INST.　　INE-348

LT830 series
Digital Indicating Controller

CHINO

Instruction Manual

Read this instruction manual carefully to use your controller safely and avoid troubles.
If your controller is with optional communications interface, read the separate instruction manual , too.

Checking of Model No.	To agents or distributors	To our valuable customers
Check Model No. of your controller and its specifications.	Make sure to pass this instruction manual to final customers.	Keep this instruction manual until disposing of your controller.

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

L T 83 　　　0000　　　… Size: 48 x 48 (mm)

Control output 1 (heating)
1: On-off pulse type
5: SSR drive pulse type

Control output 2 (cooling) (option)
0: None
1: On-off pulse type
* This option is to be combined with the event output. Specify "1" or "2" at　　.

| 2 points of event output +Communications |
IF(option)+heater disconnection(CT) (option)

0: None
1: 2 points of event output
2: 2 points of event output +
　Communications IF+
　heater disconnection(CT)
* For combination with Control output 2, 1 point of event output is only available.
* For socket type, heater disconnection is nothing.

| Terminal type and water-proof specs. |
(option)

0:Terminal block type +
　Without waterproof
1: Terminal block type +
　With waterproof (option)
2: Socket type +
　Without waterproof (option)
3: Socket type +
　With waterproof (option)
* The waterproof type is equivalent to IP66.

Power supply
A: 100 to 240VAC
D: 24V AC　DC (Option)

As for with a communication interface, we have prepared the handling description of a separate volume for　http://www.chino.co.jp.
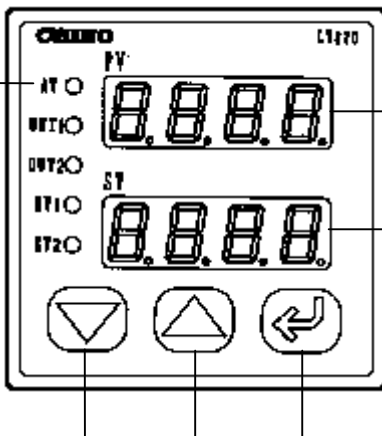
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Front view

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)
Contact protective element (for light loads)
Contact protective element (for heavy loads)

Name		Function	
Upper LED (Green)		■ Display of measured value (PV)	▨ Display of parameter item
Lower LED (Red)		■ Display of control setting value (SV), or blank	
		Display of 5 L P.U (SV rise ramp),or 5 L P.d (SV fall ramp)	
		▨ Display of the contents of a setting	
Status	AT (Green)	■ ▨ Blinks during the auto-tuning is executed.	
	OUT1 (Green)	■ ▨ Lights when the control output 1 (heating) is outputted.	
	OUT2 (Green)	■ ▨ Lights when the control output 2 (cooling) is outputted.	
	EV1(Red)	■ ▨ Lights when event1 is active.	
	EV2(Red)	■ ▨ Lights when event2 is active.	
down key		■ Decreases the setting value (SV).	▨ For down of parameter or stepping of mode
up key		■ Increases the setting value (SV).	▨ For up of parameter or stepping of mode
↵	(Select) key	■ For stepping of parameter item in operation mode	▨ For stepping of parameter item in each mode
	(Enter) key	■ ▨ For storing settings into memory (in setting mode – A dot blinks.)	
	SEL 2 sec.	■ ▨ Switching of operation screen ↔ mode screen, Quick return of setting screens in a mode screen	

■ Operation screen   ▨ Monitor or setting screen

1. Precondition for use

Your controller is designed for installation in indoor panels.

International safety standards	Conformity schedule
· Front panel (option)	equivalent to IP66 under IEC529 Not available in closed installation
· CE	EMC: EN61326+A1+A2 * Safety: EN61010-1 Overvoltage category II, Pollution degree 2

* The displayed value and the output value equivalent to maximum ±10% or ±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.
Note	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 Exception: Panel thickness for the socket type: 1 to 3mm	Installation angle: Within 10° for forward tilting and backward tilting, and within 15° for left and right

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.

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.

For the optional water-proof only, tighten the screw of the fixture.   [Tightening torque]:   0.5 to 0.7 N・m

Panel cutout

Water-proof packing (option)   Mounting hole

(Separate installation)   (Closed installation – See note.)

70

70

45 $^{+0.6}_{0}$

45 $^{+0.6}_{0}$

48 × N − 2.5 $^{+0.6}_{0}$

45 $^{+0.6}_{0}$

N: Quantity

Note)   Optional water-proof is not available in closed installation.

Panel

(Fixture)

Mounting hook

(Installation – up/down)

For optional water-proof only
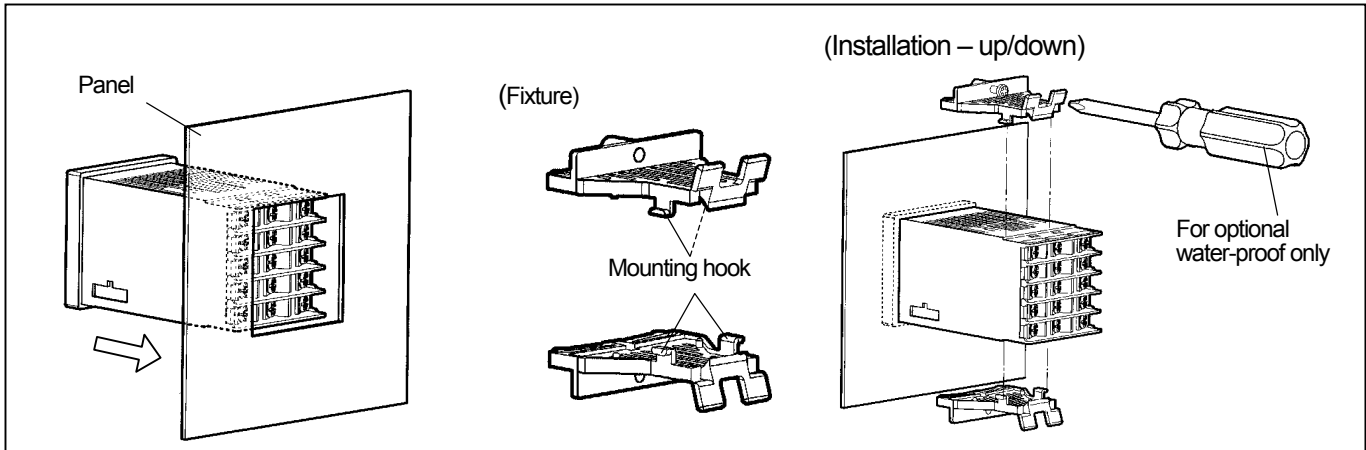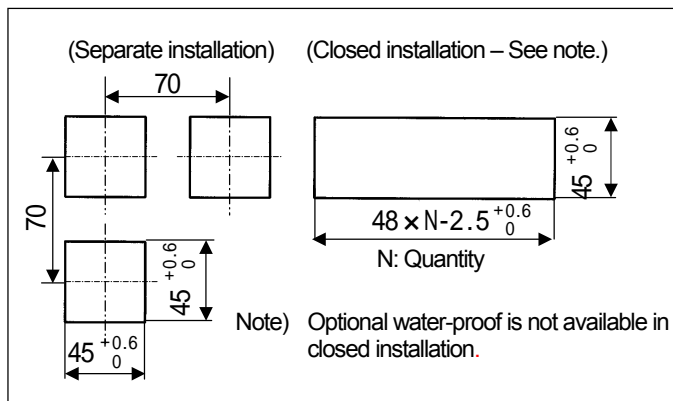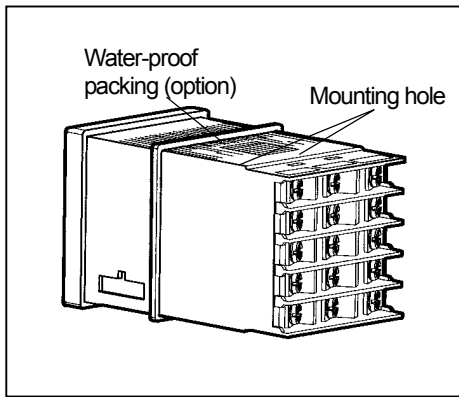
Outside dimensions
(Terminal block type)

