00: 2 digits after decimal point 0.000: 3 digits after decimal point	No decimal point
FILr	**PV filter time constant** • Sets PV filter time constant. If the value is set too large, it affects control results due to the delay of response. • Setting range: 0.0 to 10.0 seconds	0.0 sec
ro□□	**Sensor correction** • Sets the correction value for the sensor. • Setting range: -100.0 to 100.0℃ (℉), DC current, voltage input:-1000 to 1000 (The placement of the decimal point follows the selection.) **[Sensor correction function]** This corrects the input value from the sensor. When a sensor cannot be set at the exact location where control is desired, This corrects the input value from the sensor. When a sensor cannot be set at the exact location where control is desired, temperatures measured by the sensor may deviate from the temperature in the controlled location. When controlling with plural controllers, sometimes the measured temperatures (input value) 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. PV after sensor correction= Current PV+ (Sensor correction value) (e.g.) When PV is 198℃: If sensor correction value is set to 2.0℃, the PV will be 198+(2.0)=200.0℃. If sensor correction value is set to -2.0℃, the PV will be 198+(-2.0)=196.0℃.	0.0℃

Character	Name, Function, Setting Range	Default Value
E□□□	**Emissivity** • Sets infrared emissivity. Setting characters and PV are alternately indicated on the CH1 PV/SV display. Available only for Infrared thermocouple input • Setting range: 0.100 to 1.000 times	0.900 times
oLH□	**Output high limit** • Sets the output high limit value. Not available if output is in ON/OFF control. • Setting range: Output low limit to 100% (DC current output: Output low limit value to 105%)	100%
oLL□	**Output low limit** • Sets the output low limit value. Not available if output is in ON/OFF control. • Setting range: 0% to Output high limit value (DC current output: -5% to Output high limit value)	0%
HY5□	**Output ON/OFF hysteresis** • Sets the output ON/OFF hysteresis. Available only when output is in ON/OFF control. • Setting range: 0.1 to 100.0℃ (℉), DC current, voltage input: 1 to 1000 (The placement of the decimal point follows the selection.)	1.0℃
orAT	**Output rate-of-change** • Sets the change value of output MV for 1 second. • Setting the value to 0 disables the function. Not available if the output is in ON/OFF control. • Setting range: 0 to 100%/second **[Output rate-of-change]** For Heating control, if PV is lower than SV, output is generally turned from OFF to ON as shown in (Fig. 8.3-1). If Output rate-of-change is set, the output can be changed by the rate-of-change (Fig. 8.3-2). This control is suitable for high temperature heaters (which are made from molybdenum, tungsten or platinum, etc., and used at approx. 1500 to 1800℃) which are easily burnt out from turning on electricity rapidly. ● **Usual output** ● **Output when Output rate-of-change is set**  (Fig. 8.3-1) (Fig. 8.3-2)	0%/second
Pr5F	**Output when input abnormal** • Sets the output MV when input is abnormal. Available only for DC current output type. • Setting range: Output low limit to Output high limit value	0.0%
A1Fn	**Alarm 1 type** • Selects an Alarm 1 type. **Note: If an Alarm type is changed, the Alarm set value becomes 0 (0.0).** ----: No Alarm action H□□□: High limit alarm L□□□: Low limit alarm HL□□: High/Low limits alarm oI d□: High/Low limit range alarm A5□□: Process high alarm rA5□: Process low alarm H□□□: High limit alarm with standby L□□□: Low limit alarm with standby HL□□: High/Low limits alarm with standby	No Alarm action

Character	Name, Function, Setting Range	Default Value
A2Fn	**Alarm 2 type** • Selects an Alarm 2 type. (Refer to Alarm 1 type.) • Available only when the AO or AW option is added.	No Alarm action
A3Fn	**Alarm 3 type** • Selects an Alarm 3 type. (Refer to Alarm 1 type.) Available only when the AO option is added.	No Alarm action
A4Fn	**Alarm 4 type** • Selects an Alarm type. (Refer to Alarm 1 type.) Available only when the AO option is added.	No Alarm action
A 1HY	**Alarm 1 hysteresis** • Sets Alarm 1 hysteresis. • Not available if No Alarm action is selected during Alarm type selection • Setting range: 0.1 to 100.0℃(℉) DC current, voltage input: 1 to 1000 (The placement of the decimal point follows the selection)	1.0℃
A2HY	**Alarm 2 hysteresis** • Sets Alarm 2 hysteresis. (Refer to Alarm 1 hysteresis.) • Available only when the AO or AW option is added.	1.0℃
A3HY	**Alarm 3 hysteresis** • Sets Alarm 3 hysteresis. (Refer to Alarm 1 hysteresis.) • Available only when the AO option is added.	1.0℃
A4HY	**Alarm 4 hysteresis** • Sets Alarm 4 hysteresis. (Refer to Alarm 1 hysteresis.) • Available only when the AO option is added.	1.0℃
A 1dY	**Alarm 1 action delay timer** • Sets Alarm 1 action delay timer. When setting time has elapsed after the input enters the Alarm output range, the Alarm is activated. • Not available if No Alarm action is selected during Alarm type selection • Setting range: 0 to 9999 seconds	0 sec
A2dY	**Alarm 2 action delay timer** • Sets Alarm 2 action delay timer. (Refer to Alarm 1 action delay timer.) • Available only when the AO or AW option is added.	0 sec
A3dY	**Alarm 3 action delay timer** • Sets Alarm 3 action delay timer. (Refer to Alarm 1 action delay timer.) • Available only when the AO option is added.	0 sec
A4dY	**Alarm 4 action delay timer** • Sets Alarm 4 action delay timer. (Refer to Alarm 1 action delay timer.) • Available only when the AO option is added.	0 sec
E 1Fn	**Event output 1** • Selects Event output 1. Available only when the AO option is added. ・ALA□ : Alarm LP□□ : Loop break alarm ALLP : Alarm + Loop break alarm	Alarm
E2Fn	**Event output 2** • Selects Event output 2. Available only when the AO option or AW option is added. ・ALA□ : Alarm LP□□ : Loop break alarm ALLP : Alarm + Loop break alarm Hb□□ : Heater burnout alarm ALHb : Alarm + Heater burnout alarm LPHb : Loop break alarm+ Heater burnout alarm ALL□ : Alarm + Loop break alarm+ Heater burnout alarm	Alarm

Character	Name, Function, Setting Range	Default Value
rRU	**SV rise rate** • Sets SV rise rate (rising value for 1 minute). Setting to 0 or 0.0 disables the function. • Setting range: 0 to 9999℃/min. (℉/min.) Thermocouple, RTD input with a decimal point: 0.0 to 999.9℃/min. (℉/min.) DC current, voltage input: 0 to 9999/min. (The placement of the decimal point follows the selection.)	0℃/min.
rRd	**SV fall rate** • Sets SV fall rate (falling value for 1 minute). Setting to 0 or 0.0 disables the function. • Setting range: 0 to 9999℃/min. (℉/min.) Thermocouple, RTD input with a decimal point: 0.0 to 999.9℃/min. (℉/min.) DC current, voltage input: 0 to 9999/min. (The placement of the decimal point follows the selection.)	0℃/min.
conF	**Direct/Reverse action** • Selects either Reverse (Heating) or Direct (Cooling) control action. • HEAF: Reverse action (Heating) cooL: Direct action (Cooling)	Reverse action
AF_b	**AT bias** • Sets bias value for AT. (See p.53.) • Available for PID control. Not available for DC current, voltage input. • Setting range: 0 to 50℃ (0 to 100℉) Thermocouple, RTD input with a decimal point: 0.0 to 50.0℃ (0.0 to 100.0℉)	20℃
dFLH	**Difference (addition) indication high limit** • Sets difference (addition) indication high limit value. • Available for Difference (addition) input & when Base channel (*) is DC input. • Setting range: Difference (addition) indication low limit to Input range high limit	9999
dFLL	**Difference (addition) indication low limit** • Sets difference (addition) indication low limit value. • Available for Difference (addition) input & when Base channel (*) is DC input. • Setting range: Input range low limit to Difference (addition) indication high limit	-1999

(*) If Difference (addition) input is selected for Input 1 block (Console software), CH1 (Input 1) will be the Base channel.
If Difference (addition) input is selected for Input 2 block (Console software), CH2 (Input 2) will be the Base channel.

8.4 Special Function Group

To enter the Special function group, follow the procedures below.

(1) aT.Er Press the key in the PV/SV display mode until the left characters appear.

(2) Lock Press the SET/RESET key. The Set value lock will appear.

Character	Name, Function, Setting Range	Default Value
Lock	**Set value lock** • Locks set values to prevent setting errors. Selects Unlock or Lock. • When Lock 1 or Lock 2 is selected, AT and Auto-reset cannot be carried out. • ---- (Unlock) : All set values can be changed. Loc 1 (Lock 1) : None of the set values can be changed. Loc2 (Lock 2) : Only SV can be changed. Loc3 (Lock 3) : All set values except input type can be changed. However, they revert to their previous value after the power is turned off because they are not saved in the non-volatile memory. Do not change any setting item in CH1, CH2 function groups. If any item in CH1, CH2 function groups is changed, it will affect other setting items such as the SV and Alarm value. Be sure to select Lock 3 when changing the set value frequently via communication function. (If the value set by the communication function is the same as the value before the setting, the value will not be written in the non-volatile memory.)	Unlock
cnYL	**Communication protocol** • Selects communication protocol. • Available when the Serial communication (C5) option is added. • nonL : Shinko protocol nodA : Modbus ASCII mode nodr : Modbus RTU mode	Shinko protocol
cnno	**Instrument number** • Sets the instrument number individually to each instrument when communicating by connecting plural instruments in Serial communication. • Available when the Serial communication (C5 option) is added. • Setting range: 0 to 95	0
cnYP	**Communication speed** • Selects a communication speed equal to that of the host computer. • Available when the Serial communication (C5 option) is added. • □□96: 9600bps □192: 19200bps □384: 38400bps	9600bps
cnPT	**Data bit/Parity** • Selects data bit and parity. • Available when the Serial communication (C5 option) is added. • 8non : 8 bits/No parity 7non : 7 bits/No parity 8EVn : 8 bits/Even parity 7EVn : 7 bits/Even parity 8odd : 8 bits/Odd parity 7odd : 7 bits/Odd parity	7 bits/Even parity
cnYT	**Stop bit** • Selects the stop bit. • Available when the Serial communication (C5 option) is added. • □□□1: 1 □□□2: 2	1

Character	Name, Function, Setting Range	Default Value
rEmF	**Remote/Local** • SV can be set with either the Remote or Local method. • Available when the External setting input is selected from the Block function (Console software). • LocL: Local (The SV can be set by the front keypad as usual.) rEmF: Remote (The SV can be set in analog by external remote operation.)	Local
rFLH	**External setting scaling high limit** • Sets the high limit value when External setting input is selected from the Block function (Console software). (e.g. For 4 to 20mA DC, the value corresponds to 20mA input.) When the Cascade control spec is selected, this sets the high limit value corresponding to the master (CH2) MV 100%. For Potentiometer input spec, this sets the Potentiometer scaling high limit value. Available for Potentiometer input spec or when External setting input or Cascade control spec is selected from the Block function (Console software). • Setting range: External setting scaling low limit to Input range high limit	1370℃
rFLL	**External setting scaling low limit** • Sets the low limit value when External setting input is selected from the Block function (Console software). (e.g. For 4 to 20mA DC, the value corresponds to 4mA input.) When the Cascade control spec is selected, this sets the low limit value corresponding to the master (CH2) MV 0%. For Potentiometer input spec, this sets the Potentiometer scaling low limit value. Available for Potentiometer input spec or when External setting input or Cascade control spec is selected from the Block function (Console software). • Setting range: Input range low limit to External setting scaling high limit	-200℃
rmb	**Remote bias** • Sets remote bias value. During remote action, the control desired value adds SV to the remote bias value. Available when External setting input is selected from the Block function (Console software). • Setting range: Converted value of ±20% of the input span DC current, voltage input: ±20% of the scaling span (The placement of the decimal point follows the selection.)	0℃
Trns	**Transmission output** • Selects transmission output type. Available only when Transmission output is selected from the Block function (Console software). • PV□□: PV transmission SV□□: SV transmission mV□□: MV transmission	Selection from the Block function
TrLH	**Transmission output high limit** • Sets the Transmission output high limit value. (For 4 to 20mA DC, the value correponds to 20mA output.) Available when Transmission output is selected from the Block function (Console software). • Setting range: PV, SV transmission : Transmission output low limit to Input range high limit MV transmission : Transmission output low limit to 105.0 (%)	PV, SV transmission: 1370℃ MV transmission: 100.0%
TrLL	**Transmission output low limit** • Sets the Transmission output low limit value. (For 4 to 20mA DC, the value correponds to 4mA output.) Available when Transmission output is selected from the Block function (Console software). • Setting range: PV, SV transmission : Input range low limit to Transmission output high limit MV transmission : -5.0% to Transmission output high limit	PV, SV transmission: -200℃ MV transmission: 0.0%

Character	Name, Function, Setting Range	Default Value
FUnc	**Timer action** • Selects the timer action. (Refer to the Control timer and Delay timer function on p.38) Available for Timer spec. • TI mE : Control timer TI m 1: Delay timer 1 TI m2: Delay timer 2	Control timer
m_SU	**Timer action time unit** • Selects the time unit for the Control timer, Delay timer 1 and Delay timer 2. Available only for Timer spec. • mI n□: Minute SEc□: Second	Minute
on_T	**ON delay timer** • Sets ON delay timer time. Available for Timer spec. Not available if Control timer is selected during Timer action selection. • Setting range: 0 to 9999 (Time unit follows the selection from the Timer action time unit.)	0
oFFT	**OFF delay timer** • Sets OFF delay timer time. Available for Timer spec. Not available if Control timer is selected during Timer action selection. • Setting range: 0 to 9999 (Time unit follows the selection from the Timer action time unit.)	0
TmSU	**Control timer start temperature** • Sets Control timer start temperature. Available for Timer spec. Not available if Delay timer 1 or 2 is selected during Timer action selection. • Setting range: Scaling low limit to Scaling high limit	0℃
Tm_S	**Control timer time** • Sets the control time after temperature achieves Control Timer Start temperature. Available for Timer spec. Not available if Delay timer 1 or 2 is selected during Timer action selection. • Setting range: 0 to 9999 (Time unit follows the selection from the Timer action time unit.)	0
LI GT	**Auto-light function** • Selects Auto-light Effective/Ineffective. • -----: Ineffective USE□: Effective	Ineffective

