

# LT400 series Digital Indicating Controller

## CHINO

### Instruction Manual

- ◆ Read this instruction manual and the separate reference manual (INE-311) carefully to use your controller safely and avoid troubles.
- ◆ If your controller is with optional communications interface, read the separate instruction manual (INE-312), too.

**Checking of Model No**  
Check Model No. of your controller and its specifications.

**To agents or distributors**  
Make sure to pass this instruction manual to final customers.

**To our valuable customers**  
Keep this instruction manual until disposing of your controller.

#### CONTENTS

■ Model code .....	1	5. Specifications .....	2
■ Front view ■ Accessories/parts .....	1	6. Parameter directory .....	3
▲ Notes on safety .....	1	7. List of parameters .....	3
1. Installation to a panel .....	1	8. Description of parameters .....	3
2. Before wirings .....	2	9. Setting of parameters .....	4
3. Terminal arrangement .....	2	10. Operation .....	4
4. Troubleshooting/Maintenance .....	2	11. Event mode and output .....	4

■ **Model code** You can check it by keys. → 4. Refer to Troubleshooting/Maintenance.

①②③④⑤⑥ ⑦⑧⑨

LT45 □□□□□□—□□□ ... Size: 48 x 96 (mm) Model LT450.

LT47 □□□□□□—□□□ ... Size: 96 x 96 (mm) Model LT470.

① Input signal

0: Universal input

② Control output 1 (heating)

- 1: On-off pulse type
- 2: On-off servo type
- 3: Current output type
- 5: SSR drive pulse type
- 6: Voltage output type
- U: Multiple output type (On-off pulse type + Current output type + SSR drive type)

③ Control output 2 (cooling) (option)

- 0: None
- 1: On-off pulse type \*
- 3: Current output type \*
- 5: SSR drive pulse type \*
- 6: Voltage output type \*

\* Not available if Control output 1 is On-off servo type or Multiple output type

④ Remote contacts input + Comm. IF

- 1: 4 points of remote contacts input (std)
- R: RS-232C (option)
- A: RS-422A (option)
- S: RS-485 (option)
- 0: None (option)

⑤ Retransmission output

- 1: 4 to 20mA (std) \*
- 2: 0 to 1V (option) \*
- 3: 0 to 10 V (option) \*
- 0: None (option)

\* Not available for Model LT450 when Control output 1 is On-off servo type.

⑥ Remote signal input (option)

- 0: None
- 5: 4 to 20mA \* 7: 0 to 10V \*
- 6: 0 to 1V \*

\* For Model LT470, additional events are combined.  
\* Not available for Model LT450 if Control output 1 is On-off servo type or Multiple output type, or when Control output 2 is added.

⑦ Additional event + CT (option)

- 0: None
  - 1: 2 points of event \*
  - 2: Heater disconnection (CT) \*
  - 3: 2 points of event+heater disconnection (CT) \*
- \* Additional events are available in Model LT470 only.

⑧ Water-proof (option)

- 0: None
- 1: NEMA250 4X (equivalent to IP66)

⑨ Power supply

- A: 100 to 240VAC

\* Heater disconnection (CT) is available only when Control output 1 is pulse types.  
For Model LT450, it is not available when Remote signal input is added

# CHINO CORPORATION

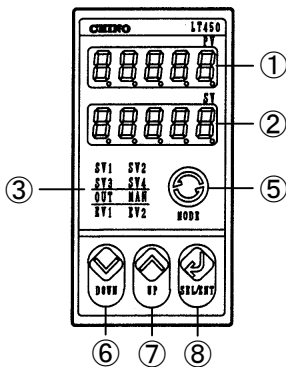
32-8, KUMANO-CHO, ITABASHI-KU, TOKYO 173-8632

Telephone: + 81-3-3956-2171  
 Facsimile: + 81-3-3956-0915  
 E - m a i l : inter@chino.co.jp  
 Website: http://www.chino.co.jp/

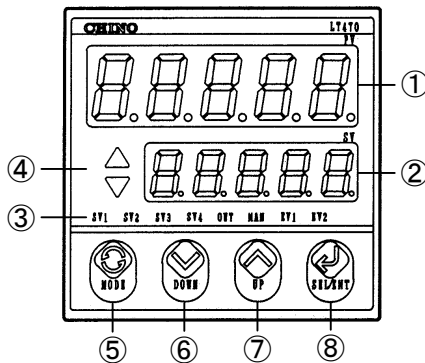
INE-303A July-'02 LT400 (2<sup>nd</sup> edition) Printed in

## Front view

●LT450



●LT470



## Accessories/parts (sold separately)

### Accessories

Fixture	2 pieces
Instruction manual (this manual)	1 copy

### Parts (sold separately)

Terminal cover	
Shunt resistor for current input (250Ω)	

Name		Function	
①	Upper LED (Green)	○ : Display of measured value (PV)	■ S : Display of parameter item
②	Lower LED (Red)	○ : Display of setpoint value (SV), control output value, or blank	■ S : Display of monitored data (operating mode) or parameter
③	Status		
	SV (Green)	○ · S : Executed SV No. lights and blinks in ramp condition	
	OUT (Green)	○ · S : It lights when control output (OUT) is displayed in the lower LED display	
	MAN (Red)	○ · S : It lights in manual operation	
	EV (Red)	○ · S : EV No. lights when any event is active	
④	Deviation (DEV) indicator	○ · S : Δ lights → PV > SV + deadband, ∇ lights → PV > SV - deadband, Lighting out →  PV - SV  ≥ deadband, For LT470 only	
⑤	(mode) key	○ · S : Switching of operation screen ↔ mode screen, Quick return of setting screens in a mode screen	
⑥	(down) key	○ : For selection of executing SV No. or adjusting of control output in manual operation	■ S : For setting of parameter or reverse stepping of mode
⑦	(up) key	○ : For selection of executing SV No. or adjusting control output in manual operation	■ S : For setting of parameter or stepping of mode
⑧	(Select) key	○ : For stepping of parameter item in operation mode	■ S : For stepping of parameter item in each mode
	(Enter) key	○ · S : For storing settings into memory (in setting mode – A dot blinks.)	

○ : Operation screen      ■ S : Monitor or setting screen



# Notes on safety

## 1. Precondition for use

Your controller is designed for installation in indoor panels.

### International safety standards

- Front panel (option) NEMA250 4X(equivalent to IP66 under IEC529)  
Not available in closed installation
- CE EMC: EN61326+A1 \*  
Safety: EN61010-1+A2  
Overvoltage category II, Pollution degree 2
- UL standards UL3121-1
- CSA standards CSA C22.2 No. 1010 (C-UL)

\* The displayed value and the output value equivalent to maximum  $\pm 10\%$  or  $\pm 2mV$  may vary under the test environment of EMC directive.

## Warning/Caution

### 1. Confirmation of power voltage and wirings

Confirm the power voltage and wirings before turning on the power supply.

### 2. Termination of wirings

Use crimping terminals with insulation sleeve.

### 3. Power switch

For the power supply, prepare a switch and an overcurrent protection device within 3m of your controller.

### 4. Safety measures for output

Control output or event output may not be correct due to wrong operation, malfunction, sensor abnormal or other factors.

Prepare safety measures at final products side if required.

### 5. Prohibition of repair and modification


To avoid electrical shock, fire and malfunction, other personnel than the service personnel authorized by CHINO are prohibited to repair, modify or disassemble your controller.

### 6. Turning off the power supply



When you feel or find abnormal conditions such as smelling or heating, turn off the power supply and contact your agent of CHINO Corporation.

## 2. Symbols used in your controller

- Used in your controller

Label	Name	Explanation
	Alert symbol mark	Indicates the locations where there is a risk of electrical shock or injury.

- Used in this manual

 Caution	Indicates the locations where there is a risk of electrical shock or injury.
	Indicates the items that your controller may result in insufficient functioning.

## Request for ensuring against risks

### 1. Environment

Make sure not to use your controllers in

- places containing corrosive gas (ex. sulfuric gas, etc.), powder or dust,
- places containing flammable or explosive gas,
- places flooded or covered with oil,
- places subject to significant change of temperature and strong wind
- places where is significantly influenced by vibration and shock
- places subject to direct sunlight and dew condensation.

### 2. Unused terminals

Make sure not to wire to unused terminals.

### 3. Inductive noise

- Make sure to separate all wirings to your controller from power line with high voltage or high current.
- Install your controller apart from equipment generating strong magnetic field, electrical field or high frequency.

### 4. Ventilation

Make sure not to block the ventilation openings to ensure the heat dissipating space for your controller.

### 5. Cleaning

When cleaning is required, make sure not to use chemicals (ex. thinner, benzene, etc.) affecting molded parts.

