DITEL

Instruction Manual

SYROS SZ

Model : SZ48
Model : SZ49

DISEÑOS Y TECNOLOGÍA S.A.

30727355
01/04/09

Thank you for purchasing the SYROS SZ temperature controller.
Once you have confirmed that this is the product you ordered, please use it in accordance with the following instructions. In addition, please keep this instruction manual within easy reach of the actuall person using this equipment.

CAUTION :

The contents of this manual are subject to change without notice. This manual is compiled with possible care for the purpose of accuracy.
However, Diseños y Tecnología S.A. shall not be held liable for any damages, including indirect damage, caused by typographical errors, absence of information or use of information in this manual.

INDEX

Confirming Specifications and Accessories

Before using the product, confirm that it matches the type ordered (for model code, please refer to pages 55/56).

Confirm that all the following accessories are included.

- Temperature controller.... 1 unit
- Instruction manual ..... 1 copy
- Mounting fixture(s)..... 1 piece (SZ48)
  ..... 2 pieces (SZ49)
- Resistor (250Ω) ..... 1 unit
- Waterproof packing..... 1 unit
- Unit nameplate..... 1 unit

Option :

Name	Order No.
Terminal cover	140000211 (SZ48) 140000216 (SZ49)
Communication cable	19500036

Safety Warnings

Please read this section thoroughly before using and observe the mentioned safety warnings fully.
Safety warnings are categoryzed as :
"**WARNING**" or "**CAUTION**", que significan :

⚠ Warning	Mishandling may lead to death or serious injury.
⚠ Caution	Mishandling may cause injury to the user or property damage.

1 ⚠ Warning

1.1 Limitations in use

This product was developed, designed and manufactured on the premise that it would be used for general machinery.
In particular, this product is to be used for applications that require the upmost safety as described below, please take into consideration of the safety of the entire system and the machine adopting such means as a fail-safe design, a redundancy design as well as the conducting of periodical inspections.

. Safety devices for the purpose of protecting human body.
. Direct control of transportation equipment.
. Airplanes
. Atomic equipment, etc.

Please do not use this product for applications which directly involve human lives.

1.2 Installation and Wiring

This equipment is intended to be used under the following conditions :

Ambient temperature	-10 to +50°C	
Ambient humidity	90% RH or below (with no condensation)	
Installation category	II	by IEC 1010-1
Pollution level	2	

• Between the temperature sensor and the location where the voltage reaches or generates the valued described below, secure clearance space and creepage distance as shown in the table below

If such space cannot be secured, the EN61010 safety compliance may become invalid.

Voltage used or generated by any assemblies	Clearance space (mm)	Creepage space (mm)
Up to 50 Vrms or Vcc	0,2	1,2
Up to 100 Vrms or Vcc	0,2	1,4
Up to 150 Vrms or Vcc	0,5	1,6
Up to 300 Vrms or Vcc	1,5	3,0
Above 300 Vrms or Vcc	Please consult DITEL	

• For the above, if voltage exceeds 50 Vdc (called danger voltage), grounding and basic insulation for all terminals of the equipment, and auxiliary insulation for digital outputs 1 to 3 is required.

Note that the insultaion class for this equipment is as follows. Before installing, please confirm that the insulation class for equipment meets usage requirements.

—— Basic insulation — — No insulation —— Functional insulation

Power		Internal circuit
Control output 1 (relay contact) or Motorized valve OPEN output		Measurement input, input CT, input RSV
		Heater current detector input
Control output 2 (relay contact) or Motorized valve CLOSE output		Control output 1 (SSR/current/voltage)
		Control output 2 (SSR/current/voltage)
		Re-transmission output (current/voltage)
Digital output 1 (Relay contact)	Digital output 1 to 3 (Relay contact)	Digital input 1 to 3*(1)
Digital output 2 (Relay contact)		Digital output 4, 5* (2)
		Communication RS 485

With code SZ4X-XXX4XXX
DO 1 and 2 have independent common

With other codes
DO 1 to 3 have independent common

*Note : (1) Digital inputs 1 to 5 (SZ49)
(2) Digital outputs 4, 5 only for SZ49

• In cases where damage or problems with this equipment may lead to serious accidents, install appropiate external protective circuits .
• As this equipment does not have power switch or fuses, install them separately as necessary. Fuse should be wired between main power switch and this equipment.
(Main power switch: Bipolar breaker, fuse rating 250V 1A).
• For power supply wiring, use wire equal to 600V vinyl insulated wire or above.
• To prevent damage and faliure of the equipment, provide the rated power voltage.
• To prevent shock and equipment faliure, do not turn power ON until all wiring is complete.
• Before turning on power, confirm that clearance space has been secured to prevent shock or fire.
• Do not touch the terminal while the machine is on. Doing so risks shock or equipment errors.
• Never disassemble, convert, modify or repair this equipment, Doing so risks abnormal operation, shock or fire.

1.3 Maintenance Cautions

• When installing or removing the equipment, turn the power OFF. Otherwise, shock, operational errors or faliures may be caused.
• Periodic maintenance is recomended for continuous and safe use. Some parts installed on this equipment have a limited life and/or may deteriorate with age.

2.  Caution

2.1 Cautions when installing

Please avoid installing in the following locations :
• Locations in which the ambient temperature falls outside the range of -10 to 50ºC when equipment is in use. (If the power supply is 200V AC, the recommended maximum ambient temperature is 45ºC).
• Locations in which the ambient humidity falls outside the range of 45 to 90% RH when equipment is in use.
• Locations with rapid temperature changes, leading to dew condensation.
• Locations with corrosive or flamable gases.
• Locations with vibration or shock directly.
• Locations in contact with water, oil, chemicals, steam or hot water.

• Locations with high concentrations of atmosferic dust, salt or iron particles.
• Locations with large inductive interference, resulting in static electricity, magnetic fields or noise.
• Locations in direct sunlight.
• Locations that build up heat from radiant heat sources, etc..

2.2 Cautions when attaching to the panels.

• Please attach the SZ49 with the included fixtures (2 pieces) to the top and bottom, and tighten with a screwdriver.
• The clamp torque is appoximately 0.15N/m (1.5kg/cm)
• It is designed such that overtighthening will cause left/right cracking to the central area of the fixtures and hence reduce the torque. Cracking to the central area will not cause any problems in terms of usability of the equipment. However, do exercise caution in not appliyng too much torque because casing is made of plastic.
• The front of this equipment is waterproof in compliance with NEMA-4X standards (IP66 equivalent). To effect waterproof, the included packing it shall be attached between the controller and the panel according to the guidelines below. (Incorrect attachment may cause the equipment to lose its waterproof capabilities).

(1)- Insert to the panel after attaching the packing to the equipment case (Fig. 1).

(2)- Tighten the fixture screws so that no gaps can remain between equipment face, the packing and the panels. (Fig. 2).
Once finished, confirm that there are no changes in shape such as displaced or impropery-fitted packing, etc (Fig. 3).

• If the panel does not have enough strength, gaps may develop between the packing and the panel to lose waterproofing capabilities.

SZ48

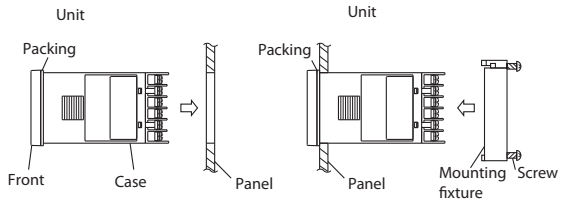


Fig. 1 Fig. 2

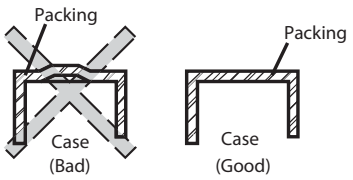
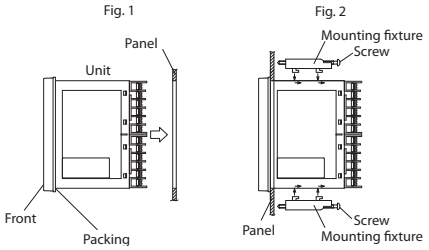
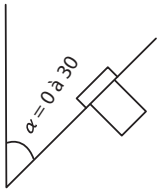


Fig. 3

SZ49





• Standard :
vertical attachment
(horizontal position attachment) It attached at an angle, the maximum gradient is 30º downslope.

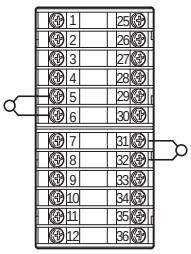
⚠ Caution

• In order to aid heat dissipation, do not block the sides of the equipment.
• Do not block the air vents on the upper part of the terminal.

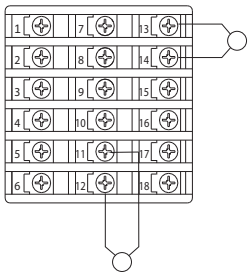
2.3 Cautions for wiring.