48

48

65

44.6 × 44.6

47

7

80

102

(Socket type)

48

48

65

44.6 × 44.6

7

73.6

14.4

95
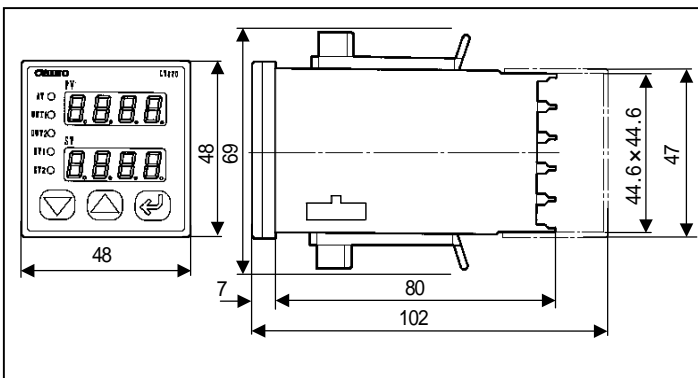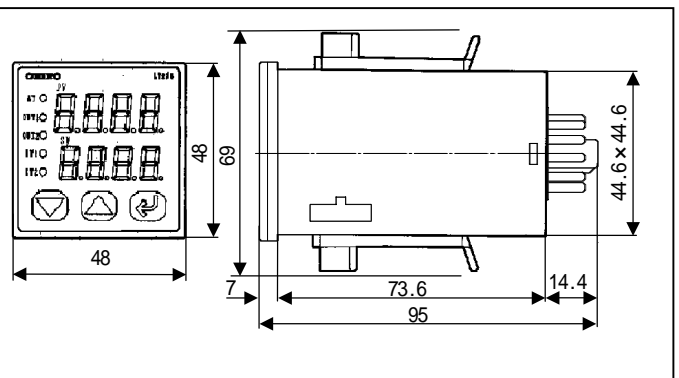
2. Before wirings

⚠ CAUTION	To avoid electrical shock, make sure to turn off the power supply and then work all wirings. 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.
3. This unit has no built-in fuse. Provide a fuse (delay type, rated current: 1A, rated voltage: 250V) for safety.
4. Please supply the power supply from a SELV circuit (power supply secured in safety) to 24V power supply specification.

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)	O type B ⊙	Y type B ↕A	Max. 0.8N m
Other terminals (M3.5)	See "Notes on wirings".	O type (Y type is usable.)	* 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	-5V to +8V DC
Resistance thermometer	±5V DC

2) Thermocouple

Connect a thermocouple (or an extension wire) to input terminals.

Note Do not connect the same thermocouple to other instruments in parallel.

3) Resistance thermometer
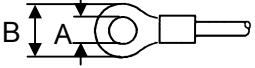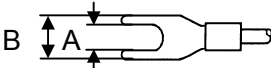
Use a 3-core cord with same resistance per each wire to avoid measurement error.

Note 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) 3A (100 to 240VAC, 30VDC *)
(Inductive load) 1.5A (100 to 240VAC, 30VDC *)
* Minimum load 5VDC 10mA or more
Electrical life of relay 1 hundred thousand times
Buffer relay and contact protection element See 3 Terminal arrangement.
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) Current output
Load resistance 600Ω or less
3) SSR drive pulse output
On/off voltage 12VDC ± 20%/0.8VDC or less
4) Voltage output
Output resistance About 10Ω
Load resistance 50kΩ or more
5) 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.

Contact protection element

Mount a contact protection element for on-off pulse 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)

H (NC)
L (NO)
C (COM)
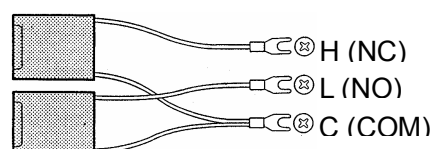
3. Terminal arrangement

(1) Terminal block type

Control output 1 (heating)

	On-off pulse type	SSR drive pulse type
COM		
NO		

Terminal diagram: circles numbered ① ⑥ ⑪ / ② ⑦ ⑫ / ③ ⑧ ⑬ / ④ ⑨ ⑭ / ⑤ ⑩ ⑮

Event output option / Control output option

Event output option		Control output 2 option	
EV1	Buffer relay	EV1	Event1
EV2	Buffer relay	NO	Control Output 2 (Cooling)
COM 12	Power	COM	
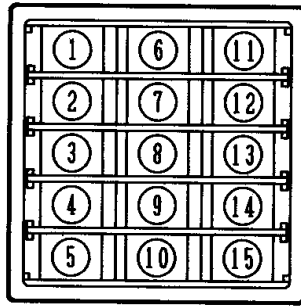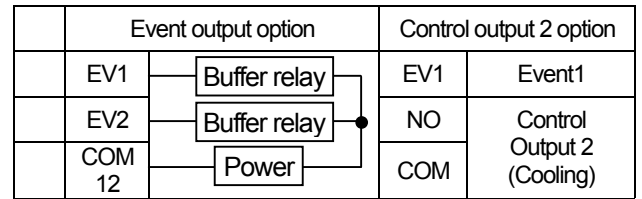
Power supply

