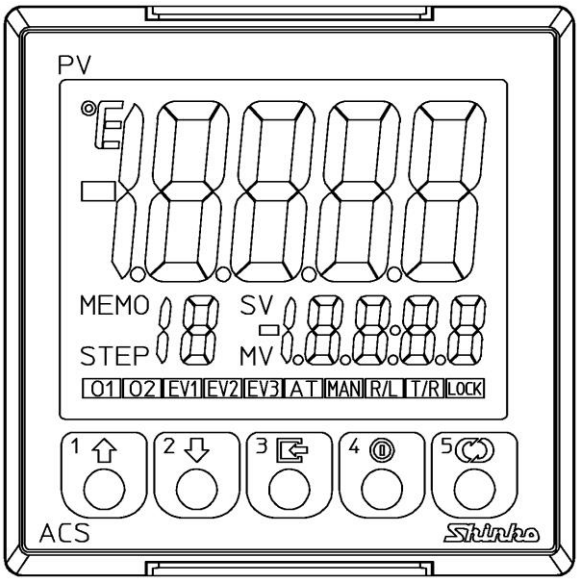
DIGITAL INDICATING CONTROLLER

ACS2

INSTRUCTION MANUAL



Shinko

Preface

Thank you for purchasing our digital indicating controller ACS2. This manual contains instructions for the mounting, functions, operations and notes when operating the BCx2. To prevent accidents arising from the misuse of this controller, please ensure the operator receives this manual.

Abbreviations used in this manual

Abbreviation	Term
PV	Process variable
SV	Desired value
MV	Manipulated variable
DV	Deviation
OUT1	Control output OUT1
OUT2	Control output OUT2
AT	Auto-tuning

Characters used in this manual

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

Notes

- This instrument should be used in accordance with the specifications described in the manual. If it is not used according to the specifications, it may malfunction or cause a fire.
- Be sure to follow 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 ensure that the contents of this instruction manual are correct, but if there are any doubts, mistakes or questions, please inform our sales department.
- This instrument is designed to be installed through a control panel indoors. If it is not, measures must be taken to ensure that the operator cannot touch power terminals or other high voltage sections.
- Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
- Shinko Technos Co., Ltd. is not liable for any damage or secondary damage(s) incurred as a result of using this product, including any indirect damage.

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

The safety precautions are classified into categories: “Warning” and “Caution”. Depending on circumstances, procedures indicated by ⚠ Caution may result in serious consequences, 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 electrical shock or fire, only Shinko or qualified service personnel may handle the inner assembly.
- To prevent an electrical shock, fire, or damage to instrument, parts replacement may only be undertaken by Shinko or qualified service personnel.

⚠ Safety Precautions

- To ensure safe and correct use, thoroughly read and understand this manual before using this instrument.
- This instrument is intended to be used for industrial machinery, machine tools and measuring equipment. Verify correct usage after 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. Proper periodic maintenance is also 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.

Warning on Model Label

⚠ Caution

Failure to handle this instrument properly may result in minor or moderate injury or property damage due to fire, malfunction, malfunction, or electric shock. Please read this manual before using the product to ensure that you fully understand the product.

⚠ 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.

Precautions for Use

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 -10 to 55℃ (14 to 131℉) 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
- Please note that the ambient temperature of this unit – not the ambient temperature of the control panel – must not exceed 55℃ (131℉) if mounted through the face of a control panel, otherwise the life of electronic components (especially electrolytic capacitors) may be shortened.

Note • Avoid setting this instrument directly 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, as they could cause a fire or malfunction.
- Use the solderless terminal with an insulation sleeve in which the M3 screw fits when wiring the instrument.
- The terminal block of this instrument is designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw.
- Tighten the terminal screw using the specified torque. If excessive force is applied to the screw when tightening, the terminal screw or case may be damaged.
- Do not pull or bend the lead wire on the terminal side when wiring or after wiring, as it could cause malfunction.
- When using a terminal cover for the BCS2, pass terminal wires numbered 7 to 12 into the holes of the terminal cover.
- This instrument does not have a built-in power switch, circuit breaker and fuse.
  It is necessary to install a power switch, circuit breaker and fuse near the controller.
  (Recommended fuse: Time-lag fuse, rated voltage 250 V AC, rated current 2 A)
- For a 24 V 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.
- For DC voltage input, (+) side input terminal number of 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC differs from that of 0 to 1 V DC.
  For the input terminal number, the (+) side for 0 to 5 V DC, 1 to 5 V DC, and 0 to 10 V DC is ⑨, and the (+) side for 0 to 1 V DC is ⑩.
- 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 controller AC power sources or load wires.

3. Operation and Maintenance Precautions

⚠ Caution

- It is recommended that AT be performed on the trial run.
- Do not touch live terminals. This may cause electrical 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 electrical 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, be careful not to put pressure on, scratch or strike it with a hard object.

4. Compliance with Safety Standards

⚠ Caution

- Always install the recommended fuse described in this manual externally.
- If the instrument is used in a manner not specified by the manufacturer, the protection provided by the instrument may be impaired.
- Use a device with reinforced insulation or double insulation for the external circuit connected to this product.

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1. Model

1.1 Model

ACS2 □ □ □- □ □						Model name: ACS2 (W48×H48×D68 mm)	
Control output	R(*5)					Relay contact: 1a	
	M(*1)					Non-contact voltage (for SSR drive) 12 V DC±15%	
						Direct current: 4 to 20mA DC	
						Direct current: 0 to 20mA DC	
	V					DC voltage: 0 to 1V	
	1					DC voltage: 0 to 5V	
	2					DC voltage: 1 to 5V	
	3					DC voltage: 0 to 10V	
	C					Open collector	
Power supply voltage		0				100 to 240V AC, 24V DC, 48V DC	
Input			M			Multi-range	
Option ①				0		No options	
				1		Event output EV2 (*1)	EV2
				2		Event output EV3 (*2)	EV3
				3		Heating/Cooling control O2(SSR/A) (*4)	O2(SSR/A)
				4		Insulated power output (*6)	P24
Option ②					0	No options	
					1	Serial communication + Heater burnout alarm (20A)	C5W(20A)
					2	Serial communication + Heater burnout alarm (100A)	C5W(100A)
					3	Heater burnout alarm (20A) (*3)	W(20A)
					4	Heater burnout alarm (100A) (*3)	W(100A)
					5	Transmission output (4-20mA) (*3)	TA
					6	Transmission output (0-1V) (*3)	TV
					7	Transmission output (0-10V) (*3)	TV
					8	External setting input (*3)	EA
					9	Serial communication (*3)	C5
					A	Event input 4 points	EI

(*1): When OUT1 is selected in [Event 2 allocation selection], the output becomes multi-output and SSR output, current output, and relay output can be selected.

(*2): Event output 3 points is common.
The COM terminals of Event output 3 points are common.

(*3): Options other than C5W and EI will simultaneously add Event input 2 points.

(*4): When O2 is selected, the output of cooling side can be selected SSR output and current output. However, cooling output of relay output is not possible.
When cooling output is desired for relay output, it can be used by selecting OUT2 in [Event 2 allocation selection].

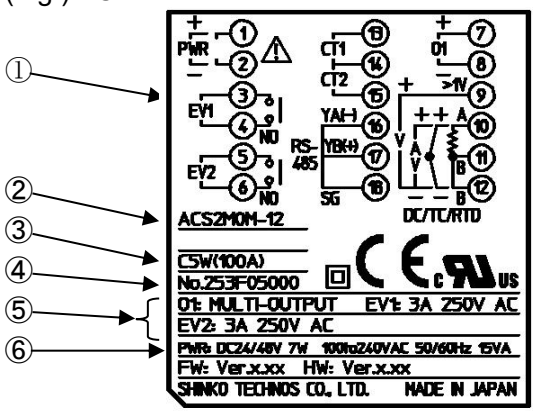
(*5): To use the heating side as a relay output in heating/cooling control, select R.

(*6): To use the insulated power output for relay output, select R.

1.2 How to Read the Model Label

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

(e.g.) ACS2M0M-12



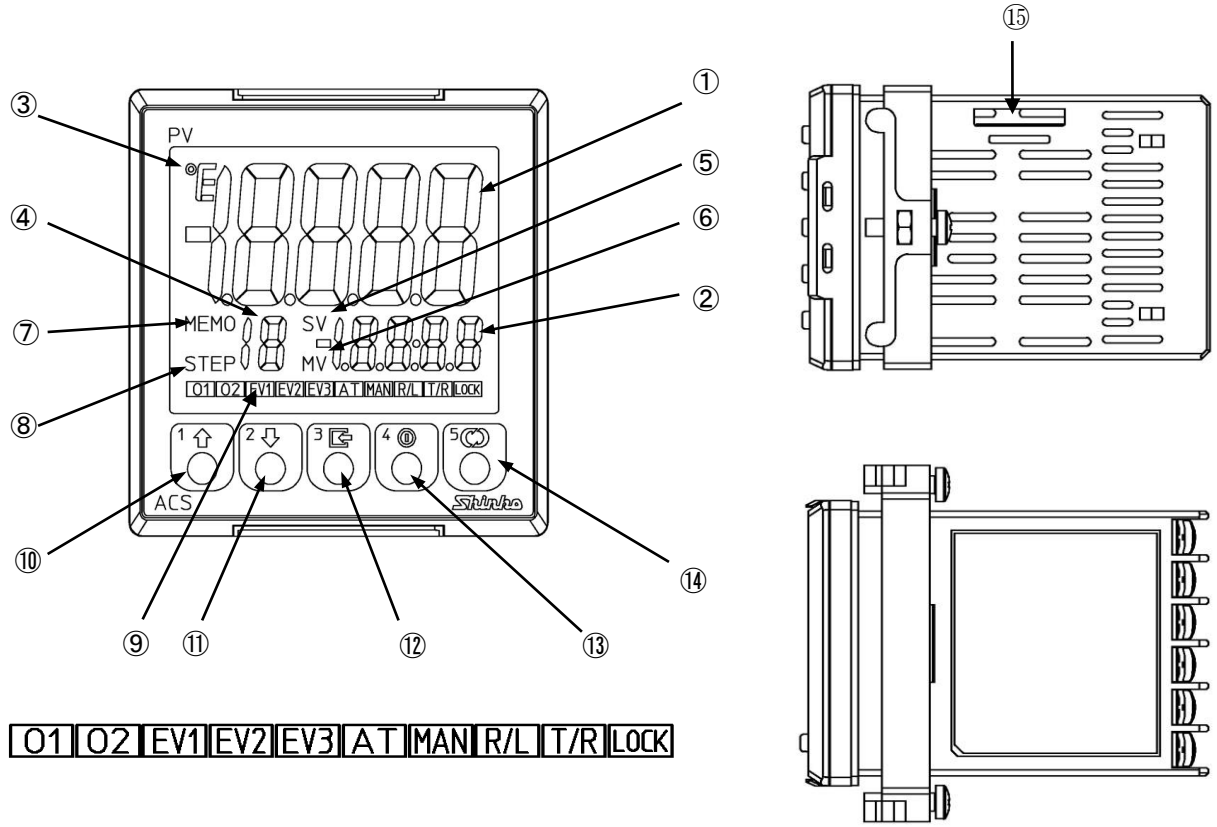
(Fig. 1.2-1)

No.	Description	Example
①	Terminal arrangement	ACS2M0M-12 (*1)
②	Model	ACS2M0M-12
③	Option	C5W(100A) [Serial communication + Heater burnout alarm (100 A)] (*2)
④	Serial number	No. 253F05000
⑤	Control output, Event output	O1: MULTI-OUTPUT (Control output OUT1) EV1: 3 A 250 V AC(Event output EV1) EV2: 3 A 250 V AC(Event output EV2)
⑥	Power supply voltage, Power consumption	DC 24V/48V 7W, 100 to 240 V AC 50/60Hz 15 VA

(*1): Terminal arrangement diagram differs depending on the model.

(*2): For Heater burnout alarm output (C5W, EIW, W options), CT rated current is entered in brackets ( ).

2. Names and Functions of Controller



(Fig. 2-1)

Display

No.	Name	Description
①	PV display	Indicates PV. Indicates setting characters in each setting mode.
②	SV display	Indicates SV. Indicates the set data in each setting mode. In monitor mode, indicates the MV or remaining time (program control).
③	Temperature unit display	Displays the temperature unit. (Displayed only for thermocouple and RTD ranges)
④	MEMO/STEP display	Indicates Set value memory number (Fixed value control) or Program step number.

Action Indicators

No.	Name	Description
⑤	SV indicator	Lit when SV display shows the set value.
⑥	MV indicator	Lit when SV display shows the MV.
⑦	MEMO indicator	Lit when set value memory function is enabled during fixed value control selection.
⑧	STEP indicator	Lit when program control is selected.
⑨	O1	Lit when control output is ON or when heating output (optional: EV2, O2 (SSR/A)) is ON. For direct current current or DC voltage outputs, flashes corresponding to the MV in 250 ms cycles.
	O2	Lit when cooling output (optional: EV2, O2 (SSR/A)) is ON. For direct current current or DC voltage outputs, flashes corresponding to the MV in 250 ms cycles.
	EV1	Lit when Event output 1 is ON.
	EV2	Lit when Event output 2 (optional: EV2) is ON.
	EV3	Lit when Event output 3 (optional: EV3) is ON.
	AT	Flashes while AT or 'AT on startup' is performing.
	MAN	Lit when manual control is performed.
	R/L	Lit when remote is selected for external setting input.
	T/R	Lit during Serial communication (C5W, C5 options) TX (transmitting) output.
	LOCK	Lit when set value lock mode is enabled.

Key

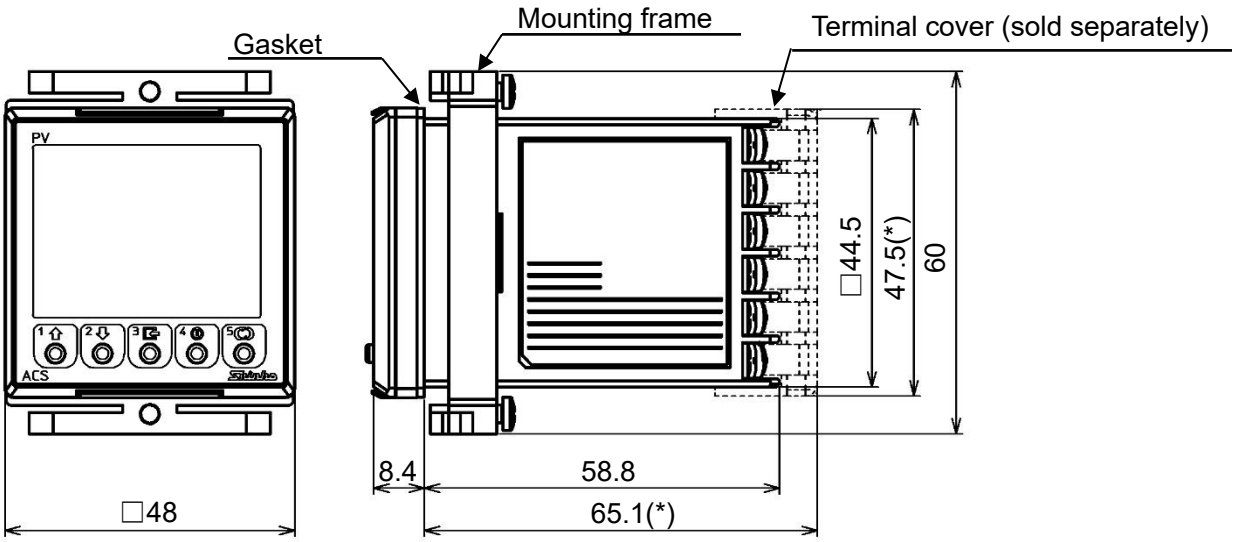
No.	Name	Description
⑩	UP key	Increases the numeric value. During program control, pressing for 1 second activates the advance function.
⑪	DOWN key	Decreases the numeric value. During program control, pressing for 1 second activates the hold function.
⑫	PF key	Operate the selected function in the PF key function selection. In setting mode, select the number of digits to be entered.
⑬	OUT/OFF key	Operate the selected function in the OUT/OFF key function selection.
⑭	MODE key	Switches a setting mode, and registers the set data. By pressing this key for 3 seconds during RUN mode, the unit enters Monitor mode.

Console Connector

No.	Name	Description
⑮	Console connector	By connecting the tool cable (CMD-001, sold separately), the following operations can be conducted from an external computer using the Console software SWC-ACS201M. • Reading and setting of SV, PID and various set values • Reading of PV and action status • Function change

3. Mounting to the Control Panel

3.1 External Dimensions (Scale: mm)



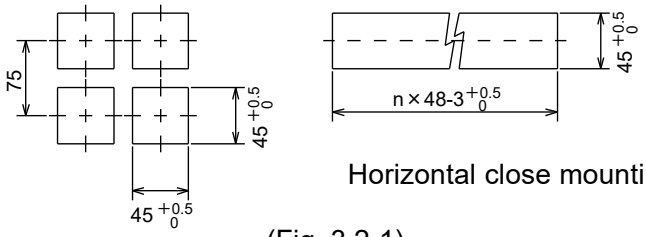
(*): When the terminal cover is used.

(Fig. 3.1-1)

3.2 Panel Cutout (Scale: mm)

⚠ Caution

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

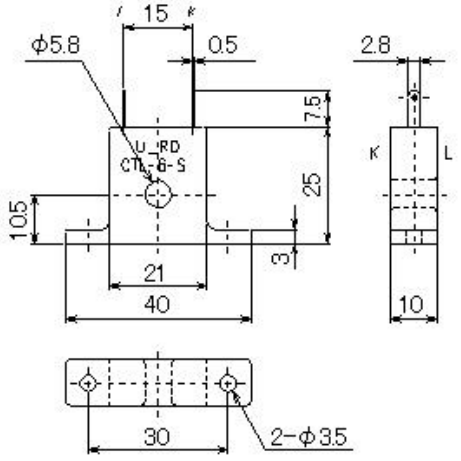


Horizontal close mounting, n: Number of units mounted

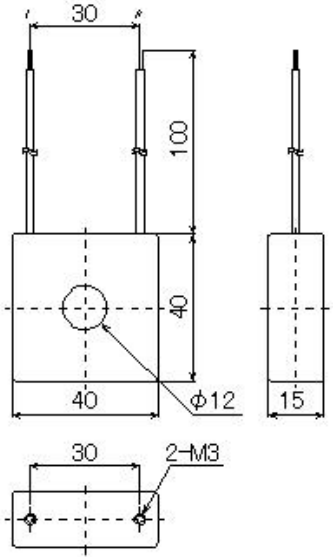
(Fig. 3.2-1)

3.3 CT External Dimensions (Scale: mm)

CTL-6-S-H(for 20A)



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



(Fig. 3.3-1)

3.4 Mounting to, and Removal from, the Control Panel

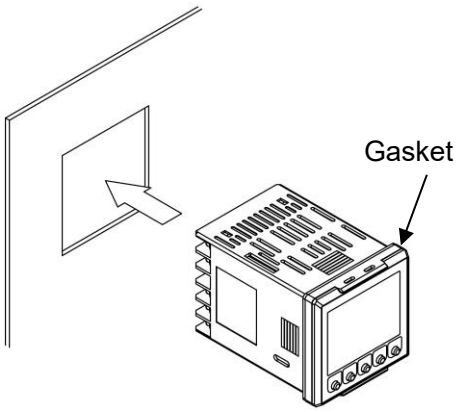
⚠ Warning

As the mounting frame of the ACS2 is made of resin, do not use excessive force while tightening screws, or the mounting frame could be damaged.
Tighten screws with one rotation upon the screw tips touching the panel.
The torque is 0.05 to 0.06 N•m.

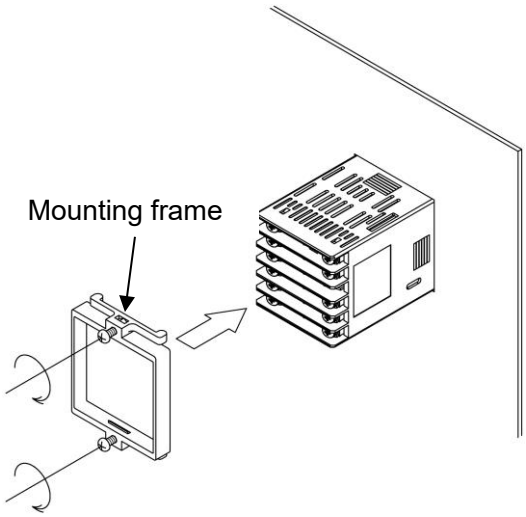
3.4.1 How to Mount the Unit

Mount the controller vertically to the flat, rigid panel to ensure it adheres to the Drip-proof/Dust-proof specification (IP66).
If the lateral close mounting is used for the controller, IP66 specification (Drip-proof/Dust-proof) may be compromised, and all warranties will be invalidated.
Mountable panel thickness: 1 to 5 mm

(1) Insert the controller from the front side of the control panel. (Fig. 3.4.1-1)
If the Drip-proof/Dust-proof specification (IP66) is not necessary, the gasket may be removed (Please keep in mind the warranty is void if gasket is removed).
(2) Insert the mounting frame until it comes into contact with the panel, and fasten with screws.
Tighten screws with one rotation upon the screw tips touching the panel. (Fig. 3.4.1-2)
The torque is 0.05 to 0.06 N•m.



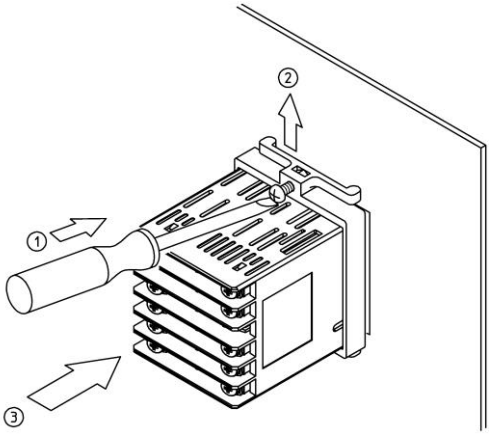
(Fig. 3.4.1-1)



(Fig. 3.4.1-2)

3.4.2 How to Remove the Mounting Frame and Unit

(1) Turn the power to the unit OFF, and disconnect all wires before removing the mounting frame.
(2) Insert a flat blade screwdriver between the mounting frame and unit (①).
(3) Slowly push the frame upward using the screwdriver (②), while pushing the unit toward the panel (③).
(4) Repeat step (2) and slowly push the frame downward using the screwdriver for the other side. The frame can be removed little by little by repeating these steps.



(Fig. 3.4.2-1)

4. Wiring

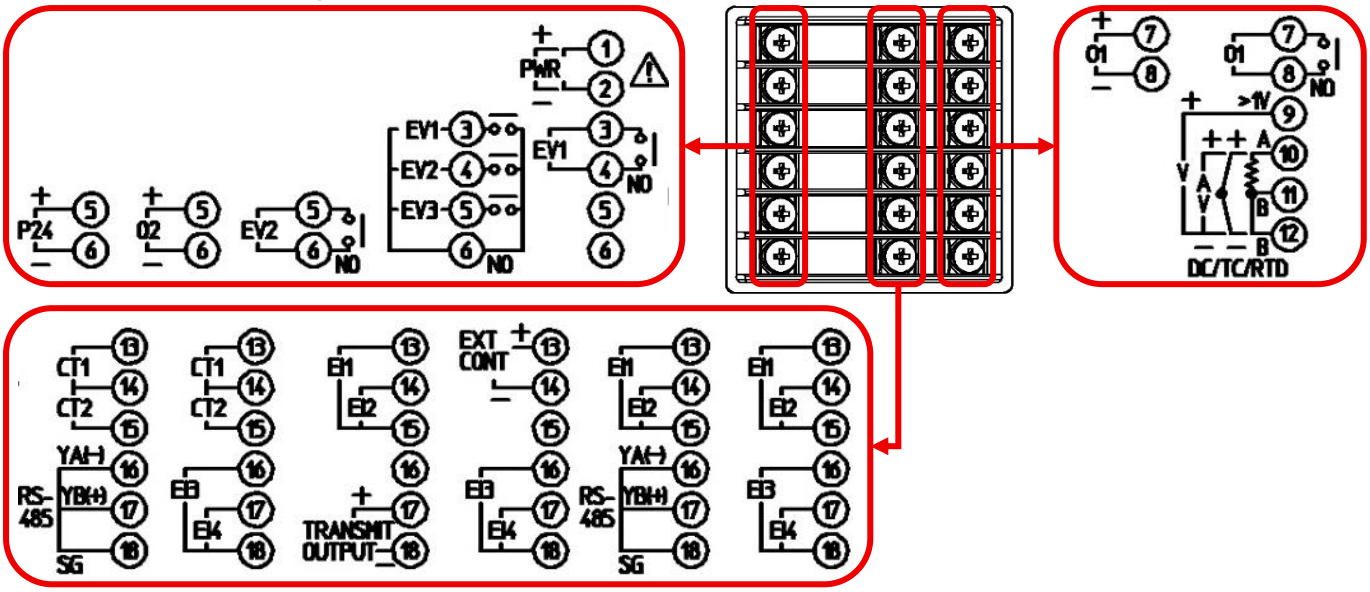
⚠ Warning

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 electrical shock.

⚠ Caution

- Do not leave wire remnants in the instrument, as they could cause a fire or malfunction.
- Use the solderless terminal with an insulation sleeve in which the M3 screw fits when wiring the instrument.
- The terminal block of this instrument is designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw.
- Tighten the terminal screw using the specified torque. If excessive force is applied to the screw when tightening, the terminal screw or case may be damaged.
- Do not pull or bend the lead wire on the terminal side when wiring or after wiring, as it could cause malfunction.
- When using a terminal cover for the BCS2, pass terminal wires numbered 7 to 12 into the holes of the terminal cover.
- This instrument does not have a built-in power switch, circuit breaker and fuse.
  It is necessary to install a power switch, circuit breaker and fuse near the controller.
  (Recommended fuse: Time-lag fuse, rated voltage 250 V AC, rated current 2 A)
- For a 24 V 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.
- For DC voltage input, (+) side input terminal number of 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC differs from that of 0 to 1 V DC.
  For the input terminal number, the (+) side for 0 to 5 V DC, 1 to 5 V DC, and 0 to 10 V DC is ⑨, and the (+) side for 0 to 1 V DC is ⑩.
- 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 controller AC power sources or load wires.

4.1 Terminal Arrangement



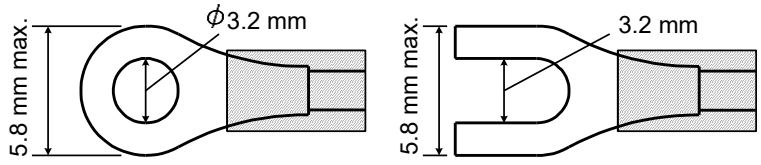
(Fig. 4.1-1)

Terminal	Description
PWR	Power supply voltage
EV1	Event output 1
EV2	Event output 2 (optional: EV2)
EV3	Event output 3 (optional: EV3)
O2	Control output OUT2 (Cooling output) [optional: EV2, O2(SSR/A)]
P24	24 V DC insulated power output (optional: P24)
O1	Control output OUT1 or heating output [optional: EV2, O2(SSR/A)]
TC	Thermocouple input
RTD	RTD input
DC	Direct current input or DC voltage input
CT1	CT input 1 (optional: C5W, W)
CT2	CT input 2 (optional: C5W, W)
RS-485	Serial communication RS-485 (optional: C5W, C5)
EVENT INPUT	EI1 (optional: other than C5W) EI2 (optional: other than C5W) EI3 (optional: other than EI, W or C5W) EI4 (optional: other than EI, W or C5W)
EXT CONT	External setting input (optional: EA)
TRANSMIT OUTPUT	Transmission output (optional: TA, TV)

4.2 Lead Wire Solderless Terminal

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

Solderless Terminal	Manufacturer	Model	Tightening Torque
Y-type	NICHIFU TERMINAL INDUSTRIES CO., LTD.	TMEX1.25Y-3	0.63 N•m
	J.S.T.MFG.CO., LTD.	VD1.25-B3A	
Ring-type	NICHIFU TERMINAL INDUSTRIES CO., LTD.	TMEX1.25-3	
	J.S.T.MFG.CO., LTD.	V1.25-3	

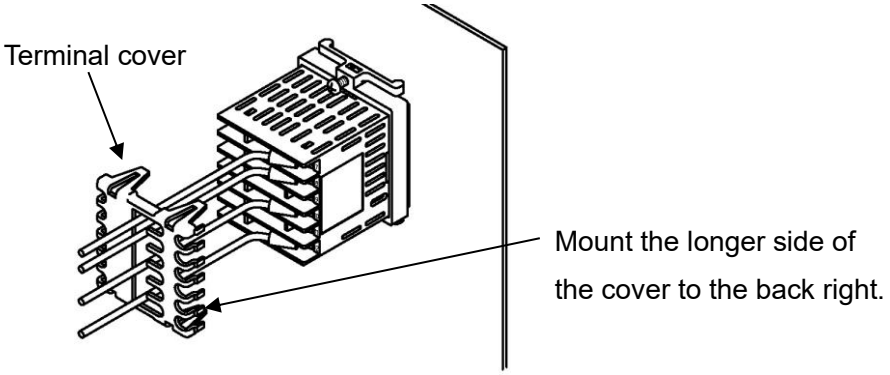


(Fig. 4.2-1)

4.3 Terminal Cover

When using a terminal cover (sold separately), make sure the longer side is on the back right side of the case.

Pass the wires from terminals 7 to 12 into the holes of the terminal cover.



(Fig. 4.3-1)

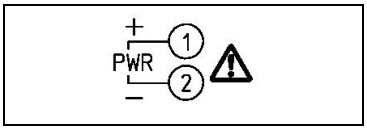
4.4 Wiring

For the terminal arrangement, refer to Section ‘4.1 Terminal Arrangement’ (p.16).

4.4.1 Power Supply

Power supply voltage is 100 to 240 V AC or 24 V DC, 48 V DC.

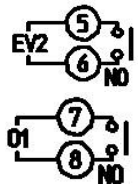
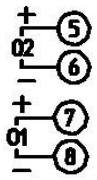
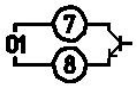
For 24 V DC or 48 V DC, ensure polarity is correct.



4.4.2 Control Output OUT1, OUT2

When EV2 or , O2(SSR/A) option is ordered, control output OUT2 is available.
Specifications of Control output OUT1, OUT2 are shown below.

Control output OUT1	
Relay contact	1a Control capacity: 3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load cosϕ=0.4) Electrical life: 100, 000 cycles Minimum applicable load: 10 mA 5 V DC
Non-contact voltage (for SSR drive)	12 V DC±15% Max. 40 mA (short circuit protected)
Direct current	4 to 20 mA DC, 0 to 20mA DC (Resolution: 12000) Allowable load resistance: Max. 550 Ω
DC voltage	0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC (Resolution: 12000) Allowable load resistance: Min. 1 kΩ
Open collector (NPN)	Allowable load current: Max. 100 mA Load voltage: Max. 30 V DC Residual voltage: Max. 1.2 V DC Leakage current when OFF: Max. 0.1 mA
Control output OUT2	
Relay contact	1a Control capacity: 3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load cosϕ=0.4) Electrical life: 100, 000 cycles Minimum applicable load: 10 mA 5 V DC
Non-contact voltage (for SSR drive)	12 V DC±15% Max. 40 mA (short circuit protected)
Direct current	4 to 20 mA DC, 0 to 20mA DC (Resolution: 12000) Allowable load resistance: Max. 550 Ω
DC voltage	0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC (Resolution: 12000) Allowable load resistance: Min. 1 kΩ

Relay contact	**Non-contact voltage Direct current DC voltage**	**Open collector**
		

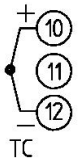
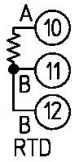
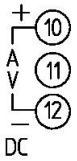
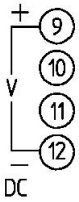
Number of Shinko SSR units when connected in parallel (for Non-contact voltage output):

• SA-500 series: 2 units

4.4.3 Input

Each input wiring is shown below.

For DC voltage input, (+) side input terminal number of 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC differs from that of 0 to 1 V DC.

Thermocouple	RTD	Direct current, DC voltage (0 to 1 V)	DC voltage (0 to 5 V, 1 to 5 V, 0 to 10 V)
			

4.4.4 Event Output 1, Event Output 2, Event Output 3

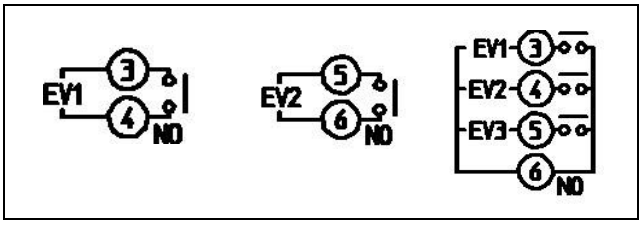
Event output EV1 is a standard feature.

If EV2 option is ordered, Event output EV2 is available.

If EV3 option is ordered, Event output EV3 is available.

Specifications of Event output 1, Event output 2 and Event output 3 are shown below.

Relay contact	1a Control capacity: 3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load cosϕ=0.4) Electrical life: 100, 000 cycles Minimum applicable load: 10 mA 5 V DC

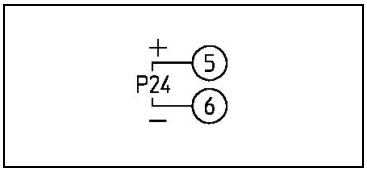


4.4.5 Insulated Power Output

If P24 option is ordered, the Insulated power output is available.

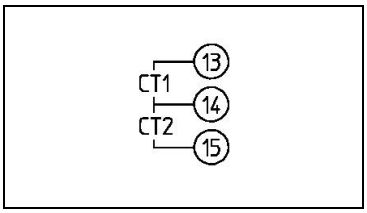
Specifications of Insulated power output are shown below.

Output voltage	24±3 V DC (at load current 30 mA DC)
Ripple voltage	Within 200 mV DC (at load current 30 mA DC)
Max load current	30 mA DC

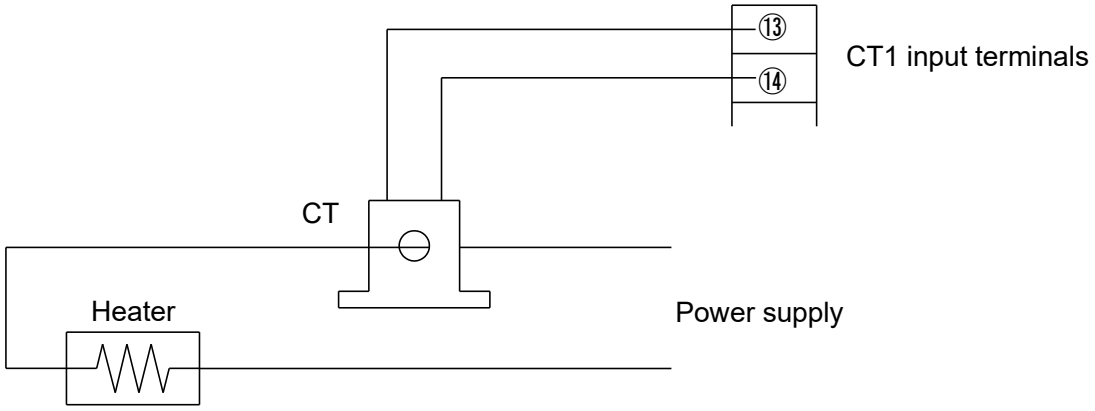


4.4.6 CT Input

CT input is available when Heater burnout alarm (C5W, W options) is ordered.

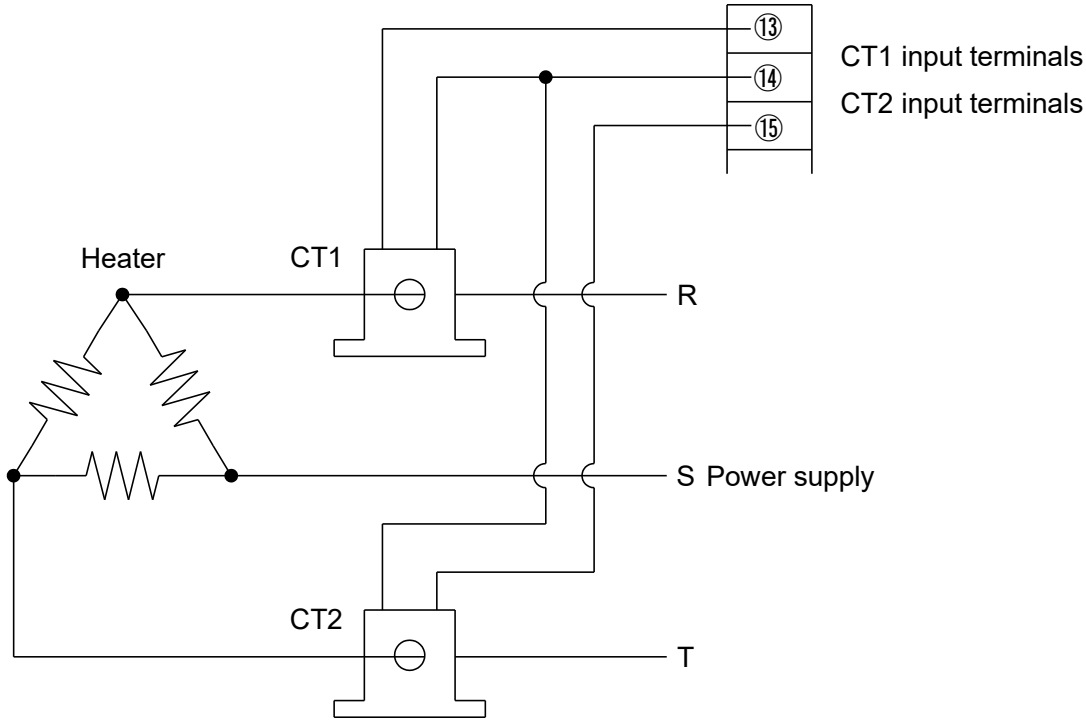


Pass one lead wire of the heater circuit into the hole of the CT. (Fig. 4.4.6-1)
When wiring, keep the CT wire away from AC sources or load wires to avoid the external interference.



(Fig. 4.4.6-1)

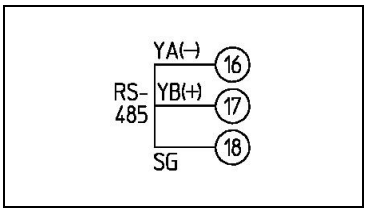
If using 3-phase, pass any 2 lead wires of R, S, T into the CT, and connect them to CT1 (⑬, ⑭) and CT2 (⑭, ⑮) terminals. (Fig. 4.4.6-2)



(Fig. 4.4.6-2)

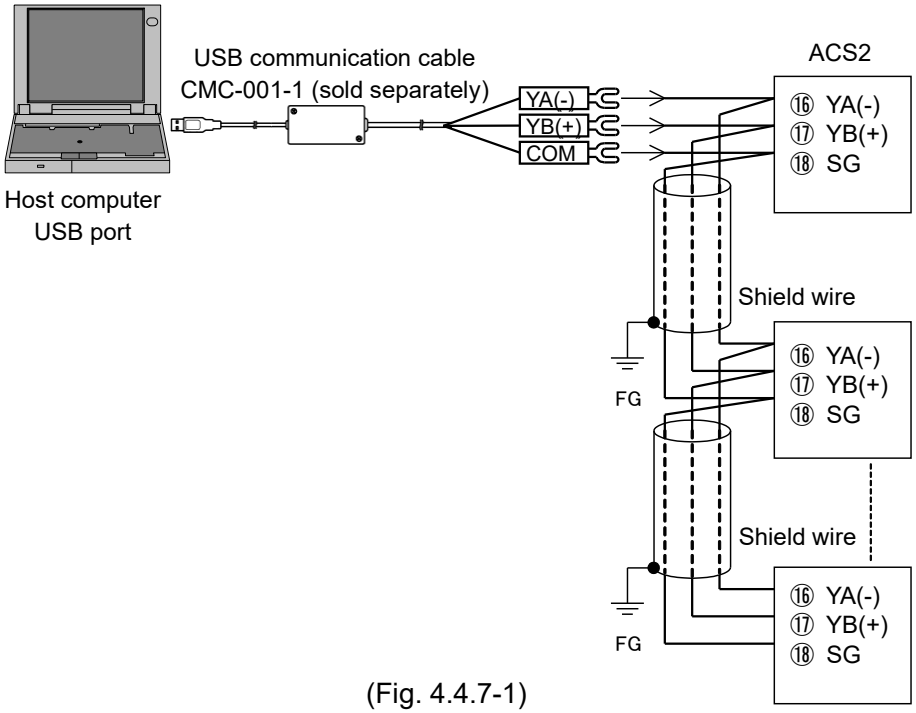
4.4.7 Serial Communication

If the C5, C5W (20A) or C5W (100A) option is ordered, Serial communication is available.



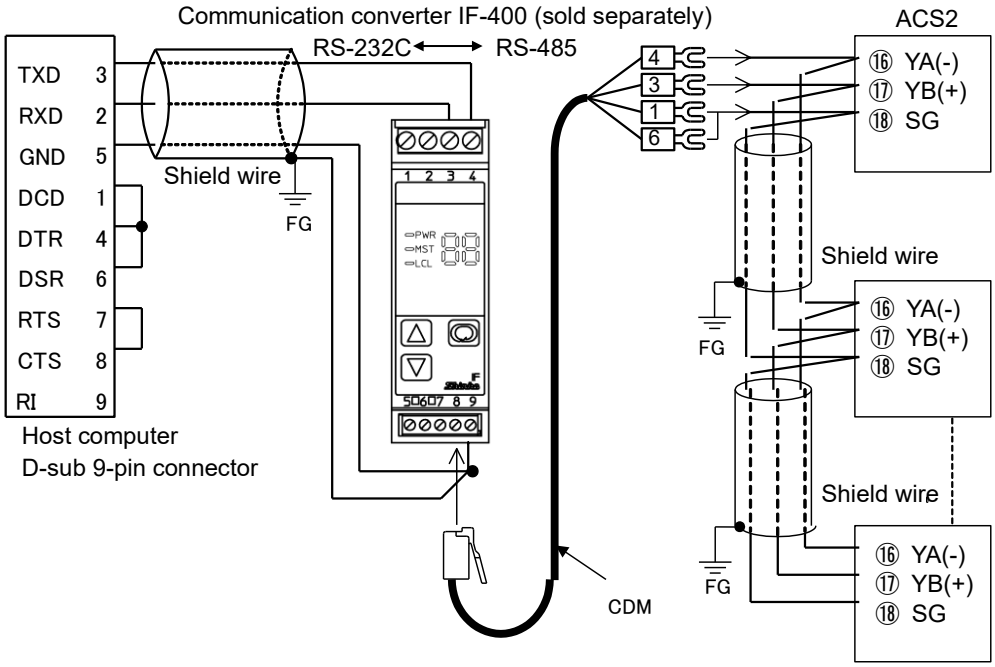
(1) Serial Communication

When using USB communication cable CMC-001-1 (sold separately)



(Fig. 4.4.7-1)

When using communication converter IF-400 (sold separately)



(Fig. 4.4.7-2)

(2) SV digital transmission

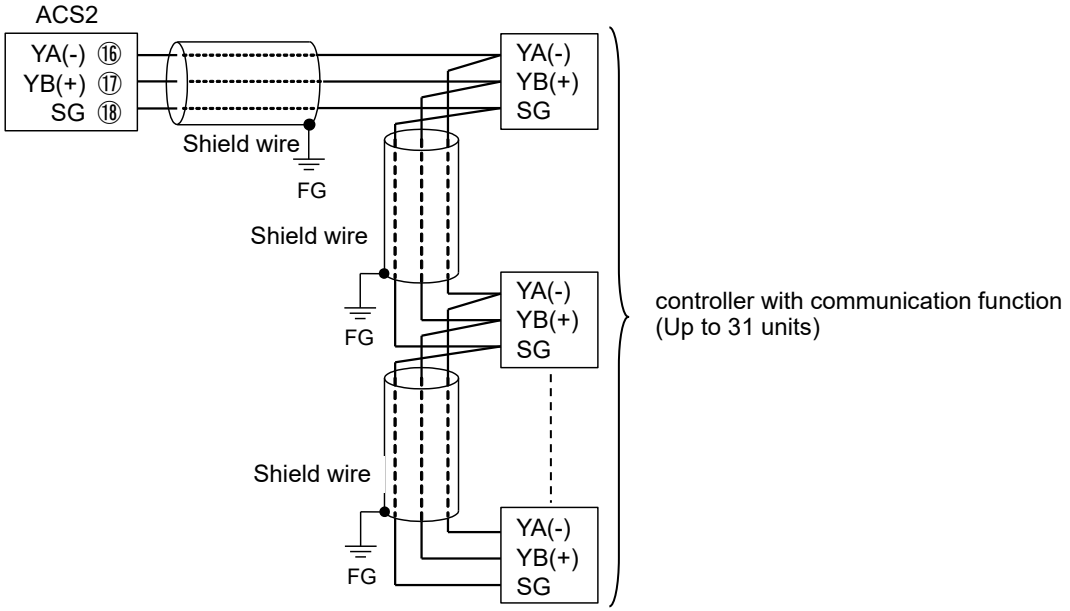
Selecting SV digital transmission in the serial communication protocol selection allows digital transmission of the SV when combined with a controller with communication function [Serial Communication (OP: C5, C5W)].

Wiring

For the SV digital transmission, connect YA (-) to YA (-), YB (+) to YB (+), SG to SG terminal respectively.

Up to 31 units can be connected.

Wiring example of controller with communication function and ACS2



(Fig. 4.4.7-3)

Shield wire

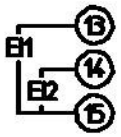
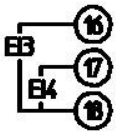
Connect only one end of the shield to the FG to avoid a ground loop. If both ends of the shield wire are connected to the FG, the circuit will be closed, resulting in a ground loop. This may cause noise. Be sure to ground the FG.

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

4.4.8 Event Input

4 points (EI1 to EI4) are added as event inputs.
For options other than C5W and EI, 2 points (EI1 and EI2) are added simultaneously.
The event allocated via the event input allocation selection is executed based on whether the allocated event is in the ON (closed) or OFF (open) state.
Specifications of Event input are shown below.

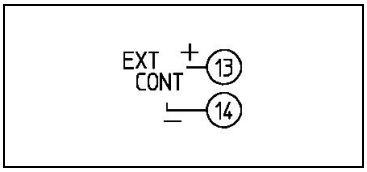
Circuit current when closed	Approx. 2.3 mA

EI1, EI2	EI3, EI4
	

4.4.9 External Setting Input

If the EA option is ordered, External setting input is available.
Specifications of External setting input are shown below.

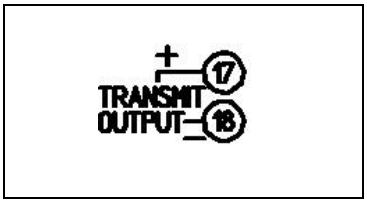
Setting signal	Direct current 4 to 20 mA DC
Allowable input	50 mA DC Max.
Input impedance	50 Ω Max.
Input sampling period	100 ms



4.4.10 Transmission Output

If the TA and TV options are ordered, Transmission output is available.
Specifications of Transmission output are shown below.

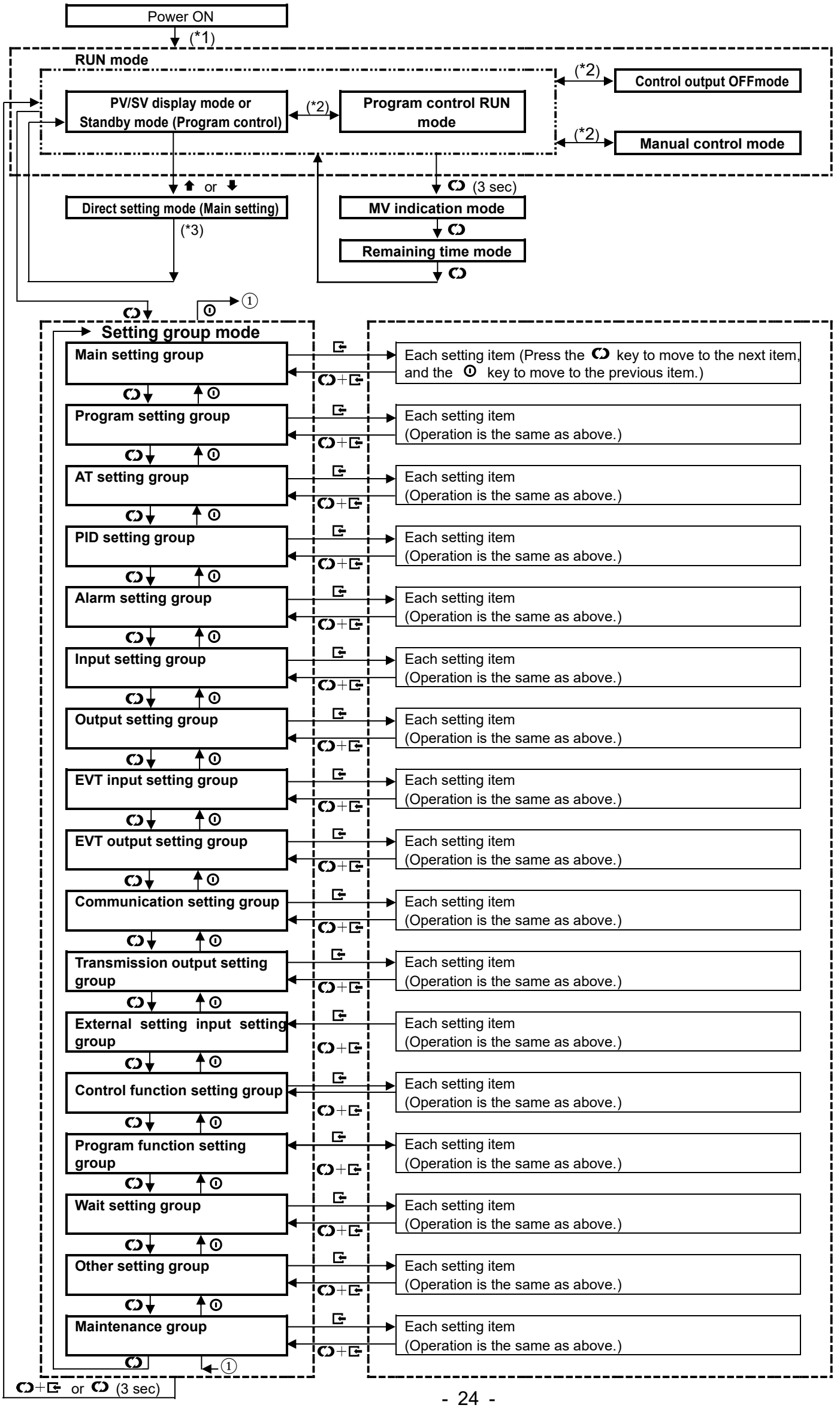
Resolution	12000
Output	4 to 20 mA DC Load resistance: Max. 550 Ω 0 to 1V DC Load resistance: Min. 1 kΩ 0 to 10V DC Load resistance: Min. 1 kΩ
Output accuracy	Within ±0.3% of Transmission output span



5. Outline of Key Operation and Each Mode

5.1 Key Operation

The key operations outline is shown below.



(*1): Control starts from previous status (last shutdown).
(*2): To switch from PV/SV display mode to control output OFF mode or manual control mode, use the ⏻ or ⏎ key.
(*3): No operation for 2 seconds or pressing the ↺ key will return to the PV/SV display mode.