<table>
<tr><th>Character</th><th>Name, Function, Setting Range</th><th>Default Value</th></tr>
<tr><td>dISP</td><td>Display selection
• Selects items to be indicated on the PV/SV display.
PV (SV) switches while ▽ is pressed in the PV/SV display mode. However, if CH1 or CH2 difference or addition inclusive item is selected, PV (SV) does not switch.
• Selection range:
<table><tr><th></th><th>CH1 PV/SV display</th><th>CH2 PV/SV display</th></tr><tr><td>PV□□</td><td>CH1 PV (*)</td><td>CH2 PV (*)</td></tr><tr><td>SV□□</td><td>CH1 SV</td><td>CH2 SV</td></tr><tr><td>CH□1</td><td>CH1 PV (*)</td><td>CH1 SV</td></tr><tr><td>CH□2</td><td>CH2 PV (*)</td><td>CH2 SV</td></tr><tr><td>S1P1</td><td>CH1 difference (addition)</td><td>CH1 PV</td></tr><tr><td>S1P2</td><td>CH1 difference (addition)</td><td>CH2 PV</td></tr><tr><td>P1S1</td><td>CH1 PV</td><td>CH1 difference (addition)</td></tr><tr><td>P2S1</td><td>CH2 PV</td><td>CH1 difference (addition)</td></tr><tr><td>S2P1</td><td>CH2 difference (addition)</td><td>CH1 PV</td></tr><tr><td>S2P2</td><td>CH2 difference (addition)</td><td>CH2 PV</td></tr><tr><td>P1S2</td><td>CH1 PV</td><td>CH2 difference (addition)</td></tr><tr><td>P2S2</td><td>CH2 PV</td><td>CH2 difference (addition)</td></tr><tr><td>none</td><td>No indication</td><td>No indication</td></tr></table>(*) If CH difference or addition is selected for Input 1 (Input 2) block from the Block function (Console software), CH1 and CH2 PV/SV displays do not indicate CH1 PV (CH2 PV) but CH difference or addition value.
For the Timer spec, if any item except “No indication” is selected, the CH2 PV/SV display will indicate timer time. If CH2 inclusive item is selected during Display selection, the CH2 PV/SV display will go off (ineffective) for Potentiometer input spec or if Heating/Cooling control output spec, External setting input spec or Transmission output spec is selected from the Block function (Console software).</td><td>CH1 PV / CH2 PV</td></tr>
<tr><td>TIME</td><td>Indication time
• Sets the indication time of the displays from the final key operation till displays go off.
Displays remain lit when setting to 00.00.
Lights when any key is pressed while in unlit status.
• Setting range:
00.00 (Remains lit)
00.01 to 60.00 (Minute.Second)</td><td>00.00</td></tr>
<tr><td>r_TM</td><td>Input sampling period
• Selects the input sampling period.
• □□25 : 25ms
□125 : 125ms
□250 : 250ms</td><td>125ms</td></tr>
<tr><td>1ZEr</td><td>Potentiometer input zero adjustment
• Adjusts potentiometer input zero (External setting scaling low limit value).
Available only for the Potentiometer input spec.
• Adjustment method:
Turn the potentiometer to the MIN side (counterclockwise) until the pointer matches the minimum value, and press the ▽ key. Automatically the potentiometer input zero will be adjusted.</td><td>-200℃</td></tr>
<tr><td>1SPA</td><td>Potentiometer input span adjustment
• Adjusts potentiometer input span (External setting scaling high limit value).
Available only for the Potentiometer input spec.
• Adjustment method:
Turn the potentiometer to the MAX side (clockwise) until the pointer matches the maximum value, and press the △ key. The potentiometer input span will be adjusted automatically.</td><td>1370℃</td></tr>
</table>

- **Control Timer Function**

Control timer starts if CH1 input exceeds Control timer start temperature, and after Control timer set time has passed, the control (Output low limit value for DC current output) and Alarm action stop.
However, for the Direct control action, Control timer starts when CH1 input drops below the CH1 timer start temperature.
CH1 PV/SV display indicates CH1 PV, and CH2 PV/SV display flashes timer remaining time.
To start control again after timer time is up, turn the power ON again or press the SET/RESET key for 1 sec.
If the Control timer time is set to 0 (zero), the timer will not work.
Even though CH1 input does not reach Control timer start temperature, the Control timer can start by the DI input ON (Closed) or by pressing the SET/RESET key for 1 sec.
If the Control timer set value has been changed while the Control timer is working, the setting will come into effect next time.
If the Control timer time has passed during AT, the AT will be forcibly stopped, and each parameter returns to the previous value at which AT was performed.

- **Delay Timer Function**

When Delay timer function 1 is selected:

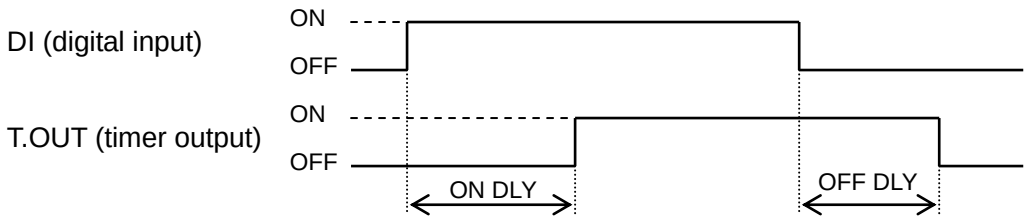
ON delay timer starts when DI input is ON (Closed), and timer remaining time will be indicated on the CH2 PV/SV display.
Timer output turns on after ON delay timer time has passed.
After that, if DI input is turned OFF (Open), OFF delay timer starts, and timer remaining time will be indicated on the CH2 PV/SV display.
Timer output turns off after OFF delay timer time has passed.

When Delay timer function 2 is selected:

Control and Alarm action start/stop are interlocked with the timer output.
If Delay timer is restarted, Alarm action will return to its initial status (for the Alarm with standby, it returns to standby status again).

Between DI terminals Open : OFF
Between DI terminals Closed: ON
Circuit current when closed : 12mA

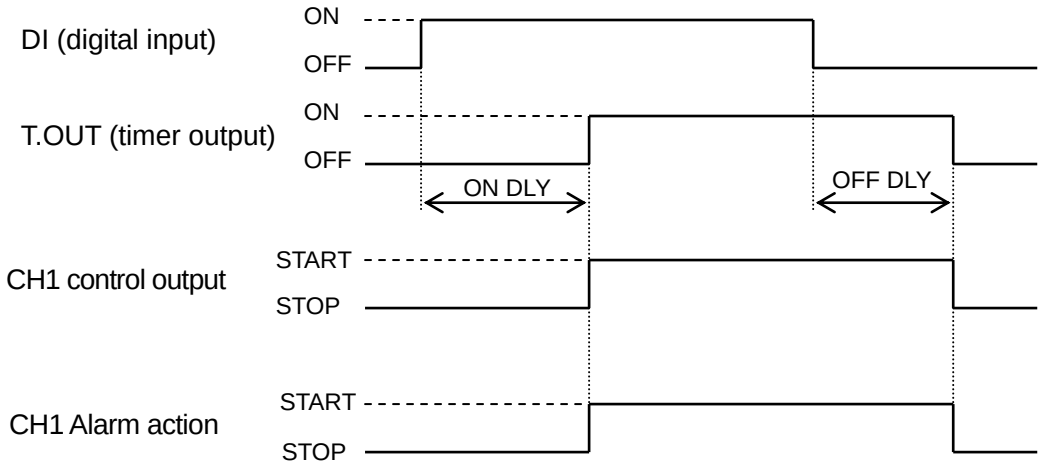
Delay timer function 1



ON DLY : ON delay timer setting
OFF DLY: OFF delay timer setting

(Fig. 8.4-2)

Delay timer function 2



ON DLY : ON delay timer setting
OFF DLY: OFF delay timer setting

(Fig. 8.4-3)

9. Settings

9.1 SV Group

Not available for Potentiometer input spec.

To proceed to the SV group, follow the procedures below.

(1) 5 . □ To enter the SV group, press the ◎ key once in the PV/SV display mode.

(2) 5 1□ Press the SET/RESET key. CH1 SV setting item will appear.

Character	Name, Function, Setting Range	Default Value
5 1□	**CH1 SV**	0℃
	• Sets CH1 SV. If Cascade control spec is selected from the Block function (Console software), CH1 SV will be AT point for slave • Setting range: CH1 scaling low limit to CH1 scaling high limit value For Cascade control spec: External setting scaling low limit to External setting scaling high limit value For Difference (addition) input & when Base channel (*) is DC input: CH1 difference (addition) indication low limit to CH1 difference (addition) indication high limit value	
52□	**CH2 SV**	0℃
	• Sets CH2 SV. • Not available for Timer spec. Not available if Heating/Cooling control output or External setting input is selected from the Block function (Console software). • Setting range: CH2 scaling low limit to CH2 scaling high limit value For Difference (addition) input & when Base channel (*) is DC input: CH2 difference (addition) indication low limit to CH2 difference (addition) indication high limit value	

(*) If Difference (addition) input is selected for Input 1 block (Console software), CH1 (Input 1) will be the Base channel.

If Difference (addition) input is selected for Input 2 block (Console software), CH2 (Input 2) will be the Base channel.

9.2 CH1 Parameter Group

To proceed to CH1 parameter group, follow the procedures below.

(1) P1.d1 Press the ◎ key twice in the PV/SV display mode. The unit will proceed to the CH1 parameter group.

(2) oFF□ Press the SET/RESET key. Control Allowed/Prohibited will appear.

Character	Name, Function, Setting Range	Default Value
oFF□	**Control Allowed/Prohibited** • Selects Control Allowed or Prohibited. When Control Prohibited is selected, the unit reverts to the PV/SV display mode by pressing the SET/RESET key. • on□□: Control Allowed oFF□: Control Prohibited	Control Allowed
AUTo	**Auto/Manual control** • Selects Automatic or Manual control. • AUTo: Automatic control mAnU: Manual control	Automatic control
mAnU	**Manual control MV** • Sets manual control MV. If the SET/RESET key is pressed after manual control MV is set, the unit will revert to the PV/SV display mode. Not available if automatic control is selected. Default value of manual control is the MV of the automatic control. (After the power is turned on, the previously set MV will be used.) • Setting range: CH1 output low limit to CH1 output high limit value	MV of the automatic control
AT□□	**AT/Auto-reset Perform/Cancel** • Selects AT Perform/Cancel or Auto-reset Perform/Cancel. If the SET/RESET key is pressed after "AT/Auto-reset Perform" is selected, the unit will revert to the PV/SV display mode. • If the AT is cancelled during the process, P, I, D and ARW values revert to the previous value at which AT was performed. • AT will be forced to stop if it has not been completed within 4 hours. • Auto-reset can be performed when the P (I=0, D=0) or PD (I=0) is control action. Auto-reset is finished in approximately 4 minutes. It cannot be released while performing this function. • ----: AT/Auto-reset Cancel AT□□ r5ET: AT/Auto-reset Perform	AT/Auto-reset Cancel
P□□□	**Proportional band** • Sets the proportional band. • Control action becomes ON/OFF control when set to 0 or 0.0. • If Heating/Cooling control output is selected from the Block function (Console software), this will be OUT1 proportional band. • Setting range: 0 to 9999℃ (℉) Range with a decimal point: 0.0 to 999.9℃ (℉) DC current, voltage input: 0.0 to 999.9% [Corresponds to the scaling span. For Difference (addition) input & when Base channel is DC input: Corresponds to the Difference (addition) indication span.]	10℃
P_b□	**OUT2 proportional band** • Sets OUT2 proportional band. • OUT2 becomes ON/OFF control when OUT1 proportional band is set to 0 or 0.0. • Available only when Heating/Cooling control output is selected from the Block function (Console software). • Setting range: 0.0 to 10.0 times OUT1 (CH1) proportional band	1.0 times
I□□□	**Integral time** • Sets the integral time. • Setting the value to 0 disables the function. • When PD (I=0) is control action, Auto-reset can be performed or Manual reset value can be set. • Not available for ON/OFF control. • Setting range: 0 to 3600 seconds	200 sec

<table>
<tr><th>Character</th><th>Name, Function, Setting Range</th><th>Default Value</th></tr>
<tr><td>d□□□</td><td>Derivative time
• Sets the derivative time.
• Setting the value to 0 disables the function.
• Not available for ON/OFF control.
• Setting range: 0 to 3600 seconds</td><td>50 sec</td></tr>
<tr><td>ARW□</td><td>ARW
• Sets the ARW (Anti-reset windup).
• Available only when PID is the control action.
• Setting range: 0 to 100%</td><td>50%</td></tr>
<tr><td>rSET</td><td>Manual reset value
• Sets the Manual reset value.
• Available when P (I=0, D=0) or PD (I=0) is the control action.
• Setting range: -100.0 to 100.0℃(℉)
DC current, voltage input: -1000 to 1000 (The placement of the decimal point follows the selection.)</td><td>0.0℃</td></tr>
<tr><td>c□□□</td><td>Proportional cycle
• Sets the proportional cycle.
• Not available for ON/OFF control or DC current output type.
This will be OUT1 proportional cycle when Heating/Cooling control output is selected from the Block function (Console software).
• Setting range: 1 to 120 sec</td><td>Relay contact output: 30 sec
Non-contact voltage output: 3 sec</td></tr>
<tr><td>c_b□</td><td>OUT2 proportional cycle
• Sets OUT2 proportional cycle.
• Available only when Heating/Cooling control output is selected from the Block function (Console software).
Not available for DC current output type or if OUT2 is in ON/OFF control.
• Setting range: 1 to 120 sec</td><td>Relay contact output: 30 sec
Non-contact voltage output: 3 sec</td></tr>
<tr><td>A 1□□</td><td>Alarm 1 value
• Sets the Alarm 1 value.
• Setting the value to 0 or 0.0 disables the function (except Process high and Process low alarm).
• Not available if No Alarm action is selected during Alarm type selection.
• Setting range:
(Table 9.2-1)
<table>
<tr><th>Alarm Type</th><th>Setting Range</th></tr>
<tr><td>High limit alarm</td><td>– (Input span) to input span℃(℉) *1</td></tr>
<tr><td>Low limit alarm</td><td>– (Input span) to input span℃(℉) *1</td></tr>
<tr><td>High/Low limits alarm</td><td>0 to input span℃(℉) *1</td></tr>
<tr><td>High/Low limit range alarm</td><td>0 to input span℃(℉) *1</td></tr>
<tr><td>Process high alarm</td><td>Input range low limit to input range high limit *2</td></tr>
<tr><td>Process low alarm</td><td>Input range low limit to input range high limit *2</td></tr>
<tr><td>High limit alarm with standby</td><td>– (Input span) to input span℃(℉) *1</td></tr>
<tr><td>Low limit alarm with standby</td><td>– (Input span) to input span℃(℉) *1</td></tr>
<tr><td>High/Low limits alarm with standby</td><td>0 to input span℃(℉) *1</td></tr>
</table>
*1: For DC current, voltage input, the input span is the same as the scaling span.
For Difference (addition) input & when Base channel is DC input: Corresponds to the Difference (addition) indication span.
*2: For DC current, voltage input, input range low (or high) limit value is the same as the scaling low (or high) limit value.
For Difference (addition) input & when Base channel is DC input: Corresponds to the Difference (addition) indication low (or high) limit value.
• 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.</td><td>0℃</td></tr>
</table>

