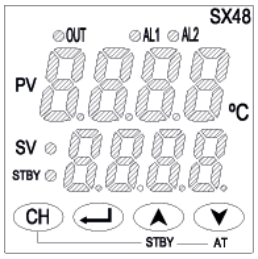


Temperature controller

Model: SX48

Operation Manual

30727486 17.02.2016

BEFORE USE

Thank you very much for purchasing our digital controller.

(1) Be sure to read this manual and grasp the concept before operating the instrument.
(2) The purpose of this manual is to provide detailed information on the function of the instrument. It does not guarantee that the instrument conforms to the specific purpose of the customer.
(3) No part or the whole of this manual may be reproduced without our permission.
(4) The contents of this manual may be changed without prior notice.

Note
Sufficient care has been taken to assure the accuracy of this manual. Please note that Ditel is not responsible for any damage, including indirect damage, resulting from an error in writing, missing information, or the use of the information described in the manual.

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.
Failure to comply with the instructions contained in this manual may reduce the safety of the instrument.
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

Installation and wiring

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

Operating temperature	–10□ ～ 50□	
Operating humidity	90%RH or less (Non condensation)	
Installation category	II	Conforming to IEC61010-1
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

Mains (Power source)	Measured value input
Control output (relay output)	Internal circuit
Alarm output (AL1)	SSR/SSC driving output
Alarm output (AL2)	

• 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 normally 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)
• A switch (or a circuit-breaker) must be included in the installation.
• A switch (or a circuit-breaker) must be suitably located and easily reached.
• A switch (or a circuit-breaker) must be marked as the disconnecting device for this equipment.
Supply wiring shall be prepared by installers in accordance with national regulations.
• A switch (or a circuit-breaker) must be included in the installation.
• A switch (or a circuit-breaker) must be suitably located and easily reached.
• A switch (or a circuit-breaker) must be marked as the disconnecting device for this equipment.
• Supply wiring shall be prepared by installers in accordance with national regulations.
• 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.
• Output relay is the part has a limited life.
• When output relay contact comes to the end of its life, it might remain on-state, or off-state. For safety, use a protective circuit outside.

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 deterio-rated with the lapse of time.
- One-year warranty is guaranteed for this unit including accessories, provided that the controller is properly used.

⚠Caution

Cautions on installation

Avoid the following places for installation.

- a place where the ambient temperature may reach beyond the range of from 0 to 50°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 output relay malfunction.)
- a place exposed to water, oil, chemicals, steam and vapor. (if immersed with water, take the inspection by sales office to avoid an electr-ical leakage and firing)
- a place where the unit is exposed to dust, salt air, or air containing iron par-ticles.
- a place where the unit is subject to intereference with static electricity, mag-netism, and noise.
- a place where the unit is exposed to direct sunlight.
- a place where the heat may be accumulated due to the radiation of heat.

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 are some gaps, tighten two screws until the gaps are eliminated. (Do not tighten the screws excessively because the mounting bracket can be removed from the stopper by the force.)
- The front side of this controller conforms to NEMA4X (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 deformation of packing as shown in Fig.3.

- If panel strength is weak, it may causes a gap between the packing and the panel, thus impairing water resistance.

Figure 1

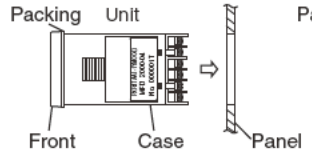


Figure 2

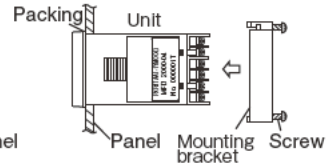
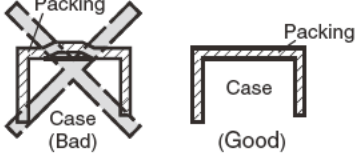


Figure 3



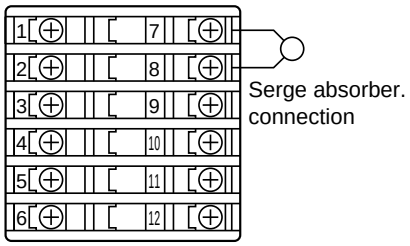
Precautions in wiring connection

- 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.
  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.)
- 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 serge absorber to protect a contact from switching serge and keep a longer life.
  Recommended spec · of serge absorber

	Varistor voltage
Voltage 100V	240V
200V	470V

Where to install: Connect it between contacts of the relay control output.

Example)



Requirement for key operation/operation in abnormalities

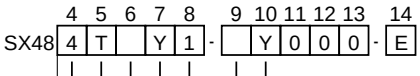
- Prior to the operation, be sure to check alarm functions, since a failure in the proper setting will result in a failure in the proper output of an alarm in case of an abnormality.
- A display of UUUU or LLLL will appear in case of a break in the input. Be sure to turn off the power when a sensor is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

Others

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

Table of Contents

Model Code Configuration

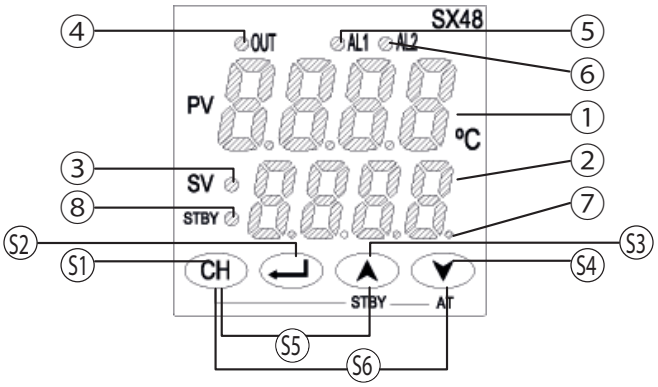


Digit	Specification	Note
4	**<Front dimensions>**	
	48 X 48mm	
5	**<Input signal>**	
	Thermocouple · RTD (°C)	
	Thermocouple · RTD (°F)	
6	**<Control output>**	
	Relay contact output	
	SSR/SSC driving output	
7	—	
8	**<Revision code>**	
9	**<Optional specifications>**	
	Alarm (1 pc.)	
	Alarm (2 pc.)	
10	**<Power supply voltage, Instruction manual>**	
	100 to 240V AC, Japanese/English/Chinese	

Input signal, measurement range, and set value at the time of deliver are as follows.
Thermocouple K, Measurement range; 0 to 400°C, Set value; 0C
Input signal of the thermocouple and the RTD can be switched by key operation on the front 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 PXE. For details about the setting of parameters, see Chapter 2.



Displays and indicator lamps

① Process value (PV)
Displays a process value (PV) or a parameter symbol.

② Setting value (SV)
Displays a set value (SV) or a parameter set value.

③ SV lamp
Lamp is lit when a set value is displayed at lower line.
Lamp is OFF while a parameter is being set.

④ Output lamp
Lamp is lit while control output is ON.
Lamp is OFF while control output is OFF.

⑤ Alarm 1 lamp

⑥ Alarm 2 lamp (Note1)
Lamp is lit while alarm is ON.
Lamp is OFF while alarm is OFF.

⑦ Auto-tuning lamp
Lamp blinks during auto-tuning
Lamp is OFF while control is being operated.

⑧ Standby lamp
Lamp is lit while control is standby(or stop)
Lamp is OFF while control is being operated.

Operation Keys

⑨ Block key
Switches parameter channels

⑩ Select key
Switches the parameters

⑪ Up key
Changes the setting value and increases numerical value

⑫ Down key
Changes the setting value and decreases numerical value

⑬ Block + Up key
Switches RUN/Stand-by with holding down for 3 seconds on PV/SV display

⑭ Block + Down key
Executes the auto-tuning Start/Stop with holding down for 3 seconds on PV/SV display

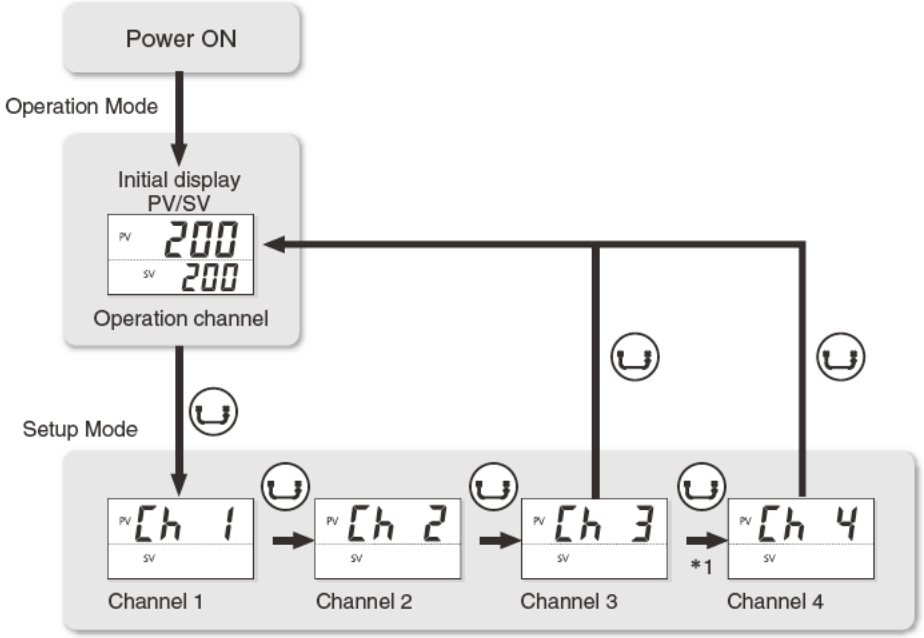
Note 1) Alarm 2 function is optional.

2 Operation

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

2-1 Basic operation

This device has two modes: operation mode and setup mode.
Refer to the following diagram about key functions and mode change.



*1: Proceed to channel 4 parameter only when the changeover of parameter display (dSPC) is set to EnG.

Operation Mode

Operation mode is the regular mode of operation. PV and SV are displayed. The controller starts in this mode when the power is turned on. This mode also allows you to change SV and alarm set point.