Use alcohol available in markets.

### 6. Safety measures at final products side

- To ensure safety in the event of malfunction of your controller, prepare separate safety measures.
- Prepare an enclosure for protection against fire when installing your controller.
- Prepare safety measures to prevent contact with terminals.

# 1. Installation to a panel

## ⚠ Caution

To avoid electrical shock, make sure to turn off the power supply and then install your controller to a panel.

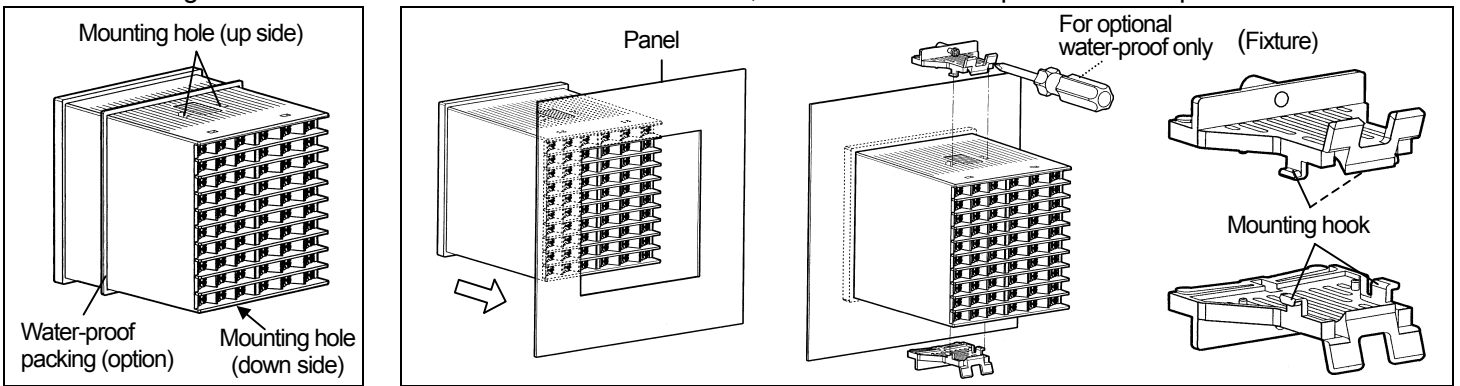
### • Installation condition

• Thickness of panel: Steel sheet of 1 to 10mm

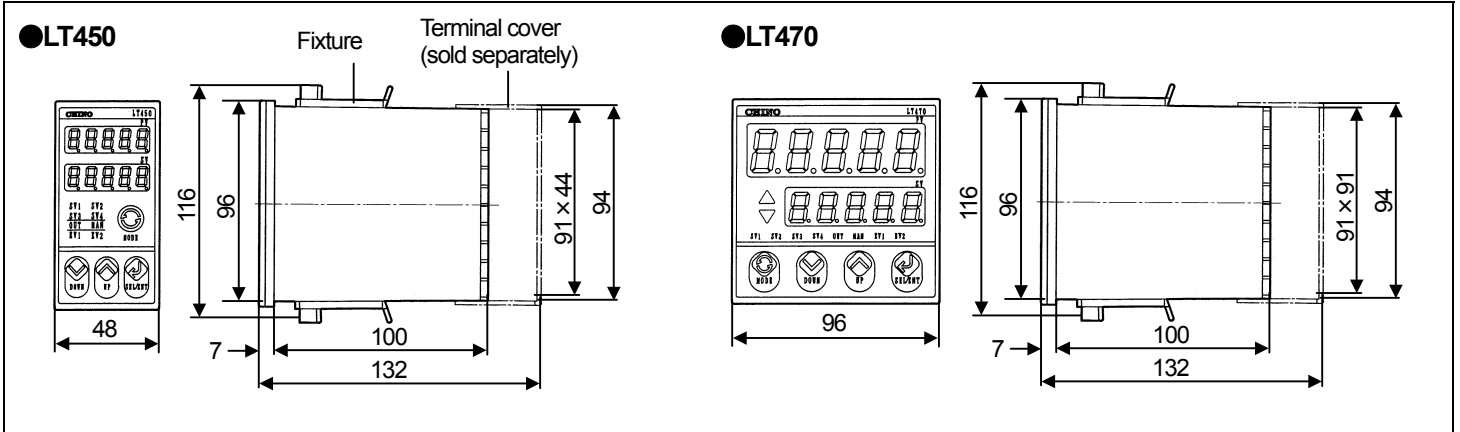
• Installation angle: Within 10° for forward tilting and backward tilting, and within 15° for left and right

- ① Insert the terminal board side of your controller into the angular hole of the panel cutout. When your controller is with optional water-proof, mount the rubber packing attached and then insert your controller.
- ② Insert the fixtures (2 pieces attached) into the mounting holes of your controller (for up and down sides), and then push them into the panel.
- ③ For the optional water-proof only, tighten the screw of the fixture. [Tightening torque]: 0.5 to 0.7 N·m

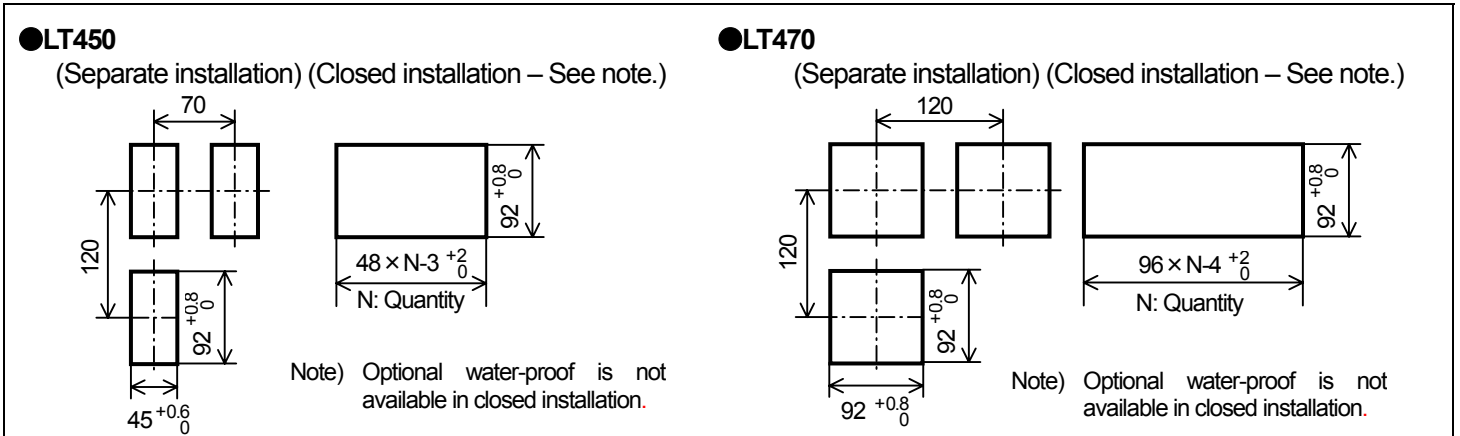
Remark : The figures below show Model LT470. For Model LT450, the same installation procedure is required.



## ■ Outside dimensions



## ■ Panel cutout



## 2. Before wirings

### ⚠ CAUTION

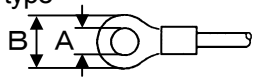
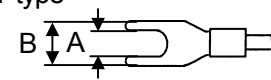
- ① To avoid electrical shock, make sure to turn off the power supply and then work all wirings.
- ② Work all wirings by only personnel who have basic knowledge of wiring and experienced the actual works.

### Note

1. Use a single-phase power supply with less noise, distortion of wave, voltage fluctuation to avoid malfunction of your controller.
2. If the power supply has noise too much, prepare a noise filter or other measures separately.

### Note

Wires and crimping terminal covered by insulation sleeve

Terminal name	Wire type	Crimping terminal covered by insulation sleeve		Tightening torque
Power terminals Relay output terminals (M3.5)	600V vinyl-insulated wires (Note)	<ul style="list-style-type: none"> <li>• O type</li> </ul> 	<ul style="list-style-type: none"> <li>• Y type</li> </ul> 	Max. 0.8N·m
Other terminals (M3.5)	See "Notes on wirings".	<ul style="list-style-type: none"> <li>• O type (Y type is usable.)</li> </ul>	* Dimension of terminal A: 3.7mm or more B: 7.0mm or less	

(Note) IEC 60227-3 ANSI/UL817, CSA C22.2 No. 49, AWG (American Wire Gauge) 16 to 22

## ■ Cautions on wirings

### 1. Power terminals

"Power supply" label is provided on the side of your controller.

Your controller may be damaged or broken if the voltage specified is not applied to.