- For thermocouple input, use the designated compensation lead.
- For resistance bulb input, use wires with small lead wire resistance and without any resistance difference among tree wires.
- To avoid noise conductor effects, input signal wires should be separated from electric power lines or load lines.
- Input signal wire and output signal wire should be deparated each other. And both should be shielded wire
- If there is a lot of noise from the power source, adding an insulation transducer and using a noise filter is recommended.
  Always attach a noise filter to a panel that is grounded securely, and keep the wiring between the noise filter output side and the measuring equipment power terminal wiring to a minimum length.
  Please don't attach fuses and switches to the noise filter output wiring, otherwise the filter's effectiveness will be decreased.
- Twisting the power wires is effective when connecting the wires.
- If there is a funcion of heather current detection, heather wires and power wires should be connected with same power line.
- Operation preparation time is required for the contact output when power is turned on. If using it as a signal to an external interlock circuit, please couple it with a delayed relay.
- Concerning the output relay, connecting the maximum rated load will shorten the product's life; so please attach an auxiliary relay. If the output operation frequency rate is high, selecting a SSR/SSC drive output type is recommended.
  Relay output : ≥ 30 seconds.
  SSR drive output : ≥ 1 second.
- When inductive loads such as magnetic opening/closing equipment as relay output equipment are connected, use of a varistor is recommended in order to protect contacts aganist opening/closing surges to ensure long-term use.
  For 110V power voltage ---> Varistor 240V (diameter 5mm)
  For 230V power voltage ---> Varistor 470V (diameter 5mm)
  Attachment position : Please connect between the relay control output contacts.

SZ49



SZ48



2.4 Key Operation Caution/Error Operation.

- The alarm function does not work properly when an error takes place unless the settings are made correctly. Always verify its setting before operation
- If the input wiring breaks, the display will read "UUUU". When replacing the sensor, always turn the power OFF

2.5 Others

Please do not wipe the equipment with organic solvents as alcohol or benzene. If wiping is necessary, use a neutral cleaning agent.
Do not use mobile phones near this equipment (within 50 cm). Otherwise a malfunction may result. Trouble may occur if the equipment is used near a radio, TV, or wireless device.

FOR PROPER USAGE

Confirmation of model code

Please confirm that the model delivered matches your order
"12-Model specifications" (page 55)

↓

1- Installation and mounting

Panel cut dimensions
"3- Installation and mounting" (page 9)

↓

2- Wiring Connection

"4- Wiring" (page 11)

↓

Turn power on

↓

3- Display and operations
4- Parameter list
5- Functions of the Temperature Controller

Changing set value
"5- Display and operations" (page 13)
Basic Operation Methods
"5- 3 Configuración general" (página 15)
Parameter list
"6- Parameter list" (page 18)
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"7- Functions" (page 28)

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6- Advanced usage

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"8-1 Input setting" (page 50)
Selecting control method
"8-3 Control setting" (page 50)
Controling through Auto-tuning
"7-6 Auto-tuning" (page 32)
Automatic Setting parameters
"7-3 Fuzzi PID Control","7-4 Self-tunning control" (page XX)

↓

Operation

↓

7- Error Indications

"9- Error indications" (page 51)

⚠ Caution — *Wait 30 minutes for the controller to stabilized thermally. Operations such as measurements should be taken after the equipment has been on for 30 minutes or more.*

3 Installation and Mounting

3-1 External/Panel Cut Dimensions

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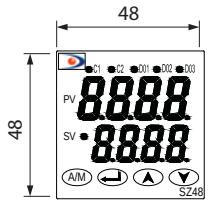
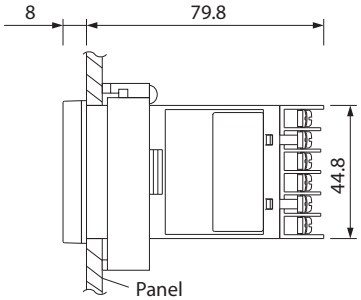
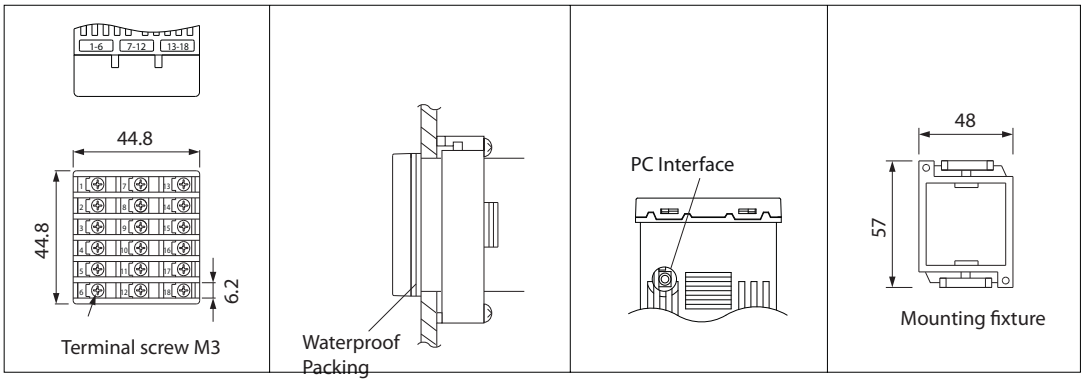
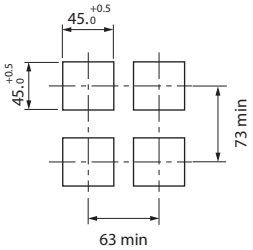


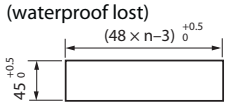




Installing multiple controllers



Installing multiple controllers horizontally (waterproof lost)



Caution

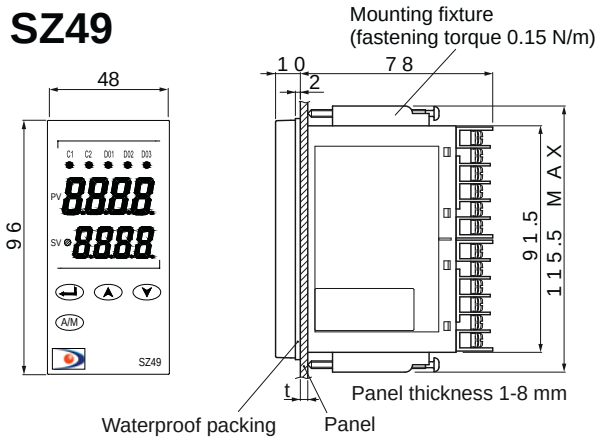
Cautions when close fit mounting.

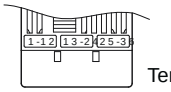
- When the power supply is AC 200V, keep the maximum ambient temperature at 45ºC. For vertical close-fit mounting, use a power source of AC 100V. (In both cases, a fan is recommended as a measure aganist radiation.
- When there is an instrument larger than 70 mm or a wall to the right of the controller, move it at least 30 mm away..

Cautions when wiring :

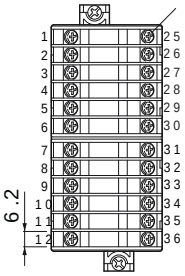
- Start by wiring from the left-hand terminals (from 1 to 6)
- Use a screw that is the right size on terminals an tighten them with a torque of about 0.8 N/m.
- Do not attach anything to unused terminals. (Do not use relay terminals).

SZ49

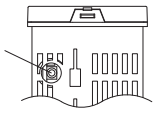




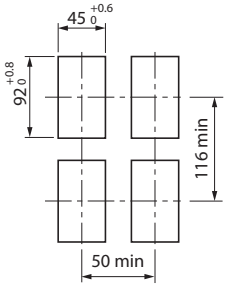
Terminal screw M3



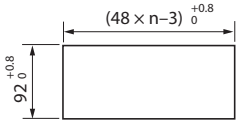
PC interface



Installing multiple controllers



Installing multiple controllers horizontally
(Waterproof is lost)



Caution

Cautions when close fit mounting.

- When the power supply is AC 200V, keep the maximum ambient temperature at 45ºC. For vertical close-fit mounting, use a power source of AC 100V. (In both cases, a fan is recommended as a measure aganist radiation.
- When there is an instrument larger than 70 mm or a wall to the right of the controller, move it at least 30 mm away..