Setup Mode

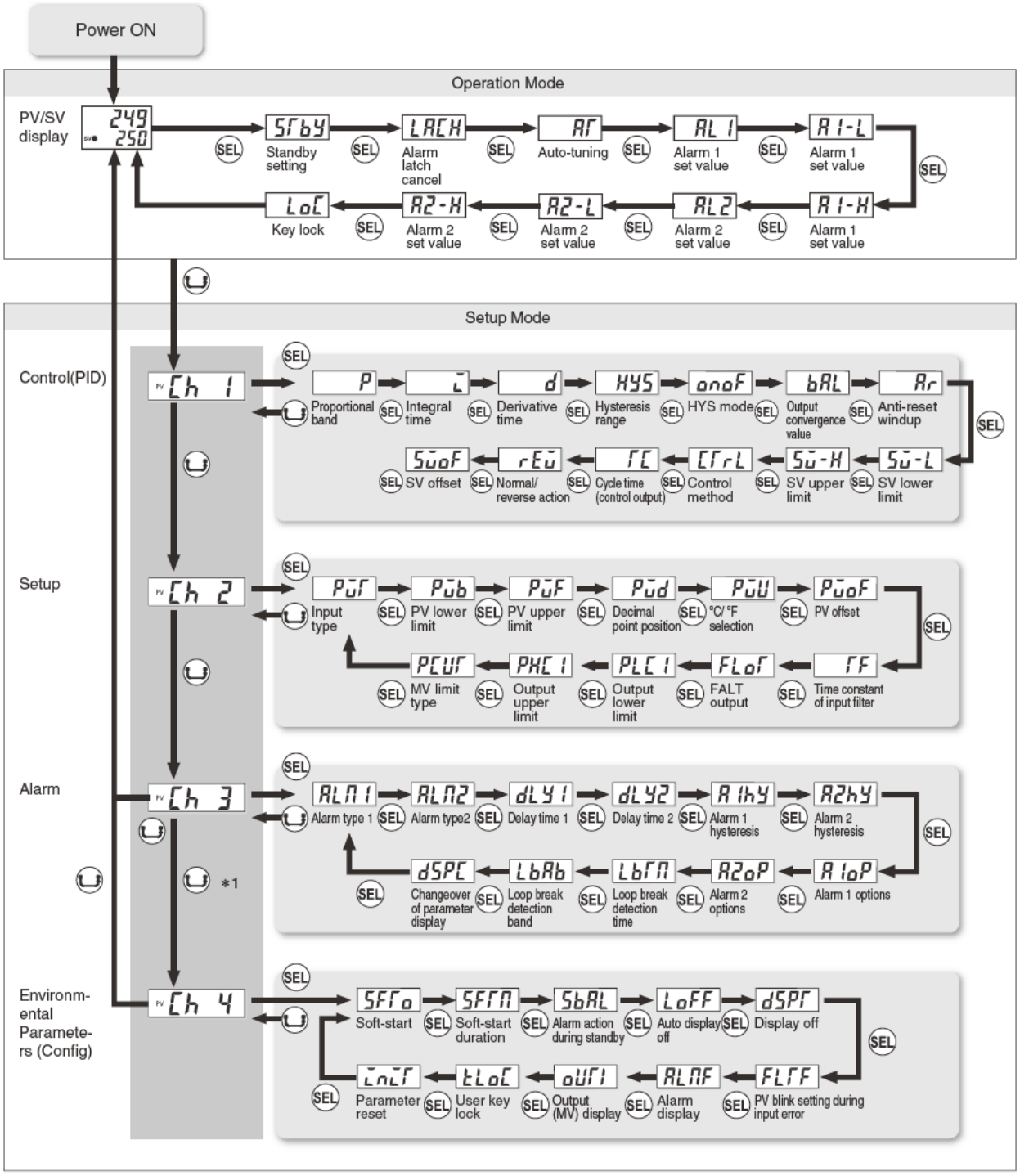
Setup mode allows you to set the parameters for the device. To enter setup mode, first press the key when in operation mode. Use the key to select the channel that includes the parameter you wish to change. Then press the SEL key to select the parameter. To change the value of a parameter, press the keys when the value of the parameter you wish to change is being displayed. Press the SEL key to save your change and proceed to the next parameter.

2-2 Parameter Overview

The parameters are divided into 5 channels. Each channel contains one series of parameters. The following is an overview of the channels.

Channel	Parameter Name	Overview
Operation Parameter	Operation	Sets the parameters for operation.
Ch 1	Control (PID)	Sets the parameters concerning controls.
Ch 2	Setup	Sets the parameters concerning input/output.
Ch 3	Alarm	Sets the parameters concerning the alarm function.
Ch 4	Environmental Parameters(Config)	Sets the parameters concerning setup definitions for the controller.

Parameter transition diagram



*1: Proceeds to channel 4 parameter only when the changeover of parameter display (dSPC) is set to EnG.

2-3 Parameter list

Operation parameter

Display	Parameter name	Description	Setting range	Default setting	Conditions for parameters to appear	Note	page
–	PV/SV display	Displays the process value (PV) and the setting value (SV). Specifys the setting value (SV).	0.00 to 100.00%FS		–		18
SrbY	Standby	Switches between RUN and Standby for control.	on: control Standby oFF: control RUN (control and alarm output are in normal operation)	oFF	–		19
LACH	Alarm latch cancel	Cancels the alarm latch. The set value will be automatically restored to OFF.	oFF: Keeps the alarm latch CLr: Opens up the alarm latch	oFF	When the alarm latch function is used.		20
AT	Auto-tuning	Starts and stops the auto-tuning.	oFF : Stop on : Normal auto-tuning L-on : Low-PV autp-tuning	oFF	When the control method (CTrL) is PID or FUZY.		21
AL1 A1-L A1-H AL2 A2-L A2-H	Alarm set value	Sets the operation points of alarm.	When the alarm type is absolute value: 0.00 to100.00%FS When the alarm type is deviation: -100.00 to100.00%FS	2.50%FS	When alarm type is set to between 1 and 11 or between 16 and 31.	Industrial value.	*23
LoC	Key lock	Sets the key lock to prevent operational error.	oFF: Change of setting is available from the face panel. ALL: All parameters can not bea changed. Invalid of AT (Block key + Down key) and standby (Block key + Up key) switchover PArA: Only SV setting can be changed. Invalid of AT (Block key + Down key) and standby (Block key + Up key) switchover	oFF	–		24

Channel 1 parameter

Display	Parameter name	Description	Setting range	Default setting	Conditions for parameters to appear	Note	page
P	Proportional band	Sets the proportional band of PID parameter.	0.1 to 999.9%	5.0%	When the control method (CTrL) is PID or FUZY.		25
I	Integral time	Sets the integral time of PID parameter	0 to 3200 seconds	240 seconds	When the control method (CTrL) is PID or FUZY.		25
d	Derivative time	Sets the derivative time of PID parameter	0.0 to 999.9 seconds	60.0 seconds	When the control method (CTrL) is PID or FUZY.		25
HYS	Hysteresis range for ON/OFF control	Selects the hysteresis range for ON/OFF control.	0 to 50%FS	0.25% FS	When the control method (CTrL) is ONOF.	Industrial value.	*26
onoF	HYS (Hysteresis) mode	Selects the hysteresis operation point 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+HYS and SV-HYS.	on	When the changeover of parameter display (dSPC) is EnG and the control method (CTrL) is ONOF.		28
bAL	Output convergence value	Sets the offset value to be add to MV.	-100.0 to 100.0%	0.0%	When the control method (CTrL) is PID or FUZY.		29
Ar	Anti-reset windup	Specify the range of integral action	0 to 100%FS	100% FS	When the changeover of parameter display (dSPC) is EnG and the control method (CTrL) is PID or FUZY.	Industrial value.	*30
SU-L	SV (Setting Value) lower limit	Sets the lower limit of the SV.	0 to 100%FS	0% FS	When the changeover of parameter display (dSPC) is EnG.	Industrial value.	*31
SU-H	SV (Setting Value) upper limit	Sets the upper limit of the SV.	0 to 100%FS	100% FS	When the changeover of parameter display (dSPC) is EnG.	Industrial value.	*31
CTrL	Control method	Selects the control method.	onoF: ON/OFF control. PId: Normal PID operation. FUZY: Fuzzy control.	onoF			32
rC	Cycle time of control output	Sets the cycle time of control output.	1 to 150 seconds	relay: 30 seconds SSR: 2 seconds	When the control method (CTrL) is PID or FUZY.		34
rEU	Normal/reverse action	Switches between normal and reverse action.	rEUS : Reverse action noRL : Normal action	rEUS			35
SUOF	SV (Setting Value) offset	Sets the offset value to be added to SV.	-50 to 50%FS	0%FS	When the changeover of parameter display (dSPC) is EnG.	Industrial value.	*36

Channel 2 parameter

Display	Parameter name	Description	Setting range	Default setting	Conditions for parameters to appear	Note	page
PūT	Input type	Selects the input type.	JPt1 : JPt100 without a decimal point JPt2 : JPt100 with a decimal point Pt1 : Pt100 without a decimal point Pt2 : Pt100 with a decimal point J1 : J thermocouple without a decimal point J2 : J thermocouple with a decimal point t1 : K thermocouple without a decimal point t2 : K thermocouple without a decimal point t3 : K thermocouple with a decimal point T1 : T thermocouple without a decimal point T2 : T thermocouple wit a decimal point r : R thermocouple without a decimal point b : B thermocouple without a decimal point S : S thermocouple without a decimal point E : E thermocouple without a decimal point n : N thermocouple without a decimal point PL-2 : PL-IIwithout a decimal point	t1			37
PūL	PV (Process value) lower limit	Sets the lower limit of PV input.	-1999 to 9999	0℃	When the changeover of parameter display (dSPC) is EnG.		38
PūF	PV (Process value) upper limit	Sets the upper limit of PV input.	-1999 to 9999	400℃	When the changeover of parameter display (dSPC) is EnG.		38
Pūd	Decimal point position	Sets the decimal point position in PV/SV display	0: No digit after a decimal point 1: 1 digit after a decimal point	0	When the changeover of parameter display (dSPC) is EnG.		39
PūU	℃ / °F selection	Choose temperature scale.	oC : ℃ oF : °F	oC	When the changeover of parameter display (dSPC) is EnG.	℃ should be selected.	-
PūoF	PV (Process value) offset	Sets the offset value to be added to PV.	-10.00 to 10.00%FS	0.00% FS		Industrial value.	*40
FF	Time constant of input filter.	Sets the time constatnt of PV input filter.	0.0 to 120.0 seconds	5.0 seconds	When the changeover of parameter display (dSPC) is EnG.		41
FLoF	FALT output	Sets the output value when an input error (FALT) occurs.	-3.0 to 103.0%	-3.0%	When the changeover of parameter display (dSPC) is EnG.		42
PLC1	Output lower limit	Sets the lower limit for output.	-3.0 to 103.0%	-3.0%	When the changeover of parameter display (dSPC) is EnG.		43
PHC1	Output upper limit	Sets the upper limit for output.	-3.0 to 103.0%	103.0%	When the changeover of parameter display (dSPC) is EnG.		43
PCUT	MV limit type	Sets the type of output limitter.	0 to 3	0	When the changeover of parameter display (dSPC) is EnG		44

Channel 3 parameter

Display	Parameter name	Description	Setting range	Default setting	Conditions for parameters to appear	Note	page
ALM1	Alarm type 1	Sets the type of alarm action.	0 to 12	5	The setting range veries depending on the changeover of parameter display (dSPC) setting.		45
		Sets the type of alarm action during dSPC is set to engineer level (EnG).	0 to 31	5			
ALM2	Alarm type 2	Sets the type of alarm action.	0 to 12	No alarm output: 0 Alarm output:9	The setting range veries depending on the changeover of parameter display (dSPC) setting.		45
		Sets the type of alarm action during dSPC is set to engineer level (EnG).	0 to 31	No alarm output: 0 Alarm output:9			
dLY1	Delay time 1	Delay time for alarm 1 output.	0 to 9999 seconds	0 seconds	When the changeover of parameter display (dSPC) is EnG.		48
dLY2	Delay time 2	Delay time for alarm 2 output.	0 to 9999 seconds	0 seconds	When the changeover of parameter display (dSPC) is EnG.		48
A1hY	Alarm 1 hysteresis	Sets the hysteresis range of ON and OFF of alarm 1.	0 to 50%FS	0.25%FS	When the changeover of parameter display (dSPC) is EnG.	Industrial value.	*48
A2hY	Alarm 2 hysteresis	Sets the hysteresis range of ON and OFF of alarm 2.	0 to 50%FS	0.25%FS	When the changeover of parameter display (dSPC) is EnG.	Industrial value.	*48
A1oP	Alarm 1 options	Sets the optional functions of alarm 1. Alarm latch (1: use,0: not use) Alarm of error status (1: use, 0: not use) De-energized output (1: use, 0: not use)	0 to 111	000	When the changeover of parameter display (dSPC) is EnG.		49
A2oP	Alarm 2 options	Sets the optional functions of alarm 2. Alarm latch (1: use,0: not use) Alarm of error status (1: use, 0: not use) De-energized output (1: use, 0: not use)	0 to 111	000	When the changeover of parameter display (dSPC) is EnG.		49
LbTM	Loop break detection time	Sets the temperature range to detect a loop break.	0 to 9999 seconds	0 seconds	When loop break alarm is used.		51
LbAb	Loop break detection band	Sets the temperature range to detect a loop break.	0 to 100%FS	2.5%FS	When loop break alarm is used.	Industrial value.	*51
dSPC	Changeover of parameter display	Sets whether or not to display hidden parameters and setting range. Every time power is turned on, operator level is always set as default.	oPE : Operator level EnG : Engineer level	oPE			52

