FUJI ELECTRIC

Instruction Manual

Micro-controller X
Model : PXR3

INP-TN1PXR3c-E

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Thank you for your purchasing "Fuji Digital Temperature Controller". Please check that the product is exactly the one you ordered and use it according to the following instructions. (Please refer to a separate operation manual for details.) Dealers are cordially requested to ensure the delivery of this Instruction Manual to hands of the end-users.

NOTICE

The contents of this document may be changed in the future without prior notice.

We paid the utmost care for the accuracy of the contents. However, we are not liable for direct and indirect damages resulting from incorrect descriptions, omission of information, and use of information in this document.

CONTENTS

Check of specifications and accessories

Before using the controller, check if the type and specifications are as ordered.
(A table of Model code configuration is given in Page 33).

Check that all of the following accessories are included in the package box.

- Temperature controller ---------- 1 unit
- Instruction manual ---------- 1 copy
- Mounting bracket ---------- 1 pce.
- Watertight packing ---------- 1 pce.
- I/V unit (250Ω resistor) ---------- 1 pce. (4-20mA DC input type only)

The related documents

Contents	Name	No.
Specifications	Catalogue	ECNO:1138
Operation method	MICRO-CONTROLLER X (Model:PXR3) OPERATION MANUAL	ECNO:409
Communication functions	COMMUNICATION FUNCTIONS (MODBUS) INSTRUCTION MANUAL	INP-TN512642-E
	COMMUNICATION FUNCTIONS (Z-ASCII) INSTRUCTION MANUAL	INP-TN512644-E

Safety Precautions

Before using this product, the user is requested to read the following precautions carefully to ensure the safety. Safety precautions must be taken by every user to prevent accidents.
The safety requirements are classified into "warning" and "caution" according to the following interpretations :

Warning	Suggesting that the user's mishandling can result in personal death or serious injury.
Caution	Suggesting that the user's mishandling can result in personal injury or damage to the property.

⚠WARNING Over-temperature Protection

“Any control system design should take into account that any part of the system has the potential to fail”.
“For temperature control systems, continued heating should be considered the most dangerous condition, and the machine should be designed to automatically stop heating if unregulated due to the failure of the control unit or for any other reason”.
The following are the most likely causes of unwanted continued heating:
1) Controller failure with heating output constantly on
2) Disengagement of the temperature sensor from the system
3) A short circuit in the thermocouple wiring
4) A valve or switch contact point outside the system is locked to keep the heat switched on.
In any application where physical injury or destruction of equipment might occur, we recommend the installation of independent safety equipment, with a separate temperature sensor, to disable the heating circuit in case of overheating.
The controller alarm signal is not designed to function as a protective measure in case of controller failure.

1. ⚠ Warning

1.1 Installation and wiring

- This controller designed to be installed at the following conditions.

Operating temperature	-10 to +50 [°C]	
Operating humidity	90%RH or less (Non condensation)	
Installation category	II	Conforming to IEC1010-1
Pollution degree	2	

- The controller must be installed such that with the exception of the connection to the mains, creepage and clearance distances shown in the table below are maintained between the temperature probe and any other assemblies which use or generate a voltage shown in the table below.
  Failure to maintain these minimum distances would invalidate the EN 61010 safety approval.

Voltage used or generated by any assemblies	Clearance (mm)	Creepage (mm)
Up to 50Vrms or Vdc	0.2	1.2
Up to 100Vrms or Vdc	0.2	1.4
Up to 150Vrms or Vdc	0.5	1.6
Up to 300Vrms or Vdc	1.5	3.0
Above 300Vrms or Vdc	Contact with our sales office.	

- If the voltage shown above exceeds 50Vdc (i.e. hazardous voltage), the basic insulation is required between all terminals of this controller and the ground, and supplementary insulation is required for the alarm output.
  Isolation class of this controller is as shown below. Be sure to check that the isolation class of the controller satisfies your requirements before installation.

——— : Basic insulation, - - - - - - : Non-insulation, ——— : Functional insulation

Mains (Power source)	Measured value input
	Internal circuit
Control output1 (relay output)	Control output1 (SSR drive output / Current output)
Control output2 (relay output)	Control output2 (SSR drive output / Current output)
	Retransmission
Alarm output (ALM1)	Digital input (with Retransmission)
	Communication (RS485) circuit
Alarm output (ALM2)	Digital input (DI1, DI2) (without Retransmission)

- If there is a danger of a serious accident resulting from a failure or a defect in this unit, provide the unit with an appropriate external protective circuit to prevent an accident.
- The unit is supplied without a power switch and fuses.
  Make wiring so that the fuse is placed between the main power supply switch and this controller.
  (Main power supply: 2 pole breaker, fuse rating: 250V, 1A)
- When wiring the power supply terminal, use vinyl insulated 600 volt cable or equivalent.
- To avoid the damage and failure of controller, supply the power voltage fitting to the rating.
- To avoid an electric shock and controller failure, do not turn ON the power before all wiring is completed.
- Be sure to check that the distance is kept to avoid electric shock or firing before turning the power ON.
- Keep away from terminals while the circuit is energized in order to avoid an electric shock and a malfunction.
- Never attempt to disassemble, fabricate, modify, or repair this unit because tampering with the unit may result in a malfunction, electric shock, or a fire.

1.2 Maintenance precautions

- Be sure to turn off the power before this controller is installed or removed in order to avoid an electric shock, malfunction, and fault.
- Regular maintenance is recommended a longer service life of this controller.
  Some parts of this controller have a limited life span, or they will be deteriorated with the lapse of time.
- One-year warranty is guaranteed for this unit including accessories, provided hat the controller is properly used.

2. ⚠ Warning

2.1 Cautions on installation

Avoid the following places for installation.

- A place where the ambient temperature may reach beyond the range of from 0 to 5°C while in operation.
- A place where the ambient humidity may reach beyond the range of from 45 to 85% RH while in operation.
- A place where a change in the ambient temperature is so rapid as to cause condensation.
- A place where corrosive gases (sulfide gas and ammonia gas, in particular) or combustible gases are emitted.
- A place where the unit is subject directly to vibration or shock.
  (vibration or shock may cause wrong action of the output relay.)
- A place exposed to water oil, chemicals,steam and vapor.
  (if immersed with water, take the inspection by sales office to avoid an electrical leakage and firing)
- A place where the unit is exposed to dust, salty air, or air containing iron particles.
- A place where the unit is subject to interference with static electricity, magnetism, and noise.
- A place where the unit is exposed to direct sunshine.
- A place where the heat may be accumulated due to the radiation of heat.

2.2 Caution on installation on panel

- Insert the mounting bracket (accessory) from the rear side until the main unit is securely fit into the panel. If there should be a play, tighten two screws lightly until the play is eliminated. (Do not tighten the screws excessively be cause the mounting bracket can be removed from the stopper by the force.)
- The front side of this controller conforms to NEMA 4X(equivalent with IP66).
  To ensure the waterproofness between the instrument and the panel, use packings that are provided as accessories in the following manner: (The improper fitting of packings will ruin the waterproofness.)
  ① As shown in Figure 1, fit a packing to the case of the unit and then insert it in the panel.
  ② Tighten screws on the fixing frame or fixtures so that no gaps are given between the front of controller and packing and between panels. Check that there are no deviation and deformation of packing as shown in Fig.3.
- If panel strength is weak, it may cause a gap between the packing and the panel, thus impairing water resistance.

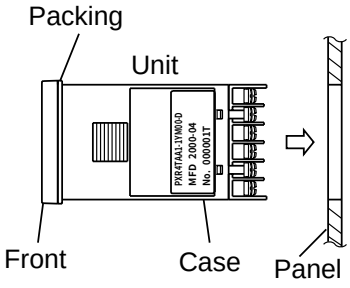


Figure 1

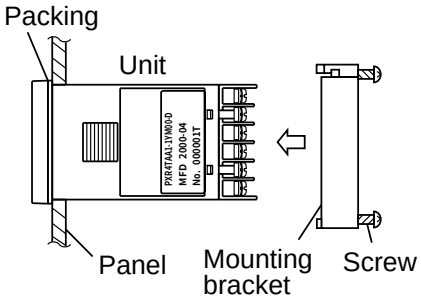


Figure 2

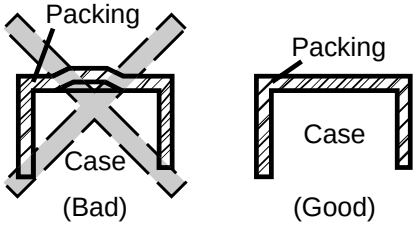
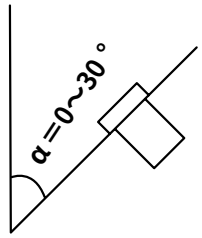


Figure 3

Standard : Vertical mounting, flush on the panel. (The controller is horizontal.)
When mounting the controller on tilted surface, the maximum tilt angle is 30° (degree) from vertical.

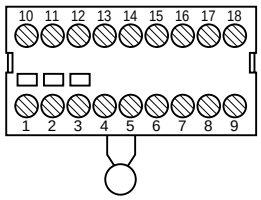


(Caution)

- Don’t block the openings around the controller, or radiation effect will be reduced.
- Don’t block the ventilation openings at the top of the terminal block.

2.3 Precautions in wiring connection

- For the thermocouple sensor type, use thermocouple compensation wires for wiring.
  For the RTD type, use a wiring material with a small lead wire resistance and no resistance differentials among three wires.
- Keep input lines away from power line and load line to avoid the influence from noise induced.
- For the input and output signal lines, be sure to use shielded wires and keep them away from each other.
- If a noise level is excessive in the power supply, the additional installation of an insulating transformer and the use of a noise filter are recommended.
  (Example: ZMB22R5-11 Noise Filter manufactured by TDK)
  Make sure that the noise filter is installed to a place such as a panel that is properly grounded. The wiring between the noise filter output terminal and the instrument power supply terminal should be made as short as possible. None of fuses or switches should be installed to the wiring on the noise filter output side because the filter effect will be degraded by such a installation.
- A better anti-noise effect can be expected by using stranded power supply cable for the instrument. (The shorter the stranding pitch is, the better the anti-noise effect can be expected.)
- For the unit with an alarm against a failure (burn-out) in the heater, use the same power line for connection of the power supplies for the heater and the controller.
- A setup time is required for the contact output when the power is turned on. If the contact output is used as a signal for an external interlock circuit, use a delay relay at the same time.
- Use the auxiliary relay since the life is shortened if full capacity load is connected to the output relay. SSR/SSC drive output type is preferred if the output operations occur frequently.
  [Proportional interval] relay output: 30 seconds or more, SSR/SSC: one second or more
- If inductive load such as magnetic switches connected as a relay output load, it is recommended to use Z-Trap manufactured by Fuji Electric to protect a contact from switching surge and keep a longer life.
  Model : ENC241D-05A (power supply voltage: 100 V)
  ENC471D-05A (power supply voltage: 200 V)
  Where to install : Connect it between contacts of the relay control output.
  Example)



Z-Trap connection

- The SSR/SSC-driven output, output of 4 to 20 mA DC, and retansmission are not electrically insulated from internal circuits.
  Use a non-grounded sensor for resistance bulb or thermocouple.

2.4 Requirement for key operation/operation in abnormalities

- Prior to the operation, be sure to check alarm functions, since a failure in the proper setting will result in a failure in the proper output of an alarm in case of an abnormality.
- A display of UUUU or LLLL will appear in case of a break in the input. Be sure to turn off the power when a sensor is replaced.

2.5 Others

- Do not use organic solvents such as alcohol and benzine to wipe this controller. Use a neutral detergent for wiping the controller.

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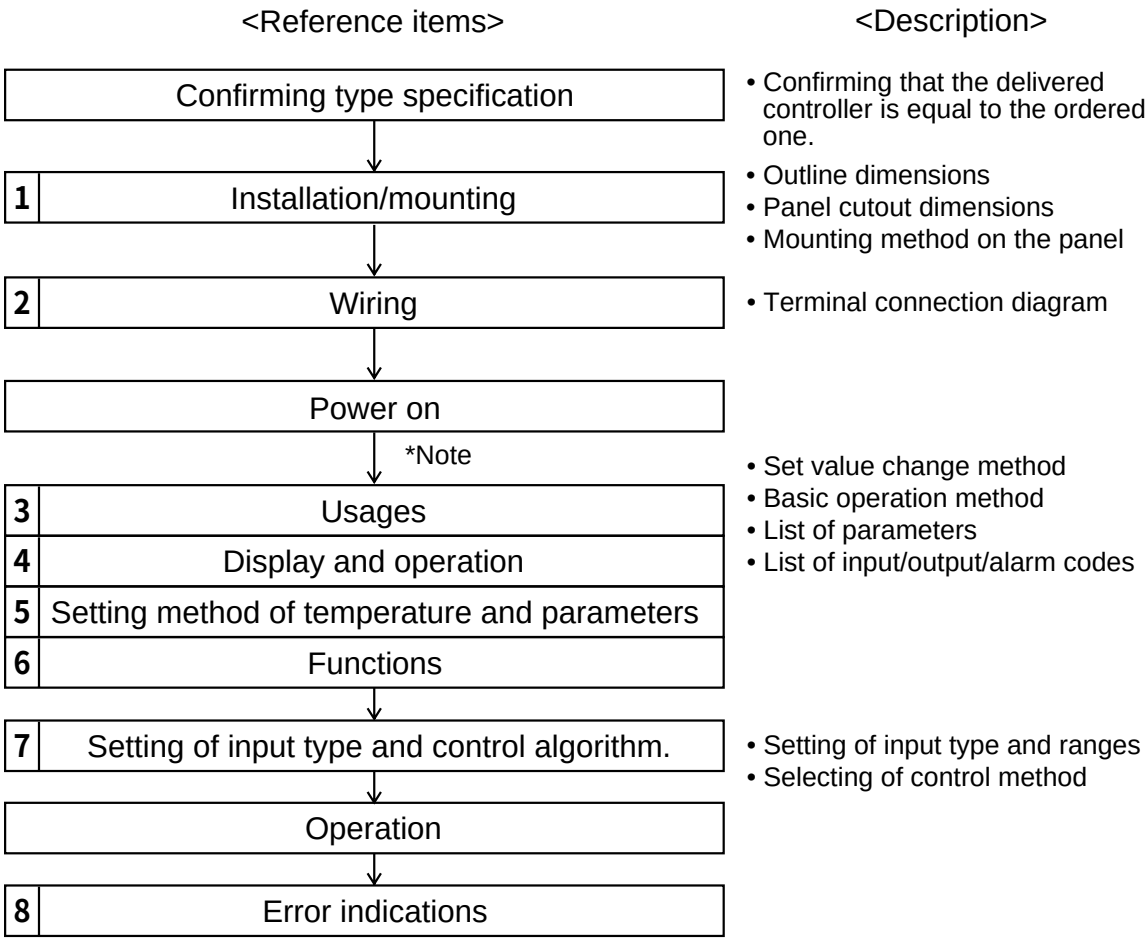
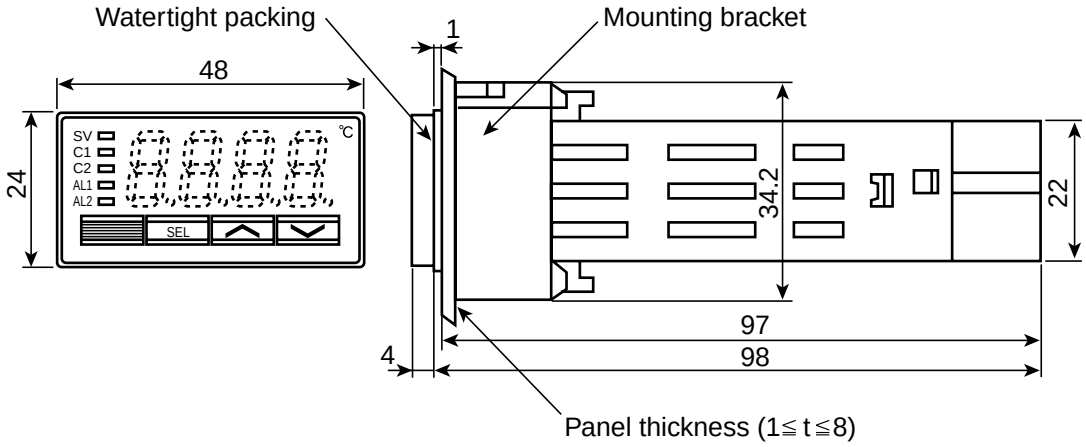


(Note) *To start the operation, wait for about 30 minutes after the power-on for warm up.

1 Installation/mounting

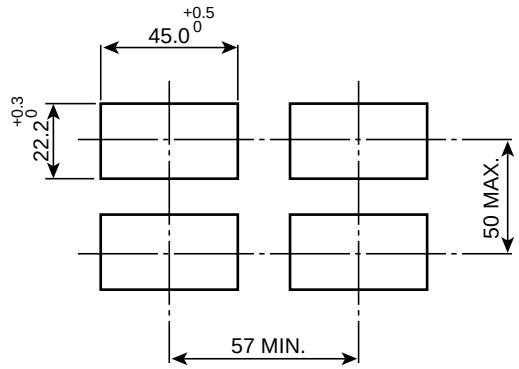
Outline and Panel Cutout Dimensions (Standard type/ Waterproof type)

Outline dimensions (Unit : mm)

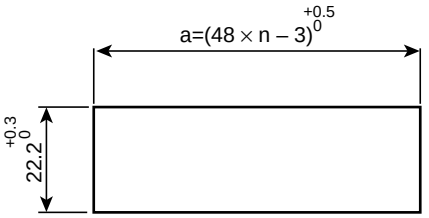


Panel cutout dimensions (Unit : mm)

For separate mounting



For mounting close together (n controllers)

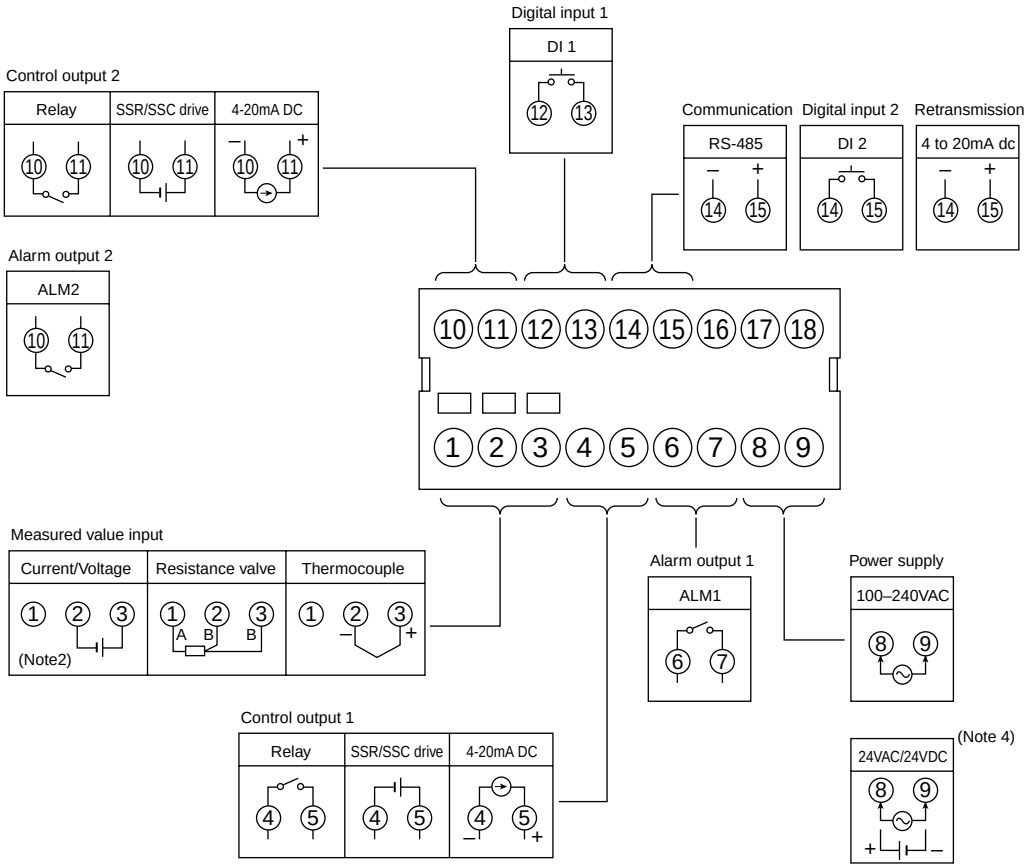


Number of units	2	3	4	5	6
a	93	141	189	237	285

Note: • Watertight feature is unavailable if mounted close together.
• Maximum ambient temperature is 45˚C if mounted close together.

2 Wiring

Terminal Connection Diagram (100 to 240 Vac)



Note1) Check the power supply voltage before installation.
Note2) Connect the I/V unit (250Ω resistor) (accessory) between the terminal ② and ③ in case of current input.
Note3) Tighten the terminal screw securely with fastening torque of 0.4N·m.
Note4) When the 10th digit of the code symbol is "C", "A", or "B", connect the power according to the connection diagram of 24VAC/24VDC power supply. Input of power of 30VAC/30VDC or more will damage the instrument.

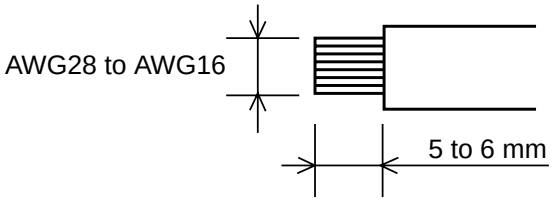
Designation of Wiring Material

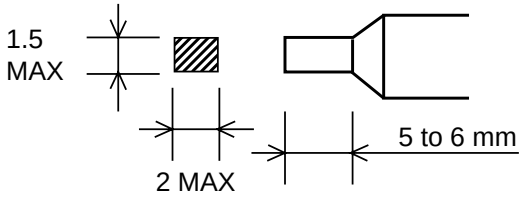
• Wire

Gauge: AWG28 (0.1mm²) to AWG16 (1.25mm²)
Strip-off length: 5 to 6 mm

• Rod terminal

Dimension of exposed conductor section:
2 x 1.5 mm or smaller
Length of exposed conductor section:
5 to 6 mm

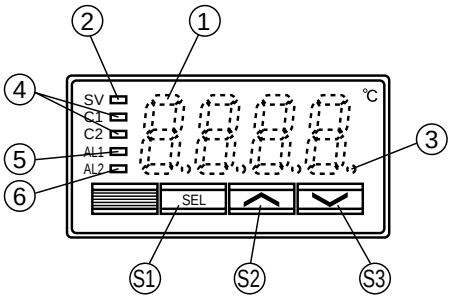




Caution To prevent disconnection or short circuit, never use the wire other than the one stated above, and make sure to insert it toward the recess of the terminal block.
Fastening torque: 0.4N·m

3 Usage (Read before using)

Name of Functional Parts and Functions



Model : PXR3

Setting keys

	Name	Function
S1	Select key	The key shifting to the 1st, the 2nd or the 3rd block parameter, switching the display between parameter and the data at the 1st, the 2nd and the 3rd block.
S2	Up key	· The numerical value is increased by pressing the key once. The numerical value keeps on increasing by pressing the key continuously. · For searching parameters within the 1st, the 2nd and the 3rd block.
S3	Down key	· The numerical value is decreased by pressing the key once. The numerical value keeps on decreasing by pressing the key continuously. · For searching parameters within the 1st, tne 2nd and the 3rd block.

Display/Indication

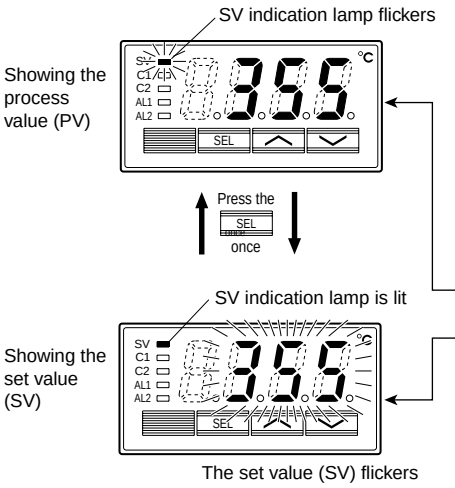
	Name	Function
①	Process value (PV)/Set value (SV) /parameter name or parameter setting display	1) Displays a process value or set value at operation mode. 2) Displays the parameter name or settings at parameter setting mode. 3) Displays the various error indications (refer to the “8. Error indications”). 4) Flickers at Standby mode when SV is displayed. 5) Displays the set value (SV) and “SV-x” (x:1 to 4) alternately when the SV-switching function is used and SV is displayed.
②	Set value (SV) indication lamp	1) The lamp is lit while a set value (SV) is displayed. 2) Flickers while the process value (PV) is displayed in Standby mode.
③	Auto-tuning/self-tuning indicator	The lamp flickers while the PID auto-tuning or the self-tuning is being performed.
④	Control output indication lamp	C1 : The lamp is lit while the control output 1 is ON. C2 : The lamp is lit while the control output 2 is ON. (Note 1)
⑤	Alarm output 1 (ALM1) indication lamp (Note 1)	The lamp is lit when the alarm output 1 is activated. It flickers during ON-delay operation.
⑥	Alarm output 2 (ALM2) indication lamp (Note 1)	The lamp is lit when the alarm output 2 is activated. It flickers during ON-delay operation.

Note 1) Control output 2 and alarm function are optional.

4 Display and operation

Standby mode

· To perform standby operation, set "STby" as ON in the 1st block parameter.



· Standby mode:

(Output) Control outputs (1 and 2) and alarm outputs (all) are not provided. However, depending on setting of "P-n1", control action, control outputs are provided at the abnormal input.
No alarm output is provided at standby mode, even in (Fault-condition).

Caution Be careful since the equipment does not provide output of the alarm of the main unit abnormality during the standby operation.

(Control) Control is not performed.

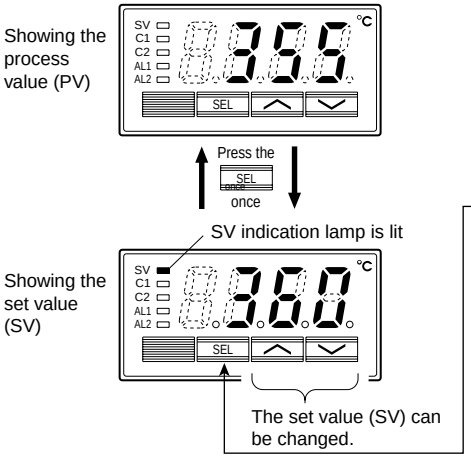
(Display) While PV being displayed ; SV indication lamp flickers.
While SV being displayed ; SV display value flickers.