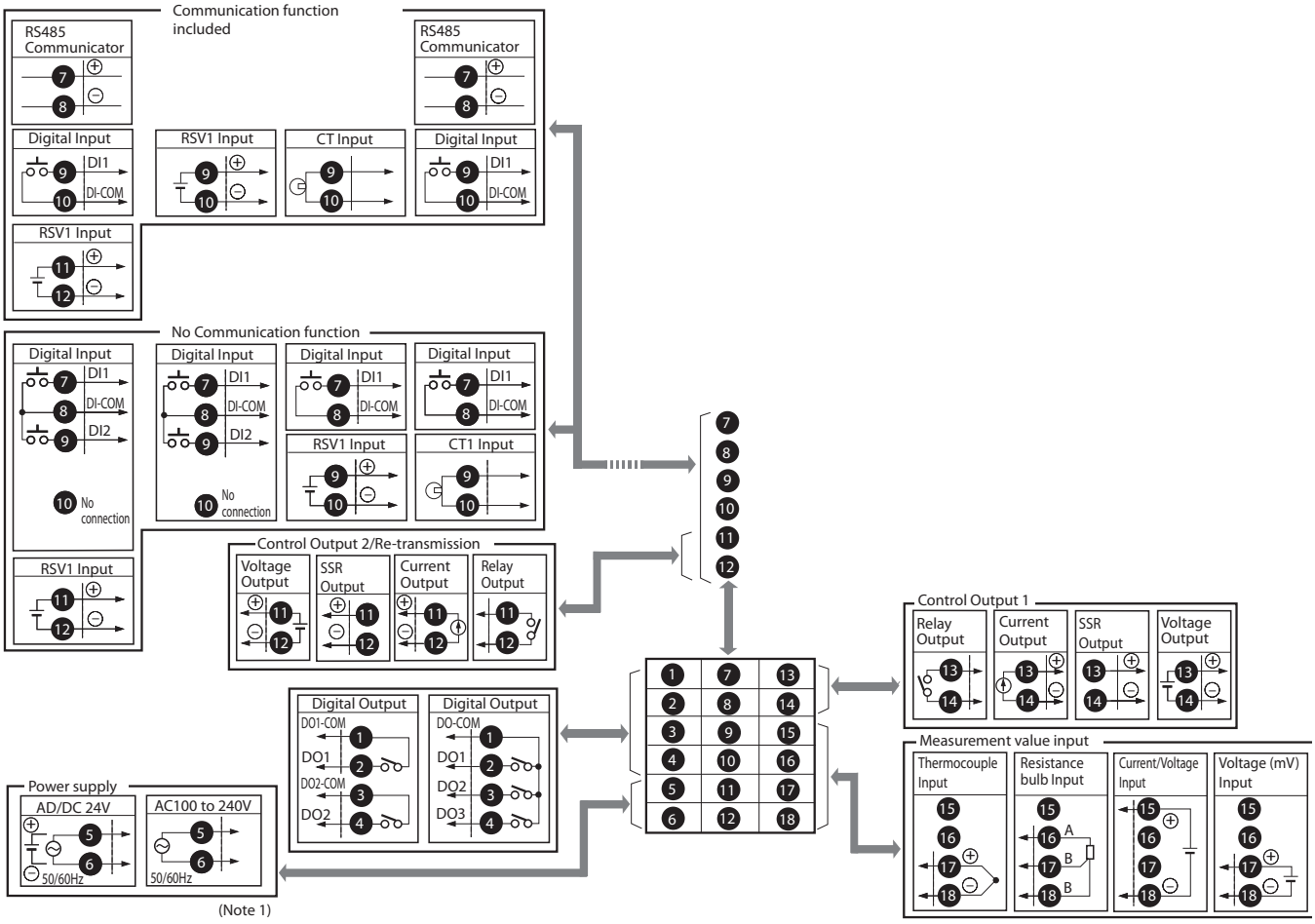
Cautions when wiring :

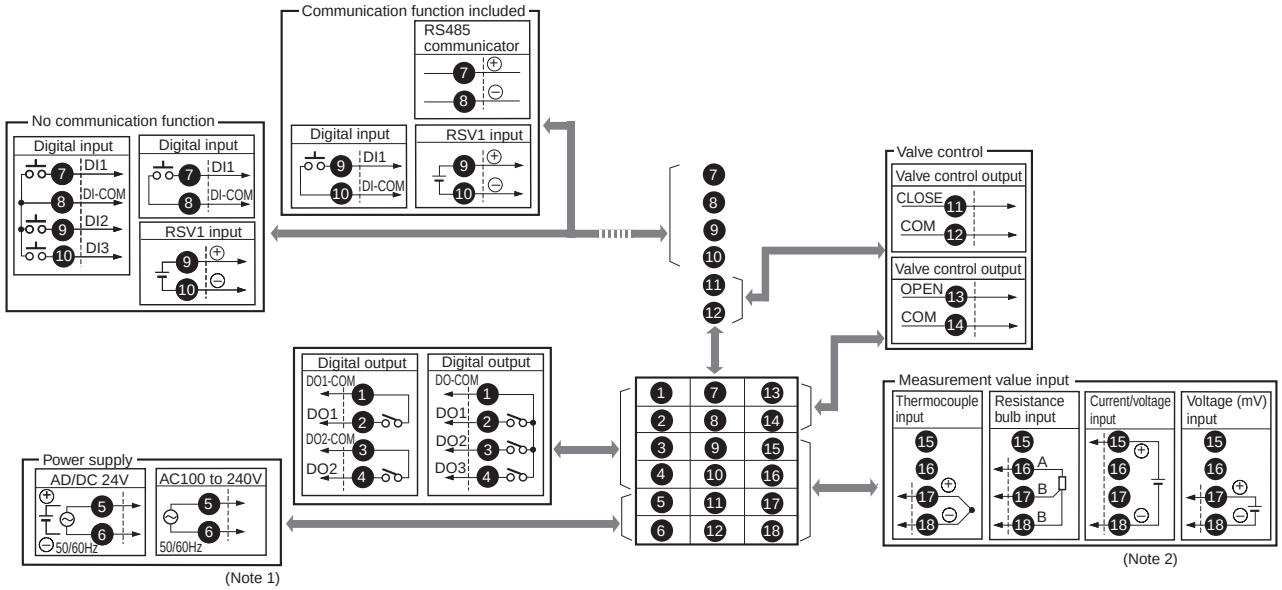
- Start by wiring from the left-hand terminals (from 1 to 12)
- Use a screw that is the right size on terminals an tighten them with a torque of about 0.8 N/m.
- Do not attach anything to unused terminals. (Do not use relay terminals)..

4 Wiring

4-1 Terminal Connection Diagram (100 to 240VAC, 24VAC/24VDC)