	AC	DC
	L (Live)	
	N (Neutral)	

Measuring input

	Voltage (current)	Thermocouple	Resistance thermometer
			A
			B
			B

Communications option

		Interface
⑥	SA	
⑦	SB	RS-485
⑧	SG	

CT option

		input
⑨		CT
⑩		CT

(2) Socket type
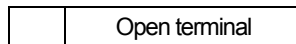
	Open terminal

Control output 1 (heating)

	On-off pulse type	SSR drive pulse type
COM		
NO		

Socket terminal diagram: circles numbered ⑤ ⑥ ⑦ / ④ ⑧ / ③ ⑨ / ② ⑩ / ① ⑪

Event output option / Control output option

	Event output option		Control output 2 option	
⑦	EV1	Buffer relay	EV1	Event1
⑧	EV2	Buffer relay	NO	Control Output 2 (Cooling)
⑨	COM 12	Power	COM	
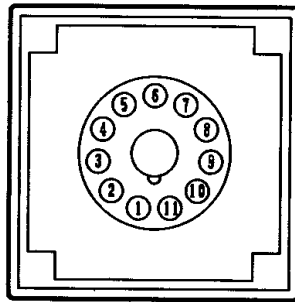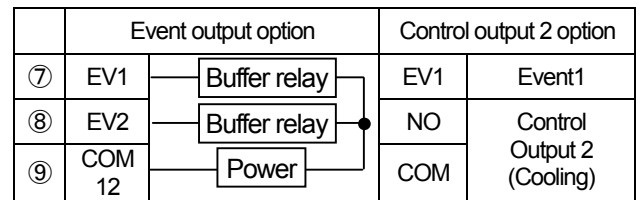
Power supply

	AC	DC
⑩	L (Live)	
	N (Neutral)	

Measuring input

	Voltage (current)	Thermocouple	Resistance thermometer
			A
			B
			B

Note Connect to communication terminals through the connector on the bottom surface.
(Refer to the instruction manual for communications interface.)

Note Make sure not to use unused terminals for relaying.

*Socket for DIN rail mount.
Recommended model: ATC180041
(Matsushita Electric Works)

Buffer relay and contact protection element

Your controller — Buffer relay

NO
Z
COM — P/S — Load
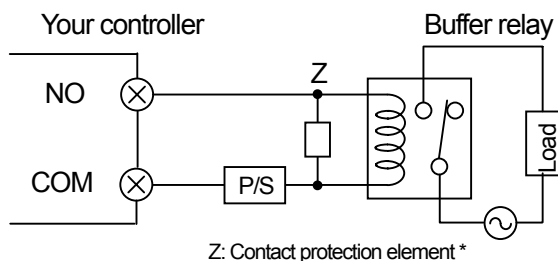
Z: Contact protection element *

* Prepare a CR filter (C: about 0.01µF + R: about 120Ω) for AC power supply.
Prepare a diode for DC power supply.

Basic connection

1. CT input

Heater
CT

2. Event output

Z R Z R
Power
- +
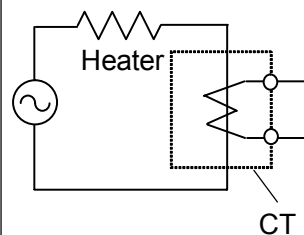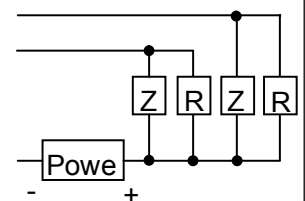
R Buffer relay   Z Contact protection element

4. Troubleshooting/Maintenance

4.1 Troubleshooting

Trouble		Check/Cause/Action
Not operated at all		Is the rated power (100 to 240V AC, 24VAC DC) supplied to the power terminals?
		Is the connection to the power terminals (L, N / +, -) correctly?
		Turn off the power supply and then tern 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 "ｒＥｄＹ". Set it to "ｒＵｎ".
	Late transition	The setting 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	The derivative time may be too short. Set it to be long. 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 setting value of "SV limiter L" or "SV limiter H" may be not correct.
	SV rising or falling	Please check the setting value of "SV rising ramp" or "SV falling ramp". (If it has been set, its ramp operation functions at the selection of SV, the change of SV, etc.)
	Key not accepted	Check if this unit is locked.

4.2 Displays and operation for troubles

Display	Explanation	Operation		Action
		Event output	Control output	
− − − −	Over-range*3	High limit event ON	"PV error output"	Is the "Input type" correct?
_ _ _ _	Under-range	Low limit event ON	"PV error output"	Is the input signal (sensor) normal?
Ｅｒ０１	Zero data abnormal		"PV error output"	Please check whether the inputted signal is over allowable input voltage.
Ｅｒ０２	RJ data abnormal	Fail ON	Control continued *1	Your controller may be in trouble. Turn off the power supply and then turn it on again. If it is still in trouble, contact your agent of CHINO Corporation.
Ｅｒ０３	A/D conversion error		"PV error output"	
Ｅｒ０４	Calibration data abnormal		Control continued *2	

*1: Control continues without reference junction compensation.   *2: Control continues on non-calibration condition.

*3: Burnout is included.

4.3 Control at power recovery

1) Short power interruption

For the short power interruption within 20msec, the normal operation continues.

2) When recovery

The control operation is determined by the selection in "Control at power recovery" of Mode 8. In case of "Ｃｏｎｔ", the control operation before power interruption or power off is continued. In case of "ｒＥｄＹ", the control output becomes to the value of "Control output at Ready".

How to check the type

Press ↵ key more than 2 seconds. and then press △ key to move to Mode 5.

Press ↵ key for two times until "Model confirmation 1" appears. 3-digit figure ("A" mentioned below) is displayed.

Press ↵ key again to appear "Model confirmation 2" or "Model confirmation 3". 3-digit figure of "B" or "C" is displayed.

MODEL LT83＿＿＿ ＿＿＿ ＿＿＿

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)	100,000 times *1
Relay for event (option)	

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

5. Specifications

5.1 Standard specifications

1) Input specifications

Input type: T/C …B, R, S, N, K, E, J, T
RTD … Pt100, JPt100
DC voltage … 0 to 5V

Rated measuring accuracy: ±0.3% ± 1 digit (See the right upper table in Chapter 9 for details.)