### 2. Input terminals

#### 1) Allowable input voltage

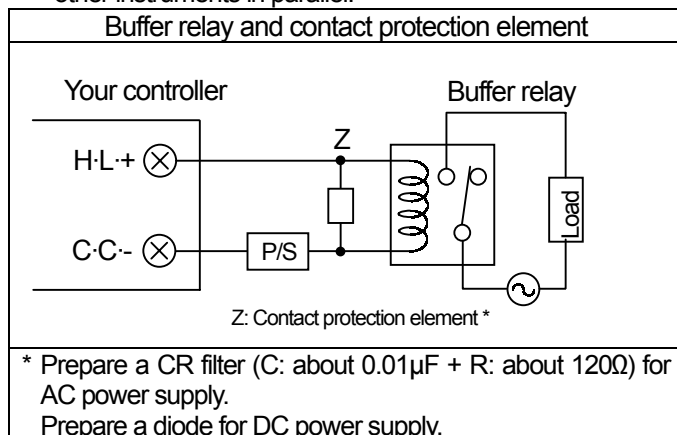
Input type	Allowable input voltage
DC voltage, thermocouple	±10VDC
Resistance thermometer	±5VDC

#### 2) Thermocouple

- Connect a thermocouple (or an extension wire) to input terminals.
- Do not connect the same thermocouple to other instruments in parallel.

#### 3) Resistance thermometer

- Use a 3-core cord with same resistance per each wire to avoid measurement error.
- Do not connect the same resistance thermometer to other instruments in parallel.



### 3. Control/Event output terminals

#### 1) On-off pulse output

- Contact ratings

(Resistive load) 5A (100 to 240V AC, 30V DC \*)

(Inductive load) 2.5A (100 to 240V AC, 30V DC \*)

\* Minimum load 5VDC 10mA or more

- Electrical life of relay 1 hundred thousand times

- Buffer relay and contact protection element → See the left figure.

Make sure to connect a load through a buffer relay.

To extend the life of relay contact, mount a contact protection element in parallel to the coil of the buffer relay.

#### 2) On-off servo output

Same contact ratings as On-off pulse output. It is applied to inductive loads only.

#### 3) Current output

- Load resistance 600Ω or less

#### 4) SSR drive pulse output

- On/off voltage 12VDC ± 20%/0.8VDC or less

#### 5) Voltage output

- Output resistance About 10Ω
- Load resistance 50kΩ or more

#### 6) Event output

- Contact ratings

(Resistive load) 3A (100 to 240VAC 30VDC \*)

(Inductive load) 1.5A (100 to 240VAC 30VDC \*)

- Electrical life 1 hundred thousand times

\* Minimum load 5VDC 10mA or more

\* The relay is not replaceable. Make sure to use a buffer relay.

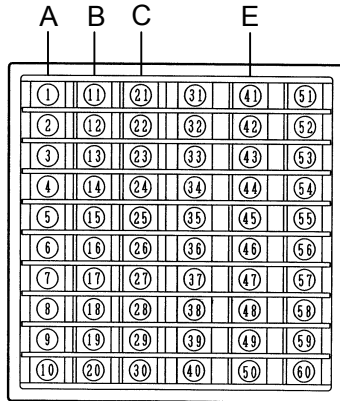
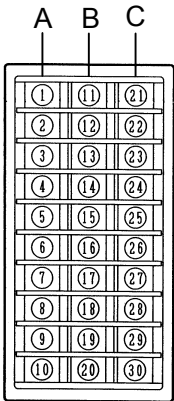
### 4. Mounting of terminal cover (sold separately)

A terminal cover (option) is available for avoiding electrical shock. If you have it, mount (push) the cover when all wirings are completed.

# 3. Terminal arrangement

●LT450

●LT470



Line A		Line B		Line C		Line E * 1	
①	Input	⑪	Communications interface	⑲	Retransmission output *2	④①	Retransmission output *2
②		⑫		④②			
③		⑬		⑲	CT input Remote signal input	④③	Remote signal input
④		⑭		⑲		④④	
⑤	Control output 1 Multiple output 1 (On-off pulse output)	⑮	Remote contacts input 4 points	⑳	Multiple output 2 (SSR drive) Multiple output 3 (current output)	④⑤	
⑥		⑯		④⑥		R/L+	
⑦	⑰	⑲		④⑦	R/L-COM		
⑧	⑱	⑳		④⑧	Additional event output (EV3, EV4)		
⑨	Power supply	⑲	⑲	④⑨			
⑩		⑲	⑳	④⑩			

\* 1: Line E (④① to ④⑩) is for Model LT470 only.

\* 2: Retransmission output is Line E for On-off servo type and Line C for other types.

## Line A Input/Control output 1/Power supply

### 1) Input

No.	Voltage (current *)	Thermocouple	Resistance thermometer
①	+	/	/
②	/	+	A
③	-	-	B
④	/	/	B

\* Connect a shunt resistor (250Ω/sold separately) between + and -.

### 2) Control output 1 (heating)

No.	On-off pulse type Multiple output 1 (On-off pulse output)	SSR drive pulse type Current output type Voltage output type	On-off servo type → Line C
⑥	H (N C)	+	/
⑦	C (COM)	-	/
⑧	L (N O)	/	/

### 3) Power supply

Common in all types	
⑨	L (Live)
⑩	N (Neutral)

## Line B Communications/ Remote contacts input

No.	Common in all types		
⑪	SD	SDA	SA
⑫	/	SDB	SB
⑬	RD	RDA	/
⑭	/	RDB	/
⑮	SG	SG	SG
⑯	DI1+		
⑰	DI2+		
⑱	DI3+		
⑲	DI4+		
⑳	DI-COM		

## Line C Retransmission output/Control output 2/CT/Event output ... These are different according to the output type of heating control.

No.	Standard		No.	On-off servo type		No.	Multiple control type	
⑲	+	Retransmission output	⑲	/		⑲	+	Retransmission output
⑳	-		⑳	R1 (Open)		⑳	-	
⑲	H(NC)	Control Output 2 (Cooling)	⑲	RC (Common)		⑲	/	
⑳	C(COM)		⑳	R2 (Close)		⑳	+	
⑲	L(NO)	⑲	M3 (Close)	⑲	-	Multi output 3 (Current output)		
⑲	CT	CT input	⑲	M2 (Open)		⑲	+	Multi output 3 (Current output)
⑲	CT		⑲	M1 (Common)		⑲	-	
⑲	EV1	Buffer relay	⑲	EV1		⑲	EV1	Buffer relay
⑲	EV2		⑲	EV2		⑲	EV2	
⑲	COM12	Power	⑲	COM12	Power	⑲	COM12	Power

\* Switching of analog remote/local (ON: Remote, OFF: Local) ... For Model LT450.

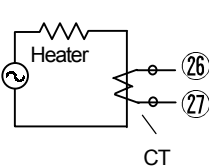
## Line E Remote contacts input, etc.

No.	Model LT470 only	
④①	+	Retransmission output (On-off servo type only)
④②	-	
④③	+	Remote signal input
④④	-	
④⑤	/	
④⑥	R/L+	Remote/Local *
④⑦	R/L-COM	
④⑧	EV3	Buffer relay
④⑨	EV4	Buffer relay
④⑩	COM34	Power

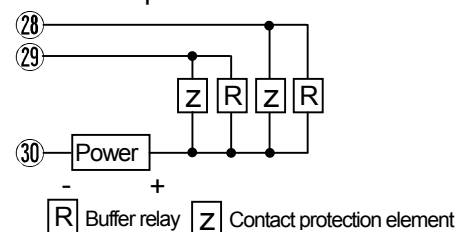
\* Switching of analog remote/local (ON: Remote, OFF: Local) ... For Model LT470

## Basic connection

### 1. CT input



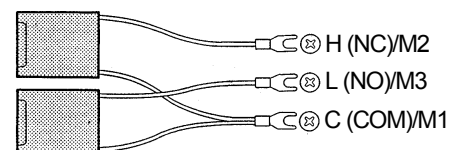
### 2. Event output



## Contact protection element (option)

Mount a contact protection element for On-off pulse type or On-off servo type.