Channel 4 parameter

Display	Parameter name	Description	Setting range	Default setting	Conditions for parameters to appear	Note	page
SFTo	Soft-start	Sets the control output value (OUT) during softstart.	-3.0 to 103.0%	103.0%	When the changeover of parameter display (dSPC) is EnG.		53
SFTM	Soft-start duration	Sets duration of soft-start operation after poweron.	0.00 to 99.59 (00 hr. 00 min. to 99 hrs. 59 min.)	0.00	When the changeover of parameter display (dSPC) is EnG.		53
SbAL	Alarm action during standby	Sets whether to turn off the alarm or to continue alarm action during standby.	0: Alarm action OFF (output OFF) 1: Alarm action ON	0	When the changeover of parameter display (dSPC) is EnG.		54
LoFF	Auto display off	Sets the time until the display automatically turn off (valid only on SV/PV screen).	oFF : Not use 15S : Auto-off after 15 seconds. 30S : Auto-off after 30 seconds. 1M : Auto-off after 1 minute. 5M : Auto-off after 5 minutes.	oFF	When the changeover of parameter display (dSPC) is EnG.		55
dSPF	Display off	Sets ON/OFF of PV and SV displays and LED indicator lamps.	0: PV, SV, and LED lamps ON (all ON) 1: SV display OFF 2: PV display OFF 3: PV and SV displays OFF 4: PV, SV, and LED lamps OFF (all OFF) 5: SV display OFF (relights for 5 sec. by pressing any key) 6: PV display OFF (relights for 5 sec. by pressing any key) 7: PV and SV displays OFF (relights for 5 sec. by pressing any key) 8: PV, SV, and LED lamps OFF (relights for 5 sec. by pressing any key)	0	When the changeover of parameter display (dSPC) is EnG.		56
FLTF	PV blink setting during input error	Sets whether or not to blink PV during an input error.	0 : PV blinks during an input error 1 : PV does not blink	0	When the changeover of parameter display (dSPC) is EnG.		57
ALNF	Alarm display	Selects the display when an alarm or alarms occur.	0 : Displays PV (no change). 1 : Displays PV and the alarm number alternately. 2 : Displays blinking PV. 3 : Displays the alarm number only.	1	When the changeover of parameter display (dSPC) is EnG.		58
oUT1	Output (MV) display	Displays output value.	-3.0 to 103.0% (display only)	-	When the changeover of parameter display (dSPC) is EnG.		59
tLoC	User key lock	Specifies whether or not to enable AT on/oFF switching(Block key + Down key) or RUN/standby switching (Block key + Up key) on PV/SV screen.	0: Both AT and RUN/standby are switchable. 1: AT is not switchable, RUN/standby is switchable. 2: AT is switchable, RUN/standby is not switchable. 3: Neither AT nor RUN/standby is switchable.	0	When the changeover of parameter display (dSPC) is EnG.		60
InIT	Parameter reset	Parameters can be restored to factory default setting.	no : Do nothing. YES : Resets the parameter setting.	no	When the changeover of parameter display (dSPC) is EnG.		61

Note 1: The set value of the parameter for which "*" is marked in "page"column changes depending on the set value of PVT, PVb, PVF and PVd. When you change the values of PVT, PVb, PVF, and PVd, you have to reconfigure the parameters marked with "*".

Note 2: FS (Full Span) in this manual means the PV input range. For example, when PV input range is from 0 to 400ºC, FS is 400ºC. %FS means the percentage of FS. For example, when FS is 400ºC, default value for "alarm set value" of which default setting is 2.5%FS is: 400ºC×2.5% = 10ºC. (10ºC will be displayed.)
All the items with %FS described in "setting range" column are displayed and configured with actual number as above example.

3 Setup procedure

3-1 Steps for Setting Parameters

Preparation

(1) Make a setting plan.

Decide how you want the controller to run and what parameter values will be needed to make the controller run to your specifications. At the very minimum, you need to determine the following settings:

- Input sensor type
- Normal or reverse action

  Refer to: "Setting of Normal/Reverse action" (p. 35)
- Control method

  Ex.) ON/OFF control, PID control

  Refer to: "Control method" (p. 32)
  "Hysteresis for ON/OFF control" (p. 26)
- SV Value

  Refer to: "SV Lower limiter" (p. 31)
  "SV Upper limiter" (p. 31)

(2) Turn the power on.

Confirm that the connections are correct, and then turn on the power.

Immediately after powering up, the controller will be in operation mode. The PV and SV displays will illuminate and display numbers. If nothing is displayed, recheck the power source and connection.

(3) Set the parameters laid out in your plan.

Refer to: Chapter 2 "Operation"

Test operation

(1) Run a test operation. Perform auto-tuning when the control method is set to PID or FUZY.

Adjust the parameters according to the results of the test. Now the controller is ready for operation.

3-2 Example for parameter setting

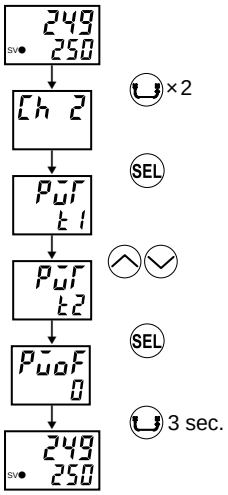
This section shows an example for the setting under the following conditions.

Conditions of use

Input type : K thermocouple -200 to 1200°C
Control method : ON/OFF Control (2 position)
Control action : Reverse
Setting value (SV) : 800°C

Operating procedure

① Set the input type to K thermocouple (-200 to 1200°C) by the following steps.



Press the ↵ key twice on PV/SV display to access channel 2 display.

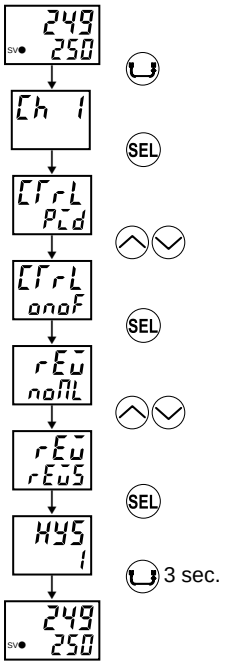
Press the SEL key once to access the setting of input type (PvT) display.

Use the ∧∨ key to select "K2" for K thermocouple with measuring range of -200 to 1200°C.

Press the SEL key once to save your change and proceed to the next parameter.

Press and hold the ↵ key for three seconds to return to PV/SV display.

② Specify the control settings (ON/OFF control, reverse action).



Press the ↵ key once on PV/SV display to access channel 1 display.

Press the SEL key several times to access the control method (CTrL) display.

Use the ∧∨ key to select "onoF" for ON/ON control.

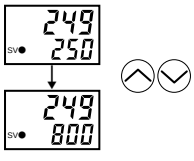
Press the SEL key once to save your change and proceed to the next parameter, namely, the Normal/reverse action (rEv).

Use the ∧∨ key to select "rEuS" for reverse action.

Press the SEL key once to save your change and proceed to the next parameter.

Press the ↵ key for three seconds to return to PV/SV display.

③ Specify the setting value (SV) to 800°C.



Use the ∧∨ key to enter "800" to the setting value (SV).
The change will be saved automatically in three seconds.
The controller will start operation with SV being 800°C.

4 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 channel 1 parameter cannot be set. (See page 31.)

Related parameters : SV-L (page 31)
SV-H (page 31)

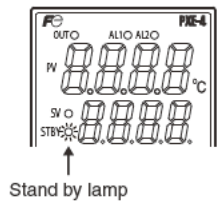
[Setting example] Changing the SV from 250°C to 1195°C

Display	Operating procedure
	**1.** Press the ⌃⌄ key to display 1195.
	**2.** The SV will be set to 1195 in three seconds. After that, the controller will operate with the SV being 1195.

SrbY Standby setting (Settings: oFF/on)

[Description]

- The control output and all the alarm output stay OFF dur ing standby.
- The standby lamp is lit during standby.
- While the alarm with a hold is selected, the hold function takes effect after changing the Standby setting from ON to OFF.



Stand by lamp

- The setting of ON/OFF for standby is saved after power-off
- When the standby is set to ON during the auto-tuning, the operation will stop. (The PID constant will not be renewed.) Even if Standby is set to OFF later, the auto-tuning will not be re-started.
- During standby, the ON-delay timer is reset. When returning to RUN from the standby, the timer will start from the beginning.

Related parameter : SbAL (page 54)

[Setting example] Switching to Standby mode

Display	Operating procedure
1499 1500	**1.** Press the SEL key to display SrbY .
SrbY oFF	
SrbY on	**2.** Press the ∧ ∨ key to select on.
	3. Press the SEL key once. The controller goes standby. (Control output and all the alarm outputs: OFF)
1499 1500	**4.** Press and hold the ↵ key for three seconds to return to the PV/SV display. STBY lamp will flash, indicating the standby status.

LACH Alarm latch cancel (Settings: oFF / CLr) (Option)

[Description]

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

[Note]

• This parameter will be displayed only when Alarm latch is set to ON in alarm options setting (A1oP, A2oP).

Related parameters : A1oP to A2oP (page 49)

[Setting example] Opening up the alarm latch

Display	Operating procedure
	**1.** Press the SEL key to display LACH on the PV display.
	
	**2.** Press the ∧ ∨ keys to display CLr.
	3. Press the SEL key once. The alarm latch is cancelled.
	**4.** Press and hold the ↵ key for three seconds to return to the PV/SV display.

AT Auto-tuning function (Settings: oFF / on / L-on)

[Description]

The optimal PID parameters will be automatically confiy-ured by auto-tuning.

Range oFF : Stop/Finish
on : Auto-tuning (normal type) starts
L-on : Auto-tuning (low PV type) starts

- There are two types of auto-tuning.
- ◆ Normal type: Requests PID and starts ON/OFF operation with SV as the baseline.
- ◆ Low PV type: Requests PID and ON/OFF operation at a baseline of SV-10%. Use this setting if you are trying to prevent overshoot.
- If the controller is powered off during auto-tuning, the auto-tuning function is invalidated with PID parameters unchanged. To start the auto-tuning operation, set to "on" or "L-on" again.
- To suspend the auto-tuning, set AT to "oFF". This makes the auto-tuning cancel with each parameter of PID unc hanged.
- Once the parameters of PID 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 "on" or "L-on", the auto-tuning operation starts, and at the end of the tuning, oFF will be displayed automatically to AT.
- After the auto-tuning operation, the controller starts to op erate at the automatically set values of PID.
- A decimal point at the right end of the SV display flashes during auto-tuning.

[Point]

The following parameters are called as PID parameters.

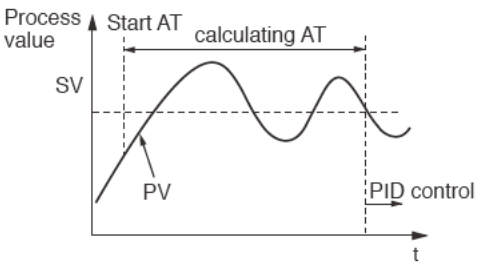
- Proportional band [P]
- Integral time [I]
- Derivative time [D]
- Anti-reset windup [Ar]

[Note]

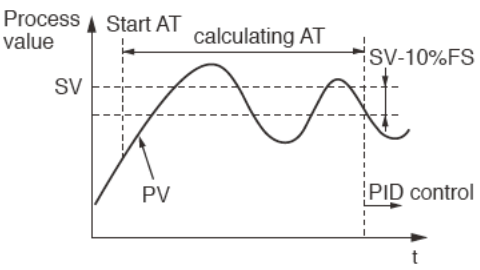
- Since ON/OFF control is performed during auto-tuning, overshoot against the SV may occur. To reduce the overs hoot, execute the auto-tuning operation with the setting code [L-on] (Low PV) selected.
- The auto-tuning can be executed both just after power-on and in a control or stable status.
- This parameter is displayed only when the control method (CTrL) is set tot PId or FUZY.

Related parameters : P (page 25)
I (page 25)
d (page 25)
Ar (page 30)
CTrL (page 32)

Auto-tuning action when set value is "on".