[Key Operation]

↺ (3 sec): Press and hold the ↺ key for approx. 3 seconds.

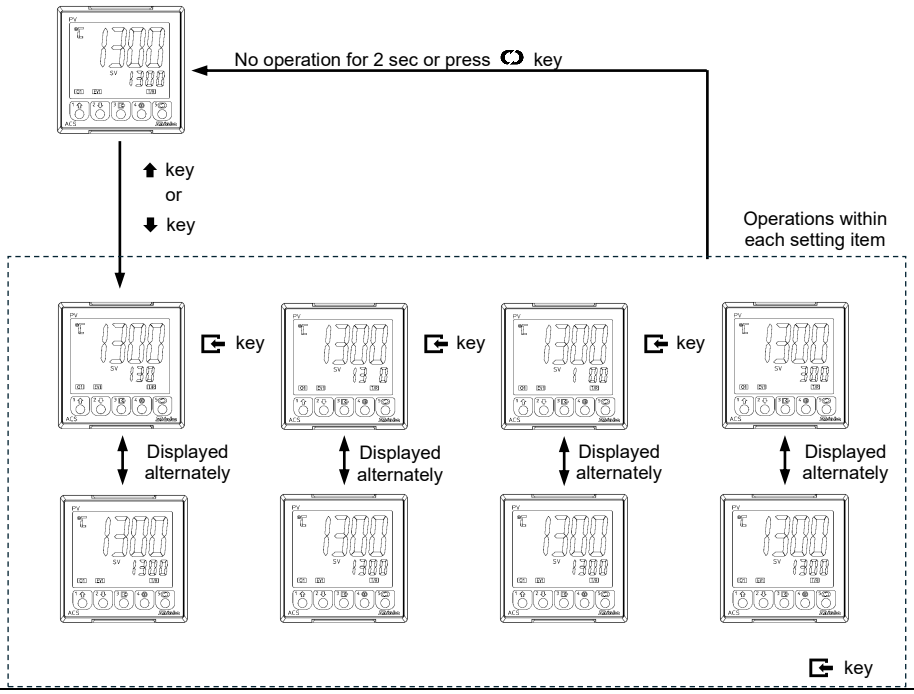
↺+⏎: Press and hold the ↺ and ⏎ keys together.

Settings for each setting item: Use the ↑ and ↓ keys to change the value, the ⏎ key to select the digit for numerical input, and the ↺ key to register it.

Selection of each selection item: Use the ↑ and ↓ keys for settings or selections, and register them by pressing the ↺ key.

5.2 Modes

The descriptions of each mode are shown below.

<table>
<tr><th>Mode</th><th>Description</th></tr>
<tr><td>RUN mode
PV/SV display mode or
Standby mode (Program control)</td><td>The PV Display indicates PV, and the SV Display indicates SV.
When the standby mode is active (program control), the PV display indicates the PV. The SV display is off.
Control starts from previous status (last shutdown).
To switch from PV/SV display mode to control output OFF mode or manual control mode, use the ⏻ or ⮆ key.
Depending on the function selection for the ⏻ key or ⮆ key, the operation will be as follows:
<table>
<tr><th>Function selection for ⏻ key or ⮆ key</th><th>Description</th></tr>
<tr><td>No function</td><td>It will become no function.</td></tr>
<tr><td>Auto/Manual control</td><td>Switches the Auto/Manual control.</td></tr>
<tr><td>Control output OFF function</td><td>Turns the control output ON or OFF.</td></tr>
<tr><td>Remote/Local selection</td><td>Switches the Remote/Local.</td></tr>
<tr><td>RUN/STOP function</td><td>Switches the RUN/STOP of Program control.</td></tr>
</table></td></tr>
<tr><td>Direct setting mode
(Main setting)</td><td>In PV/SV display mode, pressing the ⮝ or ⮟ key switches to Direct setting mode (only during Fixed value control) to set the SV.
When selecting the set value memory function in Event input allocation setting, configure SV1 to SV8.
After switching to Direct setting mode, the first digit flashes.
Press the ⮆ key to advance the digit.
 
</td></tr>
<tr><td>MV indication mode</td><td>In PV/SV display mode, press and hold the ⟲ key for approximately 3 seconds to enter MV indication mode.
The PV display shows PV, and the SV display shows MV.
The decimal point in the first digit flashes.</td></tr>
<tr><td>Remaining time mode</td><td>In MV indication mode, pressing the ⟲ key switches to Remaining time mode (only during program control).
The PV display shows the PV value, and the SV display shows the remaining time.</td></tr>
</table>

Mode	Description
Setting group mode	In PV/SV display mode or Standby mode (Program control), pressing the key switches to Setting group mode. After switching to Setting group mode, press the key to move to each setting group, and press the key to move in the opposite direction. Pressing the key in each setting group item moves to items within that group. After moving to items within the group, press the key to move to each setting item, and press the key to move in the opposite direction. By pressing the and keys (in that order) together to move to each setting group item within the group. When changing the selection items for Input type selection, Temperature unit selection, Event output EV□ allocation setting, Transmission output type selection, Control action selection, or Integral/Derivative decimal point place selection within the group, or when executing Date clear setting or Program clear setting, the PV display will turn off and [LoAd] will appear on the SV display due to the large number of items requiring update. Key operations are disabled while [LoAd] is displayed. Standby mode can transition to Setting group mode in the same manner as PV/SV display mode from Program control RUN mode. When transitioning from Setting group mode, it will transition to the mode immediately preceding the transition.

5.3 Basic Operation after Power-ON

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

(1) Turn the power supply to the unit ON

After power-on, the PV Display shows [GAtE] and the SV Display shows [□□UP]. Subsequently, for approximately 3 seconds, the PV Display shows the input type and temperature unit selection, while the SV Display shows the input range high limit (for thermocouple or RTD inputs) or the scaling high limit (for DC voltage or direct current inputs).

Control will then start, indicating the PV on the PV Display and SV on the SV Display.

(Table 5.3-1)

Sensor Input	℃		℉	
	PV Display	SV Display	PV Display	SV Display
K	t□□C	1370	t□□F	2498
	t8 .C	800.0	t8 .F	1472.0
	t4 .C	400.0	t4 .F	752.0
J	J□□C	1000	J□□F	1832
	J□ .C	400.0	J□ .F	752.0
R	r□□C	1760	r□□F	3200
S	S□□C	1760	S□□F	3200
B	b□□C	1820	b□□F	3308
E	E□□C	□800	E□□F	1472
T	T□ .C	400.0	T□ .F	752.0
N	n□□C	1300	n□□F	2372
PL-Ⅱ	PL2C	1390	PL2F	2534
C(W/Re5-26)	c□□C	2315	c□□F	4199
Pt100	Pt .C	850.0	Pt .F	1562.0
Pt100	Pt□C	□850	Pt□F	1562
Pt100	Pt 1C	100.0	Pt 1F	212.0
4 to 20 mA DC (*1) (*2)	4201	Scaling high limit value		
0 to 20 mA DC (*1) (*2)	0201			
4 to 20 mA DC (*1) (*3)	420E			
0 to 20 mA DC (*1) (*3)	020E			
0 to 1 V DC	0□ 1V			
0 to 5 V DC	0□5V			
1 to 5 V DC	1□5V			
0 to 10 V DC	0 10V			

(*1): Selectable input range and decimal point position.

(*2): It has a built-in shunt resistor (50Ω).

(*3): The separately sold shunt resistor (50Ω) is attached externally.

When power is turned ON, if an error occurs, the following error will be displayed on the PV Display.

Error	PV Display
Non-volatile IC memory error	[Err 1] is lit
Internal bus error in the instrument	Periodic reset of the instrument (malfunction)
Sensor error (outside high limit range)	[----] is flashing
Sensor error (outside low limit range)	[----] is flashing

(2) Enter each value

Refer to Sections '6. Initial Setting' (p.34) to '8. Operation and Settings of Standard Functions' (p.107): Enter each value: Input type, Control method, Direct/Reverse action, SV, PID values, Event output EV1 allocation, etc.

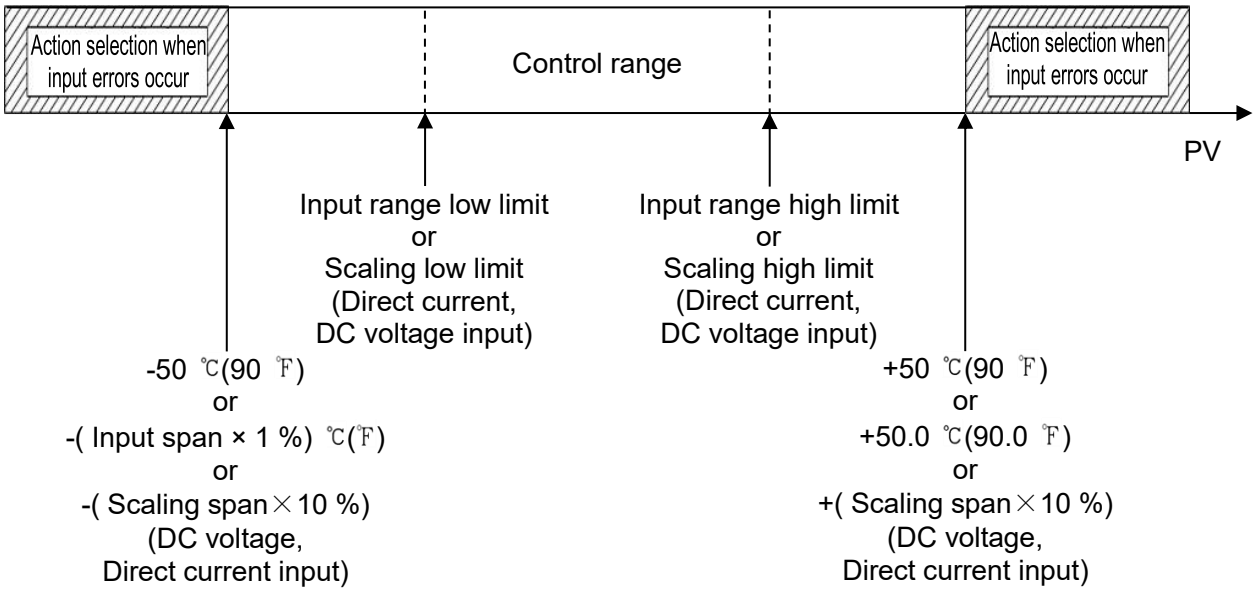
(3) Turn the load circuit power ON

Control starts, so as to reach, and then maintain the control target at the SV.

• Indication Range and Control Range

The indication range and control range for each input are as follows.

Input Type	Indication Range and Control Range
Thermocouple (no decimal point)	[Input range low limit – 50℃ (90℉)] to [Input range high limit + 50℃ (90℉)]
Thermocouple (with decimal point), RTD	[Input range low limit – (Input span × 1 %) ℃(℉)] to [Input range high limit + 50.0 ℃(90.0 ℉)]
DC voltage, Direct current	[Scaling low limit – Scaling span x 10%] to [Scaling high limit + Scaling span x 10%]



(Fig. 5.3-1)

• **Overscale and Underscale**

Overscale

The following input range is overscale, and the overscale status flag is set.

However, control operation continues during overscale.

Thermocouple (no decimal point)

Input range high limit to Input range high limit + 50 ℃(90 ℉)

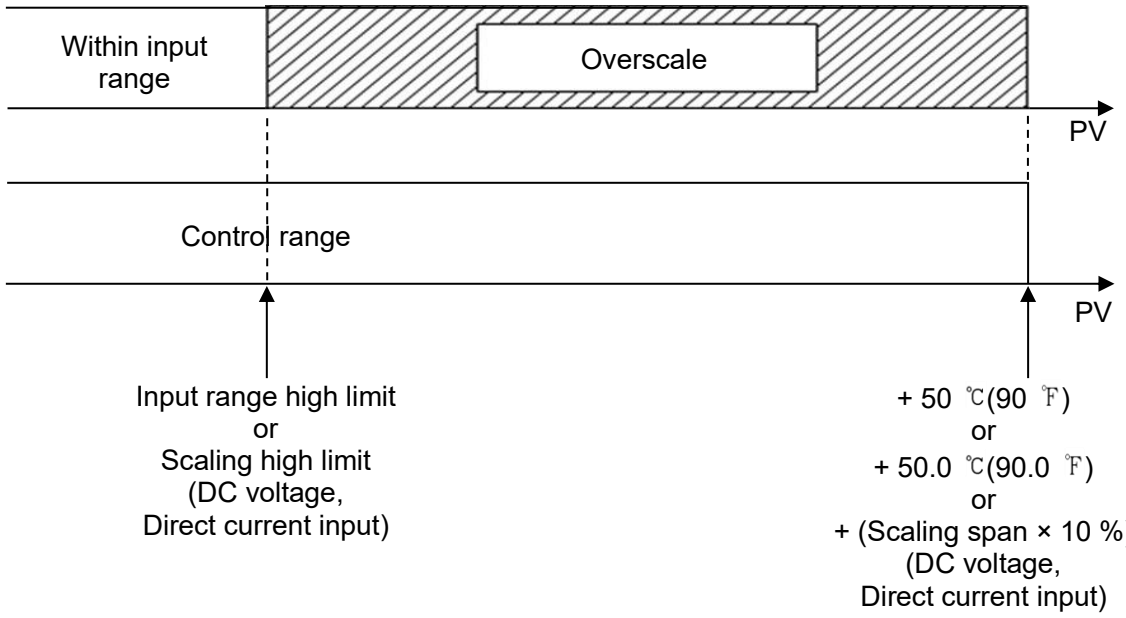
Thermocouple (with decimal point), RTD

Input range high limit to Input range high limit + 50.0 ℃(90.0 ℉)

DC voltage, Direct current

Scaling high limit to Scaling high limit + (Scaling span × 10 %)

※ If the scaling high limit is 19999 or higher, [- - - -] is displayed, and the control range extends up to the scaling high limit + (scaling span × 10%).



(Fig. 5.3-2)

Underscale

The following input range is underscale, and the underscale status flag is set.

However, control operation continues during underscale.

Thermocouple (no decimal point)

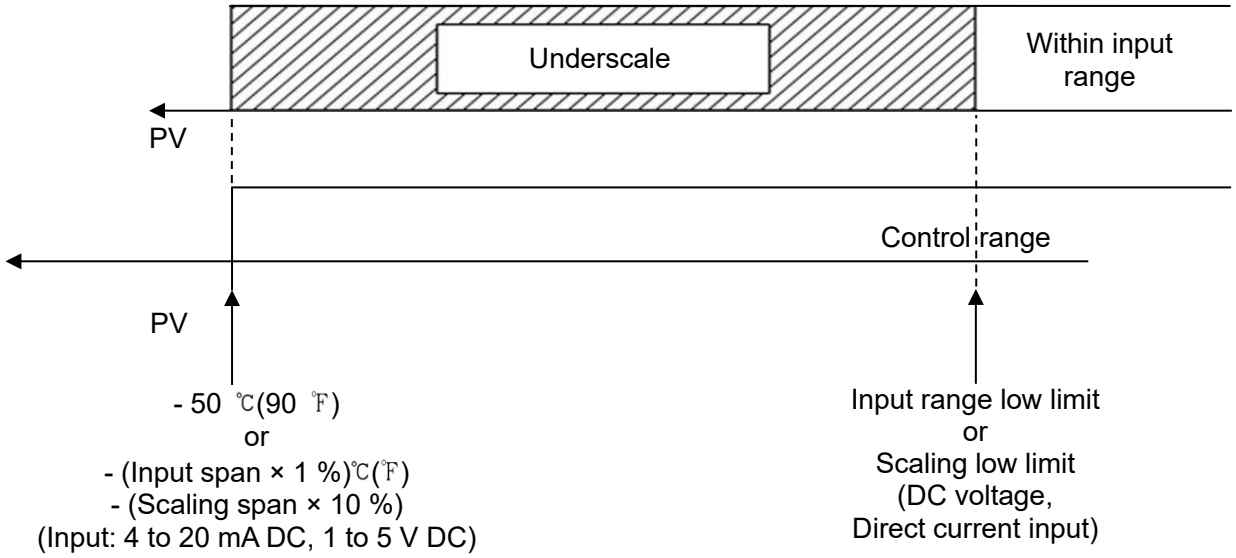
Input range low limit - 50 ℃(90 ℉) to Input range low limit

Thermocouple (with decimal point), RTD

Input range low limit - (Input span ×1 %) ℃(℉) to Input range low limit

Direct current (4 to 20mA）, DC voltage (1 to 5V) input

Scaling low limit - (Scaling span × 10 %) to Scaling low limit



(Fig. 5.3-3)

• **Sensor error**

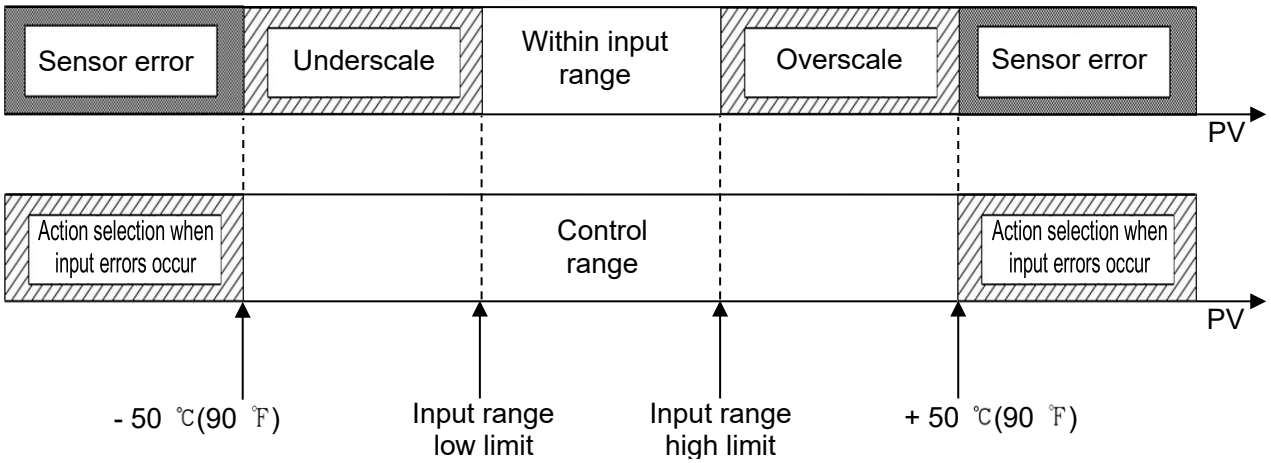
Thermocouple input (no decimal point) burnout condition

Below Input range low limit - 50 ℃(90 ℉)

The PV Display will flash [- - - -], and the action selected in Action selection when input errors occur will be performed.

Above Input range high limit + 50 ℃(90 ℉)

The PV Display will flash [¯ ¯ ¯ ¯], and the action selected in Action selection when input errors occur will be performed.



(Fig. 5.3-4)

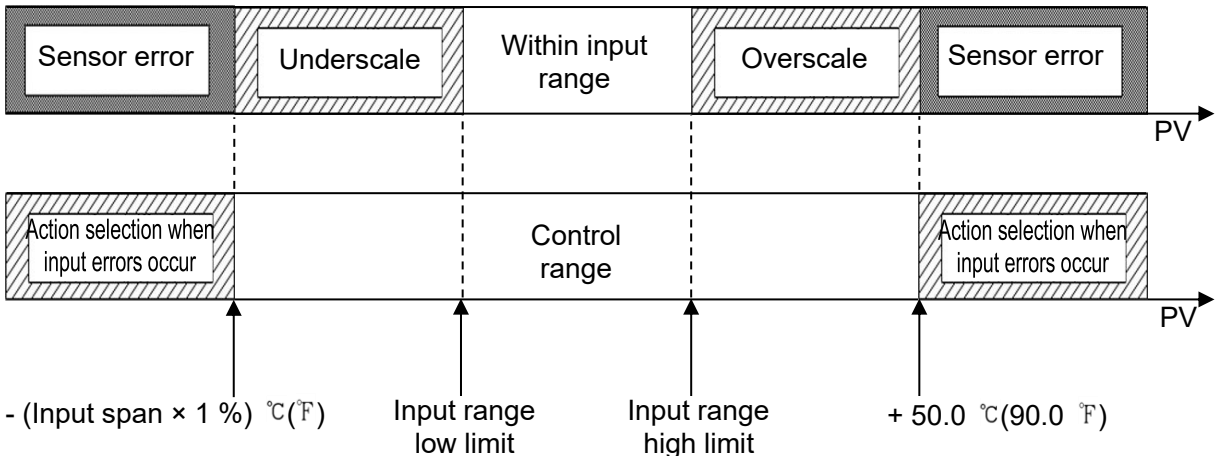
Thermocouple input (with decimal point) and RTD input burnout condition

Below Input range low limit - (Input span × 1 %)℃(℉)

The PV Display will flash [- - - -], and the action selected in Action selection when input errors occur will be performed.

Above Input range high limit + 50.0 ℃(90.0 ℉)

The PV Display will flash [¯ ¯ ¯ ¯], and the action selected in Action selection when input errors occur will be performed.



(Fig. 5.3-5)

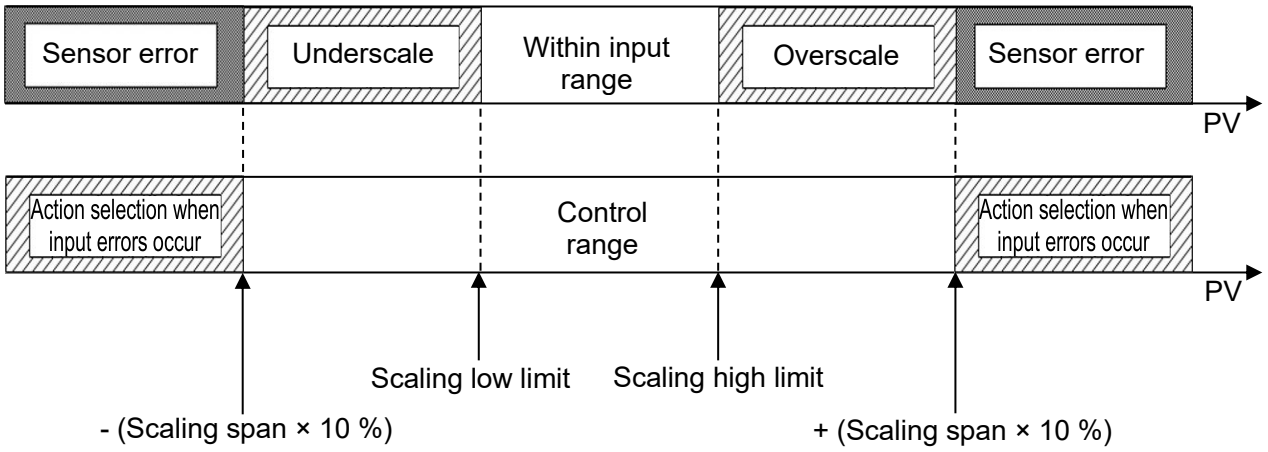
DC voltage, Direct current input burnout condition

Below Scaling low limit - (Scaling span × 10 %)

The PV Display will flash [- - - -], and the control output turns OFF.

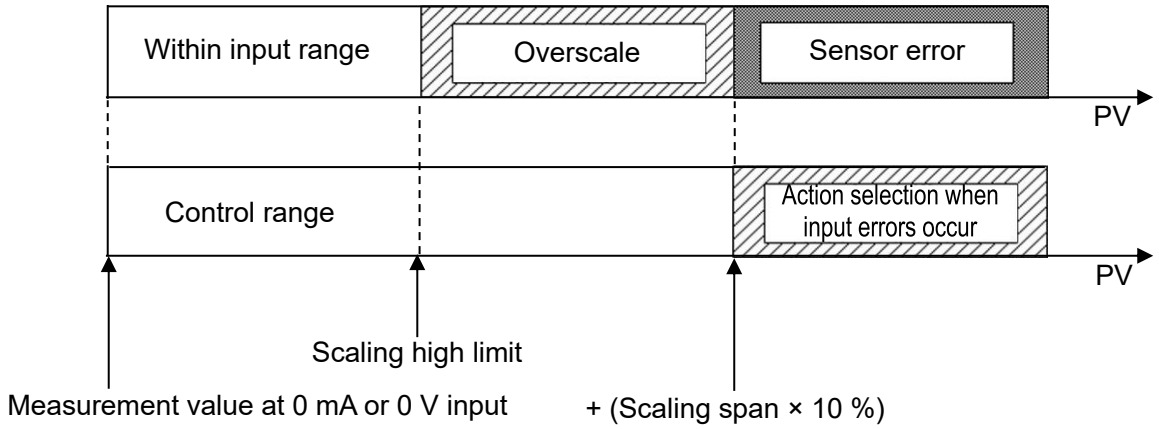
Above Scaling high limit + (Scaling span × 10 %)

The PV Display will flash [¯ ¯ ¯ ¯], and the control output turns OFF.



(Fig. 5.3-6)

However, for 0 to 20 mA, 0 to 1 V, 0 to 5 V, and 0 to 10 V, the measured value corresponds to the input at 0 mA or 0 V.



(Fig. 5.3-7)

• **Cold junction error**

If the internal cold junction temperature falls below -10 ℃ (14 ℉) or exceeds 55 ℃ (131 ℉), a cold junction error occurs.

(When thermocouple input is selected)

• **Internal bus error**

If there is a fault or other abnormality in the internal circuitry, the control output will turn OFF.

6. Initial Setting

Setup (setting the Input type, Event output allocation, SV, etc.) should be done before using this controller, according to the user's conditions.

Initial settings are configured in the Setting group mode.

The Setting group mode includes setting groups such as Main setting group, AT setting group, PID setting group, Input setting group, Output setting group, EVT input setting group, EVT output setting group, and Other setting group.

The factory default settings for the Setting group mode are as follows.

If the user's specification is the same as the factory default value of this instrument, or if user's instrument has already been installed in a system, initial settings are not necessary.

Proceed to Section '7. Settings' (p.57).

• Main setting group

Setting Item	Factory Default
SV1 setting	0

• AT setting group

Setting and Selection Item	Factory Default
AT perform/cancel selection	AT cancel
AT action model selection	Normal AT
AT bias setting	20
AT gain setting	1.0
AT hysteresys setting	0.5

• PID setting group

Setting Item	Factory Default
Block1 OUT1 Proportional band setting	10
Block1 OUT1 Integral time setting	200
Block1 OUT1 Derivative time setting	50
Block1 OUT2 Proportional band setting [Option1: EV2, O2(SSR/A)]	10
Block1 OUT2 Integral time setting [Option1: EV2, O2(SSR/A)]	200
Block1OUT2 Derivative time setting [Option1: EV2, O2(SSR/A)]	50
Block1 MV bias setting	0.0
Block1 Overlap/Dead band setting [Option1: EV2, O2(SSR/A)]	0.0
The same applies up to block number 8.	
Block8 OUT1 Proportional band setting	10
Block8 OUT1 Integral time setting	200
Block8 OUT1 Derivative time setting	50
Block8 OUT2 Proportional band setting [Option1: EV2, O2(SSR/A)]	10
Block8 OUT2 Integral time setting [Option1: EV2, O2(SSR/A)]	200
Block8 OUT2 Derivative time setting [Option1: EV2, O2(SSR/A)]	50
Block8 MV bias setting	0.0
Block8 Overlap/Dead band setting [Option1: EV2, O2(SSR/A)]	0.0

• **Input setting group**

Setting and Selection Item	Factory Default
Input type selection	K -200 to 1370 ℃
Temperature unit selection	Celsius
Scaling high limit setting	1370
Scaling low limit setting	-200
Decimal point place selection	No decimal point
Input sampling selection	125 ms
Moving average count setting	1
Sensor correction coefficient setting	1.000
Sensor correction setting	0.0
PV filter time constant setting	0.0

• **Output setting group**

Setting and Selection Item	Factory Default
OUT2 output type selection	SSR output
OUT1 proportional cycle setting	Relay contact output: 30.0 sec Non-contact voltage output: 3.0 sec Open collector output: 3.0 sec
OUT1 ON/OFF hysteresis setting	1.0
OUT1 high limit setting	100.0
OUT1 low limit setting	0.0
OUT1 rate of change limit setting	0.00
OUT2 output type selection [Option1: EV2, O2(SSR/A)]	SSR output
OUT2 cooling method selection [Option1: EV2, O2(SSR/A)]	Air cooling
OUT2 proportional cycle setting [Option1: EV2, O2(SSR/A)]	Relay contact output: 30.0 sec Non-contact voltage output: 3.0 sec Open collector output: 3.0 sec
OUT2 ON/OFF hysteresis setting [Option1: EV2, O2(SSR/A)]	1.0
OUT2 high limit setting [Option1: EV2, O2(SSR/A)]	100.0
OUT2 low limit setting [Option1: EV2, O2(SSR/A)]	0.0
Direct/Reverse action selection	Reverse action
Pre-set output setting 1 (Option2: except EI or C5W)	0.0
Pre-set output setting 2 [Option1: EV2, O2(SSR/A)] (Option2: except EI or C5W)	0.0
Action selection when input errors occur	MV when input error occur
OUT1 MV setting when input errors occur	0.0
OUT2 MV setting when input errors occur Option1: EV2, O2(SSR/A)]	0.0

• **EVT input setting group (Option 2: except C5W)**

Selection Item	Factory Default
Event input EI1 allocation setting	No event
Event input EI2 allocation setting	No event
Event input EI3 allocation setting	No event
Event input EI4 allocation setting	No event

• **EVT output setting group**

Selection Item	Factory Default
Event output EV1 allocation setting	No event
Event output EV2 allocation setting (Option1: EV2) (Option1: EV3)	No event
Event output EV3 allocation setting (Option1: EV3)	No event

• **Communication setting group (Option 2: C5 or C5W)**

Setting and Selection Item	Factory Default
Communication protocol selection	Shinko protocol
Instrument number setting	0
Communication speed selection	9600 bps
Data bit/Parity selection	7 bits/Even
Stop bit selection	1 bit
Response delay time	0
SVTC bias	0

• **Transmission output setting group (Option 2: TA)**

Setting and Selection Item	Factory Default
Transmission output type selection	PV transmission
Transmission output high limit setting	1370
Transmission output low limit setting	-200

• **External setting input setting group (Option 2: EA)**

Setting and Selection Item	Factory Default
Remote/Local selection	Local
External setting input high limit setting	1370
External setting input low limit setting	-200
Remote bias setting	0

• **Control function setting group**

Setting and Selection Item	Factory Default
Control action selection	2 DOF PID control
Proportional gain 2 DOF coefficient setting	0.40
Integral 2 DOF coefficient setting	1.35
Derivative 2 DOF coefficient setting	0.00
Desired value proportional coefficient setting	1.00
Gap width setting item	0.0
Gap coefficient setting item	1.0
Integral/Derivative decimal point place selection	No decimal point

• Program function setting group

Selection Item	Factory Default
Fixed value control/program control selection	Fixed value control

• Other setting group

Setting and Selection Item	Factory Default
Set value lock selection	Unlock
SV Rise/Fall rate action selection	PV start
SV Rise/Fall rate time unit selection	Minute
SV rise rate setting	0
SV fall rate setting	0
LCD display part selection	All parts
SV display method selection	Setting desired value
Indication when control output OFF selection	OFF indication
OUT/OFF key function selection	No function
PF key function selection	No function
Auto/Manual control after power ON selection	Automatic control
Indication time setting	00:00
Non-volatile IC memory saving selection	Save

• Maintenance group

Setting and Selection Item	Factory Default
EVT input indication	No input
EVT output ON setting	OFF
OUT1 output setting	0.0
OUT2 output setting [Option1 : EV2, O2(SSR/A)]	0.0
Transmission output setting	0.0
Data clear Yes/No setting	No
Program clear Yes/No setting	No

6.1 Power-ON

After power-on, the PV Display shows [ ] and the SV Display shows [ ]. Subsequently, for approximately 3 seconds, the PV Display shows the input type and temperature unit selection, while the SV Display shows the input range high limit (for thermocouple or RTD inputs) or the scaling high limit (for DC voltage or direct current inputs).

Control will then start, indicating the PV on the PV Display and SV on the SV Display.

(Table 6.1-1)

Sensor Input	℃		℉	
	PV Display	SV Display	PV Display	SV Display
K		1370		2498
		800.0		1472.0
		400.0		752.0
J		1000		1832
		400.0		752.0
R		1760		3200
S		1760		3200
B		1820		3308
E		800		1472
T		400.0		752.0
N		1300		2372
PL-Ⅱ		1390		2534
C(W/Re5-26)		2315		4199
Pt100		850.0		1562.0
Pt100		850		1562
Pt100		100.0		212.0
4 to 20mA DC(*1)(*2)	4201	Scaling high limit value		
0 to 20mA DC(*1)(*2)	0201			
4 to 20mA DC(*1)(*3)	420E			
0 to 20mA DC(*1)(*3)	020E			
0 to 1V DC	0 1V			
0 to 5V DC	0 5V			
1 to 5V DC	1 5V			
0 to 10V DC	0 10V			

(*1): Selectable input range and decimal point position.

(*2): It has a built-in shunt resistor (50Ω).

(*3): The separately sold shunt resistor (50Ω) is attached externally.

6.2 Basic Operation of Settings

To enter each setting mode, refer to the respective setting mode.

In the PV/SV display mode, pressing the key will enter the setting group mode.

After entering the setting group mode, press the key to enter to each setting group and the key to enter in the opposite direction.

Pressing the key in each setting group item will move to items within that group.

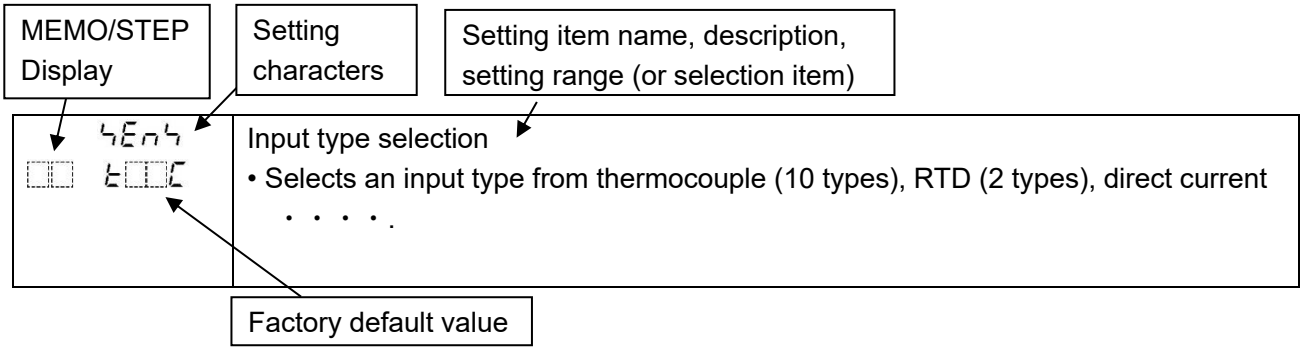
When entering to items within a group, press the key to enter to each setting item and the key to move in the opposite direction.

Within a group, press the key while holding down the key to enter to each setting group item.

6.3 Initial Setting

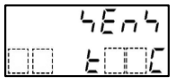
6.3.1 Input Setting Group

Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the setting (selection) item name, description, and setting range (selection items).



To enter the Input Settings group, follow the steps below.

① In PV/SV display mode, press the ↺ key several times until the character of the input setting group is displayed.

②  Press the ⊡ key.
Enter the Input type selection.

Characters, Factory Default	Setting Item, Function, Setting Range	
	Input type selection • Selects an input type from thermocouple (10 types), RTD (1 types), direct current (4 types) and DC voltage (4 type). • When changing the input from DC voltage to other inputs, remove the sensor connected to this controller first, then change the input. If the input is changed with the sensor connected, the input circuit may break. • When changing an input type, refer to Section “8.9 Items to be Initialized by Changing Settings” (p.131). • Selection item:	
	K	K -200 to 1370 ℃
	K	K -200.0 to 800.0 ℃
	K	K -200.0 to 400.0 ℃
	J	J -200 to 1000 ℃
	J	J -200.0 to 400.0 ℃
	R	R 0 to 1760 ℃
	S	S 0 to 1760 ℃
	B	B 0 to 1820 ℃
	E	E -200 to 800 ℃
	T	T -200.0 to 400.0 ℃
	N	N -200 to 1300 ℃
	PL-II	PL-II 0 to 1390 ℃
	C	C(W/Re5-26) 0 to 2315 ℃

Characters, Factory Default	Setting Item, Function, Setting Range	
SEnS □□ tC□C	Pt .C	Pt100 -200.0 to 850.0 ℃
	Pt□C	Pt100 -200 to 850 ℃
	Pt 1C	Pt100 -100.0 to 100.0 ℃
	4201	4 to 20 mA DC (*1) -19999 to 19999
	0201	0 to 20 mA DC (*1) -19999 to 19999
	420E	4 to 20 mA DC (*2) -19999 to 19999
	020E	0 to 20 mA DC (*2) -19999 to 19999
	0□ 1V	0 to 1 V DC -19999 to 19999
	0□5V	0 to 5 V DC -19999 to 19999
	1□5V	1 to 5 V DC -19999 to 19999
	0 10V	0 to 10 V DC -19999 to 19999
CorF □□ C□□□	**Temperature unit selection** • Select the temperature sensor units: Celsius or Fahrenheit. • Selection item:	
	C□□□	Celsius
	F□□□	Fahrenheit
SCLH □□ 1370	**Scaling high limit setting** • Sets scaling high limit value. • Setting range: Scaling low limit value to Input range high limit value	
SCLL □□ -200	**Scaling low limit setting** • Sets scaling low limit value. • Setting range: Input range low limit value to Scaling high limit value	
dP□□ □□ □□□□0	**Decimal point place selection** • Selects decimal point place. • Selection item:	
	□□□□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
	1.0000	4 digits after decimal point
	Available only for DC voltage and current inputs	
SPS□ □□ □ 125	**Input sampling selection** • Selects sampling period. • Selection item:	
	□ 125	125 ms
	□□50	50 ms
	□□ 10	10 ms
AVrG □□ □□□ 1	**Moving average count setting** • Sets number of times to average fluctuations in input values. • Setting range: 1 to 10	

(*1): It has a built-in shunt resistor (50Ω).

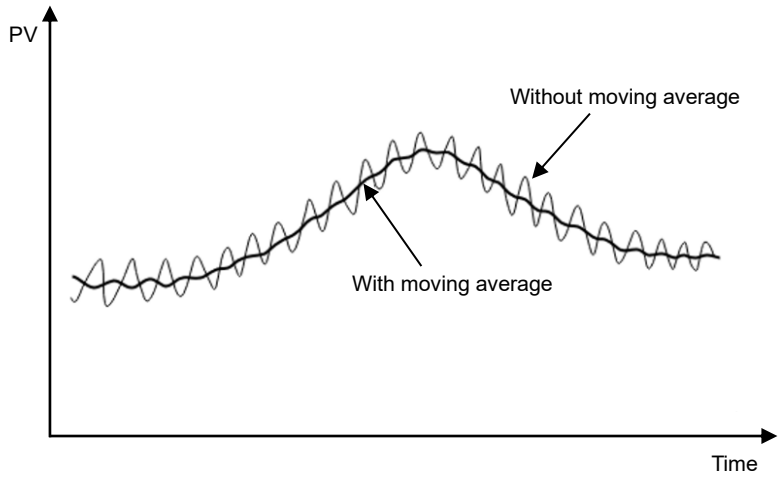
(*2): The separately sold shunt resistor (50Ω) is attached externally.

Characters, Factory Default	Setting Item, Function, Setting Range
SoE□ □□ 1.000	**Sensor correction coefficient setting** • Sets sensor correction coefficients. • Setting range: 0.000 to 10.000
So□□ □□ □□0.0	**Sensor correction setting** • Sets sensor correction values. • Setting range: -100.0 to 100.0 ℃(-180.0 to 180.0 ℉) DC voltage, current inputs: -1000 to 1000
FILT □□ □□0.0	**PV filter time constant setting** • Sets PV filter time constant. • Setting range: 0.0 to 10.0 seconds

[Number of moving average setting]

By averaging values that fluctuate due to noise, the display value is stabilized.

Moving average count: 1 to 10 times



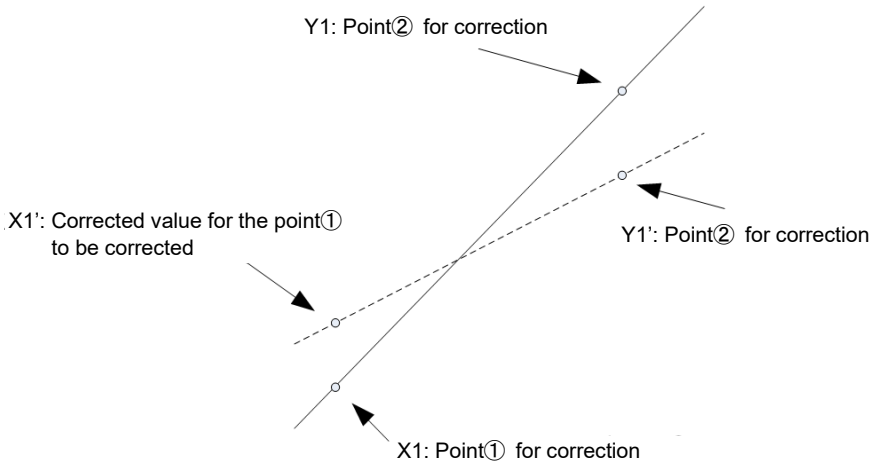
(Fig. 6.3.1-1)

[Sensor correction coefficient setting]

The slope of the sensor input value can be set.

The slope is set to the value calculated using formula ①.

Correction range: 0.000 to 10.000



(Fig. 6.3.1-2)

$$\frac{Y1' - X1'}{Y1 - X1} = \text{Sensor correction coefficient setting} \quad ①$$

[Sensor correction setting]

When the temperature at the control point differs from the temperature at the sensor installation point, the PV is shifted to compensate.

(This is effective within the input rating range, regardless of the sensor correction value.)

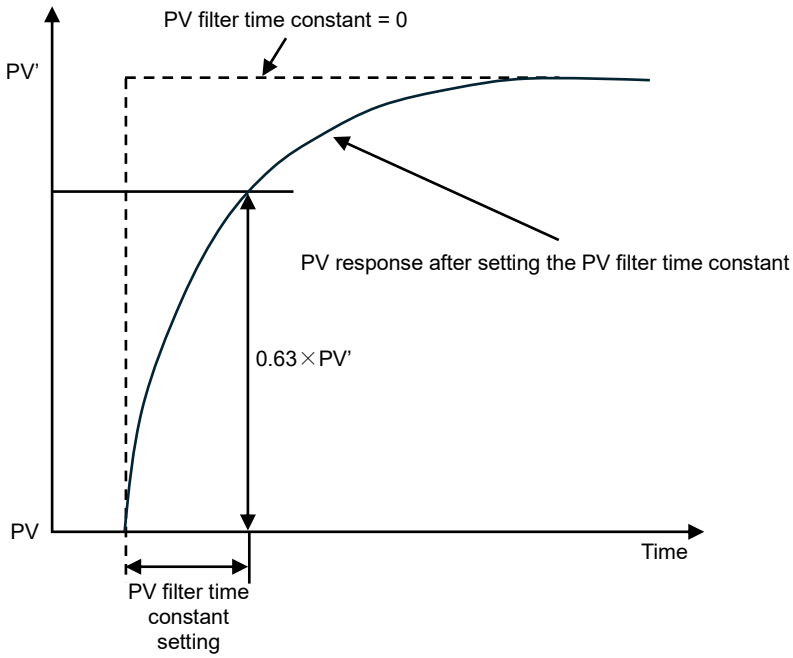
Correction range: -100.0 to 100.0 ℃(-180.0 to 180.0 ℉)

DC voltage, current inputs: -1000 to 1000

[PV filter time constant setting]

A digital first-order low pass filter reduces fluctuations in input values caused by noise.

PV filter time constant: 0.0 to 10.0 seconds

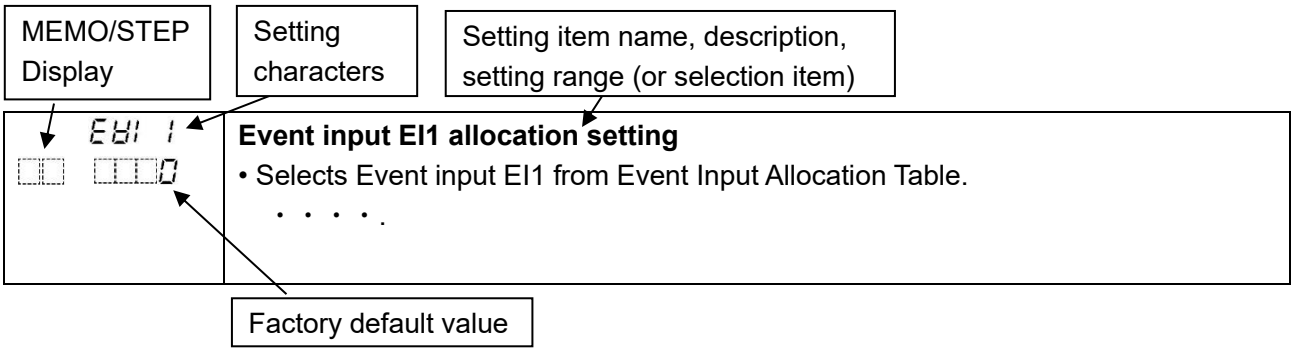


(Fig. 6.3.1-3)

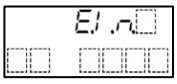
6.3.2 EVT Input Setting Group

If (Option2: except C5W) is not added, this setting group will not be displayed.

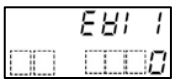
Explanation of setting items:
The upper section of the left column shows the PV Display setting character, while the lower right section shows the factory default value for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the setting item name, description, and setting range (or selection item).



To enter the EVT input setting group, follow the steps below.

① 

In PV/SV display mode, press the ↺ key several times until the character of the EVT input setting group is displayed.



Press the ⊏ key.
Enter the Event input EI1 allocation setting.

Characters, Factory Default	Setting Item, Function, Setting Range				
EVI 1 0	**Event input EI1 allocation selection** • Selects Event input EI1 from Event Input Allocation Table. • Selection item: Event Input Allocation Table				
	Selection value	**Event input function**	**Input ON (Closed)**	**Input OFF (Open)**	**Remarks**
	0	No event			
	1 (*4)	Set value memory	2^n	1	n: 1 to 3(*1)
	2 (*4)	Control ON/OFF	Control OFF	Control ON	Control output OFF function
	3	Direct/Reverse action	Direct action	Reverse action	Always effective
	4	Preset output 1 ON/OFF	Preset output (*2)	Usual control	If sensor is burnt out, the unit maintains control with the preset MV.
	5	Preset output 2 ON/OFF	Preset output (*2)	Usual control	The unit maintains control with the preset MV. (*3)
	6	Auto/Manual control	Manual control	Automatic control	

Characters, Factory Default	Setting Item, Function, Setting Range				
EVI 1 □□ □□□0	□□□7	Remote/Local	Remote	Local	Option 2: Adapting to EA
	□□□8	Program control RUN/STOP	RUN	STOP	Level action when power is turned on
	□□□9	Program control Holding/Not holding	HOLD	Not holding	
	□□10	Program control Advance function	ADVANCE	Usual control	
	□□11	Integral action Holding	Integral action Holding	Usual integral action	Control continues with the integral value being held.
	□□12	EV(x) output latch selection	Latch release	Usual operation	
	(*1): The MEMO Display shows the value obtained by adding 2^n and then incrementing by 1. If EI1=OFF and EI2=ON, the display shows 3. Event input numbers are assigned sequentially starting from the smallest number: 2^0, 2^1, and so on. For (Option2: EI), the maximum is 8 points; for (Option2: except C5W), the maximum is 4 points. (*2) Output Group Settings: “Preset Output Settings 1, 2”. (Edge Operation) When multiple event inputs select the same function, an OR determination is made. (*3) If [Option1: EV2, O2(SSR/A)] is not added, this selection item will not be displayed. (*4) When control operation is OFF, only event input assignment selections □□□1 and □□□2 are enabled.				
EVI 2 □□ □□□0	**Event input EI2 allocation selection** • Selects Event input EI2 from Event Input Allocation Table. • Selection item: Same as the Event input EI1 allocation selection.				
EVI 3 □□ □□□0	**Event input EI3 allocation selection** • Selects Event input EI3 from Event Input Allocation Table. • Selection item: Same as the Event input EI1 allocation selection.				
EVI 4 □□ □□□0	**Event input EI4 allocation selection** • Selects Event input EI4 from Event Input Allocation Table. • Selection item: Same as the Event input EI1 allocation selection.				

[Event input]

4 points (EI1 to EI4) will be added as event inputs.

For (Option2: EI), the maximum is 8 points; for (Option2: except C5W), the maximum is 4 points.

When adding (Option2: EI)

When the setting value memory function is set for Event input EI1 allocation setting and Event input EI2 allocation setting

Connecting terminal number		Set value memory number
⑬-⑮ (EI1)	⑭-⑮ (EI2)	
Open	Open	SV1
Short	Open	SV2
Open	Short	SV3
Short	Short	SV4

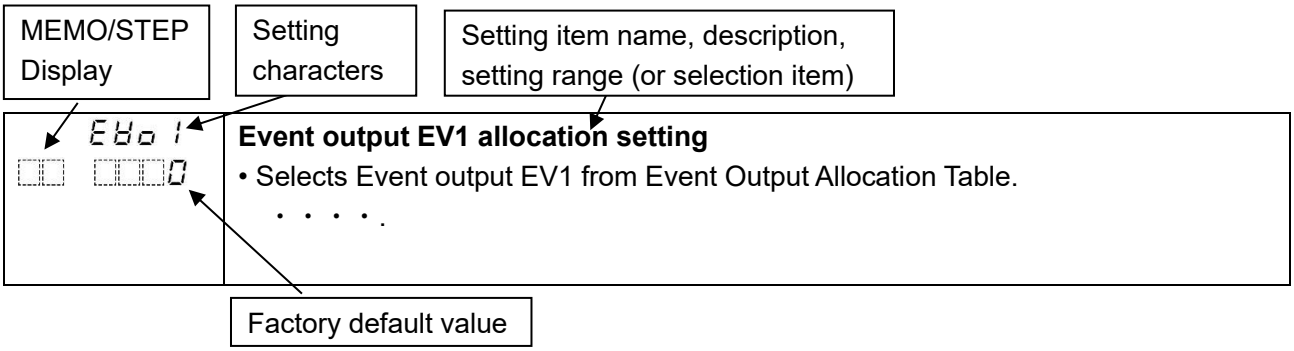
When the setting value memory function is set for Event input EI1 allocation setting and Event input EI4 allocation setting

Connecting terminal number		Set value memory number
⑬-⑮ (EI1)	⑰-⑱ (EI4)	
Open	Open	SV1
Short	Open	SV2
Open	Short	SV3
Short	Short	SV4

6.3.3 EVT Output Setting Group

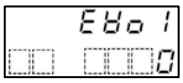
Only items selected in the Event output EV□ allocation setting will be displayed.

Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the setting (selection) item name, description, and setting range (selection items).



To enter the EVT output setting group, follow the steps below.

① In PV/SV display mode, press the key several times until the character of the EVT output setting group is displayed.

②  Press the key.
Enter the Event output EV1 allocation setting.