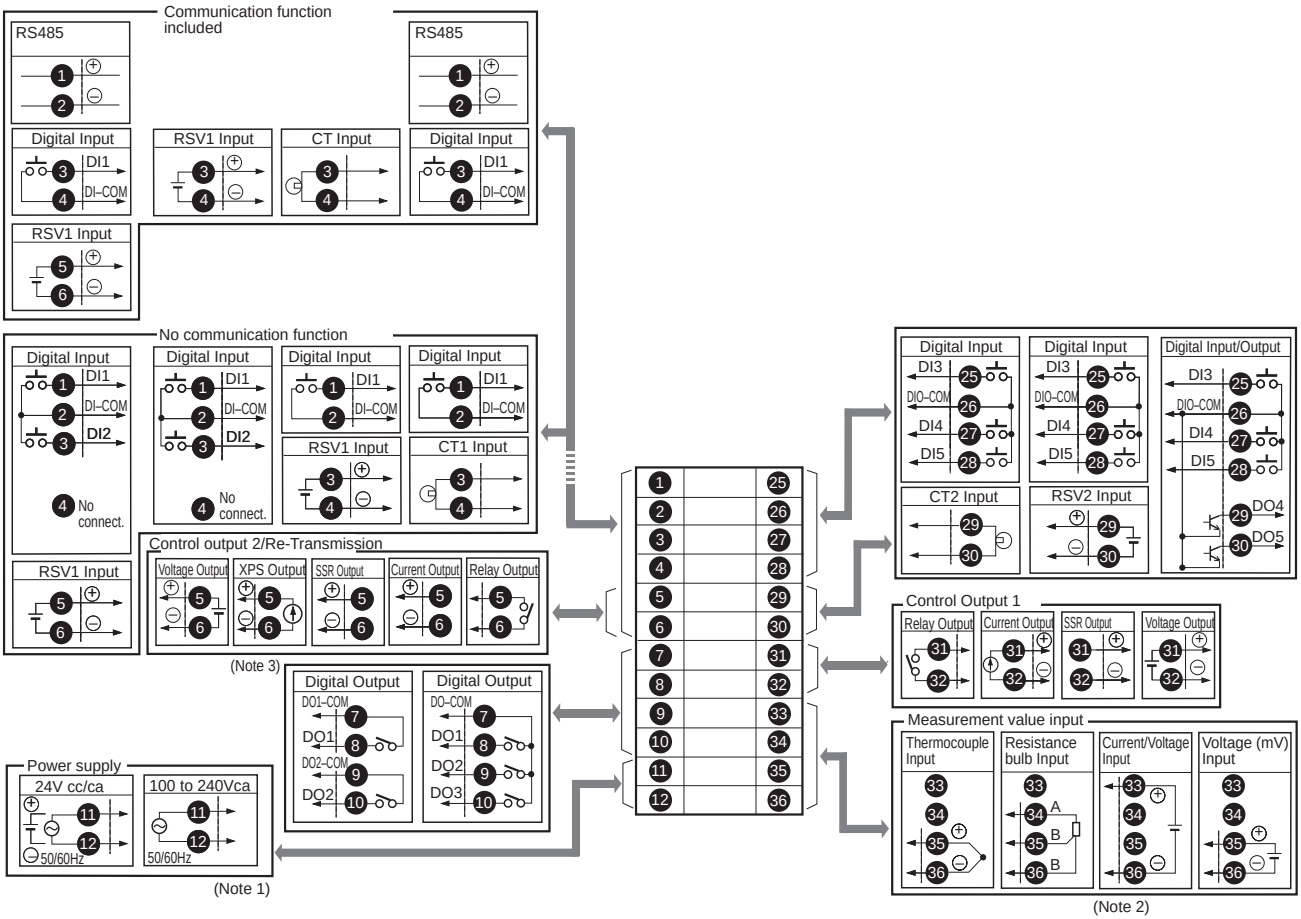
SZ48 standard



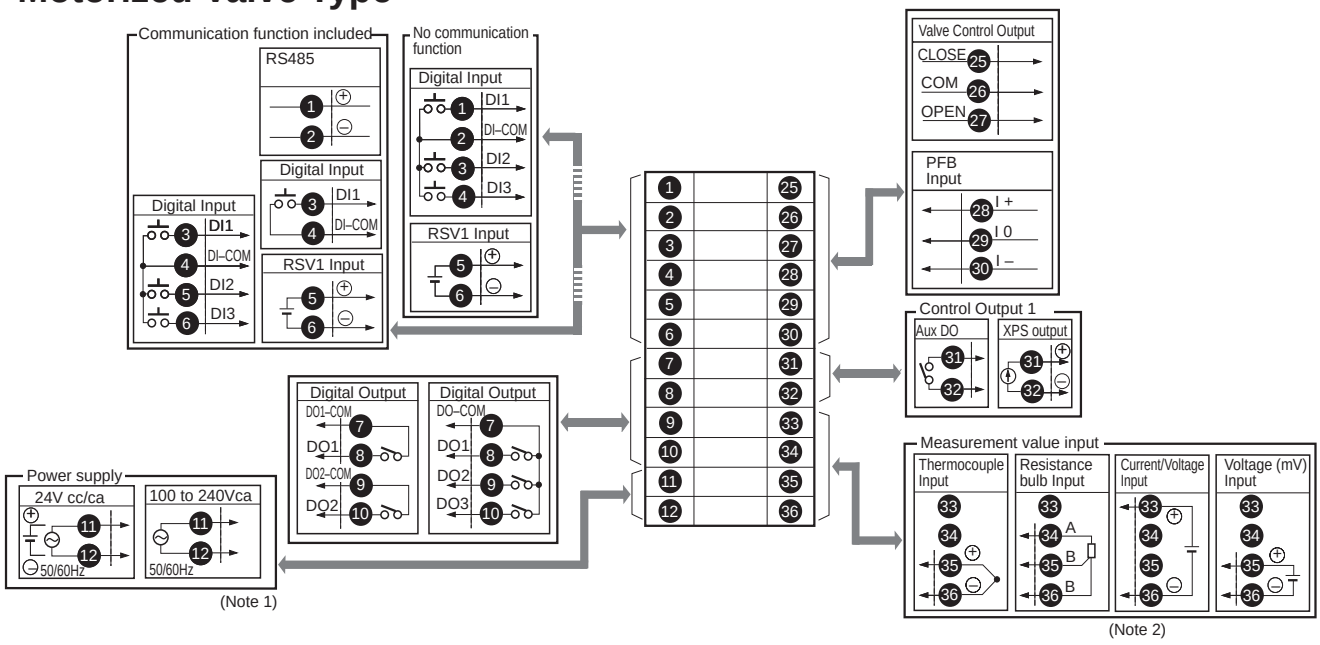


Note 1 : Check the power supply voltage before making the connections.
Note 2 : When inputting current, connect the 250 Ohm resistor between the terminals number 15 and 18 .

SZ49 standard



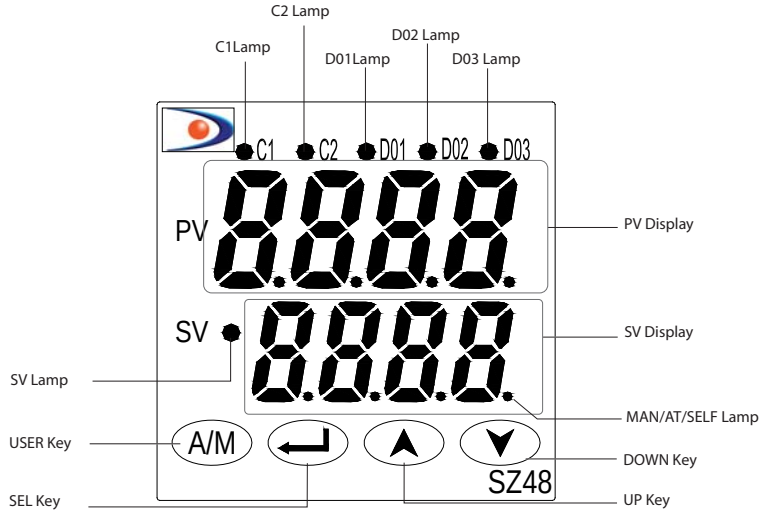
Motorized Valve Type



Note 1 : Check the power supply voltage before making the connections.
Note 2 : When inputting current, connect the 250 Ohm resistor between terminals 33 and 36 .

5 Display and Operations

5-1 Part Names and Functions



Operation Parts

USER Key
Pressing this key in monitoring mode display or setup mode display returns you the PV/SV display.
Pressing this key on the PV/SV display allows you to set the function for "UtEy" under the system menu (SYS Ch7). (The factory set function for this key is switching between auto and manual)

SEL Key
Switches the PV/SV display to the monitoring mode display or setup mode display.
Switches to setup mode when parameter display, and this key functions as the select key when changing parameters.
Holding this key down in channel display or parameter display returns you to the PV/SV display.
Pressing this key at PV/SV display in manual mode, manual output value is shown in the lower display.

▲ Key
Pressing once will increase the setting value by one.
Holding down the button will continue to increase the value.
It changes SV on the PV/SV display.
It is also used to move between items in channel screen display and parameter screen display.

▼ Key
Pressing once will decrease the setting value by one.
Holding down the button will continuo to decrease the value.
It changes SV on the PV/SV display.
Permite disminuir el valor de la consigna.
It is also used to move between items in channel screen display and parameter screen display.

Display

C1/C2 Lamp
Displays the condition of the control output. Lights ON at 100% and goes out at 0% output. For values between 0% and 100%, the output is indicated by the length of the time the lamp flickers. When acting as a valve control, the C1 lamp will light with OPEN output, and the C2 lamp will flickers with CLOSE output.

DO1/2/3 Lamp
Lights ON when there is digital output on state (DO1, DO2, DO3).
The lamp flickers when delay behavior is on.

PV Display
Displays the measurement value (PV).
Displays the name of the parameter when setting parameters.

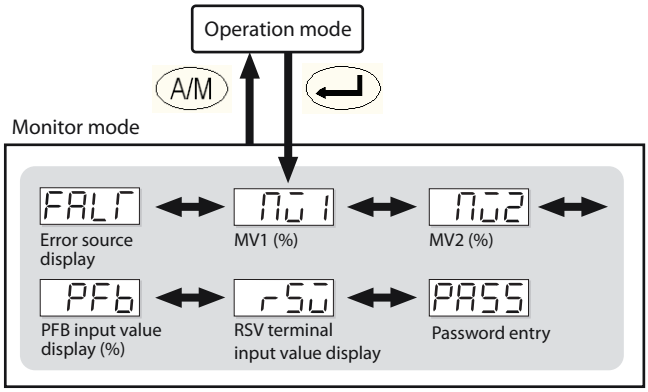
SV Display
Displays the setting value (SV).
Also can display the output value during manual mode.
Displays "rEM" during remote SV operation, and "SoFT" and set value alternately during soft start.

SV Lamp
Lights when displaying the setting value (SV). Goes out when displaying the manual output value.
The lamp flickers while performing ramp soak or lamp SV operations.

MAN/AT Lamp
Normally lights up during manual mode and blinks during auto-tuning or self-tuning.

5-2 Monitor Display and Status Display

In monitor mode, the PV display shows item names, while SV display shows the input/output values.



For more details on "PASS" mode, see "5-6 Key Lock and password" (page 17)

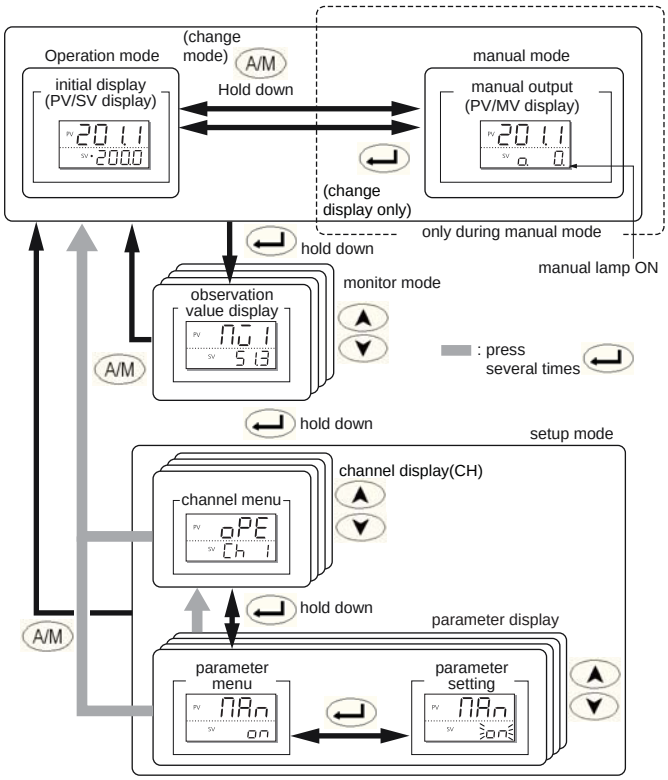
"FALT" source display	Error of an error	Displays the source	FALT = □□00 Fixe à 0 8bit : PV input underflow 9bit : PV input overflow 10bit : underrange 11bit : overrange 12bit : RSV underrange 13bit : RSV overrange 14bit : range setting error 15bit : EEPROM error	
"Mv1"	MV1 value of the control output (OUT1)	Displays the output	-3.0 to 103.0%	
*"PFb"	Displays the PFB input val.	Displays the input value of the position feedback	-3.0 to103.0%	(Note8)
"Mv2"	MV2	Displays the output value of the control output 2 (OUT2) (during dual control)	-3.0 to 103.0%	(Note4)
"rSv"	RSV input value display	Displays the input value of the RSV	-5 to 105% FS	(Note1)

For more details on (Note) in the Remarks column, see "6 Parameter list" (page 18).

*Note : Position feedback (PFb) option not available on SZ48 model.

5-3 Basic Operations

Pressing the A/M key or the ↵ key switches between modes.
Pressing ▼ ▲ in monitor mode or setup mode allows you to choose menu items.