- For light load (less than 0.2A) CX-CR1 (0.01μF + 120Ω)
- For heavy load (more than 0.2A) CX-CR2 (0.5μF + 47Ω)



# 4. Troubleshooting/Maintenance

## 4.1 Troubleshooting

Trouble		Check/Cause/Action
Not operated at all		① Is the rated power (100 to 240V AC, 50/60Hz) supplied to the power terminals?
		② Is the connection to the power terminals (L, N) correctly?
		③ Turn off the power supply and then turn it on again. If the operation is normal, CPU may be malfunctioned by electrical noise. In this case, prepare measures to suppress the noise.
Control operation abnormal	No control output	“Run/Ready” may be set at [rEAdy]. Set it to [rUn].
	Late transition	The set value of “Output variation limiter” may be low. Set it to be higher.
	Stable at above to setpoint	The control may be P and D only due to low set value of “ARW-H”. Set it to be higher.
	Stable at below to setpoint	The control may be P and D only due to low set value (minus value) of “ARW-L”. Set it to be higher.
	Control result not stable	① The derivative time may be too short. Set it to be long. ② The derivative time may be too long. Set it to be short.
	Overshooting	Set the “targeted value filter” to ON.
Measured value abnormal	Not stable	1) Are input terminals connected securely? 2) Is the input signal (sensor) stable? 3) Make sure that a sensor (thermocouple or resistance thermometer) is not connected in parallel to other instruments.
	Not correct	1) Is the input type correct? 2) Is the “engineering unit” correct? 3) For the thermocouple input, is a thermocouple or an extension wire connected to the input terminals?
Incorrect settings	SV stopped on its way	The set value of “SV limiter L” or “SV limiter H” may be not correct.
	SV rising or falling	“SV rising ramp” or “SV falling ramp” has been set. (If it has been set, its ramp operation functions at the selection of SV No., the change of SV, etc.)
	Key not accepted	Keys may be locked.

## 4.2 Displays and operation for troubles

Display	Explanation	Operation		Action
		Event output	Control output	
-----	Over-range	High limit event → ON		① Is the “Input type” correct? ② Is the input signal (sensor) normal?
-----	Under-range	Low limit event → ON		
Err02	RJ data abnormal	Fail → ON	“PV error output”	Your controller may be in trouble. Turn on the power supply and then turn it on again. If it is still in trouble, contact your agent of CHINO Corporation.
Err03	A/D conversion error			
Err04	Calibration data abnormal			

## 4.3 Control at power recovery

The control operation is determined by the selection in “Control at power recovery” of Mode 5. In case of “ $\overline{L} \square \square \square \square$ ”, the control operation before power interruption or power off is continued. In case of “ $\overline{r} \overline{E} \overline{R} \overline{d} \overline{y}$ ”, the control output becomes to the value of “Preset out”.

### ■ How to check the type

- Press  $\overline{C}$  key and then press  $\overline{\wedge}$  key to move to Mode 1.
- Press  $\overline{\leftarrow}$  key for several times until “Model confirmation 1” appears. 3-digit figure (“A” mentioned below) is displayed.
- Press  $\overline{\leftarrow}$  key again to appear “Model confirmation 2” or “Model confirmation 3”. 3-digit figure of “B” or “C” is displayed.

MODEL LT4◇■■■■■■■—■■■  
                  A    B    C

- You can verify Model No. by the above A, B and C.

### ■ Life of components

The followings are the life of components used in.

Component	Expected life
Control relay (On-off pulse/servo outputs)	100,000 times *1
Relay for event	
Electrolytic capacitor in power circuit	3 years (30°C) *2

\*1: By inserting a contact protection element and low load current, the life becomes longer.

\*2: In the environment where temperature is high, the life becomes shorter.

# 5. Specifications

## 5.1 Standard specifications

### 1) Input specifications

Input type: T/C ... B, R, S, N, K, E, J, T, U, L,  
WRe5-WRe26, W-WRe26, PtRh40-PtRh20,  
Platinel II  
RTD ... Pt100, JPt100  
DC voltage ... 0 to 20mV, 0 to 5V, 0 to 10V  
DC current ... 4 to 20mA (by adding a shunt resistor 250Ω)  
Measuring range: DC voltage ... 3 types, DC current ... 1 type  
T/C ... 14 types, RTD ... 2 types  
Rated measuring accuracy:  $\pm 0.1\% \pm 1$  digit (See the right upper table  
in Chapter 9 for details.)  
RJ compensation accuracy: At ambient 13 to 33°C ...  $\pm 1.0^\circ\text{C}$   
At ambient -10 to 50°C ...  $\pm 2.0^\circ\text{C}$   
Input resistance: DC voltage, thermocouple ... About 1MΩ  
Maximum common mode voltage: 30VAC  
Common mode rejection ratio: 130dB  
Series mode rejection ratio: 50dB

### 2) Control specifications

Control switching period: About 0.2 second  
Control output: Heating output/PID system, To be specified from the  
following 6 types, Cooling output (option) is only 4  
types of ①, ③, ④ and ⑤.

- ① On-off pulse type ...  
Contact ratings: See "Cautions on wirings" in Chapter 2.  
Pulse cycle: 1 to 180 seconds (1 second increments)
- ② On-off servo type ...  
Contact ratings: See "Cautions on wirings" in Chapter 2.
- ③ Current output type ... 4 to 20mA (600Ω or less)
- ④ SSR drive pulse type ...  
Output signal: 12VDC  $\pm 20\%$  (Max 20mA) at ON  
0.8VDC or less at OFF  
Pulse cycle: 1 to 180 seconds (1 second increments)
- ⑤ Voltage output type ... 0 to 10VDC  
(Output resistance ... About 10Ω,  
Load resistance ... 50kΩ or more)
- ⑥ Multiple control type ... Simultaneous output of 3 types (On-off  
pulse type, current output type and SSR  
drive pulse type)

### 3) General specifications

Rated supply voltage: 100 to 240VAC 50/60Hz  
(universal power supply)  
Allowable power voltage: 90 to 264VAC  
Power consumption: Maximum about 16VA  
Operating condition: As shown in the following table.

Item	Reference operating condition	Normal operating condition
Ambient temperature	23 $\pm$ 2°C	-10 to 50°C *1
Ambient humidity	55 $\pm$ 5%RH *2	20 to 90%RH *2
Power voltage	100VAC $\pm$ 1%	90 to 264VAC
Power frequency	50/60Hz $\pm$ 1%	50/60Hz $\pm$ 2%
Mounting angle	Up/down ... $\pm 3^\circ$	Up/down ... $\pm 10^\circ$
Installation altitude	Less than 2000m	Less than 2000m
Vibration, Shock	0m/s <sup>2</sup> , 0m/s <sup>2</sup>	2.0m/s <sup>2</sup> , 0m/s <sup>2</sup>

\*1: Less than 40°C for closed installation

\*2: No dew condensation is allowed.

Warming up: More than 30 minutes

Power failure: Parameters are maintained by EEPROM.

Insulation resistance: Between primary terminal (\*3) - secondary  
terminal (\*4) 500VDC, 20MΩ or more

Withstand voltage: Between primary terminal (\*3) - secondary  
terminal (\*4) 1500VAC, 1 minute

\*3: Terminals for power supply, control output and event output

\*4: Terminals other than mentioned above.

### 4) Event specification

Output point: Relay output, 2 points

Event type: Absolute value (PV), deviation (DV), absolute value  
deviation (ADV), setpoint (SV), output value (OUT) (High  
limit/low limit and standby enable/disable is selectable in  
these events.), control loop failure, FAIL, heater  
disconnection, timer function

Contact ratings: See "Cautions on wirings" in Chapter 2.

### 5) Remote contacts input

Input: 4 points

Function: ① SV No. selection, ② A/M switching, ③ Run/ready  
switching, ④ Timer start, ⑤ Ramp hold, ⑥ Ramp reset,  
⑦ Remote/local switching is selectable by settings.

### 6) Retransmission output

Output signal: 4 to 20mADC, 0 to 1VDC or 0 to 10VDC, to be  
specified

Output accuracy:  $\pm 0.2\%$  of full scale

Resolution: About 1/30000

### 7) Transportation and storage\* condition

Ambient temperature: -20 to 60°C


Ambient humidity: 5 to 95%RH (no dew condensation)

Vibration: 0 to 4.9m/s<sup>2</sup> (10 to 60Hz)

Impact: 400m/s<sup>2</sup> or less

\*The above is under the condition of shipment from the factory

### 8) International safety standards

See "1. Precondition for use" of  **Notes on safety.**

## 5.2 Options

### 1) Communications interface

Type: RS-232C, RS-422A or RS-485, to be specified

Protocol: MODBUS (RTU mode/ASCII mode selectable) and private  
Function: Settings/data transmission, digital transmission or digital  
remote, to be specified

Transmission speed: 9600/19200 bps

### 2) Remote signal input

Input signal: 4 to 20mADC, 0 to 1VDC or 0 to 10VDC, to be specified,  
(with R/L switching contact input)

### 3) Additional event

Output point: Relay output, 2 points

Event type: Absolute value (PV), deviation (DV), absolute value  
deviation (ADV), setpoint (SV) (High limit/low limit and  
standby enable/disable is selectable in these events.)

Contact ratings: See "Cautions on wirings" in Chapter 2.