Character	Name, Function, Setting Range	Default Value
A2□□	**Alarm 2 value** • Sets the Alarm 2 value. (Refer to Alarm 1 value.) Available only when the AO or AW option is added.	0℃
A3□□	**Alarm 3 value** • Sets the Alarm 3 value. (Refer to Alarm 1 value.) Available only when the AO option is added.	0℃
A4□□	**Alarm 4 value** • Sets the Alarm 4 value. (Refer to Alarm 1 value.) Available only when the AO option is added.	0℃
H□□□ H and CT1 current, alternating indication on the PV/SV display	**Heater burnout alarm 1 value** • Sets the heater current value for Heater burnout alarm 1 (CT1). Setting to 0.0 disables the alarm. CT1 current value and character H are indicated alternately on the PV/SV display. When the output is ON, the CT1 current value is updated. When the output is OFF, the WCL-13A memorizes the previous value when the output was ON. • It is recommended to set approx. 80% of the heater current value in consideration of the voltage fluctuation. • Available only when Heater burnout alarm (W, W3 option) is added. • Setting range: Rated current 20A: 0.0 to 20.0A, 100A: 0.0 to 100.0A	0.0A
H2□□ H2 and CT2 current, alternating indication on the PV/SV display	**Heater burnout alarm 2 value** • Sets the heater current value for Heater burnout alarm 2 (CT2). Setting to 0.0 disables the alarm. CT2 current value and characters H2 are indicated alternately on the PV/SV display. When the output is ON, the CT2 current value is updated. When the output is OFF, the WCL-13A memorizes the previous value when the output was ON. • It is recommended to set approx. 80% of the heater current value in consideration of the voltage fluctuation. • Available only when Heater burnout alarm (W3 option) is added. • Setting range: Rated current 20A: 0.0 to 20.0A, 100A: 0.0 to 100.0A	0.0A
LP_H	**Loop break alarm span** • Sets the temperature to assess the Loop break alarm. • Setting to 0 (zero) disables the alarm. • Setting range: 0 to 150℃ (℉) Range with a decimal point: 0.0 to 150.0℃ (℉) DC current, voltage input: 0 to 1500 (The placement of the decimal point follows the selection)	0℃
LP_T	**Loop break alarm time** • Sets the time to assess the Loop break alarm. • Setting to 0 (zero) disables the alarm. • Setting range: 0 to 200 minutes	0 minutes

9.3 CH2 Parameter Group

Not available for Timer spec or Potentiometer input spec.
Not available if Heating/Cooling control output or External setting input is selected from the Block function (Console software).

To proceed to CH2 parameter group, follow the procedures below.

(1) PI.d2 Press the ◎ key 3 times in the PV/SV display mode. The unit will proceed to the CH2 parameter group

(2) oFF□ Press the SET/RESET key. Control Allowed/Prohibited will appear.

Character	Name, Function, Setting Range	Default Value
oFF□	**Control Allowed/Prohibited** • Selects Control Allowed/Prohibited. When Control Prohibited is selected, the unit reverts to the PV/SV display mode by pressing the SET/RESET key. • on□□: Control Allowed oFF□: Control Prohibited	Control Allowed
AUTo	**Auto/Manual control** • Selects Automatic or Manual control. • AUTo: Automatic control mAnU: Manual control	Automatic control
mAnU	**Manual control MV** • Sets manual control MV. If the SET/RESET is pressed after the manual control MV has been set, the unit will revert to the PV/SV display mode. Not available if automatic control is selected. Default value of manual control is the MV of the automatic control. (After the power is turned on, the previously set MV will be used.) • Setting range: CH2 output low limit to CH2 output high limit	MV of the automatic control
AT□□	**AT/Auto-reset Perform/Cancel** • Selects AT 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. • AT will be forced to stop if it has not been completed within 4 hours. • Auto-reset can be performed when P (I=0, D=0) or PD (I=0) is control action. Auto-reset is finished in approximately 4 minutes. It cannot be released while performing this function. • ----: AT/Auto-reset Cancel AT□□ / rSET: AT/Auto-reset Perform	AT/Auto-reset Cancel
P□□□	**Proportional band** • Sets the proportional band. • Control action becomes ON/OFF control when set to 0 or 0.0. • Setting range: 0 to 9999℃ (℉), Range with a decimal point: 0.0 to 999.9℃ (℉) DC current, voltage input: 0.0 to 999.9% [Corresponds to the scaling span. For Difference (addition) input & when Base channel is DC input: Corresponds to the Difference (addition) indication span.]	10℃
I□□□	**Integral time** • Sets the integral time. • Setting the value to 0 disables the function. • Not available for ON/OFF control. • When PD (I=0) is control action, Auto-reset can be performed or Manual reset value can be set. • Setting range: 0 to 3600 seconds	200 sec
d□□□	**Derivative time** • Sets the derivative time. • Setting the value to 0 disables the function. • Not available for ON/OFF control. • Setting range: 0 to 3600 seconds	50 sec
n□□□	**ARW** • Sets the ARW (Anti-reset windup). • Available only when PID is the control action. • Setting range: 0 to 100%	50%

Character	Name, Function, Setting Range	Default Value
rSET	**Manual reset value** • Sets the Manual reset value. • Available when P (I=0, D=0) or PD (I=0) is the control action. • Setting range: -100.0 to 100.0℃ (℉) DC current, voltage input: -1000 to 1000 (The placement of the decimal point follows the selection.)	0.0℃
c□□□	**Proportional cycle** • Sets the proportional cycle. • Not available for ON/OFF control or DC current output type. • Setting range: 1 to 120 sec	Relay contact output: 30 sec Non-contact voltage output: 3 sec
A 1□□	**Alarm 1 value** • Sets the Alarm 1 value. • Setting the value to 0 or 0.0 disables the function (except Process high and Process low alarm). • Not available if No Alarm action is selected during Alarm type selection. • Setting range: See (Table 9.2-1) on p.41.	0℃
A2□□	**Alarm 2 value** • Sets the Alarm 2 value. (Refer to Alarm 1 value.) Available only when the AO or AW option is added.	0℃
A3□□	**Alarm 3 value** • Sets the Alarm 3 value. (Refer to Alarm 1 value.) Available only when the AO option is added.	0℃
A4□□	**Alarm 4 value** • Sets the Alarm 4 value. (Refer to Alarm 1 value.) Available only when the AO option is added.	0℃
H□□□ H and CT3 current, alternating display on the PV/SV display	**Heater burnout alarm 1 value** • Sets the heater current value for Heater burnout alarm 1 (CT3). Setting to 0.0 disables the alarm. CT3 current value and character H are alternately indicated on the PV/SV display. When the output is ON, the CT3 current value is updated. When the output is OFF, the WCL-13A memorizes the previous value when the output was ON. • It is recommended to set approx. 80% of the heater current value in consideration of the voltage fluctuation. • Available only when Heater burnout alarm (W, W3 option) is added. • Setting range: Rated current 20A: 0.0 to 20.0A, 100A: 0.0 to 100.0A	0.0A
H2□□ H2 and CT4 current, alternating display on the PV/SV display	**Heater burnout alarm 2 value** • Sets the heater current value for Heater burnout alarm 2 (CT4). Setting to 0.0 disables the alarm. CT4 current value and characters H2 are indicated alternately on the PV/SV display. When the output is ON, the CT4 current value is updated. When the output is OFF, the WCL-13A memorizes the previous value when the output was ON. • It is recommended to set approx. 80% of the heater current value in consideration of the voltage fluctuation. Available only when Heater burnout alarm (W3 option) is added. • Setting range: Rated current 20A: 0.0 to 20.0A, 100A: 0.0 to 100.0A	0.0A

Character	Name, Function, Setting Range	Default Value
LP_H	**Loop break alarm span** • Sets the temperature to assess the Loop break alarm. • Setting to 0 (zero) disables the alarm. • Setting range: 0 to 150℃ (℉), Range with a decimal point: 0.0 to 150.0℃ (℉) DC current, voltage input: 0 to 1500 (The placement of the decimal point follows the selection)	0℃
LP_T	**Loop break alarm time** • Sets the time to assess the Loop break alarm. • Setting to 0 (zero) disables the alarm. • Setting range: 0 to 200 minutes	0 minutes

10. Operation

10.1 Starting 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 WCL-13A ON.

For approx. 4 sec after the power is switched ON, the sensor input characters and temperature unit are indicated on the PV/SV display of each channel. See (Table 8.1-1), (Table 8.1-2) on p.24.
During this time, all outputs and LED indicators are in OFF status.
After that, a setting item selected during Display selection will be indicated.

(2) Input each set value.

Refer to “9. Settings”.

(3) Turn the load circuit power ON.

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

10.2 Switching PV/SV

To indicate SV constantly:

To indicate SV constantly, select “sv□□” during Display selection in Special function group as follows.

(1) oFF.F Press the ◎ key several times in the PV/SV display mode until the left characters appear.
(2) dI SP Press the ◎ key many times until the left characters (Display selection) appear.
(3) Select “sv□□ (CH1 SV/CH2 SV)” by pressing the △ key.
(4) Press the ◎ key several times. The unit reverts to the PV/SV display mode, and CH1 and CH2 displays always indicate SV.

To indicate SV temporarily:

Press the ▽ key in the PV/SV display mode.
While the ▽ key is pressed, the PV/SV indications will switch.
PV(SV) does not switch if a CH1, CH2 difference or addition inclusive item is selected during Display selection in the Special function group.

10.3 Indicating MV

To indicate MV:

Press the ◎ key for 3 sec in the PV/SV display mode.
Keep pressing the key even though the SV group appears during the process.
The 1st decimal point from the right flashes in 500ms cycles during MV indication.

To cancel MV indication:

Press the ◎ key again, or turn the power to the unit OFF and ON again.

10.4 AT Perform/Cancel

How to perform AT (e.g. CH1)

AT can be performed in the “AT/Auto-reset Perform/Cancel” setting item in the CH1 parameter group.

(1) PId 1 Press the ◎ key twice in the PV/SV display mode. The unit proceeds to the CH1 parameter group.
(2) AT□□ Press the SET/RESET key 3 times. AT/Auto-reset Perform/Cancel setting item will appear.
(3) Select “AT□□ (AT Perform)” with the △ key.
(4) Press the SET/RESET key. The unit reverts to the PV/SV display mode, and initiates AT.
The AT indicator flashes while AT is performing.

How to cancel AT (e.g. CH1)

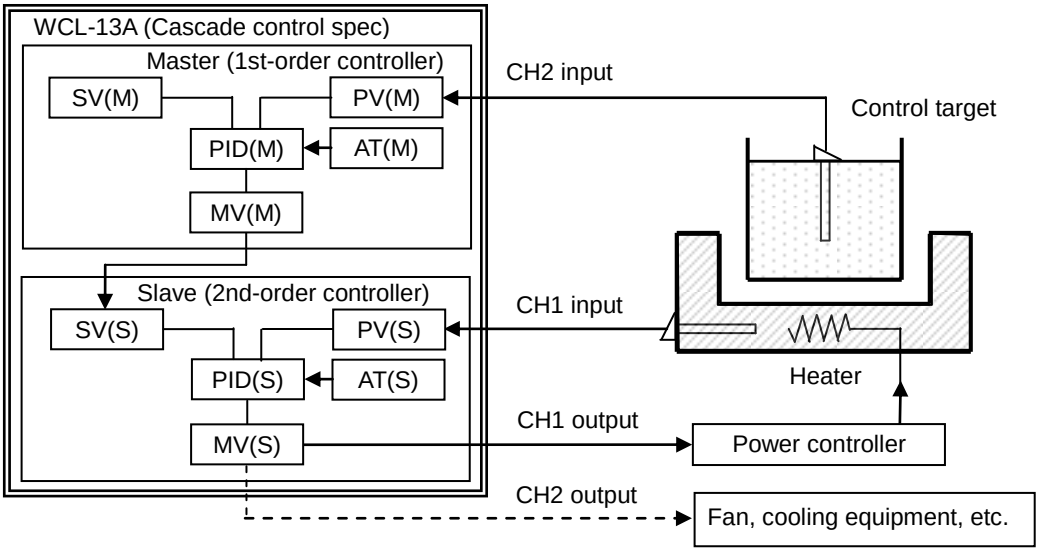
AT can be cancelled in the “AT/Auto-reset Perform/Cancel” in the CH1 parameter group.

(1) PId 1 Press the ◎ key twice in the PV/SV display mode. The unit proceeds to the CH1 parameter group.
(2) AT□□ Press the SET/RESET key 3 times. “AT/Auto-reset Perform/Cancel” setting item will appear.
(3) Select “- - - -” (AT Cancel)” with the ▽ key.
(4) Press the SET/RESET key more than 10 times. The unit reverts to the PV/SV display mode, and AT stops.
If AT is cancelled during this process, each value of P, I, D and ARW reverts to the values before the Auto-tuning was performed.

10.5 Performing Cascade Control

Cascade control of the WCL-13A

To control one process, 2 inputs [CH2 as a master (1st-order controller), and CH1 as a slave (2nd-order controller)] are used for more advanced control.
MV is calculated from PV and SV of the master (CH2), and is used as SV of the slave (CH1), with which CH1 control computation is carried out, then outputs from CH1 control output.
[CH2 control output will be turned OFF (0mA for DC current output) or will become OUT2 for Heating/Cooling control. See the “CH2 output” in (Fig. 10.5-1).]
MV (0 to 100%) of the master (CH2) corresponds to the SV (External setting scaling low limit to External setting scaling high limit value) of the slave (CH1).