RJ compensation accuracy: At ambient 13 to 33ºC … ±1.0ºC
At ambient -10 to 50ºC … ±2.0ºC

Sampling period: Approx. 0.5 second

Burnout: Up scale (T/C, RTD)

Allowable signal source resistance: thermocouple …200Ω or less
DC voltage…1KΩ or less
RTD …10Ω or less (per wire)

Input resistance: DC voltage, thermocouple … 1MΩ or more

Maximum common mode voltage: 30VAC

CMRR (thermocouple): 130dB

SMRR (thermocouple): 50dB

2) Control specifications

Control switching period: About 0.5 second

Control output: Heating output/PID system, To be specified from the following 2 types, Cooling output (option) is only 1 type of .

On-off pulse type …
Contact ratings: See "Cautions on wirings" in Chapter 2.
Pulse cycle: 1 to 180 seconds (1 second increments)
SSR drive pulse type …
Output signal: 12VDC ± 20% (Max 20mA) at ON
0.8VDC or less at OFF
Pulse cycle: 1 to 180 seconds (1 second increments)

3) General specifications

Rated supply voltage: 100 to 240VAC 50/60Hz or 24VAC DC

Allowable power voltage: 90 to 264VAC / 24V AC DC(± 10%)

Power consumption: Maximum about 6VA(100-240VAC),about 4VA(24VAC), about 3W(24VDC)

Operating condition: As shown in the following table.

Item	Reference operating condition	Normal operating condition
Ambient temperature	23 ± 2ºC	-10 to 50ºC *1
Ambient humidity	55 ± 5%RH *2	20 to 90%RH *2
Power voltage	100VAC ± 1% 24V AC DC	90 to 264VAC 24V AC DC± 10%
Power frequency	50/60Hz ± 1%	50/60Hz ± 2%
Mounting angle	Up/down …±3º	Up/down …±10º
Installation altitude	Less than 2000m	Less than 2000m
Vibration, Impact	0m/s², 0m/s²	2.0m/s², 0m/s²

*1: Less than 40ºC 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 100-240VAC power supply, on--off pulse type control output and event relay output
*4: Terminals for 24V AC DC power supply, measurement input, communication interface, CT input and SSR drive pulse type control output .

Front and case: Front…Non-flammable ABS
Case…Non-flammable polycarbonate resin

Weight:: The maximum abbreviation 160g

4) Event specification

Event calculation: 2point

Output point: 0 Relay output, 2 points (option)

Event type: Absolute value , deviation , absolute value deviation , output value (High limit/low limit and standby enable/disable is selectable in these events.), FAIL, heater disconnection(option)

5) Transportation and storage* condition

Ambient temperature: -20 to 60ºC

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

Vibration: 0 to 4.9m/s² (10 to 60Hz)

Impact: 400m/s² or less

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

5.2 Options

1) Communications interface / Remote contacts input

Communications type: RS-485

Protocol: MODBUS (RTU mode/ASCII mode selectable.)

Function: Settings/data transmission, digital transmission or digital remote, to be specified

Transmission speed: 9600/19200 bps

2) Heater disconnection (CT)

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

Measuring accuracy: ±5%FS ± 1 digit

Recommended CT: Model CTL-6-S-H

3) Event output

Output point: Relay output, 2 points

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

4) Water-proof … Not available in closed installation

Front panel protection: NEMA 250 4X equivalent to IEC 529 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 PV/SV	⇄	mod.1 Ctrl Cont. comp	⇄	mod.2 EVnt Event output	⇄	mod.3 oUt Control output	⇄	mod.4 inPt input	⇄	mod.5 tYPE type	⇄	mod.6 Com comm. *	⇄	mod.7 H-C Heat/cool *	⇄	mod.8 EnG Engineering

r-rd Run/Ready	Ctrl Control type	E1.md EV1 mode	o.mod Control action	inPt Input type	LoCK Lock function	PtCL Protocol *	HC.tY H/C type *	Ar.Y.L ARW-L

	At Auto-tuning *	EV1 EV1. set *	PULS Pulse cycle *	Unit Eng. unit *	mdL1 Model conf.1	FUnC Com. function *	HC.db H/C dead band *	Ar.Y.H ARW-H

	P id.P P *	E1.db EV1 dead band *	P.Er.o PV error output	rnG.L Range L	mdL2 Model conf.2	AdrS Inst. No. *	CooL cooling P factor *	SV.L.L SV limiter L

	P id.i I *	E1.nr EV1 Output phase *	r.oUt Control output at Ready	rnG.H Range H	mdL3 Model conf.3	rAtE Trans. speed *	SPL.d Split direct *	SV.L.H SV limiter H

	P id.d D *	E2.md EV2 mode		SV.dP SV Decimal point *	CHAr Character *	SPL.r Split reverse *	o.PrS Output preset

	db Dead band	EV2 EV2. set *		SCL.L Scale L *	rmLC Remote Local *	C.PUL C. pulse cycle *	oL-L Output limiter L

	S.FLt Target V. filter	E2.db EV2 dead band *		SCL.H Scale H *	d.trS Digital transmission *		oL-H Output limiter H

		E2.nr EV2 Output phase *		P.b.iA Sensor correction	r.b.iA Remote shift *		oSL Variation limiter

		E.rdY Event output at Ready		P.FLt Digital filter			SLP.U SV rise ramp

		Ct CT current *					SLP.d SV fall ramp

							P.USt PV start

| | | | | | | | PV.on
Power Recovery action |

| | | | | | | | SCrn
SV display |

| | | | | | | | °Cdb
°C decimal point |

Displays without condition

.... Displays under condition

Lock function	Operation mode	Setting mode (except mod.5)	Engineering mode
Level 0	Display/change enabled	Display/change enabled	Display/change enabled
Level 1 (Default)	Display/change enabled	Display/change enabled	Display disabled
Level 2	Display/change enabled	Display disabled	Display disabled
Level 3	Display enabled/ change disabled	Display enabled/ change disabled	Display enabled/ change disabled

(For the remote setting, SV can not be changed.)