Auto-tuning action when set value is "L-on".



[Setting example] Starting the auto-tuning (standard type) operation

Display	Operating procedure
 	**1.** Press the SEL key to display AT on the PV display. **2.** Press the ∧ ∨ key to select on.
	**3.** Press the SEL key once to start auto-tuning. During auto-tuning, a decimal point at the right end of the SV display flashes.
	**4.** Press and hold the ↵ key for three seconds to return to the PV/SV display. . **5.** When the auto-tuning finishes properly, a decimal point stops flashing, and the set values of P, I, d, and Ar parameters change. When the auto-tuning finishes abnormally, a decimal point stops flashing, but the set value of P, I, and D parameters remain unchanged.

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

[Description]

- These parameters are used to set operation values of alarm 1 and 2.
- When the alarm type (ALM1 or ALM2) is set to between 1 and 11, alarms 1 and 2 (AL 1 and AL2) can be set.
- When the alarm type (ALM1 or ALM2) is set to between 16 and 31, the upper and lower limits of alarm 1 and 2 (A1-H, A2-H, A1-L, A2-L) can be set.

[Note]

This parameter is not displayed when the alarm type parameters (ALM1 , ALM2) are set to 0 or between 12 and 15.

Related parameters : ALM1, ALM2 (page 45)
A1hY, A2hY (page 48)
dLY1, dLY2 (page 48)
A1oP, A2oP (page 49)

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

Display	Operating procedure
1499 1500	**1.** Press the SEL key to display AL2 on the PV display.
AL2 10	
AL2 -10	**2.** Press the ∧ ∨ key to select -10.
	3. Press the SEL key once to save the value. After that, the controller will operate with the operation value of alarm 2 being -10°C.
1499 1500	**4.** Press and hold the ↵ key for three seconds to return to the PV/SV display.

LoC Key lock (Settings: oFF / ALL / PArA)

[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 oFF.
- Even when the key lock is set, control and alarm functions can operate properly.
- There are three levels of the key lock:
  - oFF : Change of settings is available.
  - ALL : All parameters cannot be changed. Invalid of AT (Block key + Down key) and standby switchover (Block key + Up key).
  - PArA : Only SV setting can be changed. Invalid of AT (Block key + Down key) and standby switchover (Block key + Up key).

[Setting example] Setting the key lock to "PArA"

Display	Operating procedure
1499 1500	**1.** Press the SEL key to display "LoC" on the PV display.
LoC oFF	
LoC PArA	**2.** Press the ∧ ∨ key to display PArA.
	3. Press the SEL key once. The key lock is now set to PArA. After that, setting other than the SV cannot be changed from the front panel.
1499 1500	**4.** Press and hold the ↺ key for three seconds to return to the PV/SV display.

P | I | d

Proportional band, Integration time, Derivative time
(Setting range: P: 0.0% to 999.9%,
I: 0 sec to 3200 sec, D: 0.0 sec to 999.9 sec)

[Description]

This parameter specifies PID (Proportional band, Integration time, and Derivative time).

The following control methods are available by PID settings.

◆ ON/OFF (2-position) control

When the control method (CTrL) is set to onoF, ON/OFF control is used. Use this function when you want to run simple control without worrying about the controllability.

◆ PID Control

Use this function when you want to control with high controllability. Operates when P ≠ 0, I ≠ 0, and D ≠ 0, but P, I, and D must be adjusted to optimal values for the control target. In normal situations, run auto-tuning to optimally adjust P, I, and D before using this function.

◆ PI Control

When P ≠ 0, I ≠ 0, and D = 0, D control is turned off and PI control is used.

◆ P Control

When P ≠ 0 and I = D = 0, I and D controls are turned off and P control is used. In principle, P control generates offset and PV does not agree with SV. In this situation, adjust the output convergence value " bAL ".

[Point]

- Running auto-tuning automatically sets PID. See "Auto-Tuning" (p.21) for more information.
- The PID settings configured by auto-tuning are generally considered to be optimal settings. If you wish to change the responsiveness, adjust PID manually.
- Control normally becomes unstable when "P" is set too small. On the other hand, setting it too big makes the re sponse slow.
- Set the hysteresis for the ON/OFF (2-position) control with the parameter "hyS".

[Note]

This parameter is displayed when the control method (CTrL) is set to PId or FUZY.

Related parameter: CTrL (page 32)

[Setting example] Setting P = 15.0, I = 100sec., D = 20sec.

Display	Operating procedure
1499 1500	**1.** Press the ↵ key to display "Ch1" on the PV display.
Ch 1	
P 50	**2.** Press the SEL key to select P.
P 150	**3.** Use the ∧ ∨ key to enter 150.
I 100	**4.** Press the SEL key to register "15.0" as P.
d 20	**5.** Repeat the steps 2 to 4 for I and D.
1499 1500	**6.** Press and hold the ↵ key for three seconds to return to the PV/SV display.

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

[Description]

Settings for ON/OFF (2-position) control

• Range: 0.0% to 50.0% FS

The controllability varies with the size of the hysteresis.

◆ Small hysteresis

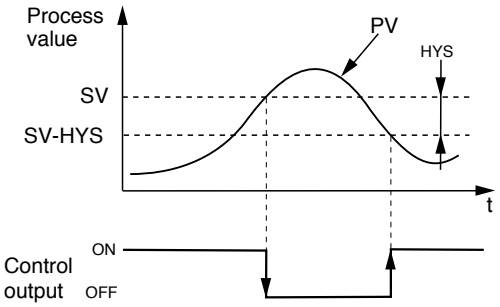
- High-precision control
- Frequency of output relays is high, so lifespan becomes short

◆ Large hysteresis

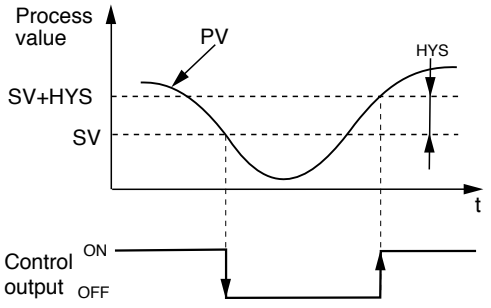
- Low-precision control
- Frequency of output relays is low, so lifespan is relatively long.

The relationship between SV and hysteresis in normal and reverse operation is shown below.

Reverse



Normal



[Point]

• If the hysteresis width is narrow, and PV and SV are near ly equal, the output may frequently switch on and off. Note that doing so may affect the operation life of the contact output.

• The unit of the set value of this parameter is °C or °F (en gineering unit). The setting range varies according to the measunig range of input.

[Example]

When using K thermocouple whose measuring range from 0 to 400°C, the setting range is from 0 to 200°C.

When using RTD whose measuring range from 0 to 150°C, the setting range is from 0 to 75°C.

[Note]

This parameter appears only when the control method (CTrL) is set to onoF.

Related parameters : onoF (page 28)
CTrL (page 32)

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

Display	Operating procedure
	**1.** Press the ↵ key to display Ch1 on the PV display.
	
	**2.** Press the SEL key to select HYS.
	**3.** Use the ∧∨ key to enter 35.
	4. Press the SEL key once to register 35°C as HYS.
	**5.** Press and hold the ↵ key for three seconds to return to the PV/SV display.

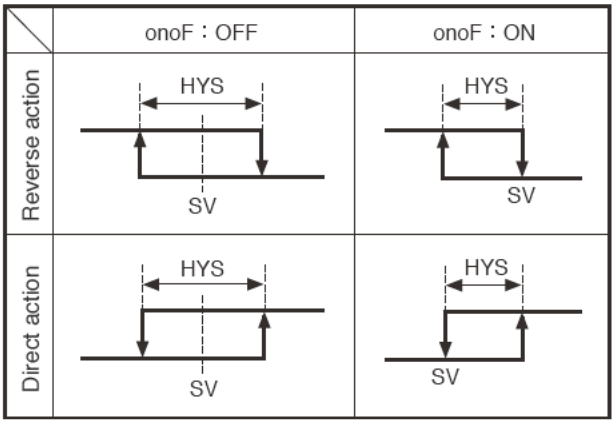
onoF HYS (Hysteresis) mode at ON/OFF control (Settings: oFF /on)

[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+$\frac{\text{HYS}}{2}$ and SV-$\frac{\text{HYS}}{2}$

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



[Note]

This parameter appears only when the changeover of parameter display (dSPC) is set to EnG and the control method (CTrL) to onoF.

Related parameters : dSPC (page 52)
CTrL (page 32)

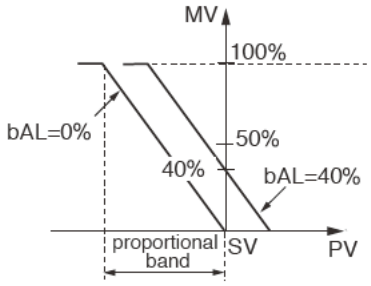
[Setting example] Setting the hysteresis mode to ON

Display	Operating procedure
1499 1500	**1.** Press the ↵ key to display Ch1 on the PV display.
Ch 1	
onoF oFF	**2.** Press the SEL key to select onoF.
	3. Use the ∨ key to select on.
onoF on	**4.** Press the SEL key once to set to "on" for the hysteresis operation mode. After that, the controller will operate with the hysteresis being as shown in the figure of ON above.
1499 1500	**5.** Press and hold the ↵ key for three seconds to return to the PV/SV display.

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

[Description]

- Output convergence value is a function that adds MV value offset.
- By this function, the bAL offset is added to original MV which is the result of PID calculation determined by PV and SV, and the totalized value is outputted as MV.



[Note]

This parameter appears only when the control method (CTrL) is set to PId or FUZY.

Related parameters : CTrL (page 32)

[Setting example] Setting the Output Convergence Value to 3.0%

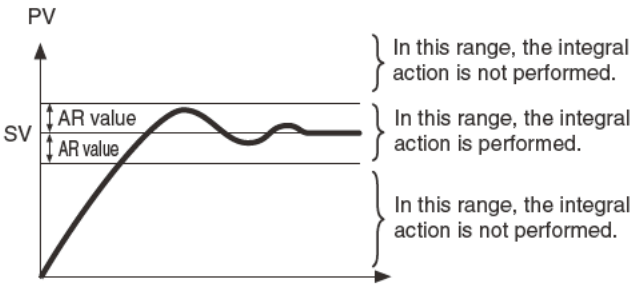
Display	Operating procedure
1499 1500	**1.** Press the ↵ key to display Ch1 on the PV display.
Ch 1	
bAL 00	**2.** Press the SEL key to select bAL.
	3. Use the ∧ ∨ key to enter 30.
bAL 30	**4.** Press tahe SEL key once to register 3.0. After that, the MV with the offset of 3.0% added will be output .
1499 1500	**5.** Press and hold the ↵ key for three seconds to return to the PV/SV display.

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

[Description]

Anti-reset windup is a function that limits the range of valid integration to control overshooting.

- The anti-reset windup function (" Ar ") cuts integration that falls outside of the Ar set range that is centered around SV. It is automatically set to the optimum value when auto-tuning is activated.



[Note]

- This parameter appears only when the changeover of parameter display (dSPC) is set to EnG and the control method (CTrL) to PId or FUZY .
- By making use of the fuzzy control system equipped with PXE, the amount of overshoot can be minimized without setting bAL and Ar.

Related parameters : dSPC (page 52)
CTrL (page 32)

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

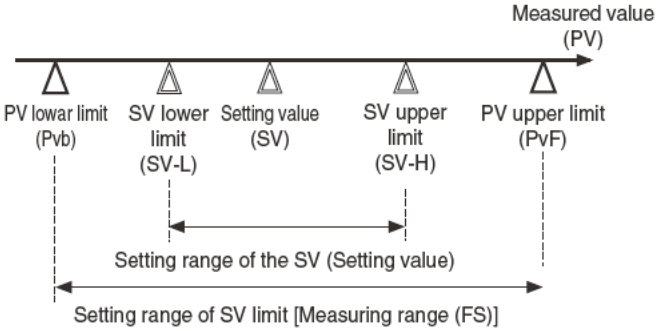
Display	Operating procedure
1499 1500	**1.** Press the ↵ key to display Ch1 on the PV display.
Ch 1	
Ar 60	**2.** Press the SEL key to select Ar.
	3. Use the ∧ ∨ key to enter 80.
Ar 80	**4.** Press the SEL key once to save the value. After that, the controller will operate with the anti-reset windup being 80°C.
1499 1500	**5.** Press and hold the ↵ key for three seconds to return to the PV/SV display.