Caution The SV display does not flicker while the 1st, 2nd and 3rd block parameters are displayed.

(Setting) SV and parameter settings are able to perform.

Switching by 1st block STby settings

Operation mode



1 Change of set value (SV)

2 Shift to the 1st, 2nd and 3rd block parameter

To shift to the other blocks, press the SEL key.

Caution Depending on the pressing time of SEL key, you can select the block to shift.

SEL pressing time	Shifting block
About 1 sec pressing	1st block
About 3 sec pressing	2nd block
About 5 sec pressing	3rd block

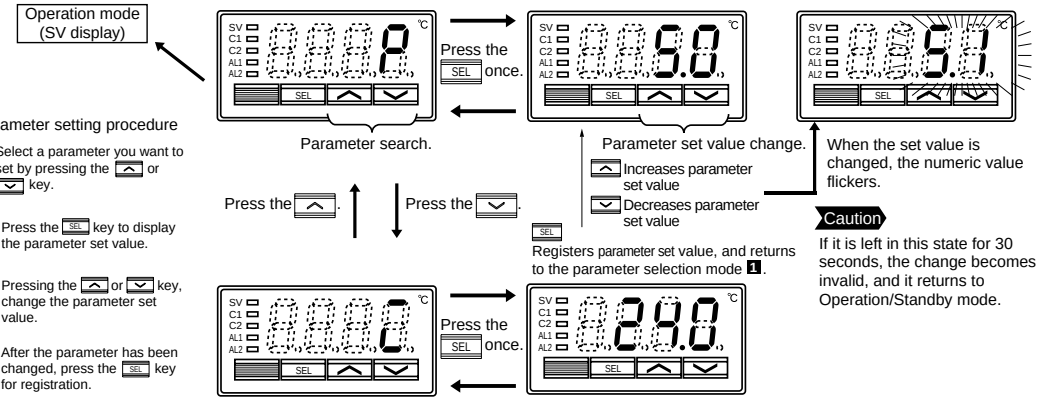
After the data setting, the data are registered automatically in 3 seconds.

Switching by the SEL key

Parameter setting mode

Press the SEL for 2 sec. **1** Parameter selection **2** Parameter settings

3 Shift to operating condition



Parameter setting procedure

1 Select a parameter you want to set by pressing the ▲ or ▼ key.

2-1 Press the SEL key to display the parameter set value.

2-2 Pressing the ▲ or ▼ key, change the parameter set value.

2-3 After the parameter has been changed, press the SEL key for registration.

3 To shift to Operation/Standby mode, press the SEL key for 2 sec.

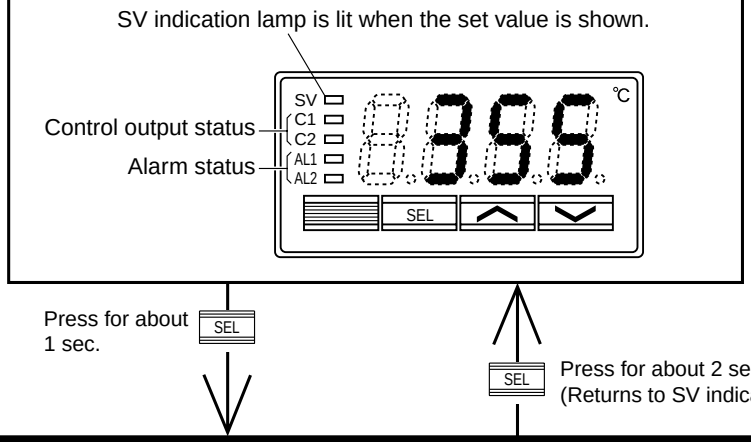
4 If unoperated state continues for 30 seconds, it returns to Operation/ Standby mode.

▲ By repeating the same procedure, the parameters can be displayed according to the parameter list shown in "5, Setting methods of

Caution After the parameter has been changed, if unoperated state continues for 30 seconds without pressing the SEL key, setting change becomes invalid.

5 Setting methods of temperature and parameters

Operation/Standby mode



· Some parameters may not be displayed on the screen, depending upon the types.

1st block parameter

Parameter display symbol		Parameter	Description of contents	Default setting	Remarks
STBY	STbY	Standby settings	Switches RUN or Standby of the control. ON: Control standby (output: OFF, alarm: OFF) OFF: Control RUN	OFF	
ProG	ProG	Ramp/soak control	OFF: stop, rUn: Start, HLd: status hold	OFF	
LACH	LACH	Alarm latch cancel	Releases alarm latch. 1: Alarm latch release	0	
AT	AT	Auto-tuning	0: Stop, 1: Standard AT start, 2: Low PV type AT start	0	
TM-1	TM-1	Timer 1 display	Time display indicating the remaining time in the timer mode.	10	
TM-2	TM-2	Timer 2 display		10	
AL 1	AL1	Alarm 1 set value	(appears only with alarm action type 1 to 10). Setting range: Note 1	10	Table 3 (Note 1)
A1-L	A1-L	Alarm 1 low limit set value	(appears only with alarm action type 16 to 31). Setting range: Note 1	10	Table 3 (Note 1)
A1-H	A1-H	Alarm 1 high limit set value		10	Table 3 (Note 1)
AL2	AL2	Alarm 2 set value	(appears only with alarm action type 1 to 10). Setting range: Note 1	10	Table 3 (Note 1)
A2-L	A2-L	Alarm 2 low limit set value	(appears only with alarm action type 16 to 31). Setting range: Note 1	10	Table 3 (Note 1)
A2-H	A2-H	Alarm 2 high limit set value		10	Table 3 (Note 1)
LoC	LoC	Key lock	Setting of key lock status.	0	

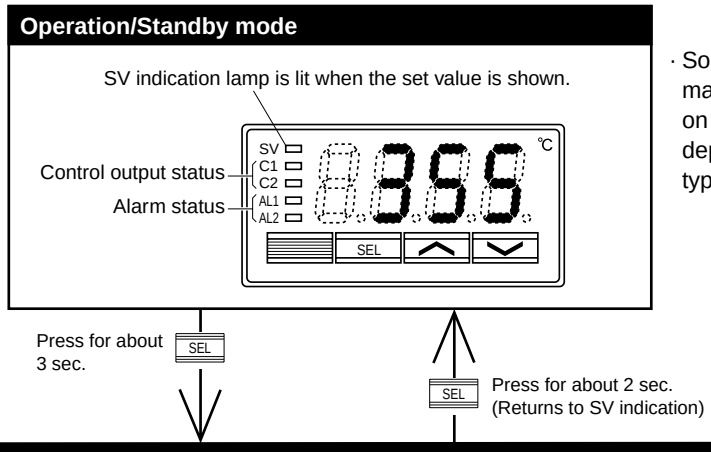
	All parameters		SV	
	Front key	Comm-unication	Front key	Comm-unication
0	○	○	○	○
1	×	○	×	○
2	×	○	○	○
3	○	×	○	×
4	×	×	×	×
5	×	×	○	×

○: Setting enable, ×: Setting disable

Note 1) Setting range : 0 to 100%FS (in case of absolute value alarm)
–100 to 100%FS (in case of deviation alarm)

Note 2) Never set "TC" / "TC2" = 0

Operation/Standby mode

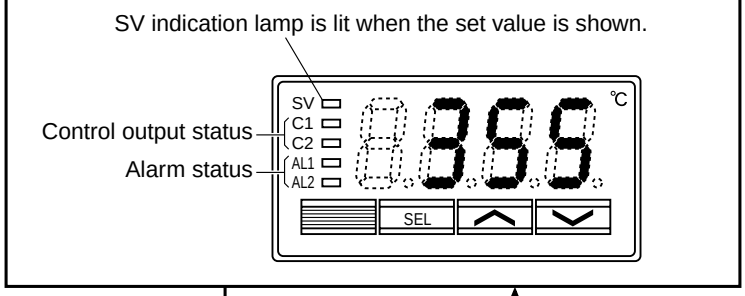


· Some parameters may not be displayed on the screen, depending upon the types.

2nd block parameter

Parameter display symbol		Parameter	Description of contents	Default setting	Remarks
P	P	Proportional band	Setting range: 0.0 to 999.9% ON/OFF control when "P" = 0	5.0	
I	I	Integral time (reset)	Setting range: 0 to 3200 sec. No integral action when "I" = 0	240	
d	D	Derivative action time	Setting range: 0.0 to 999.9 sec. No derivative action when "d" = 0	60.0	
HYS	HYS	Hysteresis for ON/OFF control	Setting range: 0 to 50% FS	1	
CooL	CooL	Proportional band coefficient on cooling side	Sets the proportional band coefficient on the cooling side. (Setting range : 0.0 to 100.0) ON/OFF control when "Cool" = 0	1.0	
db	db	Deadband/overlap	Shifts the output value on the cooling side. (Setting range: -50.0 to 50.0%)	0.0	
CTrL	CTrL	Control algorithm	Type of control algorithm. (Setting range: PID, FUZZY, SELF)	PID	
TC	TC	Cycle time (control output 1)	Sets cycle time of control output 1. (Setting range: 1 to 150 sec)	30/2	Note 2
TC2	TC2	Cycle time (control output 2)	Sets cycle time of control output 2. (Setting range: 1 to 150 sec)	30/2	Note 2
P-n2	P-n2	Input type code	Type of input	As ordered	Table 1 (Page 4)
P-SL	P-SL	Lower limit of input range	Lower limit of input range (Setting range: -1999 to 9999)	As ordered	Table 2 (Page 4)
P-SU	P-SU	Upper limit of input range	Upper limit of input range (Setting range: -1999 to 9999)	As ordered	Table 2 (Page 4)
P-dP	P-dP	Setting of decimal point position	Select a decimal point position of display. (Setting range: 0 to 2) 0 : No decimal point "1" "2"	As ordered	Table 2 (Page 4)
PVOF	PVOF	PV offset	Shift the display of process value (PV). (Setting range: -10 to 10%FS)	0	
P-dF	P-dF	Time constant of input filter	Time constant (Setting range: 0.0 to 900.0 sec.)	5.0	
ALM1	ALM1	Type of alarm 1	Setting types of alarm action (Setting range: 0 to 34)	0/5	Table 3 (Page 4)
ALM2	ALM2	Type of alarm 2		0/9	Table 3 (Page 4)
STAT	STAT	Ramp/soak status	Displays the current Ramp/Soak status. No setting can be made.	-	
PTn	PTn	Ramp/soak execute type	Selects the ramp/soak execute type. 1: Executes 1st to 4th segment. 2. Executes 5th to 8th segment. 3. Executes 1st to 8th segment.	1	
SV-1 ⋮ SV-8	SV-1 to SV-8	Ramp target SV-1 to SV-8	Sets the target SV for each ramp segment. (Setting range: 0 to 100%FS)	0%FS	
TM1r ⋮ TM8r	TM1r to TM8r	1st ramp segment time to 8th ramp segment time	Sets the time for each ramp segment. (Setting range: 0 to 99 hours and 59 minutes)	0.00	
TM1S ⋮ TM8S	TM1S to TM8S	1st soak segment time to 8th soak segmentl time	Sets the time for each soak segment. (Setting range: 0 to 99 hours and 59 minutes)	0.00	

Operation/Standby mode



· Some parameters may not be displayed on the screen, depending upon the types.

Press for about 5 sec. SEL

SEL Press for about 2 sec. (Returns to SV indication)

3rd block parameter

Parameter display symbol		Parameter	Description of contents	Default setting	Remarks
P-n1	P-n1	Control action	Selects the control action.	0	Table 4 (Page 4)
SV-L	SV-L	Lower limit of SV	Lower limit of SV (Setting range: 0 to 100%FS)	0%FS	
SV-H	SV-H	Upper limit of SV	Upper limit of SV (Setting range: 0 to 100%FS)	100%FS	
dLY1	dLY1	ON delay time of alarm 1	ON delay time setting for alarm output (Setting range: 0 to 9999 sec)	0	
dLY2	dLY2	ON delay time of alarm 2		0	
A1hY	A1hY	Hysteresis for alarm 1	Sets ON-OFF hysteresis for alarm output. (Setting range: 0 to 50%FS)	1	
A2hY	A2hY	Hysteresis for alarm 2		1	
A1oP	A1oP	Additional function of alarm 1	Additional function of alarm output (Setting range: 000 to 111) Alarm latch (1:use, 0:not use) Alarm of error status (1:use 0:not use) De-energized (1:use 0:not use), Note 3.	000	Note 3
A2oP	A2oP	Additional function of alarm 2		000	Note 3
dI-1	dI-1	DI1 operation setting	Selects digital input 1 (DI1) function (Setting range: 0 to 12)	0(OFF)	6-7 (Page 3)
dI-2	dI-2	DI2 operation setting	Selects digital input 2 (DI2) function (Setting range: 0 to 12)	0(OFF)	6-7 (Page 3)
STno	STno	Station No.	Communication station No. (Setting range: 0 to 255)	1	
CoM	CoM	Parity setting	Parity setting. Baud rate is fixed at 9600 bps. (Setting range: 0 to 2)	0	6-6 (Page 3)
PYP	PYP	Code for PYP input type	Input type code used when communicating with PYP. See the OPERATION MANUAL (Initial value: K: 0 to 400 °C)	34	
Ao-T	Ao-T	Retransmission output type	Selecting retransmission output type. 0: PV/ 1: Set point/ 2: Output/ 3: Error	0: PV	
Ao-L	Ao-L	Retransmission base scale	Setting retransmission base scale. (Setting range : –100 to 100%)	0%	
Ao-H	Ao-H	Retransmission span scale	Setting retransmission span scale. (Setting range : –100 to 100%)	100%	
dSP1 ⋮ dP13	dSP1 to dSP13	Parameter mask	Specifying parameter mask		

Note 3) De-energized: Contact opens when the alarm "ON".

6 Functions

6-1 ON/OFF control

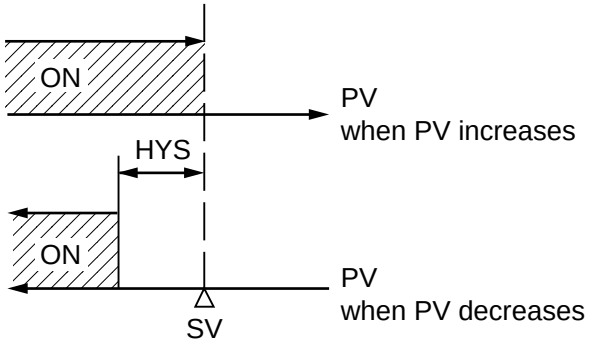
- At ON/OFF control mode,output signal is as shown below.
  Set parameter “P” = 0 for selecting the ON/OFF control mode.
  Set the hysteresis to avoid chattering.
  (Default setting: Hys = 1)

- Parameter setting and operation example

Example 1 : Reverse operation

Parameter	Setting value
P	0.0
P-n1	0 (or 1)
HYS	Any value

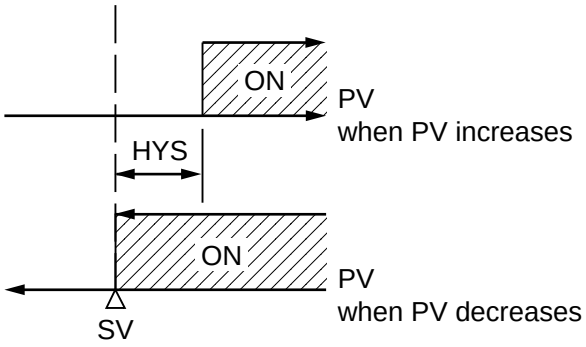
Relationship of PV and SV	Output
PV > SV	OFF
PV < SV	ON



Example 2 : Direct operation

Parameter	Setting value
P	0.0
P-n1	2 (or 3)
HYS	Any value

Relationship of PV and SV	Output
PV > SV	ON
PV < SV	OFF



6-2 Auto-tuning (AT)

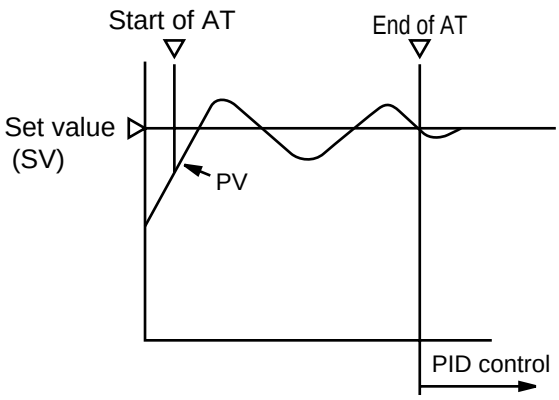
Autotuning is the automatic calculation and entering of the control parameters (P,I and D) into memory.
Prior to the auto-tuning, complete the setting of input range (P-SL,P-SU, P-dP), a set value (SV), alarm setting (AL1, AL2), and cycle time (TC).

How to start the auto-tuning

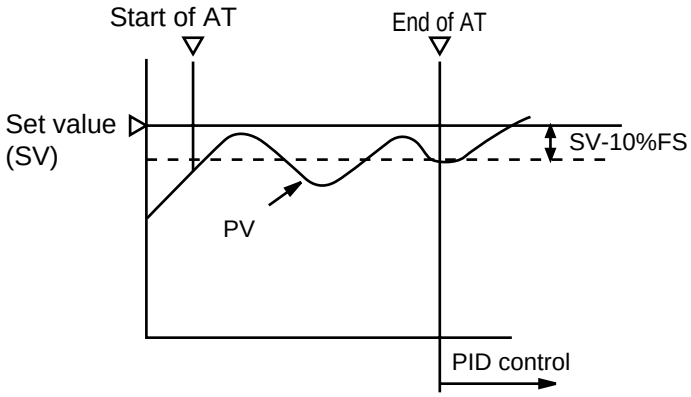
Set the parameter AT as either “1” or “2” by using ⌃ or ⌄ key, and press the SEL key to start the auto-turning. Then the point indicator at the lower right starts blinking. At the completion of Auto-tuning, the point indicator stops blinking, then parameter AT is automatically set to 0.

	When auto-tuning is cancelled or not performed.	Standard type (auto-tuning at SV)	Low PV type (auto-tuning at 10%FS below SV.)
Setting code (AT)	0	1	2

① Standard type (AT=1)



② Low PV type (AT=2) : Overshoot decreased at tuning.



(a) The P.I.D. parameter calculated by auto-tuning remains even if the power is turned off. If the power is turned off before the auto-tuning is completed, you must restart the auto-tuning.

(b) The PV may be changed greatly depending on the process, because the control output is ON/OFF action (two position operation) in the auto-tuning. So, do not use the auto-turning if the process does not allow a significant variation of PV.
In addition, the auto-tuning should not be used in any process such as pressure control and flow control, where a quick-response is required.

(c) If the auto-tuning isn’t completed in four hours, the auto-tuning is suspected to fail. In this case, check the wiring and parameters such as the control action, input type, etc.

(d) Carry out the auto-tuning again, if there is any change in SV, input range (P-SL, P-SV or P-dP) or process condition. Perform the auto-tuning if fuzzy control is selected as the control algorithm.

(e) When resetting the AT parameter, set the parameter to “0” once, then reset it.

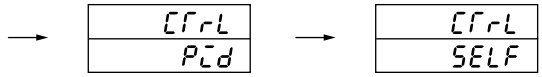
6-3 Self-tuning

1) At power on, changing a set value or the external disturbance, tuning is made automatically so that the PID parameters are re-optimized.
   It is useful where modification of PID parameters is required repeatably due to frequent change in process condition.
   If high controllability is important, select the PID or fuzzy control algorithm and use auto-tuning.

2) Setting for self-tuning
   ① Turn on the power and set the SV.
   ② Select SELF at “CTrL” (control algorithm) parameter.
   ③ Turn off the power once.
   ④ Turn on the power of the whole system. The controller should be turned on at the same time with the other equipments or even later. Otherwise, the self tuning might not be performed successfully.
   ⑤ Self-tuning starts. Then the point indicator at the lower right corner starts blinking until the PID parameters are re-optimized.

   Note) Whenever it is necessary to re-try the self-tuning, please set “CTrL” = PID once, and then start the above setting procedure from the beginning.

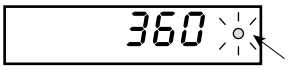
2nd block parameter



· Set "CTrL" (control algorithm) as SELF.

PID	PID control
FUZY	Fuzzy control
SELF	Self-tuning control

3) Self-tuning indication



The point indicator at the lower right corner starts blinking until the PID parameters are re-optimized.

4) Self-tuning is executed by any of the following conditions.

① During temperature rise at power ON.
② During temperature rise at SV changing if necessary.
③ When control is out of stable condition and is judged as being out of stable condition continuously.

5) Self-tuning is not executed under the following conditions:

① During standby mode
② During ON/OFF control
③ During auto-tuning
④ During ramp/soak operation
⑤ During input error
⑥ With dual output (“P-n1” ≥ 4)
⑦ When P, I, D or Ar is manually set

Under the following coditions, self-tuning is canceled.

① When SV is changed.
② When Self-tuning can not be completed in about 9 hours after the start.

6) Cautions

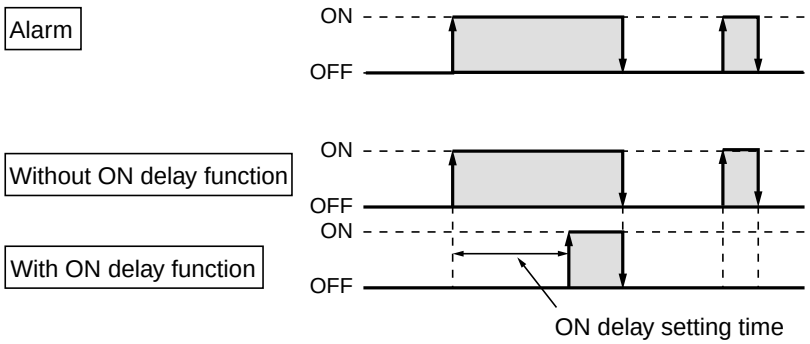
- Turn on the power of the whole system. The controller should be turned on at the same time with the other equipments or even later. Otherwise, the selftuning might not be performed successfully.
- Don’t change the SV while the self-tuning is executing.
- Once PID parameters are optimized, the self-tuning is not executed at the next power on unless SV is changed.
- After the execution of self-tuning, if the controlability is not your expected level, please select PID or FUZZY at “CTrL” parameter, and then, start the auto-tuning.

6-4 Alarm function (option)

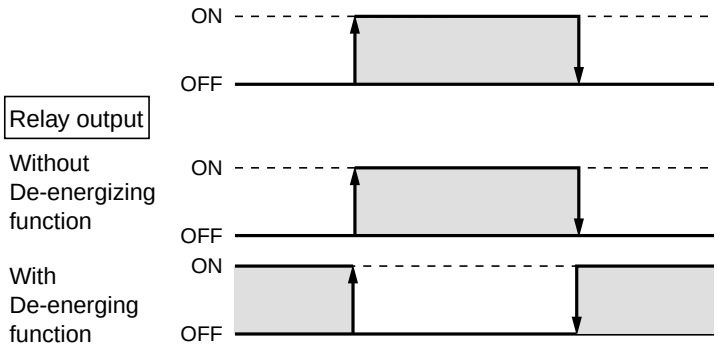
1) Kinds of alarm

- Absolute value alarm, deviation alarm, combination alarm, and zone alarm are available.
  (For details, see Table 4, Alarm action type codes on page 4.)

ON delay function



Energizing/de-energizing function



Caution When the power is turned OFF or in Standby mode, even if de-energizing function is turned ON, it cannot be output (it is kept OFF).

2) Alarm function

No.	Function	Description	Parameters to set
①	Hysteresis	Set the hysteresis to avoid chattering.	Alarm 1 : A1HY Alarm 2 : A2HY
②	ON delay	The alarm is turned on with delay of a certain seconds as previously set after PV goes in the alarm band.	Alarm 1 : dLY1 Alarm 2 : dLY2
③	Alarm latch	Keeps the alarm ON status once an alarm is turend ON. To cancel the alarm latch, please take one of the following procedure.	
		i) Turn ON the controller again.	
		ii) Turn the alarm latch settings to OFF once.	Alarm 1 : A1oP Alarm 2 : A2oP
		iii) Use alarm latch cancel parameter.	LACH
		iv) Cancel by Digital input.	dC-1, dC-2
		v) Cancel by communication function.	
④	Error status alarm	Alarm is turned on when error indications are displayed.	Alarm 1 : A1oP Alarm 2 : A2oP
⑤	De-energizing	Alarm output can be de-energized.	Alarm 1 : A1oP Alarm 2 : A2oP

Combination of alarm functions

Please see the table as shown below.
O: Possible combination
X: Impossible combination

	Without HOLD/Timer	With HOLD	With Timer
Alarm latch	O	O	X
De-energizing	O	O	O
ON delay	O	Note 1	X
Alarm in error status	O	O	X

Note 1 If HOLD has not been canceled, the HOLD state is canceled as soon as the measured value goes out of alarm band. If HOLD has been canceled, ON delay is activated as soon as the measured value goes into the alarm band.