Characters, Factory Default	Setting Item, Function, Setting Range		
Evo1 □□ □□□0	**Event output EV1 allocation selection** • Selects Event output EV1 from Event Output Allocation Table. • Selection item: Event Output Allocation Table		
	Setting value	**Event output function**	**Remarks**
	□□□0	No event	
	□□□1	Alarm output, High limit alarm	Set in the alarm setting mode.
	□□□2	Alarm output, Low limit alarm	
	□□□3	Alarm output, High/Low limits alarm	
	□□□4	Alarm output, High/Low limits independent alarm	
	□□□5	Alarm output, High/Low limit range alarm	
	□□□6	Alarm output, High/Low limit range independent alarm	
	□□□7	Alarm output, Process high alarm	
	□□□8	Alarm output, Process low alarm	
	□□□9	Alarm output, High limit with standby alarm	
	□□10	Alarm output, Low limit with standby alarm	
	□□11	Alarm output, High/Low limits with standby alarm	
	□□12	Alarm output, High/Low limits with standby independent alarm	
	□□13	Heater burnout alarm output	Set in the alarm setting mode.
	□□14	Loop break alarm output	Set in the alarm setting mode.
	□□15	Time signal output	Turns OFF or ON during Program control, by setting OFF and ON time within the step set in [Step number].
	□□16	Output during AT	Turns ON during AT.
	□□17	Pattern end output	Turns ON when Program control ends, and remains ON until turned OFF.
	□□18	Remote output	During serial communication, use bit manipulation of communication command 00D6H to turn it OFF or ON. 2^0 EV1 output 0: OFF 1: ON 2^1 EV2 output 0: OFF 1: ON 2^2 EV3 output 0: OFF 1: ON
	□□19	Output added when errors occur	Alarm, heater burnout alarm, sensor error, input error, etc., turns ON when error occurs.
	□□20	Main output	Selectable when Option1:EV2 is attached
	□□21	Cooling output	Selectable when Option1:EV2 is attached

Characters, Factory Default	Setting Item, Function, Setting Range	
A1EA □□ no□□	**EV1 alarm value 0 Enabled/Disabled** • When setting value is 0 (zero), alarm action can be Enabled or Disabled. • Selection item:	
	no□□	Disabled
	YES□	Enabled
	Displays when selecting □□□1 to □□12 in the Event output EV1 allocation setting.	
A1HY □□ □□10	**EV1 alarm hysteresis setting** • Sets EV1 alarm hysteresis. • Setting range: 0.1 to 1000.0 ℃(0.1 to 1800.0 ℉) DC voltage, current inputs: 1 to 10000 Displays when selecting □□□1 to □□12 in the Event output EV1 allocation setting.	
A1dY □□ □□□0	**EV1 alarm delay time setting** • Sets EV1 alarm action delay time. • Setting range: 0 to 10000 seconds Displays when selecting □□□1 to □□12 in the Event output EV1 allocation setting.	
A1LA □□ noAL	**EV1 alarm Energized/De-energized selection** • Selects Energized/De-energized status for EV1 alarm. • Selection item:	
	noAL	Energized
	rEVS	De-energized
	Displays when selecting □□□1 to □□14 in the Event output EV1 allocation setting.	
A1Lc □□ no□□	**EV1 output latch selection** • Select the hold setting when the EV1 output is ON. • Selection item:	
	no□□	Disabled
	YES□	Enabled
	Displays when selecting □□□1 to □□14 in the Event output EV1 allocation setting.	
TS15 □□ □□□1	**TS1 output step number** • Set the TS1 output step. • Setting range: 1 to 16 Displays when selecting □□15 in the Event output EV1 allocation setting.	
TS1F □□ 00:00	**TS1 OFF time setting** • Set the TS1 OFF time. • Setting range: 00:00 to 99:59 Displays when selecting □□15 in the Event output EV1 allocation setting.	

Characters, Factory Default	Setting Item, Function, Setting Range
T1to 00:00	**TS1 ON time setting** • Set the TS1 ON time. • Setting range: 00:00 to 99:59 Displays when selecting 15 in the Event output EV1 allocation setting.
Evo2 0	**Event output EV2 allocation selection** • Selects Event output EV2 from Event Output Allocation Table. • Selection item: Same as the Event output EV1 allocation selection. When (Option1: EV2) is attached, it will be displayed during EVT2 and EVT3.
A2EA no	**EV2 alarm value 0 Enabled/Disabled** • When setting value is 0 (zero), alarm action can be Enabled or Disabled. • Selection item: no: Disabled YES: Enabled Displays when selecting 1 to 12 in the Event output EV2 allocation setting.
A2HY 10	**EV2 alarm hysteresis setting** • Sets EV2 alarm hysteresis. • Setting range: 0.1 to 1000.0 ℃(0.1 to 1800.0 ℉) DC voltage, current inputs: 1 to 10000 Displays when selecting 1 to 12 in the Event output EV2 allocation setting.
A2dY 0	**EV2 alarm delay time setting** • Sets EV2 alarm action delay time. • Setting range: 0 to 10000 seconds Displays when selecting 1 to 12 in the Event output EV2 allocation setting.
A2LA noAL	**EV2 alarm Energized/De-energized selection** • Selects Energized/De-energized status for EV2 alarm. • Selection item: noAL: Energized rEV: De-energized Displays when selecting 1 to 14 in the Event output EV2 allocation setting.
A2Lc no	**EV2 output latch selection** • Select the hold setting when the EV2 output is ON. • Selection item: no: Disabled YES: Enabled Displays when selecting 1 to 14 in the Event output EV2 allocation setting.

Characters, Factory Default	Setting Item, Function, Setting Range
r524 □□ □□□1	**TS2 output step number** • Set the TS2 output step. • Setting range: 1 to 16 Displays when selecting □□ 15 in the Event output EV2 allocation setting.
r52F □□ 00:00	**TS2 OFF time setting** • Set the TS2 OFF time. • Setting range: 00:00 to 99:59 Displays when selecting □□ 15 in the Event output EV2 allocation setting.
r52o □□ 00:00	**TS2 ON time setting** • Set the TS2 ON time. • Setting range: 00:00 to 99:59 Displays when selecting □□ 15 in the Event output EV2 allocation setting.
Evo3 □□ □□□0	**Event output EV3 allocation selection** • Selects Event output EV3 from Event Output Allocation Table. • Selection item: Same as the Event output EV1 allocation selection. When (Option1: EV3) is attached, it will be displayed during EVT3.
A3EA □□ no□□	**EV3 alarm value 0 Enabled/Disabled** • When setting value is 0 (zero), alarm action can be Enabled or Disabled. • Selection item: no□□ Disabled YE5□ Enabled Displays when selecting □□□ 1 to □□ 12 in the Event output EV3 allocation setting.
A3HY □□ □□ 10	**EV3 alarm hysteresis setting** • Sets EV3 alarm hysteresis. • Setting range: 0.1 to 1000.0 ℃(0.1 to 1800.0 ℉) DC voltage, current inputs: 1 to 10000 Displays when selecting □□□ 1 to □□ 12 in the Event output EV3 allocation setting.
A3dY □□ □□□0	**EV3 alarm delay time setting** • Sets EV3 alarm action delay time. • Setting range: 0 to 10000 seconds Displays when selecting □□□ 1 to □□ 12 in the Event output EV3 allocation setting.
A3Lñ □□ noñL	**EV3 alarm Energized/De-energized selection** • Selects Energized/De-energized status for EV3 alarm. • Selection item: noñL Energized rEV5 De-energized Displays when selecting □□□ 1 to □□ 14 in the Event output EV3 allocation setting.

Characters, Factory Default	Setting Item, Function, Setting Range	
A3Lc □□ no□□	**EV3 output latch selection** • Select the hold setting when the EV3 output is ON. • Selection item:	
	no□□	Disabled
	YE5□	Enabled
	Displays when selecting □□□ 1 to □□ 14 in the Event output EV3 allocation setting.	
r53S □□ □□□ 1	**TS3 output step number** • Set the TS3 output step. • Setting range: 1 to 16 Displays when selecting □□ 15 in the Event output EV3 allocation setting.	
r53F □□ 00.00	**TS3 OFF time setting** • Set the TS3 OFF time. • Setting range: 00:00 to 99:59 Displays when selecting □□ 15 in the Event output EV3 allocation setting.	
r53o □□ 00.00	**TS3 ON time setting** • Set the TS3 ON time. • Setting range: 00:00 to 99:59 Displays when selecting □□ 15 in the Event output EV3 allocation setting.	

[**Energized/De-energized**]

When nonL (Energized) is selected, each event output is conductive (ON) while each event output indicator is lit.

Each event output is not conductive (OFF) while each event output indicator is not lit.

When rEV5 (De-energized) is selected, each event output is not conductive (OFF) while each event output indicator is lit.

Each event output is conductive (ON) while each event output indicator is not lit.

	Energized	De-energized
Event output indicator	Lit	Lit
Event output	ON	OFF

[Loop Break Alarm]

Detects actuator errors (heater burnout, sensor disconnection).

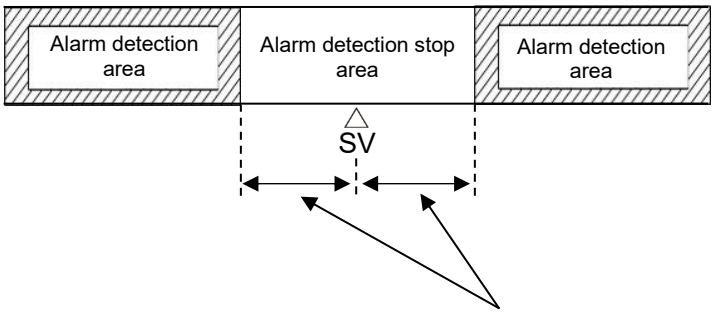
When allocated to multiple EVT outputs, the set value is common.

The loop break alarm is evaluated for each loop break alarm time setting; if a normal condition is detected after an abnormal condition is detected, the alarm is cleared.

Loop break alarm time setting: 0 to 200 min

Loop break alarm band setting: 0 to 150 ℃ (0 to 270 ℉)
or 0.0 to 150.0 ℃ (0.0 to 270.0 ℉)
DC voltage, direct current input: 0 to 1500

Loop break alarm dead band setting:
0 to 150 ℃ (0 to 270 ℉)
or 0.0 to 150.0 ℃ (0.0 to 270.0 ℉)
DC voltage, direct current input: 0 to 1500



(Fig. 6.3.3-1)

Output: Event output allocated to alarm output in event output setting mode

Selection item	Selection
Event output EV□ allocation setting	□□ 14: Loop break alarm output

[Time Signal Output]

When Time signal output is selected in the Event output allocation setting, during program operation, when the TS output step occurs, the event output turns ON during the period where TS OFF time ≤ elapsed time ≤ (TS OFF time + TS ON time).

Selection item	Selection
Event output EV□ allocation setting	□□ 15: Time signal output

[Pattern end output]

When Pattern end output is selected in the Event output allocation setting, the Pattern end output is generated after program completion, and [PEnd] flashes on the SV Display. The output turns OFF when the STOP operation is performed.

Selection item	Selection
Event output EV□ allocation setting	□□ 17: Pattern end output

[Remote output]

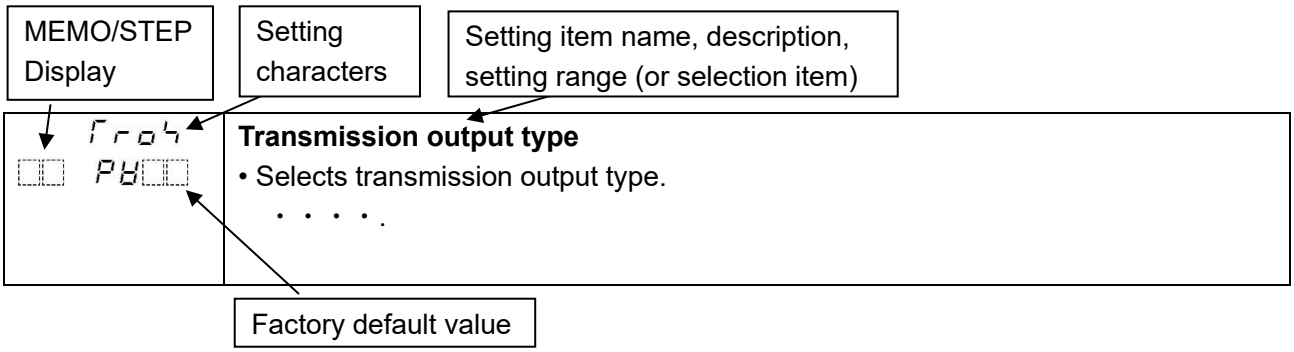
When Remote output is selected in the Event output allocation setting, the host can forcibly turn the output ON or OFF.

Selection item	Selection
Event output EV□ allocation setting	□□ 18: Remote output

6.3.4 Transmission Output Setting Group

If (Option2: TA, TV) is not added, this setting group will not be displayed.

Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the setting (selection) item name, description, and setting range (selection items).



To enter the transmission output setting group, follow the steps below.

① In PV/SV display mode, press the key several times until the character of the transmission output setting group is displayed.

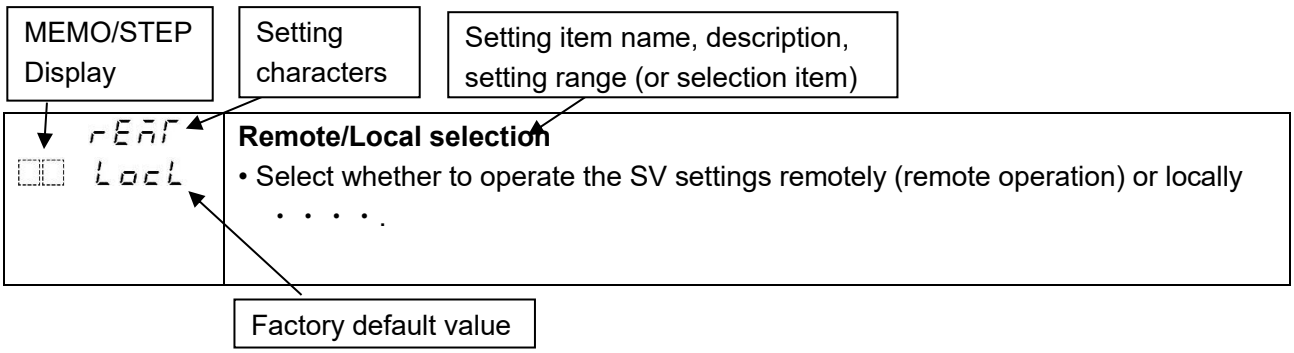
② Press the key.
Enter the transmission output setting.

Characters, Factory Default	Setting Item, Function, Setting Range	
	Transmission output type • Selects transmission output type. • Selection item:	
	PV□□	PV transmission
	SV□□	SV transmission
	MV□□	MV transmission
1370	**Transmission output high limit setting** (for PV and SV transmission) • Sets the Transmission output high limit value. • Setting range: Transmission output low limit setting to High limit input range	
-200	**Transmission output low limit setting** (for PV and SV transmission) • Sets the Transmission output low limit value. • Setting range: Low limit input range to Transmission output high limit setting	
100.0	**Transmission output high limit setting** (for MV transmission) • Sets the Transmission output high limit value. • Setting range: Transmission output low limit setting to 105.0 %	
□□0.0	**Transmission output low limit setting** (for MV transmission) • Sets the Transmission output low limit value. • Setting range: -5.0 % to Transmission output high limit setting	

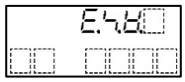
6.3.5 External Setting Input Setting Group

If (Option2: EA) is not added, this setting group will not be displayed.

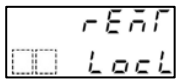
Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the setting (selection) item name, description, and setting range (selection items).



To enter the external setting input setting group, follow the steps below.

① 

In PV/SV display mode, press the ↺ key several times until the character of the external setting input setting group is displayed.

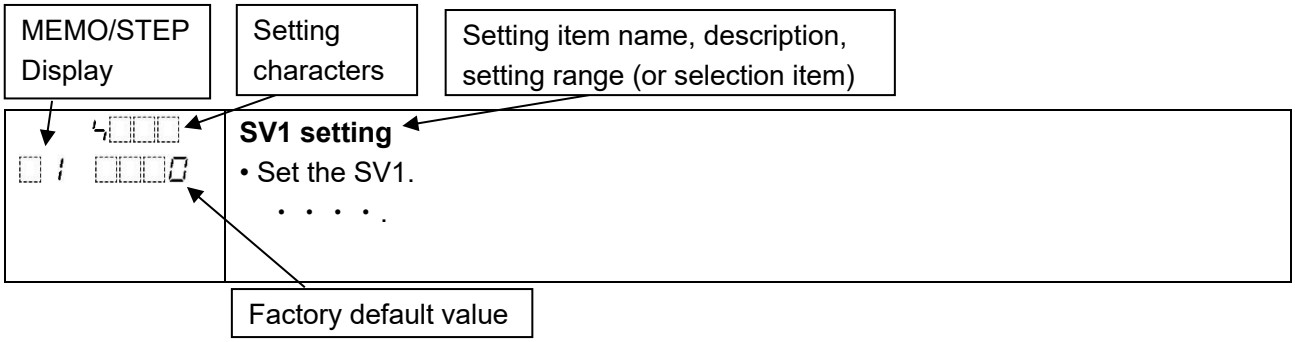
② 

Press the ↵ key.
Enter the remote/Local selection.

Characters, Factory Default	Setting Item, Function, Setting Range	
rEmT LocL	**Remote/Local selection** • Select whether to operate the SV settings remotely (remote operation) or locally (key operation). • Selection item:	
	LocL	Local
	rEmT	Remote
rTLH 1370	**External setting input high limit setting** • Set the external setting input high limit value (value when 20 mA DC is input). • Setting range: External setting input low limit setting to High limit input range	
rTLL -200	**External setting input low limit setting** • Set the external setting input low limit value (value when 4 mA DC is input). • Setting range: Low limit input range to External setting input high limit setting	
rT_b 0	**Remote bias setting** • During remote action, SV includes the remote bias value. (External setting input low limit to External setting input high limit) • Setting range: ±20% of input span	

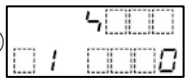
6.3.6 Main Setting Group

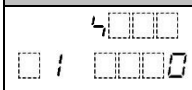
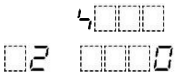
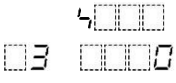
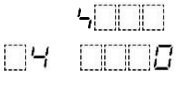
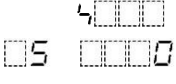
Explanation of setting items:
The upper section of the left column is the PV Display showing the process value.
The lower right section is the SV Display showing the factory default value.
The lower left section is the MEMO/STEP Display showing the setpoint memory number.
The right column shows the setting item name, description, and setting range.



To enter the main setting group, follow the steps below.

①
In PV/SV display mode, press the key one time until the character of the main setting group is displayed.

② 
Press the key.
Enter the SV1 setting.

Characters, Factory Default	Setting Item, Function, Setting Range
	**SV1 setting** • Set the SV1. • Setting range: Scaling low limit to Scaling high limit
	**SV2 setting** (*1) • Set the SV2. • Setting range: Scaling low limit to Scaling high limit
	**SV3 setting** (*1) • Set the SV3. • Setting range: Scaling low limit to Scaling high limit
	**SV4 setting** (*1) • Set the SV4. • Setting range: Scaling low limit to Scaling high limit
	**SV5 setting** (*2) • Set the SV5. • Setting range: Scaling low limit to Scaling high limit

Characters, Factory Default	Setting Item, Function, Setting Range
SV6 0	**SV6 setting** (*2) • Set the SV6. • Setting range: Scaling low limit to Scaling high limit
SV7 0	**SV7 setting** (*2) • Set the SV7. • Setting range: Scaling low limit to Scaling high limit
SV8 0	**SV8 setting** (*2) • Set the SV8. • Setting range: Scaling low limit to Scaling high limit

(*1): If (Option2: C5W) is selected, or if the set value memory function is not selected in the Event input allocation setting, this setting item will not be displayed.

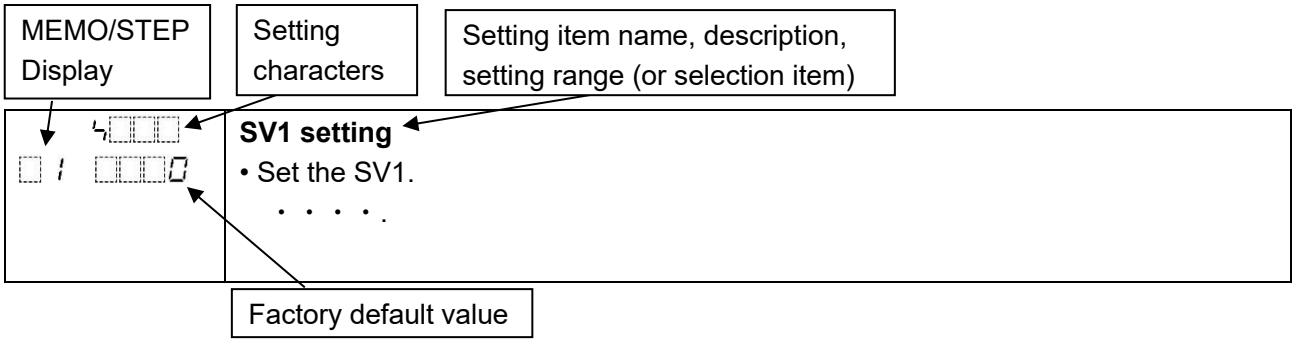
(*2): If (Option2: EI) is selected, or if the set value memory function is not selected in the Event input allocation setting, this setting item will not be displayed.

7. Settings

In this section, each setting group will be explained.

7.1 Main Setting Group

Explanation of setting items:
The upper section of the left column shows the PV value on the PV Display, while the lower right section shows the factory default value on the SV Display.
The lower left section shows the MEMO/STEP Display, indicating the setpoint memory number.
The right column shows the setting item name, description, and setting range.



To enter the main setting group, follow the steps below.

① In PV/SV display mode, press the key one time until the character of the main setting group is displayed.

② Press the key.
Enter the SV1 setting.

Characters, Factory Default	Setting Item, Function, Setting Range
1 0	**SV1 setting** • Set the SV1. • Setting range: Scaling low limit to Scaling high limit
2 0	**SV2 setting** (*1) • Set the SV2. • Setting range: Scaling low limit to Scaling high limit
3 0	**SV3 setting** (*1) • Set the SV3. • Setting range: Scaling low limit to Scaling high limit
4 0	**SV4 setting** (*1) • Set the SV4. • Setting range: Scaling low limit to Scaling high limit
5 0	**SV5 setting** (*2) • Set the SV5. • Setting range: Scaling low limit to Scaling high limit

Characters, Factory Default	Setting Item, Function, Setting Range
SV6 0	**SV6 setting** (*2) • Set the SV6. • Setting range: Scaling low limit to Scaling high limit
SV7 0	**SV7 setting** (*2) • Set the SV7. • Setting range: Scaling low limit to Scaling high limit
SV8 0	**SV8 setting** (*2) • Set the SV8. • Setting range: Scaling low limit to Scaling high limit

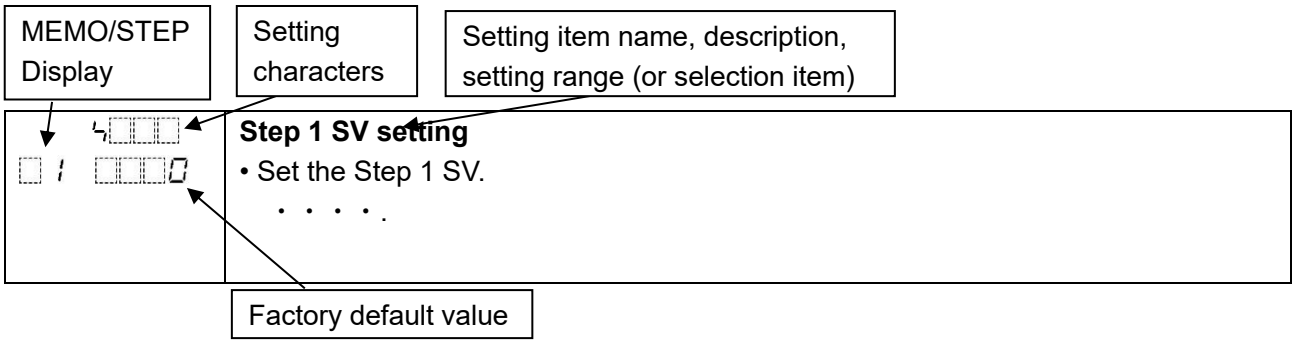
(*1): If (Option2: C5W) is selected, or if the set value memory function is not selected in the Event input allocation setting, this setting item will not be displayed.

(*2): If (Option2: EI) is selected, or if the set value memory function is not selected in the Event input allocation setting, this setting item will not be displayed.

7.2 Program Settings Group

If program control is selected in the Fixed value control/program control selection, this setting group will be displayed.

Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the program step number for the MEMO/STEP Display.
The right column shows the setting item name, description, and setting range.



To enter the program setting group, follow the steps below.

① In PV/SV display mode, press the key several times until the character of the program setting group is displayed.

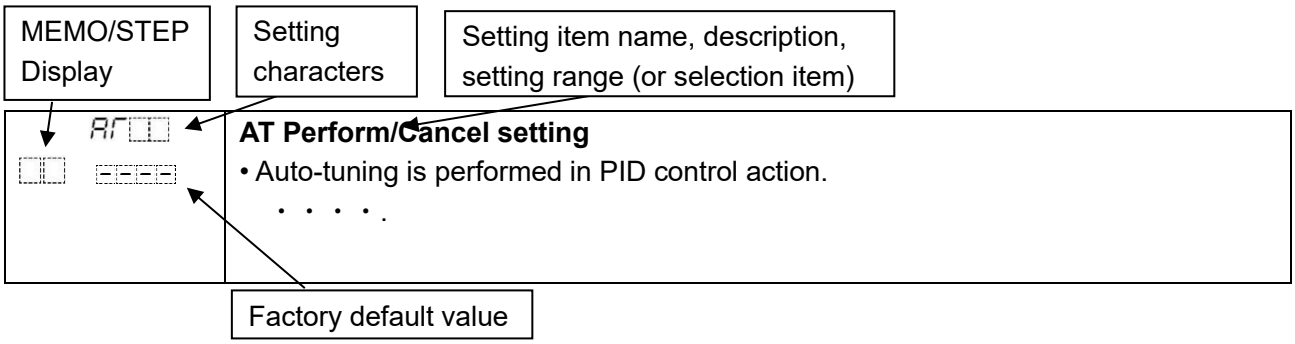
② Press the key.
Enter the Step 1 SV setting item.

Characters, Factory Default	Setting Item, Function, Setting Range
SP 1 1 0.0	**Step 1 SV setting** • Set the Step 1 SV. • Setting range: Scaling low limit to Scaling high limit
TIME 1 00:00	**Step 1 time setting** • Set the Step 1 time. • Setting range: ----, 00:00 to 99:59
JUMP 1 1	**Step 1 wait block No. setting** • Set the wait block No. to be used in Step 1. • Setting range: 1 to 8
PID 1 1	**Step 1 PID block No. setting** • Set the PID block No. to be used in Step 1. • Setting range: 1 to 8
SP 2 2 0.0	**Step 2 SV setting** • Set the Step 2 SV. • Setting range: Scaling low limit to Scaling high limit
TIME 2 00:00	**Step 2 time setting** • Set the Step 2 time. • Setting range: ----, 00:00 to 99:59
JUMP 2 1	**Step 2 wait block No. setting** • Set the wait block No. to be used in Step 2. • Setting range: 1 to 8
PID 2 1	**Step 2 PID block No. setting** • Set the PID block No. to be used in Step 2. • Setting range: 1 to 8
SP 3 3 0.0	**Step 3 SV setting** • Set the Step 3 SV. • Setting range: Scaling low limit to Scaling high limit
TIME 3 00:00	**Step 3 time setting** • Set the Step 3 time. • Setting range: ----, 00:00 to 99:59
JUMP 3 1	**Step 3 wait block No. setting** • Set the wait block No. to be used in Step 3. • Setting range: 1 to 8
PID 3 1	**Step 3 PID block No. setting** • Set the PID block No. to be used in Step 3. • Setting range: 1 to 8
	The same applies up to program step No. 16.

Characters, Factory Default	Setting Item, Function, Setting Range
SP 16 0	**Step 16 SV setting** • Set the Step 16 SV. • Setting range: Scaling low limit to Scaling high limit
TIME 16 0000	**Step 16 time setting** • Set the Step 16 time. • Setting range: ----, 00:00 to 99:59
JUMP 16 1	**Step 16 wait block No. setting** • Set the wait block No. to be used in Step 16. • Setting range: 1 to 8
PID 16 1	**Step 16 PID block No. setting** • Set the PID block No. to be used in Step 16. • Setting range: 1 to 8

7.3 AT Settings Group

Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the setting (selection) item name, description, and setting range (selection items).



To enter the AT setting group, follow the steps below.

① In PV/SV display mode, press the key several times until the character of the AT setting group is displayed.

② Press the key.
Enter the AT Perform/Cancel setting item.

Characters, Factory Default	Setting Item, Function, Setting Range	
AT OFF	**AT Perform/Cancel selection** • Auto-tuning is performed in PID control action. Press the up key to start auto-tuning, and the down key to cancel it. If auto-tuning does not finish within 4 hours after starting, it will be forcibly terminated. (This is invalid for operations other than PID control action.) • Selection item:	
	----	AT cancel
	AT	AT perform
ATA AT	**AT action mode selection** • Select Normal AT, AT on startup, or Fast AT. • Selection item:	
	AT	Normal AT
	↳AT	AT on startup
	FAT	Fast AT
AT_b 20	**AT bias setting** • Set the bias value that automatically determines the AT point based on the PV/SV deviation (invalid for no PID control action and DC voltage/direct current input). • Setting range: 0 to 50 ℃ (0 to 90 ℉) or 0.0 to 50.0 ℃ (0.0 to 90.0 ℉)	
AT_t 1.0	**AT gain setting** • Set the ratio of the proportional band calculated during AT perform. • Setting range: 0.1 to 10.0	
ATHY 0.5	**AT hysteresis setting** • Set the threshold for switching AT from ON to OFF and from OFF to ON. • Setting range: 0.0 to 5.0 ℃ (0.0 to 9.0 ℉) DC voltage, direct current input: 0 to 50	

7.4 PID Settings Group

Set the parameters for PID blocks 1 to 8.

In the case of fixed value control, the PID block for SVn is the nth block.

※n : 1 to 8

Fix control SVn	PID block n
SV1	PID block1
SV2	PID block2
¦	¦
SV8	PID block8

(1) OUT1 proportional band setting (block n) Set the OUT1 proportional band for PID block n.

(2) OUT1 integral time setting (block n) Set the OUT1 integral time for PID block n.

(3) OUT1 derivative time setting (block n) Set the OUT1 derivative time for PID block n.

(4) OUT2 proportional band setting (block n) Set the OUT2 proportional band for PID block n.

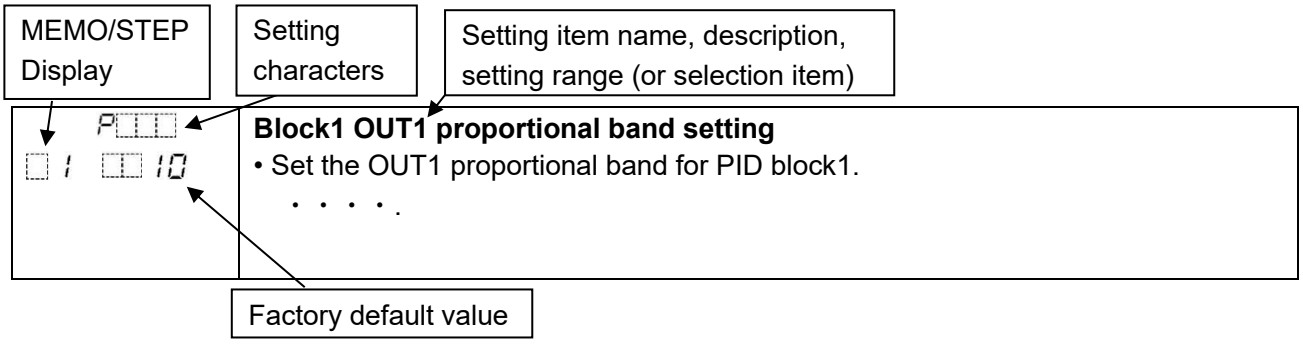
(5) OUT2 integral time setting (block n) Set the OUT2 integral time for PID block n.

(6) OUT2 derivative time setting (block n) Set the OUT2 derivative time for PID block n.

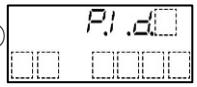
(7) MV bias setting (block n) Set the MV bias for PID block n.

(8) Overlap and deadband setting (block n) Set the overlap and deadband for PID block n.

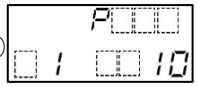
Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the PID block number for the MEMO/STEP Display.
The right column shows the setting item name, description, and setting range.



To enter the PID setting group, follow the steps below.

① 

In PV/SV display mode, press the ↺ key several times until the character of the PID setting group is displayed.

② 

Press the ↵ key.
Enter the Block1 OUT1 proportional band setting item.

Characters, Factory Default	Setting Item, Function, Setting Range
P□□□ □1 □□10	**Block1 OUT1 proportional band setting** • Set the OUT1 proportional band for PID block1. • Setting range: Except when Fast-PID control is selected Input without decimal point: 1 to input span ℃ (℉) Input with decimal point: 0.1 to input span ℃ (℉) DC voltage, direct current input: 0.1 to 1000.0 % When Fast-PID control is selected Input without decimal point: 0 to input span ℃ (℉) Input with decimal point: 0.0 to input span ℃ (℉) DC voltage, direct current input: 0.0 to 1000.0 %
I□□□ □1 □200	**Block1 OUT1 integral time setting** • Set the OUT1 integral time for PID block1. • Setting range: Except when Slow-PID control is selected 0 to 10000 sec or 0.0 to 1999.9 sec When Slow-PID control is selected 1 to 10000 sec or 0.1 to 1999.9 sec
d□□□ □1 □□50	**Block1 OUT1 derivative time setting** • Set the OUT1 derivative time for PID block1. • Setting range: 0 to 10000 sec or 0.0 to 1999.9 sec
P_b□ □1 □□10	**Block1 OUT2 proportional band setting** • Set the OUT2 proportional band for PID block1. • Setting range: 0 to input span ℃ (℉) or 0.0 to input span ℃ (℉) DC voltage, direct current input: 0.0 to 1000.0 % This setting item will not be displayed except when selecting □□21 (OUT2) in the Event output EV2 allocation setting for [Option1: EV2, O2(SSR/A)].
I_b□ □1 □200	**Block1 OUT2 integral time setting** • Set the OUT2 integral time for PID block1. • Setting range: Except when Slow-PID control is selected 0 to 10000 sec or 0.0 to 1999.9 sec When Slow-PID control is selected 1 to 10000 sec or 0.1 to 1999.9 sec
d_b□ □1 □□50	**Block1 OUT2 derivative time setting** • Set the OUT2 derivative time for PID block1. • Setting range: 0 to 10000 sec or 0.0 to 1999.9 sec
rbEr □1 □□0.0	**Block1 MV bias setting** • Set the MV bias for PID block1. • Setting range: 0.0 to 100.0 %

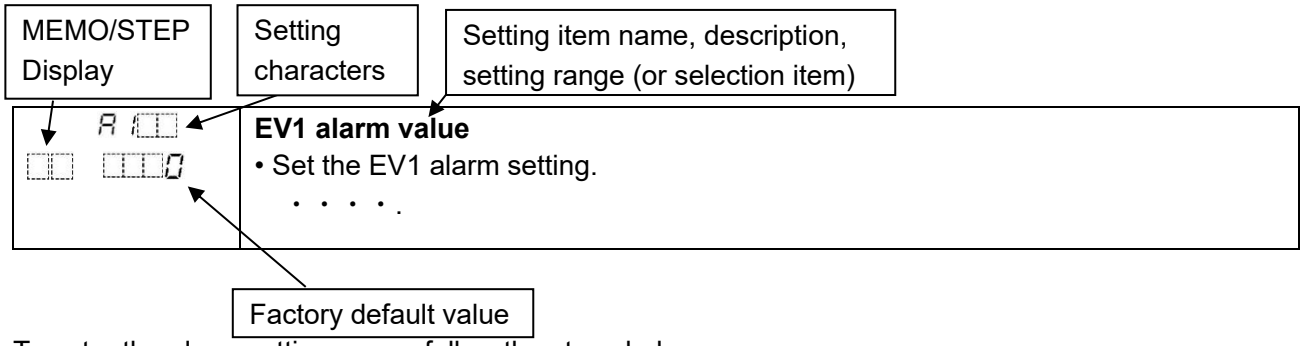
Characters, Factory Default	Setting Item, Function, Setting Range
db□□ □1 □□0.0	**Block1 Overlap and deadband setting** • Set the overlap and deadband for PID block1. • Setting range: -100.0 to 100.0 ℃ (-180.0 to 180.0 ℉) DC voltage, direct current input: -1000 to 1000 This setting item will not be displayed except when selecting □□21 (OUT2) in the Event output EV2 allocation setting for [Option1: EV2, O2(SSR/A)].
	The same applies up to block No. 8.
P□□□ □8 □□10	**Block8 OUT1 proportional band setting** • Set the OUT1 proportional band for PID block8. • Setting range: Except when Fast-PID control is selected Input without decimal point: 1 to input span ℃ (℉) Input with decimal point: 0.1 to input span ℃ (℉) DC voltage, direct current input: 0.1 to 1000.0 % When Fast-PID control is selected Input without decimal point: 0 to input span ℃ (℉) Input with decimal point: 0.0 to input span ℃ (℉) DC voltage, direct current input: 0.0 to 1000.0 %
I □□□ □8 □200	**Block8 OUT1 integral time setting** • Set the OUT1 integral time for PID block8. • Setting range: Except when Slow-PID control is selected 0 to 10000 sec or 0.0 to 1999.9 sec When Slow-PID control is selected 1 to 10000 sec or 0.1 to 1999.9 sec
d□□□ □8 □□50	**Block8 OUT1 derivative time setting** • Set the OUT1 derivative time for PID block8. • Setting range: 0 to 10000 sec or 0.0 to 1999.9 sec
P_b□ □8 □□10	**Block8 OUT2 proportional band setting** • Set the OUT2 proportional band for PID block8. • Setting range: 0 to input span ℃ (℉) or 0.0 to input span ℃ (℉) DC voltage, direct current input: 0.0 to 1000.0 % This setting item will not be displayed except when selecting □□21 (OUT2) in the Event output EV2 allocation setting for [Option1: EV2, O2(SSR/A)].
I_b□ □8 □200	**Block8 OUT2 integral time setting** • Set the OUT2 integral time for PID block8. • Setting range: Except when Slow-PID control is selected 0 to 10000 sec or 0.0 to 1999.9 sec When Slow-PID control is selected 1 to 10000 sec or 0.1 to 1999.9 sec

Characters, Factory Default	Setting Item, Function, Setting Range
d_b□ □8 □□50	**Block8 OUT2 derivative time setting** • Set the OUT2 derivative time for PID block8. • Setting range: 0 to 10000 sec or 0.0 to 1999.9 sec
rbEr □8 □□0.0	**Block8 MV bias setting** • Set the MV bias for PID block8. • Setting range: 0.0 to 100.0 %
db□□ □8 □□0.0	**Block8 Overlap and deadband setting** • Set the overlap and deadband for PID block8. • Setting range: -100.0 to 100.0 ℃ (-180.0 to 180.0 ℉) DC voltage, direct current input: -1000 to 1000 This setting item will not be displayed except when selecting □□21 (OUT2) in the Event output EV2 allocation setting for [Option1: EV2, O2(SSR/A)].

7.5 Alarm Setting Group

If selecting alarm actions (□□□ 1 to □□ 12), heater burnout alarm (□□ 13), and loop break alarm (□□ 14) in the Event output EV□ allocation setting, this setting group will be displayed.

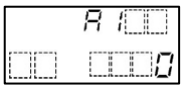
Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the setting item name, description, and setting range.



To enter the alarm setting group, follow the steps below.

①

In PV/SV display mode, press the ↻ key several times until the character of the alarm setting group is displayed.

② 

Press the ⏎ key.
Enter the EV1 alarm value item.

Characters, Factory Default	Setting Item, Function, Setting Range	
A 1□□ □□ □□□0	**EV1 alarm value** • Set the EV1 alarm setting. This is displayed when selecting an alarm action in the Event output EV1 allocation setting. When selecting □□□4 (Alarm output High/Low limits independent alarm) in the Event output EV1 allocation setting, set the low limit action point for the EV1 alarm. • Selection item:	
	No action	
	High limit alarm	-(Input span) to Input span (*1)
	Low limit alarm	-(Input span) to Input span (*1)
	High/Low limits alarm	0 to Input span (*1)
	High/Low limits independent alarm	0 to Input span (*1)
	High/Low limit range alarm	0 to Input span (*1)
	High/Low limit range independent alarm	0 to Input span (*1)
	Process high alarm	Input range low limit to Input range high limit (*2)
	Process low alarm	Input range low limit to Input range high limit (*2)
	High limit with standby alarm	-(Input span) to Input span (*1)
	Low limit with standby alarm	-(Input span) to Input span (*1)
	High/Low limits with standby alarm	0 to Input span (*1)
	High/Low limits with standby independent alarm	0 to Input span (*1)

(*1): For DC voltage and direct current inputs, this is the scaling range. (Maximum setting: -19999 to 19999)

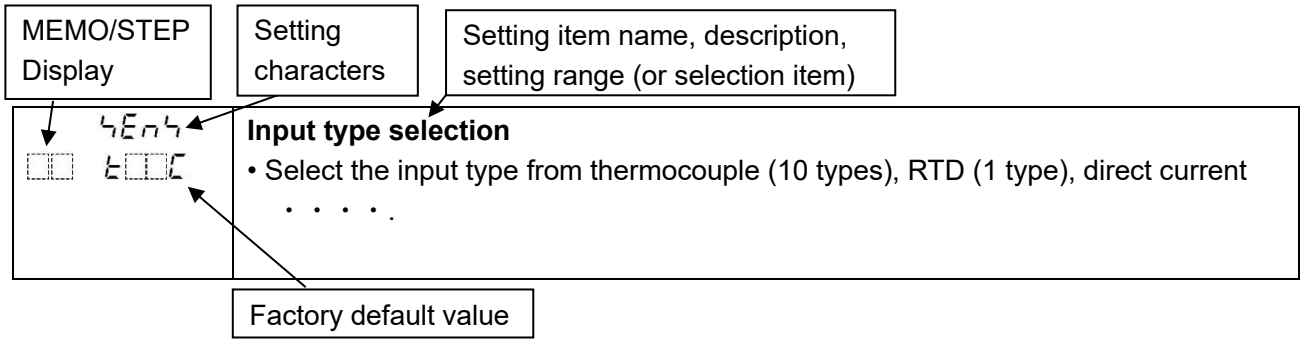
(*2): For DC voltage and direct current inputs, this is the scaling low limit (high limit). (Maximum setting: -19999 to 19999)

Characters, Factory Default	Setting Item, Function, Setting Range
A1H□ □□ □□□0	**EV1 high limit alarm value** • Set the EV1 high limit alarm value. When selecting □□□4 (Alarm output High/Low limits independent alarm) in the Event output EV1 allocation setting, set the high limit action point for the EV1 alarm. • Selection item: Same as those of EV1 alarm value.
A2□□ □□ □□□0	**EV2 alarm value** • Set the EV2 alarm setting. This is displayed when selecting an alarm action in the Event output EV2 allocation setting. When selecting □□□4 (Alarm output High/Low limits independent alarm) in the Event output EV2 allocation setting, set the low limit action point for the EV2 alarm. • Selection item: Same as those of EV1 alarm value. This setting item will be displayed, when adding (Option1: EV2, EV3) and selecting alarm actions □□□1 to □□12 in the Event output EV□ allocation setting.
A2H□ □□ □□□0	**EV2 high limit alarm value** • Set the EV2 high limit alarm value. When selecting □□□4 (Alarm output High/Low limits independent alarm) in the Event output EV2 allocation setting, set the high limit action point for the EV2 alarm. • Selection item: Same as those of EV1 alarm value. This setting item will be displayed, when adding (Option1: EV2, EV3) and selecting alarm actions □□□1 to □□12 in the Event output EV□ allocation setting.
A3□□ □□ □□□0	**EV3 alarm value** • Set the EV3 alarm setting. This is displayed when selecting an alarm action in the Event output EV3 allocation setting. When selecting □□□4 (Alarm output High/Low limits independent alarm) in the Event output EV3 allocation setting, set the low limit action point for the EV3 alarm. • Selection item: Same as those of EV1 alarm value. This setting item will be displayed, when adding (Option1: EV3).
A3H□ □□ □□□0	**EV3 high limit alarm value** • Set the EV3 high limit alarm value. When selecting □□□4 (Alarm output High/Low limits independent alarm) in the Event output EV3 allocation setting, set the high limit action point for the EV3 alarm. • Selection item: Same as those of EV1 alarm value. This setting item will be displayed, when adding (Option1: EV3).
H1□□ □□ □□0.0 Mode character and CT1 current value are alternately indicated (0.5 sec cycle).	**Heater burnout alarm 1 value** • Set the heater current value for Heater burnout alarm 1. Mode characters and CT1 current value are indicated alternately. • Setting range: 0.0 to 20.0 A (Option: W20) 0.0 to 100.0 A (Option: W100) This setting item will be displayed, when adding [Option2: C5W(20A), C5W(100A), W(20A), W(100A)] and selecting heater burnout alarm □□13 in the Event output EV□ allocation setting.

Characters, Factory Default	Setting Item, Function, Setting Range
H2□□ □□ □□0.0 Mode character and CT2 current value are alternately indicated (0.5 sec cycle).	**Heater burnout alarm 2 value** • Set the heater current value for Heater burnout alarm 2. Mode characters and CT2 current value are indicated alternately. • Setting range: 0.0 to 20.0 A (Option: W20) 0.0 to 100.0 A (Option: W100) This setting item will be displayed, when adding [Option2: C5W(20A), C5W(100A), W(20A), W(100A)] and selecting heater burnout alarm □□ 13 in the Event output EV□ allocation setting.
LP_T □□ □□□0	**Loop break alarm time setting** • Set the time to assess the Loop break alarm. • Setting range: 0 to 200 min This setting item will be displayed, when selecting loop break alarm □□ 14 in the Event output EV□ allocation setting.
LP_H □□ □□□0	**Loop break alarm band setting** • Set the temperature to assess the Loop break alarm. • Setting range: 0 to 150 ℃ (0 to 270 ℉) or 0.0 to 150.0 ℃ (0.0 to 270.0 ℉) DC voltage, current inputs: 0 to 1500 This setting item will be displayed, when selecting loop break alarm □□ 14 in the Event output EV□ allocation setting.
LP_d □□ □□□0	**Loop break alarm dead band setting** • Set the temperature to assess the Loop break alarm dead band. • Setting range: 0 to 150 ℃ (0 to 270 ℉) or 0.0 to 150.0 ℃ (0.0 to 270.0 ℉) DC voltage, current inputs: 0 to 1500 This setting item will be displayed, when selecting loop break alarm □□ 14 in the Event output EV□ allocation setting.

7.6 Input Setting Group

Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the MEMO/STEP Display, where is off.
The right column shows the setting (selection) item name, description, and setting range (selection items).



To enter the input setting group, follow the steps below.

① In PV/SV display mode, press the key several times until the character of the input setting group is displayed.

② Press the key.
Enter the input type selection item.

Characters, Factory Default	Setting Item, Function, Setting Range	
SEnS □□ tC	**Input type selection** • Select the input type from thermocouple (10 types), RTD (1 type), direct current (4 types) and DC voltage (4 type), and the unit ℃/℉. • When changing the input from DC voltage to other inputs, remove the sensor connected to this controller first, then change the input. If the input is changed with the sensor connected, the input circuit may break. • When changing an input type, refer to Section “8.9 Items to be Initialized by Changing Settings” (p.131). • Selection item:	
	tC	K -200 to 1370 ℃
	tC.8	K -200.0 to 800.0 ℃
	tC.4	K -200.0 to 400.0 ℃
	JC	J -200 to 1000 ℃
	JC.□	J -200.0 to 400.0 ℃
	rC	R 0 to 1760 ℃
	SC	S 0 to 1760 ℃
	bC	B 0 to 1820 ℃
	EC	E -200 to 800 ℃
	TC.□	T -200.0 to 400.0 ℃
	nC	N -200 to 1300 ℃
	PL2C	PL-II 0 to 1390 ℃
	cC	C(W/Re5-26) 0 to 2315 ℃
	PtC.□	Pt100 -200.0 to 850.0 ℃
	PtC	Pt100 -200 to 850 ℃
	PtC.1	Pt100 -100.0 to 100.0 ℃
	4201	4 to 20 mA DC (*1) -19999 to 19999
	0201	0 to 20 mA DC (*1) -19999 to 19999
	420E	4 to 20 mA DC (*2) -19999 to 19999
	020E	0 to 20 mA DC (*2) -19999 to 19999
	0.1V	0 to 1 V DC -19999 to 19999
	0.5V	0 to 5 V DC -19999 to 19999
	1.5V	1 to 5 V DC -19999 to 19999
	0.10V	0 to 10 V DC -19999 to 19999

(*1): It has a built-in shunt resistor (50Ω).

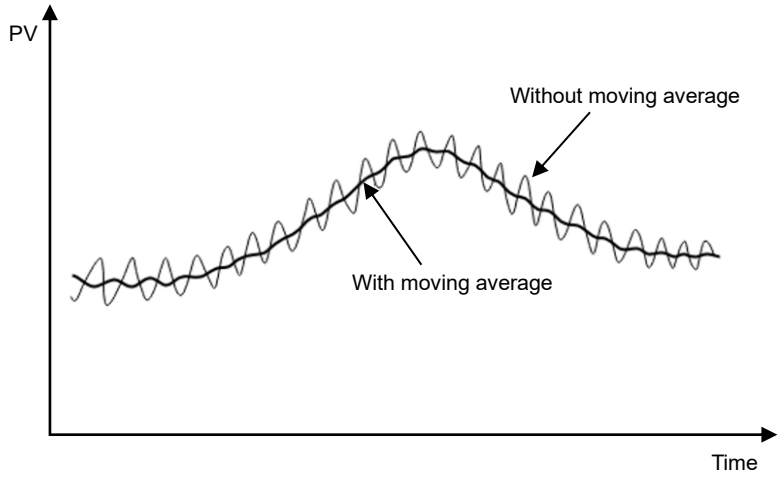
(*2): The separately sold shunt resistor (50Ω) is attached externally.

Characters, Factory Default	Setting Item, Function, Setting Range	
CorF C	**Temperature unit selection** • Select the temperature sensor units: Celsius or Fahrenheit. • Selection item:	
	C	Celsius
	F	Fahrenheit
SCLH 1370	**Scaling high limit setting** • Sets scaling high limit value. • Setting range: Scaling low limit value to Input range high limit value	
SCLL -200	**Scaling low limit setting** • Sets scaling low limit value. • Setting range: Input range low limit value to Scaling high limit value	
dP 0	**Decimal point place selection** • Selects decimal point place. • Selection item:	
	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
	0.0000	4 digits after decimal point
	Available only for DC voltage and current inputs	
SPS 125	**Input sampling selection** • Selects sampling period. • Selection item:	
	125	125 ms
	50	50 ms
	10	10 ms
AVrG 1	**Moving average count setting** • Sets number of times to average fluctuations in input values. • Setting range: 1 to 10	
SoCo 1.000	**Sensor correction coefficient setting** • Sets sensor correction coefficients. • Setting range: 0.000 to 10.000	
So 0.0	**Sensor correction setting** • Sets sensor correction values. • Setting range: -100.0 to 100.0 ℃(-180.0 to 180.0 ℉) DC voltage, current inputs: -1000 to 1000	
FILT 0.0	**PV filter time constant setting** • Sets PV filter time constant. • Setting range: 0.0 to 10.0 seconds	

[Number of moving average setting]

By averaging values that fluctuate due to noise, the display value is stabilized.