Changing SV (set values)

1. Change display to PV/SV display (shown when you turn on the power and SV lamp is lit).
2. Change the SV with the ▼ ▲ keys.
3. Press the ↵ key to save the values. (The value will automatically saved after 3 seconds even if a key is not pressed)

Changing MV (control output values)

1. Switch to manual mode.
2. Change the display to PV/MV (MAN/AT/SELF lamp is lit).
   (pressing the ↵ key in manual mode toggles between PV/SV display and PV/MV display.)
3. Change the MV with the ▼ ▲ keys.
   (Changes are reflected to the MV as it is changed.)

   Note : See “7-9 Manua output” (page 34) for more about changing to manual mode .

5-4 Operations

For the following modes, the PV display will show the PV input value.

Operation mode

SV display shows the SV setting value

Manual mode

An LED light decimal point lights ON in the lowest digit place in the SV display.
An "o" appears in the highest decimal place during MV display.
Pressing the ▼ ▲ keys sets the MV(%).

5-5 Setting Parameters

The following explains how to set the parameters.

1. **Press and hold the ↵ key in operation mode, or manual mode.**
   This switches you to the monitor mode Mv1

2. **Press and hold the ↵ key in monitor mode.**
   This switches you to the channel menu of setup mode.

3. **Choose the channel with the ▼ ▲ keys, then press and hold the ↵ key.**
   This switches you to the parameter menu.

4. **Choose the parameter with the ▼ ▲ keys, then press the ↵ key.**
   The set value flickers.

5. **Choose the parameter with the ▼ ▲ keys, then press the ↵ key.**
   The set value is fixed.

No matter where you are in monitor or setup mode, pressing the A/M key returns you to operation mode. When setting the parameters in manual mode, pressing the key holds manual mode and returns you to operation mode.

5-6 Key Lock and Password

Setting Key Lock

When key lock is activated, parameters cannot be changed but can be displayed. Use the following steps to set key lock.

1. **Display the operation menu ("oPE Ch1")**
2. **Display key lock ('LoC") and press the ↵ key.**
3. **Set the value.**
   0: No lock (All parameters can be changed. Initial value)
   1: All lock (No parameters can be changed)
   2: All lock without SV (Only the SV can be changed)
4. **Press the ↵ key to set the value.**

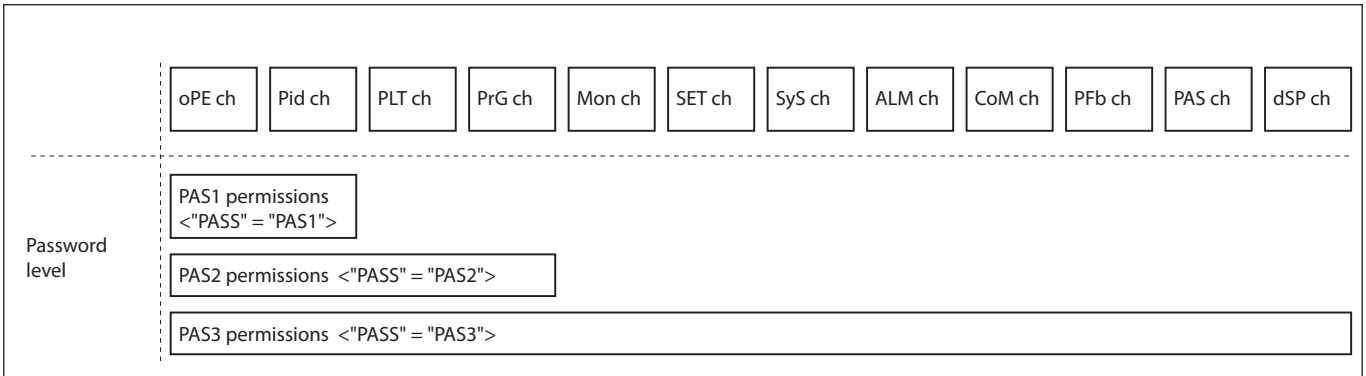
Saving and entering a Password

Use the following steps to save a password.

1. **Display the password menu ("PAS Ch11")**
2. **Display password 1 ("PAS1") and press the ↵ key.**
3. **Set the password.**
   You can enter the hexadecimal value 0000 through FFFF.
4. **Press the ↵ key to set the value.**
   "PAS2" and "PAS3" can be saved in the same way.
   The authority of the passwords grows from "PAS1" to "PAS3".
   The higher the authority, the greater number of chanels for display and settings.

Use the following steps to enter a password.

1. **In monitoring mode, display ("PASS") and press the ↵ key.**
2. **Enter a saved password and press the ↵ key.**
   You will be able to operate the equipment depending on the authority of your password.



Note : When "FEFE" is entered as ("PASS"), all of the channels "OPE ch" to "DSP ch" can be displayed and set. This "super password" function is useful when you forget the set passwords.

6 Parameter List

The following explains each channel parameter.
The list also shows the operational range of set values for parameters that are limited.

6-1 Operation "oPE" (Ch1)

The following is a menu to operate the controller. Switchover between auto and manual control output, switchover between RUN and standby, and other such options.

Parameter display	Parameter	Function	Setting range	Initial value	Remarks
Man	Switchover between auto and manual mode	Switchover between auto and manual mode	on : Manual mode oFF : Auto mode	oFF	
Stby	Switchover between RUN and standby	Switchover the operation mode between RUN and standby	on : Standby mode Out : OFF, Alarm : OFF oFF : RUN mode	oFF	
rEM	Switchover between local and remote SV operation	Switchover between remote SV and local operation	LoCL: Local operation rEM: Remote operation	LoCL	(Note1)
PrG	Ramp soak control command	Changes ramp soak run states	oFF : Stop rUn : Run HLd : Hold	oFF	Displays End (when ending) or GS (during guaranty soak)
AT	Auto-Tuning run command	Runs auto-tuning	oFF : stop/finish ON : normal type Lo : low PV type	oFF	
LACh	DO output latch release command	Cancels the DO latch state	oFF : latch active rST : latch resets	oFF	
Svn	Currently selected SV No.	Choose the SV No. used for control	Sv0 Sv1 Sv2 Sv3 Sv4 Sv5 Sv6 Sv7 Sv8 di (chooses SV according to di)	SvO	(Note19)
PLn1	Currently selected PID No.	Choose the PID group No. used for control	PID 0 (Local Pid) PID 1 (Pid group N°1) PID 2 (Pid group N°2) PID 3 (Pid group N°3) PID 4 (Pid group N°4) PID 5 (Pid group N°5) PID 6 (Pid group N°6) PID 7 (Pid group N°7) PID 8 (Pid group N°8) di (chooses Pid group according to di	PID 0	
AL1	AL1 set value	Set the alarm value:	0 to 100% FS (absolute value alarm)		
AL1L	AL1L set value		-100 a +100% FS (deviation alarm)	10°C	(Note3)
AL1H	AL1H set value				
-					
-					
AL3	AL3 set value				
AL3L	AL3L set value				
AL3h	AL3H set value				
LoC	Key lock	Sets the key lock to prevent wrong operation	0 : no lock 1 : all lock 2 : all but SV locked	0	

6-2 PID "Pid" (Ch2)

Sets parameters for controls such as PID.

Parameter display		Parameter	Function	Setting range	Initial value	Remarks
P	P	Proportional band	Setting "0.0" will turn it to ON/OFF control	0.0 to 999.9%	5,00%	
I	I	Integration time	Setting "0" will turn off integration	0 to 3200 seconds	240 sec	
d	d	Differential time	Setting "0.0" will turn off derivation	0.0 to 999.9 seconds	60.0 sec	
hyS	HYS	ON/OFF control hysteresis	Sets the hysteresis width for the ON/OFF control	0 to 50% FS	1°C	
CoL	CoL	Cooling proportional band coefficient	Sets the cooling proportional band coefficient. Setting "0.0" will turn the cooling into an ON/OFF control	0.0 to 100.0	1.0	(note4)
db	db	Dead band	Shifts the SV cooling proportional band	-50.0 to +50.0	0%	(note4)
bAL	bAL	Output convergence value	Offset value which is added to the MV output value	-100 to 100%	0/50 (calor - calor/frio)	
Ar	Ar	Anti-reset windup	Sets the rango of integration control	0 to 100% FS	100% FS	
rEv	rEU	Sets normal / reverse operations	Sets the control action	rv--(heat (reverse) / cool (none)) no--(heat (normal) / cool (none)) rvno (heat (reverse) / cool (normal)) norv (heat (normal) / cool (reverse)) rvrv (heat (reverse) / cool (reverse)) nono (heat (normal)/ cool (normal))	rv--/rvno (heat - heat/cool)	
SvL	SUL	SV limit (lower limit)	Sets the lower limit of SV	0 to 100% FS	0% FS	(note5)
Svh	SUH	SV limit (upper limit)	Sets the upper limit of SV	0 to 100% FS	100% FS	(note5)
TC1	TC1	OUT1 proportion cycle	Sets the proportion cycle of the control output (OUT1) (contacts, SSR drive)	1 to 150 sec (contact= 30, SSR/SSC=2)	30/2	(note7)
TC2	TC2	OUT2 proportion cycle	Sets the proportion cycle of the control output (OUT2) (contacts, SSR drive)	1 to 150 sec (contact= 30, SSR/SSC=2)	30/2	(note4)
PLC1	PLC1	OUT1 lower limit	Sets the lower limit of the control output (OUT1)	-3.0 to 103.0%	-3,00%	
PhC1	PHC1	OUT1 upper limit	Sets the upper limit of the control output (OUT1)	-3.0 to 103.0%	103,00%	
PLC2	PLC2	OUT2 lower limit	Sets the lower limit of the control output (OUT2)	-3.0 to 103.0%	-3,00%	(note4)
PhC2	PHC2	OUT2 upper limit	Sets the upper limit of the control output (OUT2)	-3.0 to 103.0%	103,00%	(note4)
PCUT	PCUT	Select the type of output limiter	Sets the type pf output limiter	0 to 15	0	

6-3 PID Palette "PLT" (Ch3)

Saves the palette values of PV and PID.Up to seven sets can be saved.