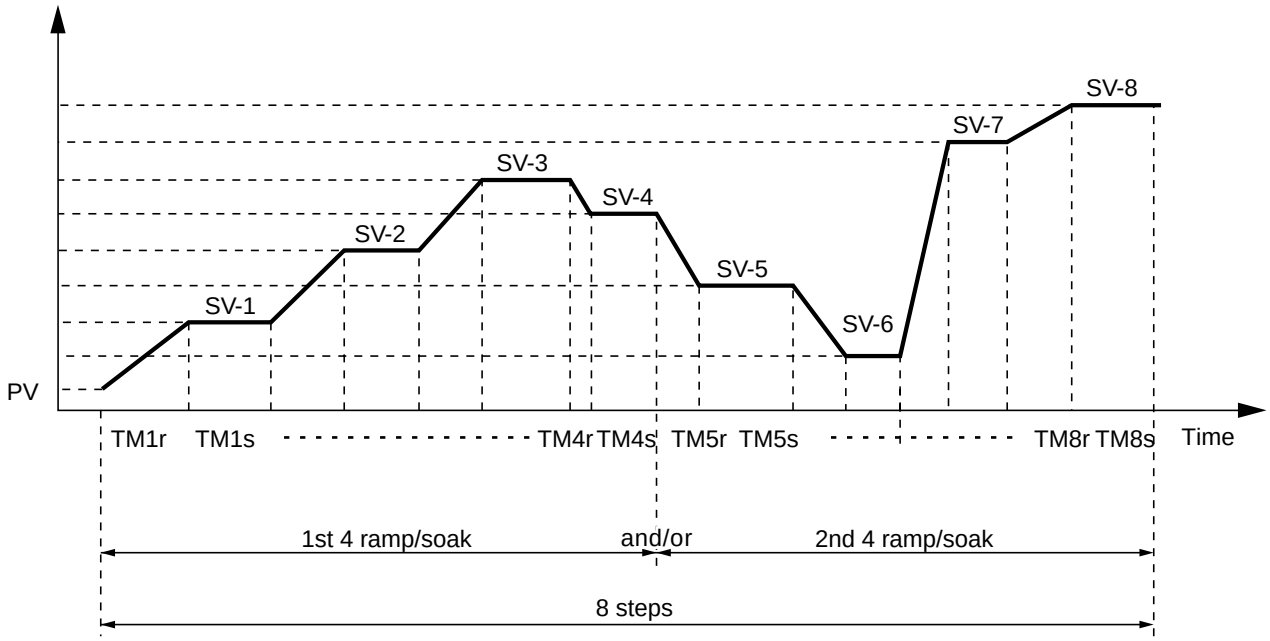
Cautions on alarms

No.	Cautions	Items/Classification
1	Note that the ON delay function is effective for alarm in error status.	Alarm in error status
2	Even during "Err" display, alarms in error status work.	Alarm at error indication
3	Even when “LLLL” or “UUUU” is displayed, an alarm function works normally.	
4	Alarm action type codes in No.12 to 15 are also included in No.24 to 27. It is, therefore, recommended to use No.24 to 27. In addition, please note when selecting No.12 to 15, setting in ALM2, dLY2, and A2hy are effective.	Alarm action type code
5	With the HB alarm, ON delay function, de-energizing function and latch function cannot be used.	HB alarm
6	The minimum alarm set value is –199.9.	Alarm set value
7	As the alarm action type changed, the alarm set value may also be changed accordingly.	
8	Note that all of alarm outputs are not provided at the standby condition.	Alarm at standby mode.
9	Error status alarm is not provided at the standby mode.	
10	The HOLD function is effective even if the PV value is in the hysteresis area when the power is turned ON.	

6-5 Ramp/soak function [option]

1. Function

Changes the set value (SV) as the time elapses according to a predetermined program pattern, as shown below.
Either 4 ramp/soak x 2 patterns or 8 ramp/soak x 1 pattern can be programmed. The first ramp starts from the process value (PV) just before the programming is executed.



2. Setting

- Select the program pattern (PTn) and set the rUn at "ProG" parameter.
- Ramp/soak pattern can not be changed while ramp/soak program is running.

PTn	Pattern	Ramp/Soak
1	1	4
2	2	4
3	1 + 2	8

Note:

- The ramp/soak program is canceled if the controller becomes to standby mode.
  Then, if the controller becomes to operation mode, the program doesn't run again.

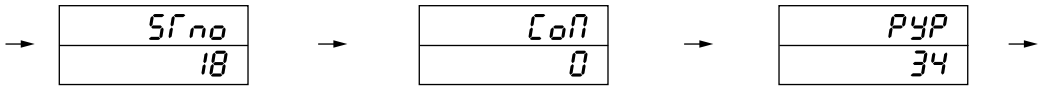
6-6 Communication function [option]

1) Function

- Data can be written/read through the RS-485 communication.

2) Before using this function, please set related parameters as shown below.

3rd block parameter



Set the station No. at "STno" (station No. setting parameter). [Sample: station No. = 18]

Set the parity at "COM".

CoM	
0	Odd
1	Even
2	No parity

[Sample: Odd parity]

Please do not change "PYP" unless used with PYP, Color Touch-Operation Unit.

3) Caution

- Station No. can be set in the range of 0 to 255. (No communication is allowed with 0).
- After changing the setting of parity at “COM”, please power off and re-start the controller.
- Baud rate is fixed to 9600 bps.
- Communication cannot be carried out with different communication protocol (such as ModbusRTU or Z-ASCII).

6-7 Digital input (DI function) [option]

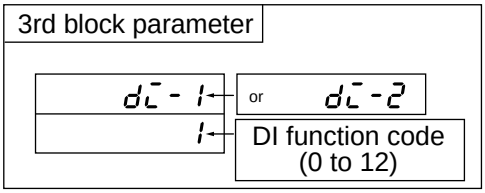
1) Function

· With Digital input, the follwing functions are available.

① SV switching
② Control mode; RUN/STANDBY selection
③ Ramp/soak RUN/RESET selection
④ Auto-tuning start/stop
⑤ Alarm latch cancel
⑥ Timer start/reset

2) To use DI function;

· Select the function refering to the Table shown below.



3) Table of DI function

DI function code	Function	Description
1	Set value (SV) switching	Switching between local SV and "SV-1" "SV-2" "SV-3"
2	Control mode, RUN/STANDBY	At standby mode, control is not provided and SV flickers.
3	Auto-tuning (standard) start	Start/Stop can be switched at the time of DI raising up or dropping down.
4	Auto-tuning (low PV) start	
5	All alarm latch cancel	When this function is not used, DI is not effective.
6	Alarm 1 latch cancel	
7	Alarm 2 latch cancel	
9	ALM1 timer	ON/OFF delay timer operation is available. The remaining time of the timer can be checked with timer-1 and -2 display parameters (first block).
10	ALM2 timer	
12	Ramp/soak RUN/RESET	RUN/RESET of ramp/soak can be performed at the time of DI raising up or dropping down.

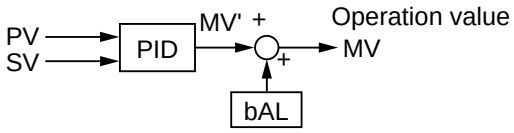
6-8 Other functions

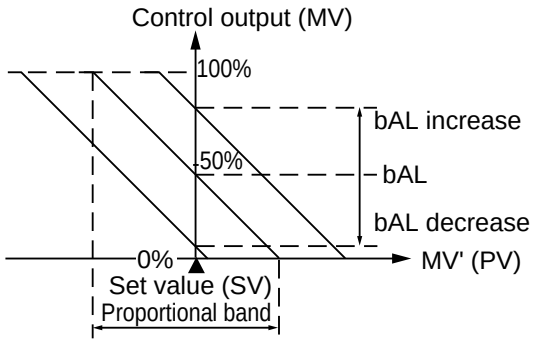
The parameters “bAL” and “Ar” are masked at default setting.
If necessary to appear these parameters, please refer to the following procedure.
1) Function
- “bAL” and “Ar” are functions to suppress overshoot.
  (Usually it is not necessary to change the setting.)

2) If they aren't optimum value, sometime you don't get the good control. Usually it is not necessary to set them.
3) "Ar"(Anti-reset wind-up) is automatically set by "Auto tuning".

1 bAL

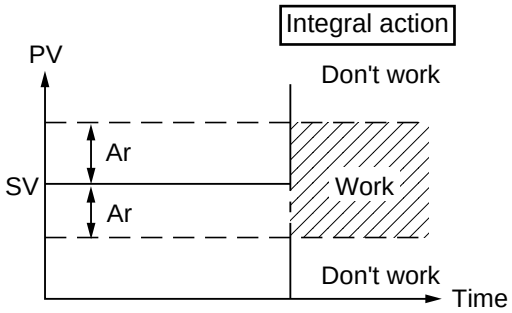
MV is calculated by adding the offset (bAL) to MV’, the result of PID calculation, from PV and SV.





2 Ar

The integral range is SV±Ar.
Integral action don't work when PV is out of the range.



Mask/Unmask bAL and Ar

1 To unmask

① Display the "dSP3" in the third block parameter and then subtract 128 from current value.
② Display the "dSP4" in the third block parameter and then subtract 1 from current value.

2 To mask

① Display the "dSP3" in the third block parameter and then add 128 to current value.
② Display the "dSP4" in the third block parameter and then add 1 to current value.

6-9 Retransmission function [option]

1) Function

·It is the function that outputs one of signals as shown below with current such as 4 to 20mA dc.

Output type: PV, Setpoint, Output or Error

2) Before using this function, please set related parameters as shown below.

3rd block parameter

→ Ao-T 1 → Ao-L 0 → Ao-H 400

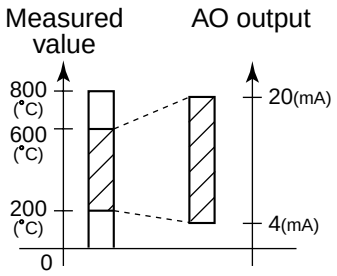
Setting output type for Retransmission.

Setting lower limit scaling.

Setting upper limit scaling.

Ao-T	
0	PV
1	SV
2	MV
3	DV

Example: Input .... K thermocouple, 0 ~ 800˚C range
4 ~ 20mA signals are to be output when PV values are at 200 - 600˚C



AO signal type .... PV value
600˚C → 75% of input range
200˚C → 25% of input range

(Setting)

Ao-T .... "0"
Ao-H .... 75.0(%)
Ao-L .... 25.0(%)

3) Note

Don't set Ao-L ≧ Ao-H.

7 Setting of input type and control algorithm

1 Setting of the input type

* Skip this procedure if the input type is specified when you order.

① Please check if the input type set at “P-n2” is same as what you use.

Choose the sensor type you use from Table 1 shown below, and set the code at “P-n2”.
(Example) For T thermocouple, set “P-n2”=7.

(Note) Please refer to the following table for the modification of the input type.

TC ⟷ RTD (within Group I)*	Can be modified by changing “P-n2”.
TC/RTD (Group I)* ⟷ 1 to 5Vdc, 4 to 20mAdc (Group II)*	Modification not possible

TC : Thermocouple RTD : Resistance bulb (*Please refer to table 1)

⇩

② **Is s**etting of input temperature range suitable for the sensor you use?

Standard range to each sensor is shown in Table 2. Select the tem perature range suitable for the equipments you use, set lower/upper limit values to “P-SL” / “P-SU” respectively.

(Example) For temperature range 0 to 800 [°C] : Set “P-SL” and “P-SU” to 0 and 800 respectively.

(Note) If the span of setting ranges is smaller than the one of minimum standard range, the accuracy (% full scale) is influenced.

(Note) No standard range is given in case of 1 to 5VDC (4 to 20mA DC) input. Please set the range within the following limitation.

- Maximum span : 9999
- Lower limit : -1999
- Upper limit : 9999

Note:
Please set “P-n2”: Input sensor type and “P-SL/P-SU/P-dP”: input range setting prior to any other parameter settings. When “P-n2” and/or “P-SL/P-SU/P-dP” is changed, some other parameters may also be in fluenced. Please check all parameters before starting control.

2 Setting of the algorithm

* Read if the control doesn't work as you expect.

① Select the type of control output action.

	Control output action	Description	Setting procedure
Heating	Reverse	As PV increases, MV decreases. As PV decreases, MV increases.	Set parameter "P-n1" = 0 or 1. (Refer to Table 2)
Cooling	Direct	As PV increases, MV also increases. As PV decreases, MV also decreases.	Set parameter "P-n1" = 2 or 3. (Refer to Table 2)

② Control algorithm (ON/OFF, PID or fuzzy)

Type of control	Description	Setting procedure
ON/OFF control	Output is either ON (100%) or OFF (0%). (Suitable when frequent output switching is inconvenient.)	Set "P" =0.0. Refer to "6-1 ON/OFF control"
PID control	The output signal changes within the range at 0 to 100% according to PID calculation which determine the proportional of ON to OFF in each TC (cycle time).	Select PID at "CTrL". Execute auto-tuning so that optimum P.I.D can be calculated automatically. (PID parameters can be set spontaneously). *Refer to "6-2 Auto-tuning".
Fuzzy control	Fuzzy operation is added to PID providing control with less overshoot.	Select FUZy at "CTrL". Then execute the auto-tuning so that FUZZY control starts.
PID control with self-tuning.	At power on, changing a set value or the external disturbance, tuning is made automatically so that the PID parameters are re-optimized. It is useful where modification of PID parameters is required repeatably due to frequent change in process condition.	Select SELF at "CTrL". Refer to "6-3 Self-tuning".

8 Error indications

Error indications

This controller has a display function to indicate several types of error code shown below.
If any of the error codes is displayed, please eliminate the cause of error immediately.
After the cause is eliminated, turn off the power once, and then re-start the controller.

Error code	Possible cause	Control output	Group
UUUU	① Thermocouple burnt out. ② RTD (A) leg burnt out. ③ PV value exceeds P-SU by 5% FS.	① when the burn-out control output is set as the lower limi (standard): OFF or 4 mA or less ② when the burn-out control output is set as the upper limit: ON or 20 mA or larger	I
LLLL	① The RTD leg (B or C) burnt out. ② The RTD leg (between A and B or A and C) short. ③ PV value is below P-SL by 5%FS. ④ 1 to 5 VDC or 4 to 20mADC wiring open or short.		
LLLL	① PV value < -1999. Note) In case of RTD input, "LLLL" is notdisplayed even if the tem peraturebecomes below -150 ˚C.	Control is continued until the value reaches -5% FS or less, after which burn-out condition will occur.	II
Err (SV indication flickers)	Incorrect range setting (P-SL/P-SU).	OFF or 4mA or less	
FALr	Fault in the control.	Undefined (Stop using this controller immediately.) Contact with Fuji Electric Co.,Ltd. or the nearest repesentatives.	

[Table 1] Input type code

Parameter : P-n2

Group	Input type	Code
I	RTD	
	· Pt100 (IEC)	1
	Thermocouple	
	· J	2
	· K	3
	· R	4
	· B	5
	· S	6
	· T	7
	· E	8
	· N	12
	· PL-II	13

Group	Input type	Code
II	1 to 5V DC, 4 to 20mA DC	16

In case of 4 to 20mA DC input, mount a 250Ω resistor enclosed in the package box.

· Modification

TC ⟷ RTD (within Group I)	Can be modified by changing "P-n2"
TC/RTD (Group I) ⟷ 1 to 5 V DC, 4 to 20 mA DC (Group II)	Modification is not possible

[Table 2] Input range (Standard range)

Parameter : P-SL, P-SU, P-dP

Input signal type		Range (℃)	Range (℉)
RTD (IEC)	Pt100Ω	0 to 150	32 to 302
	Pt100Ω	0 to 300	32 to 572
	Pt100Ω	0 to 500	32 to 932
	Pt100Ω	0 to 600	32 to 1112
	Pt100Ω	-50 to 100	-58 to 212
	Pt100Ω	-100 to 200	-148 to 392
	Pt100Ω	-150 to 600	-238 to 1112
	Pt100Ω	-150 to 850	-238 to 1562
Thermo-couple	J	0 to 400	32 to 752
	J	0 to 800	32 to 1472
	K	0 to 400	32 to 752
	K	0 to 800	32 to 1472
	K	0 to 1200	32 to 2192

Input signal type		Range (℃)	Range (℉)
Thermo-couple	R	0 to 1600	32 to 2912
	B	0 to 1800	32 to 3272
	S	0 to 1600	32 to 2912
	T	-199 to 200	-328 to 392
	T	-150 to 400	-238 to 752
	E	0 to 800	32 to 1472
	E	-199 to 800	-328 to 1472
	N	0 to 1300	32 to 2372
	PL-II	0 to 1300	32 to 2372
DC voltage	1 to 5VDC	-1999 to 9999 (Scaling is possible) • Maximum span : 9999 • Lower limit : -1999 • Upper limit : 9999	

Note 1) Except for the following, the input accuracy is ±0.5% FS ±1 digit ±1°C (Input accuracy does not be guaranteed for the ranges of measurement other than in the table above.)
R thermocouple 0 to 400 °C, B thermocouple 0 to 500 °C : in these ranges, this controller may display an incorrect process value due to the characteristic of the sensor.

Note 2) In case a measuring range of -150 to 600 °C or -150 to 850 °C is used for resistance bulb input, temperatures below -150 °C does not be indicated correctly. Therefore, "LLLL" does not appear despite a continuous fall below -150 °C.

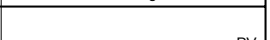
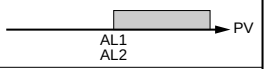
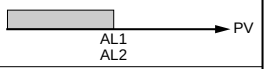
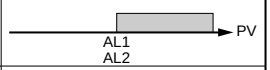
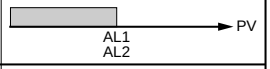
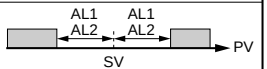
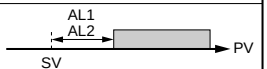
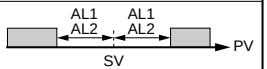
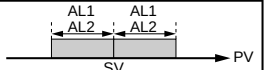
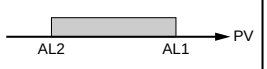
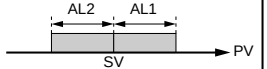
Note 3) If the resistance bulb or thermocouple is used at a temperature below the lowest value in the measurement range, the input accuracy cannot be guaranteed.

Note 4) Addition of decimal point is impossible if the input range or span is larger than 999.9 at the RTD/thermocouple input.

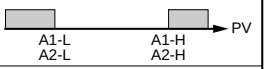
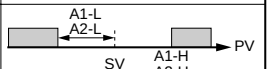
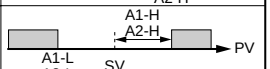
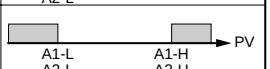
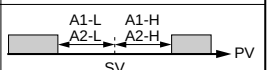
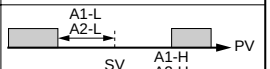
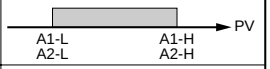
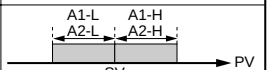
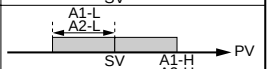
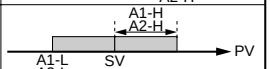
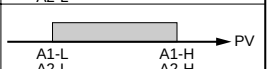
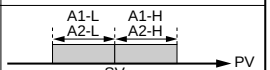
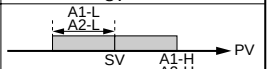
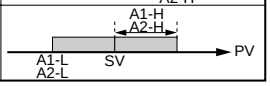
[Table 3] Alarm action type code

Parameter : P-AH , P-AL

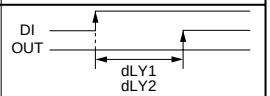
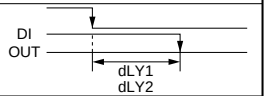
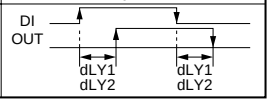
· Standard alarm code

	ALM1	ALM2	Alarm type	Action diagram
	0	0	No alarm	
Absolute value alarm	1	1	High alarm	
	2	2	Low alarm	
	3	3	High alarm (with hold)	
	4	4	Low alarm (with hold)	
Deviation alarm	5	5	High alarm	
	6	6	Low alarm	
	7	7	High/Low alarm	
	8	8	High alarm (with hold)	
	9	9	Low alarm (with hold)	
	10	10	High/Low alarm (with hold)	
Zone alarm	11	11	High/Low deviation alarm (ALM1/2 independent action)	
	-	12	High/Low absolute alarm	
	-	13	High/Low deviation alarm	
	-	14	High absolute /Low deviation alarm	
	-	15	High deviation /Low absolute alarm	

· Alarm code with dual set value

	ALM1	ALM2	Alarm type	Action diagram
High /Low limit alarm	16	16	High/Low absolute alarm	
	17	17	High/Low deviation alarm	
	18	18	High absolute /Low deviation alarm	
	19	19	High deviation /Low absolute alarm	
	20	20	High/Low absolute alarm (with hold)	
	21	21	High/Low deviation alarm (with hold)	
	22	22	High absolute /Low deviation alarm (with hold)	
	23	23	High deviation /Low absolute alarm (with hold)	
Zone alarm	24	24	High/Low absolute alarm	
	25	25	High/Low deviation alarm	
	26	26	High absolute /Low deviation alarm	
	27	27	High deviation /Low absolute alarm	
	28	28	High/Low absolute alarm (with hold)	
	29	29	High/Low deviation alarm (with hold)	
	30	30	High absolute /Low deviation alarm (with hold)	
	31	31	High deviation /Low absolute alarm (with hold)	

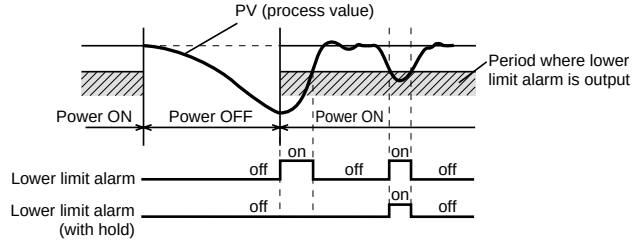
· Timer code

	ALM1	ALM2	Alarm type	Action diagram
Timer	32	32	ON delay timer	
	33	33	OFF delay timer	
	34	34	ON/OFF delay timer	

Point

What is alarm with hold?

The alarm is not turned ON immediately even when the process value is in the alarm band. It turns ON when it goes out the alarm band and enters again.



Note) · When alarm action type code is changed, alarm set value may also become different from previ ous settings.

Please check these parameters, turn off the power once, and then re-start the controller, before starting control.

· When selecting No.12 to 15, setting in ALM2, dLY2, and A2hy are effective, and output to the AL2 relay.

[Table 4] Control output action mode code

Parameter : P-n1

Code	Output	Control output action		Output at Burn-out*	
		Output 1	Output 2	Output 1	Output 2
0	Single (Control output 1)	Reverse action	---	Lower limit	---
1				Upper limit	
2		Direct action		Lower limit	
3				Upper limit	
4	Dual [Control output 1 and 2. Heating/Cooling]	Reverse action	Direct action	Lower limit	Lower limit
5				Upper limit	
6				Lower limit	Upper limit
7				Upper limit	
8		Direct action		Lower limit	Lower limit
9				Upper limit	
10				Lower limit	Upper limit
11				Upper limit	
12		Reverse action	Reverse action	Lower limit	Lower limit
13				Upper limit	
14				Lower limit	Upper limit
15				Upper limit	
16		Direct action		Lower limit	Lower limit
17				Upper limit	
18				Lower limit	Upper limit
19				Upper limit	

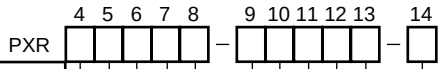
(*) Outputs when Error Indication Group I.
Please refer to 8 (Error indications).
This is effective even in Standby mode.

Lower limit: OFF or 4mA or less
Upper limit: ON or 20mA or more

[Caution for dual output] (option)

(1) Parameter “I” and “D” can not be set separately.
(2) In case “P”=0 (ON/OFF control) for heating side, cooling side becomes ON/OFF control automatically.
(3) In case “Cool” =0.0, cooling side becomes ON/OFF control. And hysteresis is fixed at 0.5%FS.

PXR Model Code Configuration



Digit	Specification			
4	<Size of front H X W>		3	
	24 X 48mm			
5	<Input signal>			
	Thermocouple °C		T	
	Thermocouple °F		R	
	RTD Pt100Ω 3-wire type °C		N	
	RTD Pt100Ω 3-wire type °F		S	
	1 to 5VDC		A	
	4 to 20mA DC		B	
6	<Control output 1>			
	Relay contact output		A	
	SSR / SSC driving output		C	
	4 to 20mA DC output		E	
7	<Control output 2>			Note 1
	None		Y	
	Relay contact output		A	
	SSR/SSC driving output		C	
	4 to 20mA DC output		E	
8	<Revision code>		1	
9	<Optional specification 1>			Note 1
	None		0	
	Alarm 1 point		1	
	8 ramps / soaks		4	
	Alarm 1 point + 8 ramps / soaks		5	
	Alarm 2 points		F	
	Alarm 2 points + 8 ramps / soaks		G	
10	<Instruction manual>	<Power supply voltage>		
	None	100 to 240VAC	N	
	Japanese	100 to 240VAC	Y	
	English	100 to 240VAC	V	
	None	24VAC/24VDC	C	
	Japanese	24VAC/24VDC	A	
	English	24VAC/24VDC	B	
11-13	<Optional specification 2>			
	None		0 0 0	
	RS-485 Modbus interface		M 0 0	
	RS-485 Z-ASCII interface		N 0 0	
	Retransmission + Digital input 1 point		Q 0 0	Note 2
	Retransmission		R 0 0	Note 2
	Digital input 2 points		T 0 0	
	RS-485 Modbus interface + Digital input 1 point		V 0 0	
	RS-485 Z-ASCII interface + Digital input 1 point		W 0 0	
14	<Non-standard specification>			
	Non-standard parameter setting		F	

Note 1) In case of 7th digit code "A", "C", or "E", the codes "F" and "G" in 9th digit are not available.

Note 2) In case of 11th digit code "Q", or "R", the codes "A", "C", "E" in 7th digit, "F", "G" in 9th digit and "A", "B", "C" in 10th digit are not available.

Specification

Power voltage:	100 (-15%) to 240 (+10%), 50/60Hz 24V AC 50/60Hz, 24V DC	
Power consumption:	6VA or less (100V AC), 8VA or less (240V AC, 24V AC/24V DC)	
Relay contact output:	SPST contact, 220V AC/30V DC 3A (resistive load)	
SSR/SSC driving output*1: (voltage pulse output)	ON: 15V DC (12 to 16V DC) OFF: 0.5V DC or less Maximum current: 20mA or less Resistive load: 600W or more	
4-20mA DC output*1:	Allowable load resistor: 100 to 500W	
Alarm output:	Relay contact (SPST contact) 220V AC / 30V DC 1A (resistive load)	
Communication function*2: (RS-485 interface)	Transmission system:	Half-duplex bit serial start-stop synchronization
	Transmission rate:	9600bps
	Transmission protocol:	In conformity to Modbus RTU or Z-ASCII (PXR protocol)
	Transmission distance:	Up to 500m (Total length)
	Connectable units:	Up to 31units
Digital input:	Number of input: 2 inputs MAX. Input contact capacity: 5V, 2mA DC	
Retransmission:	4 to 20mA DC Allowable load resistor: 500Ω or less Accuracy: ±0.3%FS (at 23°C)	
Operating ambient temperature:	-10 to 50°C -10 to 45°C (for mounting close together)	
Operating ambient humidity:	90%RH or less (no condensation)	
Preservation temperature:	-20 to 60°C	

*1 : The following table shows the difference of outputs among other micro-controller X series models.

	SSR/SSC driving output		Allowable load resistance for 4 to 20mA DC output
	Voltage	Maximum current	
PXR3	15V DC	20mA	100 to 500Ω
PXR4	24V DC	20mA	600Ω or less
PXV3	5.5V DC	20mA	600Ω or less
PXV/W/Z	24V DC	60mA	600Ω or less

*2 : For the connection with a PC, communication converter is required.