(Fig. 10.5-1)

How to perform AT in Cascade control

Perform AT in the Cascade control as follows.

- **AT of the slave (CH1)**

(1) Set the slave AT point during “CH1 (slave) SV setting”.
(2) Perform AT by selecting “AT Perform” during “AT/Auto-reset Perform/Cancel” in the CH1 parameter group.
P, I, D and ARW values of the slave (CH1) will be automatically set after AT is finished.

- **AT of the master (CH2)**

(1) Set the same value to External setting scaling high and low limit values to fix the slave (CH1) SV.
The SV of the slave (CH1) might fluctuate due to external disturbance.
Set the SV in consideration of external disturbance after checking its effect.

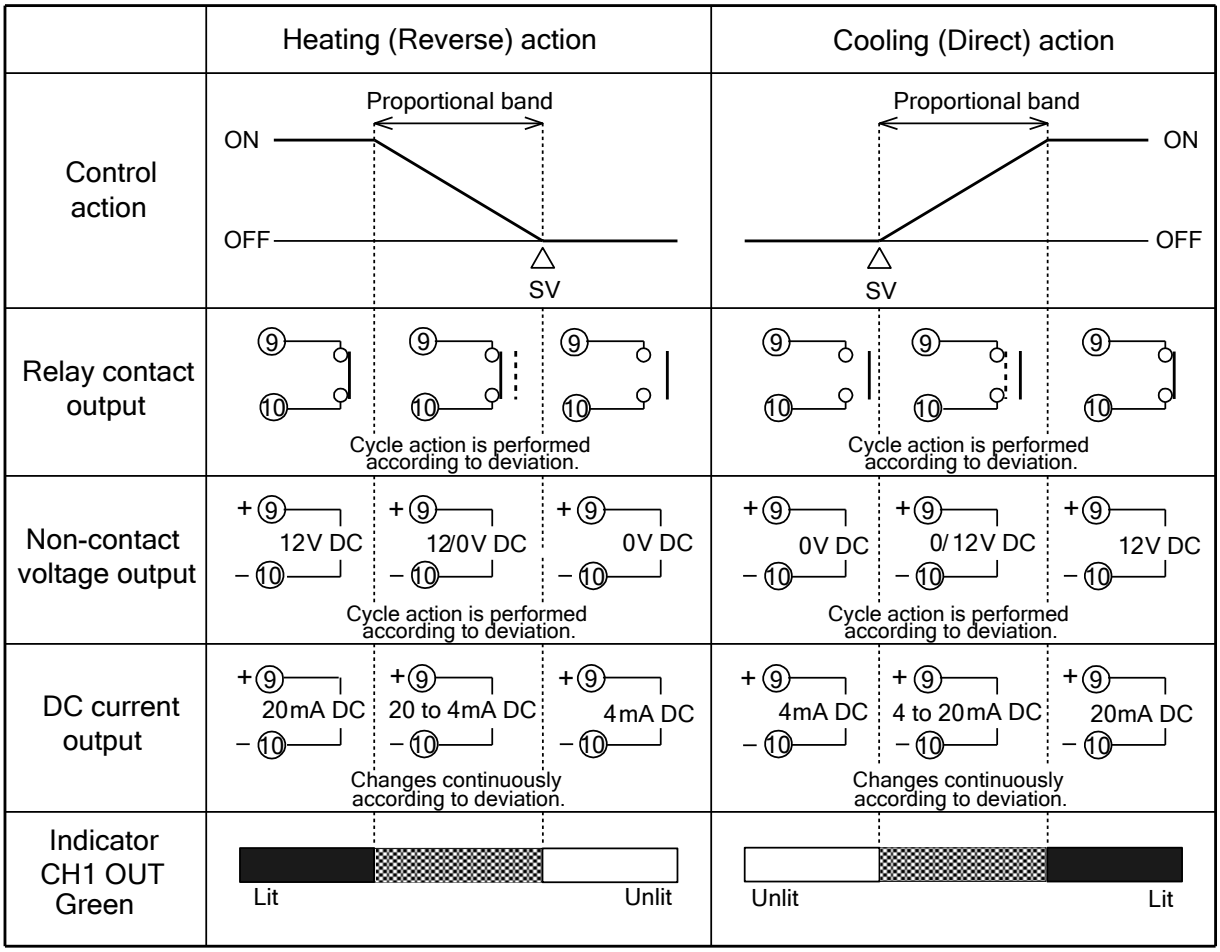
(2) Set the SV of the master (CH2).

(3) Perform AT by selecting “AT Perform” during “AT/Auto-reset Perform/Cancel” in the CH2 parameter group.
P, I, D and ARW values of the master (CH2) will be automatically set after AT is finished.
Depending on the control target, optimal P, I, D and ARW values might not be obtained. In this case, manually set P, I, D and ARW values while referring to those values after AT performance.

(4) Perform scaling of the slave (CH1) as follows.
Return the External setting scaling high and low limit values to their previous values during “External setting scaling high limit setting” and “External setting scaling low limit setting” in the Special function group.
MV (0 to 100%) of the master (CH2) corresponds to the SV (External setting scaling low limit to External setting scaling high limit value) of the slave (CH1).

11. Action Explanation

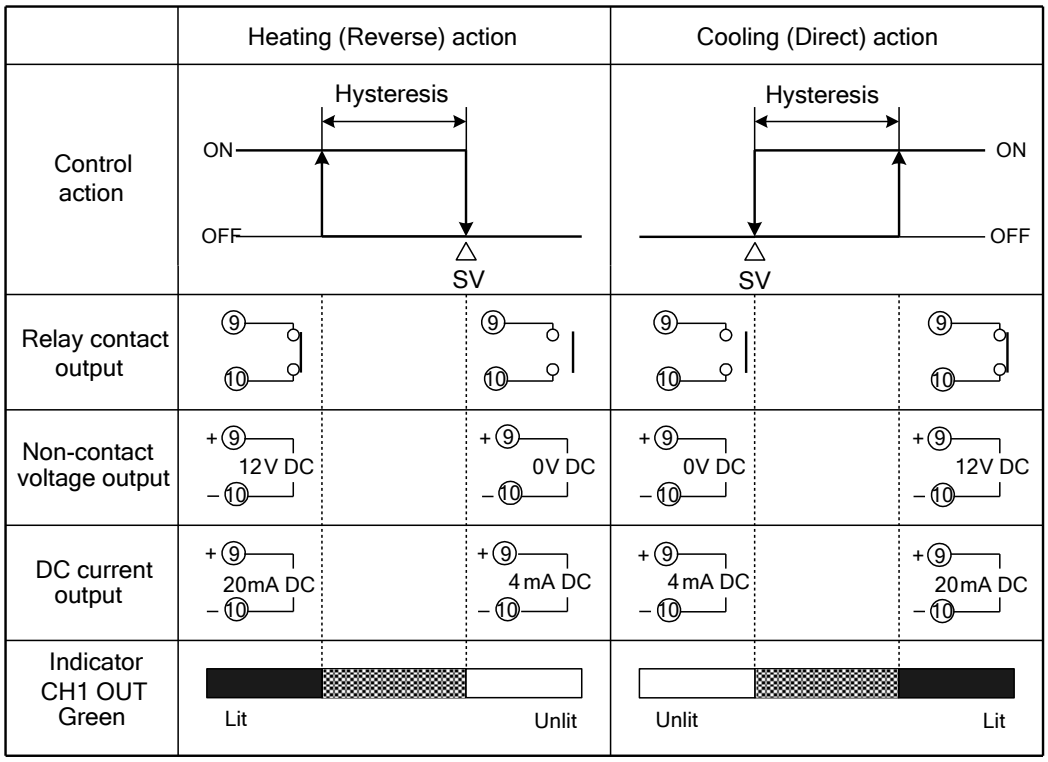
11.1 CH1, CH2 Output Action



: Turns ON or OFF.

For CH2 output, use terminals 11 and 12.

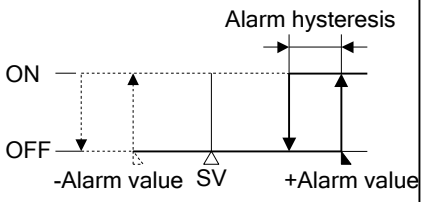
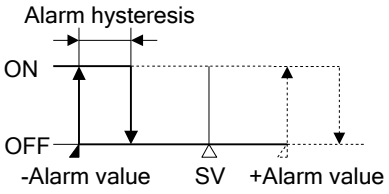
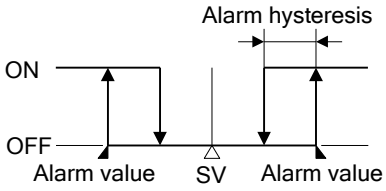
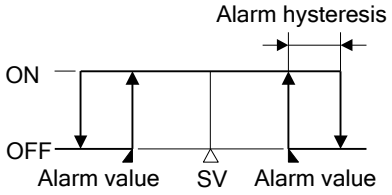
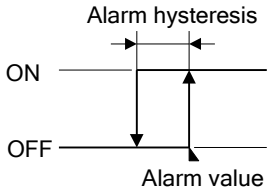
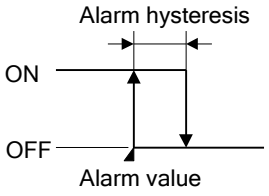
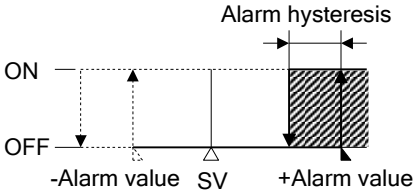
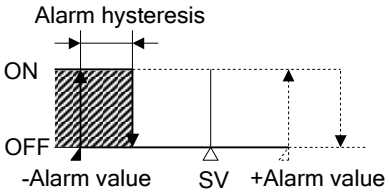
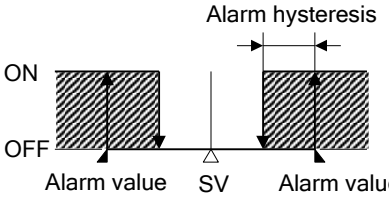
11.2 CH1, CH2 Output ON/OFF Control Action



: Turns ON or OFF.

For CH2 output, use terminals 11 and 12.

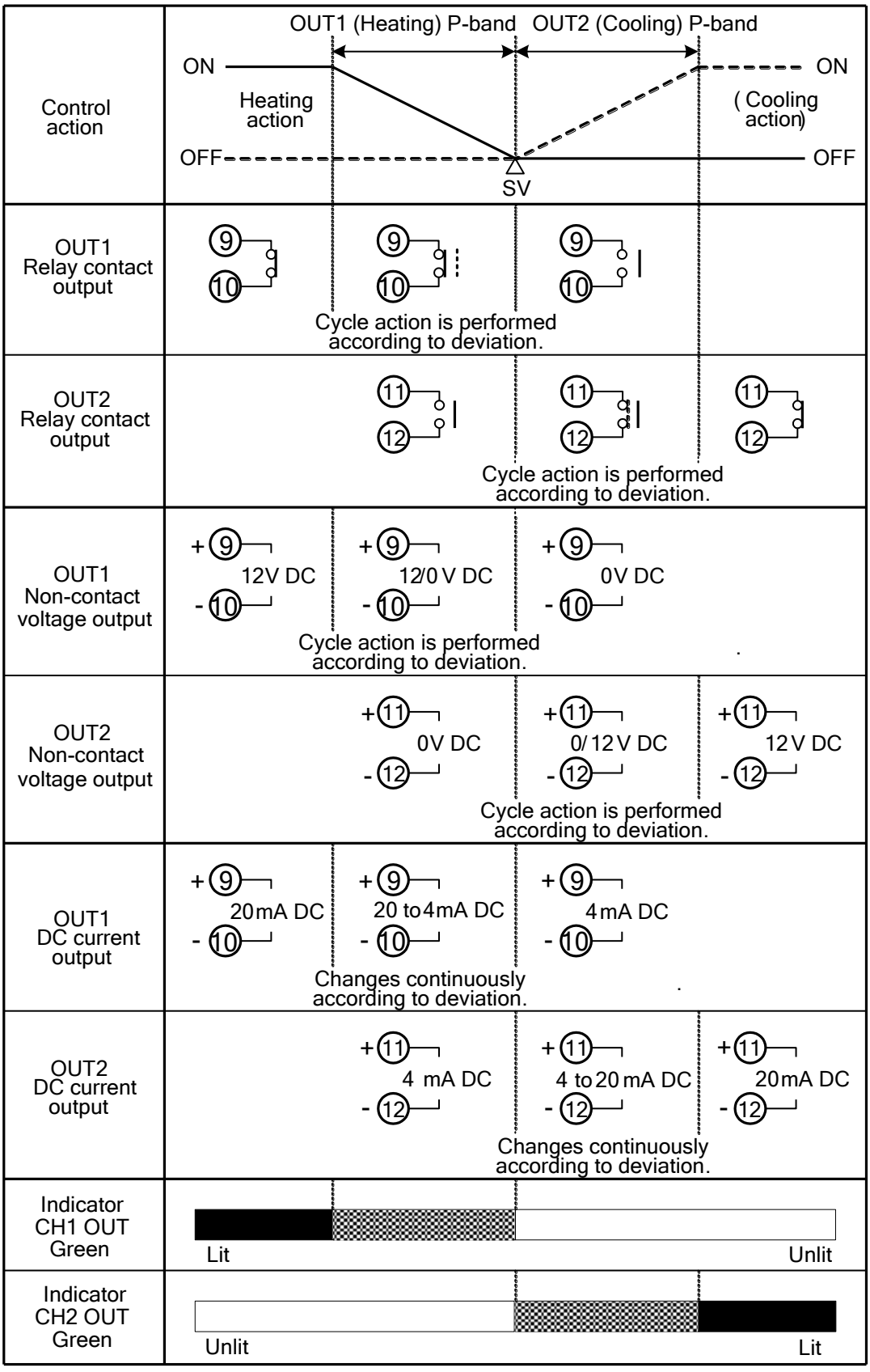
11.3 CH1, CH2 Alarm Action

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

 : Standby functions.

CH1 EVT indicator: Lights when CH1 Alarm output is ON, and goes off when the output is OFF.
CH2 EVT indicator: Lights when CH2 Alarm output is ON, and goes off when the output is OFF.