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

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

[Description]

- These parameters specify the setting range of the SV (Set ting value).
- The SV upper and lower limits (Su-H , Su-L) can be set within the range of the measuring values (Pvb, PvF).



[Note]

- Before setting the parameters of Su-H and Su-L ,be sure to set the following parameters.
  - PV lower limit (Pub)
  - PV upper limit (PuF)
  - Decimal point position (Pud)
- Before setting the SV, set the parameters of Su-H and Su-L.
- Be sure to set the values of Su-H and Su-L so that Su-H is larger than or equal to Su-L.
- The displayed SV will be limitted immediately after set ting Su-H and Su-L.
- This parameter appears only when the changeover of pa rameter display ($dSPC$) is set to EnU.

Related parameters : $dSPC$ (page 52)
Pub (page 38)
PuF (page 38)
Pud (page 39)

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

Display	Operating procedure
150 150	**1.** Press the ↵ key to display Ch1 on the PV display.
Ch 1	
Su-H 400	**2.** Press the SEL key to select Su-H.
	3. Use the ∧ ∨ key to enter 100.
Su-H 100	**4.** Press the SEL key once to register 100°C as Su-H. After that, the upper limit of the SV will be 100°C.
1499 1500	**5.** Press and hold the ↵ key for three seconds to return to the PV/SV display

CTrL Control method (settings: onoF, PId, FUZY)

[Description]

This controller has three temperature control functions. Select the best function for your application.

● Temperature Control Functions

◆ ON/OFF (2-position) Control

Switches output control ON/OFF according to the SV/PV magnitude relationship. Control systems can be built from simple elements such as SSR. This is appropriate for situations where accuracy is not required.

◆ PID Controls

PID calculation and controls proceed according to the previously set PID parameters. PID parameters can be set manually or through auto-tuning (AT). It is the most basic control in this equipment.

◆ Fuzzy PID Control

Reduces the amount of overshoot during control. It is effective when you want to suppress overshoot while changing SV, even during processes where it may take a long time to reach the target value.

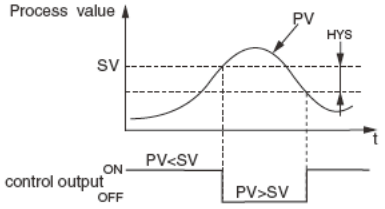
(1) ON/OFF (2-position) Control

To start ON/OFF control, set the control method (CTrL) to onoF. ON/OFF control switches the control output to ON (100%) or OFF (0%) according to the SV/PV magnitude relationship. The output hysteresis can be set under the parameter "HYS".

• Reverse Operation (Heating)

Method used to control the electrical heating furnace. Set the HYS to an appropriate value according to the control target.

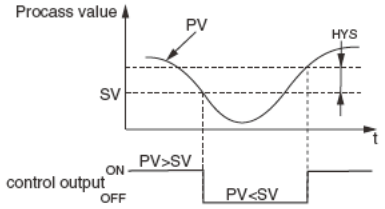
Parameter	Set Value
"r-EV"	rv--
"HYS"	Optional



• Normal Operation (Cooling)

Method used to control the cooling machine.

Parameter	Set Value
"r-EV"	no--
"HYS"	Optional



[Note]

If the hysteresis width is narrow, and PV and SV are near ly equal, the output may frequently switch on and off. Note that doing so may affect the operation life of the contact output.

(2) PID Control

To start Pid control, set when the control method (CTrL) to PId. Pid controls calculate Pid and output the result according to the set values of the parameters "P ", "I", "d ", and " Ar "(-3% to 103%). Each parameter can be set either by manually tuning the values or by running auto-tuning (AT) to automatically set the values.

• Refer to:"Auto-tuning" for more about the auto-tuning function. (p. 27)

(3) Fuzzy PID Control

To start Fuzzy PID control,set the control method (CTrL) to FUZY. This control minimizes the over shoot compared to normal PID. Fuzzy control can only be used after auto-tuning has been activated and a PID set.

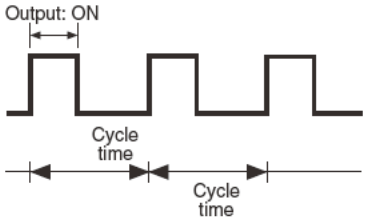
[Setting example] Changing the control system from PID to FUZZY

Display	Operating procedure
	**1.** Press the ↵ key to display Ch1 on the PV display.
	
	**2.** Press the SEL key to select CTrL.
	3. Use the ∧∨ key to select FUZY.
	**4.** Press the SEL key once to save the change. After that, the controller will operate with the FUZZY control system activated.
	**5.** Press and hold the ↵ key for three seconds to return to the PV/SV display.

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

[Description]

- While input is within the proportional band, output switches between ON and OFF in cycles. These cycles are called cycle time.



- There are different recommended settings for different types of control output, as shown below.

◆ Contact Output

The shorter the proportional cycle, the finer the control. However, shorter proportional cycles also shorten the lifespan of the contact points and operating device. Be sure to balance control and controller lifespan when adjusting the proportional cycles. Recommended setting: 30 sec

◆ SSR Drive Output

Because there are no mechanical parts to this controller, use a short proportional cycle if the operating device is working properly. Recommended setting : 1 sec to 2 sec.

[Note]

This parameter appears only when the control method (CTrL) is set to PId or FU2Y.

Related parameter: CTrL (page 32)

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

Display	Operating procedure
1499 1500	**1.** Press the ↵ key to display Ch1 on the PV display.
Ch 1	
rC 30	**2.** Press the SEL key to select rC.
	3. Use the ∧ ∨ key to enter 20.
rC 20	**4.** Press the SEL key once to register 20sec as TC.
1499 1500	**5.** Press and hold the ↵ key for three seconds to return to the PV/SV display.

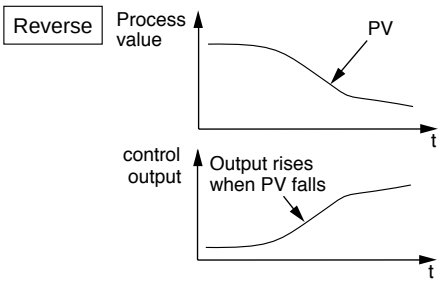
rEv Normal/Reverse Action (Settings: rEvS / noRL)

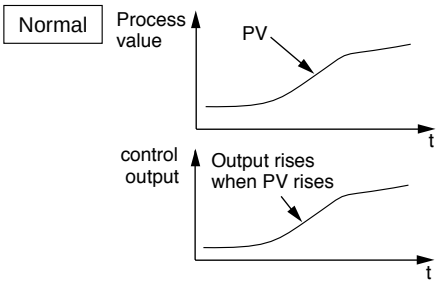
[Description]

Control action can be switched between normal (direct) and reverse.

• Range : rEvS : reverse action
noRL : normal action

Most temperature control is done with heating in reverse and cooling in normal.





[Setting example] Setting the control action to Normal action

Display	Operating procedure
1499 1500	**1.** Press the ↵ key to display Ch1 on the PV display.
Ch 1	
rEv rEvS	**2.** Press the SEL key to select rEvS.
rEv noRL	**3.** Use the ∧ ∨ key to select noRL.
	4. Press the SEL key once to save the change. After that, the controller will operate normal action.
1499 1500	**5.** Press and hold the ↵ key for three seconds to return to the PV/SV display.

SVoF SV (Setting value) 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 PXE operates based on the SV to which the SV offset value is added.
- Alarm judgement is made by the displayed SV to which the SV offset value is not added.

[Note]

This parameter appears only when the changeover of parameter display (dSPC) is set to EnG.

Related parameters : dSPC (page 52)

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

Display	Operating procedure
1499 1500	**1.** Press the ↵ key to access Ch1 on the PV display.
Ch 1	
SVoF 0	**2.** Press the SEL key to select SVOF.
SVoF 9	**3.** Use the ∧ ∨ key to enter 9.
	4. Press the SEL key once to register 9°C as SVoF. (The displayed SV remains unchanged.) After that, the controller will operate at the SV with offset value of 9°C added.
1499 1500	**5.** Press and hold the ↵ key for three seconds to return to the PV/SV display.

PUT Input type (Settings: JPT 1, JPT2, Pt 1, Pt2, J 1, J2, t 1, t2, t3, T 1, T2, r, b, S, E, n, PL-2)

[Description]

- This parameter is used for selecting the input type for PV input from RTDs and thermocouples shown below.
- Input types

Input type		Set value	Range	
			[°C]	[°F]
RTD	JPt100	JPT 1	–200 to 600 [°C]	–300 to 1100 [°F]
		JPT2	–199.9 to 500.0 [°C]	–199.9 to 800.0 [°F]
	Pt100	Pt 1	–200 to 850 [°C]	–300 to 1500 [°F]
		Pt2	–199.9 to 500.0 [°C]	–199.9 to 800.0 [°F]
Thermocouple	J	J 1	0 to 800 [°C]	0 to 1500 [°F]
		J2	0.0 to 400.0 [°C]	0.0 to 700.0 [°F]
	K	t 1	0 to 400 [°C]	0 to 700 [°F]
		t2	–200 to 1200 [°C]	–300 to 2200 [°F]
		t3	0.0 to 400.0 [°C]	0.0 to 700.0 [°F]
	T	T 1	–200 to 400 [°C]	–300 to 700 [°F]
		T2	–199.9 to 400.0 [°C]	–199.9 to 700.0 [°F]
	R	r	0 to 1600 [°C]	0 to 2900 [°F]
	B	b	0 to 1800 [°C]	0 to 3200 [°F]
	S	S	0 to 1600 [°C]	0 to 2900 [°F]
	E	E	–200 to 800 [°C]	–300 to 1400 [°F]
	N	n	0 to 1300 [°C]	0 to 2300 [°F]
	PL- II	PL-2	0 to 1300 [°C]	0 to 2300 [°F]

[Note]

When you make a change to this parameter, the following parameters are changed simultaneously.

- PUb (PV lower limit)
- PUF (PV upper limit)
- PUd (Decimal point position)

Related parameters : PUb (page 38)
PUF (page 38)
PUd (page 39)
PUU

[Setting example] Changing input type from K thermocouple to T thermocouple

Display	Operating procedure
149 150	**1.** Press the ↵ key to access Ch2 on the PV display.
Ch 2	
PUT t 1	**2.** Press the SEL key to select PUT.
	3. Use the ∧ ∨ key to select T 1.
PUT T 1	**4.** Press the SEL key once. T thermocouple without a decimal point is registered. After that, the controller will operate with the input type being T thermocouple.
149 150	**5.** Press and hold the ↵ key for three seconds to return to the PV/SV display.

PUb PV (Process value) lower limit

PUF PV (Process value) upper limit

(Setting range: -1999 to 9999)

[Description]

This is the procedure for specifying the upper and lower limits of PV input. PV input can be set to any value within measuring range.

[Note]

• This parameter appears only when the changeover of parameter display (dSPC) is set to EnG.

Related parameters : dSPC (page 52)

[Setting example] Setting the PV input upper limit to 1000°C and lower limit to 200°C

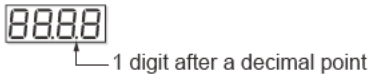
Display	Operating procedure
2497 2507	**1.** Press the ↵ key to display Ch2 on the PV display.
Ch 2	
PUb 0	**2.** Press the SEL key to select PUd.
PUb 200	**3.** Use the ∧ ∨ key to enter 200.
PUb 1000	**4.** Press the SEL key once to save the change. Repeat steps 2 to 4 to set the PV input upper limit (PUF) to 1000 °C.
2497 2507	**5.** Press and hold the ↵ key for three seconds to return to PV/SV display.