Modbus RTU : A trademark of Modicon Corp.,USA

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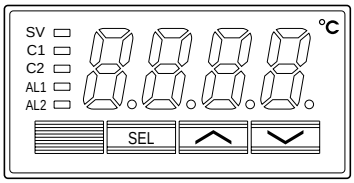


Micro-controller X

Model: PXR3

Operation Manual

ECNO:409a

Table of Contents

Model Specifications

PXR 4 5 6 7 8 – 9 10 11 12 13 – 14

digit	Specification	Note	
4	**<Size of front H x W>**		**3**
	24 × 48 mm		
5	**<Input signal>**		**T**
	Thermocouple °C		**R**
	Thermocouple °F		**N**
	RTD Pt100Ω 3-wire type °C		**S**
	RTD Pt100Ω 3-wire type °F		**A**
	1 to 5V DC		**B**
	4 to 20mA DC		
6	**<Control output 1>**		**A**
	Relay contact output		**C**
	SSR/SSC driving output		**E**
	4 to 20mA DC output		
7	**<Control output 2>**		**Y**
	None		**A**
	Relay contact output	Note 1	**C**
	SSR/SSC driving output	Note 1	**E**
	4 to 20mA DC output	Note 1	
8	**<Revision code>**		**1**
9	**<Optional specifications 1>**		**0**
	None		**1**
	Alarm 1 point		**4**
	8 ramps/soaks		**5**
	Alarm 1 point + 8 ramps/soaks		**F**
	Alarm 2 point	Note 2	**G**
	Alarm 2 point + 8 ramps/soaks	Note 2	
10	**<Instruction Manual> <Power supply voltage>**		**N**
	None 100 to 240V AC		**Y**
	Japanese 100 to 240V AC		**V**
	English 100 to 240V AC		**C**
	None 24V AC/24V DC		**A**
	Japanese 24V AC/24V DC		**B**
	English 24V AC/24V DC		
11	**<Optional specifications 2>**		**0 0 0**
12	None		**M 0 0**
13	RS-485 Modbus interface		**N 0 0**
	RS-485 Z-ASCLL interface		**Q 0 0**
	Retransmission + Digital input 1 point	Note 3	**R 0 0**
	Retransmission	Note 3	**T 0 0**
	Digital input 2 points		**V 0 0**
	RS-485 Modbus interface + Digital input 1 point		**W 0 0**
	RS-485 Z-ASCLL interface + Digital input 1 point		
14	**<Non-standard specification>**		**F**
	Non-standard parameter setting		

Note 1 Process alarm (2 points) (the codes " F and G " in the 9th digit) cannot be specified.

Note 2 Control output 2 (the codes " A, C, and E " in the 7th digit) cannot be specified.

Note 3 Control output 2, communication digital input (2 points), alarm (2 points), and 24V power supply (the codes " A, C and E " in the 7th digit, " F and G " in the 9th digit, and " A, B, and C " in the 10th digit) cannot be specified.

The default settings of input signals, measured ranges, and setting values are shown below.

Thermocouple specified : Thermocouple K, Measured range: 0 to 400°C, Setting value: 0°C

Resistance bulb specified : Pt, Measured range: 0 to 150°C, Setting value: 0°C

Voltage, Current specified : Scaling: 0 to 100%, Setting value: 0%

In any case other than the description above, specify input signals and measured range.

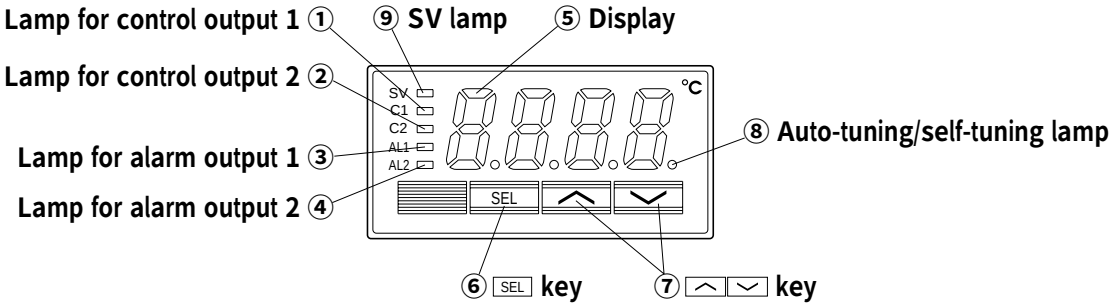
The input signals for the thermocouple and the resistance bulb can be switched with the front panel keys.

The default settings of control action is reverse for control output 1 and direct for control output 2.

The reverse and direct actions can be switched with keys on the face panel.

1 Part Names and Functions

This chapter explains the part names and functions on the face panel. The face panel has the PV and SV displays, the status indicating lamp, and the setting keys, etc. Those functions are explained below. Please read and understand them before using the PXR. For details about the setting of parameters, see Chapter 2.



Type: PXR3

① Lamp for control output 1
Lights up while control output 1 stays ON.

② Lamp for control output 2
Lights up while control output 2 stays ON.

③ Lamp for alarm output 1 (option)
Lights up when alarm output 1 is actuated. Flickers under ON-delay operation.

④ Lamp for alarm output 2 (option)
Lights up when alarm output 2 is actuated. Flickers under ON-delay operation.

⑤ Display
Displays the PV (process value) or SV (set value). When setting a parameter, its name or its value appears.

⑥ SEL key
Used to switch the PV display to/from the SV display and select a parameter block and a parameter, and register a set value.

⑦ ∧ ∨ keys
Used to change the SV, call parameters, and change parameter values.

⑧ Auto-tuning/self-tuning lamp
Flickers under an auto-tuning or self-tuning operation.

⑨ SV lamp
Displays the PV (process value) in normal condition (while the lamp stays out). Press the SEL key to light up the SV lamp and display the SV (set value). Note that the lamp stays out while parameters and data are displayed.
Flickers while the display shows the PV (process value) in standby state.

2 Operations

This chapter explains how to set the SV (Setting value) and the parameters for the PXR.

2-1 Parameter list

Parameters for the PXR are classified under three blocks according to the frequency of use. The parameters of the second and third blocks are used at initialization or when they are of absolute necessity.

Some parameters may not be displayed at the time of delivery depending on the type of the instrument.

Parameters of the first block

Parameter display symbol	Parameter name		Description		Setting range and factory default setting (*)	User's set value	Parameter mask DSP	Reference page
SrbY	Stby	Standby setting	Switches between RUN and Standby for control.		oN: Control standby (Output: OFF, Alarm: OFF) oFF: Control RUN*		dSP1-1	13
ProG	ProG	Ramp-soak control	Switches between Start, Stop, and Hold for ramp-soak control		oFF: Stop* rUn: Start HLd: Hold		dSP1-2	14
LACH	LACH	Alarm latch cancel	Cancels the alarm latch.		0: Keeps the alarm latch.* 1: Opens up the alarm latch.		dSP1-4	15
AT	AT	Auto-tuning	Used for setting the constants for P, I, and d by auto-tuning.		0: OFF (Resets the auto-tuning or does not use it.)* 1: ON (Performs the auto-tuning in the SV standard type.) 2: ON (Performs the auto-tuning in low PV type (SV value-10%FS).)		dSP1-8	16
TM-1	TM-1	Timer 1 display	Displays the remaining time of timer 1.		- (Unit: seconds)		dSP1-16	17
TM-2	TM-2	Timer 2 display	Displays the remaining time of timer 2.		- (Unit: seconds)		dSP1-32	17
AL 1	AL1	Set value of alarm 1	Sets the value at which alarm 1 is detected.	AL 1 is displayed when alarm type 1 is 0 to 15, or 32 to 34, and A1-H or A1-L is displayed when alarm type 1 is 16 to 31.	When the alarm type is absolute value: 0 to 100%FS (*:10) When the alarm type is deviation: -100 to 100%FS (*:10)		dSP1-128	18 *
A1-L	A1-L	Lower limit value of alarm 1	Sets the lower limit value at which alarm 1 is detected.				dSP2-1	18 *
A1-H	A1-H	Upper limit value of alarm 1	Sets the upper limit value at which alarm 1 is detected.				dSP2-2	18 *
AL2	AL2	Set value of alarm 2	Sets the value during which alarm 2 is detected.	AL2 is displayed when alarm type 2 is 0 to 15 or 32 to 34, and A2-H or A2-L is displayed when alarm type 2 is 16 to 31.	When the alarm type is absolute value: 0 to 100%FS (*:10) When the alarm type is deviation: -100 to 100%FS (*:10)		dSP2-4	18 *
A2-L	A2-L	Lower limit value of alarm 2	Sets the lower limit value at which alarm 2 is detected.				dSP2-8	18 *
A2-H	A2-H	Upper limit value of alarm 2	Sets the upper limit value at which alarm 2 is detected.				dSP2-16	18 *
LoC	LoC	Key lock	Specifies whether or not to allow the change of parameters.		0: All settings are changeable both from the face panel and via communication.* 1: All settings are unchangeable from the face panel, but changeable via communication. 2: Only the SV is changeable from the face panel, and all settings are changeable via communication. 3: All settings are changeable from the face panel, but unchangeable via communication. 4: All settings are unchangeable from the face panel or via communication. 5: Only the SV is changeable from the face panel, but all settings are unchangeable via communication.		dSP3-1	19

Note: The parameters for which * is marked with the page number in Reference page are related to Remedies of "4" on page 70.

Parameters of the second block

Note: The parameters for which * is marked with the page number in Reference page are related to Remedies of "4" on page 70.

Parameter display symbol	Parameter name		Description	Setting range and factory default setting (*)	User's set value	Parameter mask DSP	Reference page
P	P	Proportional band	Set P to 0.0 to select the ON/OFF control (Two-position control).	0.0 to 999.9% (*: 5.0)		dSP3-2	20
I	I	Integral time		0 to 3200 seconds (*: 240)		dSP3-4	21
d	D	Derivative time		0.0 to 999.9 seconds (*: 60.0)		dSP3-8	22
HYS	HYS	Hysteresis range for ON/OFF control	Sets the hysteresis for ON/OFF control.	0 to 50%FS (*: equivalent of 1.0°C)		dSP3-16	23 *
CooL	CooL	Cooling-side proportional band coefficient		0.0 to 100.0 (*: 1.0)		dSP3-32	24
db	db	Cooling-side proportional band shift		-50.0 to +50.0 (*: 0.0)		dSP3-64	25
bAL	bAL	Output convergence value		-100 to 100% (*: single 0.0, dual 50.0)		dSP3-128	26
Ar	Ar	Anti-reset windup		0 to 100%FS (*: 100%FS)		dSP4-1	26 *
CTrL	CTrL	Control algorithm	Selects the control algorithm.	PID: Runs normal PID control.* FUZY: Runs PID control with fuzzy logic. SELF: Runs PID control with self-running.		dSP4-2	27
SLFb	SLFb	PV (Measured value) stable range	Sets the PV stable range for the self-tuning operation.	0 to 100%FS (*: 2%FS)		dSP4-4	31 *
onoF	onoF	Setting HYS (Hysteresis) mode	Selects the hysteresis operation at ON/OFF control.	oFF: Starts the two-position control at the values of SV+HYS/2 and SV-HYS/2. on: Starts the two-position control at the values of SV and SV+HYS, or SV and SV-HYS.		dSP4-8	32
TC	TC	Cycle time of control output 1	Not shown at 4-20mA DC output	RLY, SSR: 1 to 150 seconds (*: Contact output = 30, SSR/SSC-driven output = 2)		dSP4-16	33
TC2	TC2	Cycle time of control output 2 (cooling-side)		RLY, SSR: 1 to 150 seconds (*: Contact output = 30, SSR/SSC-driven output = 2)		dSP4-32	34
P-n2	P-n2	Input signal code	Set this parameter when changing the types of temperature sensors.	1 to 16 (*: specified by customer while ordering) Note 1		dSP4-64	35
P-SL	P-SL	Lower limit of measuring range		-1999 to 9999 (*: specified by customer while ordering) Note 1		dSP4-128	36
P-SU	P-SU	Upper limit of measuring range		-1999 to 9999 (*: specified by customer while ordering) Note 1		dSP5-1	36
P-dP	P-dP	Setting the decimal point position		0 to 2 (*: specified by customer while ordering) Note 1		dSP5-2	38
P-F	P-F	°C / °F selection		°C / °F		dSP5-4	36
PVOF	PVOF	PV (Measured value) offset	Shift the display of the PV.	-10 to 10%FS (*: 0)		dSP5-8	39 *
SVOF	SVOF	SV (Setting value) offset	Shift the SV. But the SV display is not changed.	-50 to 50%FS (*: 0)		dSP5-16	40 *
P-dF	P-dF	Time constant of input filter		0.0 to 900.0 seconds (*: 5.0)		dSP5-32	41
ALM1	ALM1	Alarm type 1	Sets the types of alarm operations.	0 to 34 (*: 0/5)		dSP5-64	42
ALM2	ALM2	Alarm type 2	Sets the types of alarm operations.	0 to 34 (*: 0/9)		dSP5-128	42
STAT	STAT	Status display of ramp-soak		- (*: OFF)		dSP6-2	46
PTn	PTn	Selecting ramp-soak execute type	Selects ramp-soak patterns.	1: Performs 1st to 4th segments.* 2: Performs 5th to 8th segments. 3: Performs 1st to 8th segments.		dSP6-4	45
Sv-1	Sv-1	1st target value /Switching-SV value	Sets the 1st target SV of ramp-soak operation. / Selected at switching-SV function for DI1	Within the SV limit. (*: 0%FS)		dSP6-8	46 *
TM1r	TM1r	First ramp segment time	Sets the first ramp segment time.	0 to 99h59m (*: 0.00)		dSP6-16	46

Parameter display symbol	Parameter name		Description	Setting range and factory default setting (*)	User's set value	Parameter mask DSP	Reference page
rn 15	TM1S	1st soak segment time	Sets the 1st soak segment time.	0 to 99h59m (*: 0.00)		dSP6-32	46
Su-2	Sv-2	2nd target SV	Sets the 2nd target SV of ramp-soak operation.	Within the SV limit. (*: 0%FS)		dSP6-64	46*
rn2r	TM2r	2nd ramp segment time	Sets the 2nd ramp segment time.	0 to 99h59m (*: 0.00)		dSP6-128	46
rn25	TM2S	2nd soak segment time	Sets the 2nd soak segment time.	0 to 99h59m (*: 0.00)		dSP7-1	46
Su-3	Sv-3	3rd target SV	Sets the 3rd target SV of ramp-soak operation.	Within the SV limit. (*: 0%FS)		dSP7-2	46*
rn3r	TM3r	3rd ramp segment time	Sets the 3rd ramp segment time.	0 to 99h59m (*: 0.00)		dSP7-4	46
rn35	TM3S	3rd soak segment time	Sets the 3rd soak segment time.	0 to 99h59m (*: 0.00)		dSP7-8	46
Su-4	Sv-4	4th target SV	Sets the 4th target SV of ramp-soak operation.	Within the SV limit. (*: 0%FS)		dSP7-16	46*
rn4r	TM4r	4th ramp segment time	Sets the 4th ramp segment time.	0 to 99h59m (*: 0.00)		dSP7-32	46
rn45	TM4S	4th soak segment time	Sets the 4th soak segment time.	0 to 99h59m (*: 0.00)		dSP7-64	46
Su-5	Sv-5	5th target SV	Sets the 5th target SV of ramp-soak operation.	Within the SV limit. (*: 0%FS)		dSP7-128	46*
rn5r	TM5r	5th ramp segment time	Sets the 5th ramp segment time.	0 to 99h59m (*: 0.00)		dSP8-1	46
rn55	TM5S	5th soak segment time	Sets the 5th soak segment time.	0 to 99h59m (*: 0.00)		dSP8-2	46
Su-6	Sv-6	6th target SV	Sets the 6th target SV of ramp-soak operation.	Within the SV limit. (*: 0%FS)		dSP8-4	46*
rn6r	TM6r	6th ramp segment time	Sets the 6th ramp segment time.	0 to 99h59m (*: 0.00)		dSP8-8	46
rn65	TM6S	6th soak segment time	Sets the 6th soak segment time.	0 to 99h59m (*: 0.00)		dSP8-16	46
Su-7	Sv-7	7th target SV	Sets the 7th target SV of ramp-soak operation.	Within the SV limit. (*: 0%FS)		dSP8-32	46*
rn7r	TM7r	7th ramp segment time	Sets the 7th ramp segment time.	0 to 99h59m (*: 0.00)		dSP8-64	46
rn75	TM7S	7th soak segment time	Sets the 7th soak segment time.	0 to 99h59m (*: 0.00)		dSP8-128	46
Su-8	Sv-8	8th target SV	Sets the 8th target SV of ramp-soak operation.	Within the SV limit. (*: 0%FS)		dSP9-1	46*
rn8r	TM8r	8th ramp segment time	Sets the 8th ramp segment time.	0 to 99h59m (*: 0.00)		dSP9-2	46
rn85	TM8S	8th soak segment time	Sets the 8th soak segment time.	0 to 99h59m (*: 0.00)		dSP9-4	46
Mod	Mod	Ramp-soak mode	Selects the power-on start, repeat, and standby functions for ramp-soak operations.	0 to 15 (*: 0)		dSP9-8	46

Note 1: When a customer does not specify the settings while ordering, the following settings are selected as factory defaults.

Thermocouple input: Thermocouple K Measured range: 0 to 400°C

Resistance bulb input: Measured range: 0 to 150°C

Voltage/Current input: Scaling: 0 to 100%

Parameters of the third block

Note: The parameters for which * is marked with the page number in Reference page are related to Remedies of "4" on page 70.

Parameter display symbol	Parameter name		Description	Setting range and factory default setting (*)	User's set value	Parameter mask DSP	Reference page
P-n1	P-n1	Control action	Specifies control action and output at the input burn-out.	0 to 19 (*: specified by customer while ordering) Note 2		dSP9-16	49
Su-L	Sv-L	SV (Setting value) lower limiter	Sets the lower limit of the SV.	0 to 100%FS (*: 0%FS)		dSP9-32	50*
Su-H	Sv-H	SV (Setting value) upper limiter	Sets the upper limit of the SV.	0 to 100%FS (*: 100%FS)		dSP9-64	50*
dLY1	dLY1	Delay time 1	Delay time or timer value for alarm 1 relay.	0 to 9999 seconds (*: 0)		dSP9-128	51
dLY2	dLY2	Delay time 2	Delay time or timer value for alarm 2 relay.	0 to 9999 seconds (*: 0)		dSP10-1	51
A1hy	A1hy	Alarm 1 hysteresis	Sets the hysteresis range of ON and OFF of alarm 1.	0 to 50%FS (*: 1)		dSP10-16	53*
A2hy	A2hy	Alarm 2 hysteresis	Sets the hysteresis range of ON and OFF of alarm 2.	0 to 50%FS (*: 1)		dSP10-32	53*
A1oP	A1oP	Alarm 1 options	Sets the optional functions of alarms 1 and 2. 8888 — Alarm latch (1: use, 0: not use); Alarm of error status (1: use, 0: not use); De-energized output (1: use, 0: not use)	000 to 111 (*: 000)		dSP10-128	54
A2oP	A2oP	Alarm 2 options		000 to 111 (*: 000)		dSP11-1	54
PLC1	PLC1	Lower limit for output 1	Sets the lower limit for output 1.	-3.0 to 103.0% (*: -3.0)		dSP11-4	56
PHC1	PHC1	Upper limit for output 1	Sets the upper limit for output 1.	-3.0 to 103.0% (*: 103.0)		dSP11-8	56
PLC2	PLC2	Lower limit for output 2	Sets the lower limit for output 2.	-3.0 to 103.0% (*: -3.0)		dSP11-16	56
PHC2	PHC2	Upper limit for output 2	Sets the upper limit for output 2.	-3.0 to 103.0% (*: 103.0)		dSP11-32	56
PCUT	PCUT	Output limit types	Sets the limit types of outputs 1 and 2 (breaking the limit, or maintained within the limit).	0 to 15 (*: 0)		dSP11-64	57
oUT1	oUT1	Output value (MV) display	Displays the value of output 1.	-		dSP11-128	58
oUT2	oUT2	Output value (MV) display	Displays the value of output 2.	-		dSP12-1	58
rCJ	rCJ	RCJ (Cold junction compensation) setting	Sets the cold junction compensation function to ON/OFF.	ON: Performs the RCJ (Cold junction compensation).* OFF: Does not perform the RCJ (Cold junction compensation).		dSP12-2	59
GAin	GAin	PV gradient		0.001 to 2.000 (*: 1.000)		dSP12-4	
AdJ0	AdJ0	User-definable zero adjustment	Shifts the zero point of input value.	-50 to 50%FS (*: 0)		dSP12-8	60*
AdJS	AdJS	User-definable span adjustment	Shifts the span of input value.	-50 to 50%FS (*: 0)		dSP12-16	60*
di-1	di-1	DI1 (Digital input 1) operation	Sets the DI1 operations.	0 to 12 (*: 0=OFF)		dSP12-32	61
di-2	di-2	DI2 (Digital input 2) operation	Sets the DI2 operations.	0 to 12 (*: 0=OFF)		dSP12-64	61
STno	STno	Station No.	Sets the station No. for communication.	0 to 255 (Setting to 0 does not start the communications function.) (*: 1)		dSP12-128	64
CoM	CoM	Parity setting	Sets the parity for communication. (The baud rate is fixed at 9600bps.	0: Odd parity* 1: Even parity 2: No parity		dSP13-1	65
PYP	PYP	Input type for PYP (Color Touch-Operation Unit)	Sets the input type for communicating with PYP.	0 to 255 (*: 34)		dSP13-2	66
Ao-T	Ao-T	Retransmission output type	Selecting retransmission output type.	0: PV/ 1: Set point/ 2: Output/ 3: Error (* : 0)		dSP13-4	67
Ao-L	Ao-L	Retransmission base scale	Setting retransmission base scale.	(Setting range: 0 to 100%) (* : 0%)		dSP13-8	68
Ao-H	Ao-H	Retransmission span scale	Setting retransmission span scale.	(Setting range: 0 to 100%) (* : 100%)		dSP13-16	68

Note 2: The following settings are selected as factory defaults depending on the model you order.

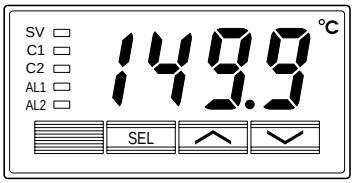
Seventh digit = Y model: 0 Seventh digit = A, C, E model: 4

Parameter display symbol	Parameter name		Description	Setting range and factory default setting (*)	User's set value	Parameter mask DSP	Reference page
dSP1 to dSP9 dP10 to dP13	**dSP1** to **dSP9** **dSP10** to **dSP13**	Parameter mask	Sets whether or not to display each parameter.	0 to 255 (*: specified by customer while ordering)		–	69

2-2 Basic operations

Just after power-on:

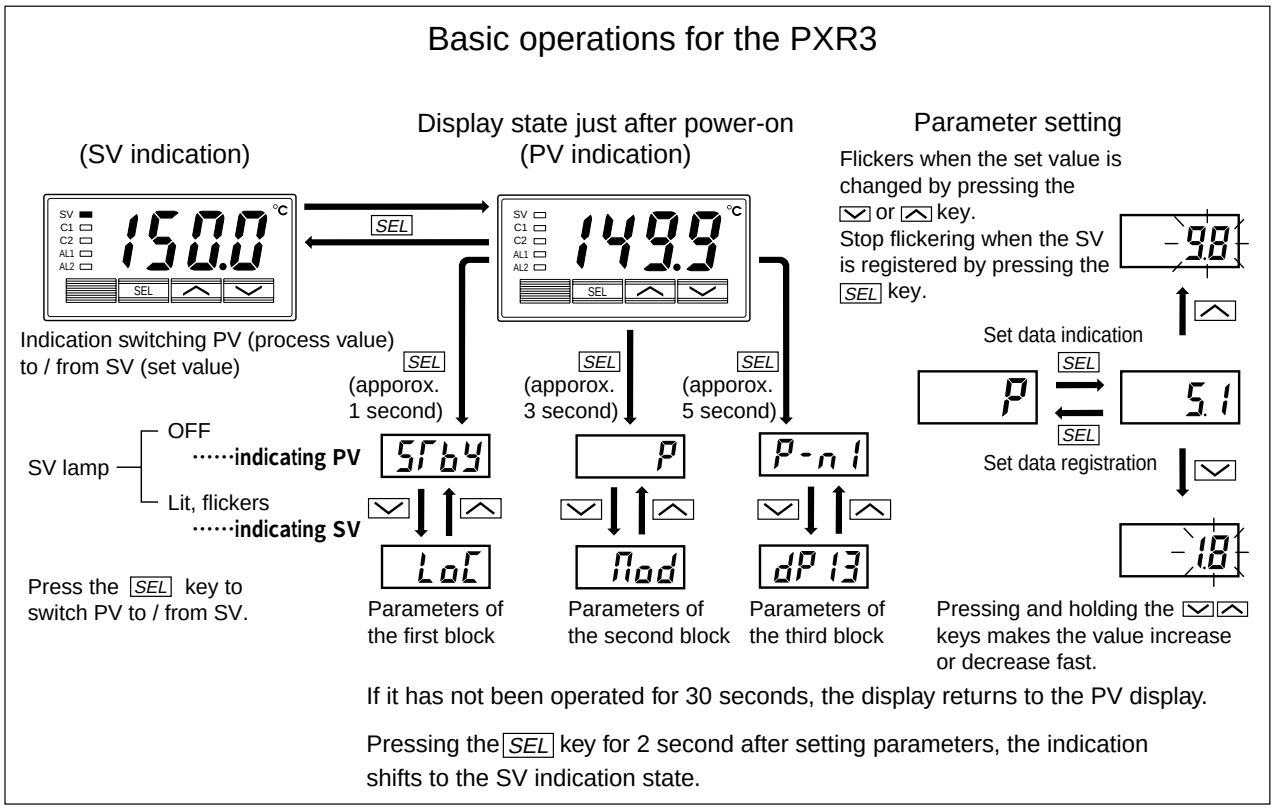
The PV (process value) is displayed just after power-on.



Exp.) In case when the PV (process value) is 149.9.

How to switch parameters:

The figure below shows the basic operations for the PXR3.



How to set values:

△ key: One press increases the value by 1.

Press and hold this key to increase the value.

▽ key: One press decreases the value by 1.

Press and hold this key to decrease the value.

How to register the set data:

By pressing the SEL key, the displayed values are registered.

Note that the SV (SV0) will be registered in 3 seconds without any operation. (Refer to P.12)

When changed the parameters "P-n2", "ALM1" or "ALM2", turn the power OFF and ON.

2-3 Parameter functions and method of settings

Method of setting the SV (Setting value)

[Description]

- The SV is a target value for control.
- Any SV that is outside of the range set in the parameters of SV-L (lower limit) and SV-H (upper limit) of the third block cannot be set. (See page 50.)