11.4 Heating/Cooling Control Action

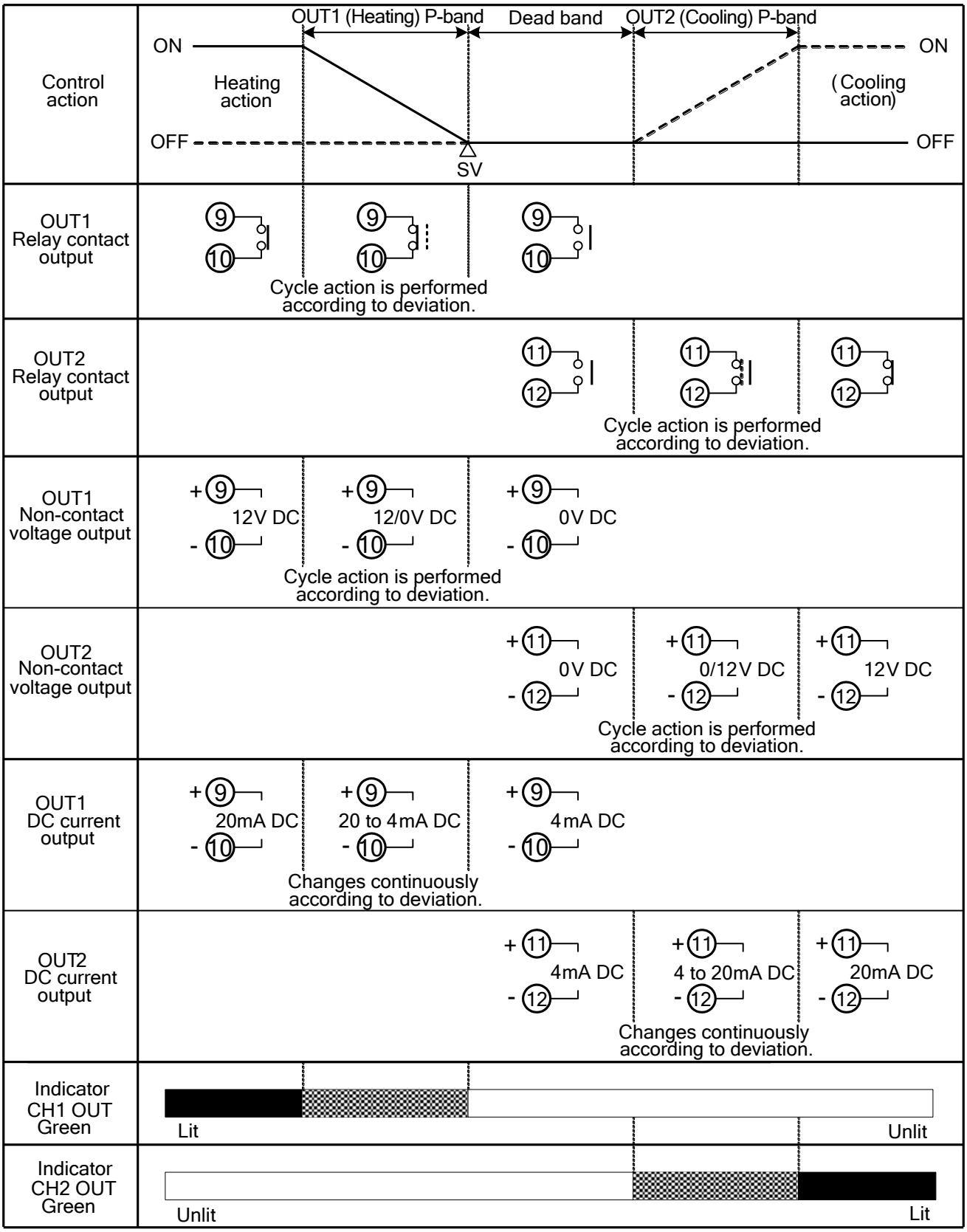


: Turns ON (lit) or OFF (unlit).

——— : Represents Heating control action (OUT1).

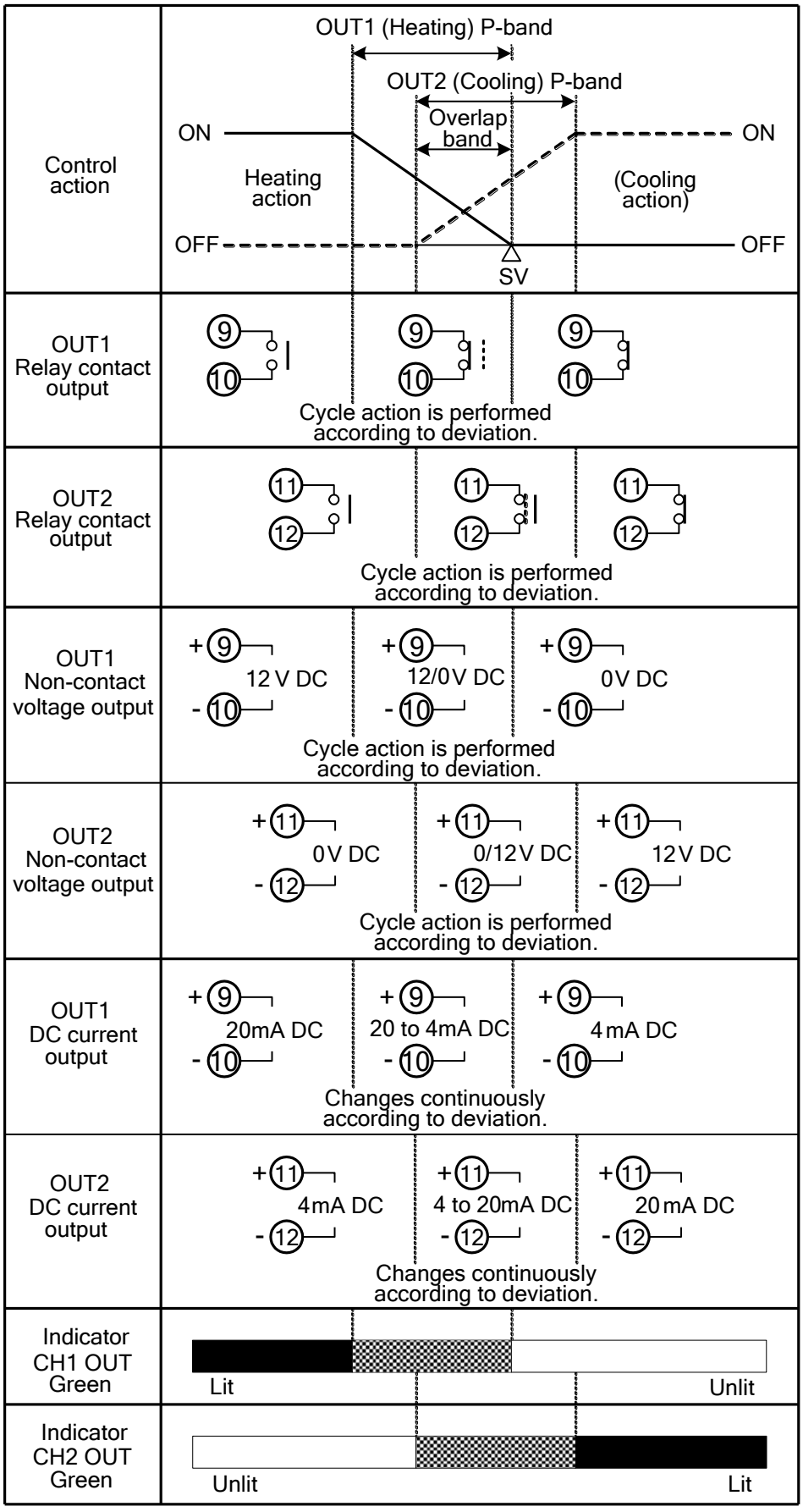
– – – – : Represents Cooling control action (OUT2).

11.5 Heating/Cooling Control Action (When Setting Dead Band)



: Turns ON (lit) or OFF (unlit).
: Represents Heating control action (OUT1).
: Represents Cooling control action (OUT2).

11.6 Heating/Cooling Control Action (When Setting Overlap Band)



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

——— : Represents Heating control action (OUT1).

– – – – : Represents Cooling control action (OUT2).

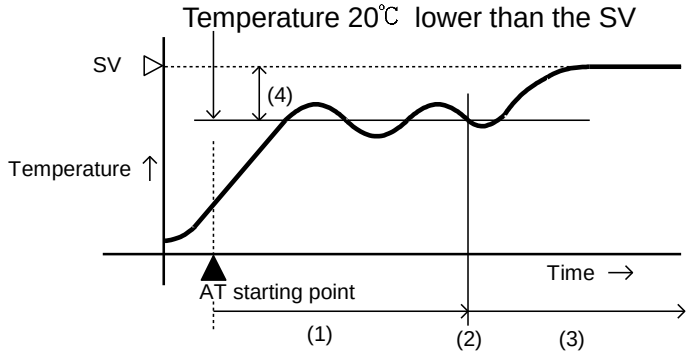
12. AT/Auto-reset of This Controller

12.1 AT (auto-tuning)

In order to set each value of P, I, D and ARW automatically, the auto-tuning process should be made to fluctuate to obtain an optimal value. One of 3 types of fluctuation below is automatically selected.
For DC current, voltage input, the AT process will fluctuate around the SV for conditions of (A), (B) and (C) below.
Sometimes the auto-tuning process will not fluctuate if auto-tuning is performed at or near room temperature. Therefore auto-tuning might not finish normally.

(A) In the case of a large difference between the SV and PV as the temperature is rising

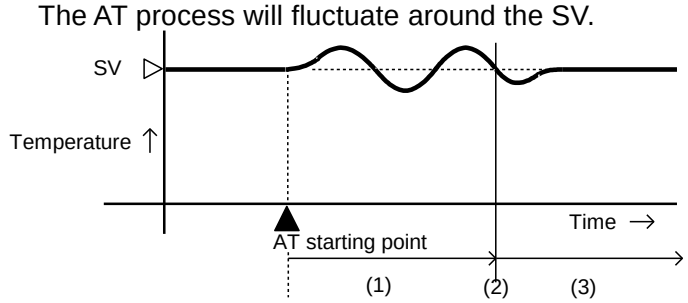
When AT bias is set to 20℃, the AT process will fluctuate at a temperatures 20℃ lower than the SV.



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

(B) When the control is stable

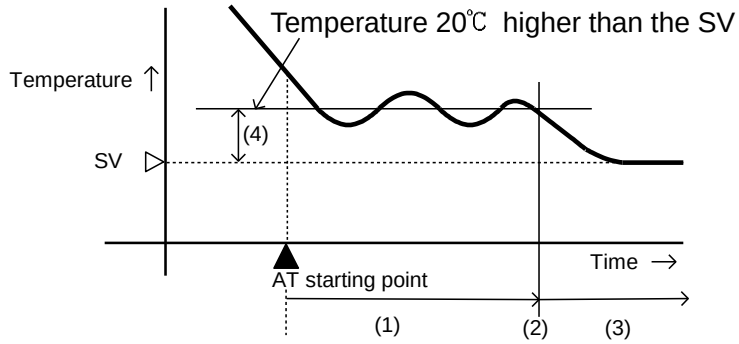
The AT process will fluctuate around the SV.



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

(C) In the case of a large difference between the SV and PV as the temperature is falling

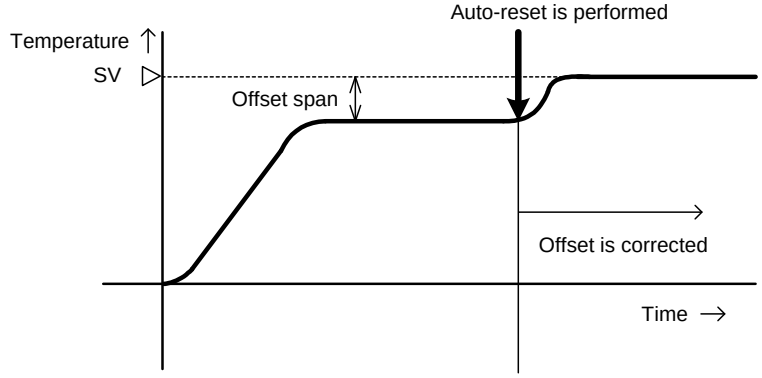
When AT bias is set to 20℃, the AT process will fluctuate at a temperature 20℃ higher than the SV.



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

12.2 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 control.
Since the corrected value is internally memorized, it is not necessary to perform auto-reset again as long as the process is the same.
However, when the proportional band (P) is set to 0 or 0.0, the corrected value is cleared.