A lock function can be changed by Mod.5 "LoCK".

display conditions (*1-*8)

* Control type [PID] selected
* EV1 mode is except [non]
* EV2 mode is except [non]
* With option [CT]
* Input type ---T/C or RTD selected
* Input type --- [5V(20mA)] selected
* With option [Communications IF]
* With [Control output 2]

| Operation MODE PV/SV | → ← | mod.1 Ctrl Cont. comp | → ← | mod.2 EUnt Event output | → ← | mod.3 oUt Control output | → ← | mod.4 inPt input | → ← | mod.5 tYPE type | → ← | mod.6 Coñ comm. | → ← | mod.7 H-C Heat/cool | → ← | mod.8 EnG Engineering |

Operation mode ◀ Setting mode (except mod5) ▶ Engineering mode
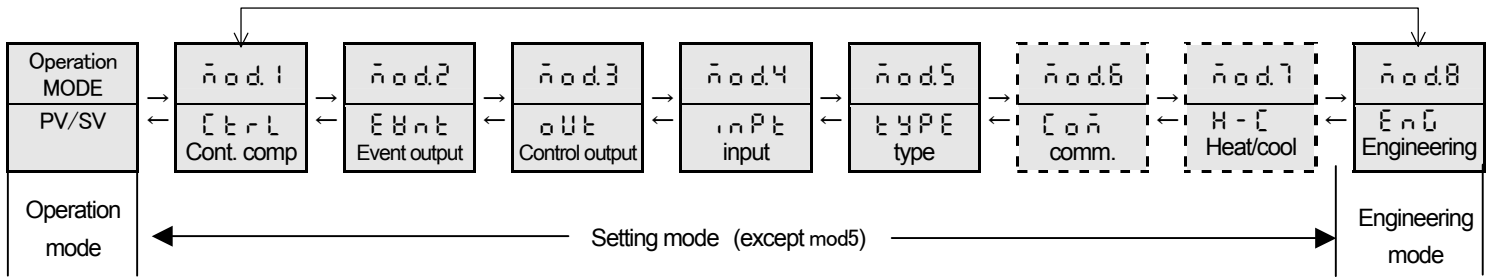
By pressing ⏎ key for 2 seconds, the operation mode is change to the setting mode. For returning to the operation mode, again, press ⏎ key 2 seconds.

The example of operation

Ope. 1 The setting method of a measuring input.

P V
0

Press ⏎ key for 2 seconds
to move to Mode 1.

mod.1
Ctrl

Press △ key 3 times
to move to Mode 4.

mod.4
inPt

Press ⏎ key once.
The input setting screen appears.

inPt
 h I

Press △ ▽ key.
Select an input kind.

inPt
HoLt —Dots blink

Press ⏎ key.
The blinking of dots disappears and the setting contents are stored into the memory.

inPt
HoLt

Input type		Display	Input range [ ]	
T/C	B	b	0	1820
	R	r	0	1760
	S	5	0	1760
	N	n	0	1300
	K1	h I	-200	1370
	K2	h 2	-199.9	500.0
	E	E	-199.9	700.0
	J	J	-199.9	900.0
	T	t	-199.9	400.0
DC voltage	5V	HoLt	0.000	5.000
RTD	Pt1	Pt I	-199.9	850.0
	Pt2	Pt 2	-199.9	200.0

Ope. 2 PID constants setting by AT (auto-tuning)

"Ctrl" in Mod.1 should be "Pid".

1. The start method of AT

P V
250

Press ⏎ key for 2 seconds
to move to Mode 1.

mod.1
Ctrl

Press ⏎ key once
to move to AT start screen.

At
End

Press △ key once.
" End" is changed to "Strt." with dots blinked.

At
Strt —Dots blink

Press ⏎ key.
The blinking of dots disappears, the AT starts, and a step number is displayed.

At
StP. I

The step number is the display for the progress of the auto-tuning. After Step 4 is displayed, automatic PID constants selection is completed when PV crosses SV

StP.2

StP.3

StP.4

At
End

Canceling of AT

At
StP.2

Press △ key once.
The step number display becomes End and dots blink.

At
End —Dots blink.

At
End

7. List of parameters

Mode	Parameter		Symbol	Setting range		Default
	Control type		Ctrl	Pid/onoF		Pid
	Auto-tuning		At	End/Strt		End
	P		P idP	0.1 999.9%		3.0%
	I		P id i	0 9999sec.		120sec
	D		P idd	0 9999sec.		20sec
	dead band	On/off	db	0.1 9.9%		0.5%
		PID		0.0 9.9%		0.1%
	Target value filter		SFLt	on/oFF		oFF
	EV1 mode		E1 nd	non/AH/AHW/AL/ALW/dH/dHW/dL/dLW/dHL/dHLW/CT		non
	EV1 setting *4		EV1	AH/AHW/dH/dHW	-1999 9999 *3	4000
				AL/ALW/dL/dLW		-1999
				dHL/dHLW:0 9999 *3		4000
				Ct:0.0 50.0		0.0
	EV1 dead band *4		E1db	AH/AHW/AL/ALW/dH/dHW/dL/dLW/dHL/dHLW :0.0 999.9 *3		2.0
				CT:0.00 99.99		0.20
	EV1 output phase		E1nr	nomL/rEV		noML
	EV2 mode		E2nd	non/AH/AHW/AL/ALW/dH/dHW/dL/dLW/dHL/dHLW/CT		non
	EV2 setting *4		EV2	AH/AHW/dH/dHW	-1999 9999 *3	4000
				AL/ALW/dL/dLW		-1999
				dHL/dHLW:0 9999 *3		4000
				Ct:0.0 50.0		0.0
	EV1 dead band *4		E1db	AH/AHW/AL/ALW/dH/dHW/dL/dLW/dHL/dHLW:0.0 999.9 *3		2.0
				CT:0.00 99.99		0.20
	EV2 output phase		E2nr	noML/rEV		noML
	Event output at Ready		ErdY	CALC/oFF		CALC
	CT current		Ct	0.0 50.0A		
	Control action		onod	rEV/dir		rEV
	Pulse cycle		PULS	1 180sec.		10sec
	PV error output		PEro	-5.0 105.0%		0.0%
	Control output at Ready		roUt	-5.0 105.0%		0.0%
	Input type		inPt	K1/K2/E/J/t/VoLt/Pt1/Pt2/b/r/S/n		K1
	Engineering unit		Unit			
	Range L *3		rnGL	K1:-200 1370 / K2:-199.9 500.0 / E:-199.9 700.0 / J:-199.9 900.0 / t:-199.9 400.0 / VoLt:0.000 5.000 / Pt1:-199.9 850.0		-200 *6
	Range H *3		rnGH	Pt2:-199.9 200.0 / b:0 1820 / r:0 1760 / S:0 1760 / n:0 1300 / however ,L<H		1370 *6