### 4) Heater disconnection (CT)

Input signal: 5.0 to 50.0 A AC (50Hz/60Hz)

Recommended CT: Model CTL-6-S-H

### 5) Water-proof ... Not available in closed installation

Front panel protection: NEMA 250 4X (equivalent to IEC529 IP66)

Panel installation: See Chapter 1 "Installation to a panel".

## 5.3 Parts (Separate purchase is required.)

### 1) Contact protection element ... To be mounted externally

Type	Specification	Open/close current	Application
CX-CR1	0.01μF + 120Ω	0.2A or less	For light load
CX-CR2	0.5μF + 47Ω	0.2A or more	For heavy load

### 2) Shunt resistor for current input ... To be mounted externally

• Resistance ... 250Ω

• Maximum allowable continuous current ... 25mA

• Type ... EZ-RX250

### 3) Terminal cover ... To be mounted externally/nonflammable



# 6.PARAMETER DIRECTORY

[Operation Mode]

[Setting Mode]

Some modes are not appeared by a password.

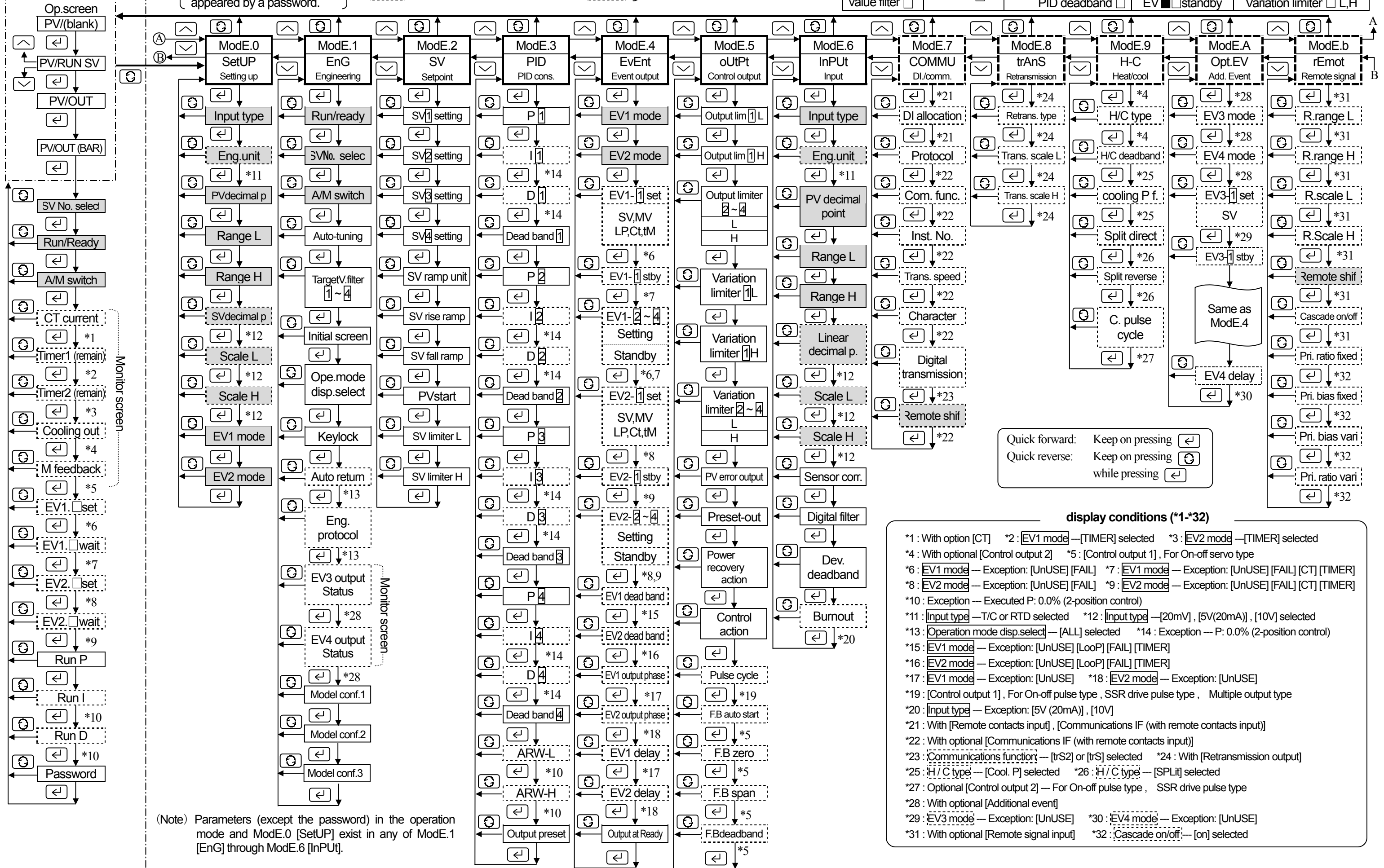
Displays without condition

Displays under condition

Can be set in both modes

Parameters combined with SV No. [ □ : SV No. (1 to 4), ■ : EV No. (1 to 4)]

ModE1	ModE2	ModE3	ModE4, ModEA	ModE5
Targeted value filter □	SV □	P □ I □ D □ PID deadband □	EV ■ □ setting EV ■ □ standby	Output limiter □ L,H Variation limiter □ L,H



Quick forward: Keep on pressing   
 Quick reverse: Keep on pressing while pressing

### display conditions (\*1-\*32)

- \*1 : With option [CT]    \*2 : [EV1 mode]—[TIMER] selected    \*3 : [EV2 mode]—[TIMER] selected
- \*4 : With optional [Control output 2]    \*5 : [Control output 1], For On-off servo type
- \*6 : [EV1 mode]—Exception: [UnUSE] [FAIL]    \*7 : [EV1 mode]—Exception: [UnUSE] [FAIL] [CT] [TIMER]
- \*8 : [EV2 mode]—Exception: [UnUSE] [FAIL]    \*9 : [EV2 mode]—Exception: [UnUSE] [FAIL] [CT] [TIMER]
- \*10 : Exception—Executed P: 0.0% (2-position control)
- \*11 : [Input type]—T/C or RTD selected    \*12 : [Input type]—[20mV], [5V(20mA)], [10V] selected
- \*13 : [Operation mode disp.select]—[ALL] selected    \*14 : Exception—P: 0.0% (2-position control)
- \*15 : [EV1 mode]—Exception: [UnUSE] [Loop] [FAIL] [TIMER]
- \*16 : [EV2 mode]—Exception: [UnUSE] [Loop] [FAIL] [TIMER]
- \*17 : [EV1 mode]—Exception: [UnUSE]    \*18 : [EV2 mode]—Exception: [UnUSE]
- \*19 : [Control output 1], For On-off pulse type, SSR drive pulse type, Multiple output type
- \*20 : [Input type]—Exception: [5V (20mA)], [10V]
- \*21 : With [Remote contacts input], [Communications IF (with remote contacts input)]
- \*22 : With optional [Communications IF (with remote contacts input)]
- \*23 : [Communications function]—[trS2] or [trS] selected    \*24 : With [Retransmission output]
- \*25 : [H/C type]—[Cool. P] selected    \*26 : [H/C type]—[SPLit] selected
- \*27 : Optional [Control output 2]—For On-off pulse type, SSR drive pulse type
- \*28 : With optional [Additional event]
- \*29 : [EV3 mode]—Exception: [UnUSE]    \*30 : [EV4 mode]—Exception: [UnUSE]
- \*31 : With optional [Remote signal input]    \*32 : [Cascade on/off]—[on] selected

(Note) Parameters (except the password) in the operation mode and ModE.0 [SetUP] exist in any of ModE.1 [EnG] through ModE.6 [InPUt].