Moving average count: 1 to 10 times



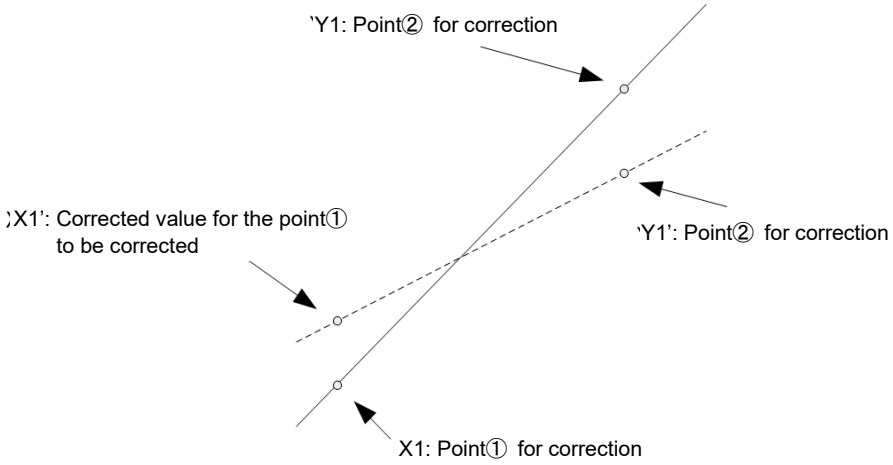
(Fig. 7.6-1)

[Sensor correction coefficient setting]

The slope of the sensor input value can be set.

The slope is set to the value calculated using formula ①.

Correction range: 0.000 to 10.000



(Fig. 7.6-2)

$$\frac{Y1' - X1'}{Y1 - X1} = \text{Sensor correction coefficient setting} \quad ①$$

[Sensor correction setting]

When the temperature at the control point differs from the temperature at the sensor installation point, the PV is shifted to compensate.

(This is effective within the input rating range, regardless of the sensor correction value.)

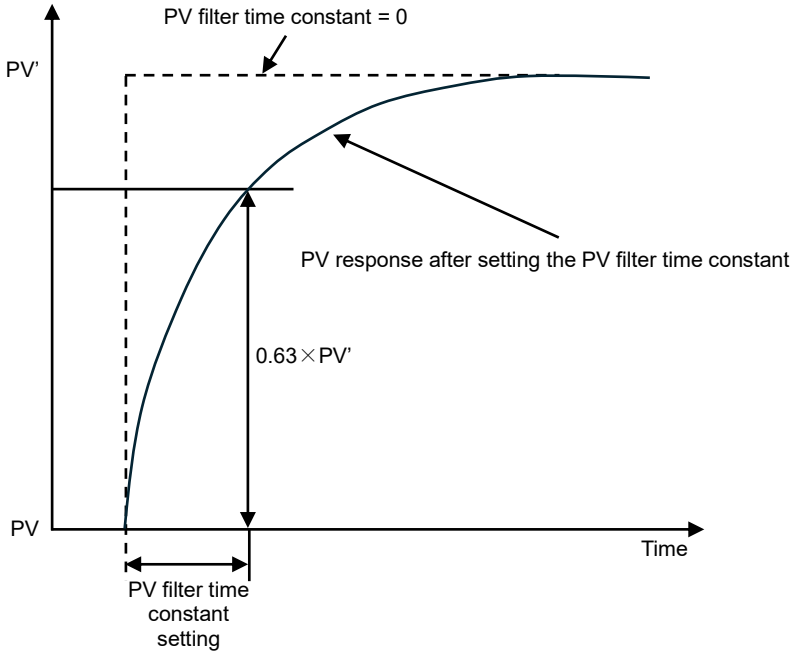
Correction range: -100.0 to 100.0 ℃(-180.0 to 180.0 ℉)

DC voltage, current inputs: -1000 to 1000

[PV filter time constant setting]

A digital first-order low pass filter reduces fluctuations in input values caused by noise.

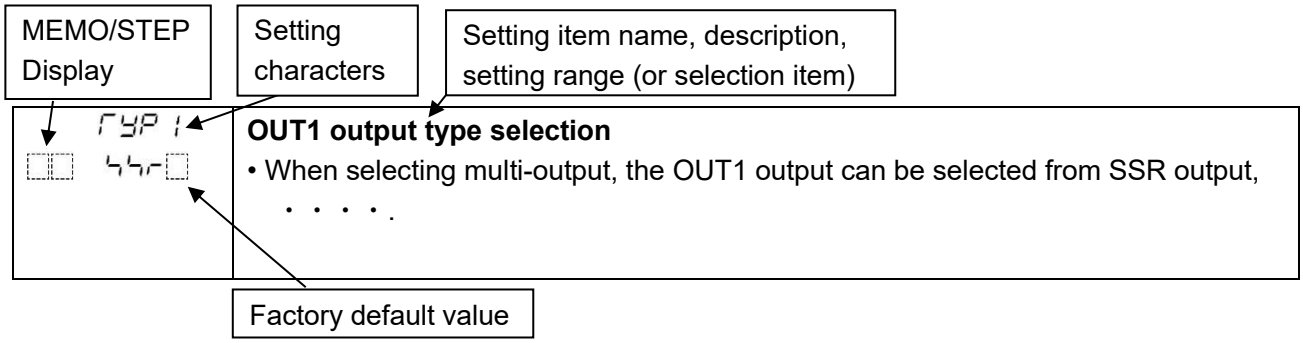
PV filter time constant: 0.0 to 10.0 seconds



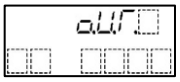
(Fig. 7.6-3)

7.7 Output Setting Group

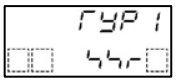
Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the setting (selection) item name, description, and setting range (selection items).



To enter the output setting group, follow the steps below.

① 

In PV/SV display mode, press the key several times until the character of the output setting group is displayed.

② 

Press the key.
Enter the input type selection item.

Characters, Factory Default	Setting Item, Function, Setting Range	
rYP1 □□ SSr□	**OUT1 output type selection** • When selecting multi-output, the OUT1 output can be selected from SSR output, direct current output 4 to 20mA, or 0 to 20mA. • Selection item:	
	SSr□	SSR output
	420A	Direct current output (4 to 20 mA DC)
	020A	Direct current output (0 to 20 mA DC)
c□□□ □□ □30.0 Factory default setting • For relay contact output type: 30.0 sec • For solid-state voltage output type, open collector type: 3.0 sec	**OUT1 proportional cycle setting** • Set the OUT1 proportional cycle. • Setting range: 0.1 to 120.0 sec This item is not displayed when the direct current/DC voltage output type is set/selected.	
HYS□ □□ □□ 1.0	**OUT1 ON/OFF hysteresis setting** • Set the OUT1 ON/OFF hysteresis. • Setting range: 0.1 to 1000.0 ℃ (0.1 to 1800.0 ℉) DC voltage, current inputs: 1 to 10000	
oLH□ □□ 100.0	**OUT1 high limit setting** • Set the OUT1 high limit. • Setting range: Output low limit setting to 100.0 % DC voltage, current inputs: Output low limit setting to 105.0 %	
oLL□ □□ □□0.0	**OUT1 low limit setting** • Set the OUT1 low limit. • Setting range: 0.0 to OUT1 high limit setting DC voltage, current inputs: -5.0 % to OUT1 high limit setting	
orAT □□ □0.00	**OUT1 rate-of-change setting** • Set the changing value of OUT1 MV for 1 second. • Setting range: 0.00 to 100.00 %/sec	
rYP2 □□ SSr□	**OUT2 output type selection** • The OUT2 output can be selected from SSR output, direct current output 4 to 20mA, or 0 to 20mA. • Selection item:	
	SSr□	SSR output
	420A	Direct current output (4 to 20 mA DC)
	020A	Direct current output (0 to 20 mA DC)
	This selection item will not be displayed, when [Option 1: O2(SSR/A)] is not added.	

Characters, Factory Default	Setting Item, Function, Setting Range
cAcF □□ AIr□	**OUT2 cooling method selection** • Select the OUT2 cooling method from air, oil or water cooling. • Selection item: AIr□ Air cooling oIL□ Oil cooling WAT□ Water cooling This selection item will not be displayed, when [Option 1: EV2, O2(SSR/A)] is not added.
c_b□ □□ □30.0 Factory default setting • For relay contact output type: 30.0 sec • For solid-state voltage output type, open collector type: 3.0 sec	**OUT2 proportional cycle setting** • Set the OUT2 proportional cycle. • Setting range: 0.1 to 120.0 sec This item is not displayed, when [Option 1: EV2, O2(SSR/A)] is not added. This item is not displayed, when the direct current/DC voltage output type is set/selected.
HYSb □□ □□ 1.0	**OUT2 ON/OFF hysteresis setting** • Set the OUT2 ON/OFF hysteresis. • Setting range: 0.1 to 1000.0 ℃ (0.1 to 1800.0 ℉) DC voltage, current inputs: 1 to 10000 This selection item will not be displayed, when [Option 1: EV2, O2(SSR/A)] is not added.
oLHb □□ 100.0	**OUT2 high limit setting** • Set the OUT2 high limit. • Setting range: Output low limit setting to 100.0 % DC voltage, current inputs: Output low limit setting to 105.0 % This selection item will not be displayed, when [Option 1: EV2, O2(SSR/A)] is not added.
oLLb □□ □□0.0	**OUT2 low limit setting** • Set the OUT2 low limit. • Setting range: 0.0 to OUT2 high limit setting DC voltage, current inputs: -5.0 % to OUT2 high limit setting This selection item will not be displayed, when [Option 1: EV2, O2(SSR/A)] is not added.
conF □□ HEAT	**Direct/Reverse action selection** • Selects either Reverse (Heating) or Direct (Cooling) control action. • Selection item: HEAT Reverse (Heating) action cooL Direct (Cooling) action
P4F 1 □□ □□0.0	**Pre-set output setting 1** • Set the OUT1 MV output when selecting Pre-set output setting 1 or 2 in the Event input allocation setting. • Setting range: -5.0 to 105.0 % This selection item will not be displayed, when [Option 1: except EI or C5W] is not added.

Characters, Factory Default	Setting Item, Function, Setting Range
P4r2 □□ □□0.0	**Pre-set output setting 2** • Set the OUT2 MV output when selecting Pre-set output setting 1 or 2 in the Event input allocation setting. • Setting range: -5.0 to 105.0 % This item is not displayed, when [Option 1: EV2, O2(SSR/A)] is not added. This item will not be displayed, when [Option 2: except EI or C5W] is not added.
ERcr □□ EoUr	**Action selection when input errors occur** • Select the output state for OUT1 and OUT2 when input error occurs. • Selection item: EoUr: MV setting when input errors occur conr: Control operation continues
Eo1 □□ □□0.0	**OUT1 MV setting when input errors occur** • Set the MV to output when an input error occurs. • Setting range: -5.0 to 105.0 % This item is displayed when MV setting when input errors occur is selected in Action selection when input errors occur.
Eo2 □□ □□0.0	**OUT2 MV setting when input errors occur** • Set the MV to output when an input error occurs. • Setting range: -5.0 to 105.0 % This item is displayed when MV setting when input errors occur is selected in Action selection when input errors occur. This item is not displayed, when [Option 1: EV2, O2(SSR/A)] is not added.

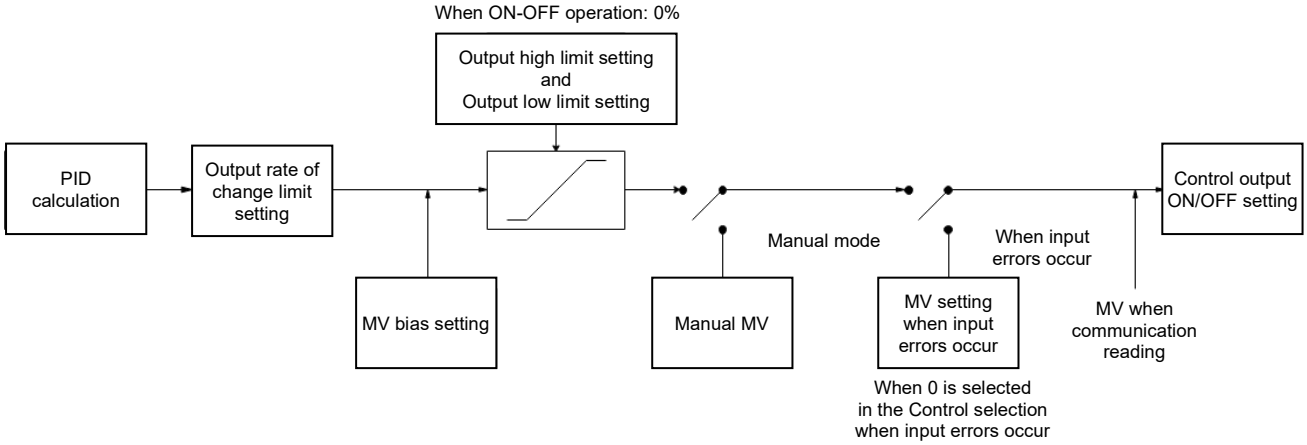
[Action selection when input errors occur]

Select whether to continue control operation when input becomes a sensor error, or to output the fixed MV set in MV setting when input errors occur.

Setting range 0: Output MV when input errors occur

-5.0 to 105.0 %

1: Control operation continues

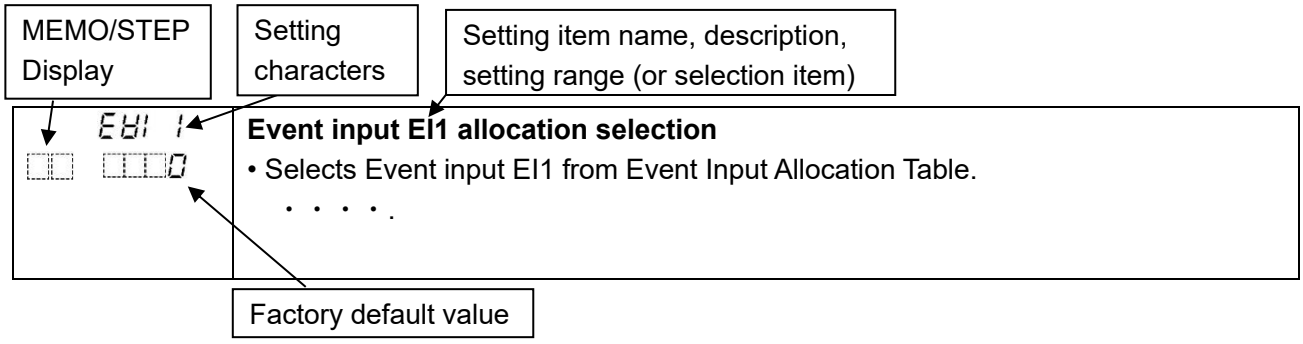


(Fig. 7.7-1)

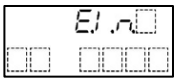
7.8 EVT Input Setting Group

If (Option 2: except C5W) is not added, this setting group will not be displayed.

Explanation of setting items:
The upper section of the left column shows the PV Display setting character, while the lower right section shows the factory default value for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the selection item name, description, and the selected item.



To enter the EVT input setting group, follow the steps below.

① 

In PV/SV display mode, press the ↺ key several times until the character of the EVT input setting group is displayed.

②

Press the ↵ key.
Enter the Event input EI1 allocation setting item.

Characters, Factory Default	Setting Item, Function, Setting Range				
EVI 1 □□ □□□0	**Event input EI1 allocation selection** • Selects Event input EI1 from Event input allocation table. • Selection item: **Event input allocation table**				
	Selection value	**Event input function**	**Input ON (Closed)**	**Input OFF (Open)**	**Remarks**
	□□□0	No event			
	□□□1 (*4)	Set value memory	2^n	1	n: 1 to 3(*1)
	□□□2 (*4)	Control ON/OFF	Control OFF	Control ON	Control output OFF function
	□□□3	Direct/Reverse action	Direct action	Reverse action	Always effective
	□□□4	Preset output 1 ON/OFF	Preset output (*2)	Usual control	If sensor is burnt out, the unit maintains control with the preset MV.
	□□□5	Preset output 2 ON/OFF	Preset output (*2)	Usual control	The unit maintains control with the preset MV. (*3)

Characters, Factory Default	Setting Item, Function, Setting Range				
EVI 1 □□ □□□0	□□□6	Auto/Manual control	Manual control	Automatic control	
	□□□7	Remote/Local	Remote	Local	Adapt to Option2: EA
	□□□8	Program control RUN/STOP	RUN	STOP	Level action when power is turned on
	□□□9	Program control Holding/Not holding	HOLD	Not holding	
	□□ 10	Program control Advance function	ADVANCE	Usual control	
	□□ 11	Integral action Holding	Integral action Holding	Usual integral action	Control continues with the integral value being held.
	□□ 12	EV(x) output latch selection	Latch release	Usual control	
	(*1): The MEMO Display shows the value obtained by adding 2^n and then incrementing by 1. If EI1=OFF and EI2=ON, the display shows 3. Event input numbers are assigned sequentially starting from the smallest number: 2^0, 2^1, and so on. For (Option 2: EI), the maximum is 8 points. For (Option 2: except C5W), the maximum is 4 points. (*2): Output Group Settings: “Preset Output Settings 1, 2”. (Edge Operation) When multiple event inputs select the same function, an OR determination is made. (*3): If [Option 1: EV2, O2(SSR/A)] is not added, this selection item will not be displayed. (*4): When control operation is OFF, only Event input allocation setting □□□1, and □□□2 are enabled.				
EVI 2 □□ □□□0	**Event input EI2 allocation selection** • Selects Event input EI2 from Event Input Allocation Table. • Selection item: Same as Event input EI1 allocation selection.				
EVI 3 □□ □□□0	**Event input EI3 allocation selection** • Selects Event input EI3 from Event Input Allocation Table. • Selection item: Same as Event input EI1 allocation selection.				
EVI 4 □□ □□□0	**Event input EI4 allocation selection** • Selects Event input EI4 from Event Input Allocation Table. • Selection item: Same as Event input EI1 allocation selection.				

[Event input]

4 points (EI1 to EI4) will be added as event inputs.

For (Option 2: EI), the maximum is 8 points; for (Option 2: C5W, except EI), the maximum is 4 points.

When adding (Option 2: EI)

When Set value memory is set for Event input EI1 allocation setting and Event input EI2 allocation setting

Connecting terminal No.		Setting value memory No.
⑬-⑮ (EI1)	⑭-⑮ (EI2)	
Open	Open	SV1
Short	Open	SV2
Open	Short	SV3
Short	Short	SV4

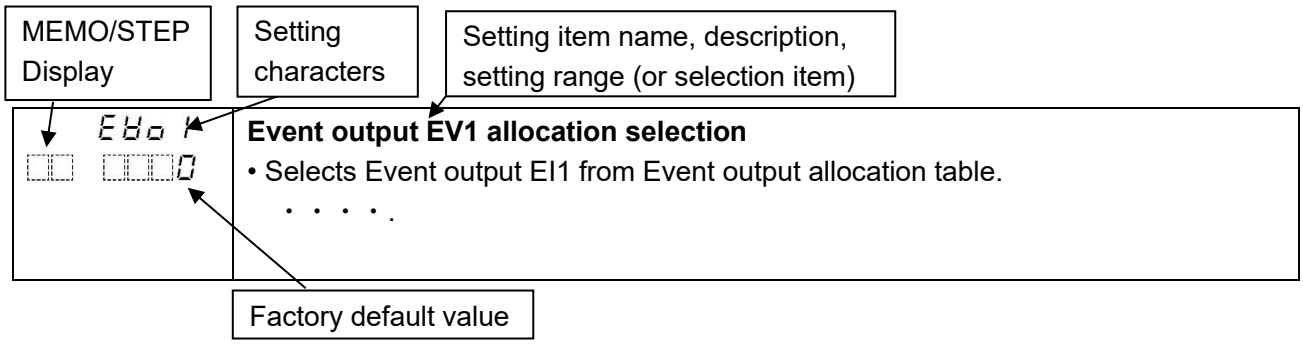
When Set value memory is set for Event input EI1 allocation setting and Event input EI4 allocation setting

Connecting terminal No.		Setting value memory No.
⑬-⑮ (EI1)	⑰-⑱ (EI4)	
Open	Open	SV1
Short	Open	SV2
Open	Short	SV3
Short	Short	SV4

7.9 EVT Output Setting Group

Only items selected in the Event output EV□ allocation setting will be displayed.

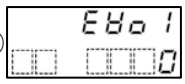
Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the setting (selection) item name, description, and setting range (selection items).



To enter the EVT output setting group, follow the steps below.

①

In PV/SV display mode, press the key several times until the character of the EVT output setting group is displayed.

② 

Press the key.
Enter the Event input EI2 allocation setting item.

Characters, Factory Default	Setting Item, Function, Setting Range
EVo1 □□ □□□0	**Event output EV1 allocation selection** • Selects Event output EV1 from Event output allocation table. • Selection item: **Event output allocation table**

Selection value	Event output function	Remarks
□□□0	No event	
□□□1	Alarm output, High limit alarm	Set in alarm setting mode.
□□□2	Alarm output, Low limit alarm	
□□□3	Alarm output, High/Low limits alarm	
□□□4	Alarm output, High/Low limits independent alarm	
□□□5	Alarm output, High/Low limit range alarm	
□□□6	Alarm output, High/Low limit range independent alarm	
□□□7	Alarm output, Process high alarm	
□□□8	Alarm output, Process low alarm	
□□□9	Alarm output, High limit with standby alarm	
□□10	Alarm output, Low limit with standby alarm	
□□11	Alarm output, High/Low limits with standby alarm	
□□12	Alarm output, High/Low limits with standby independent alarm	
□□13	Heater burnout alarm output	Set in alarm setting mode.
□□14	Loop break alarm output	Set in alarm setting mode.
□□15	Time signal output	Turns OFF or ON during Program control, by setting OFF and ON times within the step set in [Step number].
□□16	Output during AT	Turns ON during AT.
□□17	Pattern end output	Turns ON when Program control ends, and remains ON until turned OFF.
□□18	Remote output	During serial communication, use bit manipulation of communication command 00D6H to turn it OFF or ON. 2^0 EV1 output 0: OFF 1: ON 2^1 EV2 output 0: OFF 1: ON 2^2 EV3 output 0: OFF 1: ON
□□19	Output added when errors occur	Alarm, heater burnout alarm, sensor error, input error, etc., turns ON when error occurs.
□□20	Main output	Selectable when Option1: EV2 is added
□□21	Cooling output	Selectable when Option1: EV2 is added

Characters, Factory Default	Setting Item, Function, Setting Range
A1EA □□ no□□	**EV1 alarm value 0 Enabled/Disabled selection** • When alarm value is 0 (zero), alarm action can be Enabled or Disabled. • Selection item: no□□ Disabled YES□ Enabled This setting item will be displayed, when selecting alarm actions □□□ 1 to □□ 12 in the Event output EV1 allocation setting.
A1HY □□ □□ 10	**EV1 alarm hysteresis setting** • Sets EV1 alarm hysteresis. • Setting range: 0.1 to 1000.0℃ (0.1 to 1800.0 ℉) DC voltage, current inputs: 1 to 10000 This setting item will be displayed, when selecting □□□ 1 to □□ 12 in the Event output EV1 allocation setting.
A1dY □□ □□□0	**EV1 alarm delay time setting** • Sets EV1 alarm action delay time. • Setting range: 0 to 10000 seconds This setting item will be displayed, when selecting □□□ 1 to □□ 12 in the Event output EV1 allocation setting.
A1LA □□ noAL	**EV1 alarm Energized/De-energized selection** • Selects Energized/De-energized status for EV1 alarm. • Selection item: noAL Energized rEV De-energized This setting item will be displayed, when selecting □□□ 1 to □□ 14 in the Event output EV1 allocation setting.
A1Lc □□ no□□	**EV1 output latch selection** • Selects hold when EV1 output is ON. • Selection item: no□□ Disabled YES□ Enabled This setting item will be displayed, when selecting alarm actions □□□ 1 to □□ 14 in the Event output EV1 allocation setting.
TS1S □□ □□□ 1	**TS1 output step number setting** • Sets TS1 output step number. • Setting range: 1 to 16 This setting item will be displayed, when selecting □□ 15 in the Event output EV1 allocation setting.
TS1F □□ 00.00	**TS1 OFF time setting** • Sets TS1 OFF time setting. • Setting range: 00:00 to 99:59 This setting item will be displayed, when selecting □□ 15 in the Event output EV1 allocation setting.
TS1o □□ 00.00	**TS1 ON time setting** • Sets TS1 ON time setting. • Setting range: 00:00 to 99:59 This setting item will be displayed, when selecting □□ 15 in the Event output EV1 allocation setting.

Characters, Factory Default	Setting Item, Function, Setting Range
EVo2 □□ □□□0	**Event output EV2 allocation selection** • Selects Event output EV2 from Event output allocation table. • Selection item: Same as the Event output EV1 allocation selection When (Option 1: EV2) is attached, it will be displayed during EVT2 and EVT3.
A2EA □□ no□□	**EV2 alarm value 0 Enabled/Disabled selection** • When alarm value is 0 (zero), alarm action can be Enabled or Disabled. • Selection item: no□□ Disabled YE5□ Enabled This setting item will be displayed, when selecting alarm actions □□□ 1 to □□ 12 in the Event output EV2 allocation setting.
A2HY □□ □□ 10	**EV2 alarm hysteresis setting** • Sets EV2 alarm hysteresis. • Setting range: 0.1 to 1000.0℃ (0.1 to 1800.0 ℉) DC voltage, current inputs: 1 to 10000 This setting item will be displayed, when selecting □□□ 1 to □□ 12 in the Event output EV2 allocation setting.
A2dY □□ □□□0	**EV2 alarm delay time setting** • Sets EV2 alarm action delay time. • Setting range: 0 to 10000 seconds This setting item will be displayed, when selecting □□□ 1 to □□ 12 in the Event output EV2 allocation setting.
A2LA □□ noAL	**EV2 alarm Energized/De-energized selection** • Selects Energized/De-energized status for EV2 alarm. • Selection item: noAL Energized rEV5 De-energized This setting item will be displayed, when selecting □□□ 1 to □□ 14 in the Event output EV2 allocation setting.
A2Lc □□ no□□	**EV2 output latch selection** • Selects hold when EV2 output is ON. • Selection item: no□□ Disabled YE5□ Enabled This setting item will be displayed, when selecting □□□ 1 to □□ 14 in the Event output EV2 allocation setting.
r52S □□ □□□ 1	**TS2 output step number setting** • Sets TS2 output step number. • Setting range: 1 to 16 This setting item will be displayed, when selecting □□ 15 in the Event output EV2 allocation setting.
r52F □□ 00.00	**TS2 OFF time setting** • Sets TS2 OFF time setting. • Setting range: 00:00 to 99:59 This setting item will be displayed, when selecting □□ 15 in the Event output EV2 allocation setting.
r52o □□ 00.00	**TS2 ON time setting** • Sets TS2 ON time setting. • Setting range: 00:00 to 99:59 This setting item will be displayed, when selecting □□ 15 in the Event output EV2 allocation setting.

Characters, Factory Default	Setting Item, Function, Setting Range
EVo3 □□ □□□0	**Event output EV3 allocation selection** • Selects Event output EV3 from Event output allocation table. • Selection item: Same as the Event output EV1 allocation selection When (Option 1: EV3) is attached, it will be displayed during EVT3.
A3EA □□ no□□	**EV3 alarm value 0 Enabled/Disabled selection** • When alarm value is 0 (zero), alarm action can be Enabled or Disabled. • Selection item: no□□ Disabled YES□ Enabled This setting item will be displayed, when selecting alarm actions □□□ 1 to □□ 12 in the Event output EV3 allocation setting.
A3HY □□ □□ 10	**EV3 alarm hysteresis setting** • Sets EV3 alarm hysteresis. • Setting range: 0.1 to 1000.0℃ (0.1 to 1800.0 ℉) DC voltage, current inputs: 1 to 10000 This setting item will be displayed, when selecting □□□ 1 to □□ 12 in the Event output EV3 allocation setting.
A3dY □□ □□□0	**EV3 alarm delay time setting** • Sets EV3 alarm action delay time. • Setting range: 0 to 10000 seconds This setting item will be displayed, when selecting □□□ 1 to □□ 12 in the Event output EV3 allocation setting.
A3LA □□ noAL	**EV3 alarm Energized/De-energized selection** • Selects Energized/De-energized status for EV3 alarm. • Selection item: noAL Energized rEV5 De-energized This setting item will be displayed, when selecting □□□ 1 to □□ 14 in the Event output EV3 allocation setting.
A3Lc □□ no□□	**EV3 output latch selection** • Selects hold when EV3 output is ON. • Selection item: no□□ Disabled YES□ Enabled This setting item will be displayed, when selecting □□□ 1 to □□ 14 in the Event output EV2 allocation setting.
r534 □□ □□□ 1	**TS3 output step number setting** • Sets TS3 output step number. • Setting range: 1 to 16 This setting item will be displayed, when selecting □□ 15 in the Event output EV3 allocation setting.
r53F □□ 00.00	**TS3 OFF time setting** • Sets TS3 OFF time setting. • Setting range: 00:00 to 99:59 This setting item will be displayed, when selecting □□ 15 in the Event output EV3 allocation setting.
r53o □□ 00.00	**TS3 ON time setting** • Sets TS3 ON time setting. • Setting range: 00:00 to 99:59 This setting item will be displayed, when selecting □□ 15 in the Event output EV3 allocation setting.

[Energized/De-energized]

When nonL (Energized) is selected, each Event output is conductive (ON) while each indicator is lit. Each event output is not conductive (OFF) while each indicator is not lit.

When rEVr (De-energized) is selected, each Event output is not conductive (OFF) while each indicator is lit.

Each event output is conductive (ON) while each indicator is not lit.

	Energized	De-energized
Event output indicator	**Lit**	**Lit**
Event output	**ON**	**OFF**

[Loop Break Alarm]

Detects actuator errors (heater burnout, sensor break)

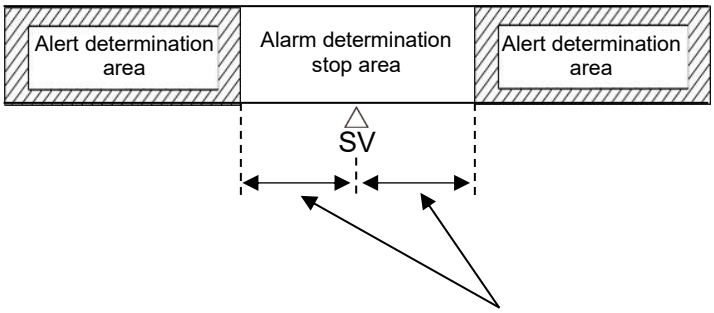
When allocated to multiple EVT outputs, the set value is common.

The loop break alarm is evaluated for each loop break alarm time setting; if a normal condition is detected after an abnormal condition is detected, the alarm is cleared.

Loop break alarm time setting: 0 to 200 min

Loop break alarm band setting: 0 to 150 ℃ (0 to 270 ℉)
or 0.0 to 150.0 ℃ (0.0 to 270.0 ℉)
DC voltage, current inputs: 0 to 1500

Loop break alarm dead band setting:
0 to 150 ℃ (0 to 270 ℉)
or 0.0 to 150.0 ℃ (0.0 to 270.0 ℉)
DC voltage, current inputs: 0 to 1500



(Fig. 7.9-1)

Output: Event outputs allocated to alarm outputs in event output setting mode

Selection item	Selection
Event output EV□ allocation setting	□□ 14: Loop break alarm output

[Time Signal Output]

When Time signal output is selected in the Event output allocation setting, during program operation, when the TS output step occurs, the event output turns ON during the period where TS OFF time ≤ elapsed time ≤ (TS OFF time + TS ON time).

Selection item	Selection
Event output EV□ allocation setting	□□ 15: Timing signal output

[Pattern end output]

When Pattern end output is selected in the Event output allocation setting, the Pattern end output is generated after program completion, and [P.End] flashes on the SV Display. The output turns OFF when the STOP operation is performed.

Selection item	Selection
Event output EV□ allocation setting	□□ 17: Pattern end output

[Remote output]

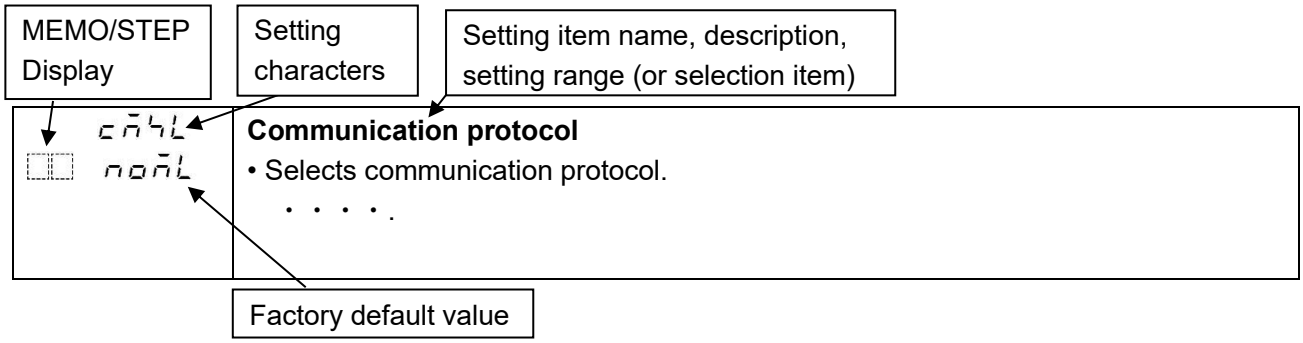
When Remote output is selected in the Event output allocation setting, the host can forcibly turn the output ON or OFF.

Selection item	Selection
Event output EV□ allocation setting	□□ 18: Remote output

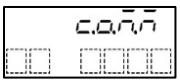
7.10 Communication Setting Group

If (Option 2: C5, C5W) is not added, this setting group will not be displayed.

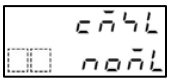
Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the setting (selection) item name, description, and setting range (selection items).



To enter the communication setting group, follow the steps below.

① 

In PV/SV display mode, press the key several times until the character of the communication setting group is displayed.

② 

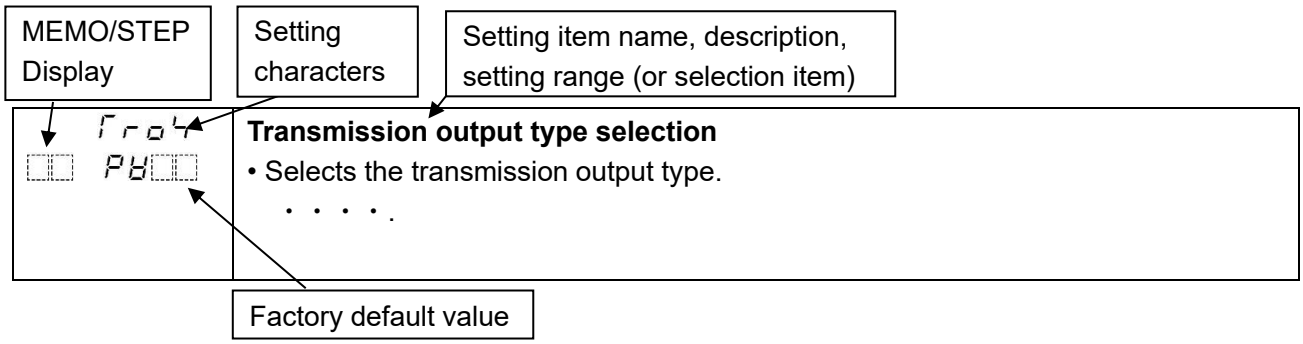
Press the key.
Enter the communication protocol setting item.

Characters, Factory Default	Setting Item, Function, Setting Range	
cnHL □□ nonL	**Communication protocol** • Selects communication protocol. • Selection item:	
	nonL	Shinko protocol
	nodr	MODBUS RTU
	nc□□	MC protocol
	SHrc	SVTC
cnno □□ □□□0	**Instrument number** • Sets the instrument number. The instrument numbers should be set one by one when multiple instruments are connected in Serial communication, otherwise communication is impossible. • Setting range: 0 to 95 When using the MC protocol, set the instrument number to 1 for the master and 2 to 8 for the slaves.	
cnHP □□ □□96	**Communication speed** • Selects a communication speed equal to that of the host computer. • Selection item:	
	□□96	9600 bps
	□192	19200 bps
	□384	38400 bps
	□576	57600 bps
	1152	115200 bps
cnFr □□ 7EVn	**Data bit/Parity** • Selects data bit and parity. • Selection item:	
	8non	8 bits/No parity
	7non	7 bits/No parity
	8EVn	8 bits/Even
	7EVn	7 bits/Even
	8odd	8 bits/Odd
	7odd	7 bits/Odd
cnHr □□ □□□1	**Stop bit** • Selects the stop bit. • Selection item:	
	□□□1	1 bit
	□□□2	2 bits
cndY □□ □□□0	**Response delay time** • Response from the controller can be delayed after receiving command from the host computer. • Setting range: 0 to 1000 ms	
SH_b □□ □□□0	**SVTC bias** • Control desired value (SV) adds SVTC bias value to the value received by the SVTC command. • Setting range: ±20% of input span Displayed when selecting the Shinko protocol. However, within the range from the scaling low limit setting to the scaling high limit setting.	

7.11 Transmission Output Setting Group

If (Option 2: TA, TV) is not added, this setting group will not be displayed.

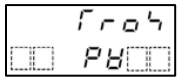
Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the setting (selection) item name, description, and setting range (selection items).



To enter the transmission output setting group, follow the steps below.

①

In PV/SV display mode, press the key several times until the character of the transmission output setting group is displayed.

② 

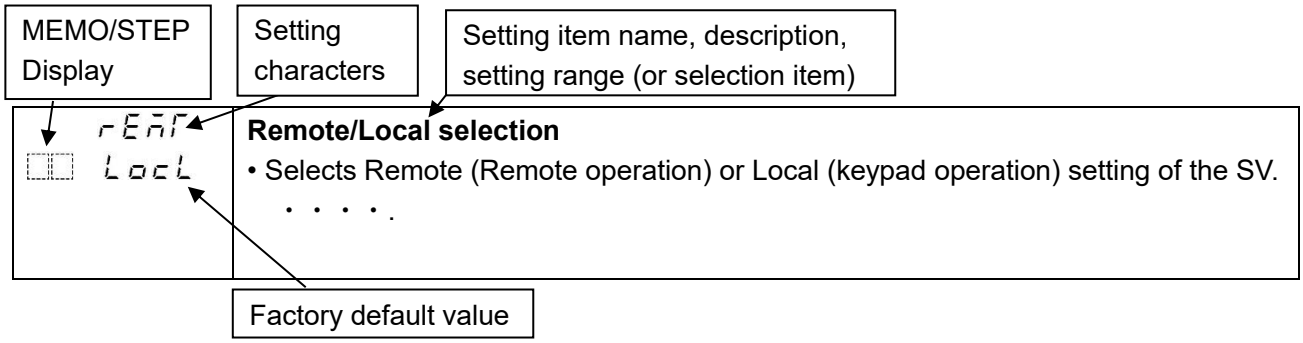
Press the key.
Enter the transmission output type selection item.

Characters, Factory Default	Setting Item, Function, Setting Range	
	Transmission output type selection • Selects the transmission output type. • Selection item:	
	PV□□	PV transmission
	SV□□	SV transmission
	MV□□	MV transmission
	Transmission output high limit setting (For PV, SV transmission) • Sets the Transmission output high limit value. • Setting range: Transmission output low limit setting to Input range high limit value	
	Transmission output low limit setting (For PV, SV transmission) • Sets the Transmission output low limit value. • Setting range: Input range low limit to Transmission output high limit setting	
	Transmission output high limit setting (For MV transmission) • Sets the Transmission output high limit value. • Setting range: Transmission output low limit setting to 105.0 %	
	Transmission output low limit setting (For MV transmission) • Sets the Transmission output low limit value. • Setting range: -5.0 % to Transmission output high limit value	

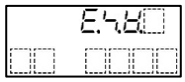
7.12 External Setting Input Setting Group

If (Option 2: EA) is not added, this setting group will not be displayed.

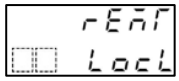
Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the setting (selection) item name, description, and setting range (selection items).



To enter the external setting input setting group, follow the steps below.

① 

In PV/SV display mode, press the key several times until the character of the external setting input setting group is displayed.

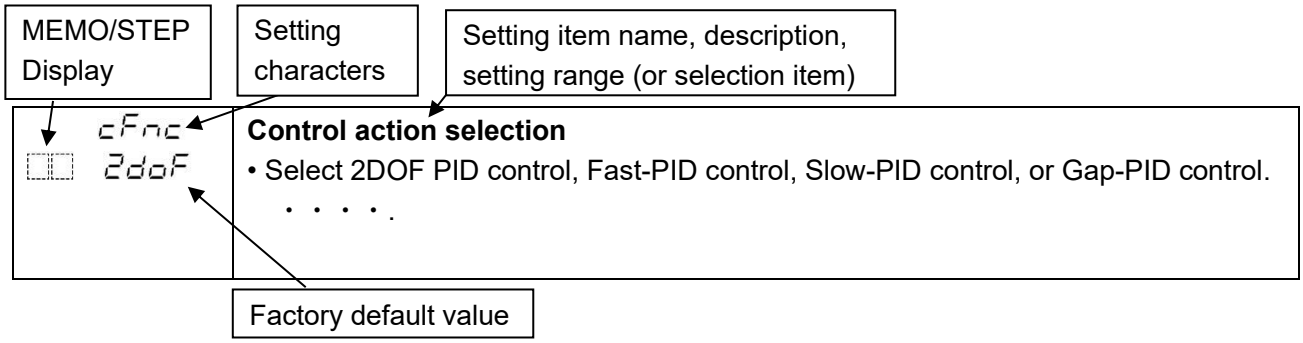
② 

Press the key.
Enter the Remote/Local selection item.

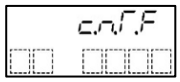
Characters, Factory Default	Setting Item, Function, Setting Range	
rEmT LocL	**Remote/Local selection** • Select whether to operate the SV settings remotely (remote operation) or locally (key operation). • Selection item:	
	LocL	Local
	rEmT	Remote
rTLH 1370	**External setting input high limit setting** • Set the external setting input high limit value (value when 20 mA DC is input). • Setting range: External setting input low limit setting to High limit input range	
rTLL -200	**External setting input low limit setting** • Set the external setting input low limit value (value when 4 mA DC is input). • Setting range: Low limit input range to External setting input high limit setting	
rT_b 0	**Remote bias setting** • During remote action, SV includes the remote bias value. (External setting input low limit to External setting input high limit) • Setting range: ±20% of input span	

7.13 Control Function Setting Group

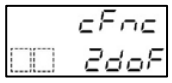
Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the setting (selection) item name, description, and setting range (selection items).



To enter the control function setting group, follow the steps below.

① 

In PV/SV display mode, press the ↺ key several times until the character of the control function setting group is displayed.

② 

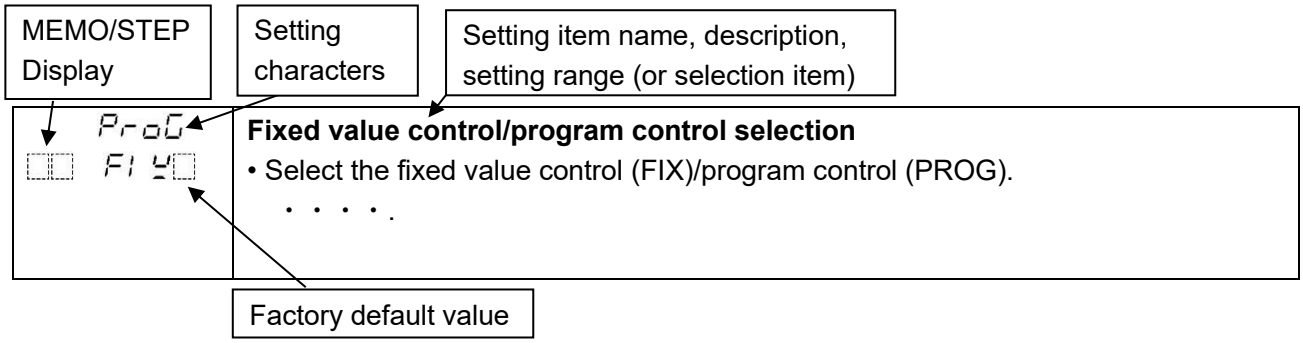
Press the ↵ key.
Enter the Control action selection item.

Characters, Factory Default	Setting Item, Function, Setting Range	
cFnc 2doF	**Control action selection** • Select the 2DOF PID control, Fast-PID control, Slow-PID control, or Gap-PID control. When program control is selected in the fixed value control/program control selection, it automatically becomes deviation PID control regardless of which control action is selected in the control action selection. • Selection item:	
	2doF	2DOF PID control
	FPId	Fast-PID control
	SPId	Slow-PID control
	GAP□	Gap-PID control
F_A□ □0.40	**Proportional gain 2 DOF coefficient setting** • Set the proportional gain 2 DOF coefficient (α). However, if program control is selected in the fixed value control/program control selection, the set value becomes invalid. • Setting range: 0.00 to 1.00	
F_b□ □1.35	**Integral 2 DOF coefficient setting** • Set the integral 2 DOF coefficient setting (β). However, if program control is selected in the fixed value control/program control selection, the set value becomes invalid. • Setting range: 0.00 to 10.00	

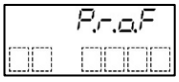
Characters, Factory Default	Setting Item, Function, Setting Range	
F_d□ □□ □0.00	**Derivative 2 DOF coefficient setting** • Set the derivative 2 DOF coefficient setting (γ). However, if program control is selected in the fixed value control/program control selection, the set value becomes invalid. • Setting range: 0.00 to 1.00	
F_cP □□ □ 1.00	**Desired value proportional coefficient** • Set the desired value proportional coefficient (Cp). • Setting range: 0.00 to 1.00	
GAPb □□ □□0.0	**Gap width setting** • Set the region where gap operation becomes active when Gap-PID control is selected. • Setting range: 0.0 to 10.0 %	
GAPt □□ □□ 1.0	**Gap coefficient setting** • Set the strength of the gap function within the region where Gap-PID control operates. Lowering the setting value increases the effect. • Setting range: 0.0 to 1.0	
F_dP □□ □□□0	**Integral/Derivative decimal point place selection** • Select the Integral/Derivative decimal point position. (No decimal point/ First decimal place) • Selection item:	
	□□□0	No decimal point
	□□0.0	With decimal point

7.14 Program Function Setting Group

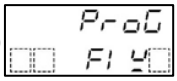
Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the setting (selection) item name, description, and setting range (selection items).



To enter the program function setting group, follow the steps below.

① 

In PV/SV display mode, press the ↺ key several times until the character of the program function setting group is displayed.

② 

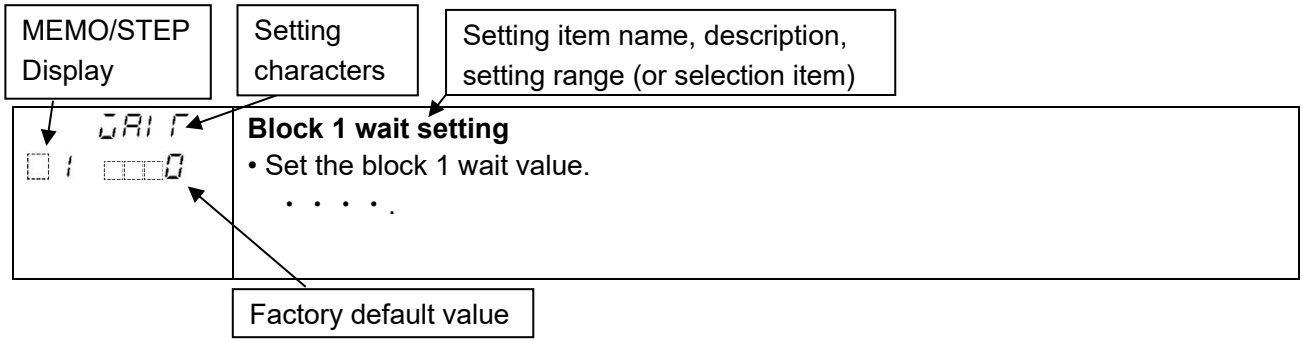
Press the ↵ key.
Enter the Fixed value control/program control selection.

Characters, Factory Default	Setting Item, Function, Setting Range	
PrOG FIXD	**Fixed value control/program control selection** • Select the fixed value control (FIX)/program control (PROG). • Selection item:	
	FIXD	Fixed value control
	PrOG	Program control
n_tM nIn	**Step time unit selection** • Select the step time unit in program control. • Selection item:	
	nIn	Hours:Minutes
	tSEC	Minutes:Seconds
	If program control is not selected, this item will not be displayed.	
PrEr trOP	**Power restore action selection** • Select the program status if a power failure occurs during program control RUN and it is restored. • Selection item:	
	trOP	Stops after power is restored.
	cont	Continues (resumes) after power is restored.
	HoLd	Suspends (on hold) after power is restored.
	If program control is not selected, this item will not be displayed.	
t_tB 0	**Step SV when program control starts setting** • Sets the step temperature when program control starts. • Setting range: Scaling low limit value to Scaling high limit value If program control is not selected, this item will not be displayed.	
t_tL PVSt	**Program control start type selection** • Selects the program control start type. • Selection item:	
	PVSt	PV start
	PVr	PVR start
	tVSt	SV start
	If program control is not selected, this item will not be displayed.	
rEPT 0	**Number of repetitions setting** • Sets the number of repetitions for program control. • Setting range: 0 to 10000 If program control is not selected, this item will not be displayed.	

7.15 Wait Setting Group

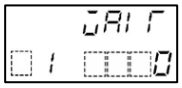
If the program control is selected in the fixed value control/program control selection, this setting group will not be displayed.

Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the wait block number for the MEMO/STEP Display.
The right column shows the setting item name, description, and setting range.

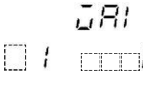
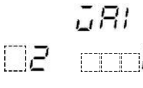
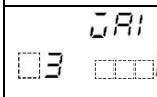
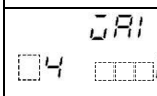
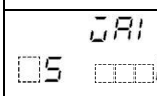


To enter the wait setting group, follow the steps below.

In PV/SV display mode, press the key several times until the character of the wait setting group is displayed.