Mode	Parameter	Symbol	Setting range	Default
	Decimal point*5	SdP	0 3	1
	Scale L *3	SCLL	-199.9 999.9	0.0
	Scale H *3	SCLH		100.0
	Sensor correction*3	Pb iA	-199.9 999.9	0.0
	Digital filter	PFLt	0.0 99.9sec.	0.1sec
	Lock function	LoCh	0 3	1
	Model conf. 1	ndL1	Lt83■■□□□-□□□	Model No. at shipment
	Model conf. 2	ndL2	Lt83□□□■■-□□□	
	Model conf. 3	ndL3	Lt83□□□□□-■■■	
*1	Protocol	PtCL	rtU/ASCi	rtU
	Communications function	FUnC	CoM/trS.2	CoM
	Instrument No.	Adr5	1 99	1
	Transmission speed	rAtE	9600/19.2K	9600
	Character	CHAr	8n1/8n2/8E1/8E2/8o1/8o2/7E1/7E2/7o1/7o2	8n1
	Remote Local	rnLC	LoCL/rEMt	LoCL
	Digital transmission	dtrS	PV/SV	PV
	Remote shift *3	rb iA	-199.9 999.9	0.0
*2	Heat/Cool type	HCtY	CoL.P/SPLt	CoL.P
	H/C dead band	HCdb	-50.0 50.0	0.0
	Cooling P factor	CooL	0.00 10.00	1.00
	Split direct	SPLd	0.0 60.0%	50.0%
	Split reverse	SPLr	40.0 100.0%	50.0%
	C. pulse cycle	CPUL	1 180sec.	10sec.
	ARW-L	ArYL	-100.0 0.0%	-50.0%
	ARW-H	ArYH	0.0 100.0%	50.0%
	SV limiter L *3	SVLL	L < H (within scale L, H)	Scale L
	SV limiter H *3	SVLH		Scale H
	Output preset	oPrS	-100.0 100.0%	50.0%
	Output limiter L	oL-L	-5.0 100.0% (H>L)	0.0%
	Output limiter H	oL-H	0.0 105.0%	100.0%
	Variation limiter	oSL	0.1 100.0%	100.0%
	SV rise ramp *3	SLPU	0 9999/min	0 /min
	SV fall ramp *3	SLPd	0 = No ramp	0 /min
	PV start	PVSt	oFF/on	oFF
	Power recovery action	PVon	Cont/rEdy	Cont
	SV display	SCrn	SV/bLnK	SV
	decimal point	PCdP	on/oFF	on

■The display mode is changed depending on the lock setting. Refer to [6. parameter directory].

*1: Refer to the separate instruction manual for communications interface.

*2: For the details, read [■ Heating/cooling control in "9. Setting of parameters"].

*3: The decimal point position changes by the setting of input type and linear decimal point.

*4: The dead band is initialized by resetting of EV mode.

*5: For thermocouple or resistance input, the linear decimal point can not be changed. (display only)

*6: The range changes by the setting of input type.

8. Description of parameters

This chapter describes parameters requiring explanation.

Parameter	Function
Run/ready	For selection of control output. rUn　Normal control output(Default) rEdY　Control output value is control output at Ready (Fixed value,Default:0.0%). "AT" cannot be executed. rEdY is displayed instead of "SV".
control system	For selection of control system. Pid　PID control onoF　ON/OFF control(2-position control)
dead band	Pid: In this dead band, the response of the control output becomes dull due to non-linearized deviation. onoF: Dead band of 2-position control
EV dead band	The gap from the event activation to reset.
EV output phase	nonL…Event activation: Relay on, 　　　Event reset: Relay off rEu… Event activation: Relay off, 　　　Event reset: Relay on
Event output at Ready	CALC..The event judgment continues even at Ready. oFF… The event judgment becomes off at Ready
CT current	CT current value is displayed.
Control action	Reverse action / Direct action 100% Output SV Low PV High / 100% Output SV Low PV High
Pulse cycle	When a control system is PID, the control 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. For example, in the case of 50% of outputs. ON — 15 sec OFF — 15 sec Pulse cycle 30 sec. (1 cycle)
PV error output	This control output is for abnormal measured value(PV)*. *Over-range ,under-range and Er01,Er03.
Control output at Ready	It is a control output (MV) at Ready.
Engineering unit	For selection of engineering unit for converting into temperature when thermocouple or resistance thermometer is selected as the input type.
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.
decimal point	The setting value (SV) is a figure up to 4 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.

Parameter	Function
Scale	The parameter is for the input types of DC voltage. 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. Variation of measured value A 0.63A — Delay of PV by filter T — Setting range of T(0.0 to 99.9 sec.)
Cooling pulse cycle	Applicable to control output 2 (cooling) This parameter is for the setting of 1-cycle time of on and off of the output.
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.)
SV limiter	For limiting the setting range of SV
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.
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 0.5 sec.). Its variation is limited within the setting value.
SV rise ramp SV fall ramp	A SV value and SLP.U (SLP.d) are displayed at the interval of 1 second in the lower LED
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"rEdY" to"rUn"
Power recovery action	For control action when the power is turned on from off (or from power failure to recovery). Cont… Continues previous control conditions. rEdY… Becomes the "Control output at Ready".
SV display	This selective screen appears when the power is turned on or the screen returns to the operation screen from the setting screen. The lower LED displays either SV or with blank.
decimal point	No decimal place indication is available for the input ranges which have temperature reading after decimal point in celsius scale. (Caution) Require reprogamming of each parameters after changing.

9. Setting of parameters

9.1 LED display of alphabetical characters

A	b	C	d	E	F	G	H	i	J	R	L	m	n	o	P	q	r	S	t	U	B	Y	y	I

■ Selection of parameter items

Parameter items in operation mode	…	Press ⏎ repeatedly to display the parameter item you want to set.