# 7. List of parameters

Mode No.	Parameter	Symbol	Setting range	Default
1	Run/ready	r-rdY	rUn/ready	rUn
	SV No. select	SVno.	SV1 to SV4	SV1
	A/M switch	A-nAn	AUto/mAn	AUto
	Auto-tuning	At	End/StArt	End
	Target value filter	nAY □	oFF/on	oFF
	Initial screen	ScREn		SV
	Ope. mode disp. sel	dISP	→ Reference manual	dISP1
	Keylock	LoCK		UnLoCK
	Auto return	RetoFF	oFF/on	on
	Eng. protocol	EPoRt	→ Reference manual	rEtU
	Model conf. 1	nmdl1	Lt4◇■■■■□□□□	Model No. at shipment
	Model conf. 2	nmdl2	Lt4◇□□□■■■■□□□□	
Model conf. 3	nmdl3	Lt4◇□□□□□□■■■■		
2	SV□	SV□	Within SV limiter L, H	00
	SV ramp unit	SLPw	SEC/min/hoUr	min
	SV rise ramp	SLPUP	0.0 to 2000.0/S, m, H	00/min
	SV fall ramp	SLPDY	0.0 = No ramp	00/min
	PV start	PVSt	oFF/on	oFF
	SV limiter L	SVL L	L < H (within scale L, H)	Scale L, H
	SV limiter H	SVL H		
3	P□	P idP□	0.0 to 999.9% 0.0 = 2 position (On/off)	50%
	I□ (P≠0)	P idI□	0 to 9999 sec., 0 = off	60sec.
	D□ (P≠0)	P idD□	0 to 9999 sec., 0 = off	15sec.
	PID deadband	db□	0.0 to 9.9%	00%
	ARW-L	ARW L	-100.0 to 0.0%	-1000%
	ARW-H	ARW H	0.0 to 100.0%	1000%
Output preset	oUtePr	-100.0 to 100.0%	500%	
4	EV1 mode	EV1nd	→ Reference manual	
	EV2 mode	EV2nd		
	EV1□ setting	E1□◇◇		
	EV1□ standby	E1□△△		
	EV2□ setting	E2□◇◇		
	EV2□ standby	E2□△△		
	EV1 deadband	EV1db	nomAL/rEVSE	noNARL
	EV2 deadband	EV2db		
	EV1 output phase	EV1nr	nomAL/rEVSE	noNARL
	EV2 output phase	EV2nr		
	EV1 delay	EV1dl	0 to 9999	0 sec.
	EV2 delay	EV2dl	0 to 9999	0 sec.
Event output at Ready	EVrdY	oFF/CALCU	CALCU	
5	Output limiter □L	oL n□L	-5.0 to 100.0% L<H	00%
	Output limiter □H	oL n□H	0.0 to 105.0% L<H	1000%
	Variation limiter □L	oSL □L	-100.0 to -0.1%	-1000%
	Variation limiter □H	oSL □H	0.1 to 100.0%	1000%
	PV error output	PVErO	-5.0 to 105.0%	00%
	Preset-out	Prout	-5.0 to 105.0%	00%
	Power recovery action	PrOvOn	Conti/rEAdy	Cont i
	Control action	oUteRnd	rEVSE/dirCt	rEVSE
	Pulse cycle	PUL SE	1 to 180 sec.	30sec.
	FB auto start	Fb At	End/StArt	End
	FB zero	Fb Zr	-5.0 to 100.0%	00%
	FB span	Fb SP	0.0 to 105.0%	1000%
FB deadband	Fb db	1.0 to 20.0%	40%	

Mode No.	Parameter	Symbol	Setting range	Default
6	Input type	inPw	→ List of input types	tC r
	Engineering unit	Un t	°C/°F	°C
	PV decimal point	PVdpt	0 to 4	1
	Range L	r n□ L	Within scale L, H L < H	Scale L, H
	Range H	r n□ H		
	Linear decimal point	SVdpt	0 to 4	2
	Scale L	ScL L	-19999 to 20000	000
	Scale H	ScL H		10000
	Sensor correction	Pb rAS	-19999 to 20000	00
	Digital filter	PdFLt	0.0 to 99.9 sec.	0.1sec.
	Deviation deadband	PdCAP	0.0 to 2000.0	10
	Burnout	bUr n	UP/DOWN	UP
7	DI allocation	d i□ in	→ Reference man.	5
	Protocol	Pr tCL		rEtU
	Communications function	FUnC		Lo n
	Instrument No.	Ad rS	1 to 99	1
	Transmission speed	rAtE	9600/19200bps	9600bps
	Character	CHAr r	→ Reference man.	8n1
	Digital transmission	d t r nS		Pd
8	Remote shift	r b rAS	-1999.9 to 2000.0	00
	Analog transmission	AR r nS	→ Reference manual	
	Transmission scale L	t SCLL		
9	Transmission scale H	t SCLH		
	Heat/Cool type	Hc t YP	Cool.L/P/SPLit	Co oLP
	H/C deadband	Hc db	-50.0 to 50.0%	00%
	Cooling P factor	Co oL	0.00 to 10.00	100
	Split direct	SP d r	0.0 to 60.0%	00%
	Split reverse	SP r r	40.0 to 100.0%	1000%
A	C. pulse cycle	CLPLS	1 to 180 sec.	30sec.
	EV3 mode	EV3nd	→ Reference manual (Event output is common at "Ready")	
	EV4 mode	EV4nd		
	EV3□ setting	E3□◇◇		
	EV3□ standby	E3□△△		
	EV4□ setting	E4□◇◇		
	EV4□ standby	E4□△△		
	EV3 deadband	EV3db	nomAL/rEVSE	noNARL
	EV4 deadband	EV4db		
	EV3 output phase	EV3nr	nomAL/rEVSE	noNARL
EV4 output phase	EV4nr			
EV3 delay	EV3dl	0 to 9999	0 sec.	
EV4 delay	EV4dl	0 to 9999	0 sec.	
b	Remote range L	r r n□L	Reference manual	
	Remote range H	r r n□H		
	Remote scale L	r SCLL		
	Remote scale H	r SCLH		
	Remote shift	r b rAS	-1999.9 to 2000.0	00
	Cascade on/off	CRSc d	oFF/on	on
	Primary ratio fixed	CRS rA	0.01 to 1.00	020
	Primary bias fixed	CRS b	-100.0 to 100.0	-100%
Primary ratio variable	CRS v	0.00 to 1.00	100	
Primary bias variable	CRS w	0.00 to 1.00	000	

(Note) Explanation of marks (□, ◇, △) after ModE.2

□ 1 to 4 correspond to SV No.

◇ Any of SV, MV, LP, or tM to be determined by EV mode

△ Either wt or db to be determined by EV mode

# 8. Description of parameters

This chapter describes parameters requiring explanation.

Parameter	Function
Run/ready	For selection of control output. 0000... Preset-out value is displayed in "OUT". "AT" cannot be executed. 0000 is displayed instead of "SV". 0000... Normal control output
Auto return	For selection of auto return function (on/off) of screen
PV start	It effects when SV rising/SV falling ramp is set. When a trigger signal* applies to SV, SV starts from the point of PV. * At turning on the power, changing SV No., changing SV, or switching 0000 to 0000
SV limiter	For limiting the setting range of SV
PID deadband	P≠0: In this deadband, the response of the control output becomes dull due to non-linearized deviation. P = 0: Deadband of 2-position control
ARW (Anti-reset windup)	For PID control range. This parameter is set to SV by % of SV range. The control out of the ARW range becomes PD control. (The ARW effects to reduce overshoot.)
Output preset	Normally P action controls the calculated output to 50% when the deviation is 0. The calculated output can be set optionally by this parameter.
EV deadband	The gap from the event activation to reset.
EV output phase	0000... Event activation: Relay on, reset: Relay off 0000... Event activation: Relay off, reset: Relay on
EV delay	Judgment time of event activation/reset If the event action continues during the set time, the event activates or is reset. It prevents misjudgment due to noise.
Event output at Ready	0000... The event judgment continues even at Ready. 0000... The event judgment becomes off at Ready
Output limiter	The control output is limited within the set value of L and H.
Variation limiter	The control output is updated per control changing period (about 0.2 sec.). Its variation is limited within the set value. This is not valid for manual operation.
PV error output	This output is for abnormal measured value (PV) *. *Over-range, under-range and Err02 to 04
Preset-out	The control output value during Ready.
Power recovery action	For control action when the power is turned on from off (or from power failure to recovery). 0000... Continues previous control conditions. 0000... Becomes the "Preset out".
Control action	
Pulse cycle	Applicable to pulse type (On-off pulse type, SSR drive pulse type) control output 1 (heating) The output is based on the time ratio of on to off. This parameter is for the setting of this 1 cycle. The new parameter effects from the next cycle.
F.B deadband	Applicable to On-off servo type control output. It is the deadband between the relays at open side and at close side.

Parameter	Function
Engineering unit	For selection of engineering unit (°C or °F) for converting into temperature when thermocouple or resistance thermometer is selected as the input type.
PV decimal point	The decimal point position of the measured value is determined by the setting of the input type, but can be changed by this parameter.
Range	Minimum value L and maximum value H of the measuring range can be set within the input range selected in the input type. This width (between H and L) becomes 100% of the proportion band P.
Linear decimal point	The setpoint value (SV) is a figure up to 5 digits and cannot be added with decimal point. For the input types of DC voltage and DC current, the decimal point can be set by this parameter.
Scale	The parameter is for the input types of DC voltage and DC current. The scale with an actual industrial quantity can be set corresponding to Range L and H.
Sensor correction	This function is to correct the measured value (PV) by adding a correction value to the measured value. It can be also used to adjust the measured value to have same display as other equipment.
Digital filter	This function is, by applying the first-order lag computation to the measured value, to reduce the variation of the measured value (PV) due to noise interference. 
Deviation deadband	The deadband (light-off width) for the deviation indicators (△ and ▽) can be set.
Burnout	For selection of up-scale burnout or down-scale burnout or under-range for a break of the sensor circuit. The detected sensor break reacts to the event output.
Cooling pulse cycle	Applicable to pulse type (On-off pulse type, SSR drive pulse type) control output 2 (cooling) This parameter is for the setting of 1-cycle time of on and off of the output.
Cascade on/off	For the setting of cascade computation enable or disable When "on" is selected, your controller functions as a primary controller for cascade.