Parameter display	Parameter	Function	Setting range	Initial value	Remarks
Sv1 SU1	SV1	Sets the SV set value	SVL to SVH %FS	0%	(note5)
P1 P1	Proportional band 1	Sets the proportional band	0.0 to 999.9%	5,00%	
i1 I1	Integration time 1	Sets the integration time	0 to 3200 seconds	240 sec	
d1 d1	Differential time 1	Sets the differential time	0.0 to 999.9 seconds	60.0 sec	
hyS1 hyS1	ON/OFF control hysteresis 1	Sets the hysteresis when using the ON/OFF control	0 to 50% FS	1°C	
CoL1 CoL1	Cooling proportional band	Sets the cooling proportional band	0.0 to 100.0	1.0	(note4)
db1 db1	Dead band 1	Sets the dead band	-50.0 to +50.0	0%	(note4)
bAL1 bAL1	Output convergence value 1	Offset value which is added to the control output	-100 to 100%	0/50	(note1)
Ar1 Ar1	Anti-reset windup 1	Sets the anti-reset windup	0 to 100% FS	100% FS	
rEv1 rEU1	Sets normal / reverse 1	Sets the control action	rv--(heat (reverse) / cool (none)) no--(heat (normal) / cool (none)) rvno (heat (reverse) / cool (normal)) norv (heat (normal) / cool (reverse)) rvrv (heat (reverse) / cool (reverse)) nono (heat (normal) / cool (normal))	rv--/rvno	(note6) RST
- -	- -	- -	- -	- -	- -
Sv7 SU7	SV7	Sets the SV set value	SVL to SVH %FS	0%	(note5)
P7 P7	Proportional band 7	Sets the proportional band	0.0 to 999.9%	5,00%	
i7 I7	Integration time 7	Sets the integration time	0 to 3200 seconds	240 sec	
d7 d7	Differential time 7	Sets the differential time	0.0 to 999.9 seconds	60.0 sec	
hyS7 hyS7	ON/OFF control hysteresis 7	Sets the hysteresis when using the ON/OFF control	0 to 50% FS	1°C	
CoL7 CoL7	Cooling proportional band 7	Sets the cooling proportional band	0.0 to 100.0	1.0	(note1)
db7 db7	Dead band 7	Sets the dead band	-50.0 to +50.0 FS	0%	(note1)
bAL7 bAL7	Output convergence value 7	Offset value which is added to the control output	-100 to 100%	0/50	(note1)
Ar7 Ar7	Anti-reset windup 7	Sets anti-reset windup	0 to 100% FS	100% FS	
rEv7 rEU7	Sets normal / reverse 7	Sets the control action	rv--(heat (reverse) / cool (none)) no--(heat (normal) / cool (none)) rvno (heat (reverse) / cool (normal)) norv (heat (normal) / cool (reverse)) rvrv (heat (reverse) / cool (reverse)) nono (heat (normal) / cool (normal))	rv--/rvno (simple/ doble)	
SvMX SUMX	Sets the max SV selection number	Choosing SV with the user keys sets it to the maximum possible number	Sv 0 Sv 1 Sv 2 Sv 3 Sv 4 Sv 5 Sv 6 Sv 7 di	Sv 7	
PL1M PL IM	Sets the max PID selection number	Choosing PID with the user keys sets it to the maximum possible number	PID 0 PID 1 PID 2 PID 3 PID 4 PID 5 PID 6 PID 7 di	PID 7	

6-4 Ramp soak "PrG" (Ch4)

Create a pattern of temperatures using ramp soak combinations. You can create a temperature pattern with up to 16 steps.

Parameter display	Parameter	Function	Setting range	Initial value	Remarks
PTn PTn	Ramp soak operation pattern (Step No.)	Sets which steps to use in the ramp soak operation pattern	0 (uses steps 1 to 4) 1 (uses steps 5 to 8) 2 (uses steps 1 to 8) 3 (uses steps 9 to 12) 4 (uses steps 13 to 16) 5 (uses steps 9 to 16) 6 (uses steps 1 to 16) di (according to di)	6	(note21)
TiMU TIMU	Ramp soak time units	Sets the units of the ramp soak time	hh:MM (hour:min) MM.SS (min:sec)	hh.MM	
Sv-1 SU-1	Ramp soak 1 seg SV	Sets the SV	0 to 100% FS	0%	
TM1r TM1r	Ramp soak 1 seg ramp time	Sets the ramp time	00.00 to 99.59 (h:min/min:seg)	00:00 (h:min)	
TM1S TM1S	Ramp soak 1 seg soak time	Sets the soak time	00.00 to 99.59 (h:min/min:seg)	00:00 (h:min)	
- -	- -	- -	- -	- -	- -
Sv16 SU16	Ramp soak 16 seg SV	Sets the SV	0 to 100% FS	0%	
T16r T16r	Ramp soak 16 seg ramp time	Sets the ramp time	00.00 to 99.59 (h:min/min:seg)	00:00 (h:min)	
T16S T16S	Ramp soak 16 seg soak time	Sets the soak time	00.00 to 99.59 (h:min/min:seg)	00:00 (h:min)	
Mod Mod	Ramp soak mode	Sets the program operation mode	0 to 15	0	RST
Gsok GSok	Guaranty soak ON/OFF	Sets the guaranty soak ON or OFF	oFF (guaranty soak OFF) on (guaranty soak ON)	oFF	
PvST PVST	PV Start	Sets whether or not to start ramp soak with PV.	oFF (PV start OFF) on (PV start ON)	oFF	
ConT ConT	Restore mode	Sets how to restart when the controller is restored after a power loss	rES (Reset) Con (Continue) ini (Restart)	rES	(note20)
GS-L GS-L	Guaranty soak band (lower)	Sets the lower limit of guaranty soak	0 to 50% PE	5°C	
GS-h GS-h	Guaranty soak band (upper)	Sets the upper limit of guaranty soak	0 to 50% PE	5°C	
PTnM PTnM	Sets the Max pattern selection	Choosing pattern with the user key sets it to the maximum possible number	0 to 6	6	
Pmin PMIn	Sets the Min pattern selection	Choosing pattern with the user key sets it to the minimum possible number	0 to 6, di	0	

FS : Full Scale

6-5 Monitor "Mon"(Ch5)

You can check the ramp soak progress, control output, heater current, remaining time and other status functions.

Parameter display	Parameter	Function	Setting range	Remarks
STAT STAT	Ramp soak progress	Displays the progress of the ramp soak No configuration can be done	oFF (ramp soak stopped) 1-rP (ramp in step 1) 1-Sk (soak in step 1) - - 16rP(ramp in step 16) 16-Sk (soak in step 16) End (ramp soak finished)	
MV1 MV1	MV1	Displays the output value of the control output (OUT1)	-3.0 to 103.0%	
MV2 MV2	MV2	Displays the output value of the control output (OUT2)	-3.0 to 103.0%	(note4)
*PFb PFb	Displays the PFb input value	Displays the input value of the position feedback	-3.0 to 103.0%	(note8)
rSv rSV	RSV input value display	Displays the input value of the RSV	-5% to 105% FS	(note1)
CT1 CT1	Heater current 1	Displays the current through the CT	0, 0.4 to 50.0A	(note10)
LC1 LC1	Leak current value 1	Displays the leak current value of CT	0, 0.4 to 50.0A	(note10)
TM1 TM1	Remaining time on timer 1	Displays the remaining time on timer 1	0 to 9999 sec / 0 to 9999 min	(note3)
. . .	. . .	. . .	. . .	. . .
TM3 TM3	Remaining time on timer 3	Displays the remaining time on timer 3	0 to 9999 sec / 0 to 9999 min	
*TM5 TM5	Remaining time on timer 5	Displays the remaining time on timer 5	0 to 9999 sec / 0 to 9999 min	
FALT FALT	Error source display	Displays the source of an error	FALT= □□00 Fixed at 00 8bit : PV input underflow 9bit : PV input overflow 10bit : underrange 11bit : overrange 12bit : RSV underrange 13bit : RSV overrange 14bit : range setting error 15bit : EEPROM error	
PLno PLno	Current palete No.	Displays the PID palette No. currently selected	0 to 7	
PTno PTno	Current pattern No.	Displays the pattern No. of the ramp soak currently selected	0 to 6	

*NOTE : 1- Position feedback(PFb) only available on SZ49 model.
2- 5 timers availables on SZ49 model and 3 timers on SZ48 model

6-6 Setup "SET" (Ch6)

Sets up the input range, output range, and other items for the equipment.