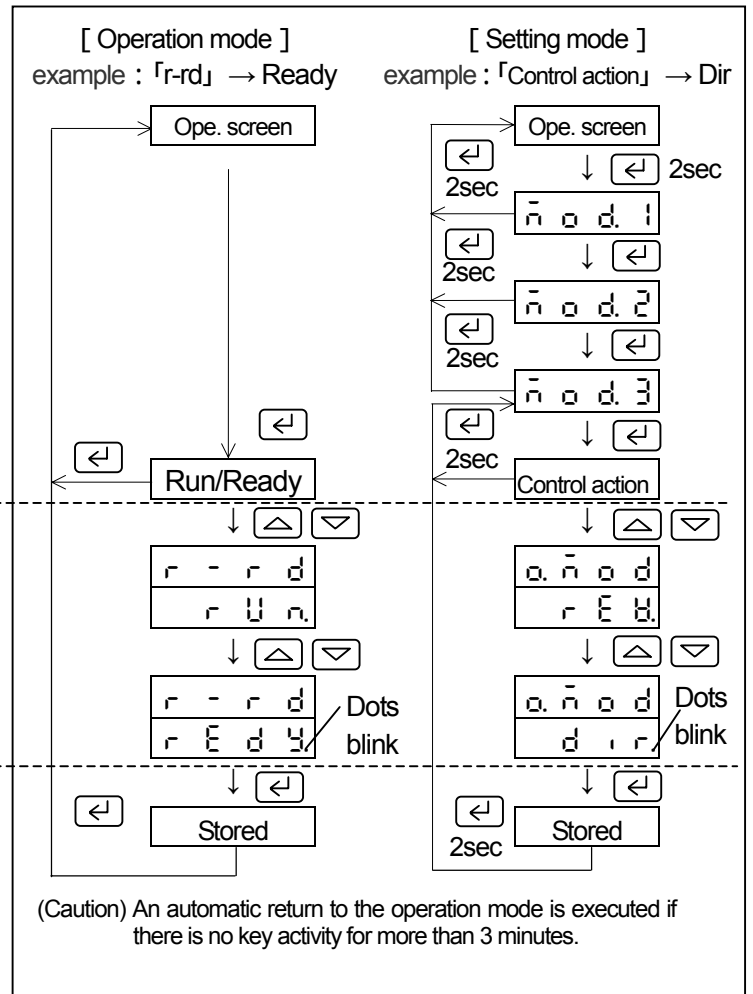| Parameter items in setting mode	…	1) Press ⏎ more than 2 sec. to shift to the setting mode. Press △ or ▽ to select Mode number. 2) Press ⏎ repeatedly to display the parameter item you want to set.

■ Settings (selection)

By pressing △ or ▽, a numerical figure or a sub-parameter item is changed, and a dot blinks.

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

Sub-item selection … Press △ or ▽ to select.

■ Storage

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

Operation mode
example   r-rd → Ready

Setting mode
example   Control action → Dir

Ope. screen → Run/Ready → r - r d / r U n. → r - r d / r E d Y (Dots blink) → Stored

Ope. screen → ⏎ 2sec → m o d. 1 → ⏎ 2sec → m o d. 2 → ⏎ 2sec → m o d. 3 → ⏎ 2sec → Control action → o. m o d / r E 8. → o. m o d / d i r (Dots blink) → Stored (2sec)

(Caution) An automatic return to the operation mode is executed if there is no key activity for more than 3 minutes.

Ref.1 > Change of executed SV

It is an operation procedure from a screen at the time of a power supply injection.
It is made the operation screen of PV/SV.

Press △ ▽ key. Select a value kind.

Press ⏎ key.

The blinking of dots disappears and the setting contents are stored into the memory.

P V
0
↓
P V
2 5 0. — Dots blink
↓
P V
2 5 0

*When the control operation is Ready, "r E d Y" is displayed in the SV display, but, by pressing △, ▽ keys, the display is changed to the SV display and the setting of the SV value is enabled.

Ref.2 > Lock function

In the operation mode, you can select screens, in which the settings are disabled to change.
See the 6 PARAMETER DIRECTORY
A setting change is made in Mod.5 "L o C R".

Ref.3 > Initialization

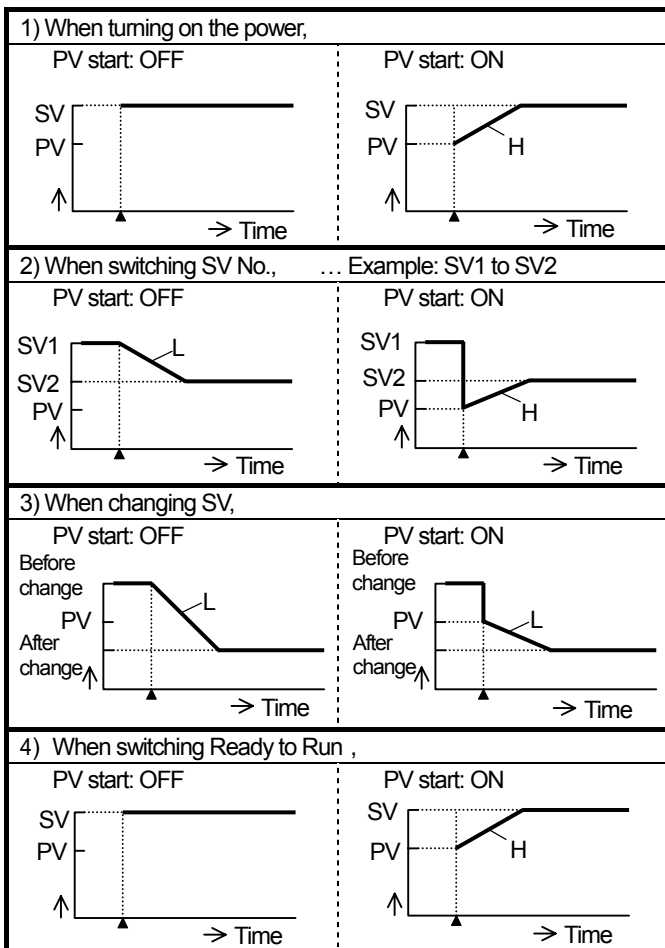All parameters are initialized by the following procedure.
While pressing ▽ and ⏎ simultaneously, turn on the power.
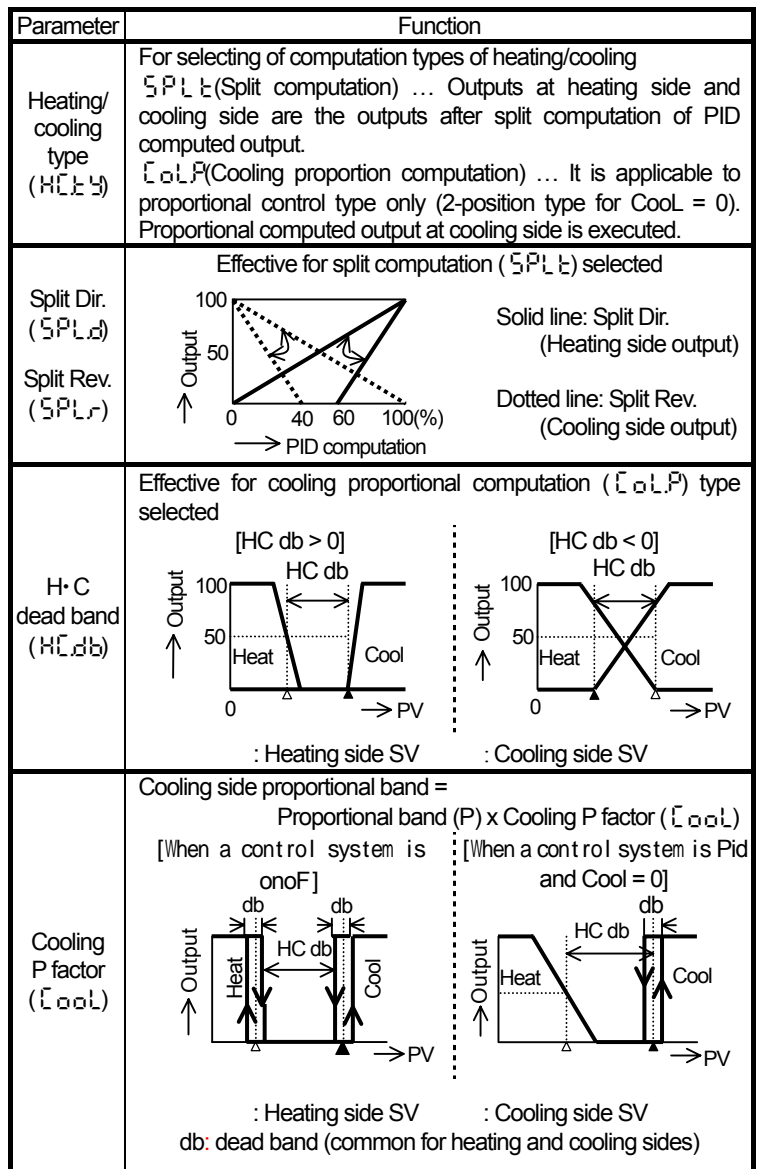Don't turn off the power during initialization.