② 

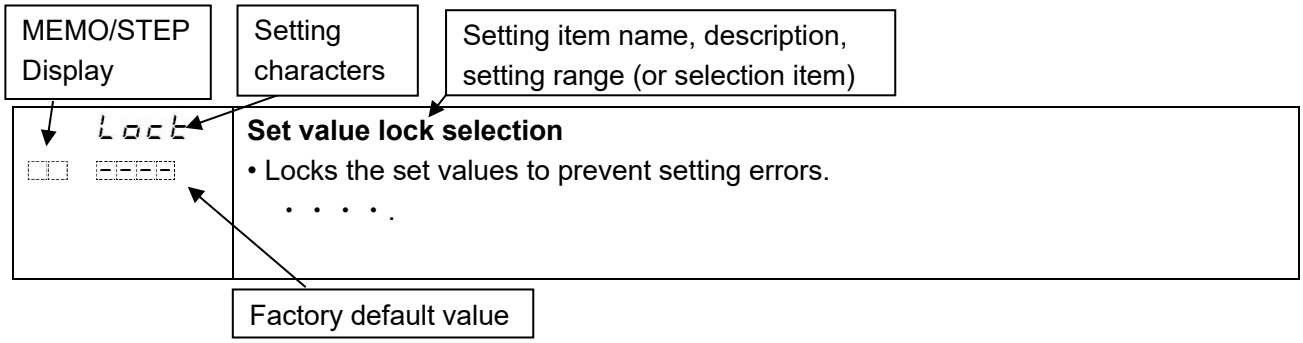
Press the key.
Enter the Fix control/program control selection.

Characters, Factory Default	Setting Item, Function, Setting Range
	**Block 1 wait setting** • Set the block 1 wait value. • Setting range: 0 to 20% of input span
	**Block 2 wait setting** • Set the block 2 wait value. • Setting range: 0 to 20% of input span
	**Block 3 wait setting** • Set the block 3 wait value. • Setting range: 0 to 20% of input span
	**Block 4 wait setting** • Set the block 4 wait value. • Setting range: 0 to 20% of input span
	**Block 5 wait setting** • Set the block 5 wait value. • Setting range: 0 to 20% of input span

Characters, Factory Default	Setting Item, Function, Setting Range
WAIT □6 □□□0	**Block 6 wait setting** • Set the block 6 wait value. • Setting range: 0 to 20% of input span
WAIT □7 □□□0	**Block 7 wait setting** • Set the block 7 wait value. • Setting range: 0 to 20% of input span
WAIT □8 □□□0	**Block 8 wait setting** • Set the block 8 wait value. • Setting range: 0 to 20% of input span

7.16 Other Setting Group

Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the setting (selection) item name, description, and setting range (selection items).



To enter the other setting group, follow the steps below.

①

In PV/SV display mode, press the key several times until the character of the other setting group is displayed.

②

Press the key.
Enter the set value lock selection.

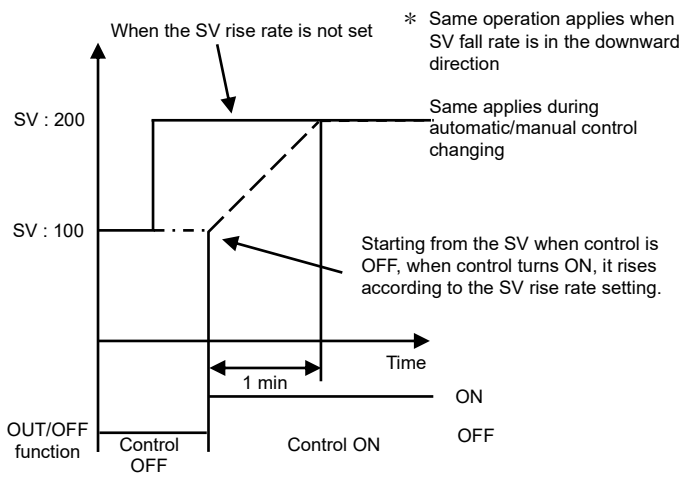
Characters, Factory Default	Setting Item, Function, Setting Range	
Lock ----	**Set value lock selection** • Locks the set values to prevent setting errors. The setting item to be locked depends on the selection. • Selection item:	
	----	Unlock (All set values can be changed.)
	Loc 1	Lock 1 (All settings cannot be changed by key operation.)
	Loc2	Lock 2 (Only the main setting mode can be changed. Other setting modes cannot be changed.)
rAMP PVST	**SV Rise/Fall rate action selection** • Select the operating conditions for the set value ramp function. • Selection item:	
	SVST	SV start
	PVST	PV start
rATE Min	**SV Rise/Fall rate time unit selection** • Select the SV Rise/Fall rate time unit. • Selection item:	
	Min	Minutes
	SEC	Seconds

Characters, Factory Default	Setting Item, Function, Setting Range	
rRTU □□ □□□0	**SV rise rate setting** • Sets the SV rise rate. • Setting range: 0 to 10000 ℃/min (0 to 18000 ℉/min) or 0.0 to 1000.0 ℃/min (0.0 to 1800.0 ℉/min) DC voltage, current inputs: 0 to 10000/min The SV rise rate setting is 0 at factory default; however, setting it to 0 disables this function.	
rRTd □□ □□□0	**SV fall rate setting** • Sets the SV fall rate. • Setting range: 0 to 10000 ℃/min (0 to 18000 ℉/min) or 0.0 to 1000.0 ℃/min (0.0 to 1800.0 ℉/min) DC voltage, current inputs: 0 to 10000/min The SV fall rate setting is 0 at factory default; however, setting it to 0 disables this function.	
dISP □□ ALL□	**LCD display part selection** • Select whether to illuminate all LCD sections or only the lower section (including the action indicator). • Selection item:	
	ALL□	All LCD sections
	Lo□□	Lower section (including the action indicator)
rSHU □□ SU□□	**SV display method selection** • Select the setting value or the desired value during fluctuation caused by ramp function. • Selection item:	
	SU□□	Setting value
	rSU□	Desired value during fluctuation due to ramp function (*)
	(*) Rise rate, fall rate, target values during program operation.	
PSU□ □□ oFF□	**Indication when control output OFF selection** • Select the indication when control output is OFF. • Selection item:	
	oFF□	OFF indication
	AoFF	No indication
	PU□□	PV indication
	PUAL	PV indication + Any Alarm active
oFSL □□ nonE	**OUT/OFF key function selection** • Select the OUT/OFF key function. • Selection item:	
	nonE	No function
	AAnU	Auto/Manual control
	oFF□	Control output OFF function
	rEAT	Remote/Local selection
	rUn□	RUN/STOP function (enabled during program control)

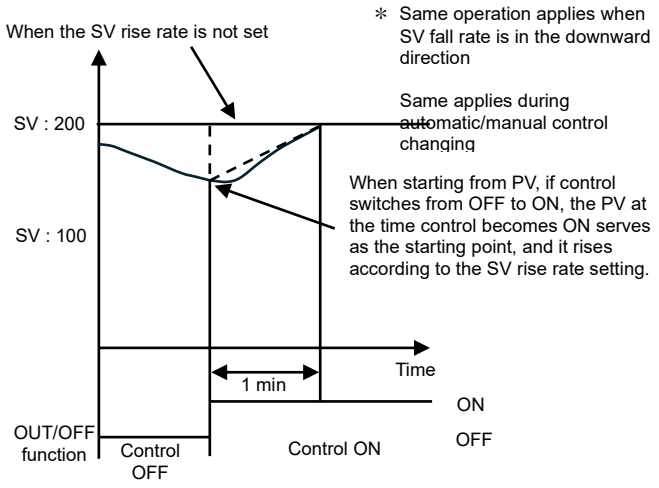
Characters, Factory Default	Setting Item, Function, Setting Range	
PFKL nonE	**PF key function selection** • Select the PF key function. • Selection item:	
	nonE	No function
	AAnU	Auto/Manual control
	oFF□	Control output OFF function
	rEAr	Remote/Local selection
	rUn□	RUN/STOP function (enabled during program control)
AAr-5 AUTo	**Auto/Manual control after power ON selection** • When the power to the controller is turned ON, selects whether the unit starts using Automatic control or Manual control. • Selection item:	
	AUTo	Automatic control
	AAnU	Manual control
d_TA 0000	**Indication time setting** • Set the time until the display turns off when no operation is performed. It will turn back on when any key is pressed or when the input error occurs. • Setting range: 0:00 to 60:00 Minutes:Seconds 0:00 Consecutively 0:01 to 60:00 Indication time	
SAVE SAVE	**Non-volatile IC memory saving selection** • Select whether to save data to non-volatile IC memory when changing settings by key operation or during communication setting. (The value reverts to the previous setting upon power-on.) • Selection item:	
	SAVE	Saving
	no□□	Not saving

[SV Rise/Fall rate action selection]

When the OUT/OFF function selection changes from OFF to ON, or when the manual/automatic control function selection switches from manual control to automatic control, you can choose whether the SV rise rate and SV fall rate operate based on the target value or based on the current PV value.



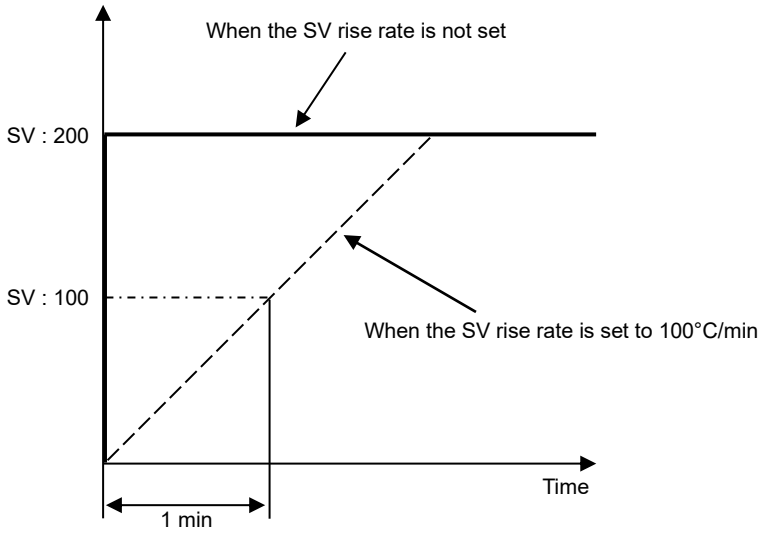
When selecting SV Start



When selecting PV Start

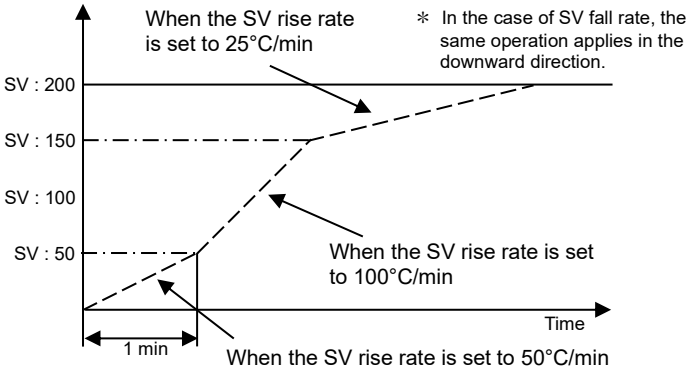
(Fig. 7.16-1)

[SV rise rate setting]

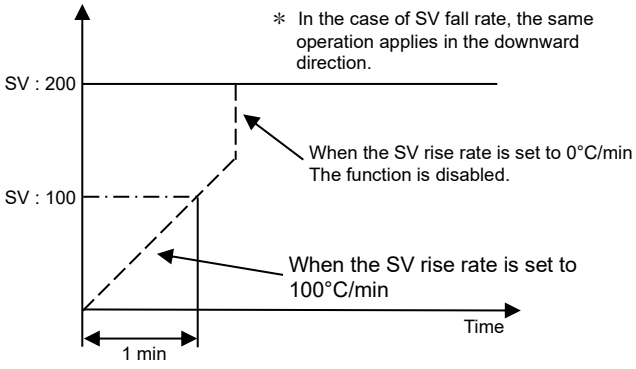


When SV rise rate is set

(Fig. 7.16-2)



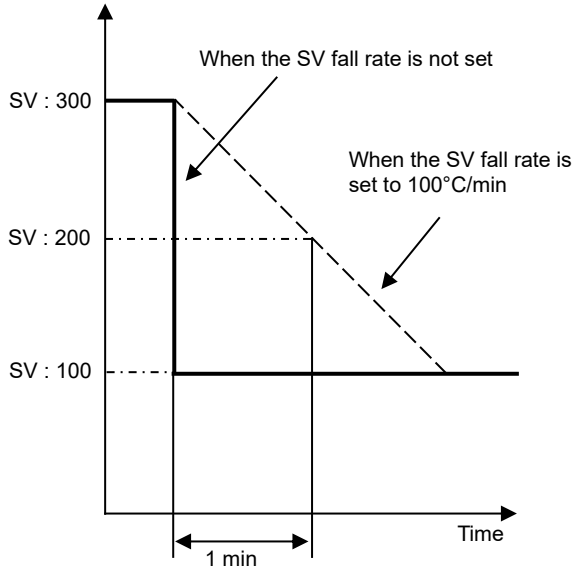
If the SV rise rate fluctuates during SV rise



If the SV rise rate fluctuates to 0 during SV rise

(Fig. 7.16-3)

[SV fall rate setting]



When SV fall rate is set

(Fig. 7.16-4)

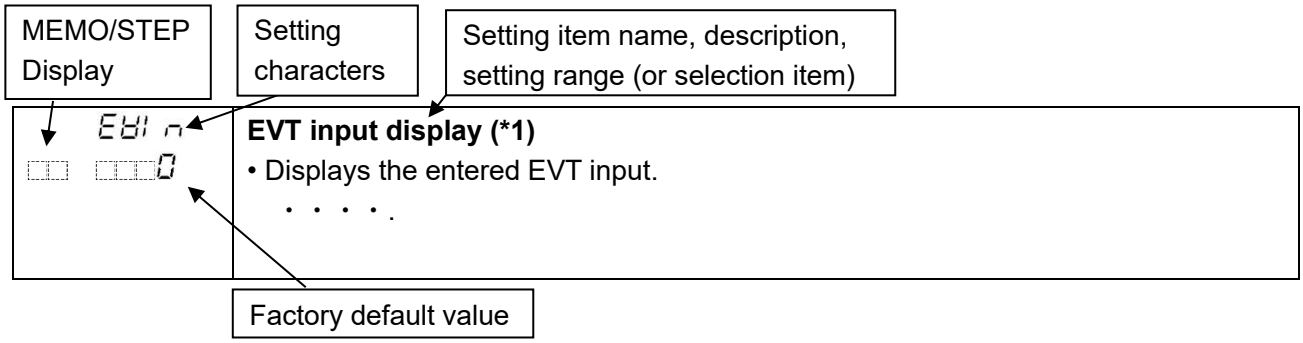
[Auto/Manual control after power ON selection]

Select the recovery operation upon power-on.

If manual control is selected in Auto/Manual control after power ON selection, recovery occurs using the manual MV setpoint. However, if □□6:: Auto/Manual Switch is selected in Event input allocation setting, recovery occurs based on the event input status.

7.17 Maintenance Group

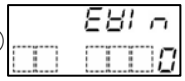
Explanation of setting items:
The upper section of the left column shows the setting item characters for the PV Display, while the lower right section shows the factory default values for the SV Display.
The lower left section shows the MEMO/STEP Display, which is off.
The right column shows the setting (selection) item name, description, and setting range (selection items).



To enter the maintenance group, follow the steps below.

①

In PV/SV display mode, press the ↺ key several times until the character of the maintenance group is displayed.

② 

Press the ⊡ key.
Enter the EVT input display.

Characters, Factory Default	Setting Item, Function, Setting Range	
EVI n 0	**EVT input display (*1)** • Displays the entered EVT input. If multiple inputs are entered, the displayed value is the total sum. • Selection item:	
	0	No input
	1	EI1 ON
	2	EI2 ON
	4	EI3 ON
	8	EI4 ON
EVoF 0	**EVT output ON selection** • EVT output will be forced to output. • Selection item:	
	0	OFF
	1	EV1 output ON
	2	EV2 output ON
	3	EV3 output ON

Characters, Factory Default	Setting Item, Function, Setting Range	
o1oF □□ □□0.0	**OUT1 output setting (*2)** • OUT1 can be output with any desired manipulated value in the control OFF status. • Setting range: 0.0 to 100.0 % DC voltage, current outputs: -5.0 to 105.0 % (*3)	
o2oF □□ □□0.0	**OUT2 output setting (*2)** • OUT2 can be output with any desired manipulated value in the control OFF status. • Setting range: 0.0 to 100.0 % DC voltage, current outputs: -5.0 to 105.0 % (*3) If [Option 1: EV2, O2(SSR/A)] is not added, this selection item will not be displayed.	
rAoF □□ □□0.0	**Transmission output setting** • Transmission output can be output at any desired output level. • Setting range: 0.0 to 100.0 % (*4)	
dcLr □□ no□□	**Date clear selection** • Selecting [YES□] will reset all settings to their factory defaults. • Selection item:	
	no□□	Cancel
	YES□	Execute
PcLr □□ no□□	**Program clear selection** • Selecting [YES□] will reset only program setting group to their factory defaults. • Selection item:	
	no□□	Cancel
	YES□	Execute

(*1): If duplicated, it will be the total value.

(*2): Can be set to 0.0 to 100.0 % or -5.0 to 105.0 %, but the output depends on the OUT□ high/low limit settings.

(*3): For outputs other than 4 to 20 mA DC or 1 to 5 V DC, values below 0% MV are not output.

(*4): For 0 to 1 V DC or 0 to 10 V DC outputs, values below 0% are not output.

8. Operation and Settings of Standard Functions

This section explains the settings required for operation and the main standard functions.

8.1 Selecting an Input Type

Select the input type.

Input type selection is performed in the input type selection section of the input setting group.

Selection item:

tC	K -200 to 1370 ℃	4201	4 to 20 mA DC -19999 to 19999 Built-in shunt resistor
tC.C	K -200.0 to 800.0 ℃		
tC.C	K -200.0 to 400.0 ℃	0201	0 to 20 mA DC -19999 to 19999 Built-in shunt resistor
JC	J -200 to 1000 ℃		
JC.C	J -200.0 to 400.0 ℃	420E	4 to 20 mA DC -19999 to 19999 Separately sold shunt resistor
rC	R 0 to 1760 ℃		
SC	S 0 to 1760 ℃	020E	0 to 20 mA DC -19999 to 19999 Separately sold shunt resistor
bC	B 0 to 1820 ℃		
EC	E -200 to 800 ℃	0 1V	0 to 1 V DC -19999 to 19999
TC.C	T -200.0 to 400.0 ℃	0 5V	0 to 5 V DC -19999 to 19999
nC	N -200 to 1300 ℃	1 5V	1 to 5 V DC -19999 to 19999
PL2C	PL-Ⅱ 0 to 1390 ℃	0 10V	0 to 10 V DC -19999 to 19999
cC	C(W/Re5-26) 0 to 2315 ℃		
Pt.C	Pt100 -200.0 to 850.0 ℃		
PtC	Pt100 -200 to 850 ℃		
Pt.1C	Pt100 -100.0 to 100.0 ℃		

Factory default value is K -200 to 1370℃.

(Example) Selecting K -200.0 to 400.0℃

Power ON

25
0 — RUN mode, PV/SV Display

(Multiple times)

In.1 — Input setting group

InTY
tC — Input type selection

or

InTY
tC.C — tC.C: K -200.0 to 400.0 ℃

+ (2 times) or (3sec)

200
0.0 — RUN mode, PV/SV Display

Selection is complete.

8.2 Selecting Fast-PID Control

From the control action, select any control type: 2DOF PID control, Fast-PID control, Slow-PID control, or Gap-PID control. Selecting the control type according to the application and process enables optimal control.

Control action selection is performed in the control action selection of the control function setting group. The factory default setting is 2DOF PID control.

2DOF PID control

It exhibits disturbance response characteristics similar to Fast-PID control while performing control operations that reduce overshoot.

Fast-PID control

Differential-leading PID control is a common control method where the derivative action operates based on the rate of change of the measured value.

Selecting Fast-PID control allows you to modify the control behavior by configuring the following settings.

P control:	When the integral time and derivative time are set to 0
PI control:	When the derivative time is set to 0
PD control:	When the integral time is set to 0
Deviation PID control:	When varying the desired value over time, select Fast-PID control in the control action selection. Set the proportional gain 2DOF coefficient (α) to 1.00 and the derivative 2DOF coefficient (γ) to 1.00 to enable derivative action based on deviation.
ON/OFF control:	When the proportional band setting is set to 0 (or 0.0)

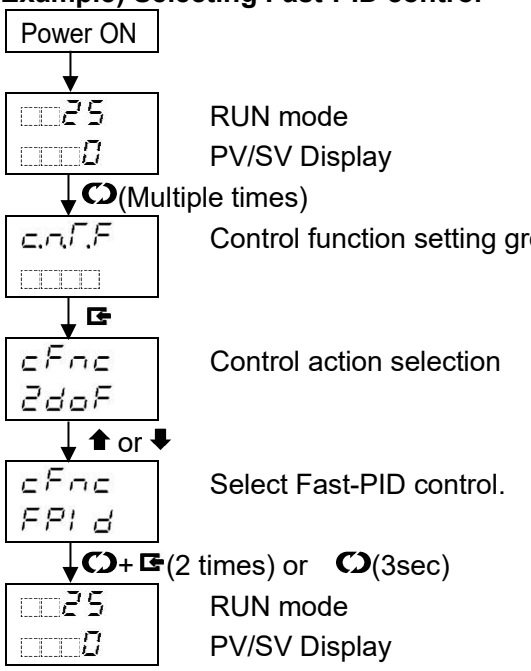
Slow-PID control

Proportional-Derivative Lead PID Control Method: A control method where the proportional action operates based on the measured value, and the derivative action operates based on the rate of change of the measured value. It is used when overshoot is to be avoided.

Gap-PID control

When measurement values contain excessive noise or control components exhibit hysteresis, slight fluctuations may persist near zero deviation. In such cases, a deadband is typically employed. However, since control does not occur within the deadband, measurement values change during disturbances. Therefore, deviation characteristics are introduced within the deadband to enable response to disturbances.

(Example) Selecting Fast-PID control



Selection is complete.

Additional Notes

- Setting the OUT1 proportional band to 0 in the PID settings group enables ON/OFF control.
- Setting both the integral time and derivative time to 0 in the PID settings group enables P control.
- Setting the integral time to 0 in the PID settings group enables PD control.
- Setting the derivative time to 0 in the PID settings group enables PI control.

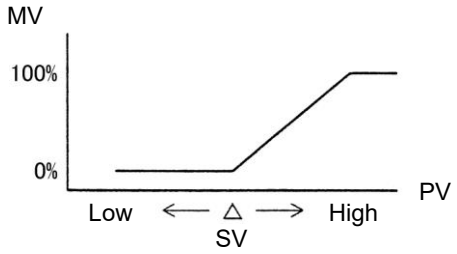
8.3 Selecting Direct/Reverse Action

Selects Direct or Reverse control action.

Select Direct or Reverse control action in [Direct/Reverse action] in output setting group.
Factory default value is Reverse action.

Direct action

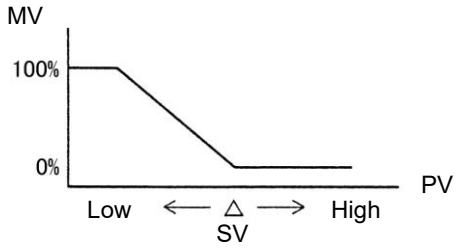
In Direct action, MV is increased when PV is higher than SV (positive deviation).
Refrigerators, etc. perform Direct action.



(Fig. 8.3-1)

Reverse action

In Reverse action, MV is increased when SV is higher than PV (negative deviation).
Electric furnaces, etc. perform Reverse action.



(Fig. 8.3-2)

(Example) Selecting Reverse action

Power ON

RUN mode
PV/SV Display

(Multiple times)

Output setting group

OUT1 output type selection

(Multiple times)

Direct/Reverse action selection

or

Select HEAT (Reverse action).

+ (2 times) or (3sec)

RUN mode
PV/SV Display

Selection is complete.

8.4 Performing Fixed Value Control

Fixed value control is a typical temperature control action, which reduces deviation from a single SV by comparing with PV.

To perform Fixed value control, set the SV.

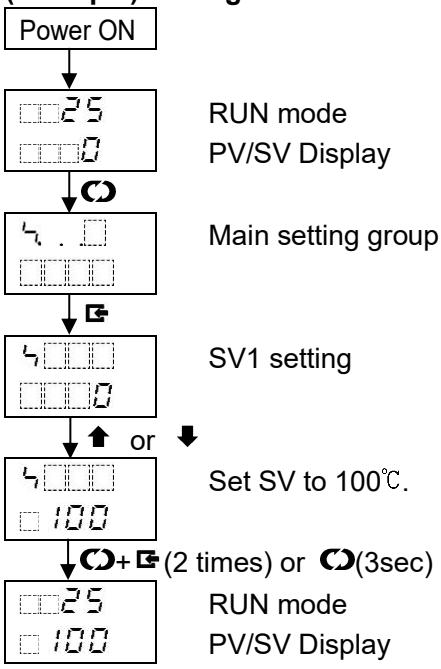
Settings can be configured in two ways: through the main setting group or through direct SV setting.

• Settings by the main setting group

SV setting are performed in the SV1 setting of the main setting group.

The factory default value is 0.

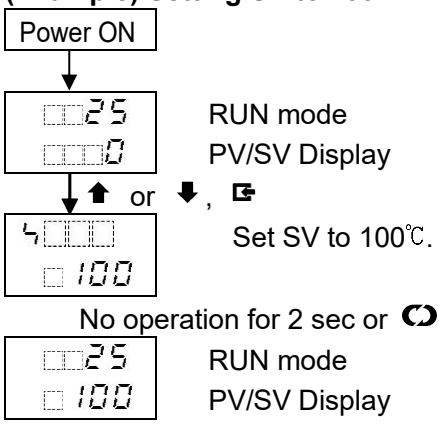
(Example) Setting SV to 100℃



Settings are complete.

• Settings by the direct SV setting

(Example) Setting SV to 100℃



Settings are complete.

8.5 Setting PID Constants (by Performing AT)

⚠ Caution

- **Perform the AT during the trial run.**
- **During the AT, none of the setting items can be set.**
- **If power failure occurs during the AT, the AT stops.**
- **If AT is cancelled during the process, P, I, D and ARW values revert to the values before AT was performed.**
- **AT will be forced to stop if it has not been completed within 4 hours.**
- **Sometimes the AT process will not fluctuate if AT is performed at or near room temperature. Therefore, AT might not finish normally.**

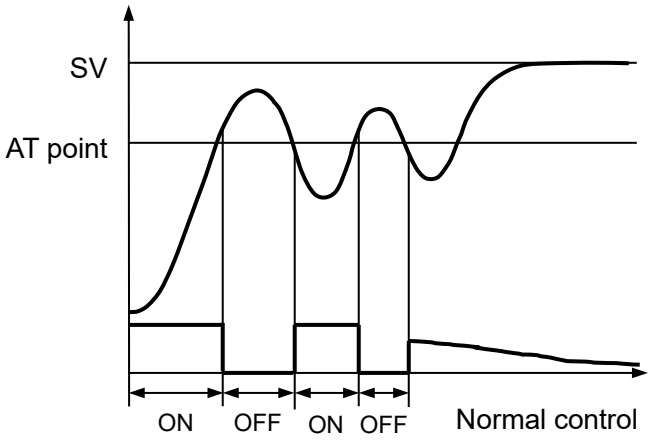
To set PID constants, perform AT.
There are 3 types of AT: Normal AT (Usual AT), 'AT on Startup' and Fast AT.

●Normal AT (Usual AT)

AT is a function that automatically calculates the optimal values for P, I, and D settings by forcibly introducing fluctuations into the process.
For DC voltage and direct current inputs, fluctuations are applied via the SV regardless of whether the process is during startup, stable operation, or shutdown.
During AT execution, AT will continue even if input is burned out.
When executing AT using Gap-PID control, the derivative time is calculated as 0 seconds.
Based on the deviation between SV and PV, AT is automatically executed in one of the following three ways.

[When executed below the AT point]

If the SV-PV at the start of AT is greater than the AT bias setting value, the AT point becomes the SV-AT bias, and limit cycling occurs at the AT point.
When the AT point exceeds the AT hysteresis setpoint, the output turns OFF. When it falls below the AT hysteresis setpoint, the output turns ON.
This process repeats twice.
At the point where the process changes from OFF to ON for the second time, AT ends and control returns to normal operation.



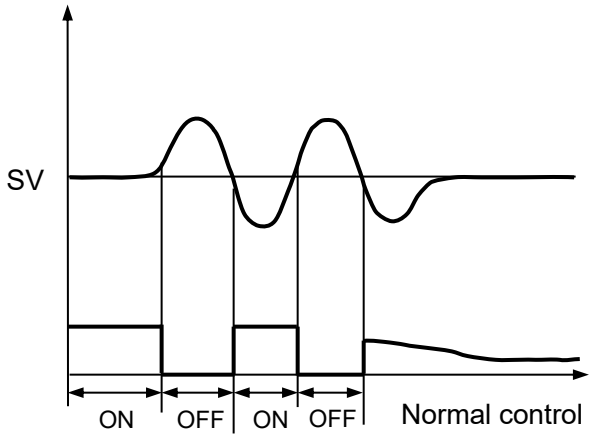
(Fig. 8.5-1)

[When executed near the SV]

The AT point becomes the set value (SV). When AT is executed, it starts from ON. If the AT hysteresis setting value becomes higher than the SV, the output turns OFF until the AT hysteresis setting value becomes lower than the SV.

This process repeats twice.

At the point where the process changes from OFF to ON for the second time, AT ends and control returns to normal operation.



(Fig. 8.5-2)

[When executed above the AT point]

When the PV-SV at AT start is greater than the AT bias setting value, the AT point becomes SV + AT bias, and limit cycling occurs at the AT point.

Output remains OFF until the value falls below the AT hysteresis setting value relative to the AT point.

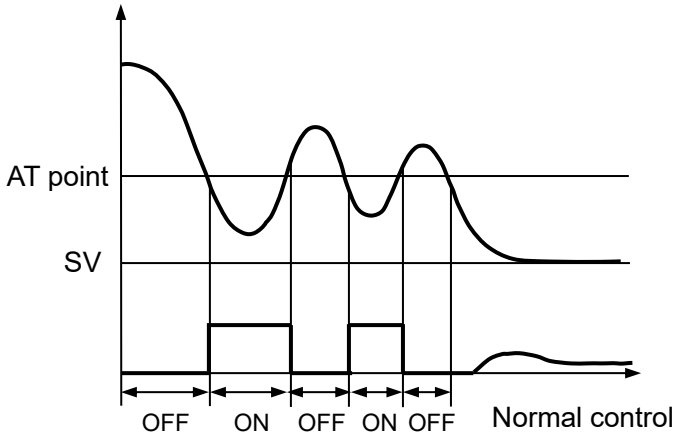
Parameter measurement begins at the point where output changes from ON to OFF after the next ON cycle.

When the output rises above the AT hysteresis setting value relative to the AT point, it turns OFF.

When the output falls below the AT hysteresis setting value relative to the AT point, it turns ON.

This process repeats twice.

At the point where the process changes from OFF to ON for the second time, AT ends and control returns to normal operation.



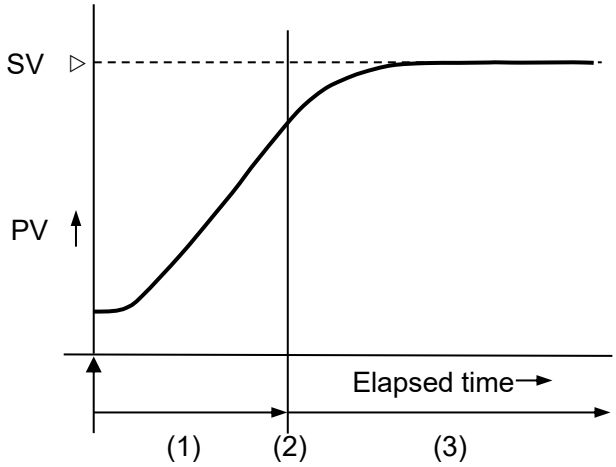
(Fig. 8.5-3)

●AT on startup

'AT on startup' calculates the P, I, and D settings during the heating phase only when normal AT cannot be performed due to temperature interference.

The selected value for executing ‘AT on startup’ is stored internally, so AT runs every time the power is turned on.

To stop ‘AT on startup’, select AT cancel in the AT perform/cancel selection.



(1) Calculates AT

(2) PID constants calculated

(3) Controls with PID constants set by ‘AT on startup’.

(Fig. 8.5-4)

[Conditions of Performing ‘AT on startup’]

- When starting ‘AT on startup’, if deviation between PV and SV exceeds the proportional band by 2 times or more, ‘AT on startup’ will perform.

  When power is turned ON (*), or when the unit reverts to RUN mode after canceling control output OFF, ‘AT on startup’ performs.

  Even after ‘AT on startup’ is successfully finished, ‘AT on startup’ has been still selected in AT Perform/Cancel selection.

  When power is turned ON again, or when the unit reverts to RUN mode by cancelling Control output OFF, ‘AT on startup’ performs again under the above performance conditions.

  To stop ‘AT on startup’, select ‘AT/AT on startup/Auto-reset Cancel’ in AT Perform/Cancel selection.

  (*) For only Fixed value control, ‘AT on startup’ can be performed when power is turned ON. It cannot be performed for Program control.

  However, if PV slope and delay time cannot be measured normally for P, I, D calculation, and automatically ‘AT on startup’ will stop.

  If an error has occurred, P, I, D values revert to the previous value at which ‘AT on startup’ is performed.

[Conditions of Cancelling ‘AT on startup’]

- When Control output OFF is enabled
- When input is burnt out
- When the derivative time setting is 0

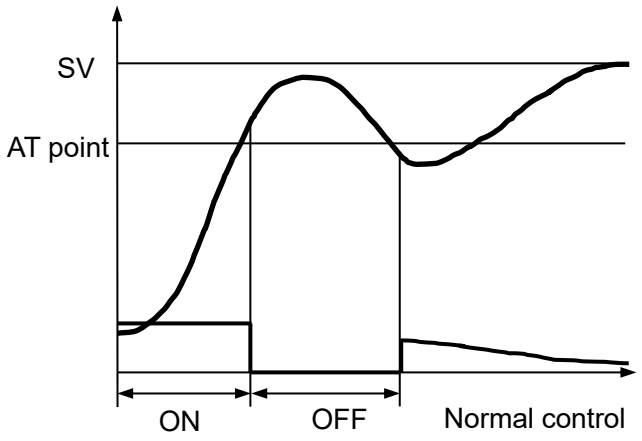
●Fast AT

Fast AT is an AT that significantly reduces the time required to calculate PID compared to normal AT. It is effective for processes where temperature takes a long time to decrease when overshoot occurs. During AT execution, it continues even if the input burns out.

When executing AT with Gap-PID control, the derivative time is calculated as 0 seconds.

[When executed below the AT point]

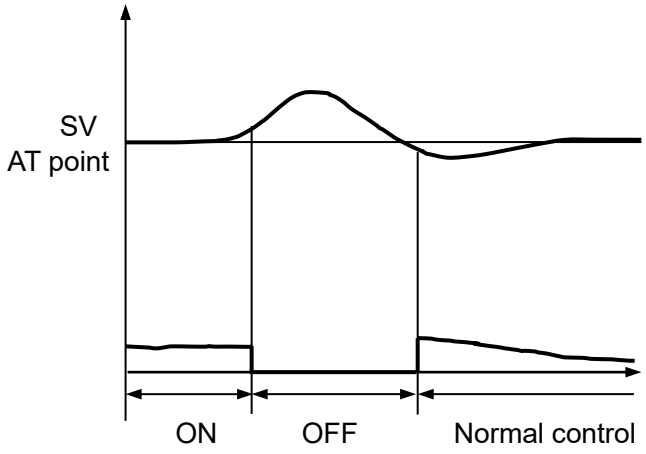
When the SV-PV at AT start is greater than the AT bias setting value, the AT point becomes SV-AT bias. If the value exceeds the AT hysteresis setting value above the AT point, the output turns OFF. If the value falls below the AT hysteresis setting value below the AT point, AT ends and control returns to normal operation.



(Fig. 8.5-5)

[When executed near the SV]

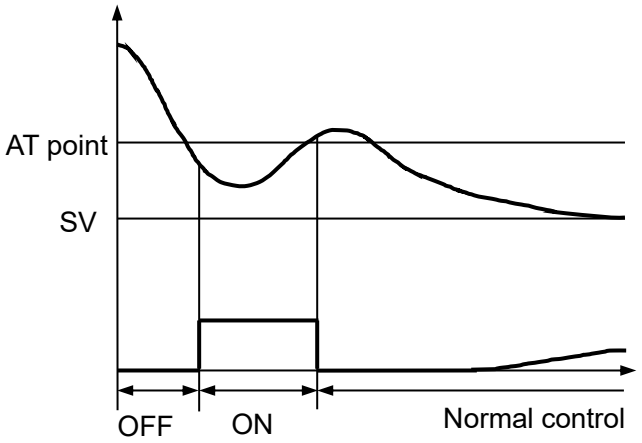
The AT point becomes the set value (SV). When AT is executed, it starts from ON. When the output exceeds the AT hysteresis setting value above SV, it turns OFF. When the output falls below the AT hysteresis setting value below SV, AT ends and control returns to normal operation.



(Fig. 8.5-6)

[When executed above the AT point]

If the PV-SV at the start of AT is greater than the AT bias setting value, the AT point becomes SV + AT bias. When the AT hysteresis setting value falls below the AT point, the output turns ON. When the AT hysteresis setting value rises above the AT point, AT ends and control returns to normal operation.



(Fig. 8.5-7)

(Example) Performing Normal AT (Usual AT)

Power ON

25
100
RUN mode
PV/SV Display

(Multiple times)

AT setting group

AT Perform/Cancel selection

or

Select AT Perform.

(2 times) or (3sec)

25
100
RUN mode
PV/SV Display

Selection is complete.

The AT indicator flashes while AT is performing.
After AT is complete, the AT indicator turns off, and control is performed using PID constants calculated by the AT.

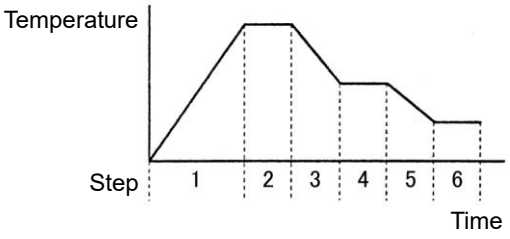
If AT does not finish after 4 hours, AT will automatically stop.

8.6 Performing Program Control

In Program control, SV changes as time elapses, and PV is controlled in order to reach each SV. SV and time can be set for every step, and a maximum of 16 steps can be repeatedly controlled. SV can be set as (Fig. 8.6-1).

Program control is performed using the values set in the program setting group.
When program control is selected, regardless of which control mode is chosen in the control action selection, it automatically becomes deviation PID control. The proportional gain 2DOF coefficient (α), integral 2DOF coefficient (β), and derivative 2DOF coefficient (γ) become invalid. However, for fixed value control when the program time is set to **----** in program control, the control action selected in the control action selection will be used, and the proportional gain 2DOF coefficient (α), integral 2DOF coefficient (β), and derivative 2DOF coefficient (γ) will be enabled.

(e.g.) Program control of electric furnaces in ceramic manufacture, food machinery, etc.



(Fig. 8.6-1)

Major functions of Program control are shown below.

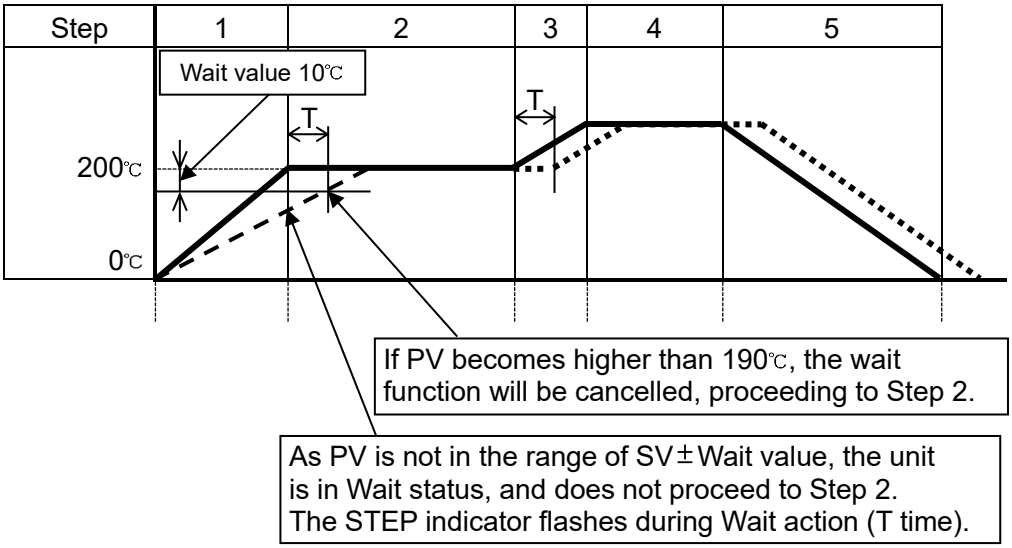
Number of patterns and steps: 1 pattern; 16 steps

Wait function

While Program control is running, the program does not proceed to the next step until the deviation between PV and SV enters SV±Wait value at the end of step. The STEP Display flashes while the Wait function is working.

The Wait function is cancelled on the condition that:

- When program pattern is rising: PV is higher than SV- Wait value
- When program pattern is falling: PV is lower than SV+ Wait value



– – – – – : PV

——— : Program pattern

▪▪▪▪▪▪▪▪▪▪▪▪ : Program pattern delayed by T due to the Wait function

(Fig. 8.6-2)

Program control Holding/Not holding

During Program control, progress of current step is suspended, and then Fixed value control is performed using the SV from the point of suspension.

To cancel the hold function, press and hold the down key for approximately one second, or turn the EVT input OFF. During manual control, the pause cannot be canceled.

Advance function

During program control execution, this function interrupts the currently executing step and advances to the beginning of the next step.

During program control execution, the advance function activates when the up key is held for approximately one second or when the EVT input is turned ON.

The advance function can be selected in the event input allocation selection.

Pattern end output

When pattern end output is selected in the event output allocation selection, the pattern end output is generated after program control ends, and the SV Display flashes P.End.

The output turns OFF with the STOP operation.

Step time unit

Step time unit can be selected: Hours:Minutes, Minutes:Seconds

Factory default is Hours:Minutes.

Power Restore Action (Program control after power is restored)

If power fails during Program control, selects a status after the power is restored.

Factory default value is 'Stops after power is restored'.

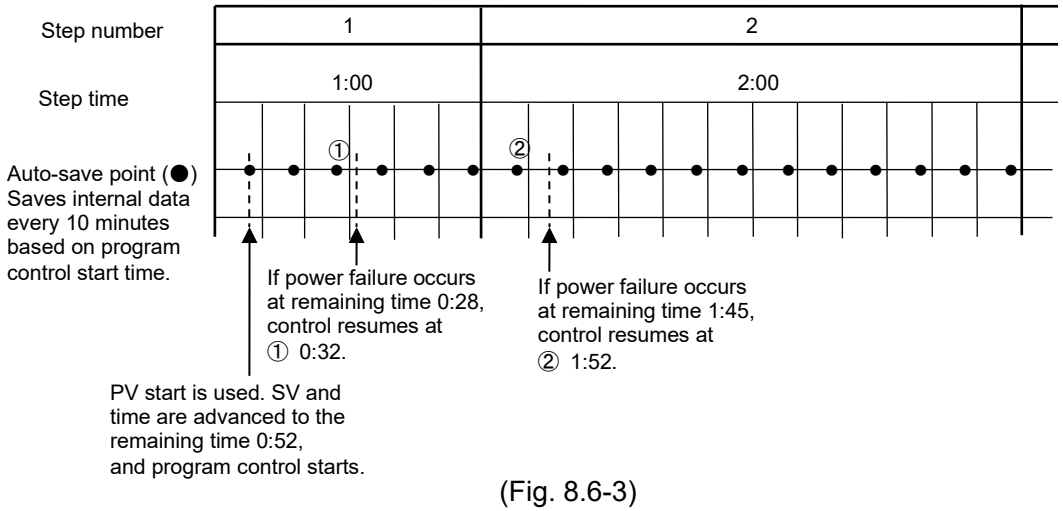
Power Restore Action	Description
Operation stops	Stops Program control, and returns to Standby (Program control waiting) mode.
Operation continues (*)	Continues (resumes) Program control.
Operation suspends (*)	Suspends (on hold) current program, and performs Fixed value control using the SV from the point of suspension. Press and hold the down key for about one second to resume operation and continue program control.

(*) Progressing time error when power is restored: 10 minutes

This controller saves internal status every 10 minutes after Program control starts.

Internal status is also saved when step is changed.

When power is restored, the unit starts from the last auto-save point.



(Fig. 8.6-3)

Program start temperature

When Program control starts, it starts from the value set in [Program start temperature].

Factory default value is 0℃.

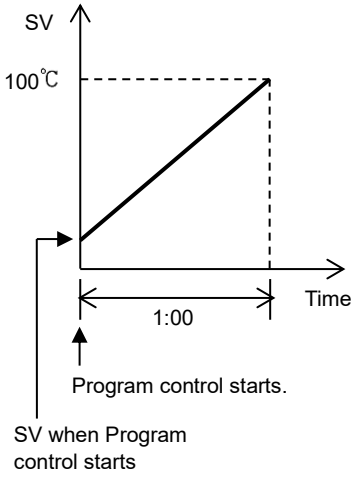
Program control start type

One type can be selected: PV start, PVR start, SV start.

Factory default value is PV start.

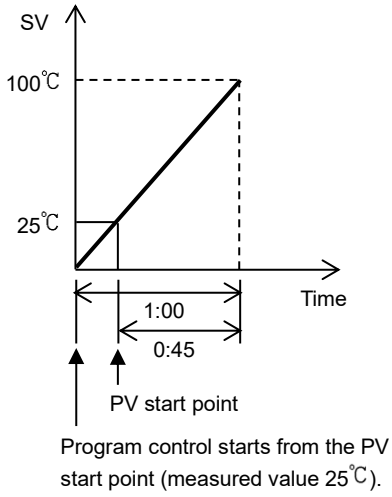
Program control start type	Description
PV start	When Program control starts, the SV and step time are advanced to the PV, then Program control starts. However, if [Program start temperature] at the time of Program control start is higher than the PV (when PV start is initiated), then Program control will start from the SV set in [Program start temperature].
PVR start	In pattern repeating, the SV and step time are advanced to the PV, then the Program control starts.
SV start	Program control starts from the SV which has been set in [Program start temperature].

[SV start]



(Fig. 8.7-4)

[PV/PVR start]



(Fig. 8.7-5)

Repeat function

Step 1 through 16 is counted as one cycle. The operation repeats the number of times specified in the repeat count setting.

Factory default value is 0 (zero).

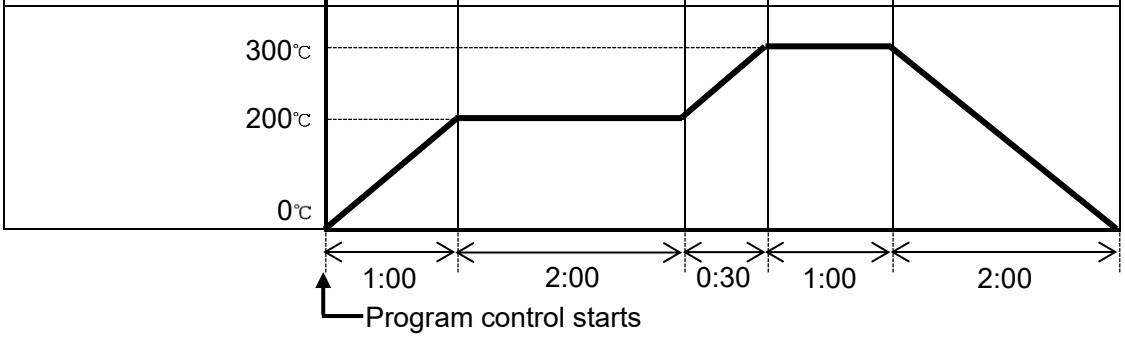
The RUN/STOP function selection is made in the Other Settings group under [OUT/OFF key function selection] or [PF key function selection].
The factory default setting is no function.

Step time unit selection, Power restore action selection, Step SV when program control starts setting, Program control starts type selection, and Number of repetitions setting are made in the Program Function Settings group.
Configure as needed.

Program pattern settings are configured in the Program Settings group.

Example of program pattern setting

Step	1	2	3	4	5
SV(℃)	200	200	300	300	0
Time	1:00	2:00	0:30	1:00	2:00
Wait block number	2	1	2	1	1
PID block number	2	2	3	3	2



(Fig. 8.7-6)

Block setting example

Since each block number in steps without a program pattern set is 1, it is clearer and more convenient to leave block number 1 in each block setting group at its factory default value and start setting from block number 2.

Setting group	Setting item	Setting example
PID setting group (*)	Block 1 OUT1 Proportional band setting	10 ℃
	Block 1 OUT1 Integral time setting	200 second
	Block 1 OUT1 Derivative time setting	50 second
	Block 2 OUT1 Proportional band setting	10 ℃
	Block 2 OUT1 Integral time setting	200 second
	Block 2 OUT1 Derivative time setting	50 second
	Block 3 OUT1 Proportional band setting	10 ℃
	Block 3 OUT1 Integral time setting	200 second
	Block 3 OUT1 Derivative time setting	50 second
Wait setting group	Block 1 Wait setting	0 ℃
	Block 2 Wait setting	10 ℃

(*): The PID setting group is left at its factory default values to perform AT and determine the PID constants.

Program pattern explanation

In the above program pattern, control is performed at each step as follows.

Step 1: The SV gradually rises to 200℃ for 1 hour.
When the step ends, Wait function works so that control cannot proceed to the next step until PV reaches 190℃ when step ends.

Step 2: Fixed value control is performed to keep SV at 200℃ for 2 hours.