Parameter display	Parameters	Function	Setting range	Initial value	Remarks
PvT PūT	PV input type	Sets the type of input sensor	0 (no function) 1 (PT100ohms) 2 (J) 3 (K) 4 (R) 5 (B) 6 (S) 7 (T) 8 (E) 9 (no function) 10 (no function) 11 (no function) 12 (N) 13 (PL-II) 14 (no function) 15 (0V to 5V / 0 to 20mA) 16 (1V to 5V / 4 to 20mA) 17 (0V to 10V) 18 (2V to 10V) 19 (0mV to 100mV)	3(K)	RST
Pvb Pūb	PV input lower limit	Sets the lower limit of PV input	-1999 to 9999	0°C	RST
PvF PūF	PV input upper limit	Sets the upper limit of PV input	-1999 to 9999	400°C	RST
Pvd Pūd	Decimal point position	Sets the number of decimal point positions for the PV/SV	0 (no decimal) 1 (1 digit) 2 (2 digits)	0	
PvoF PūoF	PV input shift	Sets the amount of shift for PV input	-10 to 10% FS	0%	
TF ſF	PV input filter	Sets the time constant for the PV input filter	0.0 to 120.0 seconds	5 sec	
rEMo rEMo	RSV Zero adjustment	Adjusts the zero RSV input	-50 to 50% FS	0%	(note1)
rEMS rEMS	RSV Span adjustment	Adjusts the span RSV input	-50 to 50% FS	0%	(note1)
rEMr rEMr	RSV input range	Sets the range for RSV input	0-5 (0V to 5V) 1-5 (1V to 5V)	1-5	(note1)
rTF rſF	RSV input filter	Sets the time constant for the RSV input filter	0.0 to 120.0 seconds	0.0 sec	(note1)
C1r C 1r	OUT1 range	Sets the range of the control output (OUT1)	0-5 (0V to 5V) 1-5 (1V to 5V) 0-10 (0V to 10V) 2-10 (2V to 10V) 0-20 (0 to 20mA) 4-20 (4 to 20mA)	0-10 (voltage) 4-20 (current)	(note9) (note13)
C2r C2r	OUT2 range	Sets the range of the control output (OUT2) Also sets for the re-transmission output	0-5V (0V to 5V) 1-5V (1V to 5V) 0-10 (0V to 10V) 2-10 (2V to 10V) 0-20 (0 to 20mA) 4-20 (4 to 20mA)	0-10 (voltage) 4-20 (current)	(note12) (note13) (note17)

Parameter display	Parameter	Function	Setting range	Initial value	Remarks
FLo1 FLo1	Output 1 set value during FALT	Sets the output value for the control output (OUT1) during FALT	-3.0 to 103.0%	-3,00%	
FLo2 FLo2	Output 2 set value during FALT	Sets the output value for the control output (OUT2) during FALT	-3.0 to 103.0%	103,00%	(note4)
SFo1 SFo1	Soft start output 1 set value	Sets the output value for the control output (OUT1) during soft start	-3.0 to 103.0%	-3,00%	
SFo2 SFo2	Soft start output 2 set value	Sets the output value for the control output (OUT2) during soft start	-3.0 to 103.0%	103,00%	(note1)
SFTM SFTM	Soft start set time	Sets the time from startup to the finish of SoftStart	00:00 to 99:59 (h:min)	0.00 (h:min)	
Sbo1 Sbo1	OUT1 output set value during standby	Sets the output value for the control output (OUT1) during standby	-3.0 to 103.0%	-3,00%	
Sbo2 Sbo2	OUT2 output set value during standby	Sets the output value for the control output (OUT2) during standby	-3.0 to 103.0%	103,00%	(note4)
SbMd SbMd	Standby mode setting	Sets the alarm, output, re-transmission output and PV/SV display during standby	ALM Re-trans Display PV/SV 0 OFF ON ON 1 ON ON ON 2 OFF OFF ON 3 ON OFF ON	0	(note14) RST
AoT AoT	Types of AO output	Displays the types of re-transmission output	PV SV MV PFB	PV	(note12)
AoL AoL	AO lower limit scaling	Sets the lower limit of AO	-100 to 100%	0%	(note12)
Aoh Aoh	AO upper limit scaling	Sets the upper limit of AO	-100 to 100%	100%	(note12)

6-7 System "SYS" (ch7)

Assigns the functions of the DI/DO, LED lamp, and other controls.

Parameter display	Parameters	Function	Setting range	Initial value	Remarks
uKey UtEY	Assigns the USER key	Sets the function of the USER key	0 (no function) 1 (Stdby ON/OFF) 2 (Auto/Manu) 3 (Local/Remote) 4 (no function) 5 (Starts Auto-tuning(standard)) 6 (Starts Auto-tuning(low PV)) 7 (Ramp SV ON/OFF) 8 (Ramp SV Hold) 9 (Ramp Soak OFF) 10 (Ramp Soak RUN/HOLD) 11 (no function) 12 (Latch release (all)) 13 (Latch release (DO1)) 14 (Latch release (DO2)) 15 (Latch release (DO3)) 16 (Latch release (DO4)) 17 (Latch release (DO5)) 18 (Start timer DO1) 19 (Start timer DO2) 20 (Start timer DO3) 21 (Start timer DO4) 22 (Start timer DO5) 23 (SV No. + 1) 24 (PID No. + 1) 25 (no function) 26 (Ramp soak pattern No. +1 (send)) 27 (SV No. +1, PID No. + 1)	2	

Parameter display	Parameters	Function	Setting range	Initial value	Remarks
di1 dI1	DI1 - Function selection	Sets the function of DI1	0 (No function) 1 (Stdby ON/OFF) 2 (Auto/Manu) 3 (Local/Remote) 4 (No function) 5 (No function) 6 (Start AT (standard)) 7 (Start AT (low PV)) 8 (No function) 9 (No function) 10 (Ramp SV ON/OFF) 11 (Ramp SV HOLD) 12 (Ramp soak OFF) 13 (Ramp soak RUN/HOLD) 14 (No function) 15 (Latch release (all)) 16 (Latch release DO1) 17 (Latch release DO2) 18 (Latch release DO3) *19 (Latch release DO4) *20 (Latch release DO5) 21 (Start timer DO1) 22 (Start timer DO2) 23 (Start timer DO3) *24 (Start timer DO4) *25 (Start timer DO5) 26 (SV No.+1) 27 (SV No.+2) 28 (SV No.+4) 29 (PID No.1+1) 30 (PID No.1+2) 31 (PID No.1+4) 32 (No function) 33 (No function) 34 (No function) 35 (SV No.+1, PID No.+1) 36 (SV No.+2, PID No.+2) 37 (SV No.+4, PID No.+4) 38 (Pattern No.+1) 39 (Pattern No.+2) 40 (Pattern No.+4) 41 (Soft Start) 42 (Ramp soak RUN) 43 (Ramp soak HOLD) 44 (Ramp soak RUN at DO1 startup) 45 (Ramp soak RUN at DO2 startup) 46 (Ramp soak RUN at DO3 startup) 47 (Ramp soak RUN at DO4 startup) 48 (Ramp soak RUN at DO5 startup)	0	(Note11)
-	-	- -	-	-	
-	-	- -	-	-	
*di5 dI5	DI-5 function selection	Sets the function of DI-5	0 to 48	0	
do1T do1F	Sets the DO-1 output event type	Sets the function of DO-1	0 to 102	0	
doP1 doP1	Sets the DO-1 option function	Assigns the four types of option functions in bit units	0000 to 1111 bit 0 : Output latch function bit 1 : Error alarm function bit 2 : Non-excitation output alarm func. bit 3 : hold reset function	0000	(note3) RST
-	-	- -	-	-	
-	-	- -	-	-	
*do5T do5F	Sets the DO-5 output event type	Sets the function of DO-5	0 to 102	0	
*doP5 doP5	Sets the DO-5 option function	Assigns the four types of option functions in bit units	0000 to 1111 bit 0 : Output latch function bit 1 : Error alarm function bit 2 : Non-excitation output alarm func. bit 3 : hold reset function	0000	
rMPL rMPL	Ramp SV decline	Sets the slope for a falling SV during ramp SV operations	0 to 100% FS	0°C	
rMPH rMPh	Ramp SV incline	Sets the slope for a rising SV during ramp SV operations	0 to 100%	0°C	

rMPU rMPU	Ramp SV slope units of time	Sets the unit of time for the slope during ramp SV operations	hoUr (slope temperature/hour) Min (slope temperature/minute)	hoUr	
SvT SUr	Ramp SV - SV display mode selection	Displays the SV during ramp operations or the SV goal value on the SV display	rMP (SV during ramp) TrG (Target SV)	rMP	
CTrL CTrL	Control methods	Allows you to select the control method	PID (PID Control) FUZY (Fuzzy PID control) SELF (Self-tuning control) PiD2 (PID2 Control)	Pid	Sections 7-1 to 7-5 (note18)
*PrCS PrCS	Control target	Allows you to select the control target	SRV1 (Servo control 1) SRV2 (Servo control 2) PFB (Position feedback control)	PFB/Srv1 (with/without PFB)	(note16) RST
STMd STMd	Start mode	Sets the operation mode when starting up	Auto (Auto mode startup) Man (Manual mode startup) Rem (Remote mode startup) STby (Standby make startup)	AUTo	

*Note : (1) - Number of parameters di, do, doP is 3 (SZ48) or 5 (SZ49)
(2) - Control target (PrCS) SRV1, SRV2 and PFB only available on SZ49 model.
(3) - For DI, scales 19, 20, 24 and 25 only available on SZ49 model.

6-8 Alarm "ALM" (Ch8)

Sets the detect conditions for each type of alarm.