(Fig.12.2-1)

13. Specifications

13.1 Standard Specifications

Rating

<table>
<tr><td>Input (CH1, CH2)</td><td>Multi-range input:
<table>
<tr><td>Thermocouple</td><td>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)</td></tr>
<tr><td>RTD</td><td>Pt100, JPt100 3-wire system
Allowable input lead wire resistance (10Ω or less per wire)</td></tr>
<tr><td>DC current</td><td>0 to 20mA DC, 4 to 20mA DC:
Input impedance: 50Ω [Connect 50Ω shunt resistor (sold separately) externally]
Allowable input current: 50mA DC or less</td></tr>
<tr><td>DC voltage</td><td>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</td></tr>
</table>
Infrared thermocouple (Infrared TC) input:
<table>
<tr><td>Infrared TC</td><td>RD-300 series, RD-401</td></tr>
</table></td></tr>
<tr><td>Supply Voltage</td><td>WCL-13A-□□/□□
100 to 240V AC 50/60Hz
WCL-13A□□/□□ 1
24V AC/DC 50/60Hz</td></tr>
<tr><td>Allowable Voltage Fluctuation Range</td><td>WCL-13A-□□/□□
85 to 264V AC
WCL-13A-□□/□□ 1
20 to 28V AC/DC</td></tr>
</table>

General Structure

<table>
<tr><td>External Dimensions</td><td>30 x 88 x 110mm (W x H x D, including the socket)</td></tr>
<tr><td>Mounting</td><td>DIN rail</td></tr>
<tr><td>Case</td><td>Material: Flame-resistant resin, Color: Light gray</td></tr>
<tr><td>Front Panel</td><td>Membrane sheet</td></tr>
<tr><td>Indication Structure</td><td>Display
<table>
<tr><td>CH1 PV/SV display</td><td>Red LED 4-digit, character size 10 x 4.6mm (HxW)</td></tr>
<tr><td>CH2 PV/SV display</td><td>Red LED 4-digit, character size 10 x 4.6mm (HxW)</td></tr>
</table></td></tr>
<tr><td>Setting Structure</td><td>CH1, CH2: Input system using membrane sheet key</td></tr>
</table>

Indication Performance

<table>
<tr><td>Indication Accuracy (CH1, CH2)</td><td>
<table>
<tr><td>Thermocouple</td><td>Within ±0.2% of each input span ±1digit or within ±2℃ (4℉), whichever is greater
However, R, S input 0 to 200℃(400℉): Within ±6℃(12℉)
B input, 0 to 300℃(600℉): Accuracy is not guaranteed.
K, J, E, T, N input, less than 0℃(32℉): ±0.4% of each input span ±1digit</td></tr>
<tr><td>RTD</td><td>Within ±0.1% of each input span ±1digit or within ±1℃ (2℉), whichever is greater</td></tr>
<tr><td>DC current</td><td>Within ±0.2% of each input span ±1digit</td></tr>
<tr><td>DC voltage</td><td>Within ±0.2% of each input span ±1digit</td></tr>
<tr><td>Infrared TC</td><td>Within ±0.2% of each input span ±1digit or within ±2℃ (4℉), whichever is greater</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td>Cold Junction Temperature Compensation Accuracy (CH1, CH2)</td><td>Within ±1℃ at 0 to 50℃</td></tr>
<tr><td>Input Sampling Period (CH1, CH2)</td><td>25ms, 125ms, 250ms, Selectable by keypad</td></tr>
<tr><td>Potentiometer Input Setting Accuracy</td><td>
<table>
<tr><td>Total resistance</td><td>1 to 10kΩ</td></tr>
<tr><td>Reference voltage</td><td>1V DC</td></tr>
<tr><td>Accuracy</td><td>The same as the Setting accuracy</td></tr>
<tr><td>Temperature coefficient</td><td>±0.05%/℃</td></tr>
<tr><td>Potentiometer input sampling period</td><td>Depends on the selection of Input sampling period.</td></tr>
</table>
Potentiometer input high limit and low limit value depend on External setting scaling high limit and low limit value.
</td></tr>
</table>

Timer Performance

Time Accuracy	Within ±0.5% of the setting time

Controlling Performance

<table>
<tr><td>Setting Accuracy (CH1, CH2)</td><td>The same as Indication accuracy</td></tr>
<tr><td>Control Action (CH1, CH2)</td><td>
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
<table>
<tr><td>Proportional band</td><td>0 to 9999℃(℉)
Range with a decimal point: 0.0 to 999.9℃(℉),
DC current, voltage input: 0.0 to 999.9%
(ON/OFF control when set to 0 or 0.0)</td></tr>
<tr><td>Integral time</td><td>0 to 3600 sec (OFF when set to 0)</td></tr>
<tr><td>Derivative time</td><td>0 to 3600 sec (OFF when set to 0)</td></tr>
<tr><td>Proportional cycle</td><td>1 to 120 sec (DC current output: Not available)</td></tr>
<tr><td>ARW</td><td>0 to 100%</td></tr>
<tr><td>Manual reset</td><td>±100.0℃(℉)
DC current, voltage input: ±1000 (The placement of the decimal point follows the selection)</td></tr>
<tr><td>ON/OFF hysteresis</td><td>0.1 to 100.0℃(℉)
DC current, voltage input: 1 to 1000 (The placement of the decimal point follows the selection)</td></tr>
<tr><td>Output high limit,
Output low limit</td><td>0 to 100% (DC current output: -5 to 105%)</td></tr>
<tr><td>Output
rate-of-change</td><td>0 to 100%</td></tr>
</table>
</td></tr>
<tr><td>Control Output (CH1, CH2)</td><td>
<table>
<tr><td>Relay contact 1a</td><td>Control capacity 3A 250V AC (resistive load)
1A 250V AC (inductive load, cosϕ=0.4)
Electrical life: 100,000 cycles</td></tr>
<tr><td>Non-contact voltage
(For SSR drive)</td><td>12V DC±15% Max 40mA (short circuit protected)</td></tr>
<tr><td>DC current</td><td>4 to 20mA DC, Load resistance: Max 550Ω</td></tr>
</table>
</td></tr>
</table>

Standard Functions

<table>
<tr><td>Alarm</td><td>Selectable from the following via keypad.
• No Alarm action
• High limit alarm
• Low limit alarm
• High/Low limits alarm
• High/Low limit range alarm
• Process high alarm
• Process low alarm
• High limit alarm with standby
• Low limit alarm with standby
• High/Low limits alarm with standby
<table>
<tr><td>Setting accuracy</td><td>The same as Indication accuracy</td></tr>
<tr><td>Action</td><td>ON/OFF action</td></tr>
<tr><td>Hysteresis</td><td>Thermocouple, RTD input: 0.1 to 100.0℃(℉)
DC current, voltage input: 1 to 1000 (The placement of the decimal point follows the selection.)</td></tr>
<tr><td>Output</td><td>No output (Can be read by the status flag when the Serial communication option is added.)</td></tr>
<tr><td>Alarm delay timer</td><td>0 to 9999 sec</td></tr>
</table></td></tr>
<tr><td>Loop Break Alarm</td><td>Detects actuator trouble (Heater burnout, sensor burnout).
<table>
<tr><td>Loop break alarm time</td><td>0 to 200 minutes</td></tr>
<tr><td>Loop break alarm span</td><td>Thermocouple, RTD input: 0 to 150℃ (℉) or
0.0 to 150.0℃ (℉)
DC current, voltage input: 0 to 1500 (The placement of the decimal point follows the selection.)</td></tr>
<tr><td>Output</td><td>No output (Can be read by the status flag when the Serial communication option is added.)</td></tr>
</table></td></tr>
<tr><td>SV Ramp</td><td>When the SV is adjusted, it approaches the new SV by the preset rate-of-change (℃/min, ℉/min).
When the power is turned on, the control starts from the PV, and approaches the SV by the rate-of-change.</td></tr>
<tr><td>Auto/Manual Control Switching</td><td>Automatic or Manual control can be switched by keypad operation.
If control action is switched from automatic to manual and vice versa, balanceless-bumpless function works to prevent a sudden change in manipulated variable.
When automatic control is switched to manual control, manual MV is indicated on the display. (The switched CH1 or CH2 display flashes.)
When power is turned on, control action starts from its previous controller status (last shutdown).</td></tr>
<tr><td>Timer Spec.</td><td>Control timer or Delay timer function is selectable via keypad.
• Control timer
Control timer starts if CH1 input exceeds Control timer start temperature, and after Control timer time has elapsed, control (Output low limit value for DC current output) and Alarm action will stop.
• Delay timer
Delay timer starts when DI input is ON (Closed). Timer output turns on after ON delay timer time has passed.
Timer output turns off after OFF delay timer time has passed.</td></tr>
<tr><td>Cascade Control Spec.
(Block Function)</td><td>To control one process, 2 inputs [CH2 as a master(1st-order controller), and CH1 as a slave (2nd-order controller)] are used for more advanced control.
MV is calculated from PV and SV of the master (CH2), and is used as SV of the slave (CH1), with which CH1 control computation is carried out, then outputs from CH1 control output.
[CH2 control output will be turned OFF (0mA for DC current output) or will become OUT2 for Heating/Cooling control.]
CH2 will be a master (1st-order controller), CH1 will be a slave (2nd-order controller).
MV (0 to 100%) of the master (CH2) corresponds to the SV (External setting scaling low limit to External setting scaling high limit value) of the slave (CH1).</td></tr>
</table>

<table>
<tr><td>Heating/Cooling Control Output Spec. (Block Function)</td><td>This is 1ch Heating/Cooling control output spec. CH1 will be Heating output (OUT1) and CH2 will be Cooling output (OUT2), followed by control performance.
<table>
<tr><td>OUT2 proportional band</td><td>0.0 to 10.0 times OUT1 (CH1) proportional band (ON/OFF control when set to 0.0)</td></tr>
<tr><td>Integral time (I)</td><td>The same as that of CH1</td></tr>
<tr><td>Derivative time(D)</td><td>The same as that of CH1</td></tr>
<tr><td>OUT2 proportional cycle</td><td>1 to 120 sec</td></tr>
<tr><td>ARW</td><td>The same as that of OUT1</td></tr>
<tr><td>Overlap/Dead band</td><td>Thermocouple, RTD input: -100.0 to 100.0℃ (℉)
DC current, voltage input: -1000 to 1000 (The placement of the decimal point follows the selection.)</td></tr>
<tr><td>OUT2 ON/OFF hysteresis</td><td>Thermocouple, RTD input: 0.1 to 100.0℃ (℉)
DC current, voltage input: 1 to 1000 (The placement of the decimal point follows the selection.)</td></tr>
<tr><td>OUT2 high limit, OUT2 low limit</td><td>0 to 100% (DC current output: -5 to 105%)</td></tr>
<tr><td>OUT2 action mode</td><td>Air cooling (linear characteristic), Oil cooling (1.5th power of the linear characteristic) and Water cooling (2nd power of the linear characteristic) via keypad</td></tr>
</table></td></tr>
<tr><td>External Setting Input (Block Function)</td><td>External analog signal will be the SV.
Control desired value adds remote bias value to the SV.
As a setting signal, select any DC range during CH2 input type selection.
<table>
<tr><td>Setting signal</td><td>DC current: 4 to 20mA or 0 to 20mA DC
DC voltage: 1 to 5V or 0 to 1V DC</td></tr>
<tr><td>Allowable input</td><td>DC current: 50mA DC or less
DC voltage (0 to 1V): 5V DC or less
DC voltage (1 to 5V): 10V DC or less</td></tr>
<tr><td>Input impedance</td><td>DC current: 50Ω [Connect 50Ω shunt resistor (sold separately) externally.]
DC voltage: 100kΩ</td></tr>
<tr><td>Input sampling period</td><td>Depends on the selection of Input sampling period.</td></tr>
</table></td></tr>
<tr><td>Transmission Output Spec. (Block Function)</td><td>Converting the value (PV, SV or MV transmission) to analog signal every input sampling period, outputs the value in current.
<table>
<tr><td>Resolution</td><td>1/10000</td></tr>
<tr><td>Current</td><td>4 to 20mA DC (Load resistance, Max. 550Ω)</td></tr>
<tr><td>Output accuracy</td><td>Within ±0.3% of transmission output span</td></tr>
</table></td></tr>
<tr><td>CH1 Difference Input (Block Function)</td><td>Temperature difference (CH1-CH2, CH2-CH1) will be the input value for CH1, and control for CH1 performs using this value.
PV = (CH1 PV - CH2 PV)
PV = (CH2 PV - CH1 PV)
Set values such as input type, scaling and PV filter time constant can be set to CH1 and CH2 individually.
However, if CH ranges differ from each other, indication and difference will be based on the Base channel.</td></tr>
<tr><td>CH1 Addition Input (Block Function)</td><td>Addition value of CH1 and CH2 will be the input value for CH1, and control for CH1 performs using this value.
PV = (CH1 PV + CH2 PV)
Set values such as input type, scaling and PV filter time constant can be set to CH1 and CH2 individually.
However, if CH ranges differ from each other, indication and addition will be based on the Base channel.</td></tr>
<tr><td>CH2 Difference Input (Block Function)</td><td>Temperature difference (CH1-CH2, CH2-CH1) will be the input value for CH2, and control for CH2 performs using this value.
PV = (CH1 PV - CH2 PV)
PV = (CH2 PV - CH1 PV)
Set values such as input type, scaling and PV filter time constant can be set to CH1 and CH2 individually.
However, if CH ranges differ from each other, indication and difference will be based on the Base channel.</td></tr>
</table>

CH2 Addition Input (Block Function)	Addition value of CH1 and CH2 will be the input value for CH2, and control for CH2 performs using this value. PV = (CH1 PV + CH2 PV) Set values such as input type, scaling and PV filter time constant can be set to CH1 and CH2 individually. However, if CH ranges differ from each other, indication and addition will be based on the Base channel.

Attached Functions

Sensor Correction	When the sensor measured temperature deviates from the temperature in the controller location, this corrects PV by adjusting the input value of sensors. However, it's only effective within the input rating range regardless of the sensor correction value. • Correction range: -100.0 to 100.0℃(℉) DC current, voltage input: -1000 to 1000 (The placement of the decimal point follows the selection)
Set Value Lock	Locks all set values so as not to be changed
Automatic Cold Junction Temperature Compensation (only thermocouple input)	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 temperature was at 0℃ (32℉).
Burnout (Overscale)	When the thermocouple or RTD input is burnt out, control output is turned OFF (for DC current output type, output low limit value), and the PV/SV display flashes "‾‾‾‾". However, the infrared thermocouple is excluded.
Indication Range, Control range	Thermocouple, RTD input

Input	Input Range	Indication Range	Control Range
K, T	-199.9 to 400.0℃	-199.9 to 450.0℃	-206.0 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℉	-210.0 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℉	-210.0 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 and Control range:

[Scaling low limit value-(1% of Scaling span)] to [Scaling high limit value +(10% of Scaling span)]

("‾‾‾‾" flashes when input drops below -1999, or "‾‾‾‾" flashes when input exceeds 9999.)

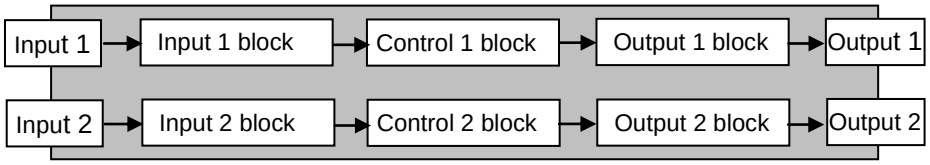
DC input disconnection:

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.