Related parameters: SV-L (page 50)
SV-H (page 50)

[Setting example] Changing the SV from 250.0°C to 348.7°C

Display	Operating procedure
1499 PV indication 2500 SV indication 3487	1. Press the SEL key to display the SV. (SV lamp is lit.) 2. Press the ^ or v keys to display 348.7. 3. 348.7 will be registered in the SV (front SV) in three seconds. After that, the controller will operate with the SV being 348.7.

① First block parameters

SrbY Standby setting (Settings: oFF/on)

[Description]

- This parameter switches the control between RUN and Standby.
- During standby, the control output and the alarm output stay OFF, like the standby for ramp-soak operation. Retransmission output is kept operated. (However, if the type of retransmission output is set to the MV, it becomes 4mA or lower.)
- While the alarm with a hold is selected, the hold function takes effect after changing the Standby setting from ON to OFF.
- SrbY is displayed during the standby for ramp-soak operations or the controller changes to the standby state in case of the occurrence of errors.
- The other operations are the same as those of the ramp-soak standby.
- The setting of ON/OFF for standby is saved after power-off.
- When the standby is set to ON during the auto-tuning, self-tuning, and ramp-soak operations, those operations will stop. (The PID constant will not be renewed.) Even through it is set to OFF later, the auto-tuning, self-tuning, and ramp-soak operations will not be re-started.
- During standby, the ON-delay timer is reset. When returning to RUN from the standby state, the timer will start from the beginning.
- The SV lamp flickers only when standby state.

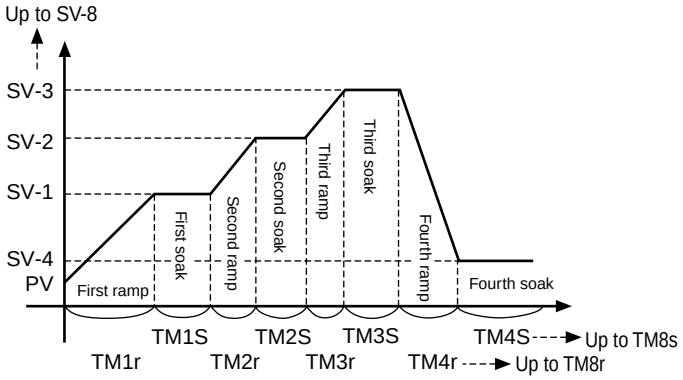
[Setting example] Starting the control

Display	Operating procedure
1499 PV indication SrbY	1. Press and hold the SEL key for one second. SrbY will be displayed.
oFF	2. Press the SEL key once. The current setting (oFF) will be displayed.
on	3. Press the ^ or v keys to flicker and to display on.
SrbY	4. Press the SEL key once. The standby state for control is selected. (control output and all the alarm outputs: OFF) (Repeat the procedure from 2 to 4 to check the set value.)
2500 SV indication	5. If you want to display the operation status, press and hold the SEL key for two seconds. The value on the SV display will flash, indicating the standby status.
1499 PV indication	If unoperated state continues, the PV will be displayed.

ProG Ramp-soak control (Settings: oFF/rUn/hLd) (Option)

[Description]

- This function automatically changes the SV (Setting value) according to the program pattern set in advance as shown in the right line graph. Up to eight pairs of ramp-soak operation can be programmed.
- The first ramp starts at the PV (Measured value) that is the one just before running the program.
- The program can also automatically run at power-on (Power-on starting function). Refer to the parameter of Mod (page 46).



Ramp: the section in which the SV changes toward the target value.
Soak: the section in which the SV is the target value, and remains unchanged.

Related parameters: SrAr (page 46)
Su-1 to Su-8 (page 46)
rM1r to rM8r (page 46)
rM1S to rM8S (page 46)
Mod (page 46)
PrM (page 45)

[Setting example] Starting the ramp-soak operation

Display	Operating procedure
1499 PV indication SrbY	1. Press and hold the SEL key for one second. SrbY will be displayed.
ProG	2. Press the ∨ key to display ProG .
oFF	3. Press the SEL key once. The current setting (oFF) is displayed.
rUn	4. Pressing the ∧ or ∨ keys, the display flickers and rUn is displayed.
ProG	5. Press the SEL key once. Then, the program will start according to the ramp-soak pattern that is set in advance. *1 (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV is displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

*1) When the program was not set, it is turned to End.

LACH Canceling the alarm latch (Setting range: 0/1) (Option)

[Description]

- This parameter cancels the alarm latch when it is latching.

Related parameters:
A1oP to A2oP (page 54)

[Setting example] Opening up the alarm latch

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for one second.
SrbY	SrbY will be displayed.
LACH	2. Press the ∨ key to display LACH.
0	3. Press the SEL key once. The current setting (0) is displayed.
0	4. Pressing the ∧ or ∨ keys to flicker and to display 1.
LACH	5. Press the SEL key once. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV is displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

AT Auto-tuning function (Settings: 0/1/2)

[Description]

[Note]

If the controller is powered off during auto-tuning, this makes the auto-tuning ineffective with each parameter of P, I, and d unchanged. To start the auto-tuning operation, set AT to "1" or "2" again.

- To suspend the auto-tuning, set AT to "0". This makes the auto-tuning cancel with each parameter of P, I, and d unchanged.
- Once the parameters of P, I, and d are set automatically by the auto-tuning, those parameters are stored in the controller even after it is powered off. Therefore, it is not necessary to execute the auto-tuning again.
- By setting AT to "1" or "2" , the auto-tuning operation starts, and at the end of the tuning, 0 will be displayed automatically to AT.
- After the auto-tuning operation, the controller starts to operate at the automatically set values of P, I, and d.
- A decimal point at the right end of the SV display flashes during auto-tuning.
- There are two codes for AT:
  Setting code [1]: SV standard type
  Performs the auto-tuning based on the SV.
  Setting code [2]: Low PV type
  Performs the auto-tuning based on the SV-10%FS.

[Note]

Since ON/OFF control is performed during auto-tuning, overshoot against the SV may occur. To reduce the overshoot, execute the auto-tuning operation with the setting code [2] (Low PV) selected.

- The auto-tuning can be executed both just after power-on and in a control or stable status.

Related parameters:

P (page 20)
I (page 21)
d (page 22)
Ar (page 26)
CooL (page 24)

[Setting example] Setting the auto-tuning operation to 1

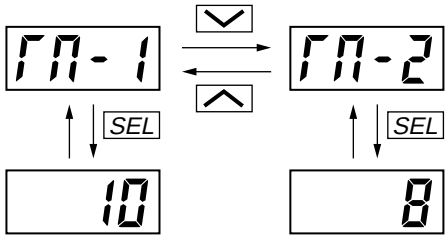
Display	Operating procedure
1499 PV indication STBY	1. Press and hold the SEL key for one second. STBY will be displayed.
AT	2. Press the ∨ key to display AT.
0	3. Press the SEL key once. The current setting (0) is displayed.
1	4. Press the ∧ or ∨ keys to flicker the display and to display 1.
AT	5. Press the SEL key once. AT is displayed and the auto-tuning will start. During auto-tuning, a decimal point at the first digit from the right end of the display flickers. (Repeat the procedure from 3 to 5 to check the set value.)
1499 PV indication	6. When the auto-tuning finishes properly, a decimal point stops flashing, and the set values of P, I, and d parameters change. When the auto-tuning finishes abnormally, a decimal point stops flashing, but the set values of P, I, and d parameters remain unchanged.
2500 SV indication	7. If you want to display the operation status, press and hold the SEL key for two seconds. The SV is displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

rn-1, rn-2 Displaying ON-delay alarm or the remaining time of timers (unit: seconds) (Option)

[Description]

- These parameters display the remaining time of Timers 1 and 2.
- The remaining time of the ON/OFF-delay timer is counted down. When the counter shows 0, the alarm relay is closed.
- During count-down, if the PV changes to the value of the temperature at which the alarm is set to OFF, or if "DI" for the timer is set to OFF, the counter is reset, and the alarm relay is opened.

- rn-1, rn-2 display parameter



[Setting example] Displaying ON-delay alarm or the remaining time of timers

Display	Operating procedure
1499 PV indication SrbY	1. Press and hold the SEL key for one second. SrbY will be displayed.
rn-1 10	2. Press the ∨ key to display rn-1. By pressing the SEL key, the remaining time (10 seconds) of the timer 1 will be displayed. Pressing the SEL key again, it returns to rn-1 display.
rn-2 8	3. Press the ∨ key to display rn-2. By pressing the SEL key, the remaining time (8 seconds) of the timer 2 will be displayed. Pressing the SEL key again, it returns to rn-2 display.
2500 SV indication	4. If you want to display the operation status, press and hold the SEL key for two seconds. The SV is displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

AL 1	AL2	Setting alarm 1 and 2	(Setting range: Absolute value alarm: 0 to 100%FS Deviation value alarm: -100 to 100%FS)
A1-H	A2-H	Upper limit of alarm 1 and 2	
A1-L	A2-L	Lower limit of alarm 1 and 2	(Option)

[Description]

- These parameters are used to for settings of alarm 1 and 2.
- When the alarm type (ALM1 or ALM2) is set to 0 to 15, alarms 1 and 2 (AL 1 and AL2) can be set.
- When the alarm type (ALM1 or ALM2) is set to any value other than 0 to 15, the upper and lower limits of alarm 1 and 2 (A1-H, A2-H, A1-L, A2-L) can be set.

[Note]

Setting codes (12 to 15) cannot be selected in alarm type 1 (ALM1).

Related parameters: ALM1, ALM2 (page 42)
A1HY, A2HY (page 53)
dLY1, dLY2 (page 51)
A1oP, A2oP (page 54)

[Setting example] Setting the operation value of alarm 2 to -10°C

Display	Operating procedure
1499 PV indication SrbY	1. Press and hold the SEL key for one second. SrbY will be displayed.
AL2	2. Press the ∨ key to display AL2.
10.0	3. Press the SEL key once. The current setting (10.0) will be displayed.
-10.0	4. Press the ∧ or ∨ keys to flicker and to display -10.0.
AL2	5. Press the SEL key once. AL2 will be displayed and the operation value -10°C will be registered for AL2 . After that, the controller will operate with the operation value of AL2 = -10°C. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

LoC Key lock (Setting range: 0–5)

[Description]

- This parameter makes the set values of parameters unchangeable. However, the parameter name and the set values can be displayed.
- To reset the key lock, change to 0 .
- Even when the key lock is set, control and alarm functions can operate properly.
- There are six levels of the key lock:
  - 0 : Unlocked (reset)
  - 1 : All settings are unchangeable from the controller, but changeable via communication.
  - 2 : Only the SV is changeable from the controller, and all settings are changeable via communication.
  - 3 : All settings are changeable from the controller, but unchangeable via communication.
  - 4 : All settings are unchangeable from the controller or via communication.
  - 5 : Only the SV is changeable from the controller, but all settings are unchangeable via communication.

[Setting example] Setting the key lock to “2”

Display	Operating procedure
1499 PV indication SrbY	1. Press and hold the SEL key for one second. SrbY will be displayed.
LoC	2. Press the ∨ key to display LoC .
0	3. Press the SEL key once. The current setting (0) will be displayed.
2 (flickering)	4. Press the ∧ or ∨ keys to flicker and to display 2 .
LoC	5. Press the SEL key once. LoC will be displayed and "2" will be registered for LoC . After that, any setting other than the SV cannot be changed from the front panel. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

② Second block parameters

P Proportional band (Setting range: 0.0 to 999.9% of the measured range)

[Description]

- To select the ON/OFF control (two-position control), set P to 0.0. It is not necessary to set I and d.
- P can be automatically set by the auto-tuning operation.
- When P is too small, control will be unstable, and when P is too large, the response will be delayed.
- Set the hysteresis of the ON/OFF control (two-position control) in the parameter HYS.
- If auto-tuning is run after the ON/OFF control is selected, the ON/OFF control changes to the PID control. To keep the ON/OFF control selected, do not execute the auto-tuning.

Related parameters: HYS (page 23)
onoF (page 32)

[Setting example] Changing the proportional band from 5.0% to 15.0%

Display	Operating procedure
1499 PV indication P	1. Press and hold the SEL key for three seconds. P will be displayed.
5.0	2. Press the SEL key once. The current setting (5.0) will be displayed.
15.0	3. Press the ∧ or ∨ keys to flicker and to display 15.0.
P	4. Press the SEL key once. P will be displayed and the 15.0% will be registered for P. After that, the controller will operate with P being 15.0%. (Repeat the procedure from 2 to 4 to check the set value.)
2500 SV indication	5. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

Integral time (Setting range: 0 to 3200 seconds)

[Description]

- $\overline{I}$ can be set automatically by the auto-tuning operation.
- $\overline{I}$ can also be set manually.
- When $\overline{I}$ is set to 0, the integral operation does not start.
- When P is set to 0.0, this makes the setting of $\overline{I}$ ineffective.

[Setting example] Changing the integral time from 240 seconds to 600 seconds

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
$\overline{I}$	2. Press the ∨ key to display $\overline{I}$.
240	3. Press the SEL key once. The current setting (240) will be displayed.
600	4. Press the ∧ or ∨ keys to flicker and to display 600.
$\overline{I}$	5. Press the SEL key once. 600 will stop flashing and will be registered for $\overline{I}$. After that, the controller will operate with $\overline{I}$ being 600 seconds.
	(Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

d Derivative time (Setting range: 0.0 to 999.9 seconds)

[Description]

- d can be set automatically by the auto-tuning operation.
- d can also be set manually.
- When d is set to 0, the differential operation does not start.
- When P is set to 0.0, this makes the setting of d ineffective.

[Setting example] Changing the differential time from 60.0 seconds to 50.0 seconds

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
d	2. Press the ∨ key to display d.
60.0	3. Press the SEL key once. The current setting (60.0) will be displayed.
50.0	4. Press the ∧ or ∨ keys to flicker and to display 50.0.
d	5. Press the SEL key once. d will be displayed and 50.0 seconds will be registered for d. After that, the controller will operate with d being 50.0 seconds. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

HYS Hysteresis range for ON/OFF control (Setting range: 0 to 50%FS)

[Description]

- To select the ON/OFF control (two-position control), set P to 0.0. It is not necessary to set I and d.
- When the hysteresis range (Range of ON/OFF control) is too small, the output may switch the ON/OFF frequently. (This may affect the life of the device to be controlled, especially when contact output is selected.)
- The unit of the set value of this parameter is ºC or ºF (engineering unit). The setting range varies according to the measured range of input.

[Ex] Input Thermocouple K : At measured range of 0 to 400 ºC, the setting range is 0 to 200 ºC.

Resistance bulb : At measured range of 0 to 150 ºC, the setting range is 0 to 75 ºC.

Related parameters: P (page 20)
onoF (page 32)

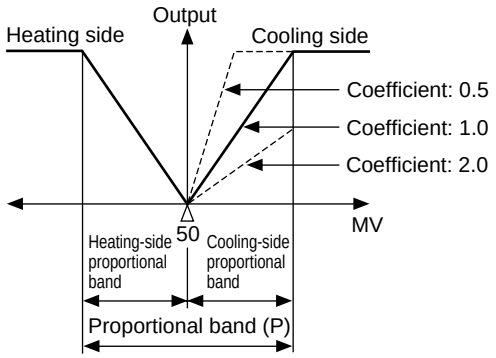
[Setting example] Changing the hysteresis range from 1˚C to 35˚C

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
HYS	2. Press the ∨ key to display HYS.
1	3. Press the SEL key once. The current setting (1) will be displayed.
35	4. Press the ∧ or ∨ keys to flicker and to display 35.
HYS	5. Press the SEL key once. HYS will be displayed and 35˚C will be registered for HYS. After that, the controller will operate with the HYS being 35˚C. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

CoolL Cooling-side proportional band coefficient (Option: Available for DUAL output only) (Setting range: 0.0 to 100.0)

[Description]

- This parameter is used for setting the cooling-side proportional band. (See the figure below.)



- Before setting the cooling-side proportional band, set the heating-side proportional band to an optimum value. To select the two-position control for the cooling side, set CoolL to 0.0.

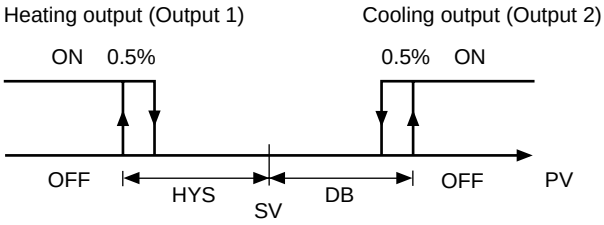
$$\text{Cooling-side proportional band} = \frac{\text{Proportional band (P)}}{2} \times \text{Coefficient}$$

Ex) When making the proportional band of 10% of the full scale with the proportional band (P) being 50%:

$$10\% = \frac{50\%}{2} \times \text{Coefficient}$$

Consequently, the coefficient is 0.4.

- When P is set to 0.0 and CoolL is set to 0.0 in the dual output type, the cooling output is as shown in the figure below. The hysteresis is fixed at 0.5%FS.



Related parameters: HYS (page 23)
P (page 20)

[Setting example] Changing the cooling-side proportional band coefficient from 1.0 to 2.5

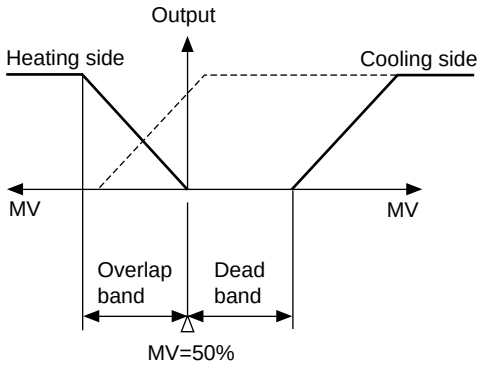
Display	Operating procedure
1499 PV indication P	1. Press and hold the SEL key for three seconds. P will be displayed.
CoolL	2. Press the ∨ key to display CoolL.
10	3. Press the SEL key once. The current setting (10) will be displayed.
2.5	4. Press the ∧ or ∨ keys to flicker and to display 2.5.
CoolL	5. Press the SEL key once. CoolL will be displayed and 2.5 will be registered for CoolL. After that, the controller will operate with the CoolL being 2.5. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

db Cooling-side proportional band shift (Dead band/Overlap band)

(Option: Available for DUAL output only) (Setting range: -50.0 to +50.0)

[Description]

- This parameter is used for shifting the cooling-side proportional band from the set value. (See the figure below.)



- When db is a positive value, it is called the "Dead band", and when it is a negative value, the "Overlap band".
- Since the unit of db is same one used for MV [%], if you want to set db in the unit of deviation [%], db must be converted using the equation below.

$$\text{DB [\%]} = \text{Deviation} \times \frac{100}{\text{P}} \text{ [\%]}$$

Ex) When making a dead band with a deviation of 1.0 [%] from the SV while the proportional band (P) is 5.0%:

$$\text{DB [\%]} = 1.0 \times \frac{100}{5.0} = 20 \text{ [\%]}$$

Consequently, set the parameter db to 20 [%].

- Related parameter: P (page 20)

[Setting example] Shifting the cooling-side proportional band by 2.0

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
db	2. Press the ∨ key to display db.
0.0	3. Press the SEL key once. The current setting (0.0) will be displayed.
−2.0	4. Press the ∧ or ∨ keys to flicker and to display 2.0.
db	5. Press the SEL key once. db will be displayed and 2.0 will be registered for db. After that, the controller will operate with db being 2.0 %. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

bAL Output offset value (Setting range: -100.0 to 100.0 %)

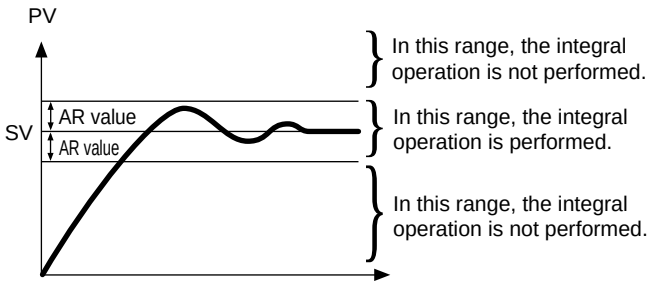
Ar Anti-reset windup (Setting range: 0 to 100%FS)

[Description]

- The anti-reset windup (Ar) is automatically set to an optimum value by the auto-tuning operation.
  By setting bAL, the amount of overshoot can be adjusted.

[Note]

By making use of the fuzzy control system equipped with PXR, the amount of overshoot can be minimized without setting bAL and Ar.



[Setting example] Changing the anti-reset windup from 60˚C to 80˚C.

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
Ar	2. Press the ∨ key to display Ar.
60.0	3. Press the SEL key once. The current setting (60.0) will be displayed.
80.0	4. Press the ∧ or ∨ keys to flicker and to display 80.0.
Ar	5. Press the SEL key once. Ar will be displaed and 80˚C will be registered for Ar. After that, the controller will operate with the Ar being 80˚C. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

CTrL Control algorithm (Settings: PID/FUZY/SELF)

[Description]

- This parameter is used for selecting PID control, FUZZY-PID control, or PID control with self-tuning.
- To select the PID control or FUZZY-PID control, it is necessary to set the parameters of P, I, d, and Ar manually or by the auto-tuning in advance.
- For the ON/OFF control (Two-position control), select the PID control and then set P to 0.0. For detailed information, refer to P (page 20).
- Refer to the next page for the PID control with self-tuning.

[Setting example] Changing the control system from PID to FUZZY

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
CTrL	2. Press the ∨ key to display CTrL.
PId	3. Press the SEL key once. The current setting (PId) will be displayed.
FUZY	4. Press the ∧ or ∨ keys to flicker and to display FUZY.
CTrL	5. Press the SEL key once. CTrL will be displayed and FUZZY will be registered fo CTrL. After that, the controller will operate with the FUZZY control system activated. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

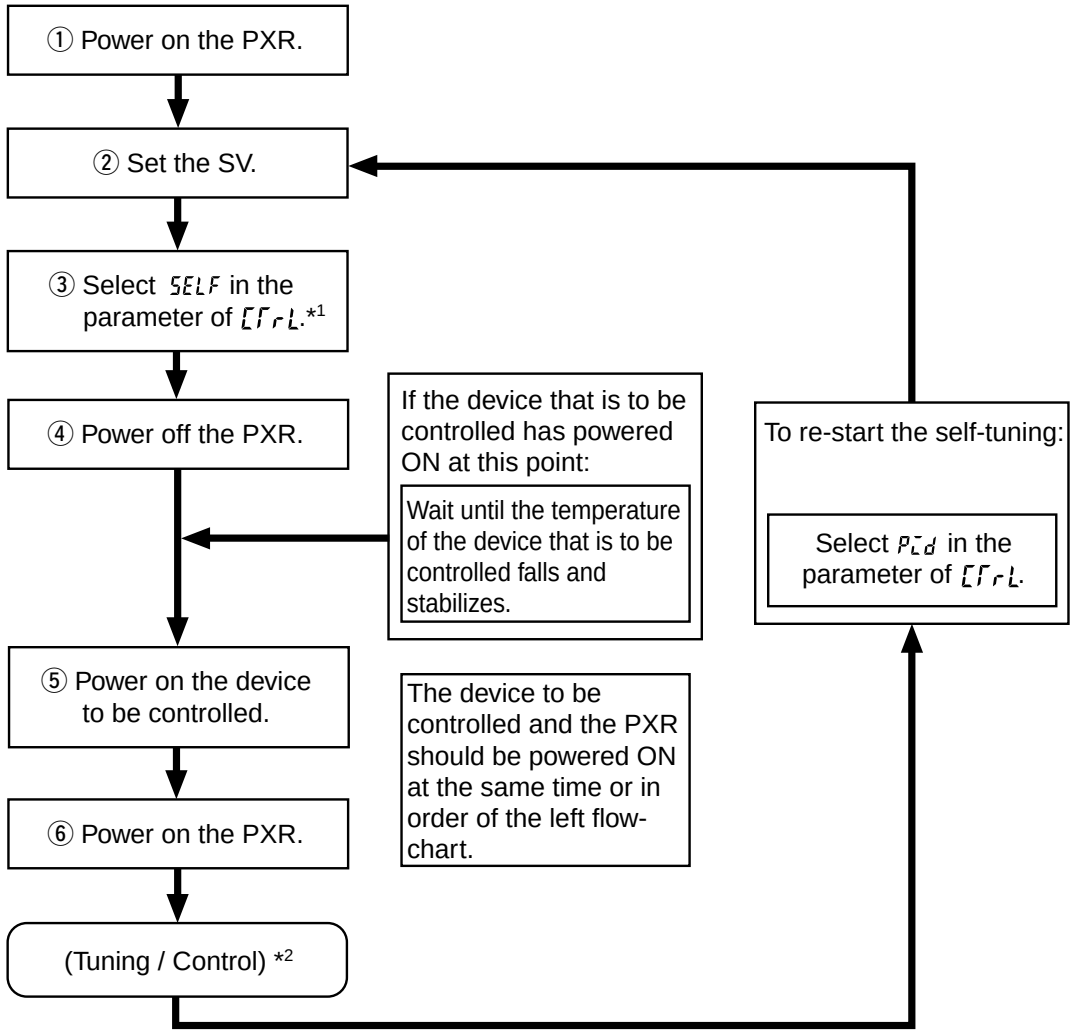
[Self-tuning]

1 Function:

With the self-tuning function, PID parameters are automatically re-optimised depending on the actual condition of device to be controlled and the setting temperature (SV).

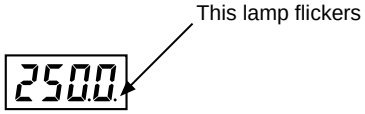
2 How to execute:

Follow the procedure shown below to set and execute the self-tuning. The self-tuning starts to run at the appropriate conditions. (See page 27)



*1: How to set the parameter of CTrL:

*2: Display during self-tuning is shown below:



3 Conditions under which the self-tuning runs:

① At power-on:

The self-tuning runs when all of the following conditions are met.

- The SV that appears at power-on is not the same one when the P , I , d , and Ar were set previously. (i.e. P , I , d , and Ar set by the self-tuning, auto-tuning, manual setting, and writing by communications tools at previous time)
- The (SV-PV) at power-on is larger than (the value of P × input range) or (the set value of SLFb).

② When the SV is changed:

The self-tuning runs when all the conditions below are met.

- The changed SV is larger than the SV that was set when the P , I , d , and Ar were selected previously.
- The changed amount of the SV is larger than 0.
- The changed amount of the SV is larger than (the set value of P × input range) or (the set value of SLFb).

③ When output becomes unstable:

The self-tuning runs when control becomes unstable and the hunting of the operating output (MV) occurs. (The self-tuning runs only once as long as the SV is not changed.)