■Refer to other chapters for the following parameters.

Mode No.	Parameter	Chapter
Operation	Password	9.2
1	Auto/manual operation, automatic tuning, control output, targeted value filter	10.
	Model confirmation	4.3
4, A	Event mode, setting, standby, deadband	11
5	Input type	9
9	Heating/cooling type, split direct, split reverse, H/C deadband, cooling P factor	9

# 9. Setting of parameters

## 9.1 LED display of alphabetical characters

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
ā	ḃ	ċ	ḍ	ē	ḥ	ġ	ḥ	ı	ı	ḥ	ḥ	ñ	ñ	o	p	q	r	s	t	u	v	w	x	y	z

## 9.2 Settings

### Note Start to set from Mode 0.

Make sure to set in the order of parameters in Mode 0 (setup). If the settings are in the wrong order, the parameters previously set may return to the default values.

### 1 Selection of parameter items

- Parameter items in operation mode ... Press repeatedly to display the parameter item you want to set.
- Parameter items in setting mode ... 1 Press to shift to the setting mode. Press or to select Mode number.  
2 Press repeatedly to display the parameter item you want to set.
- Forward/reverse of parameter items ... Forward ... Press continuously.  
Reverse ... Press while pressing .

### 2 Settings (selection)

By pressing or , a numerical figure or a sub-parameter item is changed, and a dot blinks. However, the dot does not blink at the setting of the manual control output.

Numerical figure ... Press or to change. For forwarding setting figures, press either key continuously.

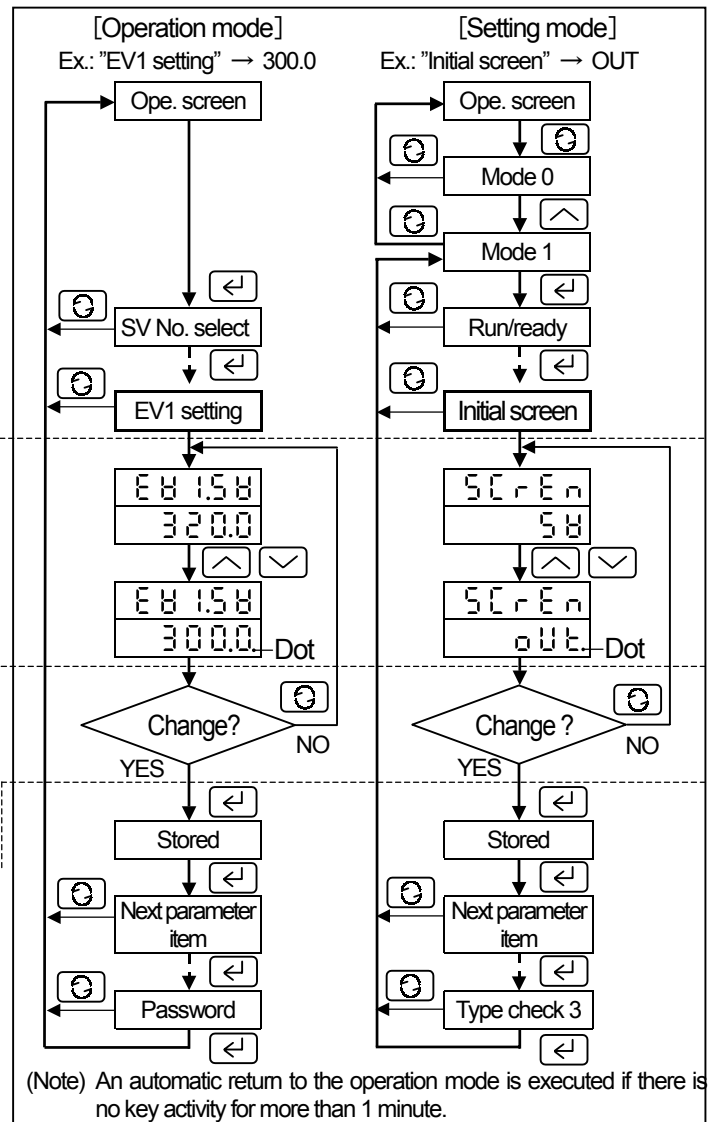
Sub-item selection ... Press or to select.

### 3 Cancel of settings

By pressing , the dot disappears and the parameter set is canceled.

### 4 Storage

By pressing , the dot disappears and the parameter set is stored into memory.



#### Ref. 1 Change of executed SV

The executed SV is indicated by the lighting status lamp of SV1 to SV4.

- Shift to the operation screen with PV/RUN SV.
- By pressing or , a dot blinks in the SV.
- Press or to set to the value you desire.
- By pressing , the dot disappears and the SV newly set is stored into memory.

#### Ref. 2 Password

Appearance or disappearance of screens in the setting mode can be set by numeric figures up to 4 digits. (○: Appearance)

Mode No.	Password		
	0	180	1000
0, 1	X	○	○
2 to b	X	X	○

- The default is "1000". By entering any figures other than 3 figures above, the password being set can be hidden. Until any of 3 figures above is entered, the previous password is valid.

#### Ref. 3 Keylock

In the operation mode, you can select screens, in which the settings are disabled to change. See the reference manual

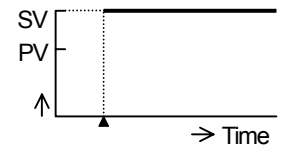
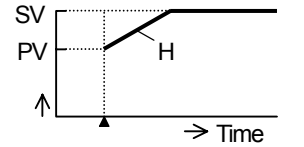
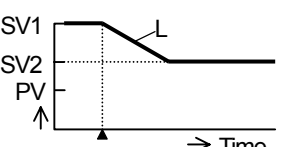
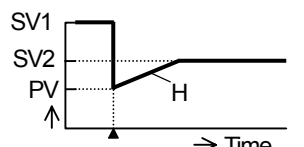
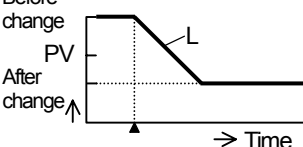
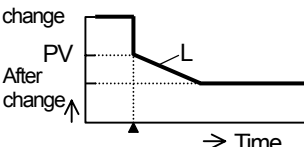
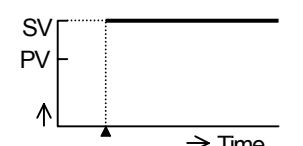
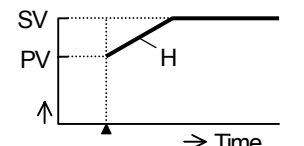
#### Ref. 4 Initialization

All parameters are initialized by the following procedure. While pressing and simultaneously, turn on the power.

## List of input types

Input type	Selection symbol	Input type		Accuracy ratings	Detailed specification	
		°C	°F			
T/C	B	tc b	0.0 to 1820.0	32 to 3300	±0.1% ±1 digit  For less than 0°C, ±0.2% ±1 digit	Less than 400°C: not specified Less than 800°C: ±0.2%
	R	tc r	0.0 to 1760.0	32 to 3200		Less than 400°C: ±0.2% ± 1 digit
	S	tc s	0.0 to 1760.0	32 to 3200		
	N	tc n	0.0 to 1300.0	32 to 2350		
	K	tc K	-200.0 to 1370.0	-300 to 2450		
	E	tc E	-200.0 to 700.0	-300.0 to 1250.0		
	J	tc J	-200.0 to 900.0	-300.0 to 1650.0		
	T	tc t	-200.0 to 400.0	-300.0 to 700.0		
	U	tc U	-200.0 to 400.0	-300.0 to 700.0		
	L	tc L	-200.0 to 900.0	-300.0 to 1650.0		
	WRe5-WRe26	tc WRe5	0 to 2310	32 to 4190		Less than 400°C: ±0.4% ± 1 digit
	W-WRe26	tc WRe26	0 to 2310	32 to 4190		Less than 400°C: ±0.4% ± 1 digit
PtRh40-PtRh20	tc PtRh	0.0 to 1880.0	32 to 3400	±0.3%	Less than 400°C: ±2%, Less than 800°C: ±1%	
Platinel II	tc Plat II	0.0 to 1390.0	32 to 2500			
RTD	Pt100	Pt	-200.0 to 850.0	-300.0 to 1500.0	±0.1% ±1 digit	
	JPt100	JPt	-200.0 to 649.0	-300.0 to 1200.0		
DC voltage	20mV	20mV	0.00 to 20.00		±0.1% ±1 digit	
	5V	5V	0.000 to 5.000			
	10V	10V	0.000 to 10.000			