Pud Decimal point position (Settings: 0 / 1)

[Description]

This is the procedure for setting the decimal point position in PV display.

• Setting range 0: No digit after a decimal point
1: 1 digit after a decimal point



[Note]

This parameter appears only when the changeover of parameter display (dSPC) is set to End.

Related parameters : dSPC (page 52)

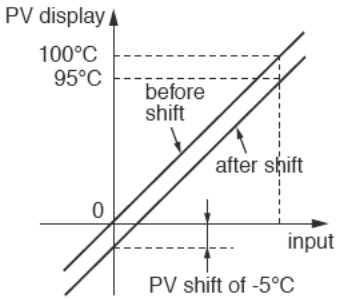
[Setting example] Setting the number of the digit after a decimal point to 1

Display	Operating procedure
249 250	**1.** Press the ↵ key to access Ch2 on the PV display.
Ch 2	
Pud 0	**2.** Press the SEL key to select Pud.
Pud 1	**3.** Use the ∧ ∨ key to select 1.
	4. Press the SEL key once to save the change. After that, the controller will operate with one digit after a decimal point displayed.
249.7 250.7	**5.** Press and hold the ↵ key for three seconds to return to PV/SV display.

PūoF PV (Process value) offset (Setting range: -10 to 10%FS)

[Description]

- This function shifts displayed value of PV input. This parameter is used for adjusting PXE's indication so that it becomes same as the one of the other instruments.
- The PXE operates at the displayed PV (the value to which the PV offset value is added).



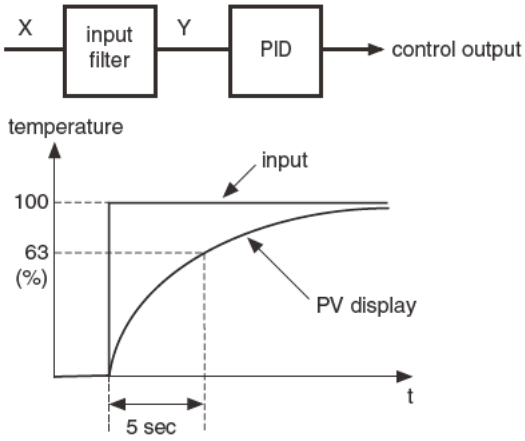
[Setting example] Adding the PV offset value of 5°C to the input value of 1200°C

Display	Operating procedure
1200 1200	**1.** Press the ↵ key to access Ch2 on the PV display.
Ch 2	
PūoF 0	**2.** Press the SEL key to select PūoF.
PūoF 5	**3.** Use the ∧ ∨ key to enter 5.
	4. Press the SEL key once to save the change. 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.
1205 1200	**5.** Press and hold the ↵ key for three seconds to return to PV/SV display.

rF Time constant of input filter (Setting range: 0.0 to 120.0 seconds)

[Description]

• This parameter functions as a low-pass filter which reduc es the fluctuation of input signal or the noise. 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.

• This parameter appears only when the changeover of parameter display (dSPC) is set to EnG.

Related parameters : dSPC (page 52)

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

Display	Operating procedure
1499 1500	**1.** Press the ↵ key to access Ch2 on the PV display.
Ch 2	
rF 50	**2.** Press the SEL key to select rF.
rF 100	**3.** Use the ∧ ∨ key to enter 100.
	4. Press the SEL key once to save the change. After that, the controller will operate with the filter constant being 10.0.
1499 1500	**5.** Press and hold the ↵ key for three seconds to return to PV/SV display.

FLoF FALT output (Setting range: -3.0% to 103.0%)

[Description]

This is the procedure for specifying the output value when a FALT (Input Error) occurs.

[Note]

- This parameter appears only when the changeover of parameter display (dSPC) is set to EnD.

Related parameter: dSPC (page 52)

[Setting example] Setting the FALT OUT to 5%

Display	Operating procedure
2497 2500	**1.** Press the ↵ key to access Ch2 on the PV display.
Ch 2	
FLoF -30	**2.** Press the SEL key to select FLoF.
FLoF 50	**3.** Use the ∧ ∨ key to enter 50.
	4. Press the SEL key once to save the change. After that, output value at an error will be 5%.
2497 2500	**5.** Press and hold the ↵ key for three seconds to return to PV/SV display.

PLC 1 PHC 1 Output upper/lower limit (Setting range: -3.0 to 103.0%)

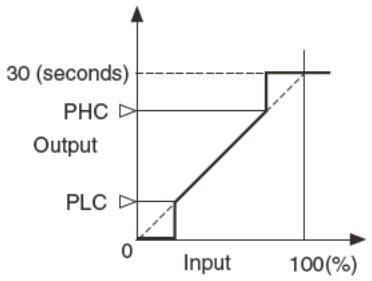
[Description]

- These parameters set the upper and lower limits to control output.
- How the output is limited (maintained within the limit or breaks the limit) is set in the parameter of PCUR.
- When flammability is controlled by turning the gas on and off, flashing can be avoided with this function.

(Minimum ON pulse width [seconds]) = PLC 1 × $\frac{100}{TC}$

(Minimum OFF pulse width [seconds]) = (100 − PHC 1) × $\frac{100}{TC}$

rC : Cycle time



[Note]

- This parameter appears only when the changeover of parameter display (dSPC) is set to EnG.

Related parameters : rC (page 34)
PCUR (page 44)
dSPC (page 52)

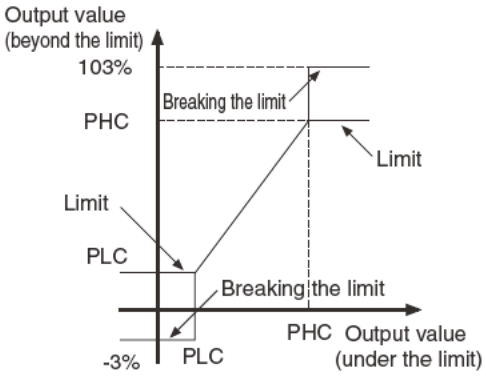
[Setting example] Changing the lower pulse width limit from 20.0% to 10.0%

Display	Operating procedure
1499 1500	**1.** Press the ↵ key to access Ch2 on the PV display.
Ch 2	
PLC 1 100	**2.** Press the SEL key to select PLC 1.
PLC 1 100	**3.** Use the ∧ ∨ key to enter 100.
	4. Press the SEL key once to save the change. After that, the controller will operate with the output lower limit being 10%.
1499 1500	**5.** Press and hold the ↵ key for three seconds to return to PV/SV display.

PCUT MV limit type (Setting range: 0 to 3)

[Description]

• This parameter sets whether or not to maintain the value within the limit when the output value increases up to the limit set value. The output varies with the setting.



There are four types of setting defined by the combination as shown below.

PCUT	Output	
	Upper limit	Lower limit
0	103%	-3%
1	103%	Limit
2	Limit	-3%
3	Limit	Limit

[Note]

• This parameter appears only when the changeover of parameter display (dSPC) is set to EnG.

Related parameters : PLC 1 (page 43)
PHC 1 (page 43)
dSPC (page 52)

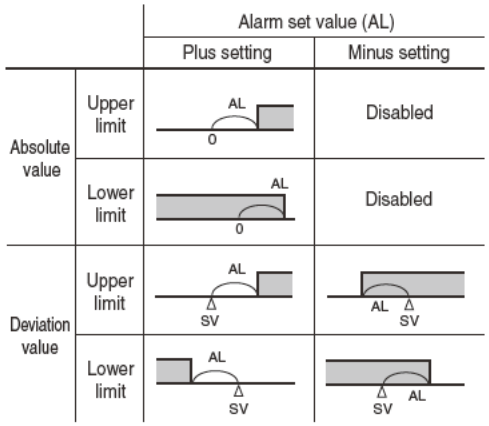
[Setting example] Maintaining the output within the upper and lower limits

Display	Operating procedure
1499 1500	**1.** Press the ↵ key to access Ch2 on the PV display.
Ch 2	
PCUT 0	**2.** Press the SEL key to select PCUT.
PCUT 3	**3.** Use the ∧ ∨ key to enter 3.
	4. Press the SEL key once to save the change. After that, the controller will operate with the output maintained within the upper and lower limits.
1499 1500	**5.** Press and hold the ↵ key for three seconds to return to PV/SV display.

AL01 AL02 Alarm type (Setting range: 0 to 31) (Option)

[Description]

- These parameters are used for selecting the operation types of Alarms 1 and 2.
- The display of the parameter in which the alarm value is set varies depending on the alarm type.
- LBRN and LBRB will be displayed when the alarm type is set to 12 (loop break alarm).



[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 types, turn off the controller, and then on.
- Setting code 0 indicates "No alarm".
- The setting range of this parameter varies depending on the changeover of parameter display (DSPC) setting.
  oPE: 0 to 12
  EnG: 0 to 31

Related parameters : A1HY, A2HY (page 48)
A1oP, A2oP (page 49)
AL 1, AL2 (page 23)
dLY1, dLY2 (page 48)
LBRN (page 51)
LBRB (page 51)
DSPC (page 52)

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

Display	Operating procedure
1499 1500	**1.** Press the key to access Ch3 on the PV display.
Ch 3	
AL02 5	**2.** Press the SEL key to select AL02.
AL02 8	**3.** Use the key to enter 8.
	4. Press the SEL key once to save the change. After that, the controller will operate with Alarm 2 of upper limit deviation with hold.
1499 1500	**5.** Press and hold the key for three seconds to return to PV/SV display

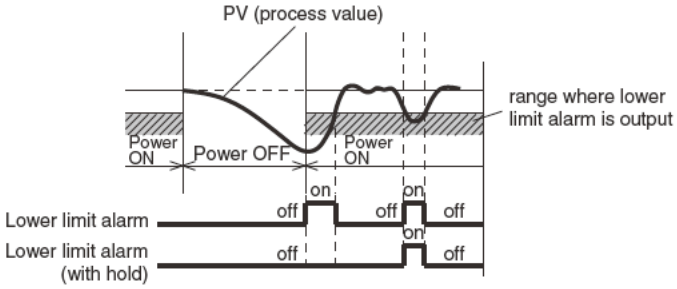
[Alarm type list]

The table below shows the meaning of symbols.

Alarm type	Alarm 1		Alarm 2	
	Display symbol	Description	Display symbol	Description
0 to 15	AL 1	Set value of Alarm 1	AL2	Set value of Alarm 2
16 to 31	A1-L	Lower-limit of Alarm 1	A2-L	Lower-limit of Alarm 2
	A1-H	Upper-limit of Alarm 1	A2-H	Upper-limit of Alarm 2

- The display of the parameter in which the alarm value is set varies depending on the alarm type.
- Since the alarm set value may change after changing the alarm operation types, confirm the alarm set value. (Note that this is not abnormal.)
- 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.