List of input types

Input type		Display	Input type	Accuracy ratings	Detailed specification
			°C		
T/C	B	b	0 to1820	±0.3% ±1 digit For more than -200 , less than 0ºC, ± 0.5% ± 1 digit	Less than 400ºC: not specified Less than 800ºC: ±1.0%± 1digit
	R	r	0 to 1760		
	S	5	0 to 1760		
	N	n	0 to 1300		
	K1	h 1	-200 to 1370		
	K2	h 2	-199.9 to 500.0		
	E	E	-199.9 to 700.0		
	J	J	-199.9 to 900.0		
	T	t	-199.9 to 400.0		
RTD	Pt1	P t 1	-199.9 to 850.0	±0.3% ±1 digit	
	Pt2	P t 2	-199.9 to 200.0		
DC voltage	5V	Uolt	0.000 to 5.000		

SV ramp and PV start

1) When turning on the power,

PV start: OFF | PV start: ON

2) When switching SV No., … Example: SV1 to SV2

PV start: OFF | PV start: ON

3) When changing SV,

PV start: OFF | PV start: ON

4) When switching Ready to Run ,

PV start: OFF | 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 (HCty)	For selecting of computation types of heating/cooling SPLt(Split computation) … Outputs at heating side and cooling side are the outputs after split computation of PID computed output. CoLP(Cooling proportion 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. (SPLd) Split Rev. (SPLr)	Effective for split computation (SPLt) selected Solid line: Split Dir. (Heating side output) Dotted line: Split Rev. (Cooling side output)
H C dead band (HCdb)	Effective for cooling proportional computation (CoLP) type selected : Heating side SV : Cooling side SV
Cooling P factor (CooL)	Cooling side proportional band = Proportional band (P) x Cooling P factor (CooL) [When a control system is onoF] [When a control system is Pid and Cool = 0] : Heating side SV : Cooling side SV db: dead band (common for heating and cooling sides)

10. Operation

■ Control output

"Run" or "Ready" * is selectable in control output.
"Run/Ready" is in Operation mode.
Press △ or ▽ to select "⎓⎓⎓" or "⎓⎓⎓", and
then press ⏎ .
*The output at "Ready" is the value set by "control output at Ready" in Mod.3. (Default value is 0.0%.)

■ Operation mode

The displays of the following operation modes can be selected in the [SV display] setting in Mod 8.

Choice screen	SV display	
	SV (Initial value)	bLnK
Ope. mode — PV/blank	×	
Ope. mode — PV/SV		
Ope. mode — Run/Ready		

Operation screen

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

PV/ SV …Setting value (SV) being used is displayed in the lower display. "⎓⎓⎓" is displayed in "Ready".

At SV value increased ramp…

A SV value and ⎓⎓⎓⎓ are displayed at the interval of 1 second in the lower LED.

At SV value decreased ramp…

A SV value and ⎓⎓⎓⎓ are displayed at the interval of 1 second in the lower LED.

■ Targeted value filter

1) Targeted value filter

This is a function suppressing overshoot. Control is executed by computing an optimum SV.

2) ON/OFF of "Targeted value filter"

"Targeted value filter" is in Mod.1, and ON (enable) or OFF (disable) is selectable . Press ⏎ by selecting "⎓⎓" to enable this function.

■ PID control

1) P (Proportional) action

This is a basic action of PID control. It affects responsiveness and stability. The proportional action only results in offset.

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

This action can eliminate offset resulted from the proportional action, but the stability becomes worse because phase delays.

By setting the integral time shorter (stronger integral action), the responsiveness becomes better but overshoot becomes larger.

3) D (Derivative) action

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.

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

	Input		
	Output		
	Proportional action	Integral action	Derivative action
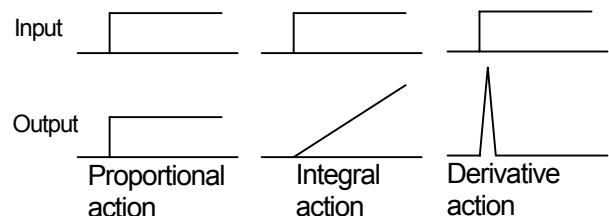
11.Event mode and output

View-point	▬	Judgment output	Symbol	►	Event set value
				db	Event deadband

Event mode Display	Set value and output	Event mode Display	Set value and output
Absolute value high limit No standby 月 H		Absolute value high limit with standby 月 H Ꮞ	
Absolute value low limit No standby 月 L		Absolute value low limit with standby 月 L Ꮞ	
Deviation high limit No standby d H		Deviation high limit with standby d H Ꮞ	
Deviation low limit No standby d L		Deviation low limit with standby d L Ꮞ	
Deviation high/low limits No standby d H L		Deviation high/low limits with standby d H L Ꮞ]	
Heater disconnection [ヒ		No event n o n	An output occurs only at the time of FAIL (when the LED display of the upper row is the following). E r 0 (2 4)

* 1 The judgment is not executed when relay ON time shorter than 300msec.
*2 "0" is set, no judgment is executed.

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