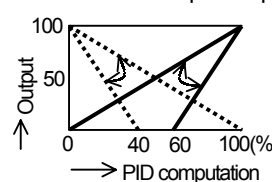
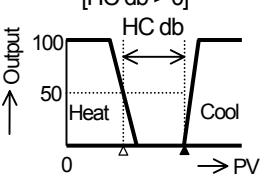
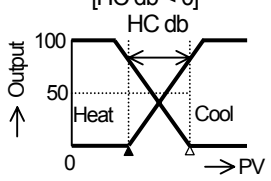
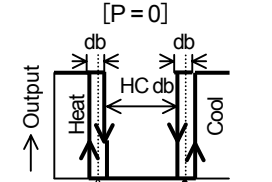
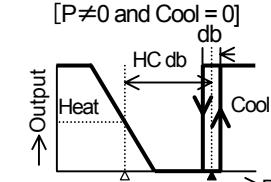
## SV ramp and PV start

1) When turning on the power, ▲	
① PV start: OFF 	② PV start: ON 
2) When switching SV No., ▲ ... Example: SV1 to SV2	
① PV start: OFF 	② PV start: ON 
3) When changing SV, ▲	
① PV start: OFF Before change After change 	② PV start: ON Before change After change 
4) When switching Ready to Run / when switching Man to Auto, ▲	
① PV start: OFF 	② PV start: ON 

H: Rising ramp set value L: Falling ramp set value

\* The SV ramp operation is not backed up for power interruption.




## Heating/Cooling control (Option)

Parameter	Function
Heating/cooling type (HC db)	For selecting of computation types of heating/cooling Split Dir. (Split computation) ... Outputs at heating side and cooling side are the outputs after split computation of PID computed output. Cooling P factor (Cooling proportional computation) ... It is applicable to proportional control type only (2-position type for Cool = 0). Proportional computed output at cooling side is executed.
Split Dir. (Split Dir.)	Effective for split computation (Split Dir.) selected  Solid line: Split Dir. (Heating side output) Dotted line: Split Rev. (Cooling side output)
Split Rev. (Split Rev.)	Effective for cooling proportional computation (Cooling P factor) type selected [HC db > 0]  [HC db < 0]  △: Heating side SV    ▲: Cooling side SV
H·C dead band (HC db)	Cooling side proportional band = Proportional band (P) x Cooling P factor (Cooling P factor) [P = 0]  [P ≠ 0 and Cool = 0]  △: Heating side SV    ▲: Cooling side SV db: PID dead band (common for heating and cooling sides)

# 10. Operation

## 1 Automatic/Manual operation



### 1) Switching of automatic/manual operation

- ① "A/M switching" is in **Operation mode** or **ModE.1**.
- ② For switching, press  or  to select "A/M" or "M/A", and then press  ( **MAN** lights in manual operation)

Note 1. The control output from "Automatic" to "Manual" is balanceless bumpless.




Note 2. For the manual control output, "Variation limiter" is invalid.

### 2) Output adjustment at manual operation

- ① Switch the operation screen to display **PV/OUT**.
- ② By watching OUT display, adjust control output to the value desired by pressing  or . For 2-position control selected, the control output become 0.0% (OFF) or 100.0% (ON).

## 2 Control output

"Run" or "Ready" \* is selectable in control output.

- ① "Run/Ready" is in **Operation mode** or **Mod E.1**.
- ② Press  or  to select "Run" or "Ready", and then press .

\* The output at "Ready" is the value set by "Preset out" in **ModE.5**. (Default value is 0.0%.)

## 3 Operation mode

### 1) Operation screen

PV/Blank ... Measured value (PV) only is displayed.

PV/RUN SV ... Setpoint value (SV) being used is displayed in the lower display. "Ready" is displayed in "Ready".

PV/OUT ... Output value (OUT) is displayed in the lower display. Dot blinks during execution of Auto-tuning (AT).

PV/OUT (BAR) ... Output value (OUT) is displayed by a bargraph in the lower display. Dot blinks during the execution of Auto-tuning (AT).

### 2) SV No. selection, Run/ready switching, A/M switching

The selection of SV1 to SV4 and the switching of functions (Ref. 1 and 2) can be executed.

### 3) Monitor screen

CT current ... The current value of CT is displayed.

Timer remaining time ... The remaining time of timer event is displayed. The elapsed time after event ON is displayed up to -9999 seconds by counting down from the event setpoint.

Cooling out ... The output value at cooling side in heating/cooling control is displayed.

M feedback ... The motor opening degree (for on-off servo type) is displayed in 0 to 100%, and ON/OFF status of relay is displayed, too.

"MFB O" = Open relay – ON

"MFB C" = Close relay – ON




"MFB N" = Relay – OFF

Output status of EV3 and EV4 ... The output status of additional events is displayed.

## 4 Auto-tuning

### 1) Auto-tuning

This function is for automatic tuning of PID constants.


- ① "Auto-tuning" is in **ModE.1**.
- ② Press  or  to select "Auto-tuning", and then press . "Auto-tuning" starts and the display becomes its progressing screens (STEP 1 to 3, End).

## 5 Targeted value filter

### 1) Targeted value filter

This is a learning type function suppressing overshoot. Control is executed by computing an optimum SV from last control result.

### 2) ON/OFF of "Targeted value filter"

"Targeted value filter" is in "ModE.1", and ON (enable) or OFF (disable) is selectable for each SV. Press  by selecting "On" to enable this function.

## 6 PID control

### 1) P (Proportional) action

- ① This is a basic action of PID control. It affects responsiveness and stability. The proportional action only results in offset.
- ② By setting the proportion band wider, the control stability becomes better due to smaller amplitude of cycling and longer cycle time, but the responsiveness becomes worse.

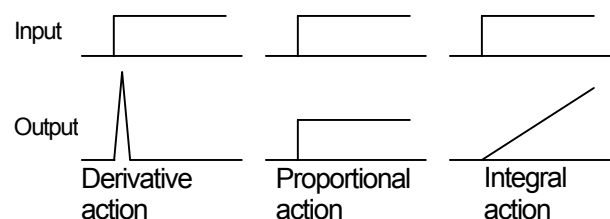
### 2) I (Integral) action

- ① This action can eliminate offset resulted from the proportional action, but the stability becomes worse because phase delays.
- ② By setting the integral time shorter (stronger integral action), the responsiveness becomes better but overshoot becomes larger.

### 3) D (Derivative) action

- ① This action compensates the delay of phase due to dead time or delay factor. However, because the gain increases in high frequency area, its strength has a limit.
- ② By setting the derivative time longer, the response to large deviation becomes faster and the cycle is shortened. However, for deviation with high frequency, the stability becomes worse.

### 4) Relation of input and output of PID action



# 11.Event mode and output

View-point		① Judgment output only with standby ( standby ) set to "OFF" ② Judgment output not related to "ON/OFF" of standby ( standby )	Symbol		Event set value
				db	Event deadband

Event mode	Set value and output	Event mode	Set value and output
Absolute value high limit (PH H)		Absolute value low limit (PH L)	
Deviation high limit (dH H)		Deviation low limit (dH L)	
Absolute value deviation high limit (RdH H)		Absolute value deviation low limit (RdH L)	
Setpoint high limit (SH H)		Setpoint low limit (SH L)	
Output value high limit (oH H)		Output value low limit (oH L)	
Control loop abnormal (LooP)	<p>                     H: Output limiter high limit                      L: Output limiter low limit                      ΔT: Abnormal judgment time (LP)                      ● Loop normal: <math>\Delta P_n &gt;</math> Abnormal judgment band (bd)                      ● Loop abnormal: <math>\Delta P_n &lt;</math> Abnormal judgment band (bd)                      * If the control output (OUT) is within the output limiter, the abnormal judgment is not executed.                 </p>	Fail (FR L)	Output is executed when RJ data abnormal, A/D conversion error and calibration data abnormal.
		Heater disconnection (LT)	
		Timer (t nEr)	<p>*1: Allocate the remote contacts input (DI) to Timer 1 or Timer 2. *2: Timer 1 is for EV1 and Timer 2 is for EV2.</p>

\* The relation of the event judgment output and the relay output at terminals is determined by the setting of the EV output phase.