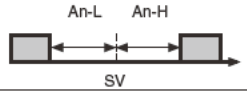
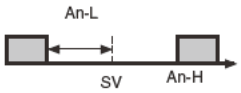
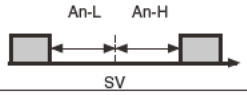
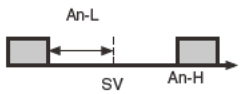


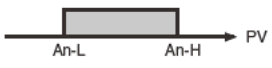
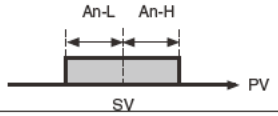
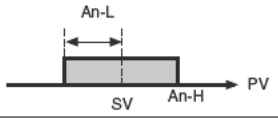
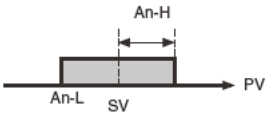
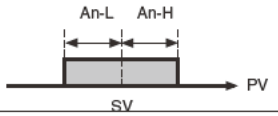
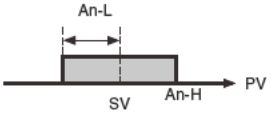
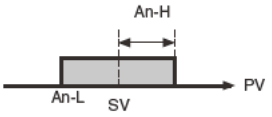
- Alarm codes for standard types

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

	ALM1	ALM2	Alarm type	Operation figure
zone alarm	11	11	Range upper and lower limits deviation (ALM1/2 independent operation)	ALn, ALn, PV, SV
	12	12	Loop break alaem	
	13	13	No alarm	
	14	14	No alarm	
	15	15	No alarm	

• 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
zone 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)	

ALn : The set value of Alarms 1 and 2

An-L : The set value (lower limit) of Alarms 1 and 2

An-H : The set value (upper limit) of Alarms 1 and 2

dLY1 dLY2 Delay time (Setting range: 0 to 9999 seconds)

A1hY A2hY Alarm Hysteresis (Setting range: 0 to 50% FS)

[Description]

• The setting items for alarm parameters are as follows:

●Alarm Hysteresis

Specifies alarm detection and recovery width.

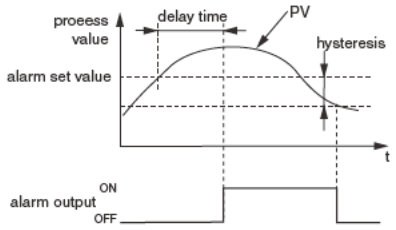
●Delay time

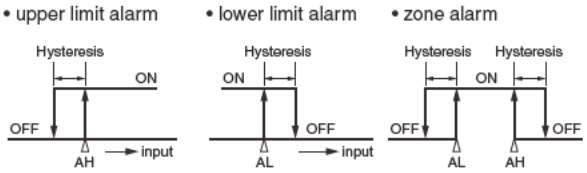
Specifies the amount of time from the occurrence of the alarm situation to the output of the alarm.

• Alarm 1/2 lamps blink during alarm on-delay operation.

• The alarm and hysteresis are related as follows.

Example of an Upper Limit Alarm





[Note]

• This parameter appears only when the changeover of pa rameter display (dSPC) is set to EnG.

Related parameters : dSPC (page 52)

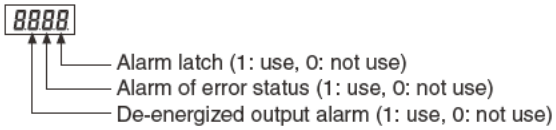
[Setting example] Setting the delay time 1 to 30 seconds and alarm 1 hysteresis to 5°C

Display	Operating procedure
249.7 250.7	**1.** Press the ↵ key to access Ch3 on the PV display.
Ch 3	
dLY1 0	**2.** Press the SEL key to select dLY1.
dLY1 30	**3.** Use the ∧ ∨ key to enter 30.
	4. Press the SEL key once to save the change. Delay time of alarm 1 is now set to 30 seconds.
A1hY 0.25	**5.** Press the SEL key to select A1hY on the PV display.
A1hY 5.0	**6.** Use the ∧ ∨ key to enter 5.0.
	7. Press the SEL key once to save the change. The alarm 1 hysteresis is now set to 5°C .
249.7 250.7	**8.** Press and hold the ↵ key for three seconds to return to PV/SV display.

A1oP A2oP Alarm 1 and 2 options (Setting range: 000 to 111) (Option)

[Description]

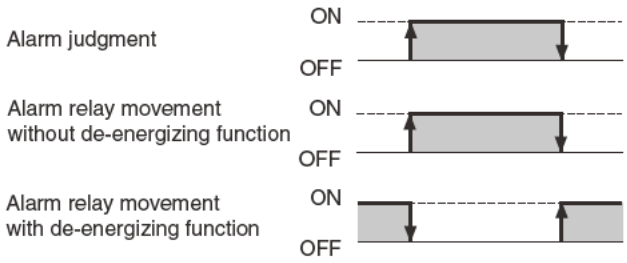
- These parameters are used to switch ON/OFF of the alarm latch, the error status alarm, and the de-energized output alarm functions for each of Alarm 1 and 2.
- Each function is set to ON by setting the following digit to "1":



- The alarm latch is the function to keep the alarm ON, once the alarm judgment shows the alarm ON status. There are three ways to cancel the alarm latch, as follows.
  - Power off the PXR, and then on.
  - Set the alarm latch to OFF.
  - Cancel the alarm latch at the "alarm latch cancel" parameter.
- 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 type (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.

- 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 by 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.
- This parameter appears only when the changeover of parameter display (dSPC) is set to EnG.

Related parameters : dSPC (page 52)

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

Display	Operating procedure
	**1.** Press the ↺ key to access Ch3 on the PV display.
	
	**2.** Press the SEL key to select A2oP.
	**3.** Use the ∧∨ key to enter 0.10.
	4. Press the SEL key once to save the change. After that, the controller will operate with the error status alarm function for Alarm 2 being ON.
	**5.** Press and hold the ↺ key for three seconds to return to PV/SV display.

LbTM Loop Break Detection Time (Setting range: 0 to 9999 seconds)

LbAb Loop Break Detection Band (Setting range: 0.0 to 100.0%FS)

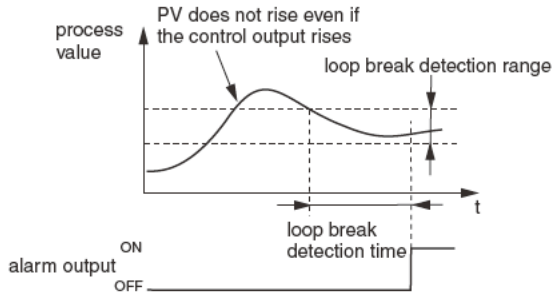
[Description]

This function detects the loop break by PV change when using control output.

- Loop break detection time
  Specifies the amount of time before the loop is determined to be broken.
- Loop break detection band
  Sets a temperature range for detecting a broken loop.

Loop break detection time and band are related as follows:

Example of Loop Break Detection in Reverse Action



[Note]

- If there is an abnormal input (UUUU, LLLL) or an input setting error (Err), the loop break detection alarm sounds even before the loop break detection time period.
- These parameters appear only when the alarm type 1 and/or 2 (AL01 , AL02) is set to 12 (Loop break alarm).

Related parameters : AL01 (page 45)
AL02 (page 45)

[Setting example] Setting the loop detection time to 600 sec. and detection band to 20°C

Display	Operating procedure
2497 2507	**1.** Press the ↵ key to access Ch3 on the PV display.
Ch 3	
LbTM 0	**2.** Press the SEL key to select LbTM.
LbTM 600	**3.** Use the ∧ ∨ key to enter 600.
	4. Press the SEL key once to save the change. The loop break time is now set to 600 seconds.
LbAb 100	**5.** Press the SEL key to select LbAb on the SV display.
LbAb 200	**6.** Use the ∧ ∨ key to enter 200.
	7. Press the SEL key once to save the change. The detection band is now set to 20°C .
2497 2507	**8.** Press and hold the ↵ key for three seconds to return to PV/SV display.

dSPC Changeover of parameter display (Settings: oPE / EnG)

[Description]

This parameter is used to specify whether or not to display hidden parameters and setting ranges.

oPE : Operator level hides the parameters that are unnecessary for normal use.

EnG : Engineer level displays all the parameters including the hidden parameters.

The setting of this parameter is not stored in the device. The controller always starts in oPE (Operation level).

See page 13 to 15 regarding the conditions of each parameter to appear.

[Setting example] Changing the changeover of parameter display from oPE to EnG

Display	Operating procedure
2497 2507	**1.** Press the ↺ key to access Ch3 on the PV display.
Ch 3	
dSPC oPE	**2.** Press the SEL key to select dSPC.
dSPC EnG	**3.** Use the ∧ ∨ key to select EnG.
	4. Press the SEL key once to save the change. The changeover of parameter display is now set to engineer level.
2497 2507	**5.** Press and hold the ↺ key for three seconds to return to PV/SV display.

SFTo Soft-start (Setting range: -3.0 to 103.0%)

SFTM Soft-start duration (Setting range: 0 hr. 0min. to 99 hrs 59 min.)

[Description]

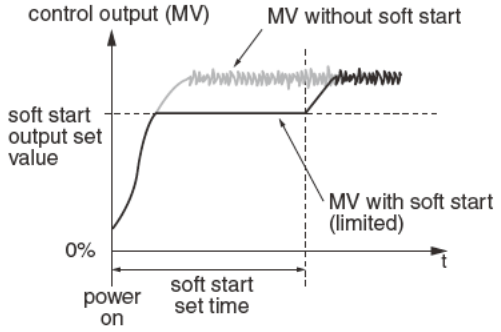
This function controls the maximum output produced when turning on the equipment (including the temperature controller).

The controls place an upper limit on the output for specified duration after the power is turned on.

This function is useful for such occasions as suppressing the heater output during equipment startup to reduce a load.

After the specified time has passed since switching on the equipment (or changing the value of SFTM to O), the soft start function ends and normal controls begin.

Parameter	Function
SFTo	The output is limited for the time period specified in SFTM after the power is turned on.
SFTM (unit: hh, mm)	Sets the duration for soft-start to function after turning power on. Setting "0" will turn off soft-start.



[Note]

• This parameter appears only when the changeover of parameter display (dSPC) is set to EnG.

Related parameters : dSPC (page 52)

[Setting example] Setting the soft-start output to 5% and the duration to 30min.

Display	Operating procedure
2497 2507	**1.** Press the key to access Ch4 on the PV display.
Ch 4	
SFTo 1030	**2.** Press the SEL key to select SFTo.
SFTo 1030	**3.** Use the key to select 50.
	4. Press the SEL key once to save the change. The soft-start output is now set to 5%.
SFTM 000	**5.** Press the SEL key to proceed to SFTM.
SFTM 030	**6.** Use the key to enter 030.
	7. Press the SEL key once to save the change. The soft-start duration is now set to 30 minutes.
2497 2507	**8.** Press and hold the key for three seconds to return to PV/SV display.

SbAL Alarm action during standby (Settings: 0 / 1)

[Description]

- Specifies the alarm action during standby.
  0: suspends alarm action (output OFF)
  1: alarm action ON

[Note]

- This parameter appears only when the changeover of parameter display (dSPC) is set to EnG.

Related parameters : dSPC (page 52)

[Setting example] Setting the alarm action to be continued during standby.

Display	Operating procedure
2497 2507	**1.** Press the ↵ key to access Ch4 on the PV display.
Ch 4	
SbAL 0	**2.** Press the SEL key to select SbAL.
SbAL 1	**3.** Use the ∧ ∨ key to enter 1.
	4. Press the SEL key once to save the change. The controller will continue alarm action during standby.
2497 2507	**5.** Press and hold the ↵ key for three seconds to return to PV/SV display.

LoFF Auto display off (Settings: oFF / 15S / 30S / 1M / 5M)

[Description]

With this function, the displays and indicator lamps are automatically turned off if the specified time passed without any key operation.

Setting	Function
oFF	Displays stay ON
15S	Displays are turned off 15 seconds after the last key operation.
30S	Displays are turned off 30 seconds after the last key operation.
1M	Displays are turned off 1 minute after the last key operation.
5M	Displays are turned off 5 minutes after the last key operation.

- During the displays are turned off, all the displays and lamps except SV lamp will be turned off and SV lamp blinks.
- The displays stay ON during an input error or an alarm status.
- PV and SV will be turned on when an input error or an alarm occurs during the displays are turned off.

[Note]

- The displays and lamps stay on in parameter setting screen.
- This parameter appears only when the changeover of parameter display (dSPC) is set to EnG.