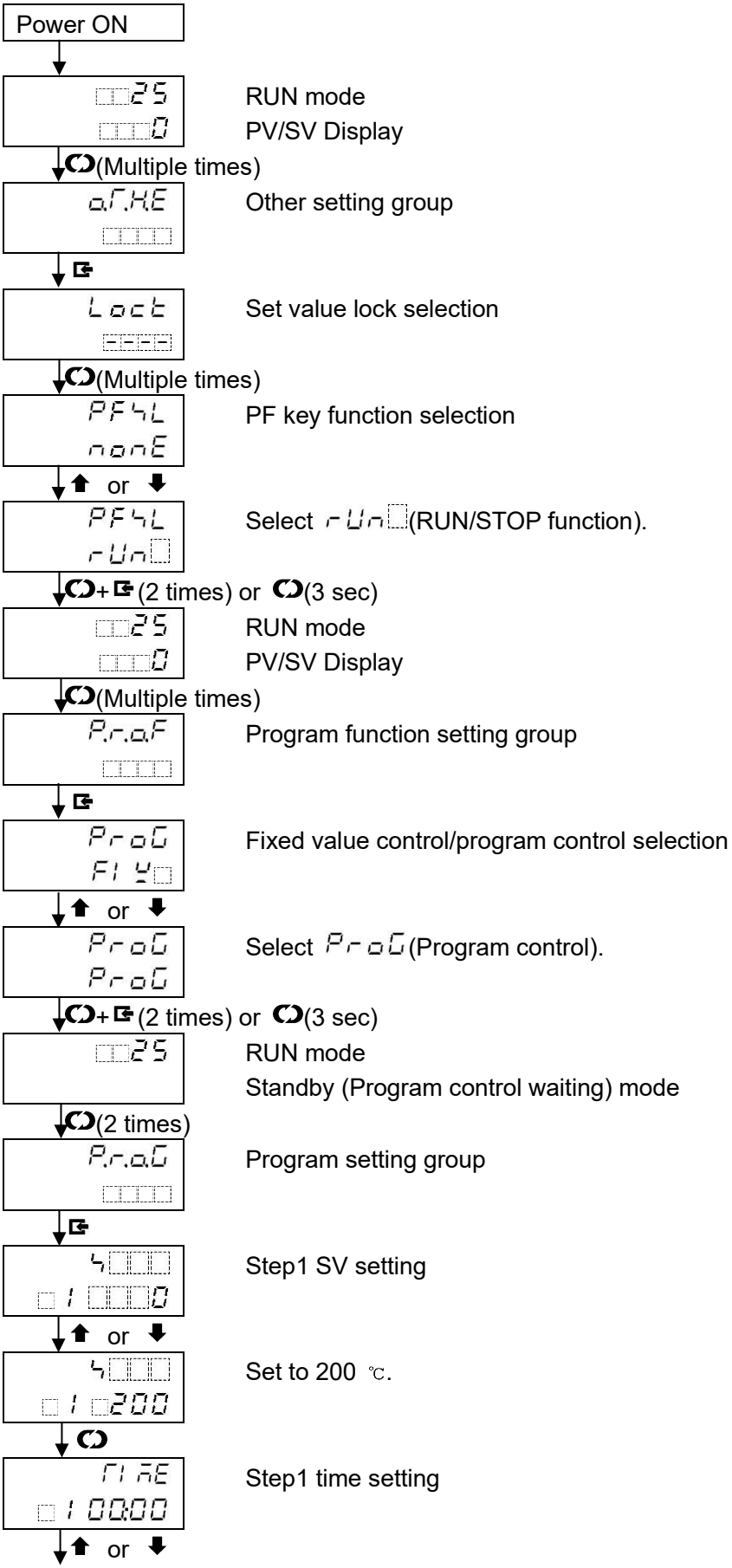
Step 3: Control is performed so that the SV gradually rises to 300℃ for 30 minutes.
When the step is finished, Wait function works so that control cannot proceed to the next step until PV reaches 290℃.

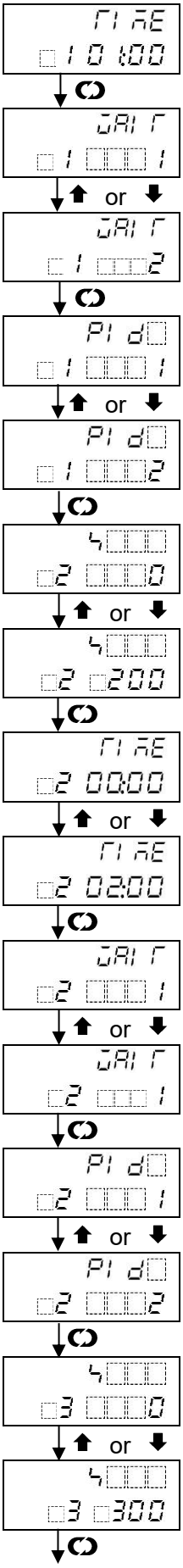
Step 4: Fixed value control is performed to keep SV at 300℃ for 1 hour.

Step 5: Control is performed so that the SV gradually falls to 0℃ for 2 hours.

(Example)

When selecting the RUN/STOP function via the PF key function selection and setting the program pattern shown in (Fig. 8.7-6)





Set to 1:00.

Step1 wait block number setting

Set to 2.

Step1 PID block number setting

Set to 2.

Step2 SV setting

Set to 200 ℃.

Step2 time setting

Set to 2:00.

Step2 wait block number setting

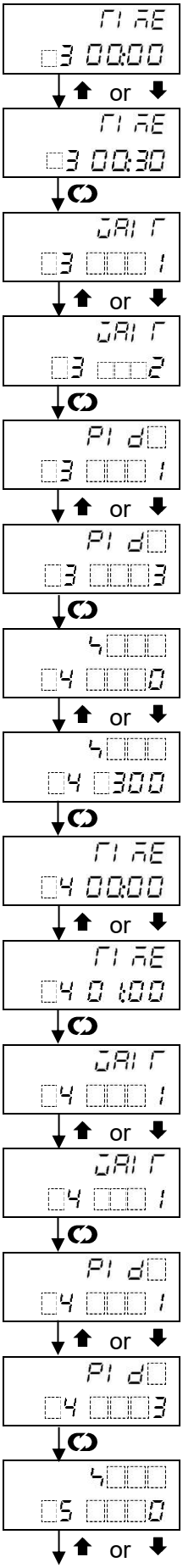
Set to 1.

Step2 PID block number setting

Set to 2.

Step3 SV setting

Set to 300 ℃.



Step3 time setting

Set to 0:30.

Step3 wait block number setting

Set to 2.

Step3 PID block number setting

Set to 3.

Step4 SV setting

Set to 300 ℃.

Step4 time setting

Set to 1:00.

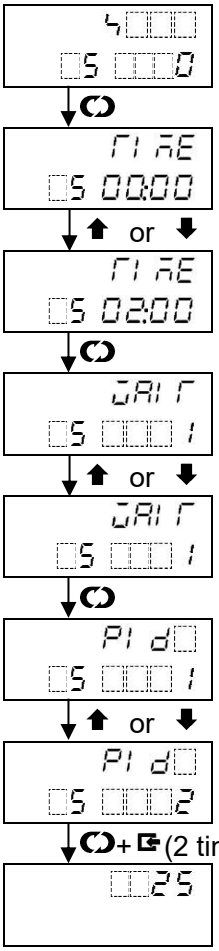
Step4 wait block number setting

Set to 1.

Step4 PID block number setting

Set to 3.

Step5 SV setting



Set to 0 ℃.

Step5 time setting

Set to 2:00.

Step5 wait block number setting

Set to 1.

Step5 PID block number setting

Set to 2.

RUN mode

Standby (Program control waiting) mode

Selection and settings are complete.

Program control RUN

To execute program control, press and hold the OUT/OFF key or PF key for approximately 1 second in Standby (program control waiting) mode, or turn the EVT input ON.

Program control will start using the start method selected in Program control start type selection.
When the wait function activates, the PV Display will flash.

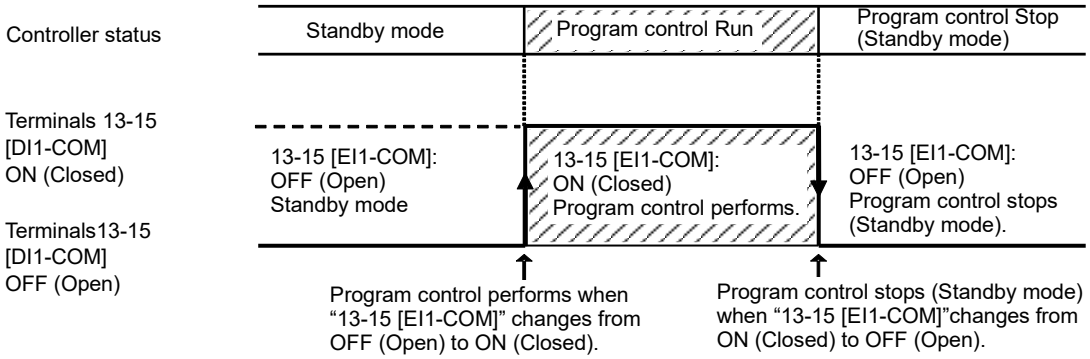
Program control STOP

To stop program control, press and hold the OUT/OFF key or PF key for approximately 1 second during program control execution, or set the EVT input to OFF in the EVT input allocation selection.
Program control will stop and return to Standby (program control waiting) mode.

Proceeding to the next step during Program control (Advance function)

During program control execution, press and hold the up key for approximately one second or turn on the EVT input to proceed to the next step.
This interrupts the currently executing step and advances to the next step.
If the wait function is active, it cancels the wait function and proceeds to the next step.

If '□□□8((Program control RUN/STOP)' is selected in Event input EI1 allocation selection, Program control
RUN/STOP can be switched by terminals 13 and 15 [EI1-COM]:
Signal edge action from OFF to ON / ON to OFF is engaged.
However, for the action when power is turned ON, Level action [ON (Closed) or OFF (Open)] is engaged.



(Fig. 8.7-7)

(Fig. 8.6-7)

8.7 Event Output EV□ Allocation

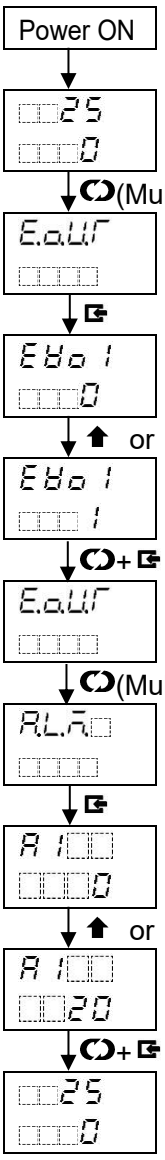
Selects Event output EV□ allocation.

Selecting the EV□ allocation for event output is done in the EVT output settings group under Event output EV□ allocation selection.
Factory default value is No event.

Selection item:

0	No event	
1	Alarm output, High limit alarm	
2	Alarm output, Low limit alarm	
3	Alarm output, High/Low limits alarm	
4	Alarm output, High/Low limits independent alarm	
5	Alarm output, High/Low limit range alarm	
6	Alarm output, High/Low limit range independent alarm	
7	Alarm output, Process high alarm	
8	Alarm output, Process low alarm	
9	Alarm output, High limit with standby alarm	
10	Alarm output, Low limit with standby alarm	
11	Alarm output, High/Low limits with standby alarm	
12	Alarm output, High/Low limits with standby independent alarm	
13	Heater burnout alarm output	
14	Loop break alarm output	
15	Time signal output	Turns OFF or ON during Program control, by setting OFF time and ON time within the step set in [Step number].
16	Output during AT	Turns ON during AT.
17	Pattern end output	Turns ON when Program control ends, and remains ON until turned OFF.
18	Remote output	During serial communication, use bit manipulation of communication command 00D6H to turn it OFF or ON. 2^0 EV1 output 0: OFF 1: ON 2^1 EV2 output 0: OFF 1: ON 2^2 EV3 output 0: OFF 1: ON
19	Output added when errors occur	Alarm, heater burnout alarm, sensor error, input error, etc., turns ON when error occurs.
20	Main output	Selectable when EV2 is added in OP1
21	Cooling output	Selectable when EV2 is added in OP1

(Example) Selecting High limit alarm, and setting EV1 alarm value to 20℃



Selection and settings are complete.

8.8 Indicating MV, Remaining Time (Program Control)

In Fixed value control and Program control, MV and remaining time are indicated.

To indicate MV, press and hold the key for approx. 3 seconds on the PV/SV Display.

The unit enters Monitor mode, and indicates MV.

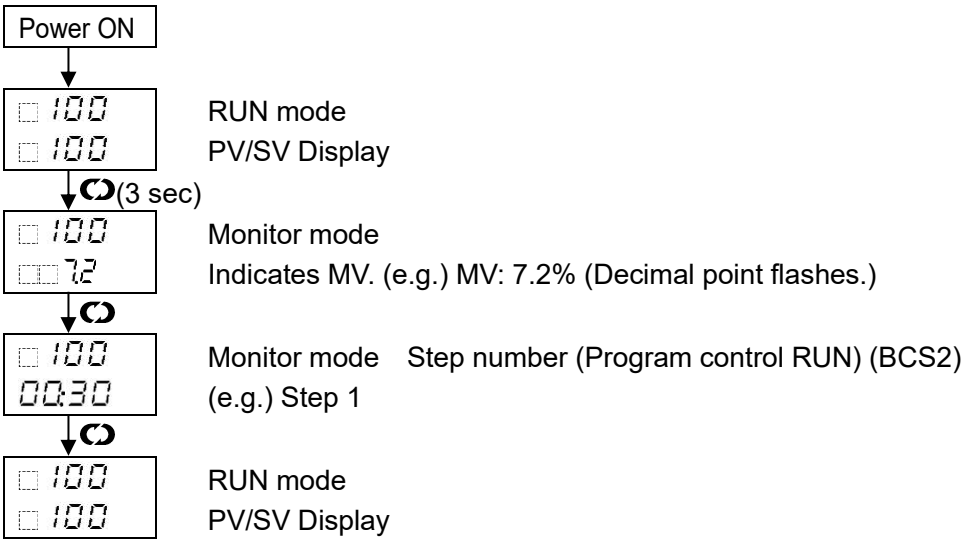
While MV is indicating, the MV indicator lights and the decimal point flashes.

While in Standby (Program control waiting) mode of Program control, the unit cannot move to Monitor mode.

In monitor mode, depending on the control state, pressing the key will cycle through the following displays:。

Control State	Indicated Contents
Fixed value control	Indicates only MV.
Program control	Indicates MV, Remaining time (in that order).

Indicating MV, Remaining time



8.9 Items to be Initialized by Changing Settings

If settings are changed, the following items will be initialized.

○: Initialized

－: Not initialized

Setting item to be Changed / Item to be initialized	Input type selection Temperature unit selection	Event output EV1 allocation selection	Event output EV2 allocation selection	Event output EV3 allocation selection	Transmission output type selection
SV1 to SV8 setting	○	－	－		－
Step1 to 16 SV setting	○	－	－	－	－
Step1 to 16 time setting	○	－	－	－	－
Step1 to 16 wait block number setting	○	－	－	－	－
Step1 to 16 PID block number setting	○	－	－	－	－
AT bias setting	○	－	－		－
AT hysteresys setting	○	－	－	－	－
Block1 to 8 OUT1 proportional band setting	○	－	－		－
Block1 to 8 OUT1 Integral time setting	○	－	－	－	－
Block1 to 8 OUT1 Derivative time setting	○	－	－	－	－
Block1 to 8 OUT2 proportional band setting	○	－	－	－	－
Block1 to 8 OUT2 Integral time setting	○	－	－	－	－
Block1 to 8 OUT2 Derivative time setting	○	－	－	－	－
Block1 to 8 MV bias setting	○	－	－	－	－
Block1 to 8 Overlap/dead band setting	○	－	－	－	－
EV1 alarm setting	○	○	－	－	－
EV1 high limit alarm setting	○	○	－	－	－
EVT2 alarm setting	○	－	○	－	－
EVT2 high limit alarm setting	○	－	○	－	－
EVT3 alarm setting	○	－	－	○	－
EVT3 high limit alarm setting	○	－	－	○	－
Loop break alarm time setting	○	－	－	－	－
Loop break alarm band setting	○	－	－	－	－
Loop break alarm dead band setting	○	－	－	－	－
Scaling high limit setting	○	－	－	－	－
Scaling low limit setting	○	－	－	－	－
Sensor correction coefficient setting	○	－	－	－	－
Sensor correction setting	○	－	－	－	－

Setting item to be Changed / Item to be initialized	Input type selection Temperature unit selection	Event output EV1 allocation selection	Event output EV2 allocation selection	Event output EV3 allocation selection	Transmission output type selection
OUT1 ON/OFF hysteresis setting	○	—	—	—	—
OUT2 ON/OFF hysteresis setting	○	—	—	—	—
EV1 hysteresis setting	○	—	—	—	—
EV2 hysteresis setting	○	—	—	—	—
EV3 hysteresis setting	○	—	—	—	—
SVTC bias setting	○	—	—	—	—
Transmission output high limit setting (except for MV transmission)	○	—	—	—	○
Transmission output low limit setting (except for MV transmission)	○	—	—	—	○
External setting input high limit setting	○	—	—	—	—
External setting input low limit setting	○	—	—	—	—
Remote bias setting	○	—	—	—	—
Program start temperature setting	○	—	—	—	—
Block1 to 8 wait setting	○	—	—	—	—
SV rise rate setting	○	—	—	—	—
SV fall rate setting	○	—	—	—	—

9. Attached Function

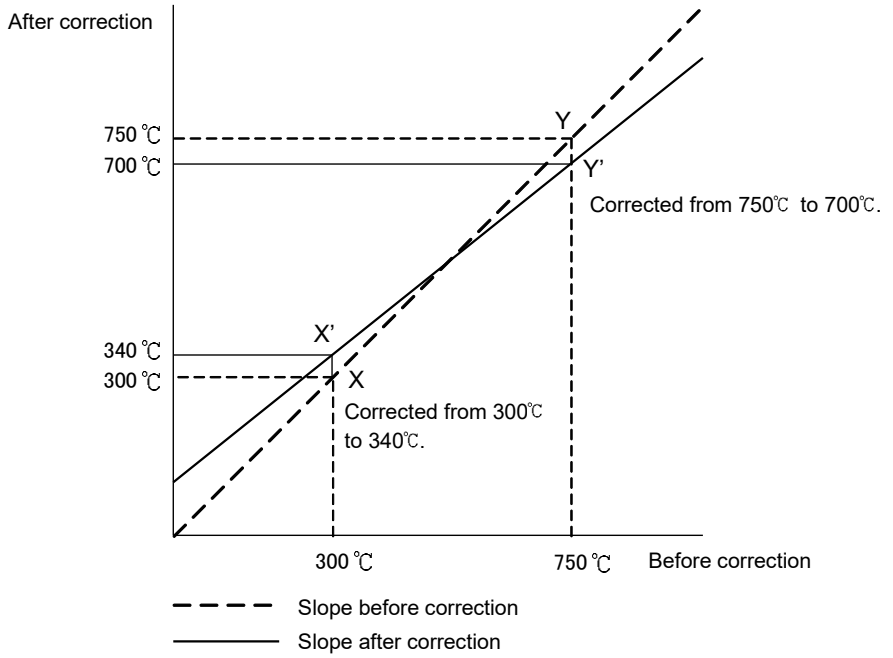
This section explains the settings for the main attached functions.

9.1 Input Value Correction

Input value can be corrected in [Sensor correction coefficient] and [Sensor correction] in Input setting group.
In [Sensor correction coefficient], set the slope of temperature change.
In [Sensor correction], set the difference between temperatures before correction and after correction.

PV after input correction is expressed by the following formula.
PV after input correction = Current PV x Sensor correction coefficient + (Sensor correction value)

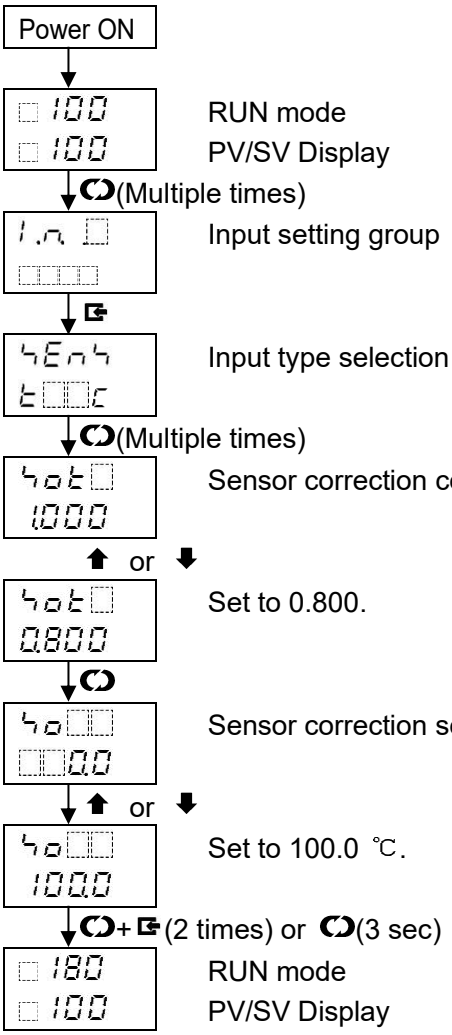
The following shows an example of input value correction using 'Sensor correction coefficient' and 'Sensor correction value'.



(Fig. 9.1-1)

(1) Select any 2 points of PV to be corrected, and determine the PV after correction.
PV before correction: 300℃ ⟶ PV after correction: 340℃
PV before correction: 750℃ ⟶ PV after correction: 700℃
(2) Calculate Sensor correction coefficient from Step (1).
$(Y' - X') / (Y - X) = (700 - 340) / (750 - 300) = 0.8$
(3) Enter a PV value of 300℃ using an mV generator or dial resistor.
(4) Set Step (2) value as a Sensor correction coefficient.
(5) Read the PV.
240℃ will be indicated.
(6) Calculate the sensor correction value.
Calculate the difference between 'PV after correction' and Step (5) PV.
340℃ – 240℃ = 100℃
(7) Set Step (6) value as a Sensor correction value.
(8) Enter an electromotive force or resistance value equivalent to 750℃ using an mV generator or dial resistor.
(9) Read the PV, and confirm that 700℃ is indicated.

(Example) Setting Sensor correction coefficient to 0.800, and Sensor correction to 100.0℃



Settings are complete.

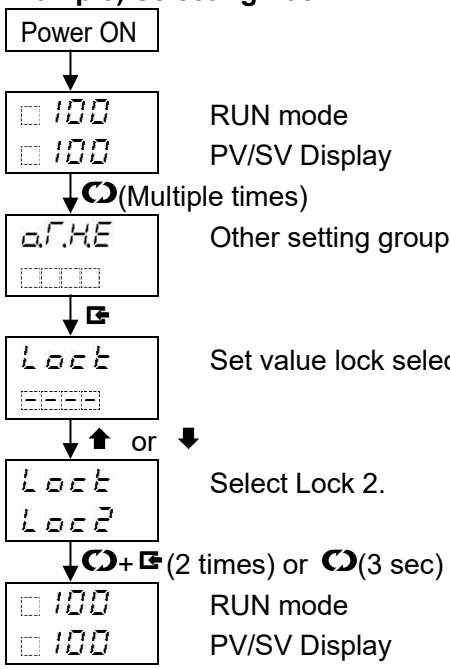
9.2 Set Value Lock

Locks the set values to prevent setting errors.
Make a selection in [Set value lock] in other setting group.

The setting item to be locked depends on the selection.

Selection Item	Change via Keypad	Change via Software Communication
Unlock	All set values can be changed.	All set values can be changed.
Lock 1	None of the set values can be changed.	
Lock 2	Only the main settings group can be changed.	

(Example) Selecting Lock 2



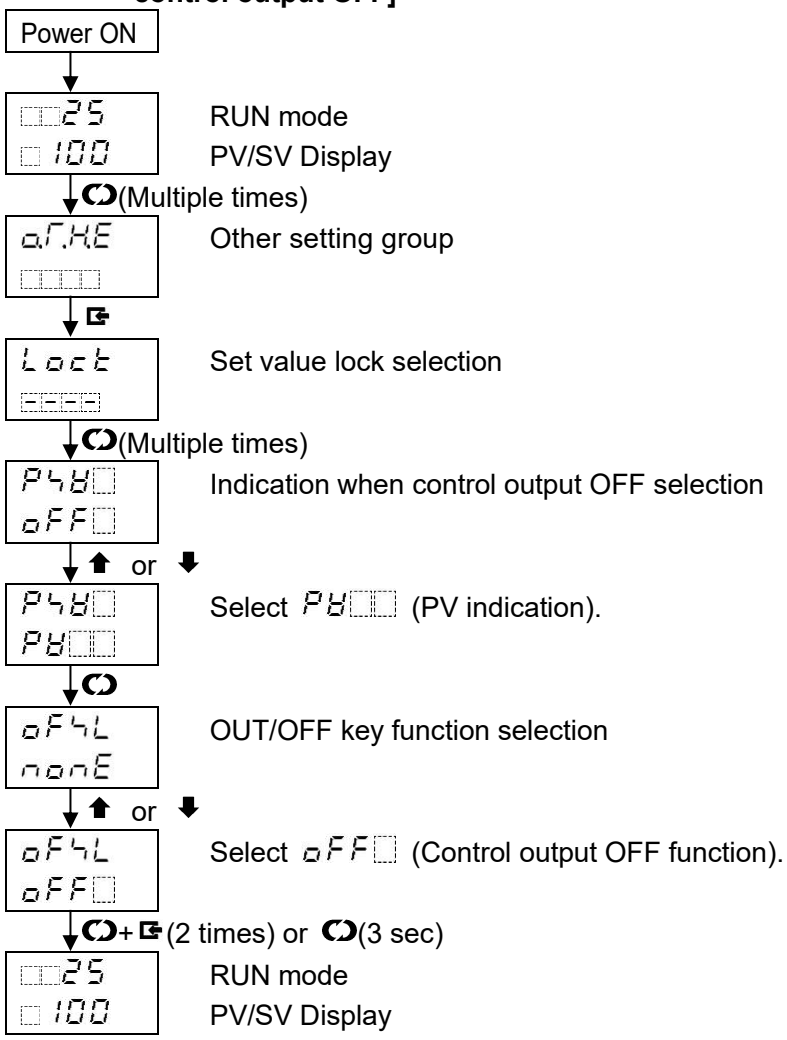
Selection is complete.

9.3 Control Output OFF Function

The control action and output of an instrument (or instruments) can be turned OFF without turning OFF their power supplies using this function.

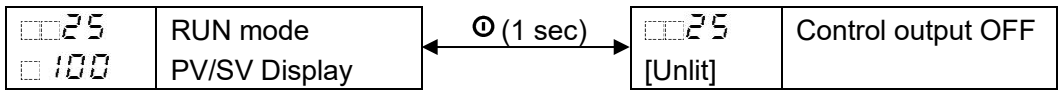
Select 'Control output OFF function' in [OUT/OFF key function] or [PF key function selection] in other setting group.
Factory default value is Control output OFF function.

(Example) Selecting 'Control output OFF function', and 'PV indication' in [Indication when control output OFF]



Selection is complete.

To turn the control output OFF, press the ◎ key for approximately 1 second on the PV/SV Display. PV is indicated on the PV Display. Indication differs depending on the selection in [Indication when control output OFF].
Once the control output OFF function is enabled, the function cannot be cancelled even if the power to the instrument is turned OFF and ON again.
To cancel the function, press the ◎ key again for approx. 1 second.



9.4 Switching Auto/Manual Control (Auto/Manual Control Function)

Control action can be switched from automatic to manual and vice versa.

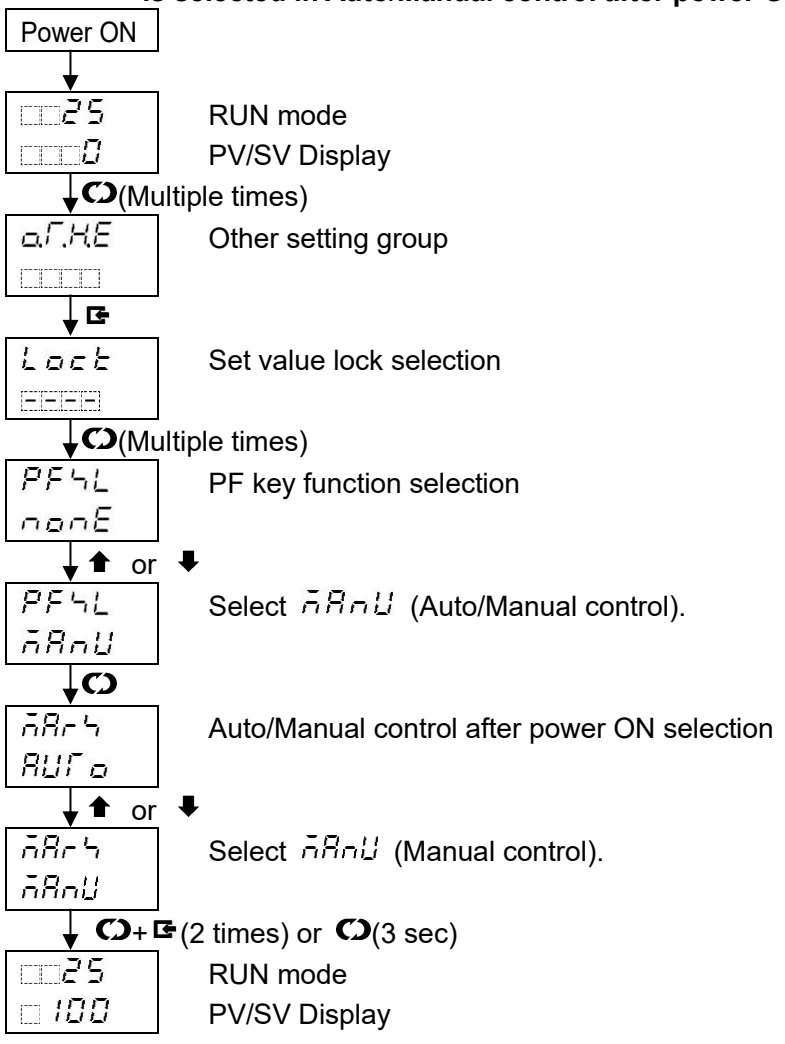
When switching from automatic control to manual control, or from manual control to automatic control, the balanceless-bumpless function activates to prevent sudden changes in the MV.
When automatic control is switched to manual control, the MAN indicator lights. Set the MV using the up or down keys. After changing the manual MV, the data is saved after 2 seconds.

Additionally, when the instrument power is turned on, you can choose whether to restore via automatic control or manual control.
If manual control is selected in the Auto/Manual control after power ON selection, restoration occurs using the manual setpoint. However, if 6: Auto/Manual Switch is selected in the event input allocation selection, restoration occurs based on the event input status.

The selection of automatic/manual control functions is performed via the OUT/OFF key function selection or PF key function selection in the other setting group.
The factory default setting is no function.

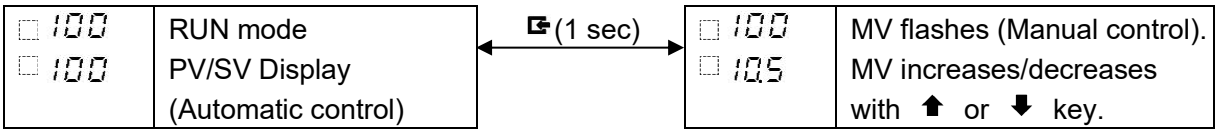
The selection for automatic/manual control recovery is made in the Auto/Manual control after power ON selection within the other setting group.
The factory default setting is automatic control.

(Example) When Auto/Manual control is selected in PF key function selection and Manual control is selected in Auto/Manual control after power ON selection



Selection is complete.

When Manual control is selected in Auto/Manual control after power ON selection, the instrument will resume at the manual MV set value when the power is turned on.
However, if □005 (Auto/Manual control) is selected in Event input allocation selection, it will resume based on the event input status.
Pressing the key again for approximately 1 second will return it to automatic control.



9.5 Data Clear and Program Clear

If data is cleared, data will revert to factory default values.

There are two types: Data Clear and Program Clear.

・Data clear: Resets all settings to factory default values.

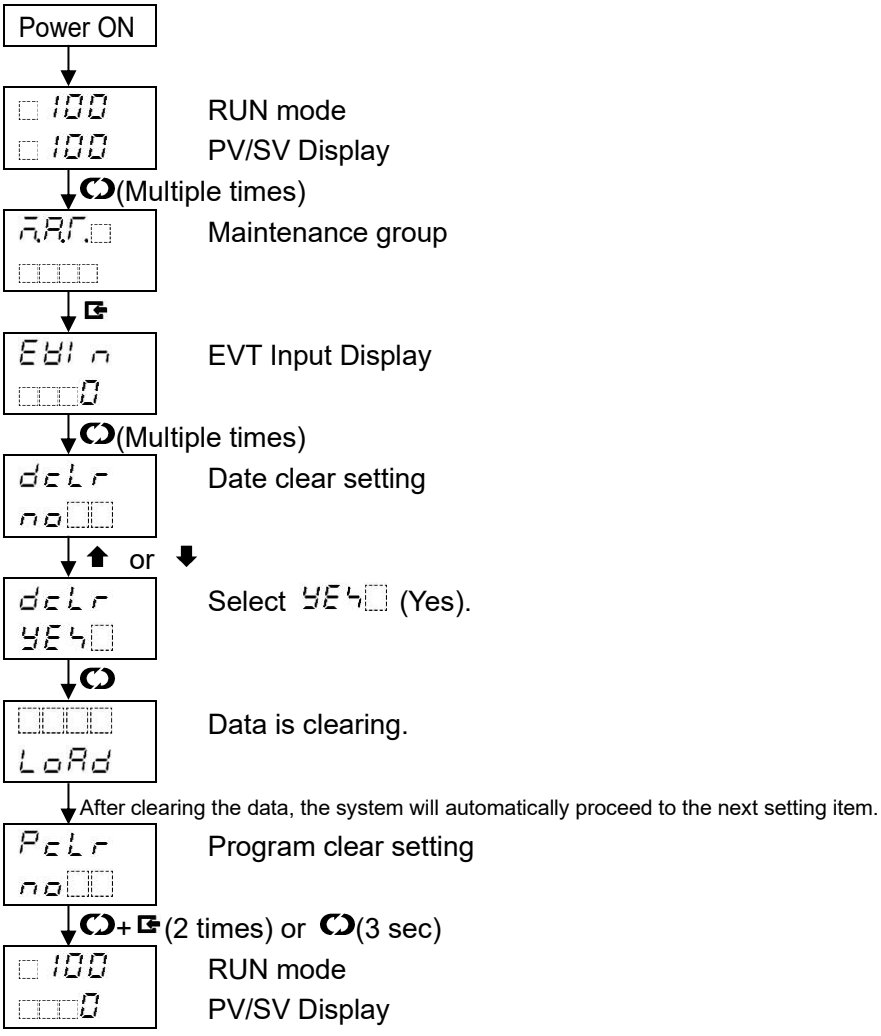
・Program clear: Resets only the settings within the program setting group to factory default values.

Data Clear and Program Clear are performed via the maintenance group's Date Clear Yes/No and Program Clear Yes/No settings.

Select Yes and press the key to execute data clear.

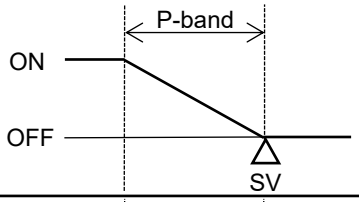
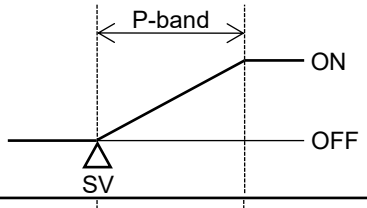
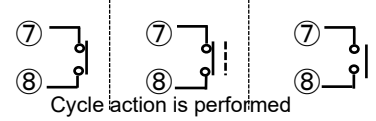
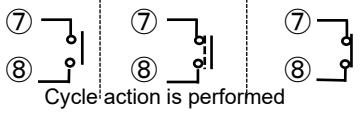
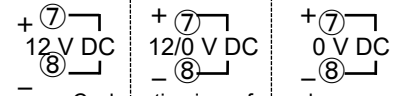
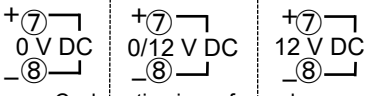
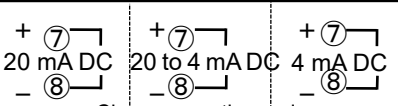
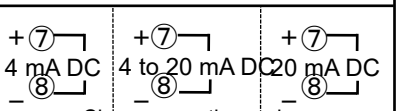
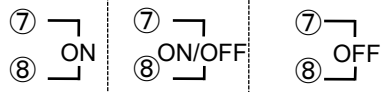
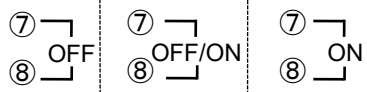
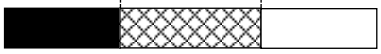
During data clear execution, the PV Display will turn off and the SV Display will show LoAd.

Performing Data Clear



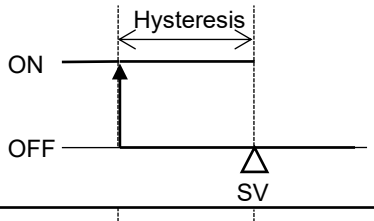
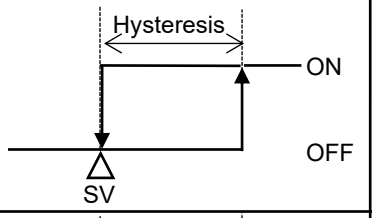
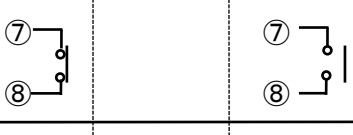
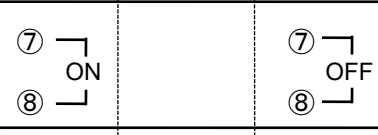
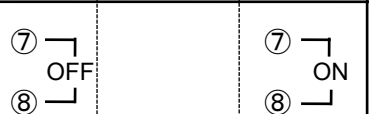
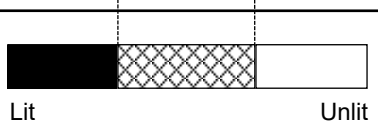
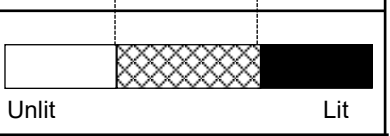
10. Action Explanation

10.1 OUT1 Action

Action	Reverse (Heating) Action	Direct (Cooling) Action
Control action		
Relay contact output	 Cycle action is performed according to deviation.	 Cycle action is performed according to deviation.
Non-contact voltage output	 Cycle action is performed according to deviation.	 Cycle action is performed according to deviation.
Direct Current Output DC Voltage Output	 Changes continuously according to deviation	 Changes continuously according to deviation
Open-collector output	 Cycle action is performed according to deviation.	 Cycle action is performed according to deviation.
Indicator (O1) Orange		

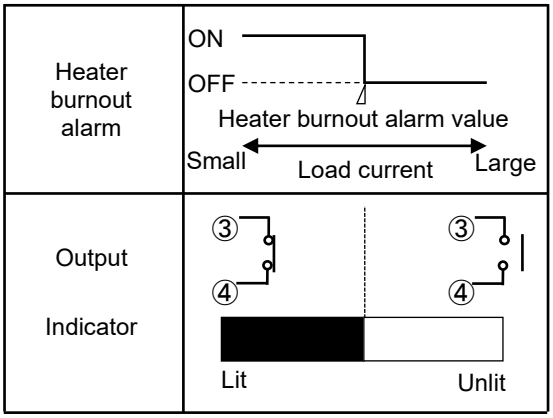
: Turns ON (lit) or OFF (unlit).

10.2 OUT1 ON/OFF Action

Action	Reverse (Heating) Action	Direct (Cooling) Action
Control action		
Relay contact output		
Non-contact voltage output		
Direct Current Output DC Voltage Output		
Open-collector output		
Indicator (O1) Orange		

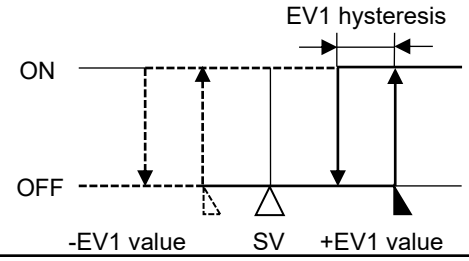
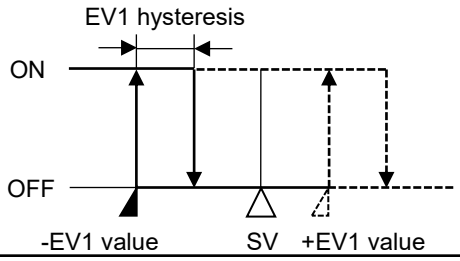
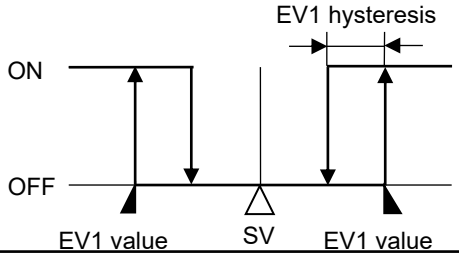
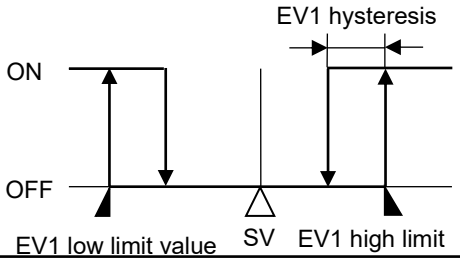
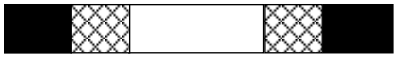
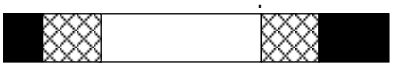
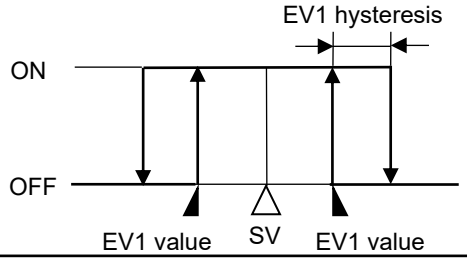
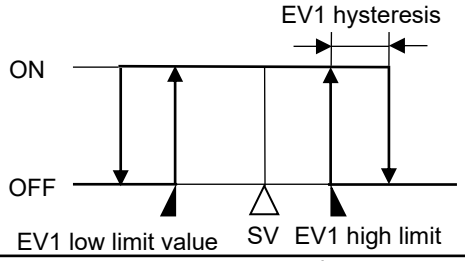
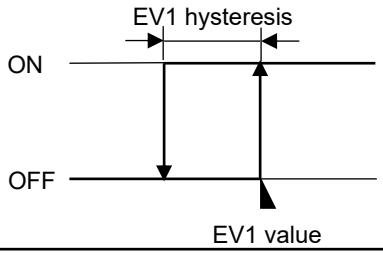
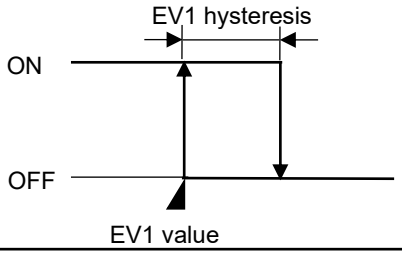
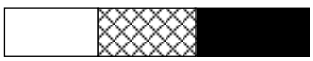
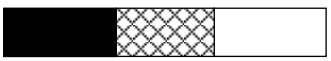
: Turns ON (lit) or OFF (unlit).

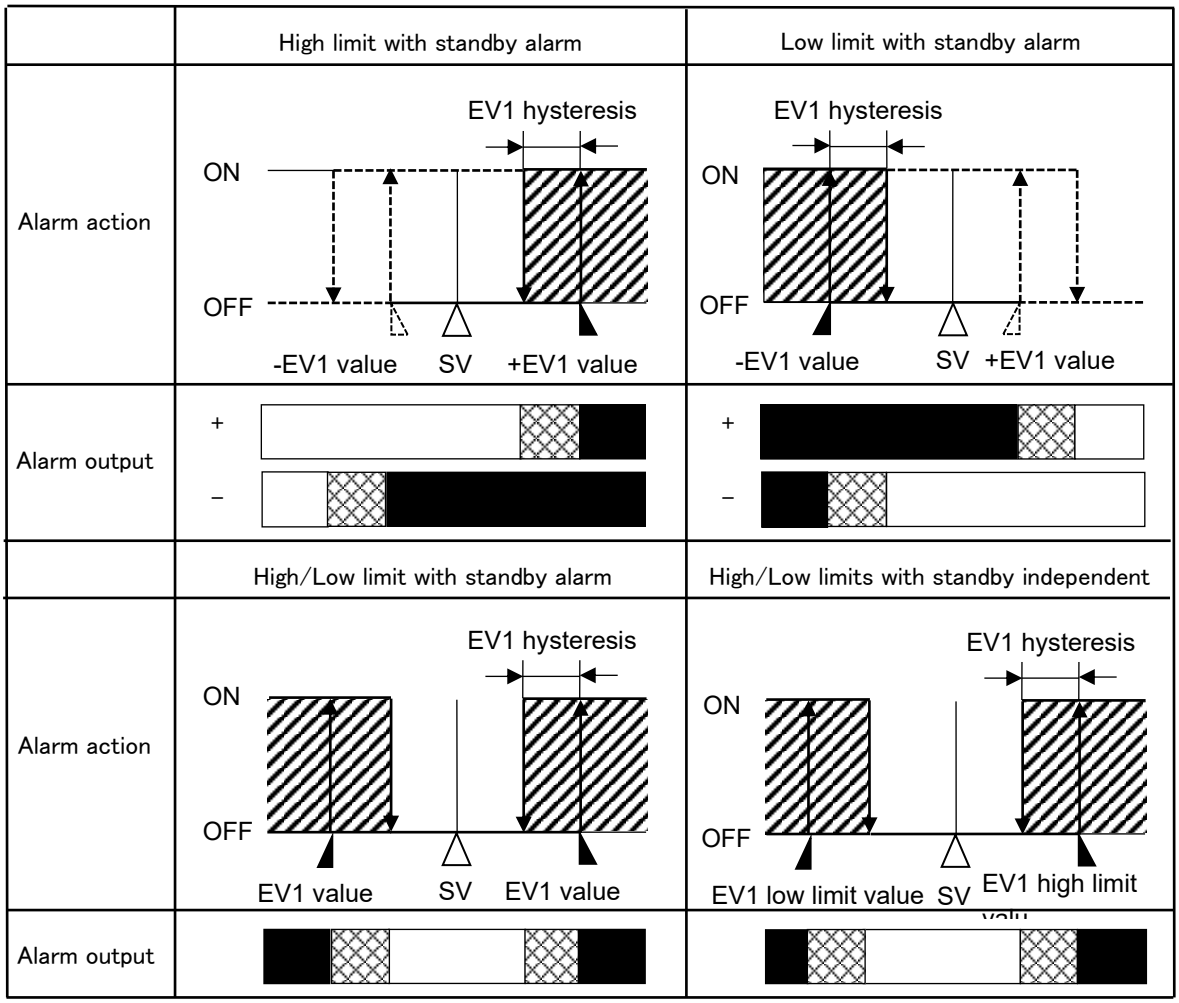
10.3 Heater Burnout Alarm Action



- Event output 1 terminal numbers: 3, 4,
  Option EV2: Event output 2 terminal numbers: 5, 6
- Option EV3: Event output 1 terminal numbers: 3, 6
  Event output 2 terminal numbers: 4, 6
  Event output 3 terminal numbers: 5, 6

10.4 Alarm Action

	High limit alarm	Low limit alarm
Alarm action		
Alarm output		
	High/Low limit alarm	High/Low limit independent alarm
Alarm action		
Alarm output		
	High/Low limit range alarm	High/Low limit range independent alarm
Alarm action		
Alarm output		
	Process high alarm	Process low alarm
Alarm action		
Alarm output		



: Event output EV1 terminals 3, 4: ON

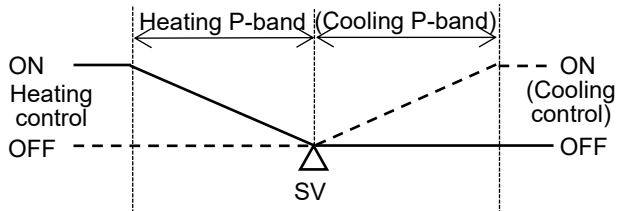
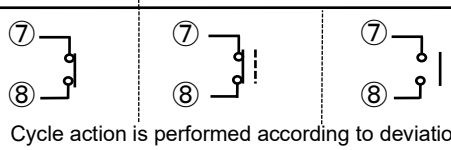
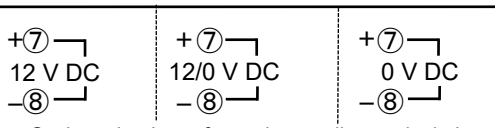
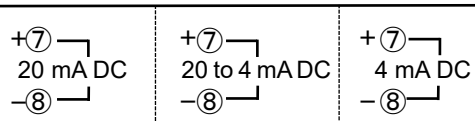
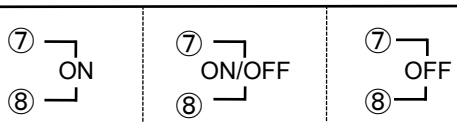
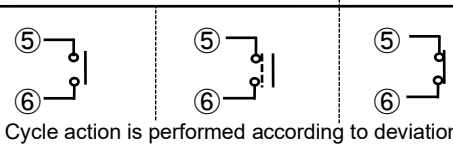
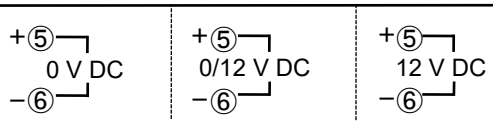
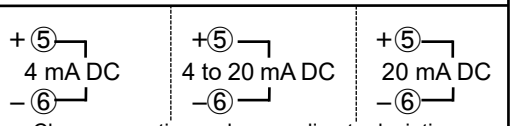
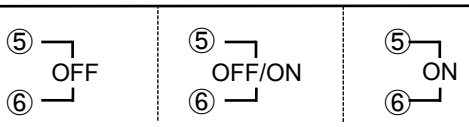
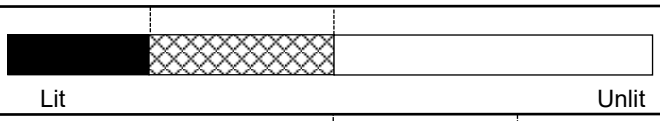
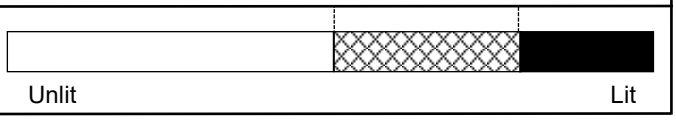
: Event output EV1 terminals 3, 4: ON or OFF

: Event output EV1 terminals 3, 4: OFF

: Alarm output is in standby.

- EV1 value, EV1 high limit value and EV1 hysteresis represent EV1 alarm value, EV1 high limit alarm value and EV1 alarm hysteresis respectively.
  For EV2 and EV3, read “EV2” and “EV3” for “EV1”.
- EV1 indicator lights when Event output 1 terminals 3 and 4 are ON, and turns off when their output terminals 3 and 4 are OFF.
- When option: EV2,
  EV2 indicator lights when Event output 2 terminals 5 and 6 are ON, and turns off when their output terminals 5 and 6 are OFF.
- When option: EV3,
  EV1 indicator lights when Event output 1 terminals 3 and 6 are ON, and turns off when their output terminals 3 and 6 are OFF.
  EV2 indicator lights when Event output 2 terminals 4 and 6 are ON, and turns off when their output terminals 4 and 6 are OFF.
  EV3 indicator lights when Event output 3 terminals 5 and 6 are ON, and turns off when their output terminals 5 and 6 are OFF.