④ When the control standby mode is cancelled:

The self-tuning runs by the same reason as "① At power-on" are met.

* Only when the PXR is set to standby mode at power-on.

4 Conditions under which the self-tuning does not run:

① During control standby mode
② During two-position control (Parameter of P = 0)
③ During auto-tuning operation
④ During ramp-soak operation
⑤ Error display (LLLL or UUUU is displayed.)
⑥ During dual output (The set value of the parameter of P-n1 is larger than 4.)
⑦ When setting the parameters of P , I , d , and Ar manually (including the setting written by communications tools)

5 Conditions under which the self-tuning is suspended:

① At the condition described in 4 shown above
② When the SV is changed during self-tuning operation
③ When the self-tuning operation can not be completed within approx. 9 hours

6 Caution

① Once the PID constant is set, the self-tuning does not operate at next power-on as long as the SV is not changed.
② For an accurate tuning, be sure to power on the device to be controlled before or at the same time as the PXR is powered on. If the PXR has to be powered on first for reasons of the system configuration, perform the auto-tuning with the PID or FUZZY control.
③ If the device to be controlled is powered on under temperature change (especially when it rises), accurate tunings can not be performed. Be sure to power on the PYX when the temperature of device to be controlled is stabilized.
④ The self-tuning does not run for cooling system control under Direct Action output (Parameter P-n1 = 2 or 3).
⑤ In case the control is not stable after performing the self-tuning, change the algorithm to the PID or FUZZY control and perform the auto-tuning.

7 Reference [About the self-tuning method]

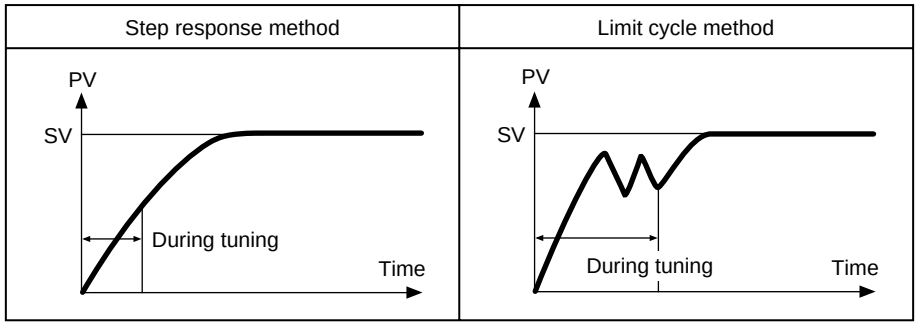
The PID constant is calculated in one of the following two methods.

The method is selected automatically depending on the characteristics of the device to be controlled.

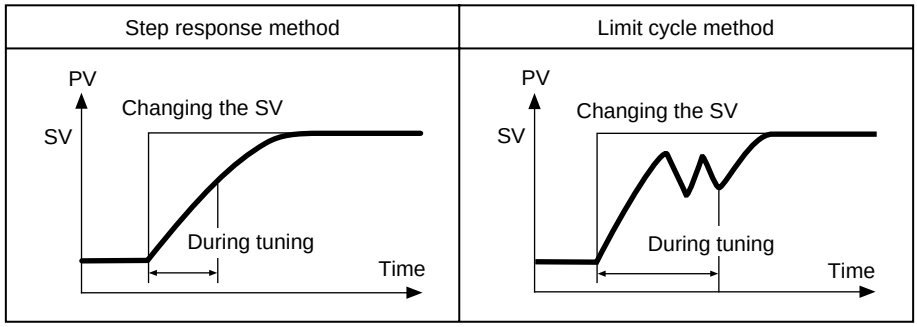
- Step response method
- Limit cycle method

The following figures show the operations at power-on and changing the SV, and under unstable control.

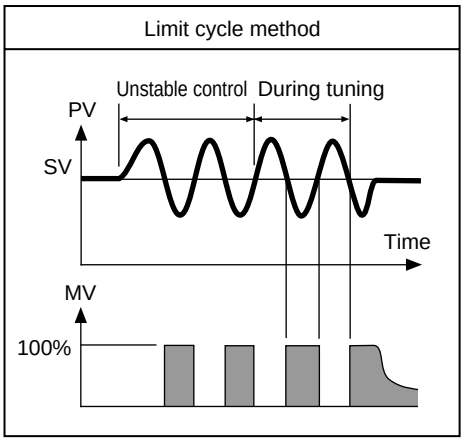
① Operations at power-on



② Operations at changing the SV



③ Operation under unstable control



SLFb PV (Measured value) stable range (Setting range: 0 to 100%FS)

[Description]

- Self-tuning logic recognizes that control is stable if PV is staying within the SV ± SLFb .
- It is not necessary to set this parameter under normal conditions.

[Setting example] Changing the PV stable range from 2 to 3

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
SLFb	2. Press the ∨ key to display SLFb.
2.0	3. Press the SEL key once. The current setting (2.0) will be displayed.
3.0	4. Press the ∧ or ∨ keys to flicker and to display 3.0.
SLFb	5. Press the SEL key once. SLFb will be displayed and 3 will be registered for SLFb. After that, the controller will operate with the PV stable range being 3. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

onoF HYS (Hysteresis) mode at ON/OFF control (Settings: oFF/on)

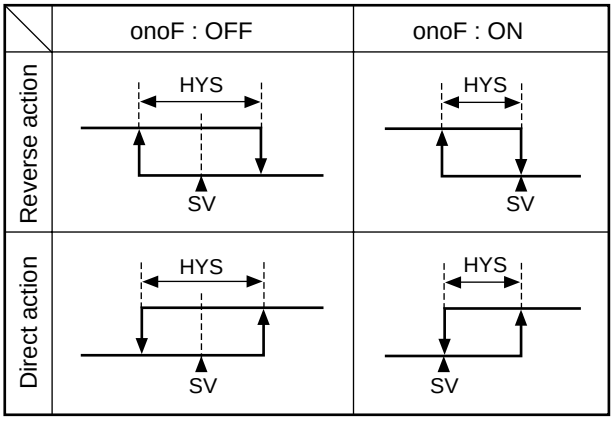
[Description]

- This parameter is used for selecting the hysteresis operation mode at ON/OFF control.

  oFF : Starts the ON/OFF control at the values of SV+ $\frac{HYS}{2}$ and SV- $\frac{HYS}{2}$.

  on : Starts the ON/OFF control at the values of SV and SV+HYS, or SV and SV-HYS.

- Related parameters: P (page 20)
  HYS (page 23)
  P-n1 (page 49)



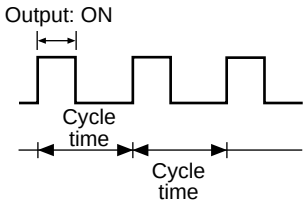
[Setting example] Setting the hysteresis mode to ON

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
onoF	2. Press the ∨ key to display onoF.
oFF	3. Press the SEL key once. The current setting (oFF) will be displayed.
on	4. Press the ∨ key to flicker and to display on.
onoF	5. Press the SEL key once. onoF will be displayed and the hysteresis action ON will be registered for onoF. After that, the controller will operate with the hysteresis being as shown in the figure of ON above. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

rC Cycle time of control output 1 (Setting range: 1 to 150 seconds)

[Description]

- This parameter is applicable for to the contact output and SSR-driving output.
- While input is within the proportional band, output changes between ON and OFF in cycles. These cycles are called cycle time.



- Do not set this parameter to "0".

For contact output:

The higher the frequency of output is, the more precise the control becomes. However a high frequency of output may shorten the life of the contacts and the device to be controlled. Be sure to adjust the proportional cycles considering controllability and the life of the device and the contacts.

Typical: 30 seconds

For SSR-driving output:

Use in short cycles if there is no problem with the device to be controlled.

Typical: 1 to 2 seconds

[Setting example] Setting the cycle time from 30 seconds to 20 seconds

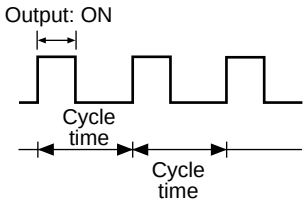
Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
rC	2. Press the ∨ key to display rC.
30	3. Press the SEL key once. The current setting (30) will be displayed.
20	4. Press the ∧ or ∨ key to flicker and to display 20.
rC	5. Press the SEL key once. rC will be displayed and 20 seconds will be registered for rC. After that, the controller will operate with the cycle time being 20 seconds. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

rC2 Cycle time of control output 2 (Cooling-side)

(Setting range: 1 to 150 seconds) (Option: Available for DUAL output only)

[Description]

- By this parameter is set, the cycle time of control output 2.
- While input is within the proportional band, output changes between ON and OFF in cycles. These cycles are called cycle time.



- Do not set this parameter to "0".

For contact output:

The higher the frequency of output is, the more precise the control becomes. However a high frequency of output may shorten the life of the contacts and the device to be controlled. Be sure to adjust the proportional cycles considering controllability and the life of the device and the contacts.

Typical: 30 seconds

For SSR-drive output:

Set it to short time if it does not cause any problem on the operation end.

Typical: 1 to 2 seconds

[Setting example] Setting the cooling-side cycle time from 30 seconds to 20 seconds

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
rC2	2. Press the ∨ key to display rC2.
30	3. Press the SEL key once. The current setting (30) will be displayed.
20	4. Press the ∧ or ∨ key to flicker and to display 20.
rC2	5. Press the SEL key once. rC2 will be displayed and 20 seconds will be registered for rC2. After that, the controller will operate with the cooling-side cycle time being 20 seconds.
	(Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

P-n2 Input signal code (Setting range: 0 to 16)

[Description]

- This parameter is used for selecting input signals. Input signal varies depending on the sensors (2 types below). Set a code that corresponds to the sensor you use.
  - Type I : Thermocouples (9 kinds of signals)
    Resistance bulbs (1 kind of signal)
  - Type II : Voltage, current
- Input signals can be selected within the same type. It is impossible to select input signals of a different type.
- For type II, when changing from the voltage input to the current input, connect the supplied resistance of 250 Ω between terminals ② and ③ .
  When changing from the current input to the voltage input, remove the resistance of 250 Ω connected to the input terminals.

[Note]

After changing the codes, power off the PXR, and then power it on again.

- Input signals and codes

① Input signals code table

Type	Input signal	Code P-n2
I	Resistance bulb (RTD)	
	• Pt 100	1
	Thermocouple	
	• J	2
	• K	3
	• R	4
	• B	5
	• S	6
	• T	7
	• E	8
	• N	12
	• PL-II	13
II	1 to 5 V, 4 to 20mA DC	16

[Setting example] Changing from thermocouple K to thermocouple T in Type I

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds. P will be displayed.
P	
P-n2	2. Press the ∨ key to display P-n2.
3	3. Press the SEL key once. The current setting (3) will be displayed.
-7-	4. Press the ∧ or ∨ key to flicker and to display 7.
P-n2	5. Press the SEL key once. P-n2 will be displayed and the thermocouple T will be registered for P-n2. After that, the controller will operate with the kind of input signals being thermocouple T. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

P-SL Setting lower limit of the measuring range (Setting range: -1999 to 9999)

P-SU Setting upper limit of the measuring range (Setting range: -1999 to 9999)

P-F Selection ˚C / ˚F (Setting: ˚C or ˚F)

[Description]

- These parameters are used for setting the lower and upper limits of the measured range.
- A decimal point position can be set in the parameter of P-dP.
- For the current and voltage inputs, P-dP = 1 , 2, and for other inputs, P-dP = 1 are valid.
- See the right table for input range.

② Input range table (Standard range)

Input type		Range (°C)	With / without a decimal point (°C)*	Range (°F)	With / without a decimal point (°F)*
Resistance bulb JIS (IEC)	Pt100Ω	0 to 150	O	32 to 302	O
		0 to 300	O	32 to 572	O
		0 to 500	O	32 to 932	O
		0 to 600	O	32 to 1112	X
		-50 to 100	O	-58 to 212	O
		-100 to 200	O	-148 to 392	O
		-150 to 600	O	-238 to 1112	X
		-150 to 850	X	-238 to 1562	X
Thermocouple	J	0 to 400	O	32 to 752	O
	J	0 to 800	O	32 to 1472	X
	K	0 to 400	O	32 to 752	O
	K	0 to 800	O	32 to 1472	X
	K	0 to 1200	X	32 to 2192	X
	R	0 to 1600	X	32 to 2912	X
	B	0 to 1800	X	32 to 3272	X
	S	0 to 1600	X	32 to 2912	X
	T	-150 to 200	O	-238 to 392	X
	T	-150 to 400	O	-238 to 752	X
	E	0 to 800	O	32 to 1472	X
	E	-150 to 800	O	-238 to 1472	X
	N	0 to 1300	X	32 to 2372	X
	PL-II	0 to 1300	X	32 to 2372	X
Direct-current voltage	1 to 5 V DC	-1999 to 9999 (Scaling is possible)			Settable up to 2 digits

* O: with
X: without

* For 4 to 20 mA DC input, connect a resistance of 250Ω between terminals ② and ③ to change the input to the 1 to 5 V DC input.

[Note]

The input accuracy is ±0.5%FS±1 digit except the cases shown below.

Thermocouple R at 0 to 400 °C : ±1%FS ± 1 digit ±1˚C

Thermocouple B at 0 to 500 °C : ±5%FS ± 1 digit ±1˚C

Other kinds of thermocouples : ±0.5% FS ± 1 digit ±1˚C

[Setting example] Changing the measuring range from 0°C to 150°C to -100°C to 200°C (Pt100)

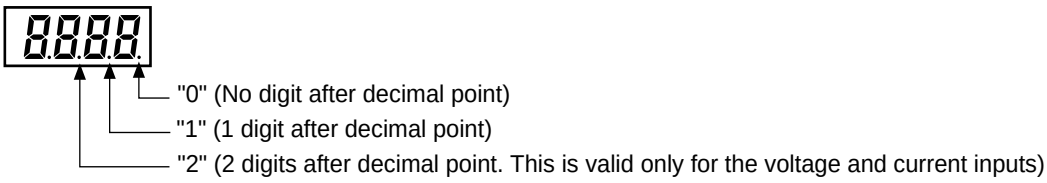
Display	Operating procedure
149 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
P-SL	2. Press the ∨ key to display P-SL.
0	3. Press the SEL key once. The current setting (0) will be displayed.
-100	4. Press the ∧ or ∨ key to flicker and to display -100.
P-SL	5. Press the SEL key once. P-SL will be displayed and -100 will be registered for P-SL. (Repeat the procedure from 3 to 5 to check the P-SL .)
P-SU	6. Press the ∨ key to display P-SU.
150	7. Press the SEL key once. The current setting (150) will be displayed.
200	8. Press the ∧ or ∨ key to flicker and to display 200.
P-SU	9. Press the SEL key once. P-SU will be displayed and 200 will be registered for P-SU. After that, the controller will operate with the measured range being -100˚C to 200˚C. (Repeat the procedure from 7 to 9 to check the P-SU .)
200 SV indication	10. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
149 PV indication	If unoperated state continues, the PV will be displayed.

P-dP Decimal point position (Settings: 0 / 1 / 2)

[Description]

- This parameter is used for selecting the number of decimal point positions for the process value (PV) .

Related parameters: P-SL (page 36)
P-SU (page 36)



[Setting example] Changing the decimal point position setting from 0 to 1

Display	Operating procedure
149 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
P-dP	2. Press the ∨ key to display P-dP.
0	3. Press the SEL key once. The current setting (0) will be displayed.
1 (flicker)	4. Press the ∧ ∨ keys to flicker and to display 1.
P-dP	5. Press the SEL key once. P-dP will be displayed and 1 will be registered for P-dP. After that, the controller will operate with one decimal point position displayed. (Repeat the procedure from 3 to 5 to check the set value.)
1500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

PUOF PV offset (Setting range: -10 to 10%FS)

[Description]

- With this function, predetermined value is added to the input reading. This parameter is used for adjusting PXR3's indication so that it becomes same as the one of the recorder.
- The PXR3 operates at the displayed PV (the value to which the PV offset value is added).

[Setting example] Adding the PV offset value of 5°C to the input value of 1200 °C

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
PUOF	2. Press the ∨ key to display PUOF.
0.0	3. Press the SEL key once. The current setting (0.0) will be displayed.
-5.0	4. Press the ∧ or ∨ keys to flicker and to display 5.0.
PUOF	5. Press the SEL key once. PUOF will be displayed and 5 will be registered for PUOF, and then offset 5˚C will be added to the input value. After that, the controller will operate so that the value to which the offset value of 5˚C is added can be brought close to the set value. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1549 PV indication	If unoperated state continues, the PV will be displayed.

SUOF SV offset (Setting range: -50 to 50%FS)

[Description]

- With this function, predetermined value is added to the original SV. This parameter is used to eliminate the offset that occurs in performing P control.
- The PXR3 operates based on the SV to which the SV offset value is added.
- Alarm judgment is made by the displayed SV to which the SV offset value is not added.
- When the retransmission output type is set to the SV, the displayed SV, to which the SV offset value is not added, is output.

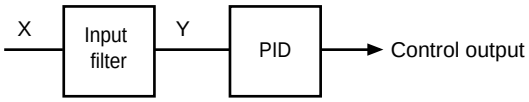
[Setting example] Adding the SV offset value of 9°C to the currently set value

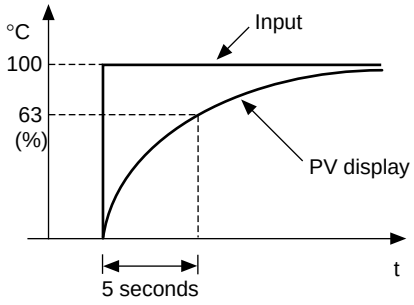
Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
SUOF	2. Press the ∨ key to display SUOF.
00	3. Press the SEL key once. The current setting (00) will be displayed.
-90	4. Press the ∧ or ∨ keys to flicker and to display 90.
SUOF	5. Press the SEL key once. SUOF will be displayed and 9 will be registered for SUOF. (The displayed SV remains unchanged.) After that, the controller will operate at the SV value to which the SV offset value of 9˚C is added. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

P-dF Time constant of input filter (Setting range: 0.0 to 900.0 seconds)

[Description]

- This parameter is used for reducing the fluctuation of input signal (filter function).
  For example, when the input filter constant is set to 5 seconds, the PV changes as shown in right figure while input changes from 0 to 100% suddenly. It takes 5 seconds for the PV to change from 0 to 63.2%.





[Note]

The factory default setting is 5.0 (5 seconds). Do not change this parameter as long as changing is not of absolute necessity.

[Setting example] Changing the filter constant from 5.0 (5 seconds) to 10.0 (10 seconds)

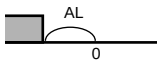
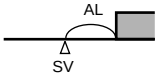
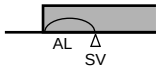
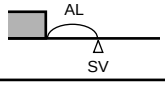
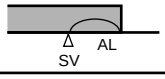
Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
P-dF	2. Press the ∨ key to display P-dF.
5.0	3. Press the SEL key once. The current setting (5.0) will be displayed.
10.0	4. Press the ∧ or ∨ keys to flicker and to display 10.0.
P-dF	5. Press the SEL key once. P-dF will be displayed and 10.0 will be registered for P-dF. After that, the controller will operate with the filter constant being 10.0. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

AL01 , AL02 Alarm types (Setting range: 0 to 34) (Option)

[Description]

- These parameters are used for selecting the operation types of Alarms 1 and 2.
- Alarm1 is activated in the same way as Alarm2 except for codes 12 to 15. (Codes 12 to 15 cannot be selected for Alarm1 .)
- When any code of 12 to 15 is selected for Alarm 2, Alarm 2 is activated and Alarm 1 is cancelled. "Alarm hysteresis", "Delay time", and "Alarm latch" can be selected in Alarm 2 settings.
- The display of the parameter in which the alarm value is set varies depending on the alarm operation types.

[Note] Alarm set value and alarm operations

		Alarm set value (AL)	
		Plus setting	Minus setting
Absolute value	Upper limit		Disabled
	Lower limit		Disabled
Deviation value	Upper limit		
	Lower limit		

[Note]

- Since the alarm set value may change after changing the alarm operation types, be sure to set the alarm set value again.
- After changing the alarm operation types, power the PXR off, and then on.
- Setting code 0 indicates "No alarm".

Related parameters: A1HY , A2HY (page 53)
A1oP , A2oP (page 54)
AL 1 , AL 2 (page 18)
dLY1 , dLY2 (page 51)

[Setting example] Changing the alarm type of Alarm 2 from upper-limit deviation to the upper-limit deviation with hold

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
AL02	2. Press the ▽ key to display AL02.
5	3. Press the SEL key once. The current setting (5) will be desplayed.
-8-	4. Press the △ ▽ keys to flicker and to display 8.
AL02	5. Press the SEL key once. AL02 will be displayed and 8 will be registered for AL02. After that, the controller will operate with Alarm 2 of upper limit deviation with hold. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

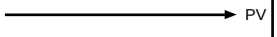
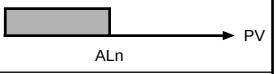
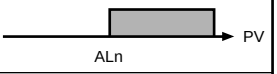
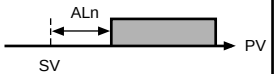
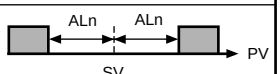
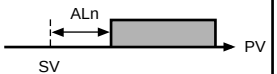
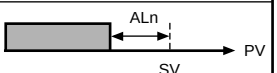
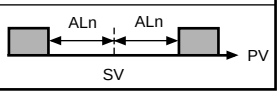
[Alarm type list]

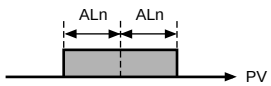
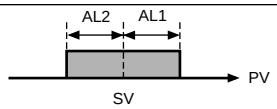
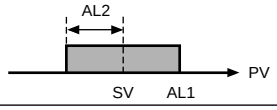
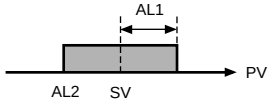
The table below shows the meaning of symbols in the following operation figures.

Alarm type	Alarm 1		Alarm 2	
	Display symbol	Screen name	Display symbol	Screen name
0~15	AL1	Set value of Alarm 1	AL2	Set value of Alarm 2
16~31	A1-L	Lower-limit of set value of Alarm 1	A2-L	Lower-limit of set value of Alarm 2
	A1-H	Upper-limit of set value of Alarm 1	A2-H	Upper-limit of set value of Alarm 2

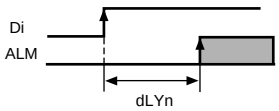
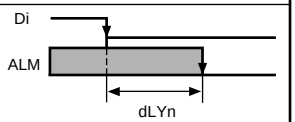
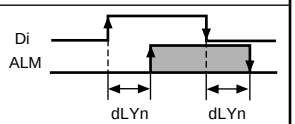
- Alarm 1 is activated in the same way as Alarm 2 except codes 12 to 15. (Codes 12 to 15 cannot be selected for Alarm 1. If any of them is set, it is recognized as code 0, which indicates "No alarm".)
- When any code of 12 to 15 is selected for Alarm 2, Alarm 2 is activated and Alarm 1 is not raised. "Alarm hysteresis", "Delay time", and "Alarm latch" can be selected in Alarm 2 settings.
- The display of the parameter in which the alarm value is set varies depending on the alarm operation types.
- Since the alarm set value may change after changing the alarm operation types, confirm the alarm set value. (Note that this is not abnormal.)

• Alarm codes for standard types

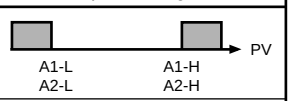
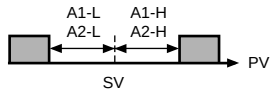
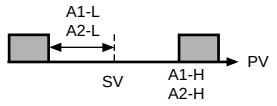
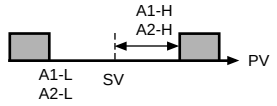
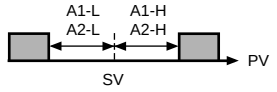
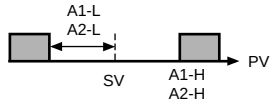
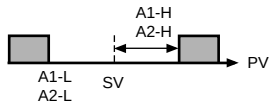
	ALM1	ALM2	Alarm type	Operation figure
	0	0	No alarm	
Absolute value alarm	1	1	Upper-limit absolute value	
	2	2	Lower-limit absolute value	
	3	3	Upper-limit absolute value (with hold)	
	4	4	Lower-limit absolute value (with hold)	
Deviation value alarm	5	5	Upper-limit deviation	
	6	6	Lower-limit deviation	
	7	7	Upper and lower limits deviation	
	8	8	Upper-limit deviation (with hold)	
	9	9	Lower-limit deviation (with hold)	
	10	10	Upper and lower limits deviation (with hold)	

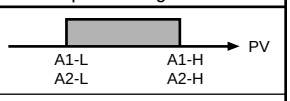
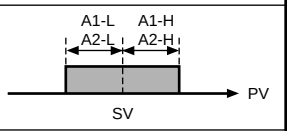
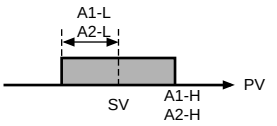
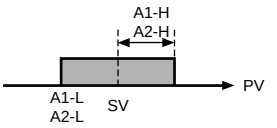
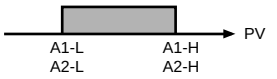
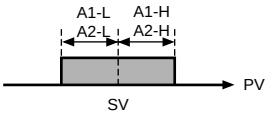
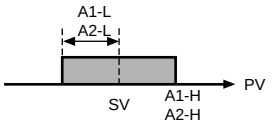
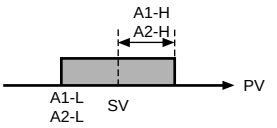
	ALM1	ALM2	Alarm type	Operation figure
Range alarm	11	11	Range upper and lower limits deviation (ALM1/2 independent operation)	
	-	12	Range upper and lower limits absolute value	
	-	13	Range upper and lower limits deviation	
	-	14	Range upper limit absolute value and lower limit deviation	
	-	15	Range upper limit deviation and lower limit absolute value	

• Timer codes

	ALM1	ALM2	Alarm type	Operation figure
Timer	32	32	ON-delay timer	
	33	33	OFF-delay timer	
	34	34	ON/OFF-delay timer	

• Alarm codes with dual set values

	ALM1	ALM2	Alarm type	Operation figure
Upper and lower limits alarm	16	16	Upper and lower limits absolute value	
	17	17	Upper and lower limits deviation	
	18	18	Upper limit absolute value and lower limit deviation	
	19	19	Upper limit deviation and lower limit absolute value	
	20	20	Upper and lower limits absolute value (with hold)	
	21	21	Upper and lower limit deviation (with hold)	
	22	22	Upper limit absolute value and lower limit deviation (with hold)	
	23	23	Upper limit deviation and lower limit absolute value (with hold)	

	ALM1	ALM2	Alarm type	Operation figure
Range alarm	24	24	Range upper and lower limits absolute value	
	25	25	Range upper and lower limits deviation	
	26	26	Range upper limit absolute value and lower limit deviation	
	27	27	Range upper limit deviation and lower limit absolute value	
	28	28	Range upper and lower limits absolute value (with hold)	
	29	29	Range upper and lower limits deviation (with hold)	
	30	30	Range upper limit absolute value and lower limit deviation (with hold)	
	31	31	Range upper limit deviation and lower limit absolute value (with hold)	

dLYn: The delay time of Alarms 1 and 2 or timers 1 and 2

ALn: The set value of Alarms 1 and 2

AL1: The set value of Alarm 1

AL2: The set value of Alarm 2

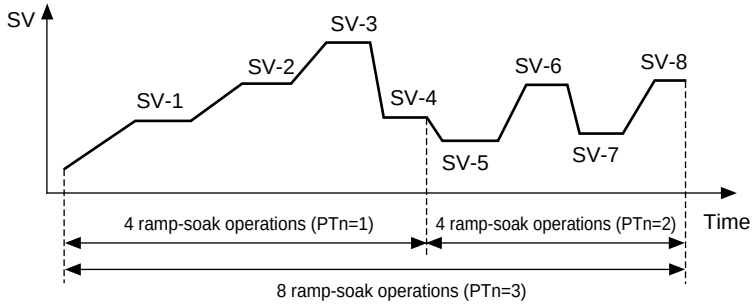
PTn Selecting ramp-soak patterns (Settings: 1 / 2 / 3) (Option)

[Description]

- This parameter becomes effective when the ramp-soak operation is changed from oFF to run.
- Setting range
  - 1 : Performs 1st to 4th segments.
  - 2 : Performs 5th to 8th segments.
  - 3 : Performs 1st to 8th segments.