Related parameters : dSPC (page 52)

[Setting example] Setting the time for auto display off to 15 seconds after the last key operation

Display	Operating procedure
2497 2507	**1.** Press the ↵ key to access Ch4 on the PV display.
Ch 4	
LoFF oFF	**2.** Press the SEL key to select LoFF.
	3. Use the ∧ ∨ key to select 15 5.
LoFF 15 5	**4.** Press the SEL key once to save the change. The display will be turned off 15 seconds after the last key operation.
2497 2507	**5.** Press and hold the ↵ key for three seconds to return to PV/SV display.

dSPF Display off

[Description]

This parameter is used to manually turn off the PV, SV, and LED lamps on PV/SV screen.

Setting	Function
0	PV, SV, and LED lamps stay ON
1	SV display OFF
2	PV display OFF
3	PV and SV displays OFF
4	PV, SV, and LED lamps OFF
5	SV display OFF (relights for 5 sec. by pressing any key)
6	PV display OFF (relights for 5 sec. by pressing any key)
7	PV and SV displays OFF (relights for 5 sec. by pressing any key)
8	8 PV, SV, and LED lamps OFF (relights for 5 sec. by pressing any key)

* LED lamps: includes all the indicator lamps of OUT, AL1, AL2, SV, STbY.

- In settings 5 to 8, the displays and lamps stay ON even after 5 seconds, during an input error or an alarm status.
- In settings 5 to 8, if an input error or an alarm occurs during display OFF, the items that is set to OFF will reappear.

[Note]

- This parameter appears only when the changeover of parameter display (dSPC) is set to EnG.

Related parameters : dSPC (page 52)

[Setting example] Turning off the PV display

Display	Operating procedure
2497 2507	**1.** Press the ↵ key to access Ch4 on the PV display.
Ch 4	
dSPF 0	**2.** Press the SEL key to select dSPF.
dSPF 2	**3.** Use the ∧ ∨ key to select 2.
	4. Press the SEL key once to save the change. The PV display will be turned off.
2497 2507	**5.** Press and hold the ↵ key for three seconds to return to PV/SV display.

FLTF PV blink setting during input error (Settings: 0 / 1)

[Description]

Sets whether or not to blink PV during an input error (UUUU, LLLL, Err).

Setting	Function
0	PV blinks during an input error
1	PV does not blink during an input error

[Note]

- This parameter appears only when the changeover of parameter display (dSPC) is set to EnG.

Related parameters : dSPC (page 52)

[Setting example] Setting PV display not to blink during an input error

Display	Operating procedure
2497 2507	**1.** Press the ↺ key to access Ch4 on the PV display.
Ch 4	
FLTF 0	**2.** Press the SEL key to select FLTF.
FLTF 1	**3.** Use the ∧ ∨ key to select 1.
	4. Press the SEL key once to save the change. The PV display is now set not to blink during an input error.
2497 2507	**5.** Press and hold the ↺ key for three seconds to return to PV/SV display.

ALNF Alarm display (Setting range: 0 to 3)

[Description]

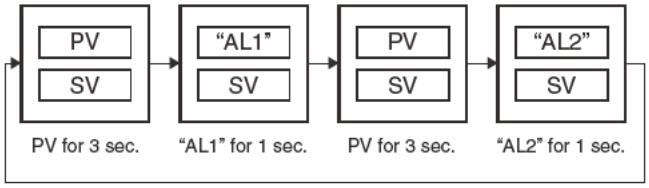
This parameter specifies the contents displayed when an alarm occurs.

Setting	Function
0	Displays PV (no change)
1	Displays PV and the alarm status alternately
2	Displays flashing PV
3	Displays the alarm status only (PV is not displayed)

• The following shows the detail of the contents displayed for each setting.

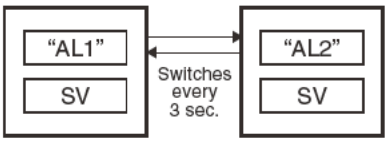
Setting 0: Displays PV (no change)

Setting 1: PV and the alarm status are alternately displayed when an alarm or alarms occur. PV and the alarm number that is activated ("AL1" for the alarm 1 and "AL2" for the alarm 2) are alternately displayed.



Setting 2: Blinking PV is displayed when an alarm or alarms occur.

Setting 3: The alarm status is only displayed when an alarm or alarms occur. PV is not displayed.



The alarm number that is activated ("AL1" for the alarm 1, "AL2" for the alarm 2) will be displayed on PV display area. When both of the alarm 1 and 2 are activated, "AL1" and "AL2" are displayed alternately.

[Note]

• This parameter appears only when the changeover of parameter display (dSPC) is set to EnG.

Related parameters : dSPC (page 52)

[Setting example] Setting to display only the alarm status during an alarm

Display	Operating procedure
2497 2507 / Ch 4	**1.** Press the ↵ key to access Ch4 on the PV display.
ALNF 1	**2.** Press the SEL key to select ALNF.
ALNF 3	**3.** Use the ∧ ∨ key to select 3.
	4. Press the SEL key once to save the change. After that, only the alarm status will be displayed during an alarm.
2497 2507	**5.** Press and hold the ↵ key for three seconds to return to PV/SV display.

oUT 1 Output (MV) display (display only: -3.0 to 103.0%)

[Description]

• This parameter displays the current value of control output.

[Note]

• This parameter appears only when the changeover of parameter display (dSPC) is set to EnG .

Related parameters : dSPC (page 52)

[Setting example] Checking the Control Output (MV)

Display	Operating procedure
1499 1500	**1.** Press the ↵ key to access Ch4 on the PV display.
Ch 4	
oUT 1 298	**2.** Press the SEL key to select oUT 1. The control output will be displayed on SV display area.
1499 1500	**3.** Press and hold the ↵ key for three seconds to return to PV/SV display.

tLoC User key lock (Setting range: 0 to 3)

[Description]

Specifies whether or not to enable AT on/oFF switching (Block key + Down key) or RUN/standby switching (Block key + Up key) on PV/SV screen.

Setting	Function
0	Both AT and RUN/standby are switchable.
1	AT is not switchable, RUN/standby is switchable.
2	AT is switchable; RUN/standby is not switchable.
3	Neither AT nor RUN/standby is switchable.

[Note]

- This parameter appears only when the changeover of parameter display (dSPC) is set to EnG.

Related parameters : dSPC (page 52)

[Setting example] Disabling the RUN/standby switchover by pressing two keys on PV/SV screen

Display	Operating procedure
2497 2507	**1.** Press the ↵ key to access Ch4 on the PV display.
Ch 4	
tLoC 0	**2.** Press the SEL key to select tLoC.
tLoC 2	**3.** Use the ∧ ∨ key to select 2.
	4. Press the SEL key once to save the change. After that, AT is switchable but RUN/standby is not switchable.
2497 2507	**5.** Press and hold the ↵ key for three seconds to return to PV/SV display.

INIT Parameter reset (Settings: no / YES)

[Description]

The parameters can be restored to factory default setting.
By setting YES, and then press and hold the Up key for 14 seconds or more, you can reset the parameters. After parameter reset, the controller will restart.

[Note]

- This parameter appears only when the changeover of parameter display (dSPC) is set to EnG.

Related parameters : dSPC (page 52)

[Setting example] Resetting the parameters

Display	Operating procedure
	**1.** Press the ↵ key to access Ch4 on the PV display.
	
	**2.** Press the SEL key to select INIT.
	**3.** Use the ∧ ∨ key to select YES.
	4. Press and hold the SEL key for 14 seconds or more. The parameters are reset and the controller will restart.

5 Troubleshooting

Symptoms	Possible causes	Remedies	Reference pages
1. The display shows UUUU or LLLL.	① The setting of PvTr is not correct for the input signals of sensors or others.	Set the parameter of PvTr correctly.	Page 37
	② The polarity of the sensor does not match that of the PXE.	Correct the polarity of the sensor and the PXE.	–
	③ Input terminals are short-circuited in thermocouple B or R. (PvTr = b , 5)	Set the parameter of PvTr to t 1, 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 37
	④ The input signals 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.	Page 9
	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 PXE have problems.	Replace the sensor or other input devices with new ones.	–
	⑧ The set value of the parameter of PVb is larger than the value of PVF.	Set the parameters again so that the value of PVb is smaller than the value of PVF.	Page 38
	⑨ The measured value is too large or too small.	Set the parameters again so that the difference of the set values of PVb and PVF is made larger.	Page 38
2. Err is displayed.	The value of PVF is set to 3277°C or more.	Set the parameters of PVb and PVF again according to the input range table.	Page 38
3.A decimal point is not displayed.	“0” is set in the parameter of Pvd.	Set the parameter of PVd to “1”.	Page 39
4. The SV or the set values of some parameters change without any operation.	① The parameter of PvTr, PvTb, PvTF or Pvtd was changed.	Set all the parameters again. (When the set values of the parameters of PVT, PVb, PVF and PVd are changed, the set value of each parameter for which “*” is marked with the page # to # of the Parameter list, are changed.)	Page 13
	② When the set value of PvTF is larger than 1000, “1” is registered for Pvd.	Set Pvd to “0”, and return PvTF to an original value.	Page 39
5. ON/OFF control (Twoposition control) won't start.	Parameter CTrL is not set to onoF.	Set the CTrL to onoF.	Page 32
6.ON/OFF control does not function 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 26
	② The setting of parameter onoF is not correct.	Set the parameter onoF correctly.	Page 28
7. The temperature is not well controlled.	① The set values of the parameters P, I, and d are not correct.	Perform the auto-tuning.	Page 21
	② The cycle times are too long.	Decrease the set value of the parameters CT gradually.	Page 34
	③ Output is limited.	Set the parameters of PLT 1 and PHT 1 again to be suitable for the process.	Page 43
	④ Output is not limited correctly.	Set the parameters of PCUr again to be suitable for the process.	Page 44

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 of FF.	Page 41
9. Output changes between ON and OFF, but the reading 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.Set the parameter of LoC to OFF.	–
	④ The output signals of the Micro-controller do not match the input signals of the device to be controlled.	Prepare the Micro-controller suitable for the device to be controlled. Or select the device to be controlled suitable for the Micro-controller.	–
10. The keys do not work. The set value of the parameters cannot be changed.	ALL or PArA is set in the parameter of LoC.	Set the parameter of LoC to oFF	Page 24
11. The SV cannot be changed.	① ALL is set in the parameter of LoC.	Set the parameter of LoC to oFF or PArA.	Page 24
	② You have tried to set the value that is outside of the SV limiter (Parameters of SU-L to SU-H).	Widen the range of SU-L and SU-H. (However, it should be within the set range in the input range table.)	Page 31
12. The parameters you want to confirm or change are not displayed.	The setting does not satisfy the conditions for the concerned parameters to be displayed.	Change the setting so as it to satisfy the conditions.	Page 13
13. Auto-tuning does not work properly.	① After starting the autotuning operation, the display has showed UUUU or LLLL.	Set the parameters so that the difference of the set values of PUb and PUF is made larger, and perform the auto-tuning again.	Page 38
	② You have changed the SV after autotuning operation.	Set the desirable SV, and perform the auto-tuning again.	Page 21
	③ The response of the controlled device was too fast.	Use a controller whose control cycle is fast, such as PXH.	–
	④ Peripheral devices have problems. Or they are not connected properly.	Connect them properly.	–
	⑤ Direct/reverse actions are not suitable for the operations of the device to be controlled.	Set the parameter of rEU properly.	Page 35
	⑥ The response of the controlled device was too slow and a timeout occurred (approx. over 3.6 hours)	Perform the tuning manually. (Set the parameter of CTrL to onoF to try the ON/OFF control in a hurry.)	Page 32
14. An excessive overshoot has occurred during auto-tuning operation.	–	(1)Perform the auto-tuning with the parameter of AT being L-on (Low PV type).	Page 21
	–	(2) Perform the tuning manually.	–
16. The PV display disappeared.	The set value of parameter dSPT is not proper.	See the page of parameter dSPT.	Page 52

Memo

⚠Safety Precaution

- Before using the PXE, 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 PXR, 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.

⚠ Caution on Safety

*Before using this product, be sure to read its instruction manual in advance.

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