10.5 OUT2 (Heating/Cooling Control) Action

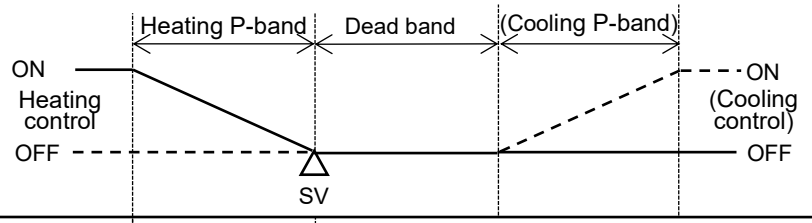
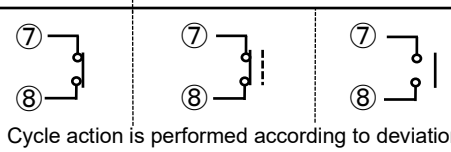
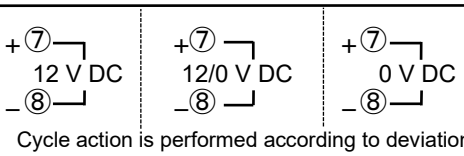
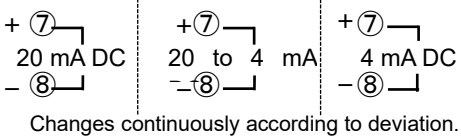
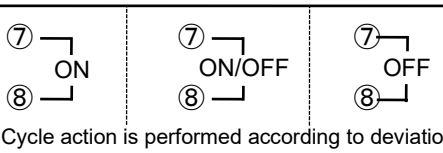
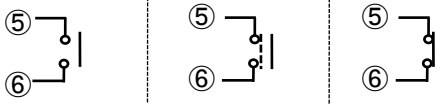
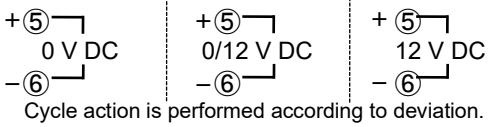
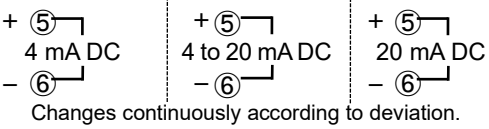
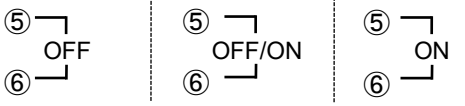
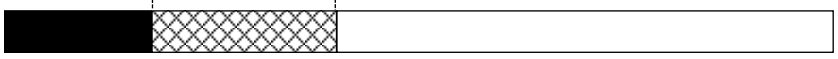
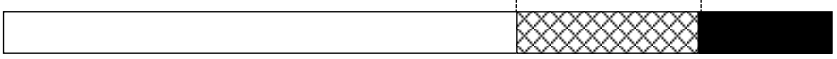
Control action	
Relay contact output (OUT1)	 Cycle action is performed according to deviation.
Non-contact voltage output (OUT1)	 Cycle action is performed according to deviation.
Direct current output (OUT1) DC voltage output (OUT1)	 Changes continuously according to deviation.
Open collector output (OUT1)	 Cycle action is performed according to deviation.
Relay contact output (OUT2)	 Cycle action is performed according to deviation.
Non-contact voltage output (OUT2)	 Cycle action is performed according to deviation.
Direct current output (OUT2) DC voltage output (OUT2)	 Changes continuously according to deviation.
Open collector output (OUT2)	 Cycle action is performed according to deviation.
Indicator (O1)	
Indicator (O2)	

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

——— : Represents Heating control action.

- - - - - : Represents Cooling control action.

10.6 OUT2 (Heating/Cooling Control) Action (When Setting Dead Band)

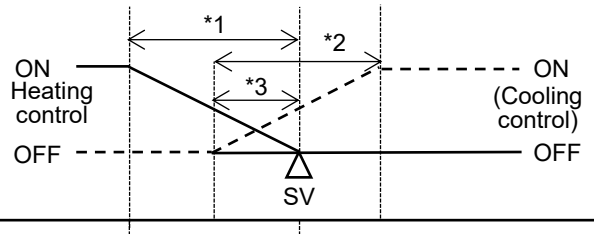
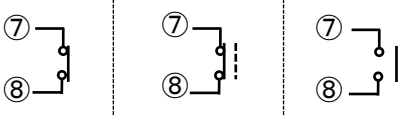
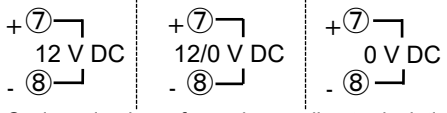
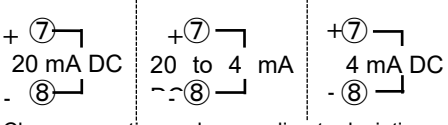
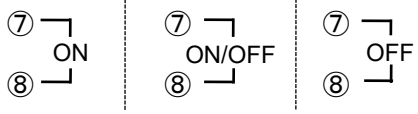
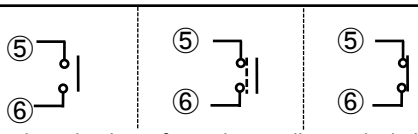
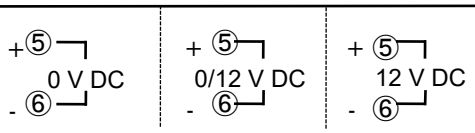
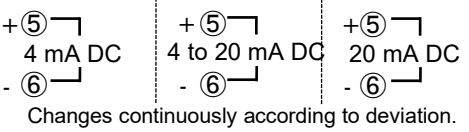
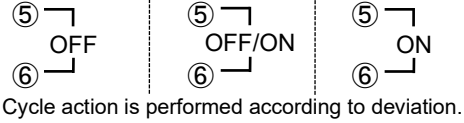
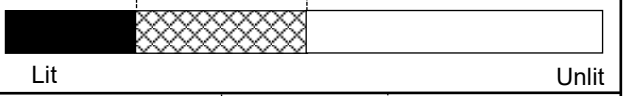
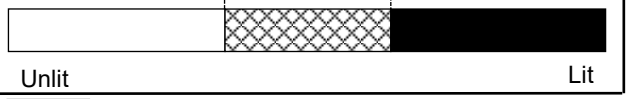
Control action	
Relay contact output (OUT1)	 Cycle action is performed according to deviation.
Non-contact voltage output (OUT1)	 Cycle action is performed according to deviation.
Direct current output (OUT1) DC voltage output (OUT1)	 Changes continuously according to deviation.
Open collector output (OUT1)	 Cycle action is performed according to deviation.
Relay contact output (OUT2)	 Cycle action is performed according to deviation.
Non-contact voltage output (OUT2)	 Cycle action is performed according to deviation.
Direct current output (OUT2) DC voltage output (OUT2)	 Changes continuously according to deviation.
Open collector output (OUT2)	 Cycle action is performed according to deviation.
Indicator (O1)	
Indicator (O2)	

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

—— : Represents Heating control action.

- - - - : Represents Cooling control action.

10.7 OUT2 (Heating/Cooling Control) Action (When Setting Overlap Band)

Control action	
Relay contact output (OUT1)	 Cycle action is performed according to deviation.
Non-contact voltage output (OUT1)	 Cycle action is performed according to deviation.
Direct current output (OUT1) DC voltage output (OUT1)	 Changes continuously according to deviation.
Open collector output (OUT1)	 Cycle action is performed according to deviation.
Relay contact output (OUT2)	 Cycle action is performed according to deviation.
Non-contact voltage output (OUT2)	 Cycle action is performed according to deviation.
Direct current output (OUT2) DC voltage output (OUT2)	 Changes continuously according to deviation.
Open collector output (OUT2)	 Cycle action is performed according to deviation.
Indicator (O1)	
Indicator (O2)	

*1: Heating P-band
*2: Cooling P-band
*3: Overlap

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

11. Specifications

11.1 Standard Specifications

Rating

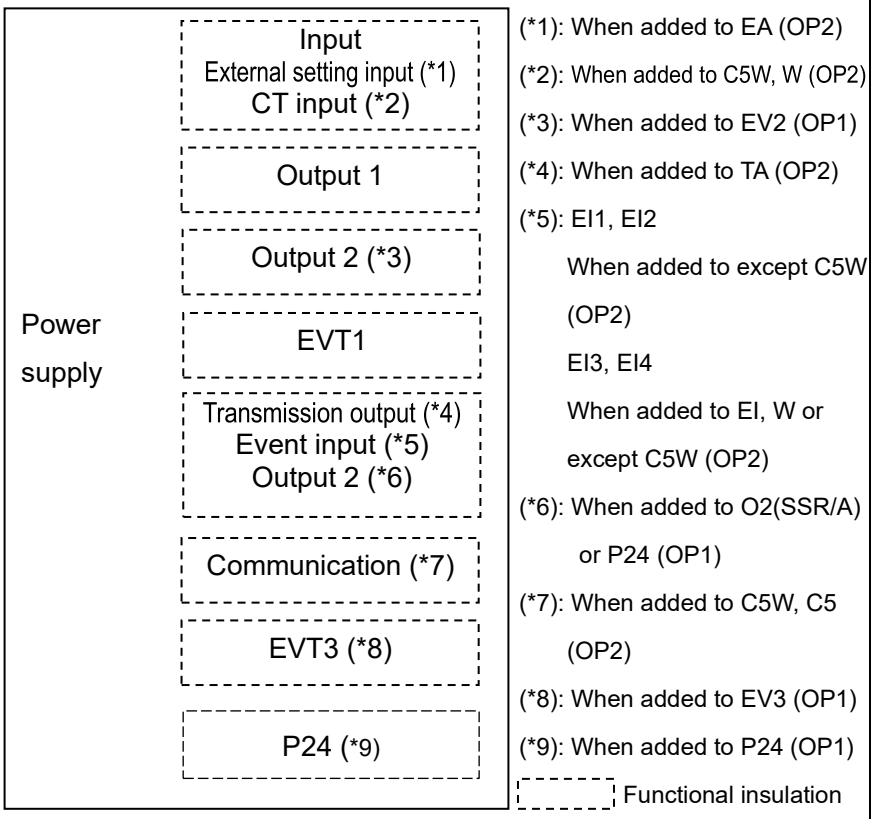
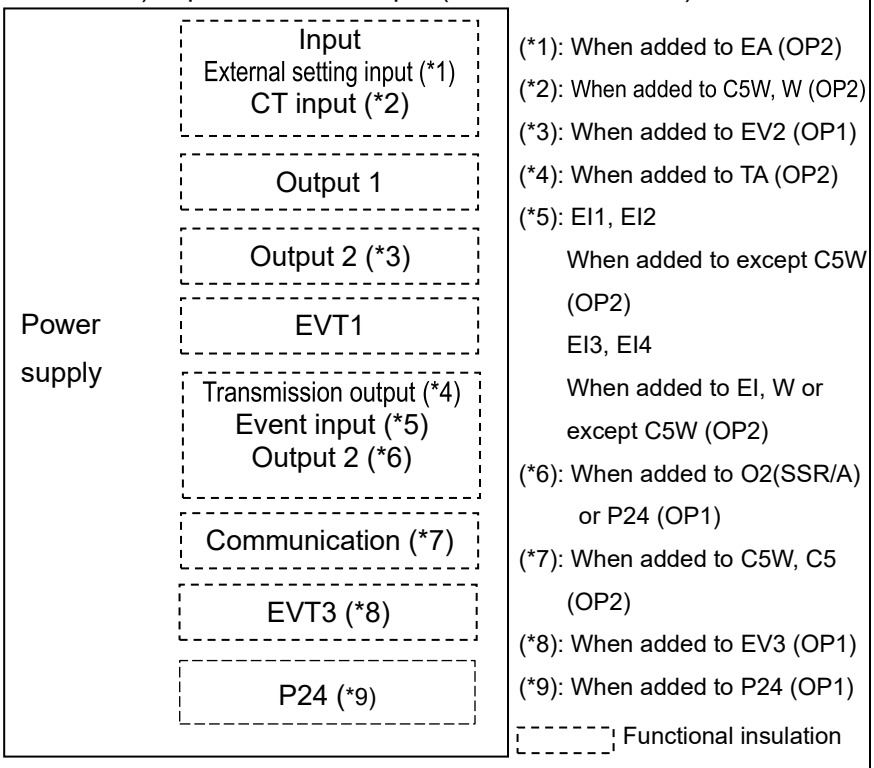
Rated scale		**Input**	**Input Range**		**Resolution**
		K	-200 to 1370 ℃	-328 to 2498 ℉	1 ℃(℉)
			-200.0 to 800.0 ℃	-328.0 to 1472.0 ℉	0.1 ℃(℉)
			-200.0 to 400.0 ℃	-328.0 to 752.0 ℉	0.1 ℃(℉)
		J	-200 to 1000 ℃	-328 to 1832 ℉	1 ℃(℉)
			-200.0 to 400.0 ℃	-328.0 to 752.0 ℉	0.1 ℃(℉)
		R	0 to 1760 ℃	32 to 3200 ℉	1 ℃(℉)
		S	0 to 1760 ℃	32 to 3200 ℉	1 ℃(℉)
		B	0 to 1820 ℃	32 to 3308 ℉	1 ℃(℉)
		E	-200 to 800 ℃	-328 to 1472 ℉	1 ℃(℉)
		T	-200.0 to 400.0 ℃	-328.0 to 752.0 ℉	0.1 ℃(℉)
		N	-200 to 1300 ℃	-328 to 2372 ℉	1 ℃(℉)
		PL-II	0 to 1390 ℃	32 to 2534 ℉	1 ℃(℉)
		C(W/Re5-26)	0 to 2315 ℃	32 to 4199 ℉	1 ℃(℉)
		Pt100	-200.0 to 850.0 ℃	-328.0 to 1562.0 ℉	0.1 ℃(℉)
			-200 to 850 ℃	-328 to 1562 ℉	1 ℃(℉)
			-100.0 to 100.0 ℃	-148.0 to 212.0 ℉	0.1 ℃(℉)
		4 to 20 mA(*2)	-19999 to 19999(*1)		1
		0 to 20 mA(*2)	-19999 to 19999(*1)		1
		4 to 20 mA(*3)	-19999 to 19999(*1)		1
		0 to 20 mA(*3)	-19999 to 19999(*1)		1
		0 to 1 V	-19999 to 19999(*1)		1
		0 to 5 V	-19999 to 19999(*1)		1
		1 to 5 V	-19999 to 19999(*1)		1
		0 to 10 V	-19999 to 19999(*1)		1
		(*1): Scaling and decimal point place selection are possible. (*2): It has a built-in shunt resistor (50Ω). (*3): The separately sold shunt resistor (50Ω) is attached externally.			
Input	Thermocouple	K, J, R, S, B, E, T, N, PL-II(ASTM E1751M-15), C(W/Re5-26) External resistance: 100 Ω max. However, for B input, External resistance: 40 Ω max.			
	RTD	Pt100 3-wire type (JIS C1604-2013) Allowable input lead wire resistance: 10 Ω max. per wire			
	Direct current	0 to 20 mA DC, 4 to 20 mA DC Input impedance: 50 Ω (shunt resistor) Allowable input current: 50 mA DC max. Protection circuit forward voltage: 0.9 V DC max.			
	DC voltage	0 to 1 V DC Input impedance: 1 MΩ min. Allowable input voltage: 5 V DC max. Allowable signal source resistance: 2 kΩ max.			
		0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC Input impedance: 100 kΩ min. Allowable input voltage: 15 V DC max. Allowable signal source resistance: 100 Ω max.			

Output

Control output	Relay contact 1a	Control capacity: 3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load cosϕ=0.4) Electrical life: 100,000 cycles Minimum applicable load: 10 mA 5 V DC
	Non-contact voltage (For SSR drive)	12 V DC±15% Max. 40 mA (short circuit protected)
	Direct current	4 to 20 mA DC, 0 to 20 mA DC Resolution: 12000 Load resistance: Max. 550 Ω
	DC voltage	0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC Resolution: 12000 Load resistance: Min. 1 kΩ
	Open collector (NPN)	Allowable load current: Max. 100 mA Load voltage: Max. 30 V DC Residual voltage: Max. 1.2 V DC Leakage current when OFF: Max. 0.1 mA
Event output		Output point: 1 point Relay contact: 1a Control capacity: 3 A 250 V AC(resistive load) 1 A 250 V AC(inductive load cosϕ=0.4) Electrical life: 100,000 cycles Minimum applicable load: 10 mA 5 V DC

Power supply

Power supply voltage	24 V DC, 48 V DC, 100 to 240 V AC Allowable voltage fluctuation range 24 V DC: 24 V ±10 % 48 V DC: 48 V ±10 % 100 to 240 V AC: 85 to 264 V AC
Power consumption	24 V DC Approx. 5 W max. 48 V DC Approx. 5 W max. 100 to 240 V AC Approx. 11 VA max.

Circuit insulation configuration	・Relay output (when R is selected)  ・Multi output (when M is selected), Voltage output (when V, 1, 2, or 3 is selected), Open collector output (when C is selected)  Insulation resistance: 10 MΩ minimum, at 500 V DC
Dielectric strength	Between input terminal and power terminal: 1.5 kV AC for 1 minute Between output terminal and power terminal: 1.5 kV AC for 1 minute

Environmental conditions

Ambient temperature	-10 to 55℃ (Non-condensing, No icing)
Ambient humidity	35 to 85 %RH (Non-condensing)
Altitude	Below 2,000 m
Environmental specification	RoHS Directive compliant
Corrosion resistance	No corrosive gases

Performance

Base accuracy		At ambient temperature 23℃ (for a single unit mounting)
	Thermocouple input	Within ±0.2% of each input span±1 digit However, below 0 ℃ (32 ℉), within ±0.4% of each input span R, S inputs, 0 to 200℃ (32 to 392℉): Within ±6℃ (12℉) B input, 0 to 300℃ (32 to 572℉): Accuracy is not guaranteed.
	RTD input	Within ±0.1% of each input span±1 digit
	Direct current, DC voltage input	Within ±0.2% of each input span±1 digit
	Direct current, DC voltage output	Within ±0.3% of each input span
Cold junction compensation accuracy		within ±1℃ at -10 to 55℃
Effect of ambient temperature		Thermocouple input (no decimal point) Within ±100 ppm/℃ of each input span Below 0 ℃(32 ℉), within ±200 ppm/℃ of each input span Thermocouple Input (with decimal point) Within ±200 ppm/℃ of each input span Below 0 ℃(32 ℉), within ±400 ppm/℃ of each input span Others Within ±100 ppm/℃ of each input span
Effect of electromagnetic interference		Within ±1 % of each input span
Input sampling period		10 ms (Direct current, DC voltage input only), 50 ms, 125 ms

General Structure

Weight		Approx. 120 g
External dimensions		48 x 48 x 68 mm (W x H x D) (Depth of control panel interior: 60 mm)
Mounting		Control panel flush-mounting type (compatible panel thickness: 1 to 5 mm)
Case		Flame-resistant resin, Black
Front panel		Polycarbonate sheet
Drip-proof/Dust-proof		Front panel: IP66
Compliant standards	LVD	EN61010-1 (Pollution degree 2, Overvoltage category Ⅱ)
	EMC	EMI: EN61326-1 CISPR11 Group1 ClassA EMS: EN61326-1

Indication structure

Indication structure	PV Display	Indicates PV. In setting mode, indicates setting characters. 7-segment LCD display (White) Character size: 15.2×6.0 mm (H x W)	
	SV Display	Indicates SV. In setting mode, indicates setting value. 7-segment LCD display (Green) Character size: 5.8×2.8 mm (H x W)	
	MEMO/STEP Display	Indicates the program execution step or the set value memory number. 7-segment LCD display (Green) Character size: 5.8×2.8mm (H x W)	
	Temperature unit display	Indicates the temperature unit. (Indicates only for thermocouple and RTD ranges.) Temperature unit segment LCD display (White) Character size: 4.0×3.4mm (H x W)	
	Action indicator (Orange)	SV	Lit when set value is displayed on the SV Display.
		MV	Lit when MV is displayed on the SV Display.
		MEMO	Lit when set value memory function (fixed value control) is enabled.
		STEP	Lit when program control is selected.
		O1	Lit when control output OUT1 is ON, or when the heating output (Option 1: EV2, O2 (SSR/A)) is ON. For direct current output type, flashes corresponding to the MV in 250 ms cycles.
		O2	Lit when cooling output (Option 1: EV2, O2 (SSR/A)) is ON. For direct current output type, flashes corresponding to the MV in 250 ms cycles.
		EV1	Lit when Event output 1 is ON.
		EV2	Lit when Event output 2 is ON. (Option1: EV2)
		EV3	Lit when Event output 3 is ON. (Option1: EV3)
		AT	Flashes during auto tuning.
		MAN	Lit during manual control.
		R/L	Lit when remote selection is selected for external settings input.
		T/R	Lit during Serial communication (Option2: C5W, C5) TX (transmitting) output.
		LOCK	Lit when in setting value lock mode.
Terminal arrangement		Refer to ‘Terminal arrangement’. (p.16)	
Console connector		By connecting to the tool cable (CMD-001, sold separately), the following operations can be conducted from an external computer using the Console software SWC-ACS201M. • Reading and setting of SV, PID and various set values • Reading of PV and action status • Function change	

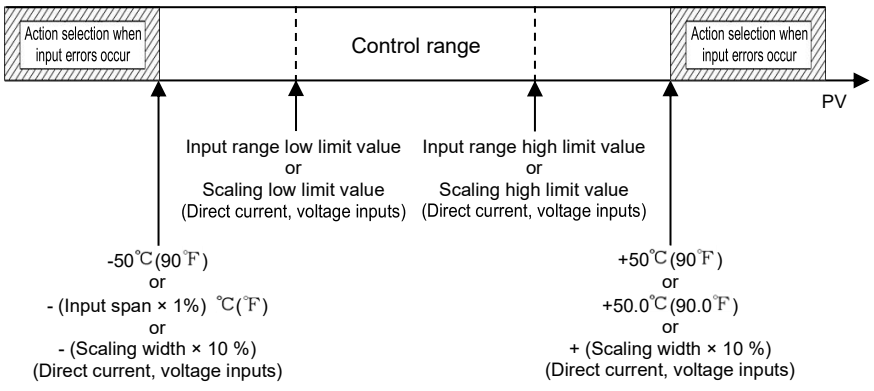
Setting Structure

<table>
<tr><td rowspan="11">Function key</td><td>UP key</td><td colspan="2">Increase the setting value.
During program control, press for 1 second to activate the advance function.</td></tr>
<tr><td>DOWN key</td><td colspan="2">Decrease the setting value.
During program control, press for 1 second to activate the hold function.</td></tr>
<tr><td rowspan="7">PF key</td><td colspan="2">Depending on the PF key function selection, it operates as follows.</td></tr>
<tr><td>PF key function selection</td><td>Action</td></tr>
<tr><td>0: No function</td><td>No function</td></tr>
<tr><td>1: Automatic/Manual control function</td><td>Switch between automatic and manual control.</td></tr>
<tr><td>2: Control output OFF function</td><td>Turn control output ON/OFF.</td></tr>
<tr><td>3: Remote/Local selection</td><td>Switch between remote and local operation.</td></tr>
<tr><td>4: RUN/STOP function</td><td>Switch program control execution ON/OFF.</td></tr>
<tr><td colspan="2">In setting mode, it is possible to select the number of digits for numerical input.</td></tr>
<tr><td rowspan="7">OUT/OFF key</td><td colspan="2">Depending on the OUT/OFF key function selection, it operates as follows.</td></tr>
<tr><td>OUT/OFF key function selection</td><td>Action</td></tr>
<tr><td>0: No function</td><td>No function</td></tr>
<tr><td>1: Automatic/Manual control function</td><td>Switch between automatic and manual control.</td></tr>
<tr><td>2: Control output OFF function</td><td>Turn control output ON/OFF.</td></tr>
<tr><td>3: Remote/Local selection</td><td>Switch between remote and local operation.</td></tr>
<tr><td>4: RUN/STOP function</td><td>Switch program control execution ON/OFF.</td></tr>
<tr><td>MODE key</td><td colspan="2">Enter setup mode and register the settings.</td></tr>
</table>

Control Performance

Control action selection	In the control action selection menu, you can choose any control method from 2 DOF PID control, Fast-PID control, Slow-PID control, or Gap-PID control. Selecting the control method according to the application and process enables optimal control. However, when changing the control operation, reset and display the warm-up.

<table>
<tr><td colspan="2">Control action</td><td>・2 DOF PID control
It performs control operations with disturbance response characteristics similar to Fast-PID control while reducing overshoot.
・Fast-PID control (PI-D control)
Derivative-leading PID control method, a common control method where the derivative action operates according to the change in the measured value.
The control action can be changed by making the following settings.
P control: When the integral time and derivative time are set to 0.
PI control: When the derivative time is set to 0.
PD control: When the integration time is set to 0.
Deviation PID control:
When the desired value changes over time, select Fast-PID control in the control action selection. Set the proportional gain 2 DOF coefficient (α) to 1.00 and the derivative 2 DOF coefficient (γ) to 1.00 to enable the derivative action to operate according to the deviation.
ON/OFF control:
When the proportional band setting is set to 0 (or 0.0).
・Slow-PID control (I-PD control)
Proportional-derivative leading PID control method, where the proportional action operates based on the measured value and the derivative action operates based on the rate of change of the measured value. This control method is used when overshoot is to be avoided.
・Gap-PID control (Gapped PID control)
When measurement values contain excessive noise or control components exhibit hysteresis, slight fluctuations may persist near zero deviation.
In such cases, a deadband is typically employed. However, since control does not occur within the deadband, measurement values change during disturbances.
Therefore, deviation characteristics are introduced within the deadband to enable response to disturbances.</td></tr>
<tr><td></td><td>Proportional band (P)</td><td>・2 DOF PID control, Slow-PID control, Gap-PID control
Thermocouple, RTD inputs without decimal point:
1 to input span ℃(℉)
Thermocouple, RTD inputs with decimal point:
0.1 to input span ℃(℉)
Direct current, voltage inputs:
0.1 to 1000.0 %
・Fast-PID control (PI-D control)
Thermocouple, RTD inputs without decimal point:
0 to input span ℃(℉)
Thermocouple, RTD inputs with decimal point:
0.0 to input span ℃(℉)
Direct current, voltage inputs:
0.0 to 1000.0 %</td></tr>
<tr><td></td><td>Integral time (I)</td><td>Except when Slow-PID control is selected
0 to 10000 sec or 0.0 to 1999.9 sec
When Slow-PID control is selected
1 to 10000 sec or 0.1 to 1999.9 sec
Change the setting by selecting the integral/derivative decimal point place.</td></tr>
<tr><td></td><td>Derivative time (D)</td><td>0 to 10000 sec
0.0 to 1999.9 sec
Change the setting by selecting the integral/derivative decimal point place.</td></tr>
</table>

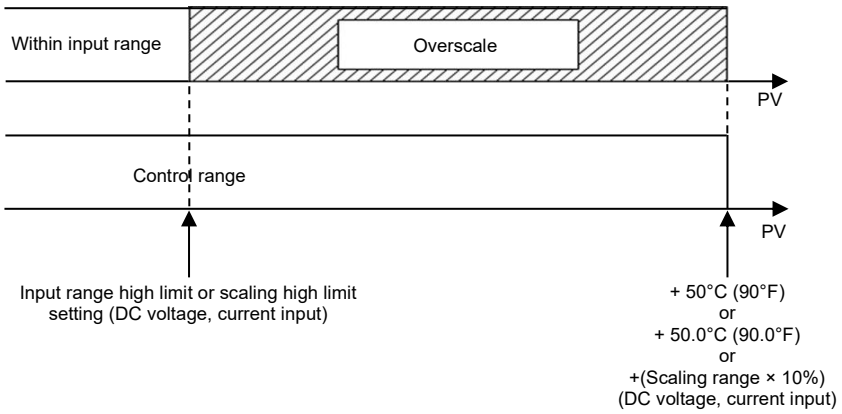
	Proportional gain 2 DOF coefficient (α)	0.00 to 1.00
	Integral 2 DOF coefficient (β)	0.00 to 10.00
	Derivative 2 DOF coefficient (γ)	0.00 to 1.00
	OUT1 proportional cycle	0.1 to 120.0 sec
	OUT1 ON/OFF hysteresis (Fast-PID control)	0.1 to 1000.0 ℃(0.1 to 1800.0 ℉) Direct current, voltage inputs:1 to 10000
	OUT1 high limit	0.0 to 100.0 % Direct current, voltage inputs: -5.0 to 105.0 % (However, for outputs other than 4-20 mA DC or 1-5 V DC, values below 0.0% will not be output.)
	OUT1 low limit	0.0 to 100.0 % Direct current, voltage inputs: -5.0 to 105.0 % (However, for outputs other than 4-20 mA DC or 1-5 V DC, values below 0.0% will not be output.)
	Gap width setting (Gap-PID control)	0.0 to 10.0% Proportional band width × Gap width (%), 0.0% means gap width is disabled
	Gap coefficient setting (Gap-PID control)	0.0 to 1.0
Control range		If the value exceeds the specified control range, the action set in the action selection when input error occurs will be executed. Thermocouple input (without decimal point) Input range low limit value - 50 ℃(90 ℉) to Input range high limit value + 50 ℃(90 ℉) Thermocouple input (with decimal point), RTD input Input range low limit value - (Input span × 1%) ℃(℉) to Input range high limit value + 50.0 ℃(90.0 ℉) Direct current, voltage inputs Scaling low limit setting value - (Scaling width × 10%) to Scaling high limit setting value + (Scaling width × 10%) 

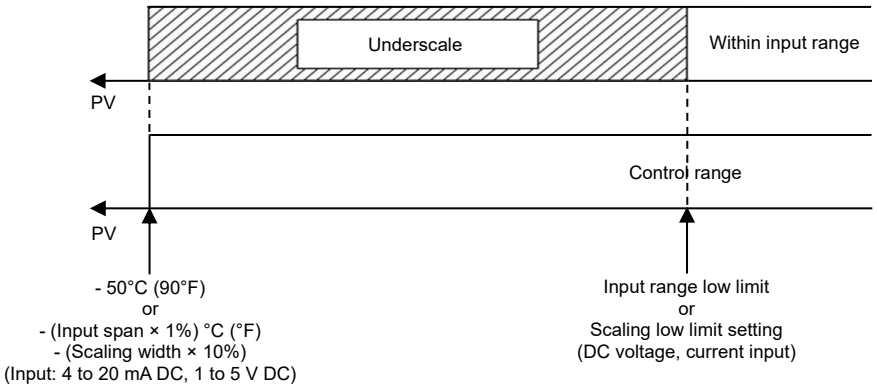
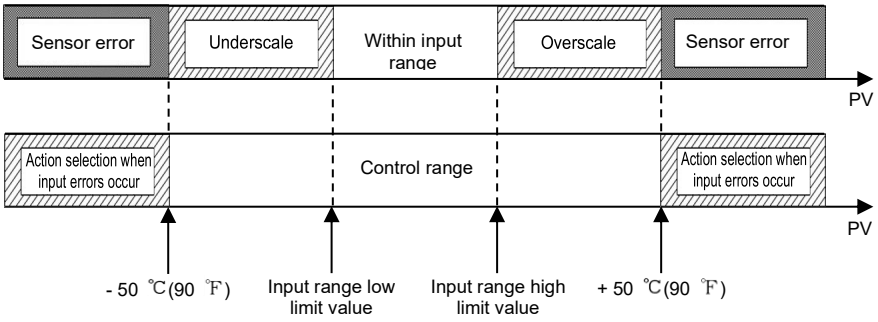
Standard Function

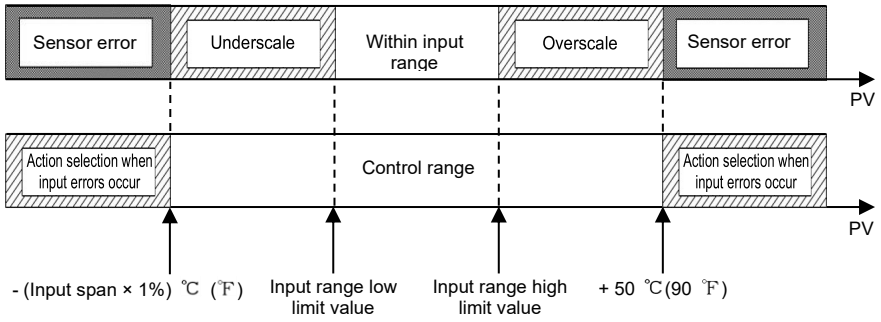
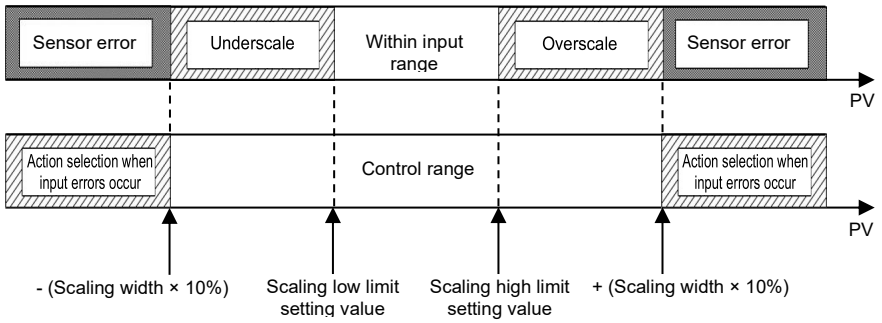
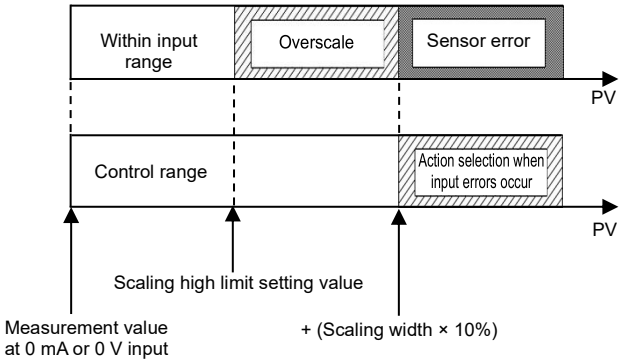
EV1 output		The output is turned ON or OFF based on the event conditions allocated in the event output selection mode. When “Enable” is selected for the output latch, the output remains ON even if the event condition changes from ON to OFF.
Alarm action		When the alarm action is selected as energized in the Event alarm Energized/De-energized selection, if the PV exceeds the deviation setting range for the SV (excluding absolute value alarms), the output turns ON or OFF (high/low limit range alarm). When de-energized is selected, the output behavior is reversed.
	Type	High limit alarm, Low limit alarm, High/Low limits alarm, High/Low limits independent alarm, High/Low limit range alarm, High/Low limit range independent alarm, Process high alarm, Process low alarm, High limit with standby alarm, Low limit with standby alarm, High/Low limits with standby alarm, High/Low limits with standby independent alarm Energized/De-energized action are applied to the above alarms, totaling 24 alarm types. No alarm action can also be selected.
	Action	ON/OFF action
	Alarm hysteresis setting	Thermocouple, RTD inputs: 0.1 to 1000.0 ℃(0.1 to 1800.0 ℉) Direct current, voltage inputs: 1 to 10000
	Alarm delay time setting	0 to 10000 sec
	Output	Event output allocated to alarm output in Event output allocation selection
	Alarm value 0 Enabled/ Disabled	If ‘Enabled’ is selected in [Alarm value 0 Enabled/Disabled], the following alarm type activates even if alarm value is set to 0 (zero): High limit alarm, Low limit alarm, High/Low limits alarm， High/Low limits independent alarm, High/Low limit range alarm, High/Low limit range independent alarm, High limit with standby alarm, Low limit with standby alarm, High/Low limits with standby alarm, High/Low limits with standby independent alarm.
Loop break alarm (LA)		Detects heater burnout, sensor burnout and actuator trouble.
	Setting range	Loop break alarm time setting: 0 to 200 min Loop break alarm band setting: 0 to 150 ℃(0 to 270 ℉) or 0.0 to 150.0 ℃(0.0 to 270.0 ℉) Direct current, voltage inputs: 0 to 1500 Loop break alarm dead band setting: 0 to 150 ℃(0 to 270 ℉) or 0.0 to 150.0 ℃(0.0 to 270.0 ℉) Direct current, voltage inputs: 0 to 1500
	Output	Event output allocated to alarm output in Event output allocation selection
Setting value ramp function		When the SV changes, control from the previous SV to the new SV at the set change rate. Set the SV rise rate and SV fall rate separately.
	SV rise rate setting	Thermocouple, RTD inputs: 0 to 10000 ℃/min (0 to 18000 ℉/min) or 0.0 to 1000.0 ℃/min (0.0 to 1800.0 ℉/min) Direct current, voltage inputs: 0 to 10000 /min [However, if set to 0 (0.0), this function will not operate.]

	SV fall rate setting	Thermocouple, RTD inputs: 0 to 10000 ℃/min (0 to 18000 ℉/min) or 0.0 to 1000.0 ℃/min (0.0 to 1800.0 ℉/min) Direct current, voltage inputs: 0 to 10000 /min [However, if set to 0 (0.0), this function will not operate.]
	SV Rise/Fall rate time unit selection	It is possible to select the time unit for the rise rate setting and fall rate setting in minutes/seconds.
	SV Rise/Fall rate action selection	When the OUT/OFF key function selection changes from OFF to ON, or when the Auto/Manual control selection changes from manual control to automatic control, the SV rise rate and SV fall rate operation can be selected to either operate from the desired value or operate from the current PV value.
Auto/Manual control selection		Switch between Auto/Manual control. When in PV/SV display mode, Auto/Manual control can be switched using the OUT/OFF key, PF key, or EVT input.
Sensor correction coefficient setting		Set the slope of the input value.
Sensor correction setting		Shift and correct the input value.
Program control function		Enabled when program control is selected in the Fixed value control/program control selection. Program control is performed using the values set in the program setting group. When program control is selected, regardless of which control action is selected in the control action selection, it automatically becomes deviation PID control, and the proportional gain 2 DOF coefficient (α), integral 2 DOF coefficient (β), and derivative 2 DOF coefficient (γ) become invalid. However, for fixed value control when the program time is set to ---- in program control, the control action selected in the control action selection will be used, and the proportional gain 2 DOF coefficient (α), integral 2 DOF coefficient (β), and derivative 2 DOF coefficient (γ) will be enabled. To enable ON/OFF action during program control, select Fast-PID control in the control action selection menu and set the proportional band of the desired PID block to 0 or 0.0 ℃ (℉) (0 for DC range). Setting range Steps 16 Programming Time 00:00 to 99:59/step (Setting ---- enables fixed value control in step SV.) Wait block 1 to 8 PID block 1 to 8

Attached Functions

Power failure countermeasure	The setting data is backed up in the non-volatile IC memory.
Self-diagnosis	The watchdog timer monitors program runaway and stoppage. Upon detecting an abnormality, it resets the MCU and restores the instrument to its initial state.
Automatic cold junction temperature compensation	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 ℉).
PV filter time constant setting	Digital first-order low-pass filter reduces fluctuations in input values caused by noise. PV filter time constant: 0.0 to 10.0 seconds
Number of moving average	Stabilize the indicated value by averaging values that fluctuate due to noise. Moving average count: 1 to 10 times
Scaling function	For DC voltage and direct current inputs, the input analog value can be scaled to any display range set between the scaling low limit setting value and the scaling high limit setting value. For thermocouple and RTD inputs, the desired value setting range is limited to the range set between the scaling low limit setting value and the scaling high limit setting value.
Overscale	The input range below is overscale, and the overscale status flag is set. However, control operations continue during overscale. Thermocouple input (without decimal point) Scaling high limit to Input range high limit + 50 ℃(90 ℉) Thermocouple input (without decimal point), RTD input Scaling high limit to Input range high limit + 50.0 ℃(90.0 ℉) Direct current, voltage inputs Scaling high limit setting value to Scaling high limit setting value + (Scaling width × 10 %) ※ If the scaling high limit setting value is 19999 or higher, it will display as [----]. The control range extends up to the scaling high limit setting value + (Scaling width × 10%). 

Underscale	The input range below is underscale, and the underscale condition flag is set. However, control operations continue during underscale. Thermocouple input (without decimal point) Input range low limit - 50 ℃(90 ℉) to Input range low limit Thermocouple input (without decimal point), RTD input Input range low limit - (Input span × 1 %) ℃(℉) to Input range low limit Direct current (4 to 20 mA), voltage(1 to 5 V) inputs Scaling low limit setting value - (Scaling width × 10 %) to Scaling low limit setting value 
Sensor error	Thermocouple Input (without decimal points) disconnection condition When below the input range low limit value -50°C (90°F) The PV Display flashes [- - - -], and the action set in the input error operation selection is performed. When exceeding the input range high limit value +50°C (90°F) The PV Display flashes [¯ ¯ ¯ ¯], and the action set in the Action selection when input errors occur is performed. 

	Thermocouple Input (with decimal points) disconnection condition When below the input range low limit value - (Input span × 1 %) ℃(℉) The PV Display flashes [- - - -], and the action set in the input error operation selection is performed. When exceeding the input range high limit value + 50.0 ℃(90.0 ℉) The PV Display flashes [¯ ¯ ¯ ¯], and the action set in the Action selection when input errors occur is performed.  DC voltage, direct current input disconnection condition When less than the scaling low limit setting value - (Scaling width × 10%) The PV Display flashes [- - - -], and the control output turns OFF. When exceeding the scaling high limit setting value + (Scaling width × 10%) The PV Display flashes [¯ ¯ ¯ ¯] and the control output turns OFF.  However, for 0 to 20 mA, 0 to 1 V, 0 to 5 V, and 0 to 10 V, the measured value corresponds to the input at 0 mA or 0 V. 
Cold junction error	If the internal cold junction temperature falls below -10°C (14°F) or exceeds 55°C (131°F), the cold junction becomes errored. (When thermocouple input is selected)
Internal bus error	If the internal circuitry experiences a fault or other abnormality, the control output will turn OFF.

Warm-up indication	After power-on, the PV Display shows [ꞒAtE] and the SV Display shows [UP]. Subsequently, for approximately 3 seconds, the PV Display shows the input type and temperature unit selection, while the SV Display shows the input range high limit (for thermocouple or RTD inputs) or the scaling high limit (for DC voltage or direct current inputs). During this period, all outputs and indicator lights are OFF. For direct current output and transmission output (option: TA (4-20 mA)), the output is 4 mA DC.
Console communication	Operated via the tool cable connector from the external computer.
Contact switching total number of times function	The outputs (O1, O2, EV1, EV2, EV3) ON/OFF count can be integrated and measured. ON/OFF is set as one time and totaling is performed. This allows you to grasp the approximate contact life as the number of switching times of the switch used externally. However, since the saving cycle is 10 minutes, the number of times within 10 minutes may not be saved due to a power failure. The measurement count can be confirmed using the dedicated console software.
Total energizing time function	It can check the time that the power is on. The accumulated time is saved every 10 minutes. It can grasp the approximate usage time from the accumulated time. However, since the save cycle is 10 minutes, the time within 10 minutes may not be saved due to a power failure. Total energizing time: 10 minutes/count
Heater accumulated energizing time function	For relay contact output or non-contact voltage output, you can check the cumulative time the heater is energized. When the output time to the heater reaches 1 minute cumulatively, the count is added. The accumulated time is saved every 10 minutes. The accumulated time can be used to understand the approximate usage period of the heater, which can be used as a guide for replacing the heater. However, since the save cycle is 10 minutes, the time within 10 minutes may not be saved due to a power failure. Cumulative heater energization time: 1 minute/count

<table>
<tr><td rowspan="11">Error history</td><td colspan="3">When an error occurs, the bit ON/OFF and accumulated energization time are saved for the past 10 times.
Error history exists for each channel, and device common errors are saved in the error history of all channels.
Total energizing time: 1 hour/count</td></tr>
<tr><td colspan="3">Error content</td></tr>
<tr><td>Alarm 1</td><td colspan="2">Sensor error</td></tr>
<tr><td>Alarm 2</td><td colspan="2">Input error (overscale)</td></tr>
<tr><td>Alarm 3</td><td colspan="2">Input error (underscale)</td></tr>
<tr><td>Heater burnout alarm</td><td colspan="2">Cold junction error (-10°C or below, 55°C or above)</td></tr>
<tr><td>Actuator short circuit alarm</td><td colspan="2">Non-volatile IC memory error</td></tr>
<tr><td>Loop break alarm</td><td colspan="2">Internal bus error</td></tr>
<tr><td colspan="3">When selecting the event output allocation selection 19: Output added when error occurs, output is generated when error occurs.

Exception display when alarm occurs</td></tr>
<tr><td colspan="2">Error content</td><td>Exception display</td></tr>
<tr><td colspan="2">Non-volatile IC memory error</td><td>PV Display shows [Err 1] lit</td></tr>
<tr><td colspan="2">Internal bus error</td><td>Instrument periodic reset (malfunction)</td></tr>
<tr><td colspan="2">Sensor error (out of high limit range)</td><td>PV Display shows [----] flashing</td></tr>
<tr><td colspan="2">Sensor error (out of low limit range)</td><td>PV Display shows [----] flashing</td></tr>
<tr><td>Firmware Update Function</td><td colspan="3">Function updates can be performed via the console software.</td></tr>
<tr><td>Non-volatile IC memory data saving selection</td><td colspan="3">All settings can be temporarily changed.
Upon power-on, the values revert to those before selecting the non-volatile IC memory save prohibition.</td></tr>
<tr><td>Set value lock</td><td colspan="3">Locks the set values to prevent setting errors.</td></tr>
</table>

Others

Accessories included	Mounting frame: 1 piece Instruction manual (excerpt): 1 copy
Accessories sold separately	Terminal cover (TC-ACS) CT (Current transformer): CTL-6-S-H (For Heater burnout alarm 20 A) CTL-12-S36-10L1U (For Heater burnout alarm 100 A) Tool cable CMD-001

11.2 Optional Specifications

Event input (Option: EI)	4 points (EI1 to EI4) are added as event inputs. For options except C5W and EI, 2 points (EI1 and EI2) are added simultaneously. Events allocated via the event input allocation selection are executed based on whether they are in the ON (closed) or OFF (open) state. Input points: 4 points (optional) Input method: Contact input Closed-circuit current: Approx. 2.3 mA Input judgment time: 40 ms to 40 ms + within input sampling range
Event output (Options: EV2, EV3)	The output is turned ON or OFF based on the event conditions allocated in the event output settings. If "Enabled" is selected in the output latch selection, the output remains ON even when the event condition changes from ON to OFF. For the EV3 option, the COM pin is shared. Relay contact, 1a Control capacity: 3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load, cosϕ=0.4) Electrical life: 100,000 cycles Minimum applicable load: 10 mA 5 V DC
Heater burnout alarm [Options: C5W (20 A), C5W (100 A), W (20 A), W (100A)]	When allocated to multiple EVT outputs, the set value is common. When the control output is ON, if the CT input (detected current) value falls below the heater burnout alarm set value, a heater burnout error occurs and the EVT output turns ON. Additionally, the heater burnout alarm flag is set in status flag 1. Rated current: 20 A, 100 A (Must be specified when ordering.) Setting range: 0.0 to 20.0 A (If set to 0.0, it does not function.) 0.0 to 100.0A (If set to 0.0, it does not function.) Setting accuracy: 5% of the rated value Operation point Setting value Operation: ON/OFF action Output: Event outputs allocated in the event output allocation selection will be turned ON or OFF. ・Actuator short circuit alarm When the control output is OFF, if the CT input (detected current) value exceeds the heater burnout alarm setpoint, an actuator short circuit alarm occurs and the EVT output turns ON. Additionally, the actuator short circuit alarm flag is set in status flag 1.
Heating/Cooling control [Options: EV2 (Select 21 in the output allocation selection), O2 (SSR/A)]	Performs Heating/Cooling control. Cooling proportional band (Pc) Thermocouple input, RTD input (without decimal point): 0 to Input span ℃(℉) Thermocouple input, RTD input (with decimal point): 0.0 to Input span ℃(℉) DC voltage, current inputs: 0.0 to 1000.0 % When 0 or 0.0 is set: ON-OFF control Cooling integral time (Ic) 2-DOF PID control, Fast-PID control 0 to 10000 sec 0.0 to 1999.9 sec Slow-PID control 1 to 10000 sec 0.1 to 1999.9 sec

	Change settings via the Integral/Derivative decimal point place selection. Cooling derivative time (Dc) 0 to 10000 sec 0.0 to 1999.9 sec Change settings via the Integral/Derivative decimal point place selection. Cooling proportional cycle 0.1 to 120.0 sec Cooling output high limit, output low limit 0.0 to 100.0 % DC voltage, current inputs: -5.0 to 105.0 % (However, for outputs other than 4-20mA, values below 0% are not output.) Cooling ON/OFF hysteresis 0.1 to 1000.0 ℃(0.1 to 1800.0 ℉) DC voltage, current inputs: 1 to 10000 Cooling method selection One cooling method can be selected from Air cooling (linear characteristics), Oil cooling (1.5th power of the linear characteristics) and Water cooling (2nd power of the linear characteristics) by key operation. Overlap/Dead band setting: -100.0 to 100.0 ℃(-180.0 to 180.0 ℉) DC voltage, current inputs: -1000 to 1000
External setting input (Option: EA)	When Remote is selected via Remote/Local selection operation (key operation, event input), the external analog signal is used as the setpoint. The control desired value is the value with the remote bias value added. However, this is disabled during program control and operates within the range from the low limit to the high limit of the external setting input. Setting signal: 4 to 20 mA DC Allowable input: Max. 50 mA DC Input impedance: Max. 50 Ω Input sampling period: 100 ms
Transmission output (Option: TA, TV)	Converting the value (PV, SV or MV transmission) to analog signal every 125 ms, outputs the value in current or voltage. Resolution: 12000 Output: 4 to 20 mA DC (Allowable load resistance: Maximum 550 Ω) 0 to 1 V DC (Allowable load resistance: Minimum 1 kΩ) 0 to 10 V DC (Allowable load resistance: Minimum 1 kΩ) Output accuracy: Within ±0.3% of Transmission output span If the transmission output high limit setting and the transmission output low limit setting are the same, the transmission output low limit value shall be output.
Insulated power output (Option: P24)	Output voltage: 24±3 V DC (when load current is 30 mA DC) Ripple voltage: Within 200 mV DC (when load current is 30 mA DC) Max. load current: 30 mA DC
Serial communication [Options: C5, C5W (20 A), C5W (100 A)]	The following operations can be carried out from an external computer. (1) Reading and setting of the SV, PID values and various set values (2) Reading of the PV and action status (3) Function change Cable length: Max 1.2 km, Cable resistance: Within 50 Ω (Terminators are not necessary, but if used, use 120 Ω or more on both sides.) Communication line: EIA RS-485

	Communication method: Half-duplex communication Communication speed: 9600, 19200, 38400, 57600, 115200 bps (Selectable by key operation) Synchronization method: Start-stop synchronization Data bit/Parity: Data bit: 7 bits, 8 bits, (Selectable by key operation) Parity: Even/Odd/No parity (Selectable by key operation) Stop bit: 1 bit, 2 bits (Selectable by key operation) Communication protocol: Shinko protocol/MODBUS RTU/MC protocol/ SVTC (Selectable by key operation) Instrument number: 0 to 95 When selecting the MC protocol, set the master to 1 and the slave to 2 to 8. ・SV digital transmission Selecting SVTC digital transmission in the communication protocol selection allows digital transmission of the set value (SV) when combined with a digital indicating controller (with serial communication (options: C5, C5W)). If the transmission range of the SVTC digital transmission sender exceeds the scaling range of the digital indicating controller, the transmission is limited to the scale range of the digital indicating controller. Update cycle: 250 ms ・SVTC bias setting ACS2 Digital external setting (active when Shinko protocol is selected) Receives digital set value from the SVTC program controller option. The control desired value is the value received via the SVTC command plus the SVTC bias value. The control target value is the value received via the SVTC command plus the SVTC bias value, constrained within the range defined by the scaling low limit setting to scaling high limit setting. Setting Range: Equivalent to ±20% of the input span ・Response delay time setting After receiving a command from the host, the response time can be delayed. Setting range: 0 to 1000 ms ・PLC link function When MC Protocol is selected in the communication protocol selection, the PLC Link function (program-free communication function) becomes available. This function enables serial communication connection with Mitsubishi Electric's “Q Series” PLC, allowing various data to be written to and read from PLC registers using the PLC's communication protocol. The communication protocol uses “QW” and “QR” commands, targeting PLCs that support A-compatible 1C frame AnA/AnU common commands (QR/QW). In the console software, specify the PLC register address, the monitor items linked to the register address, and the configuration items to perform initial setup. ACS2 periodically writes to the PLC registers using the QW command for the specified monitor items, constantly updating the register values. Additionally, it reads data from the PLC registers using the QR command in response to configuration requests for specified items. If

	the read data changes, ACS2 updates its configuration values. Set the master device number to 1 and slave device numbers from 2 to 8. Set the PLC station number to 0 and the PC number to 255 (fixed). ・Remote output When selecting remote output in EVT output allocation, it becomes possible to forcibly turn the output ON/OFF from the host.