[Note]

- This parameter is not effective if it is changed during RUN or HOLD.
- Types 1 and 2 cannot run one after another.
- Once SU-1 to SU-8 are set, when the SV limiter is set the set values of SU-1 to SU-8 are not changed, but the SV displayed during ramp-soak operation is affected by the SV limiter.



[Setting example] Changing the ramp-soak execute type from 1 to 3

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
PTn	2. Press the ∨ key to display PTn.
1	3. Press the SEL key once. The current setting (1) will be displayed.
3	4. Press the ∧ ∨ keys to flicker and to display 3.
PTn	5. Press the SEL key once. PTn will be displayed and 3 will be registered for PTn. After that, the controller will operate in ramp-soak type 3 (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

SrAr Ramp-soak status display (Display only)

Su-1 to Su-8 1st to 8th target SV (Setting range: Su-L to Su-H) (Option)

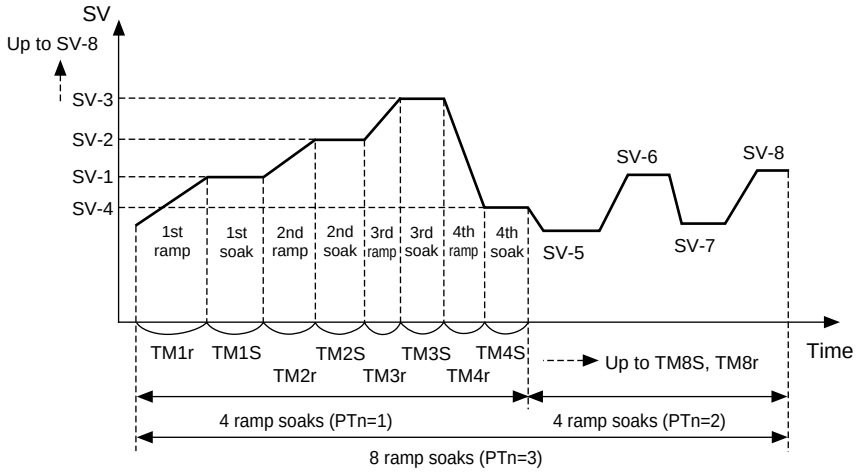
rM1r to rM8r 1st to 8th ramp segment time (Setting range: 0 to 99h 59min) (Option)

rM1S to rM8S 1st to 8th soak segment time (Setting range: 0 to 99h 59min) (Option)

Mod Ramp-soak modes (Setting range: 0 to 15) (Option)

[Description]

- By these parameters, the SV (Set value) are automatically changed over time according to the patterns set in advance as shown in the figure below. A maximum of 8 ramp-soak segments can be set in PXR.
- The first ramp starts from the PV (Measured value) just before performing the program.
- The program can also be started at power-on automatically (Power-on start function).
- A maximum of eight ramp-soak segments can be set. It is also possible to set 4 ramp-soak segments twice instead.
- When the following parameters are changed under ramp-soak operation, operation will change the patterns of the ramp-soak pattern is changed to the new setting.
  - Su-1 to Su-8
  - rM1r to rM8r
  - rM1S to rM8S
  - Mod



[Parameters]

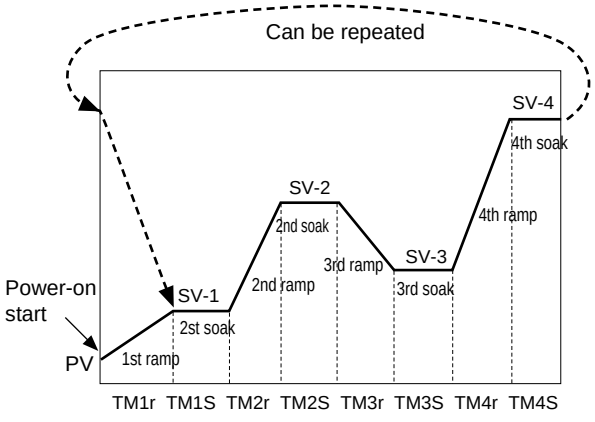
In order to execute these functions, it is necessary to set the programs in advance. To set the programs, set the SV (Setting value) and time desired for the parameters shown in the table on next page.

Related parameters: PTn (page 45)
ProG (page 14)
Su-L (page 50)
Su-H (page 50)

Parameter display symbol	Name		Description	Factory default settings	Remark
STAT	STAT	Current program status	Displays the Ramp-soak current status. This parameter is only for display, and cannot set anything. oFF: OFF 1-rP to 8-rP: Under the 1st to 8th ramp operation 1-St to 8-St: Under the 1st to 8th soak operation End: Ends the program	–	No symbol appears when the ramp-soak model is not selected.
SU-1 to SU-8	SV-1 to SV-8	1st to 8th target SV	Sets the target value (SV) of each ramp segment (Setting range: SU-L to SU-H)	0%FS	
TM1r to TM8r	TM1r to TM8r	1st to 8th ramp segment time	Sets the ramp time for each segment (Setting range: 0 to 99h 59min)	0.00	
TM1S to TM8S	TM1s to TM8s	1st to 8th soak segment time	Sets the soak time for each segment (Setting range: 0 to 99h 59min)	0.00	
Mod	Mod	Ramp-soak mode	Selects the modes of ramp-soak function. Set to "0" under normal conditions	0	

[MODE code list]

MOD	Power-on start	Output at the END	Output at OFF	Repeat operation
0	OFF	Continuous control	Continuous control	OFF
1	OFF	Continuous control	Continuous control	ON
2	OFF	Continuous control	Standby mode	OFF
3	OFF	Continuous control	Standby mode	ON
4	OFF	Standby mode	Continuous control	OFF
5	OFF	Standby mode	Continuous control	ON
6	OFF	Standby mode	Standby mode	OFF
7	OFF	Standby mode	Standby mode	ON
8	ON	Continuous control	Continuous control	OFF
9	ON	Continuous control	Continuous control	ON
10	ON	Continuous control	Standby mode	OFF
11	ON	Continuous control	Standby mode	ON
12	ON	Standby mode	Continuous control	OFF
13	ON	Standby mode	Continuous control	ON
14	ON	Standby mode	Standby mode	OFF
15	ON	Standby mode	Standby mode	ON



[Description of functions]

1. Power-on start: The ramp-soak operation starts to run from the current PV value.
2. Output at END: The output status at the END of the ramp-soak operation.
3. Output at OFF: The output status while the ramp-soak operation is set to OFF.
4. Repeat operation: This function makes the ramp-soak operation to continue after one cycle of ramp-soak operation is completed. At the event of Repeat operation: OFF, the SV that is set in the final cycle is kept.

* Standby mode: Output: control output OFF or -3%
Alarm: OFF
Control: OFF
Retransmission output is kept operational. (However, if the type of retransmission output is set to the MV, it becomes 4mA or lower.)

[Ramp]

The segment in which the set value changes toward the target value.

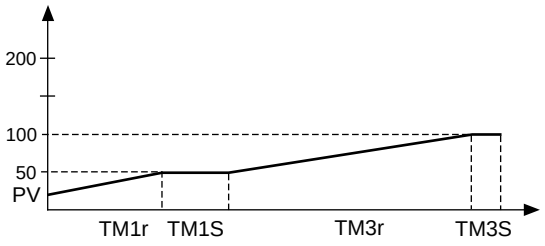
[Soak]

The segment in which the set value is always the target value and remains unchanged.

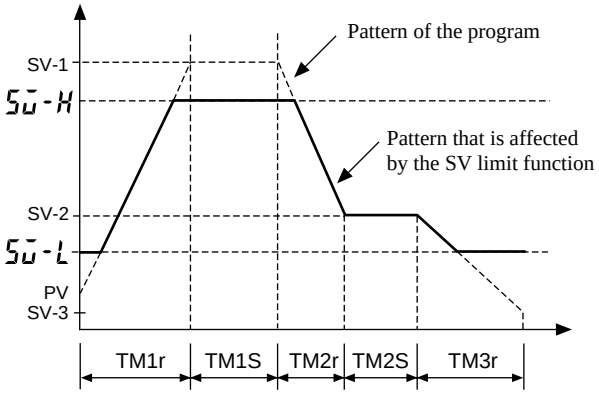
- The segment in which both the ramp time and soak time are set to "0" is skipped.

  [Ex]

SV-1: 50	SV-2:200	SV-3:100
TM1r:0.10	TM2r:0.00	TM3r:1.00
TM1S:0.05	TM2S:0.00	TM3S:0.75



- The SV limit function is valid even while the ramp-soak operation is running.
  Although the set value (SV-n) remains unchanged, the SV under ramp-soak operation is affected by the limit function. Therefore, the pattern is as shown in the figure on right, and it may not change according to the original set time.



[Setting example] Setting the 1st target SV to 400°C

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for three seconds.
P	P will be displayed.
SU-1	2. Press the ∨ key to display SU-1.
00	3. Press the SEL key once. The current setting (00) will be displayed.
4000	4. Press the ∧ ∨ keys to flicker and to display 4000.
SU-1	5. Press the SEL key once. SU-1 will be displayed and 400˚C will be registered for the 1st target value. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

③ Third block parameters

P-n1 Specifying control system and action, and output direction at input burn-out
(Setting range: 0 to 19)

[Description]

- This parameter specifies action (Single/Dual and Heating/Cooling), and output direction at input burn-out.
- The standard model (single output) or the heating/cooling control output (dual output) are available.
- There is defference of hardware between the standard model and the heating/cooling control output model. Set the code that is applicable to your controller.
- In general, reverse action is applyed for the heating process and direct action is applyed for the cooling process.

  * The lower limit of a burn-out output indicates that output is set to OFF, or 4mA or less. The upper limit indicates that output is set to ON, or 20mA or more.
  * Retransmission output is kept operated. However, if the type of retransmission output is set to the MV, the output becomes the same as the output at burnout.

• Control operation code table

Code (P-n1)	Model	Control action		Burn-out output*	
		Output 1	Output 2	Output 1	Output 2
0	Standard (single)	Reverse	...	Lower limit	...
1				Upper limit	
2		Direct		Lower limit	
3				Upper limit	
4	Heating /Cooling (dual)	Reverse	Direct	Lower limit	Lower limit
5				Upper limit	
6				Lower limit	Upper limit
7				Upper limit	
8		Direct		Lower limit	Lower limit
9				Upper limit	
10				Lower limit	Upper limit
11				Upper limit	
12		Reverse	Reverse	Lower limit	Lower limit
13				Upper limit	
14				Lower limit	Upper limit
15				Upper limit	
16		Direct		Lower limit	Lower limit
17				Upper limit	
18				Lower limit	Upper limit
19				Upper limit	

[Setting example] Changing the "Reverse/Lower limit for burn-out output" to the "Direct/Upper limit for burn-out output"

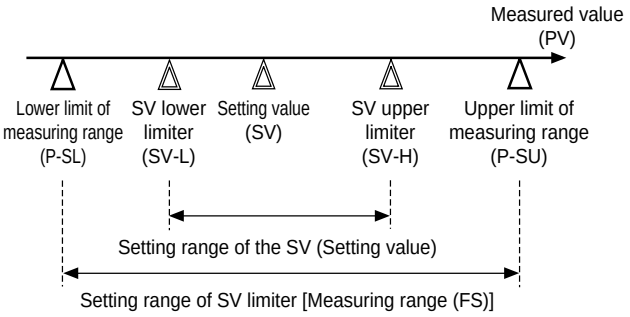
Display	Operating procedure
1499 PV indication P-n1	1. Press and hold the SEL key for five seconds. P-n1 will be displayed.
0	2. Press the SEL key once. The current setting (0) will be displayed.
3	3. Press the ^ or v keys to flicker and to display 3.
P-n1	4. Press the SEL key once. P-n1 will be displayed and 3 will be registered for P-n1. After that, the controller will operate with the "Direct/Upper limit for burn-out output" selected. (Repeat the procedure from 2 to 4 to check the set value.)
2500 SV indication	5. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

SV (Setting value) lower limiter (Setting range: 0 to 100%FS)

SV (Setting value) upper limiter (Setting range: 0 to 100%FS)

[Description]

- These parameters set the setting range of the SV (Setting value).
- Both the SV under ramp-soak operation and the SV switched by the DI1 function are affected by the SV limiter.
- The SV upper and lower limiters (,) can be set within the range of the measuring values (,).



[Note]

- Before setting the parameters of and , be sure to set the following parameters.
  - Setting the lower limit of the measured range ( )
  - Setting the upper limit of the measured range ( )
  - Setting the of decimal places point position ( )
- After changing the parameters of , , and , power off the PXR, and then on. Then, set the parameters of and again.
- Before setting the SV, set the parameters of and .
- Be sure to set the values of and so that is larger than or is the same as .
- Although the displayed SV is affected by the limiter immediately after setting and , the set values of to are not affected.
- When the SV limiter is set during ramp-soak operation or switching the SV with the DI function, the SV (SV0) that is set manually and the displayed SV are affected by the SV limiter. So, after setting the ramp-soak operation to OFF, or returning the switched SV to the original SV, the PXR3 operates with the SV0 affected by the SV limiter.

[Setting example] Setting the upper limiter to 100°C

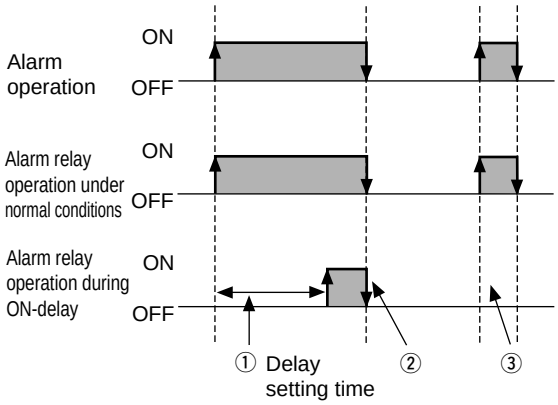
Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for five seconds.
P-n1	will be displayed.
SU-H	2. Press the ∨ key to display .
4000	3. Press the SEL key once. The current setting (4000) will be displayed.
1000	4. Press the ∧ or ∨ keys to flicker and to display 1000.
SU-H	5. Press the SEL key once. will be displayed and 100˚C will be registered for . After that, the upper limit of the SV will be 100˚C. (Repeat the procedure from 3 to 5 to check the set value.)
1000 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

dLY1 , dLY2 The time of ON-delay alarm or timer function (Setting range: 0 to 9999 seconds) (Option)

[Description]

ON-delay alarm

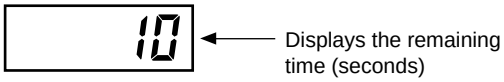
- With this function, the alarm relay is closed after the predetermined delay time. (See operation ① shown in the figure below.)
- In case the cause of the alarm is solved within the delay time, the alarm relay is not closed. (See operation ③ shown in the figure below.)
- The alarm relay is opened regardless of this parameter. (See operation ② shown in the figure below.)



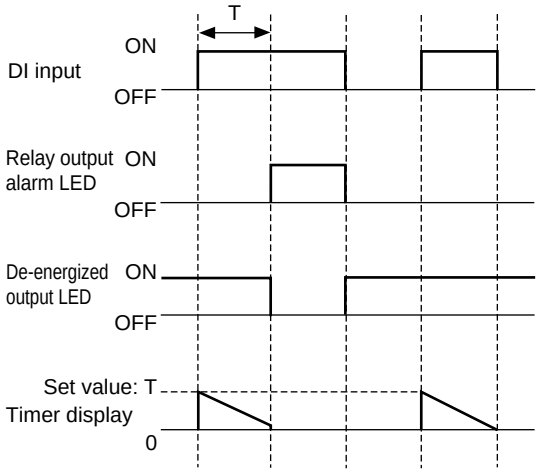
- In case the alarm is set to OFF during standby, the ON-delay operation performs again when returning to RUN.
- When the delay time is changed during ON-delay operation, the alarm is activated in the changed delay time.

Timer function

- When the ON-delay timer is selected, the relay is closed in the set time after DI input is set to ON. While the DI input stays OFF, the timer cannot be activated.
- When the OFF-delay timer is selected, the timer cannot be activated while the DI input is set to ON. The relay is closed in the set time after DI input is set to OFF.
- When the ON/OFF-delay timer is selected, the timer is activated while the DI input stays either ON or OFF.
- The timer display function shows the remaining time of timers 1 and 2.
- The set time is counted down while the ON or OFF timer is activated.
- While the ON timer is activated, the alarm relay is closed when the remaining time is 0. While the OFF timer is activated, the alarm relay is opened when the remaining time is 0.

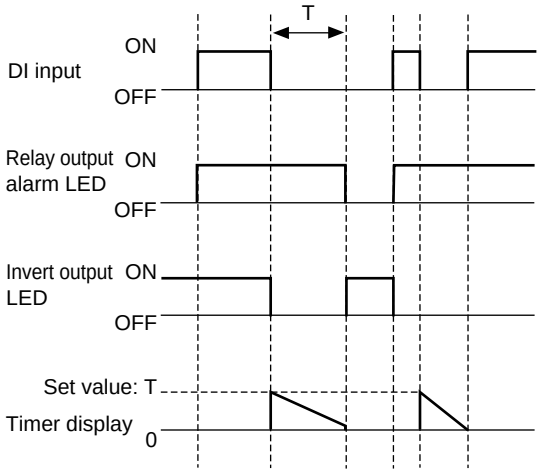


• ON-delay timer operation



T:dLYn(n=1 / 2 / 3)

• OFF-delay timer operation



T:dLYn(n=1 / 2 / 3)

[Setting example] Setting the delay time for ON-delay alarm to 30 seconds

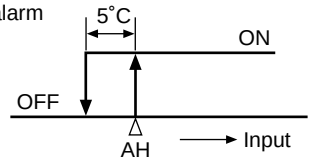
Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for five seconds.
P-n1	P-n1 will be displayed.
dLY1	2. Press the ∨ key to display dLY1.
0	3. Press the SEL key once. The current setting (0) will be displayed.
30	4. Press the ∧ or ∨ keys to flicker and to display 30 .
dLY1	5. Press the SEL key once. dLY1 will be displayed and 30 seconds will be registered for dLY1. After that, the controller will operate with dLY1 being 30 seconds. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

A1hy , A2hy Hysteresis of alarm 1 and 2 (Setting range: 0 to 50% FS) (Option)

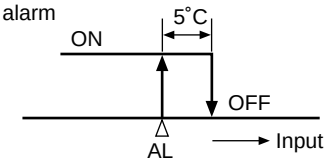
[Description]

- The alarm is detected in the two-position operation (ON/OFF). The hysteresis means the difference between the input at ON and the input at OFF. For example, the hysteresis of 5°C means that the range between ON and OFF is 5°C.
- Setting the decimal place with P-dP allows decimal point to be placed automatically.

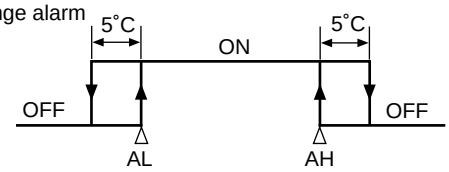
• Upper limit alarm



• Lower limit alarm

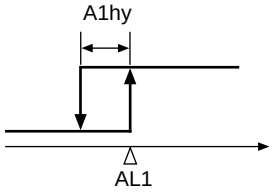


• Range alarm

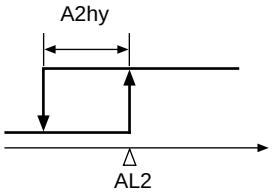


- Hysteresis can be set for each alarm.

• ALM1



• ALM2



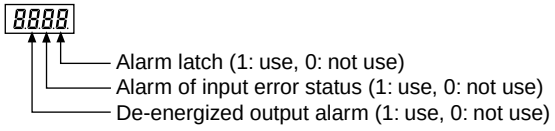
[Setting example] Changing the hysteresis of alarm 2 from 1°C to 3°C

Display	Operating procedure
1499 PV indication P-n1	1. Press and hold the SEL key for five seconds. P-n1 will be displayed.
A2hy	2. Press the ∨ key to display A2hy.
1.0	3. Press the SEL key once. The current setting (1.0) will be displayed.
3.0	4. Press the ∧ or ∨ keys to flicker and to display 3.0.
A2hy	5. Press the SEL key once. A2hy will be displayed and 3˚C will be registered for A2hy. After that, the controller will operate with the hysteresis of alarm 2 being 3˚C. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

A1oP , A2oP Options of alarm 1 and 2 (Setting range: 000 to 111) (Option)

[Description]

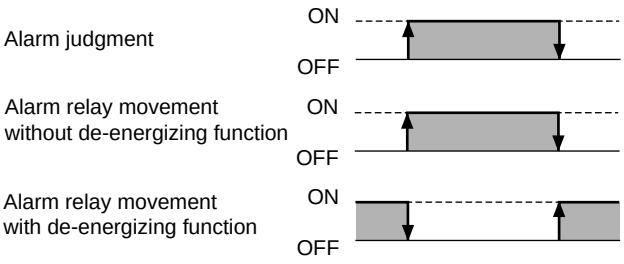
- These parameters are used to switch ON/OFF the alarm latch, the error satus alarm, and the de-energized output alarm functions for each of Alarm 1 and 2.
- Each function is set to ON by setting the following digit to "1":



- The alarm latch is the function to keep the alarm ON, once the alarm judgment shows the alarm ON status. To cancel the alarm latch, follow the instructions below.
  - Power off the PXR, and then on.
  - Set the alarm latch to OFF.
  - Cancel the alarm latch at the alarm latch canceling parameter.
  - Cancel the alarm latch by DI input.
  - Cancel the alarm latch via communication.
- The alarm of error status is activated, when the problems in the table below occur. When using this error status alarm function, set the alarm types (ALM1 or 2) to "0".

Display	Causes
UUUU	• A break in the thermocouple sensor • A break in the resistance bulb sensor (RTD) (A) • The PV reading value exceeds the P-SU by 5%FS or more.
LLLL	• A break in the resistance bulb sensor (B) or (C) • The resistance bulb sensor (A-B) or (A-C) is short-circuited. • The PV reading value is below the P-SL by 5%FS or more. • A break or a short-circuit in the voltage input line.
FALF	• Breakdown in the PXR

- The de-energized output alarm function is used for energizing or de-energizing the alarm relay to be closed. While this function is set to ON, when the alarm judgment shows the ON status, the relay is opened, and when the alarm judgment shows the OFF status, the relay is closed.



[Note]

- The ON-delay, the alarm latch, and the de-energized output functions can be activated for the error status alarm.
- The alarm lamps (AL1, AL2) goes on and off according to the alarm judgment regardless of the de-energized output settings.

[Setting example] Setting the error status alarm function for Alarm 2 to ON

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for five seconds.
P-n1	P-n1 will be displayed.
R2oP	2. Press the ∨ key to display R2oP.
000	3. Press the SEL key once. The current setting (000) will be displayed.
010	4. Press the ∧ or ∨ keys to flicker and to display 010.
R2oP	5. Press the SEL key once. R2oP will be displayed and the main unit input error alarm function for Alarm 2 will be turned ON. After that, the controller will operate with the error status alarm function for Alarm 2 being ON. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

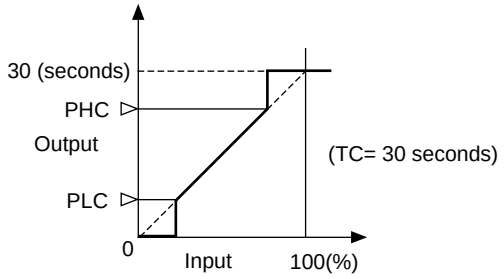
PLC1 , PHC1 Upper and lower limits for control output 1 (Setting range: -3.0 to 103.0%)

PLC2 , PHC2 Upper and lower limits for control output 2 (Setting range: -3.0 to 103.0%)
(Option: only for DUAL type)

[Description]

- These parameters set the limit value of output.

	Upper limit	Lower limit
OUT1	PHC1	PLC1
OUT2	PHC2	PLC2



- How the output is limited (maintained within the limit or breaks the limit) is set in the parameter of PCUT .
- When flammability is controlled by turning the gas on and off, this function can avoid flashing.