Difference (addition) spec

When Base channel (*) is thermocouple or RTD input:

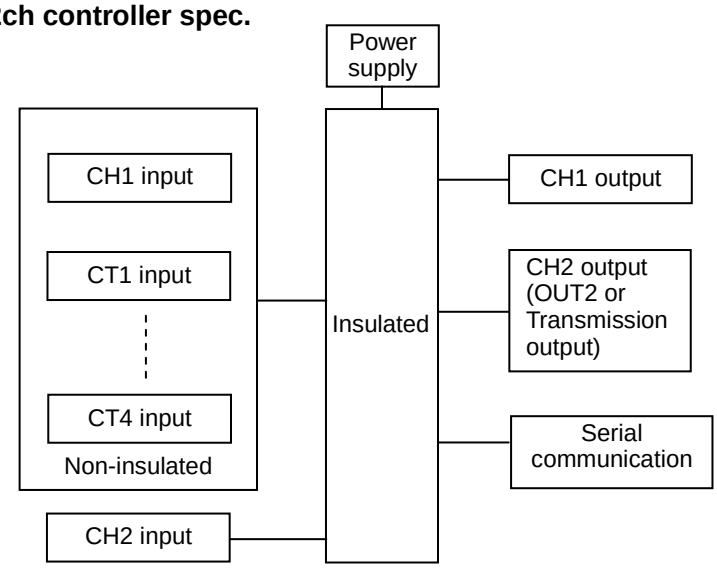
Input	Input Range	Indication Range	Control Range
K, T	-199.9 to 400.0℃	-199.9 to 450.0℃	-206.0 to 450.0℃
	-199.9 to 750.0℉	-199.9 to 850.0℉	-209.0 to 850.0℉
Pt100	-199.9 to 850.0℃	-199.9 to 900.0℃	-210.0 to 900.0℃
	-200 to 850℃	-210 to 900℃	-210 to 900℃
	-199.9 to 999.9℉	-199.9 to 999.9℉	-210.0 to 1099.9℉
	-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℉	-210.0 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℉)] **When Base channel (*) is DC input**: Indication range and Control range: [CH1(CH2) difference (addition) indication low limit–1% of Difference (addition) indication span] to [CH1(CH2) difference (addition) indication high limit + 10% of Difference (addition) indication span] For any input, the PV/SV display flashes "- - - -" when input drops below [CH1(CH2) difference (addition) indication low limit –1% of Difference (addition) indication span]. The PV/SV display flashes "‾ ‾ ‾ ‾" when input exceeds [CH1(CH2) difference (addition) indication high limit + 10% of Difference (addition) indication span]. (*) **Base channel**: If Difference (or addition) input is selected for Input 1 block (console software), CH1 (Input 1) will become the Base channel, and Indication range and Control range will be based on the Base channel input range. If Difference (or addition) input is selected for Input 2 block (console software), CH2 (Input 2) will become the Base channel, and Indication range and Control range will be based on the Base channel input range. **Infrared thermocouple burnout**: If infrared thermocouple is burnt out, input will become irregular, so indication will be incorrect.
Console Communication	The following operations can be carried out via console connector (use-specific cable) from an external computer. (1) Reading and setting of the SV, PID values and each set value (2) Reading of PV and action status (3) Function change Cannot be used together with the Serial communication (C5 option).
Block Function	Console software function. Each channel has the following independent blocks, which can be combined freely. (Cannot be set via keypad operation.) • **Input block** (Channel difference input, Channel addition input) • **Control block** [Heating/Cooling control output spec, External setting input (Remote) spec, Cascade control spec] • **Output block** [Output 2 output spec, 1-input 2-output spec, Transmission output spec (Selectable when CH2 output is DC current output.)] Initial Selection Status: 
Power Failure Countermeasure	The setting data is backed up in the non-volatile IC memory.
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.
Warm-up Indication	After the power supply to the instrument is turned on, the sensor input characters are indicated on the PV/SV display for approx. 4 seconds.
Display-off Function	Indication item (PV, SV or No indication) on the PV/SV display can be selected during Display selection by keypad. When any item except No indication is selected, displays are turned off if operation does not take place for the time set during Indication time setting. If any key is pressed, displays will be turned ON again. If indication time is set to 0 (zero), continuous indication will occur, and this function will be disabled.
Auto-light Function	Automatically measures and controls brightness of the CH1, CH2 PV/SV displays.

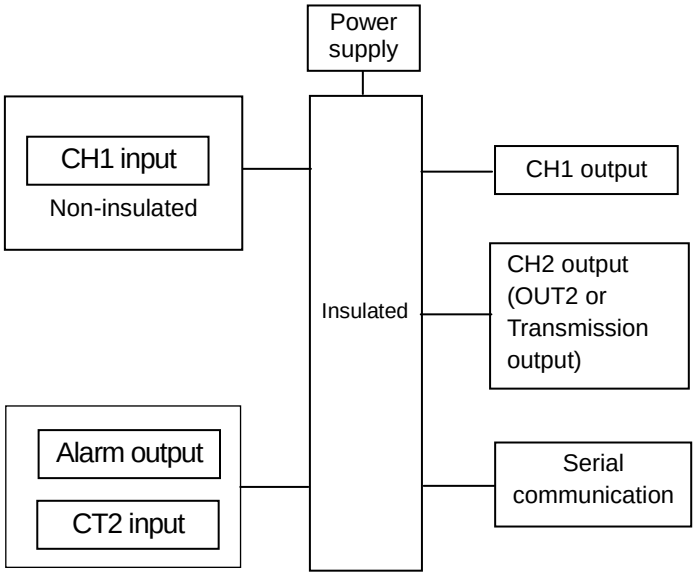
Insulation/Dielectric Strength

Circuit Insulation Configuration

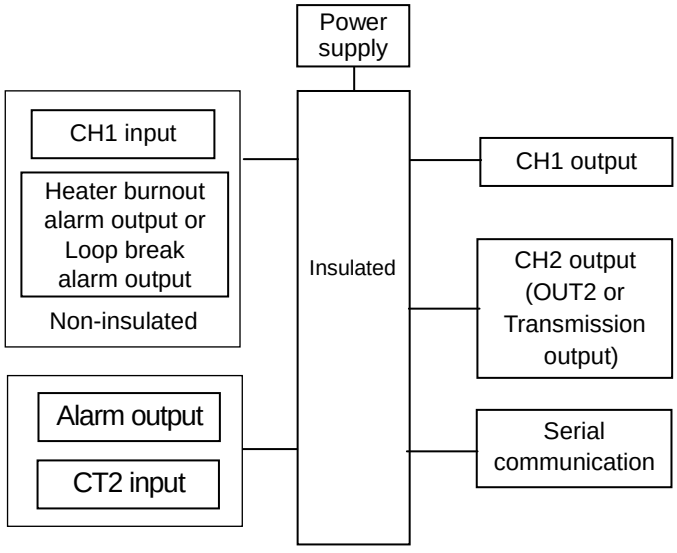
2ch controller spec.

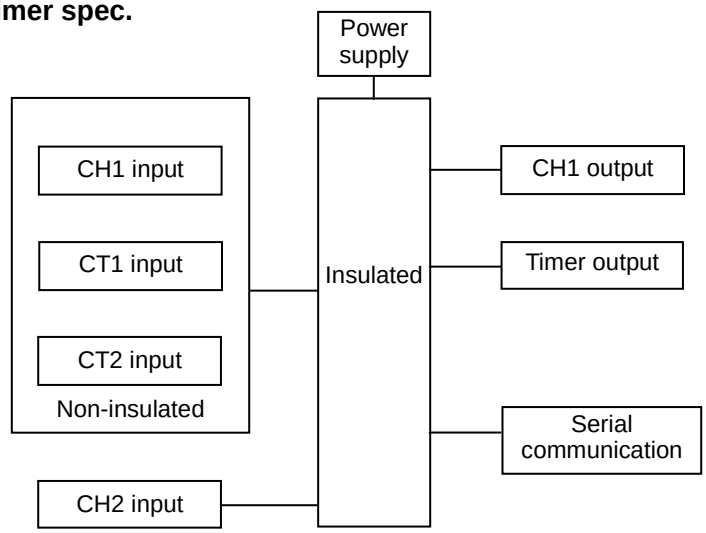
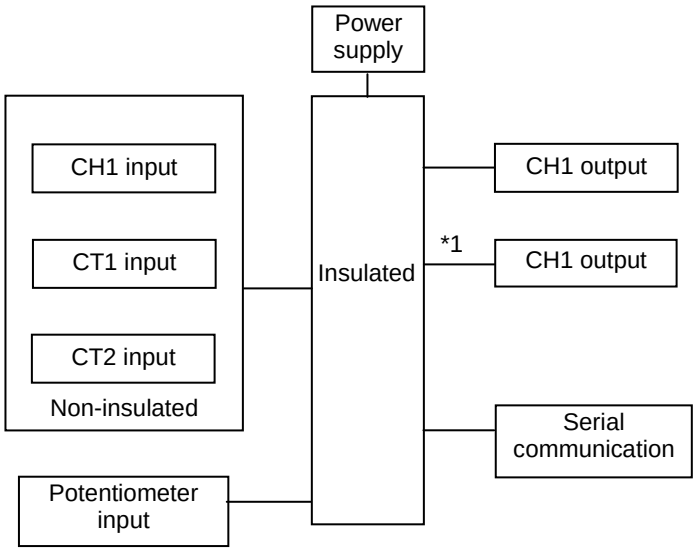


2ch controller spec. (AO option)



2ch controller spec. (AW option)



Circuit Insulation Configuration	**Timer spec.**  **Potentiometer input spec.**  *1: Effective when “Heating/Cooling control output” is selected for Control 1 block, or “1-input 2-output” is selected for Output 1 block (Block Function of Console software).
Insulation Resistance	10MΩ or more, at 500V DC
Dielectric Strength	1.5kV AC for 1 minute between power terminal and ground, between input terminal and ground, between input terminal and power terminal

Other

Power Consumption	Approx. 9VA
Ambient Temperature	0 to 50℃
Ambient Humidity	35 to 85%RH (non-condensing)
Weight	Approx. 200g (including the socket)
Accessories Included	Instruction manual 1 copy Communication instruction manual, 1 copy [When Serial communication (C5 option) is added]

Accessories Sold Separately

Socket	ASK-001-1 (Finger-safe, Ring terminals unusable)
	ASK-002-1 (Ring terminals usable)
Shunt resistor	50Ω (for DC current input)
USB communication cable	CMB-001 (for SWS-WCL01M Console software)

When Heater burnout alarm [Option: W(20A), W(100A), W3(20A), W3(100A), AW(20A), AW(100A)] is added:

CT	W(20A)	CTL-6S (1 piece needed for each channel)
	W(100A)	CTL-12-S36-10L1U (1 piece needed for each channel)
	W3(20A)	CTL-6S (2 pieces needed for each channel)
	W3(100A)	CTL-12-S36-10L1U (2 pieces needed for each channel)
Connector harness		W 3m W(20A), W(100A): 1 length needed for each channel W3(20A), W3(100A): 2 lengths needed for each channel

When Alarm output (AO option) is added

Connector harness	AO 3m

13.2 Optional Specifications

Heater Burnout Alarm (Option code: W, W3)

Monitors heater current with CT (current transformer, sold separately), and detects burnout.
This option cannot be applied to DC current output type.

Rated Current	Must be specified from below: Single-phase 20A [W(20A)], Single-phase 100A [W(100A)], 3-phase 20A [W3(20A)], 3-phase 100A [W3(100A)] Single-phase: Detects with CT1 (CT input for CH1), CT3 (CT input for CH2). 3-phase: Detects with CT1, CT2 (CT input for CH1), CT3, CT4 (CT input for CH2).
Setting Range	0.0 to 20.0A [for W (20A), W3 (20A). Disabled when set to 0.0.] 0.0 to 100.0A [for W (100A), W3 (100A). Disabled when set to 0.0]
Setting Accuracy	±5% of the rated current
Action Point	Set value
Action	ON/OFF action
Output	No output (Can be read by the status flag when Serial communication is added.)

Serial Communication (Option code: C5)

The following operations can be carried out from an external computer.
Cannot be used together with the Console communication.
(1) Reading and setting of the SV, PID values and various set values
(2) Reading of the PV and action status
(3) Function change

<table>
<tr><td>Communication Line</td><td>EIA RS-485</td></tr>
<tr><td>Communication Method</td><td>Half-duplex communication</td></tr>
<tr><td>Synchronization Method</td><td>Start-stop synchronization</td></tr>
<tr><td>Communication Speed</td><td>9600, 19200, 38400bps, Selectable by keypad</td></tr>
<tr><td>Data bit/Parity</td><td>Data bit: 7 or 8
Parity: Even, Odd, No parity, Selectable by keypad</td></tr>
<tr><td>Stop Bit</td><td>1 or 2, Selectable by keypad</td></tr>
<tr><td>Data Format</td><td>
<table>
<tr><td>Communication protocol</td><td>Shinko protocol</td><td>Modbus ASCII</td><td>Modbus RTU</td></tr>
<tr><td>Start bit</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>Data bit</td><td>7</td><td>7 or 8</td><td>8</td></tr>
<tr><td>Parity</td><td>Yes (Even)</td><td>Yes(Even, Odd), No parity</td><td>Yes(Even, Odd), No parity</td></tr>
<tr><td>Stop bit</td><td>1</td><td>1 or 2</td><td>1 or 2</td></tr>
</table>
</td></tr>
<tr><td>Communication Protocol</td><td>Shinko protocol, Modbus (ASCII mode or RTU mode),
Selectable by keypad</td></tr>
</table>

Alarm Output (Option code: AO)

Adds 2-points open collector output and 4-points status flag for CH1 and CH2 respectively.

<table>
<tr><td>Event Output</td><td>• Alarm
• Loop break alarm
• Loop break alarm + Alarm, Selectable by keypad operation</td></tr>
<tr><td>Output</td><td>Open collector: Control capacity 0.1A 24V DC
2-points open collector output (for each channel)
<table>
<tr><td>Connector No.</td><td>Alarm Output</td></tr>
<tr><td>1</td><td>CH1: Alarm 1 output</td></tr>
<tr><td>2</td><td>CH1: Alarm 2 output</td></tr>
<tr><td>3</td><td>CH2: Alarm 1 output</td></tr>
<tr><td>4</td><td>CH2: Alarm 2 output</td></tr>
</table>
</td></tr>
<tr><td>Status Flag</td><td>If the Serial communication option is added, 4-points status flag can be read.</td></tr>
</table>

Heater Burnout Alarm (single-phase) + Alarm Output (Option code: AW)

Adds Heater burnout alarm (Single-phase 20A or 100A) + 1-point open collector output + 4-points status flag (for each channel) for CH1, CH2 respectively.

This option cannot be added to the DC current output type.