12. Troubleshooting

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

12.1 Indication

Problem	Possible Cause	Solution
The PV Display indicates [E--□].	Internal non-volatile IC memory is defective.	Contact our agency or us.
The PV Display indicates [----].	PV has exceeded the Indication range and Control range.	Check the input signal source.
	Burnout of thermocouple, RTD or disconnection of DC voltage (0 to 1 V DC)	Replace 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. 100 Ω of resistance is connected to the input terminals between A-B of the instrument and between B-B is shorted, and if a value around 0℃ (32℉) is indicated, the instrument is likely to be operating normally, however, the sensor may be burnt out. **[DC voltage (0 to 1 V 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 1 V DC) are securely mounted to the instrument input terminals.	Connect the sensor terminals to the instrument input terminals securely.

Problem	Possible Cause	Solution
The PV Display indicates [----].	PV has dropped below the Indication range and Control range.	Check the input signal source and wiring of input terminals.
	Check whether input signal wire for DC voltage (1 to 5 V DC) or direct current (4 to 20 mA DC) is disconnected.	**How to check whether the input signal wire is disconnected [DC voltage (1 to 5 V DC)]** If the input to the input terminals of the instrument is 1 V 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. **[Direct current (4 to 20 mA DC)]** If the input to the input terminals of the instrument is 4 mA 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 5 V DC) or current (4 to 20 mA DC) is securely connected to the instrument input terminals.	Connect the input signal wire to the terminals of this instrument securely.
	Check if polarity of thermo- couple or compensating lead wire is correct. Check whether codes (A, B, B) of RTD agree with the instrument terminals.	Wire them correctly.
The PV Display indicates [oFF],nothing or PV.	Control output OFF function is enabled.	Press the ◎ key or ⮆ key for approx. 1 second to cancel the function.
The indication of PV Display is irregular or unstable.	Check whether sensor input or temperature unit (℃ or ℉) is correct.	Select the sensor input and temperature unit (℃ or ℉) correctly.
	Sensor correction coefficient or Sensor correction value is unsuitable.	Set them to suitable values.
	Check whether the sensor specification is correct.	Use a sensor with appropriate specifications.
	AC leaks into the sensor circuit.	Use an ungrounded type sensor.
	There may be equipment that interferes with or makes noise near the instrument.	Keep the instrument clear of any potentially disruptive equipment.

Problem	Possible Cause	Solution
The PV Display keeps indicating the value set in [Scaling low limit].	Check whether the input signal wire for DC voltage (0 to 5 V DC, 0 to 10 V DC) and direct current (0 to 20 mA DC) is disconnected.	Check the input signal wires of DC voltage (0 to 5 V DC, 0 to 10 V DC) and direct current (0 to 20 mA DC). **How to check whether the input signal wire is disconnected** **[DC voltage (0 to 5 V DC, 0 to 10 V DC)]** If the input to the input terminal of this controller is 1 V DC, and if a value (converted value from scaling high, low limit setting) corresponding to 1 V DC is indicated, the controller is likely to be operating normally, however, the input signal wire may be disconnected. **[Direct current (0 to 20 mA DC)]** If the input to the input terminal of this controller is 4 mA DC, and if a value (converted value from scaling high, low limit setting) corresponding to 4 mA DC is indicated, the controller is likely to be operating normally, however, the input signal wire may be disconnected.
	Check whether the input terminals for DC voltage (0 to 5 V DC, 0 to 10 V DC) or direct current (0 to 20 mA DC) are securely connected to the instrument input terminals.	Connect the input terminals of DC voltage and current to the input terminals of this instrument securely.

12.2 Key Operation

Problem	Possible Cause	Solution
None of the set values can be set.	Set value Lock 1 is selected.	Release the lock in [Set value lock].
	AT, ‘AT on startup’ or Fast AT is performing.	If AT, ‘AT on startup’ or Fast AT is performing, cancel AT, ‘AT on startup’ or Fast AT.
SV cannot be set.	Set value Lock 2 is selected.	Release the lock in [Set value lock].
The setting indication does not change in the input range, and new values are unable to be set.	Scaling high or low limit value may be set at the point where the value does not change.	Set it to a suitable value.

12.3 Control

Problem	Possible Cause	Solution
Temperature does not rise.	Sensor is out of order.	Replace the sensor.
	Check whether the sensor or control output terminals are securely connected to the instrument input terminals.	Ensure that the sensor or control output terminals are connected to the instrument input terminals securely.
	Check whether the wiring of sensor or control output terminals is correct.	Wire them correctly.
The control output remains in an ON status.	OUT1 (or OUT2) low limit value is set to 100% or higher.	Set it to a suitable value.
	Have you selected “MV setting when input errors occur” under “action selection when input errors occur” and set “MV setting when input errors occur” to 100.0%? If the input cable breaks, the control output will remain ON.	Set it to a suitable value.
The control output remains in an OFF status.	OUT1 (or OUT2) high limit value is set to 0% or less.	Set it to a suitable value.

13. Character Table

The character list is shown below.

13.1 Display Mode

13.1.1 PV/SV Display Mode

The upper section of the left column is the PV Display.
The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.
The PV Display shows the PV, and the SV Display shows the value of the displayed item.
The right column indicates the status of this instrument.

Character	Status
[Memory number] [Setting value]	During fixed value control • The memory number is displayed when the fixed value control is selected and the setting value memory function is enabled (the MEMO indicator light also illuminates).
	During program control (Standby mode)
[Step number] [Setting value]	During program control (Run)

13.1.2 MV Monitor Mode

The upper section of the left column is the PV Display.
The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.
The PV Display shows the PV, and the SV Display shows the value of the displayed item.
The right column indicates the status of this instrument.

Character	Status
[Memory number] [MV]	During fixed value control • The memory number is displayed when the fixed value control is selected and the setting value memory function is enabled (the MEMO indicator light also illuminates).
	During program control (Standby mode)
[Step number] [MV]	During program control (Run)

SV Display, the decimal point in the first digit flashes.

13.1.3 Remaining Time Monitor Mode

The upper section of the left column is the PV Display.
The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.
The PV Display shows the PV, and the SV Display shows the value of the displayed item.
The right column indicates the status of this instrument.

Character	Status
	During program control (Standby mode)
[Step number] [Remaining time]	During program control (Run)

Displays the remaining time during program control run (turns off when program control is stopped).

13.2 Settings

13.2.1 Manual Control Mode

The upper section of the left column is the PV Display.
The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.
The PV Display shows the PV value, while the SV Display shows the factory default value.
The right column shows the setting item name and the setting range.

Characters, Factory Default	Setting Item, Setting Range
25 [(*1)]	Manual control MV OUT1 low limit setting to OUT1 high limit setting Option1: O2 (SSR/A) when added, -OUT2 high limit setting to OUT1 high limit setting

(*1) This is the MV when switching from automatic control to manual control.

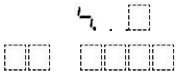
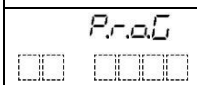
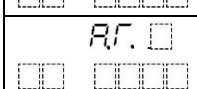
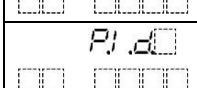
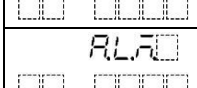
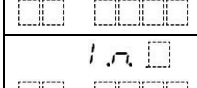
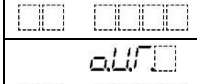
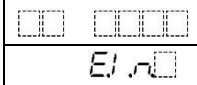
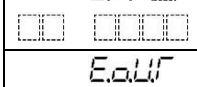
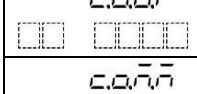
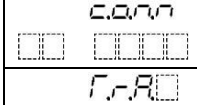
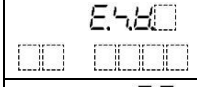
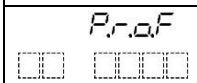
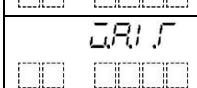
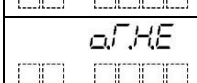
13.2.2 SV Setting (Direct Setting for Fixed Value Control)

The upper section of the left column is the PV Display.
The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.
The PV Display shows the PV value, and the SV Display shows the factory default value.
The MEMO/STEP Display shows the setpoint memory number.
The right column shows the setting item name and setting range.

Characters, Factory Default	Setting Item, Setting Range
25 1 0	SV1 setting Scaling low limit to Scaling high limit
25 2 0	SV2 setting Scaling low limit to Scaling high limit
25 3 0	SV3 setting Scaling low limit to Scaling high limit
25 4 0	SV4 setting Scaling low limit to Scaling high limit
25 5 0	SV5 setting Scaling low limit to Scaling high limit
25 6 0	SV6 setting Scaling low limit to Scaling high limit
25 7 0	SV7 setting Scaling low limit to Scaling high limit
25 8 0	SV8 setting Scaling low limit to Scaling high limit

13.2.3 Setting Group

The upper row of the left column is the PV Display.
The PV Display shows the group name characters.
The lower left is the MEMO/STEP Display, and the lower right is the SV Display.
The PV Display shows the group name characters.
The MEMO/STEP Display and SV Display are off.
The right column shows the group name.

Characters, Factory Default	Group Name
	Main setting group
	Program setting group
	AT setting group
	PID setting group
	Alarm setting group
	Input setting group
	Output setting group
	EVT Input setting group
	EVT Output setting group
	Communication setting group
	Transmission output setting group
	External setting input setting group
	Control function setting group
	Program function setting group
	Wait setting group
	Other setting group
	Maintenance group

(1) Program Setting Group

The upper section of the left column is the PV Display.

The PV Display shows the setting item character.

The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.

The PV Display shows the setting item character.

The SV Display shows the factory default value.

The MEMO/STEP Display indicates the program step number.

The right column shows the setting item name and setting range.

Characters, Factory Default	Setting Item, Setting Range
SP 1 0	Step1 SV setting Scaling low limit to Scaling high limit
TIME 1 00:00	Step1 Time setting ----, 00:00 to 99:59
JUMP 1 1	Step1 Wait block number setting 1 to 8
PID 1 1	Step1 PID block number setting 1 to 8
	The same applies up to program step No. 16.
SP 16 0	Step16 SV setting Scaling low limit to Scaling high limit
TIME 16 00:00	Step16 Time setting ----, 00:00 to 99:59
JUMP 16 1	Step16 Wait block number setting 1 to 8
PID 16 1	Step16 PID block number setting 1 to 8

(2) AT Setting Group

The upper section of the left column is the PV Display.

The PV Display shows the setting item character.

The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.

The PV Display shows the setting item character.

The SV Display shows the factory default.

The MEMO/STEP indicator is off.

The right column displays the setting (selection) item name and the setting range (selection items).

Characters, Factory Default	Setting Item, Setting Range	
AT -----	AT Perform/Cancel selection	
	-----	AT cancel
	AT	AT perform
ATA AT	AT action mode selection	
	AT	Normal AT
	LAT	AT on startup
	FAT	FastAT
AT_b 20	AT bias setting 0 to 50 ℃(0 to 90 ℉) or 0.0 to 50.0 ℃(0.0 to 90.0 ℉)	
AT_t 10	AT gain setting 0.1 to 10.0	
ATHY 0.5	AT hysteresys setting 0.0 to 5.0 ℃(0.0 to 9.0 ℉) DC voltage, current inputs: 0 to 50	

(3) PID Setting Group

The upper section of the left column is the PV Display.

The PV Display shows the setting item character.

The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.

The PV Display shows the setting item character.

The SV Display shows the factory default.

The MEMO/STEP Display shows the block number.

The right column shows the setting item name and setting range.

Characters, Factory Default	Setting Item, Setting Range
P□□□ □1 □□10	Block1 OUT1 Proportional band setting Except when Fast-PID control is selected If input is without decimal points, 1 to input span ℃(℉) If input with decimal points, 0.1 to input span ℃(℉) DC voltage, current inputs: 0.1 to 1000.0 % When Fast-PID control is selected If input is without decimal points, 0 to input span ℃(℉) If input with decimal points, 0.0 to input span ℃(℉) DC voltage, current inputs: 0.0 to 1000.0 %
I □□□ □1 □200	Block1 OUT1 Integral time setting Except when Slow-PID control is selected 0 to 10000 sec or 0.0 to 1999.9 sec When Slow -PID control is selected 1 to 10000 sec or 0.1 to 1999.9 sec
d□□□ □1 □□50	Block1 OUT1 Derivative time setting 0 to 10000 sec or 0.0 to 1999.9 sec
P_b□ □1 □□10	Block1 OUT2 Proportional band setting 0 to input span ℃(℉) or 0.0 to input span ℃(℉) DC voltage, current inputs: 0.0 to 1000.0 %
I_b□ □1 □200	Block1 OUT2 Integral time setting Except when Slow-PID control is selected 0 to 10000 sec or 0.0 to 1999.9 sec When Slow -PID control is selected 1 to 10000 sec or 0.1 to 1999.9 sec
d_b□ □1 □□50	Block1 OUT2 Derivative time setting 0 to 10000 sec or 0.0 to 1999.9 sec
rbEr □1 □□0.0	Block1 MV bias setting 0.0 to 100.0 %
db□□ □1 □□0.0	Block1 Overlap, dead band setting -100.0 to 100.0 ℃(-180.0 to 180.0 ℉) DC voltage, current inputs: -1000 to 1000
	The same applies to block numbers up to 8.

Characters, Factory Default	Setting Item, Setting Range
P□□□ □8 □□ 10	Block8 OUT1 Proportional band setting Except when Fast-PID control is selected If input is without decimal points, 1 to input span ℃(℉) If input with decimal points, 0.1 to input span ℃(℉) DC voltage, current inputs: 0.1 to 1000.0 % When Fast-PID control is selected If input is without decimal points, 0 to input span ℃(℉) If input with decimal points, 0.0 to input span ℃(℉) DC voltage, current inputs: 0.0 to 1000.0 %
I □□□ □8 □200	Block8 OUT1 Integral time setting Except when Slow-PID control is selected 0 to 10000 sec or 0.0 to 1999.9 sec When Slow -PID control is selected 1 to 10000 sec or 0.1 to 1999.9 sec
d□□□ □8 □□50	Block8 OUT1 Derivative time setting 0 to 10000 sec or 0.0 to 1999.9 sec
P_b□ □8 □□ 10	Block8 OUT2 Proportional band setting 0 to input span ℃(℉) or 0.0 to input span ℃(℉) DC voltage, current inputs: 0.0 to 1000.0 %
I_b□ □8 □200	Block8 OUT2 Integral time setting Except when Slow-PID control is selected 0 to 10000 sec or 0.0 to 1999.9 sec When Slow -PID control is selected 1 to 10000 sec or 0.1 to 1999.9 sec
d_b□ □8 □□50	Block8 OUT2 Derivative time setting 0 to 10000 sec or 0.0 to 1999.9 sec
rbEr □8 □□0.0	Block8 MV bias setting 0.0 to 100.0 %
db□□ □8 □□0.0	Block8 Overlap, dead band setting -100.0 to 100.0 ℃(-180.0 to 180.0 ℉) DC voltage, current inputs: -1000 to 1000

(4) Alarm Setting Group

The upper section of the left column is the PV Display.

The PV Display shows the setting item character.

The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.

The PV Display shows the setting item character.

The SV Display shows the factory default.

The MEMO/STEP Display is off.

The right column shows the setting item name and setting range.

Characters, Factory Default	Setting Item, Setting Range	
A1□□ □□ □□□0	EV1 alarm value	
	No action	
	High limit alarm	-(Input span) to Input span (*1)
	Low limit alarm	-(Input span) to Input span (*1)
	High/Low limits alarm	0 to Input span (*1)
	High/Low limits independent alarm	0 to Input span (*1)
	High/Low limit range alarm	0 to Input span (*1)
	High/Low limit range independent alarm	0 to Input span (*1)
	Process high alarm	Input range low limit to Input range high limit (*2)
	Process low alarm	Input range low limit to Input range high limit (*2)
	High limit with standby alarm	-(Input span) to Input span (*1)
	Low limit with standby alarm	-(Input span) to Input span (*1)
	High/Low limits with standby alarm	0 to Input span (*1)
	High/Low limits with standby independent alarm	0 to Input span (*1)
	(*1) For DC voltage and direct current inputs, this is the scaling range. (Maximum setting: -19999 to 19999) (*2) For DC voltage and direct current inputs, this is the scaling low limit (high limit). (Maximum setting: -19999 to 19999)	
A1H□ □□ □□□0	EV1 high limit alarm setting Same as the EV1 alarm setting.	
A2□□ □□ □□□0	EV2 alarm setting Same as the EV1 alarm setting.	
A2H□ □□ □□□0	EVT2 high limit alarm setting Same as the EV1 alarm setting.	
A3□□ □□ □□□0	EVT3 alarm setting Same as the EV1 alarm setting.	
A3H□ □□ □□□0	EVT3 high limit alarm setting Same as the EV1 alarm setting.	
H1□□ □□ □□0.0 Alternating display of mode character and measured CT current value (0.5-second cycle)	Heater burnout alarm 1 setting 0.0 to 20.0 A(Option, W20) 0.0 to 100.0 A(Option, W100)	

Characters, Factory Default	Setting Item, Setting Range
H2□□ □□ □□0.0 Alternating display of mode character and measured CT current value (0.5-second cycle)	Heater burnout alarm 2 setting 0.0 to 20.0 A(Option, W20) 0.0 to 100.0 A(Option, W100)
LP_r □□ □□□0	Loop break alarm time setting 0 to 200 min
LP_H □□ □□□0	Loop break alarm band setting 0 to 150 ℃(0 to 270 ℉) or 0.0 to 150.0 ℃(0.0 to 270.0 ℉) DC voltage, current inputs: 0 to 1500
LP_d □□ □□□0	Loop break alarm dead band setting 0 to 150 ℃(0 to 270 ℉) or 0.0 to 150.0 ℃(0.0 to 270.0 ℉) DC voltage, current inputs: 0 to 1500

(5) Input Setting Group

The upper section of the left column is the PV Display.

The PV Display shows the setting item character.

The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.

The PV Display shows the setting item character.

The SV Display shows the factory default.

The MEMO/STEP Display is off.

The right column shows the setting (selection) item name and the setting range (selection items).

Characters, Factory Default	Setting Item, Setting Range	
InP □□ t□□C	Input type selection	
	t□□C	K -200 to 1370 ℃
	t8 .C	K -200.0 to 800.0 ℃
	t4 .C	K -200.0 to 400.0 ℃
	J□□C	J -200 to 1000 ℃
	J□ .C	J -200.0 to 400.0 ℃
	r□□C	R 0 to 1760 ℃
	S□□C	S 0 to 1760 ℃
	b□□C	B 0 to 1820 ℃
	E□□C	E -200 to 800 ℃
	T□ .C	T -200.0 to 400.0 ℃
	n□□C	N -200 to 1300 ℃
	PL2C	PL-II 0 to 1390 ℃
	c□□C	C(W/Re5-26) 0 to 2315 ℃
	Pt .C	Pt100 -200.0 to 850.0 ℃
	Pt□C	Pt100 -200 to 850 ℃
	Pt .C	Pt100 -100.0 to 100.0 ℃
	4201	4 to 20 mA DC (*1) -19999 to 19999
	0201	0 to 20 mA DC (*1) -19999 to 19999
	420E	4 to 20 mA DC (*2) -19999 to 19999
	020E	0 to 20 mA DC (*2) -19999 to 19999
	0□ 1V	0 to 1 V DC -19999 to 19999
	0□5V	0 to 5 V DC -19999 to 19999
	1□5V	1 to 5 V DC -19999 to 19999
	0 10V	0 to 10 V DC -19999 to 19999
	(*1): It has a built-in shunt resistor (50Ω). (*2): The separately sold shunt resistor (50Ω) is attached externally.	
CorF □□ C□□□	Temperature unit selection	
	C□□□	Celsius
	F□□□	Fahrenheit

Characters, Factory Default	Setting Item, Setting Range	
SCLH 1370	Scaling high limit setting Scaling low limit to Input range high limit	
SCLL -200	Scaling low limit setting Input range low limit to Scaling high limit	
dP 0	Decimal point place selection	
	0	No decimal point
	0.0	1st decimal place
	0.00	2nd decimal place
	0.000	3rd decimal place
	0.0000	4th decimal place
SMP 125	Input sampling selection	
	125	125 ms
	50	50 ms
	10	10 ms
AVG 1	Moving average count setting 1 to 10	
SCOE 1.000	Sensor correction coefficient setting 0.000 to 10.000	
SC 0.0	Sensor correction setting -100.0 to 100.0 ℃(-180.0 to 180.0 ℉) DC voltage, current inputs: -1000 to 1000	
FILT 0.0	PV filter time constant setting 0.0 to 10.0 sec	

(6) Output Setting Group

The upper section of the left column is the PV Display.

The PV Display shows the setting item character.

The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.

The PV Display shows the setting item character.

The SV Display shows the factory default.

The MEMO/STEP Display is off.

The right column shows the setting (selection) item name and the setting range (selection items).

Characters, Factory Default	Setting Item, Setting Range	
TYP1 □□ SSR□	OUT1 output type selection	
	SSR□	SSR output
	420A	Direct current output (4 to 20 mA DC)
	020A	Direct current output (0 to 20 mA DC)
c□□ □□ □30.0 Factory default settings ・For relay contact output type: 30.0 seconds ・For non-contact voltage output type, open collector type: 3.0 seconds	OUT1 proportional cycle setting 0.1 to 120.0 sec (When the direct current/DC voltage output type is set/selected, the proportional cycle item will not be displayed.)	
HYS□ □□ □□ 1.0	OUT1 ON/OFF hysteresis setting 0.1 to 1000.0 ℃(0.1 to 1800.0 ℉) DC voltage, current outputs: 1 to 10000	
oLH□ □□ 100.0	OUT1 high limit setting OUT1 Output low limit setting value to 100.0 % DC voltage, current outputs: Output low limit setting value to 105.0 %	
oLL□ □□ □□0.0	OUT1 low limit setting 0.0 to OUT1 Output high limit setting value DC voltage, current outputs: -5.0 % to Output high limit setting value	
orAr □□ □0.00	OUT1 rate-of-change setting 0.00 to 100.00 %/sec	
TYP2 □□ SSR□	OUT2 output type selection	
	SSR□	SSR output
	420A	Direct current output (4 to 20 mA DC)
	020A	Direct current output (0 to 20 mA DC)
cAcT □□ AIr□	OUT2 cooling method selection	
	AIr□	Air cooling
	oIL□	Oil cooling
	WAT□	Water cooling

Characters, Factory Default	Setting Item, Setting Range
c_b□ □□ □30.0 Factory default settings ・For relay contact output type: 30.0 seconds ・For non-contact voltage output type, open collector type: 3.0 seconds	OUT2 proportional cycle setting 0.1 to 120.0 sec (When the direct current/DC voltage output type is set/selected, the proportional cycle item will not be displayed.)
HYsb □□ □□ 1.0	OUT2 ON/OFF hysteresis setting 0.1 to 1000.0 ℃(0.1 to 1800.0 ℉) DC voltage, current outputs: 1 to 10000
oLHb □□ 100.0	OUT2 high limit setting OUT2 Output low limit setting value to 100.0 % DC voltage, current outputs: OUT2 Output low limit setting value to 105.0 %
oLLb □□ □□0.0	OUT2 low limit setting 0.0 to OUT2 Output high limit setting value DC voltage, current outputs: -5.0 % to OUT2 Output high limit setting value
conf □□ HEAt	Direct/Reverse action selection HEAt: Reverse action cooL: Direct action
Pst 1 □□ □□0.0	Pre-set output setting 1 -5.0 to 105.0 %
Pst2 □□ □□0.0	Pre-set output setting 2 -5.0 to 105.0 %
ERcf □□ Eout	Action selection when input errors occur Eout: MV setting when input errors occur conf: Control operation continues
Eon 1 □□ □□0.0	OUT1 MV setting when input errors occur -5.0 to 105.0 %
Eon2 □□ □□0.0	OUT2 MV setting when input errors occur -5.0 to 105.0 %

(7) EVT Input Setting Group

The upper column on the left side is the PV Display.

The lower left side is the MEMO/STEP Display, and the lower right side is the SV Display.

The PV Display indicates the setting item character.

The SV Display indicates the factory default.

The MEMO/STEP Display is off.

The right column indicates the selection item name and the selected item.

<table>
<tr><th>Characters,
Factory Default</th><th colspan="4">Setting Item, Setting Range</th></tr>
<tr><td>EVI 1
□□ □□□0</td><td colspan="4">Event input EI1 allocation selection
Event input EI1 allocation table
<table>
<tr><th>Selection value</th><th>Event input function</th><th>Input ON (Closed)</th><th>Input OFF (Open)</th></tr>
<tr><td>□□□0</td><td>No event</td><td></td><td></td></tr>
<tr><td>□□□1</td><td>Set value memory (*1)</td><td>2^n</td><td>1</td></tr>
<tr><td>□□□2</td><td>Control ON/OFF</td><td>Control OFF</td><td>Control ON</td></tr>
<tr><td>□□□3</td><td>Direct/Reverse action</td><td>Direct action</td><td>Reverse action</td></tr>
<tr><td>□□□4</td><td>Preset output 1 ON/OFF</td><td>Preset output</td><td>Usual control</td></tr>
<tr><td>□□□5</td><td>Preset output 2 ON/OFF</td><td>Preset output</td><td>Usual control</td></tr>
<tr><td>□□□6</td><td>Auto/Manual control</td><td>Manual control</td><td>Automatic control</td></tr>
<tr><td>□□□7</td><td>Remote/Local</td><td>Remote</td><td>Local</td></tr>
<tr><td>□□□8</td><td>Program control
RUN/STOP</td><td>RUN</td><td>STOP</td></tr>
<tr><td>□□□9</td><td>Program control
Holding/Not holding</td><td>HOLD</td><td>Not holding</td></tr>
<tr><td>□□ 10</td><td>Program control
Advance function</td><td>ADVANCE</td><td>Usual control</td></tr>
<tr><td>□□ 11</td><td>Integral action holding</td><td>Integral action holding</td><td>Usual integral action</td></tr>
<tr><td>□□ 12</td><td>EV(x) output latch selection</td><td>Latch release</td><td>Usual control</td></tr>
</table>
(*1): The MEMO Display shows the value obtained by adding 2^n and then incrementing by 1. If EI1=OFF and EI2=ON, the display shows 3.
Event input numbers are allocated sequentially starting from the smallest number: 2^0, 2^1, and so on.</td></tr>
<tr><td>EVI 2
□□ □□□0</td><td colspan="4">Event input EI2 allocation setting
Same as Event input EI1 allocation selection.</td></tr>
<tr><td>EVI 3
□□ □□□0</td><td colspan="4">Event input EI3 allocation setting
Same as Event input EI1 allocation selection.</td></tr>
<tr><td>EVI 4
□□ □□□0</td><td colspan="4">Event input EI4 allocation setting
Same as Event input EI1 allocation selection.</td></tr>
</table>

(8) EVT Output Setting Group

The upper section of the left column is the PV Display.

The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.

The PV Display shows the setting item character.

The SV Display shows the factory default.

The MEMO/STEP Display is off.

The right column shows the setting (selection) item name and the setting range (selection items).

Characters, Factory Default	Setting Item, Setting Range	
EVo 1 □□ □□□0	Event output EV1 allocation selection Event output EV1 allocation table	
	Selection value	**Event output function**
	□□□0	No event
	□□□1	Alarm output, High limit alarm
	□□□2	Alarm output, Low limit alarm
	□□□3	Alarm output, High/Low limits alarm
	□□□4	Alarm output, High/Low limits independent alarm
	□□□5	Alarm output, High/Low limit range alarm
	□□□6	Alarm output, High/Low limit range independent alarm
	□□□7	Alarm output, Process high alarm
	□□□8	Alarm output, Process low alarm
	□□□9	Alarm output, High limit with standby alarm
	□□10	Alarm output, Low limit with standby alarm
	□□11	Alarm output, High/Low limits with standby alarm
	□□12	Alarm output, High/Low limits with standby independent alarm
	□□13	Heater burnout alarm output
	□□14	Loop break alarm output
	□□15	Time signal output
	□□16	Output during AT
	□□17	Pattern end output
	□□18	Remote output
	□□19	Output added when errors occur
	□□20	Main output
	□□21	Cooling output
A1EA □□ no□□	EV1 alarm value 0 Enabled/Disabled selection	
	no□□	Disabled
	YES□	Enabled
A1HY □□ □□10	EV1 hysteresis setting 0.1 to 1000.0 ℃(0.1 to 1800.0 ℉) DC voltage, current inputs: 1 to 10000	
A1dY □□ □□□0	EV1 alarm delay time setting 0 to 10000 sec	
A1LN □□ noNL	EV1 alarm Energized/De-energized selection	
	noNL	Energized
	rEVS	De-energized

Characters, Factory Default	Setting Item, Setting Range	
A1Lc no	EV1 output latch selection	
	no	Disabled
	YES	Enabled
rS1n 1	TS1 output step number 1 to 16	
rS1F 00:00	TS1 OFF time setting 00:00 to 99:59	
rS1o 00:00	TS1 ON time setting 00:00 to 99:59	
Evo2 0	Event output EV2 allocation selection Same as Event output EV1 allocation selection.	
A2EA no	EV2 alarm value 0 Enabled/Disabled selection	
	no	Disabled
	YES	Enabled
A2HY 1.0	EV2 hysteresis setting 0.1 to 1000.0 ℃(0.1 to 1800.0 ℉) DC voltage, current inputs: 1 to 10000	
A2dY 0	EV2 alarm delay time setting 0 to 10000 sec	
A2LA noAL	EV2 alarm Energized/De-energized selection	
	noAL	Energized
	rEVS	De-energized
A2Lc no	EV2 output latch selection	
	no	Disabled
	YES	Enabled
rS2n 1	TS2 output step number 1 to 16	
rS2F 00:00	TS2 OFF time setting 00:00 to 99:59	
rS2o 00:00	TS2 ON time setting 00:00 to 99:59	
Evo3 0	Event output EV3 allocation selection Same as Event output EV1 allocation selection.	
A3EA no	EV3 alarm value 0 Enabled/Disabled selection	
	no	Disabled
	YES	Enabled
A3HY 1.0	EV3 hysteresis setting 0.1 to 1000.0 ℃(0.1 to 1800.0 ℉) DC voltage, current inputs: 1 to 10000	
A3dY 0	EV3 alarm delay time setting 0 to 10000 sec	
A3LA noAL	EV3 alarm Energized/De-energized selection	
	noAL	Energized
	rEVS	De-energized

Characters, Factory Default	Setting Item, Setting Range	
A3Lc no	EV3 output latch selection	
	no	Disabled
	YES	Enabled
r34 1	TS3 output step number 1 to 16	
r3F 00:00	TS3 OFF time setting 00:00 to 99:59	
r3o 00:00	TS3 ON time setting 00:00 to 99:59	

(9) Communication Setting Group

The upper section of the left column is the PV Display.

The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.

The PV Display shows the setting item character.

The SV Display shows the factory default.

The MEMO/STEP Display is off.

The right column shows the setting (selection) item name and the setting range (selection items).

Characters, Factory Default	Setting Item, Setting Range	
cnHL nonL	Communication protocol	
	nonL	Shinko protocol
	nodr	MODBUS RTU
	nc□□	MC protocol
	HUTc	SVTC
cnno □□□0	Instrument number 0 to 95	
cnHP □□96	Communication speed	
	□□96	9600 bps
	□192	19200 bps
	□384	38400 bps
	□576	57600 bps
	1152	115200 bps
cnFT 7EVn	Data bit/Parity	
	8non	8 bits/No parity
	7non	7 bits/No parity
	8EVn	8 bits/Even
	7EVn	7 bits/Even
	8odd	8 bits/Odd
	7odd	7 bits/Odd
cnHT □□□1	Stop bit	
	□□□1	1 bit
	□□□2	2 bits
cndY □□□0	Response delay time 0 to 1000 ms	
HU_b □□□0	SVTC bias ±20% of input span	

(10) Transmission Output Setting Group

The upper section of the left column is the PV Display.

The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.

The PV Display shows the setting item character.

The SV Display shows the factory default.

The MEMO/STEP Display is off.

The right column shows the setting (selection) item name and the setting range (selection items).

Characters, Factory Default	Setting Item, Setting Range	
Tro5 □□ PV□□	Transmission output type selection	
	PV□□	PV transmission
	5V□□	SV transmission
	MV□□	MV transmission
TrLH □□ 1370	Transmission output high limit setting (For PV, SV transmission) Transmission output high limit setting (For PV, SV transmission)	
TrLL □□ -200	Transmission output low limit setting (For PV, SV transmission) Input range low limit to Transmission output high limit setting	
TrLH □□ 1000	Transmission output high limit setting (For MV transmission) Transmission output low limit setting to 105.0 %	
TrLL □□ □□0.0	Transmission output low limit setting (For MV transmission) -5.0 % to Transmission output high limit value	

(11) External Setting Input Setting Group

The upper section of the left column is the PV Display.

The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.

The PV Display shows the setting item character.

The SV Display shows the factory default.

The MEMO/STEP Display is off.

The right column shows the setting (selection) item name and the setting range (selection items).

Characters, Factory Default	Setting Item, Setting Range	
rEnr LocL	Remote/Local selection	
	LocL	Local
	rEnr	Remote
rHLH 1370	External setting input high limit setting External setting input low limit to Input range high limit	
rHLL -200	External setting input low limit setting Input range low limit to External setting input high limit	
rH_b 0	Remote bias setting ±20% of input span	

(12) Control Function Setting Group

The upper section of the left column is the PV Display.

The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.

The PV Display shows the setting item character.

The SV Display shows the factory default.

The MEMO/STEP Display is off.

The right column shows the setting (selection) item name and the setting range (selection items).

Characters, Factory Default	Setting Item, Setting Range	
cFnc 2doF	Control action selection	
	2doF	2 DOF PID control
	FPId	Fast-PID control
	SPId	Slow-PID control
	GAP□	Gap-PID control
F_A□ 0.40	Proportional gain 2 DOF coefficient setting 0.00 to 1.00	
F_b□ 1.35	Integral 2 DOF coefficient setting 0.00 to 10.00	
F_d□ 0.00	Derivative 2 DOF coefficient setting 0.00 to 1.00	
F_cP 1.00	Desired value proportional coefficient 0.00 to 1.00	
GAPb 00.0	Gap width setting 0.0 to 10.0 %	
GAPt 1.0	Gap coefficient setting 0.0 to 1.0	
F_dP □□□0	Integral/Derivative decimal point place selection	
	□□□0	No decimal point
	□□0.0	With decimal point

(13) Program Function Setting Group

The upper section of the left column is the PV Display.

The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.

The PV Display shows the setting item character.

The SV Display shows the factory default.

The MEMO/STEP Display is off.

The right column shows the setting (selection) item name and the setting range (selection items).

Characters, Factory Default	Setting Item, Setting Range	
PrOG FIX	Fixed value control/program control selection	
	FIX	Fixed value control
	PrOG	Program control
n_h nI n	Step time unit selection	
	nI n	Hours:Minutes
	hEc	Minutes:Seconds
PrEr hrSP	Power restore action selection	
	hrSP	Stops after power is restored.
	cont	Continues (resumes) after power is restored.
	HoLd	Suspends (on hold) after power is restored.
h_hB 0	Program start temperature setting Scaling low limit value to Scaling high limit value	
h_hL PB	Program control start type selection	
	PB	PV start
	PBr	PVR start
	hB	SV start
rEPt 0	Number of repetitions setting 0 to 10000	

(14) Wait Setting Group

The upper section of the left column is the PV Display.

The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.

The PV Display shows the setting item character.

The SV Display shows the factory default.

The MEMO/STEP Display shows the block number.

The right column shows the setting item name and setting range.

Characters, Factory Default	Setting Item, Setting Range
WAIT □1 0	Block 1 wait setting 0 to 20% of input span
WAIT □2 0	Block 2 wait setting 0 to 20% of input span
WAIT □3 0	Block 3 wait setting 0 to 20% of input span
WAIT □4 0	Block 4 wait setting 0 to 20% of input span
WAIT □5 0	Block 5 wait setting 0 to 20% of input span
WAIT □6 0	Block 6 wait setting 0 to 20% of input span
WAIT □7 0	Block 7 wait setting 0 to 20% of input span
WAIT □8 0	Block 8 wait setting 0 to 20% of input span

(15) Other Setting Group

The upper section of the left column is the PV Display.

The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.

The PV Display shows the setting item character.

The SV Display shows the factory default.

The MEMO/STEP Display is off.

The right column shows the setting (selection) item name and the setting range (selection items).

Characters, Factory Default	Setting Item, Setting Range	
LocK □□ -----	Set value lock selection	
	-----	Unlock
	LoC 1	Lock 1
	LoC2	Lock 2
rAtt □□ PUtr	SV Rise/Fall rate action selection	
	tUtr	SV start
	PUtr	PV start
rAtt □□ Ai n□	SV Rise/Fall rate time unit selection	
	Ai n□	Minutes
	tEc□	Seconds
rAtU □□ □□□0	SV rise rate setting 0 to 10000 ℃/min (0 to 18000 ℉/min) or 0.0 to 1000.0 ℃/min (0.0 to 1800.0 ℉/min) DC voltage, current inputs: 0 to 10000/min	
rAtd □□ □□□0	SV fall rate setting 0 to 10000 ℃/min (0 to 18000 ℉/min) or 0.0 to 1000.0 ℃/min (0.0 to 1800.0 ℉/min) DC voltage, current inputs: 0 to 10000/min	
di SP □□ ALL□	LCD display part selection	
	ALL□	All LCD sections
	Lou□	Lower section (including the action indicator)
rAtU □□ tU□□	SV display method selection	
	tU□□	Setting value
	rtU□	Desired value during fluctuation due to ramp function (*)
PtU□ □□ oFF□	Indication when control output OFF selection	
	oFF□	OFF indication
	AoFF	No indication
	PU□□	PV indication
	PUAL	PV indication + Any Alarm active
oFtL □□ nonE	OUT/OFF key function selection	
	nonE	No function
	AAnU	Auto/Manual control
	oFF□	Control output OFF function
	rEnt	Remote/Local selection
	rUn□	RUN/STOP function (enabled during program control)

(*): Rise rate, fall rate, target values during program operation.

Characters, Factory Default	Setting Item, Setting Range	
PFnL □□ none	PF key function selection	
	none	No function
	Anu	Auto/Manual control
	oFF□	Control output OFF function
	rEnt	Remote/Local selection
	run□	RUN/STOP function (enabled during program control)
Ant □□ AUto	Auto/Manual control after power ON selection	
	AUto	Automatic control
	Anu	Manual control
d_tn □□ 0000	Indication time setting 0:00 to 60:00 Minutes:Seconds 0:00 Consecutively 0:01 to 60:00 Indication time	
nvbE □□ nvbE	Non-volatile IC memory saving selection	
	nvbE	Saving
	no□□	Not saving

(16) Maintenance Group

The upper section of the left column is the PV Display.

The lower left section is the MEMO/STEP Display, and the lower right section is the SV Display.

The PV Display shows the setting item character.

The SV Display shows the factory default.

The MEMO/STEP Display is off.

The right column shows the setting (selection) item name and the setting range (selection items).

Characters, Factory Default	Setting Item, Setting Range	
EVIn □□ □□□0	EVT input display (*1)	
	□□□0	No input
	□□□1	EI1 ON
	□□□2	EI2 ON
	□□□4	EI3 ON
	□□□8	EI4 ON
EVoF □□ □□□0	EVT output ON selection	
	□□□0	OFF
	□□□1	EV1 output ON
	□□□2	EV2 output ON
	□□□3	EV3 output ON
o1oF □□ □□0.0	OUT1 output setting (*2) 0.0 to 100.0 % DC voltage, current outputs: -5.0 to 105.0 % (*3)	
o2oF □□ □□0.0	OUT2 output setting (*2) 0.0 to 100.0 % DC voltage, current outputs: -5.0 to 105.0 % (*3)	
rAoF □□ □□0.0	Transmission output setting 0.0 to 100.0 %(*4)	
dcLr □□ no□□	Date clear selection	
	no□□	Cancel
	YES□	Execute
PcLr □□ no□□	Program clear selection	
	no□□	Cancel
	YES□	Execute

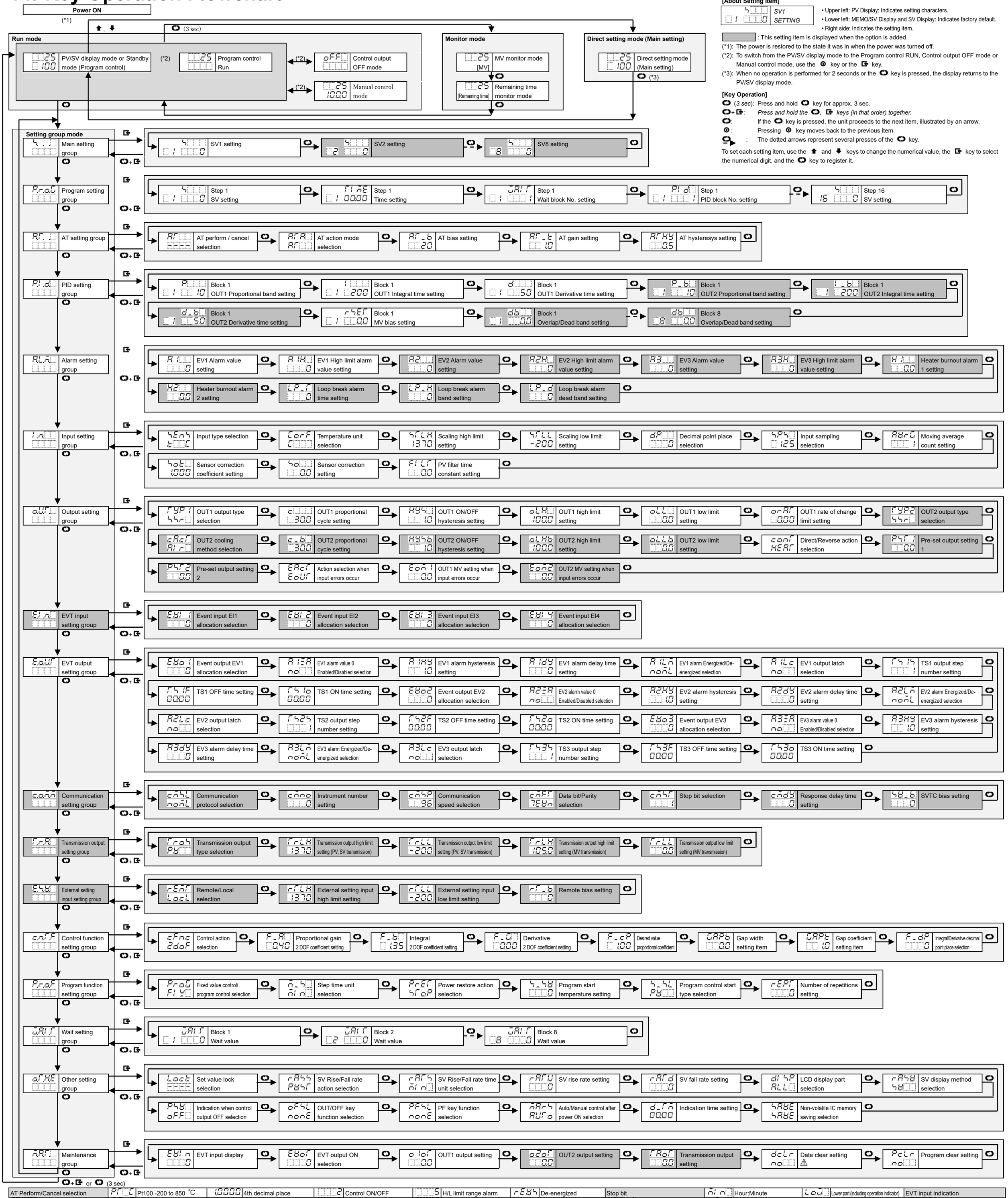
(*1): If duplicated, it will be the total value.

(*2): Can be set to 0.0 to 100.0 % or -5.0 to 105.0 %, but the output depends on the OUT□ high/low limit settings.

(*3): For outputs other than 4 to 20 mA DC or 1 to 5 V DC, values below 0% MV are not output.

(*4): For 0 to 1 V DC or 0 to 10 V DC outputs, values below 0% are not output.

14. Key Operation Flowchart



[About Setting Item]

SV1 SETTING

- Upper left: PV Display: Indicates setting characters.
- Lower left: MEMO/SV Display and SV Display: Indicates factory default.
- Right side: Indicates the setting item.

: This setting item is displayed when the option is added.

(*1): The power is restored to the state it was in when the power was turned off.

(*2): To switch from the PV/SV display mode to the Program control RUN, Control output OFF mode or Manual control mode, use the key or the key.

(*3): When no operation is performed for 2 seconds or the key is pressed, the display returns to the PV/SV display mode.

[Key Operation]

(*3 sec*): Press and hold key for approx. 3 sec.

+ : *Press and hold the , keys (in that order) together.*

: If the key is pressed, the unit proceeds to the next item, illustrated by an arrow.

: Pressing key moves back to the previous item.

: The dotted arrows represent several presses of the key.

To set each setting item, use the and keys to change the numerical value, the key to select the numerical digit, and the key to register it.

AT Perform/Cancel selection		PT_C	Pt100 -200 to 850 ℃	0.0000	4th decimal place	2	Control ON/OFF	5	H/L limit range alarm	rEVS	De-energized	Stop bit		Min	Hour:Minute	Low	Lower part (including operation indicator)	EVT input indication	
-----	AT Cancel	PT_IC	Pt100 -100.0 to 100.0 ℃	Input sampling selection		3	Direct/Reverse action	6	H/L limit range independent	EV1/EV2/EV3 output latch selection		1	1 bit	SEc	Minute:Second	SV display method selection		0	No input
AT	AT Perform	4201	4 to 20 mA DC (Built-in shunt resistor)	125	125 ms	4	Preset output 1	7	Process high alarm	no	Disabled	2	2 bits	Power restore action selection		Sv	Setting SV	1	EI1 ON
AT action mode selection				50	50 ms			8	Process low alarm	YES	Enabled	Transmission output type selection		SToP	Stop	rSb	Changing SV by ramp function	2	EI2 ON
AT	Normal AT	0201	0 to 20 mA DC (Built-in shunt resistor)	10	10 ms	5	Preset output 2	9	High limit with standby	Communication protocol		Pv	PV transmission	cont	Continue (resume)	Indication when control output OFF selection		4	EI3 ON
tAT	Startup AT		-19999 to 19999	OUT1/OUT2 output type selection			ON/OFF	10	Low limit with standby	noML	Shinko protocol	Sv	SV transmission	HoLd	Suspend (on hold)	oFF	OFF indication	8	EI4 ON
FAT	Fast AT	420E	4 to 20 mA DC (Externally mounted shunt resistor)	SSr	SSR output	6	Auto/Manual control	11	H/L limits with standby	modr	MODBUS RTU	mV	MV transmission	Program control start type selection		RoFF	NO indication	EVT output ON selection	
Input type selection				420A	Direct current output (4 to 20 mA DC)	7	Remote/Local	12	H/L limits with standby independent	mc	MC protocol	Remote/Local selection		Pv	PV start	Pv	PV indication	0	OFF
tC	K -200 to 1370 ℃	020E	0 to 20 mA DC (Externally mounted shunt resistor)	020A	Direct current output (0 to 20 mA DC)	8	Program control	13	Heater burnout alarm output	SVTC	SVTC	LocL	Local	PVr	PVR start	PvAL	PV indication (Any Alarm active)	1	EV1 output ON
tR	K -200.0 to 800.0 ℃		-19999 to 19999	OUT2 cooling method selection			RUN/STOP	14	Loop break alarm output	Communication speed		rEmt	Remote	Sv	SV start	OUT/OFF key/ PF key function selection		2	EV2 output ON
t4	K -200.0 to 400.0 ℃	0 to 1	0 to 1 V DC -19999 to 19999	Air	Air cooling	9	Program control	15	Time signal output	96	9600 bps	Control action selection		2doF	2DOF PID control	nonE	No function	3	EV3 output ON
J	J -200 to 1000 ℃	0 to 5	0 to 5 V DC -19999 to 19999	oiL	Oil cooling		Holding/Not holding	16	Output during AT	192	19200 bps	FPid	Fast-PID control	-----	Unlock	AMnU	Auto/Manual control function	Date clear perform/cancellation selection	
J	J -200.0 to 400.0 ℃	1 to 5	1 to 5 V DC -19999 to 19999	wAt	Water cooling	10	Program control	17	Pattern end output	384	38400 bps	SPid	Slow-PID control	Loc1	Lock 1	oFF	Control output OFF function	no	Cancellation
r	R 0 to 1760 ℃	0 to 10	0 to 10 V DC -19999 to 19999	Direct/Reverse action selection			Advance function	18	Remote output	576	57600 bps	CAP	Gap-PID control	Loc2	Lock 2	rEmt	Remote/Local selection	YES	Perform
S	S 0 to 1760 ℃	Temperature unit selection		rEAr	Reverse action	11	Integral action Holding	19	Additional output when error occur	1152	115200 bps	SV Rise/Fall rate action selection				rUn	RUN/STOP function	Program clear perform/cancellation selection	
b	B 0 to 1820 ℃	C	Celsius	cooL	Direct action	12	EV (x) output latch selection	20	Main output (EV2 only)	Data bit/Parity		Integral/Derivative decimal point place selection		rUnt	SV start		(enabled during program control)	no	Cancellation
E	E -200 to 800 ℃	F	Fahrenheit	Action selection when input errors occur		Event output EV1/EV2/EV3 allocation selection		21	Cooling output (EV2 only)	8non	8 bits/No parity	0	No decimal point	PVrT	PV start	Auto/Manual control after power ON selection		YES	Perform
T	T -200.0 to 400.0 ℃	Decimal point place selection		EoUt	MV output when input errors occur	0	No event	EV1/EV2/EV3 alarm value 0 Enabled/Disabled selection		7non	7 bits/No parity	0.0	With decimal point	SV Rise/Fall rate time unit selection		AUTo	Auto control	⚠ When performing data clear, disconnect the input/output wiring before performing the data clear. Performing data clear with the wiring still in place may result in a malfunction.	
n	N -200 to 1300 ℃	0	No decimal point	cont	Control action continued	1	High limit alarm	no	Disabled	8Edd	8 bits/Even	Fixed value control/program control selection		Min	Minute	nAnU	Manual control		
PL2	PL-Ⅱ 0 to 1390 ℃	0.0	1st decimal place	Event input EI1/EI2/EI3/EI4 allocation selection		2	Low limit alarm	YES	Enabled	7Edd	7 bits/Even	FIX	Fix control	SEc	Second	Non-volatile IC memory saving selection			
C	C(W/Re5-26) 0 to 2315 ℃	0.000	2nd decimal place	0	No event	3	H/L limits alarm	EV1/EV2/EV3 alarm Energized/De-energized selection		8odd	8 bits/Odd	ProG	Program control	LCD display part selection		SAVE	Saving		
PT_C	Pt100 -200.0 to 850.0 ℃	0.000	3rd decimal place	1	Set value memory	4	H/L limits independent	noAL	Energized	7odd	7 bits/Odd	Step time unit selection		ALL	All parts	no	No saving		

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