Related parameters: CT (page 33)
PCUT (page 57)

(Minimum ON pulse width [seconds]) = $PLC1 \times \frac{100}{TC}$

(Minimum OFF pulse width [seconds]) = $(100 - PHC1) \times \frac{100}{TC}$

CT : Cycle time

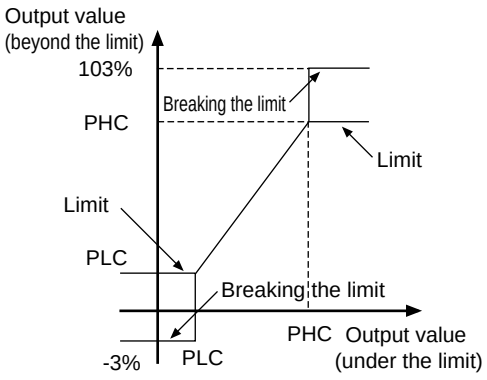
[Setting example] Changing the lower pulse width limit from 20.0% to 10.0%

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for five seconds.
P-n1	P-n1 will be displayed.
PLC1	2. Press the ∨ key to display PLC1.
20.0	3. Press the SEL key once. The current setting (20.0) will be displayed.
10.0	4. Press the ∧ or ∨ keys to flicker and to display 10.0.
PLC1	5. Press the SEL key once. PLC1 will be displayed and 10% will be registered for PLC1. After that, the controller will operate with the output lower limit being 10%. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

PCUT Output limit types (Setting range: 0 to 15)

[Description]

- This parameter sets whether to maintain the value within the limit or to break the limit when the output value increases up to the limit set value.



PCUT	Output 1		Output 2	
	Upper limit	Lower limit	Upper limit	Lower limit
0	103%	-3%	103%	-3%
1	103%	Limit	103%	-3%
2	Limit	-3%	103%	-3%
3	Limit	Limit	103%	-3%
4	103%	-3%	103%	Limit
5	103%	Limit	103%	Limit
6	Limit	-3%	103%	Limit
7	Limit	Limit	103%	Limit
8	103%	-3%	Limit	-3%
9	103%	Limit	Limit	-3%
10	Limit	-3%	Limit	-3%
11	Limit	Limit	Limit	-3%
12	103%	-3%	Limit	Limit
13	103%	Limit	Limit	Limit
14	Limit	-3%	Limit	Limit
15	Limit	Limit	Limit	Limit

[Setting example] Selecting the operation that outputs 1 and 2 are maintained within the upper and lower limits

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for five seconds.
P-n1	P-n1 will be displayed.
PCUT	2. Press the ∨ key to display PCUT.
0	3. Press the SEL key once. The current setting (0) will be displayed.
15	4. Press the ∧ or ∨ keys to flicker and to display 15.
PCUT	5. Press the SEL key once. PCUT will be displayed and 15 will be registered for PCUT. After that, the controller will operate with outputs 1 and 2 maintained within the upper and lower limits. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

oUT1, oUT2 Output value display (Display only: -3.0 to 103.0%)

[Description]

- These parameters display the output values of outputs 1 and 2 in the unit of %. (Since the values are calculated with the software, they may have some error comparing to the actual output.)

[Setting example] Confirming the output value (the calculated value) of control output 1

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for five seconds.
P-n1	P-n1 will be displayed.
oUT1	2. Press the ∨ key to display oUT1.
29.8	3. Press the SEL key once. The output value will be displayed.
2500 SV indication	4. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

rCJ RCJ (Cold junction compensation) (Setting range: ON/OFF)

[Description]

- This parameter sets whether or not to perform the RCJ (Cold junction compensation) for the thermocouple input. Use the factory default setting (ON: performs the RCJ) under normal conditions.
  - on : Performs the RCJ (Cold junction compensation).
  - oFF : Does not perform the RCJ (Cold junction compensation).
- Set this parameter to OFF under the conditions that the RCJ is not needed, such as when the RCJ is performed outside of the PXR or when the temperature deviations are recorded.

[Setting example] Changing the RCJ (Cold junction compensation) from ON to OFF

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for five seconds.
P-n1	P-n1 will be displayed.
rCJ	2. Press the ∨ key to display rCJ.
on	3. Press the SEL key once. The current setting (on) will be displayed.
oFF	4. Press the ∧ or ∨ keys to flicker and to display oFF.
rCJ	5. Press the SEL key once. rCJ will be displayed and oFF will be registered for rCJ. After that, the controller will operate with the RCJ (Cold junction compensation) being oFF. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

AdJ0 Adjusting the PV (Measured value) display (0%) (Setting range: -50 to 50% FS)

AdJ5 Adjusting the PV (Measured value) display (100%) (Setting range: -50 to 50% FS)

[Description]

- The user-definable functions are independent of the adjustment values of the PXR. Setting the parameters of **AdJ0** and **AdJ5** to **0** can return to the factory default settings.

1. Prepare the following devices before adjustment by using these parameters.
   - DC voltage standard generator
     1 to 5V (for voltage input)
     0 to 100 mV (for thermocouple input)
   - Decade resistance box
     100.0 to 400.0 Ω (for resistance bulb input)
2. Set the parameter of **rCJ** to OFF.
3. Apply a voltage that is equivalent of 0%.
   If there is an error large enough to impair its accuracy, set the parameter of **AdJ0**. (See the right example to set **AdJ0**.)
4. Apply a voltage that is equivalent of 100%.
   If there is an error large enough to impair its accuracy, set the parameter of **AdJ5**. (See the right example to set **AdJ5**.)
5. Return the parameter of **rCJ** to ON.

[Operating example for input range of 0°C to 400°C]

{ Reading at input of 0°C: -1°C
{ Reading at input of 400°C: 402°C

Set the parameter of **AdJ0** to "1".
Set the parameter of **AdJ5** to "-2"

Therefore;

{ Reading at input of 0°C: 0°C
{ Reading at input of 400°C: 400°C

[Adjustment example for input range of 0 to 400°C]

Before adjustment	Adjustment value	After adjustment
Display at input of 0°C: -1°C	**AdJ0** : 1	Display at input of 0°C: 0°C
Display at input of 400°C: 402°C	**AdJ5** : -2	Display at input of 400°C: 400°C

Setting the parameters of **AdJ0** and **AdJ5** to "0" returns to the factory default settings.

[Setting example] Setting the zero adjustment to "+1°C"

Display	Operating procedure
1499 PV indication	1. Press and hold the SEL key for five seconds.
P-n1	**P-n1** will be displayed.
AdJ0	2. Press the ∨ key to display **AdJ0**.
00	3. Press the SEL key once. The current setting (**00**) will be displayed.
-10	4. Press the ∧ or ∨ keys to flicker and to display **10**.
AdJ0	5. Press the SEL key once. **AdJ0** will be displayed and 1˚C will be registered for **AdJ0**. After that, the controller will operate with the zero adjustment being +1˚C. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	6. If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

dI-1 dI-2 DI operation (Setting range: 0 to 12) (Option)

[Description]

- Select each DI function with dI-1 and dI-2 (DI setting parameter) and set the DI to ON to activate the functions.

  Setting range: 0 to 12

  0 = No function
  1 = Switches the SV.
  2 = Control RUN/Standby
  3 = Starts the auto tuning (standard).
  4 = Starts the auto tuning (low PV).
  5 = Cancels latching for all alarms.
  6 = Cancels latching for alarm 1.
  7 = Cancels latching for alarm 2.
  9 = Activates ALM 1 relay timer.
  10 = Activates ALM 2 relay timer.
  12 = Ramp-soak operation RUN/RESET

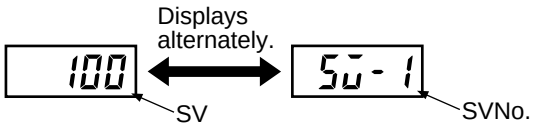
Switching the SV (DI function 1)

- This function switches the SV.

(Exp.) In case of switching SV 4 points
DI set parameter, DI and type of SV to be switched and selected

dI-1 Set value	dI-2 Set value	DI2 OFF		DI2 ON	
		DI1 OFF	DI1 ON	DI1 OFF	DI1 ON
1	1	SU	SU-1	SU-2	SU-3

- SU-1 of the ramp-soak target SV is used to set the SV 1.
- The SV cannot be changed on the SV display screen while SU-1 is selected.
- While switching the SV, the SV and the SV No. appear alternately. (SV: 2 seconds, SV No.: 1 second) However, the SV No. is not displayed during the ramp-soak operation.



Ramp-soak operation RUN/RESET (DI function 12)

- The ramp-soak operation is switched between RUN/RESET by DI.

  DI ON edge ⇑: RUN
  DI OFF edge ⇓: RESET

[Note]

RUN and RESET are switched by ON and OFF edge of DI.

- The ramp-soak operation can be also switched between RUN/RESET manually.
- The ramp-soak execute types that are set in the parameter of PTn operate.
- The table below shows the operations when the DI changes during ramp-soak operation.

Ramp-soak operation status	DI	
	ON edge	OFF edge
RUN	No change	RESET
RESET	RUN	No change
HOLD	RUN	RESET
END	No change	RESET

- When the settings are set manually, via communication, and DI, the settings that are set later are valid.

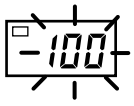
Switching control RUN/Standby (DI function 2)

- RUN and Standby mode is switched by DI

  DI ON : Standby
  DI OFF: RUN

- When the control is in standby state,

During PV display — The SV (set value) flickers.



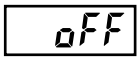
During SV display — The SV lamp flickers.

- The control can also be switched between RUN/Standby manually.

  Select ON or OFF in the parameter for STBY (Setting standby).

STBY setting screen (the first block)

Display during OFF: Control RUN mode



Display during ON: Control Standby mode

- The table below shows the relationship between the RUN and Standby mode switched with a manual operation, DI 1, and ramp-soak operation.

DI	Standby status of ramp-soak operation			
	OFF		ON	
	Manual setting			
	OFF	ON	OFF	ON
DI OFF	RUN	Standby	Standby	Standby
DI ON	Standby	Standby	Standby	Standby

Starting the auto-tuning (DI functions 3, 4)

- These functions can switch the start/stop of the auto-tuning.

DI function	DI ON edge	DI OFF edge
AT (Standard)	AT start	AT cancel
AT (Low PV)		

Cancel the alarm latch (DI functions 5 to 7)

- These functions can cancel the alarm latch while alarms are latched by setting the alarm latch function to ON.

Set value of dL-1 or dL-2	DI ON	DI OFF
5	Cancels the latching for alarms 1 and 2	Keeps the alarm latching
6	Cancels the latching for alarm 1	
7	Cancels the latching for alarm 2	

Timer operation (DI functions 9, 10)

- The DI can set the ON/OFF of timer while codes 32 to 34 are set in "Setting alarm types" (page 42). For the operation, see page 42.

[Setting example] Changing the SV (Front SV) to SV1

Display	Operating procedure
1499 PV indication P-n1	**1.** Press and hold the SEL key for five seconds. P-n1 will be displayed.
dL-1	**2.** Press the ∨ key to display dL-1.
0	**3.** Press the SEL key once. The current setting (0) will be displayed.
-1	**4.** Press the ∧ or ∨ keys to flicker and to display 1 .
dL-1	**5.** Press the SEL key once. dL-1 will be displayed and 1 will be registered for dL-1 . (Repeat the procedure from 3 to 5 to check the set value.)
	6. Short-circuit the Di1 terminals. The SV will be changed from the front SV to SV1.
2500 SV indication	**7.** If you want to display the operation status, press and hold the SEL key for two seconds. The SV value and SV No. will appear alternately. The switched SV or SV-1 will be displayed alternately on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

SR no Station No. for communication (Setting range: 0 to 255) (Option)

[Description]

- Do not set the same number as other Micro-controllers.

[Setting example] Setting the station No. to "123"

Display	Operating procedure
1499 PV indication	**1.** Press and hold the SEL key for five seconds.
P-n 1	P-n 1 will be displayed.
SR no	**2.** Press the ∨ key to display SR no.
1	**3.** Press the SEL key once. The current setting (1) will be displayed.
123	**4.** Press the ∧ or ∨ keys to flicker and to display 123.
SR no	**5.** Press the SEL key once. SR no will be displayed and 123 will be registered for SR no. After that, the controller will operate with the station number being 123. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	**6.** If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

CoM Parity for communication (Setting range: 0 to 2) (Option)

[Description]

- This parameter sets the parity for communications.
  The baud rate is fixed at 9600bps.
  - 0 : Odd parity
  - 1 : Even parity
  - 2 : No parity

[Setting example] Setting the even parity

Display	Operating procedure
1499 PV indication P-n1	**1.** Press and hold the SEL key for five seconds. P-n1 will be displayed.
CoM	**2.** Press the ∨ key to display CoM.
0	**3.** Press the SEL key once. The current setting (0) will be displayed.
1	**4.** Press the ∧ or ∨ keys to flicker and to display 1.
CoM	**5.** Press the SEL key once. CoM will be displayed and the even parity will be registered for CoM. However, it does not switch to the even parity at this point. (Repeat the procedure from 3 to 5 to check the set value.)
	6. Power off the PXR3, and then on. The even parity is set now.
2500 SV indication	**7.** If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

PYP Input type for PYP (Setting range: 0 to 7, 32 to 47) (Option)

[Description]

- When the Color Touch-Operation Unit (Model: PYP) made by Fuji Electric is connected to the PXR, this parameter makes the PYP recognize the measured range.
- When setting the same temperature range that is set in the input range, P-SL, and P-SU of the PXR, the readings between the PXR and PYP are met.

Set value	Input type		Temperature range(°C)
00	Resistance bulb	Pt100	0 to 150°C
01	JIS		0 to 300°C
02	IEC		0 to 500°C
03			0 to 600°C
04			-50 to 100°C
05			-100 to 200°C
06			-150 to 600°C
07			-150 to 850°C
32	Thermocouple	J	0 to 400°C
33		J	0 to 800°C
34		K	0 to 400°C
35		K	0 to 800°C
36		K	0 to 1200°C
37		R	0 to 1600°C
38		B	0 to 1800°C
39		T	-199.9 to 200°C
40		T	-150 to 400°C
41		E	0 to 800°C
42		E	-199.9 to 800°C
43		S	0 to 1600°C
44		N	0 to 1300°C
45		U	-199.9 to 400°C
46		WRe5 · 26	0 to 2300°C
47		PLII	0 to 1300°C

[Setting example] Setting the input range of the PXR3 to thermocouple B

Display	Operating procedure
1499 PV indication P-n1	**1.** Press and hold the SEL key for five seconds. P-n1 will be displayed.
PYP	**2.** Press the ∨ key to display PYP.
34	**3.** Press the SEL key once. The current setting (34) will be displayed.
38	**4.** Press the ∧ or ∨ keys to flicker and to display 38.
PYP	**5.** Press the SEL key once. PYP will be displayed and 38 (Thermocouple B) will be registered for the input range. After that, PYP will recognize the input range of the PXR3 as thermocouple B (0 to 1800˚C). (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	**6.** If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

Ro-T Retransmission output type setting (Setting range: 0 to 3) (Option)

[Description]

- This parameter is used to set the retransmission output type.
  The means of the set values are as shown below.

Set value	Output type
0	PV
1	SV
2	MV
3	DV

Related parameters: Ro-L (page 68)
Ro-H (page 68)

[Setting example] Changing the retransmission output type from the process value (PV) to the set value (SV)

Display	Operating procedure
25 PV indication	**1.** Press and hold the SEL key for 5 seconds.
P-n1	P-n1 will be displayed.
Ro-T	**2.** Press the ∨ key to display Ro-T.
0	**3.** Press the SEL key once. The current setting (0 : PV retransmission) will be displayed.
1	**4.** Press the ∧ or ∨ key to flicker and to display 1 (SV retransmission).
Ro-T	**5.** Press the SEL key once. Ro-T will be displayed and 1 (SV retransmission) will be registred for the retransmission output type. After that, the controller will operate with the retransmission output being SV.
	(Repeat the procedure from 3 to 5 to check the set value.)
25 SV indication	**6.** If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
25 PV indication	If unoperated state continues, the PV will be displayed.

Ao-L Retransmission base scale (Setting range: 0.0 to 100.0%) (Option)

Ao-H Retransmission span scale (Setting range: 0.0 to 100.0%) (Option)

[Description]

- The retransmission base scale and span scale can be set as shown below. Unit for the setting is %.

Output type	Description of percentage
PV/SV/DV	Percentage of input measurement range (Note 1)
MV	Output value

Note 1: Calculate the set value by using the following formula (refer also to the setting example shown below).

Set value (%) = (A ÷ B) × 100 [%]

A = Temperature to be set – Set value of parameter "P-SL"

B = Set value of parameter "P-SU" – Set value of "P-SL"

- When the value of retransmission output (example: SV) becomes equal to the set value of Ao-L, the retransmission output becomes 0% (output).
- When the value of retransmission output (example: PV) becomes equal to the set value of Ao-H, the retransmission output becomes 100% (output).

Related parameters: **Ao-r** (page 67)

[Note]

- Be sure to always set **Ao-L** smaller than **Ao-H**.

[Setting example] At K thermocouple input of 0 to 400˚C, make the setting so that the PV (value of retransmission output type) becomes 0% at 100˚C, and 100% at 300˚C.

Since the measurement range is 0 to 400˚C, P − SL = 0 (lower limit value of measurement range), and P − SU = 400 (upper limit value of measurement range). So, from the formula shown above,

A = (100˚C − 0) or (300˚C − 0), B = 400 − 0 = 400

1) Setting Ao-L : What position is 100˚C in the temperature range from 0 to 400˚C ? = 25% (=(100 − 0) ÷ 400 × 100 [%]) → Ao-L = 25.0 (%)

2) Setting Ao-H : What position is 300˚C in the temperature range from 0 to 400˚C ? = 75% (=(300 − 0) ÷ 400 × 100 [%]) → Ao-H = 75.0 (%)

Display	Operating procedure
25 PV indication P-n1	**1.** Press and hold the SEL for five seconds. P-n1 will be displayed.
Ao-L	**2.** Press the ∨ key to display Ao-L.
0.0	**3.** Press the SEL key once. The current setting value will be displayed.
25.0	**4.** Press the ∧ or ∨ key to flicker and to display 25.0.
Ao-L	**5.** Press the SEL key once. Ao-L will be displayed and 25.0 will be registered for the retransmission base scale. (Repeat the procedure from 3 to 5 to check the set value.)
Ao-H	**6.** Press the ∨ key to display Ao-H.
100.0	**7.** Press the SEL key once. The current setting value will be displayed.
75.0	**8.** Press the ∧ or ∨ key to flicker and to display 75.0.
Ao-H	**9.** Press the SEL key once. Ao-H will be displayed and 75.0 will be registered for the retransmission span scale. (Repeat the procedure from 7 to 9 to check the set value.)
25 SV indication	**10.** If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
25 PV indication	If unoperated state continues, the PV will be displayed.

dSP1 to dSP9

dP10 to dP13 Parameter display mask (Setting range: 0 to 255)

[Description]

- This parameter skips the parameter display by items.
- This parameter is used not to display the items that are not used, or not to change the settings mistakenly.
- "Parameter mask DSP" in "2-1 Parameter list" (page 6) shows which parameter is skipped by setting dSP1 to dSP9 and dP10 to dP13.
- Set the total value of the codes of the item that you want to skip.

[Setting example] Skipping "I" and "d"

Setting "4+8=12" according to the code table of dSP3

Display	Operating procedure
1499 PV indication P-n1	**1.** Press and hold the SEL key for five seconds. P-n1 will be displayed.
dSP3	**2.** Press the ∨ key to display dSP3.
0	**3.** Press the SEL key once. The current setting (0) will be displayed.
12	**4.** Press the ∧ or ∨ keys to flicker and display 12.
dSP3	**5.** Press the SEL key once. dSP3 will be displayed and 12 will be registered for dSP3. After that, the parameters of I and d will be skipped, and will not be displayed. (Repeat the procedure from 3 to 5 to check the set value.)
2500 SV indication	**6.** If you want to display the operation status, press and hold the SEL key for two seconds. The SV will be displayed on the display area.
1499 PV indication	If unoperated state continues, the PV will be displayed.

3 Troubleshooting

This section explains the judgments and remedies for problems.

Symptoms	Possible causes	Remedies	Reference pages
1. The display has shown UUUU or LLLL.	① The setting of P-n2 is not correct for the input signals of sensors or others.	Set the parameter of P-n2 correctly.	Page 35
	② The polarity of the input signal does not match that of the PXR.	Correct the polarity of the input signal on the PXR3.	
	③ Input terminals are short-circuited in thermocouple B or R. (P-n2 = 4, 5)	Set the parameter of P-n2 to 3, and check if the temperature around an ordinary temperature is displayed. (Thermocouples B and R have a large error around ordinary temperatures. However, this is not a fault.)	Page 35
	④ The input signals and type of sensors or others do not match those of the controller you use.	Ask to make adaptations on your model. Or replace your model with a new one.	-
	⑤ The connecting cables for the sensor are loose.	Tighten the connecting cables.	-
	⑥ A break or short-circuit occurred in the sensor.	Replace the sensor with a new one. Or remove the short-circuit.	-
	⑦ The sensor or other input devices that are connected to the PXR3 have problems.	Replace the sensor or other input devices with new ones.	-
	⑧ The set value of the parameter of P-SL is larger than the value of P-SU.	Set the parameters again so that the value of P-SL is smaller than the value of P-SU.	Page 36
	⑨ The measured value is too large or too small.	Set the parameters again so that the difference of the set values of P-SL and P-SU is made larger.	Page 36
2. Err has been displayed.	① The value of P-SU is set to 3277°C or more for thermocouple and resistance bulb input.	Set the parameters of P-SL and P-SU again according to the input range table.	Page 36
	② The measured range (P-SU to P-SL) is set to 10000 or more for voltage and current input.	Set the parameters of P-SL and P-SU again so that the measured range is 9999 or less.	Page 36
3. A decimal point has not been displayed.	"0" is set in the parameter of P-dP.	Set the parameter of P-dP to "1" or "2".	Page 38
4. The SV or the set values of some parameters have been changed without any operation.	① The parameter of P-SL, P-SU, or P-dP was changed.	Set all the parameters again. (When the set values of the parameters of P-SL, P-SU, and P-dP are changed, the set value of each parameter for which "*" is marked at the page number of the reference page in the Parameter list, are changed.)	Page 36
	② When the set value of P-SU is larger than 1000, "1" is registered for P-dP.	Set P-dP to "0", and return P-SU to an original value.	Page 34
5. ON/OFF control (Two-position control) has not started.	0.0 is not set in the parameter P.	Set the parameter P to 0.0.	Page 20
6. ON/OFF control is not functioning properly.	① The set value of parameter HYS is not correct.	Adjust the set value of parameter HYS to be suitable for the device to be controlled.	Page 23
	② The setting of parameter onoF is not correct.	Set the parameter onoF correctly.	Page 32
7. The Micro-controller is not controlling properly.	① The set values of the parameters P, I, and d are not correct.	Perform the auto-tuning.	Page 16
	② The cycle times are too long.	Decrease the set value of the parameters rC and rC2 gradually.	Page 33
	③ Output is limited.	Set the parameters PLC1, PHC1, PLC2 and PHC2 again to be suitable for the process.	Page 56
	④ Output is not limited correctly.	Set the parameter PCUr again to be suitable for the process.	Page 57

Symptoms	Possible causes	Remedies	Reference pages
8. Response is too slow. (The measured value changes slowly.)	Input filter constant is too large.	Decrease the set value of the parameter P-dF.	Page 39
9. Output changes between ON and OFF, but the indicated value does not change.	① Some input terminals are short-circuited.	Remove the short-circuited terminals.	-
	② The connecting cable for the device to be controlled are not connected properly.	Connect it properly.	-
	③ The device to be controlled has powered off.	Power it on.	-
	④ The output signals of the Micro-controller do not match the input signals of the device to be controlled.	Prepare the Micro-controller to be suitable for the device to be controlled. Or select the device to be controlled to be suitable for the Micro-controller.	-
10. The keys do not operate. The set value of the parameters cannot be changed.	"1", "2", "4", or "5" is set in the parameter LoC.	Set the parameter LoC to "0" or "3".	Page 19
11. The SV cannot be changed.	① "1", or "4" is set in the parameter LoC.	Set the parameter LoC to "0", "2", "3" or "5".	Page 19
	② You have tried to set the value that is outside of the measuring temperature range (Parameters of SU-L to SU-H).	Widen the range SU-L to SU-H. (However, it should be within the set range in the input range table.)	Page 50
	③ You have tried to change the SV during ramp-soak operation (run, HLd, or End is selected.)	Set the parameter of ProG to oFF.	Page 14
12. The parameters you want to confirm or change are not displayed.	The concerned parameters are set to skip in the parameters of dSP1 to dP13.	Change the set value of the concerned dSP.	Page 69
13. Auto-tuning does not work properly.	① After starting the auto-tuning operation, the display has showed UUUU or LLLL.	Make the difference of the set values of P-SL and P-SU larger, and perform the auto-tuning again.	Page 36
	② You have changed the SV after starting the auto-tuning operation.	Set the desirable SV, and perform the auto-tuning again.	-
	③ The response of the controlled device was too fast.	Use a controller whose control cycle is fast, such as PYH.	-
	④ You have tried to perform the auto-tuning during ramp-soak operation.	Set the parameter ProG to oFF, and perform the auto-tuning again.	Page 14
	⑤ Peripheral devices have problems. Or they are not connected properly.	Connect them properly.	
	⑥ Direct/reverse actions are not suitable for the operations of the system to be controlled.	Set the parameter of P-n1 properly.	Page 49
	⑦ The response of the controlled system was too slow, and the auto-tuning did not finish in 9 hours.	Perform the tuning manually. (Set the parameter P to "0" to try the ON/OFF control.)	Page 20
14. An excessive overshoot has occurred during auto-tuning operation.	-	(1) Perform the auto-tuning with the parameter AT being "2" (Low PV type AT).	Page 16
	-	(2) Perform the tuning manually.	Page 20
15. The self-tuning does not work properly.	See the section of the parameter CtrL.		Page 27

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Memo

⚠Safety Precaution

- Before using the PXR3, read the “Instruction Manual” or consult with your local distributor or Fuji Electric for safety purpose.
- The uses and places for some of equipment described in this manual are limited. Some devices need regular inspections. Consult with your local distributor or Fuji Electric.
- Only electricians should connect this equipment.
- The contents of this manual have been prepared carefully. However, it should be noted that Fuji Electric is not responsible for any loss, including consequential damage from errors in writing or missing information.
  Before operating the PXR3, carefully read the safety precaution in the “Instruction Manual”.

Over-temperature Protection

Any control system design should take into account that any part of the system has the potential to fail.

For temperature control systems, continued heating should be considered the most dangerous condition, and the machine should be designed to automatically stop heating if unregulated due to the failure of the control unit or for any other reason.

The following are the most likely causes of unwanted continued heating:

1) Controller failure with heating output constantly on
2) Disengagement of the temperature sensor from the system
3) A short circuit in the thermocouple wiring
4) A valve or switch contact point outside the system is locked to keep the heat switched on.

In any application where physical injury or destruction of equipment might occur, we recommend the installation of independent safety equipment, with a separate temperature sensor, to disable the heating circuit in case of overheating.

The controller alarm signal is not designed to function as a protective measure in case of controller failure.

Consult on the PXR3 with the following:

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