<table>
<tr><td>Rating</td><td>Single-phase 20A [AW(20A)], Single-phase 100A [AW(100A)]
Must be specified.</td></tr>
<tr><td>Setting Range</td><td>• 0.0 to 20.0A [When AW(20A) is selected.] (Disabled when set to 0.0.)
• 0.0 to 100.0A [When AW(100A) is selected.] (Disabled when set to 0.0.)</td></tr>
<tr><td>Setting Accuracy</td><td>±5% of the rated value</td></tr>
<tr><td>Action Point</td><td>Set value</td></tr>
<tr><td>Action</td><td>ON/OFF action</td></tr>
<tr><td>Event Output</td><td>• Alarm
• Loop break alarm
• Loop break alarm +Alarm
• Heater burnout alarm
• Heater burnout alarm +Alarm
• Heater burnout alarm +Loop break alarm
• Heater burnout alarm +Alarm +Loop break alarm,
Selectable by keypad operation.</td></tr>
<tr><td>Output</td><td>Open collector: Control capacity, 0.1A 24V DC
1-point open collector output (for each channel)
<table>
<tr><th>Connector No.</th><th>Alarm Output</th></tr>
<tr><td>1</td><td>CH1: CT input</td></tr>
<tr><td>2</td><td>CH1: Alarm output</td></tr>
<tr><td>3</td><td>CH2: CT input</td></tr>
<tr><td>4</td><td>CH2: Alarm output</td></tr>
</table></td></tr>
<tr><td>Status Flag</td><td>If the Serial communication option is added, 4-points status flag can be read.</td></tr>
</table>

14. Troubleshooting

If any malfunctions occur, refer to the following items after checking that power is being supplied to the controller.

14.1 Indication

Problem	Presumed Cause and Solution
[- - - -] is flashing on the PV/SV display.	• Thermocouple, RTD or DC voltage (0 to 1V DC) is burnt out. Change each sensor. **How to check whether the sensor is burnt out** [Thermocouple] If the input 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. [RTD] If approx. 100Ω of resistance is connected to the input terminals between A-B of the instrument and between B-B is shorted, and if approximate 0℃ (32℉) is indicated, the instrument is likely to be operating normally, however, the sensor may be burnt out. [DC voltage (0 to 1V DC)] If the input 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. • Check whether the input terminals of thermocouple, RTD or DC voltage (0 to 1V DC) are securely mounted to the instrument input terminals. Connect the sensor terminals to the instrument input terminals securely.
[- - - -] is flashing on the PV/SV display.	• Check whether input signal source for DC voltage (1 to 5V DC) or DC current (4 to 20mA DC) is disconnected. **How to check whether the input signal wire is disconnected** [DC voltage (1 to 5V DC)] If the input to the input terminals of the instrument is 1V DC and if a scaling low limit value is indicated, the instrument is likely to be operating normally, however, the signal wire may be disconnected. [DC current (4 to 20mA DC)] If the input to the input terminals of the instrument is 4mA DC and if a scaling low limit value is indicated, the instrument is likely to be operating normally, however, the signal wire may be disconnected. • Check whether input signal wire for DC voltage (1 to 5V DC) or DC current (4 to 20mA DC) is securely connected to the instrument input terminals. • Check if polarity of thermocouple or compensating lead wire is correct. • Check whether codes (A, B, B) of RTD agree with the instrument terminals.
The PV/SV display keeps indicating the value which was set during Scaling low limit setting.	• Check whether the input signal source for DC voltage (0 to 5V DC, 0 to 10V DC) and DC current (0 to 20mA DC) is disconnected. **How to check whether the input signal wire is disconnected** [DC voltage (0 to 5V DC, 0 to 10V DC)] If the input to the input terminals of the instrument is 1V DC, and if a value (converted value from Scaling high, low limit setting) corresponding to 1V DC is indicated, the instrument is likely to be operating normally, however, the signal wire may be disconnected. [DC current (0 to 20mA DC)] If the input to the input terminals of the instrument is 4mA DC, and if a value (converted value from Scaling high, low limit setting) corresponding to 4mA DC is indicated, the instrument is likely to be operating normally, however, the signal wire may be disconnected. • Check whether the input lead wire terminals for DC voltage (0 to 5V DC, 0 to 10V DC) or DC current (0 to 20mA DC) are securely mounted to the instrument input terminals.
The indication of PV/SV display is irregular or unstable.	• Check whether sensor input or temperature unit (℃ or ℉) is correct. Select the sensor input and temperature unit (℃ or ℉) properly. • Sensor correcting value is unsuitable. Set it to a suitable value. • Check whether the specification of the sensor is correct. • AC leaks into the sensor circuit. Use an ungrounded type sensor. • There may be equipment that interferes with or makes noise near the controller. Keep equipment that interferes with or makes noise away from the controller.
The PV does not change.	• SV may be selected during Display selection in the Special function group. Select indications other than SV.

The PV/SV display is indicating [Err 1].	• Internal memory is defective. Contact our agency or us.

14.2 Key Operation

Problem	Presumed Cause and Solution
• Unable to set the SV, P, I, D, proportional cycle or Alarm value • The values do not change by △, ▽ keys.	• "Lock" is selected during Set value lock selection in the Special function group. Release the "Lock" selection. • During AT or auto-reset. In the case of AT, cancel AT. 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.	• Scaling high or low limit value in the CH1, CH2 function group may be set at the point where the value does not change. Set it to a suitable value.
CH2 SV cannot be set.	• Timer spec is selected, or Heating/Cooling control output or External setting input is selected from the Block function (Console software). In the case of the above spec, CH2 SV setting item will not be indicated.
CH2 parameter group is not indicated.	• Timer spec or Potentiometer input spec is selected, or Heating/Cooling control output or External setting input is selected from the Block function (Console software). In the case of the above spec, CH2 parameter group will not be indicated.
CH2 function group is not indicated.	• Timer spec or Potentiometer input spec is selected, or Heating/Cooling control output is selected from the Block function (Console software). In the case of the above spec, CH2 function group will not be indicated.

14.3 Control

Problem	Presumed Cause and Solution
Temperature does not rise.	• Sensor is out of order. Replace the sensor. • Check whether the Sensor or control output terminals are securely mounted to the instrument input terminals. Ensure that the sensor or control output terminals are mounted to the instrument input terminals securely. • Check whether the wiring of the sensor or control output terminals is correct.
The control output remains in an ON status.	• Output low limit value is set to 100% or higher in the CH1, CH2 function group. Set it to a suitable value.
The control output remains in an OFF status.	• "Control Prohibited" has been selected during Control Allowed/ Prohibited selection in the CH1, CH2 parameter group. Select "Control Allowed". • Output high limit value is set to 0% or less in the CH1, CH2 function group. Set it to a suitable value.
Control timer does not work.	• Control timer time is set to 0 (zero) seconds in the Special function group. Set it to a suitable value. • Control timer start temperature in the Special function group is not set to a suitable value. Timer starts when CH1 input exceeds Control timer start temperature. (In the case of Direct control action, timer starts when CH1 input drops below Control timer start temperature.) Set it to a suitable value.
Delay timer does not work.	• Timer action time unit, ON delay timer or OFF delay timer in the Special function group is not set to a suitable value. Set it to a suitable value.

15. Character tables

SV Group

Character	Setting Item	Default Value	Data
SV1	CH1 SV	0℃	
SV2	CH2 SV	0℃	

CH1 Parameter Group

Character	Setting Item	Default Value	Data
oFF	Control Allowed/Prohibited	Control Allowed	
AUTo	Auto/Manual control	Automatic control	
MANU	Manual control MV	MV of the automatic control	
AT	AT/Auto-reset Perform/Cancel	AT/ Auto-reset Cancel	
P	Proportional band	10℃	
P_b	OUT2 proportional band	1.0 times	
I	Integral time	200 sec	
d	Derivative time	50 sec	
ARW	ARW (Anti-reset windup)	50%	
rSET	Manual reset value	0.0℃	
c	Proportional cycle	Relay contact output: 30 sec Non-contact voltage output: 3 sec	
c_b	OUT2 proportional cycle	Relay contact output: 30 sec Non-contact voltage output: 3 sec	
A1	Alarm 1 value	0℃	
A2	Alarm 2 value	0℃	
A3	Alarm 3 value	0℃	
A4	Alarm 4 value	0℃	
H	Heater burnout alarm 1	0.0A	
H2	Heater burnout alarm 2	0.0A	
LP_H	Loop break alarm span	0℃	
LP_T	Loop break alarm time	0 minutes	

CH2 Parameter Group

Character	Setting Item	Default Value	Data
oFF	Control Allowed/Prohibited	Control Allowed	
AUTo	Auto/Manual control	Automatic control	
MANU	Manual control MV	MV of the automatic control	
AT	AT/Auto-reset Perform/Cancel	AT/Auto-reset Cancel	
P	Proportional band	10℃	
I	Integral time	200 sec	
d	Derivative time	50 sec	
ARW	ARW (Anti-reset windup)	50%	
rSET	Manual reset value	0.0℃	
c	Proportional cycle	Relay contact output: 30 sec Non-contact voltage output: 3 sec	
A1	Alarm 1 value	0℃	
A2	Alarm 2 value	0℃	
A3	Alarm 3 value	0℃	
A4	Alarm 4 value	0℃	
H	Heater burnout alarm 1	0.0A	
H2	Heater burnout alarm 2	0.0A	
LP_H	Loop break alarm span	0℃	
LP_T	Loop break alarm time	0 minutes	

CH1 Function Group

Character	Setting Item	Default Value	Data
sEnS	Input type	Multi-range input: K -200 to 1370℃ Infrared TC input: 180 to 250℃	
srLH	Scaling high limit	Multi-range input: 1370℃ Infrared TC input: 500℃	
srLL	Scaling low limit	Multi-range input: -200℃ Infrared TC input: -50℃	
dP□□	Decimal point place	No decimal point	
FILr	PV filter time constant	0.0 sec	
So□□	Sensor correction	0.0℃	
E□□□	Emissivity	0.900 times	
oLH□	Output high limit	100%	
oLL□	Output low limit	0%	
HYS□	Output ON/OFF hysteresis	1.0℃	
cAcr	OUT2 action mode	Air cooling	
oLHb	OUT2 high limit	100%	
oLLb	OUT2 low limit	0%	
HYSb	OUT2 ON/OFF hysteresis	1.0℃	
db□□	Overlap/Dead band	0.0℃	
orAr	Output rate-of-change	0%/sec	
PrSr	Output when input abnormal	0.0%	
A1Fn	Alarm 1 type	No Alarm action	
A2Fn	Alarm 2 type	No Alarm action	
A3Fn	Alarm 3 type	No Alarm action	
A4Fn	Alarm 4 type	No Alarm action	
A1HY	Alarm 1 hysteresis	1.0℃	
A2HY	Alarm 2 hysteresis	1.0℃	
A3HY	Alarm 3 hysteresis	1.0℃	
A4HY	Alarm 4 hysteresis	1.0℃	
A1dY	Alarm 1 action delay timer	0 sec	
A2dY	Alarm 2 action delay timer	0 sec	
A3dY	Alarm 3 action delay timer	0 sec	
A4dY	Alarm 4 action delay timer	0 sec	
E1Fn	Event output 1	Alarm	
E2Fn	Event output 2	Alarm	
rArU	SV rise rate	0℃/minute	
rArd	SV fall rate	0℃/minute	
conr	Direct/Reverse action	Reverse action	
Ar_b	AT bias	20℃	
dFLH	Difference (addition) indication high limit	9999	
dFLL	Difference (addition) indication low limit	-1999	

CH2 Function Group

Character	Setting Item	Default Value	Data
2Ent	Input type	Multi-range input: K -200 to 1370℃ Infrared TC input: 180 to 250℃	
2rLH	Scaling high limit	Multi-range input: 1370℃ Infrared TC input: 500℃	
2rLL	Scaling low limit	Multi-range input: -200℃ Infrared TC input: -50℃	
dP□□	Decimal point place	No decimal point	
FILr	PV filter time constant	0.0 sec	
2o□□	Sensor correction	0.0℃	
E□□□	Emissivity	0.900 times	
oLH□	Output high limit	100%	
oLL□	Output low limit	0%	
HY2□	Output ON/OFF hysteresis	1.0℃	
orAr	Output rate-of-change	0%/sec	
Pr2r	Output when input abnormal	0.0%	
A1Fn	Alarm 1 type	No Alarm action	
A2Fn	Alarm 2 type	No Alarm action	
A3Fn	Alarm 3 type	No Alarm action	
A4Fn	Alarm 4 type	No Alarm action	
A1HY	Alarm 1 hysteresis	1.0℃	
A2HY	Alarm 2 hysteresis	1.0℃	
A3HY	Alarm 3 hysteresis	1.0℃	
A4HY	Alarm 4 hysteresis	1.0℃	
A1dY	Alarm 1 action delay timer	0 sec	
A2dY	Alarm 2 action delay timer	0 sec	
A3dY	Alarm 3 action delay timer	0 sec	
A4dY	Alarm 4 action delay timer	0 sec	
E1Fn	Event output 1	Alarm	
E2Fn	Event output 2	Alarm	
rArU	SV rise rate	0℃/minute	
rArd	SV fall rate	0℃/minute	
conr	Direct/Reverse action	Reverse action	
Ar_b	AT bias	20℃	
dFLH	Difference (addition) indication high limit	9999	
dFLL	Difference (addition) indication low limit	-1999	

Special Function Setting Group

Character	Setting Item	Default Value	Data
Lock	Set value lock	Unlock	
cnHL	Communication protocol	Shinko protocol	
cnno	Instrument number	0	
cnHP	Communication speed	9600bps	
cnFF	Data bit/Parity	7 bits/Even parity	
cnHr	Stop bit	1	
rEnF	Remote/Local	Local	
rFLH	External setting scaling high limit	1370℃	
rFLL	External setting scaling low limit	-200℃	
rn_b	Remote bias	0℃	
Fro4	Transmission output	Selection from the Block function	
FrLH	Transmission output high limit	PV, SV transmission: 1370℃ MV transmission : 100.0%	
FrLL	Transmission output low limit	PV, SV transmission: -200℃ MV transmission : 0.0%	
FUnc	Timer action	Control timer function	
tn_4	Timer action time unit	Minute	
on_T	ON delay timer	0	
oFFT	OFF delay timer	0	
TnHB	Control timer start temperature	0℃	
Tn_4	Control timer time	0	
LI GT	Auto-light function	Ineffective	
dI 4P	Display selection	CH1 PV/CH2 PV	
TI nE	Indication time	00.00	
r_Fn	Input sampling period	125ms	
I 3Er	Potentiometer input zero adjustment	-200℃	
I 4PA	Potentiometer input span adjustment	1370℃	

***** Inquiry *****

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

[Example]

- Model ---------- WCL-13A-RR/MM
- Serial number ---------- No. 094F05000

In addition to the above, please let us know the details of the malfunction, if any, and the operating conditions.

SHINKO TECHNOS CO., LTD.
OVERSEAS DIVISION

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