Parameter display	Parameters	Function	Setting range	Initial value	Remarks
A1hy A1hY	ALM1 hysteresis	Sets the hysteresis for alarm output 1 ON/OFF	0 to 50% FS	1°C	(note3)
dLY1 dLY1	ALM1 delay	Sets the delay before detecting alarm output 1	0 to 9999 (sec/min)	0	
dL1U dL1U	ALM1 delay time units	Sets the delay time units for alarm output 1	sec (second) Min (minute)	sec	
. .	. .	. .	. .	. .	
*A5hY A5hY	ALM5 hysteresis	Sets the hysteresis for alarm output 5 ON/OFF	0 to 50% FS	1°C	
*dLY5 dLY5	ALM5 delay	Sets the delay before detecting alarm output 5	0 to 9999 (sec/min)	0	
*dL5U dL5U	ALM5 delay time units	Sets the delay time units for alarm output 5	sec (second) Min (minute)	sec	
hb1 hb1	HB alarm set value for CT	Sets the heater burnout alarm detection value for CT	0.0 to 50.0 A	0 A	
hb1h hb1h	HB alarm hysteresis for CT	Sets the heather burnout alarm ON/OFF hysteresis for CT	0.0 to 50.0 A	5 A	(note10) (note13)
hS1 hS1	Load short-circuit alarm setting value for CT	Sets the heater load short-circuit alarm setting value for CT	0.0 to 50.0 A	0 A	
hS1h hS1h	Load short-circuit alarm hysteresis for CT	Sets the heater load short-circuit alarm ON/OFF hysteresis for CT	0.0 to 50.0 A	5 A	
LbTM LbTM	Loop break detection time	Sets the time before detecting a broken loop	0 to 9999 sec	0 sec	
LbAb LbAb	Loop break detection range (ºC)	Sets the temperature range before detecting a broken loop	0 to 100% FS	10°C	

*Note : Up to 5 alarms available on SZ49 model, and up to 3 alarms on SZ48 alarms.

6-9 Communication "CoM" (Ch9)

Sets the communication conditions towards the host computer.

Parameter display	Parameters	Function	Setting range	Initial value	Remarks
Stno Stno	St. No. setting	Sets the station number	0 to 255	1	(note15)
CoM CoM	Baud rate / Parity setting	Sets the baud rate and parity check	96od (9600bps/odd) 96Ev (9600bps/even) 96no (9600bps/none) 19od (19200bps/odd) 19Ev (19200bps/even) 19no (19200bps/none)	96od	(note15)
SCC SCC	Communication permissions	Sets whether or not overwriting is possible from the master side (PC, etc...)	r (read only) rW (read and overwrite)	rW	(note15)

6-10 PFB "PFb" (Ch10)

Changes settings to use valve control

Parameter display	Parameters	Function	Setting range	Initial value	Remarks
PGAP PGAP	PFB dead band	Sets the PFB dead band	0.0 to 100%	5%	(note8)
TrvL TrUL	Valve stroke time	Sets the full stroke time for the valve (0 to 100%)	5 to 180 seg	30sec	(note8)
*CAL CAL	PFB input adjustment command	Adjusts the zero / span for PFB input	0 (none/forcibly termination) 1 (zero adjustment) 2 (span adjustment) 3 (automatic adjustment)		

*Note : CAL parameter is only available on SZ49 (motorized valve) model.

6-11 Password Setup "PAS" (Ch11)

Sets the password. Passwords can be set at three levels.

Parameter display	Parameters	Function	Setting range	Initial value	Remarks
PAS1 PAS1	Password 1	Sets password 1	0000 to FFFF	0000	
PAS2 PAS2	Password 2	Sets password 2	0000 to FFFF	0000	
PAS3 PAS3	Password 3	Sets password 3	0000 to FFFF	0000	

6-12 Display "dSP" (Ch12)

Sets the parameter mask function. Optional parameters can be set or not to display.

Parameter display	Parameters	Function	Setting range	Initial value	Remarks
dP01 dP01	Parameter mask of each parameter	Sets the parameters to be displayed /not displayed	0000 to FFFF	depending on model	
- -					
dP30 dP30	Parameter mask of each parameter	Sets the parameters to be displayed /not displayed	0000 to FFFF	depending on model	

Note 1: Displayed when codification block E is 3,6,8,9 or B.
Note 2: Displayed when codification block D is not 0.
Note 3: Display changes according to the DO number and the selected alarm type.
Note 4: Displayed when codification block C is 1,2,3 or 5.
Note 5: “SvL” y “Svh” must be set so that SvL < Svh.
When setting values of “SvL” and “SvH” are changed, check SV1 (“Sv1 CH3”) through SV7 (“Sv7 CH3”).
Note 6: Set the same value as the one for the normal/reverse setting (“rEv CH2”).
Note 7: Displayed when codification block B is 1 or 2.
Note 8: Displayed when codification block B is 5.
Note 9: Displayed when codification block B is 3 or 4.
Note 10: Displayed when codification block E is 4 or 7.
Note 11: The number of parameters to be displayed varies depending on the number of DIs.
Note 12: Displayed when codification block C is 4 or 6.
Note 13: The parameter uses this even if the terminal uses CT2 input.
Note 14: Select the proper setup range for the output type.
Note 15: Do not set 4 to 7.
Note 16: Displayed when codification block E is 1,6,7,8 or C.
Note 17: Displayed when codification block C is 1 or 2.
Note 18: Displayed when codification block C is 3 or 5.
Note 19: When the number in the codification block B is 5, be sure to select PID control . Options other than PID cannot be used.
Note 20: When changing SV with the front keys, do not change "SVn" parameter via communication. Otherwise, the changed SV may not be stored correctly.
Note 21 : Do not change this parameter during ramp soak operation.
Be sure to set "PrG"= "oFF" before changing the parameter.

7 Functions

This controller has 5 types of temperature control functions (All) and 1 type of valve control function (SZ48) or 3 types of valve control functions (SZ49).
Select according to type and use.

⚠ Caution	The ramp soak function (p35), the remote SV function (p43), and SV selection function (pXX) cannot be combined.

● Temperature Control functions

ON/OFF control	Turns the control output ON/OFF according to the size relationship of PV and SV. Can build a control system out of simple elements such as SSR. Suitable when accuracy is not requested..	Chap. 7-1 (Pag 29)
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). Is the most basic control in this equipment.	Chap.7-2 (Pag 29)
Fuzzi PID Control	PID control that reduces the amount of overshoot during control. Is effective when you want to supress overshoot when SV changed, even if you may take a long time to reach the target value.	Chap.7-3 (Pag 30)
Self-tuning Control	Automatically calculating PID control according to the control target or SV change. It is effective when the control conditions change frequently.	Chap.7-4 (Pag 30)
PID2 Control	In case the power supply of the control target goes ON-OFF-ON, this PID2 control can supress the amount of overshoot during control target turns OFF-ON.	Chap.7-5 (Pag 31)

● Valve Control functions

Servo Control 1 (Servo 1)	Regulates the valve position according to [OPEN] and [CLOSE] of the contact output.	Chap.7-7 (Pag 33)
*Servo Control 2 (Servo 2)	Regulates the valve position according to [OPEN] and [CLOSE] of the contact output. It can also display the valve's degree of openess according to the position signal of valve. However, is not used to calculate control output.	Chap.7-7 (Pag 33)
*Position Feedback (PFB Control)	Controls the valve according to a calculation performed on the opening signal. Regulates the valve position according to [OPEN] and [CLOSE] of the contact output. It can be used when there is an opening signal coming from the valve.	Chap.7-8 (Pag 33)

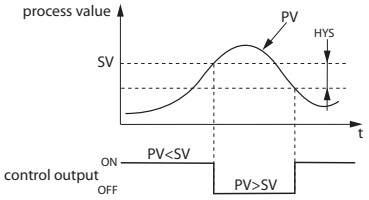
* Note : Not available on SZ48 (Motorized valve) model.

7-1 ON/OFF (2-position) Control

Act as an ON/OFF when the PID parameter is set to P=0.0 (Pid Ch2).
ON/OFF control switches the control output to On (100%) or Off (0%) according to the size relationship of PV and SV.
The output hysteresis can be set under the parameter "hYS" (Pid Ch2)

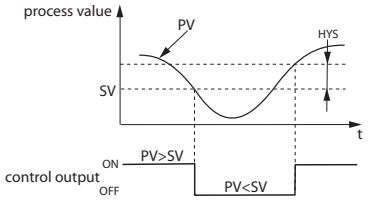
Reverse operation (heat control)
Method used to control the electric heating furnace.
Set "hYS" to an appropiate value according to the control target.

Parameter	Set value
P	0
rEv	rv--
hYS	Arbitrary (factory setting 1°C)



Normal operation (cooling control)
Method used to control the cooling machine

Parameter	Set value
P	0
rEv	no--
hYS	Arbitrary (factory setting 1°C)



Note : • During ON/OFF control, the I and D settings do not affect control.
• The manual operation during ON/OFF control will become MV = 100% when the key is pressed, and MV=0% when the key is pressed.
• If the hysteresis width is narrow, and PV and SV are nearly equal, the output may frequently switch ON and OFF. Note that may affect the operation life of the contact output.

7-2 PID Controls

PID controls run as long as the parameter is set to P≠ 0 (Pid Ch2) and CTrL = Pid (SYS Ch7).
PID controls calculate PID based on the set values P, i, d and Ar, and output the calculated result (-3% to 103%).
Each parameter can be set either by manually tuning the valves or by running auto-tuning to automatically set the values.

For more details on auto-tuning, see "7-6 auto-tuning" (page 32)

Setting PID control

1. **Display the system menu (SYS ch7).**
2. **Display the control parameter (CTrL) and choose PID controls (Pid).**
3. **Press the ↵ key to set the value.**

7-3 Fuzzy PID Control

Related to normal PID controls, fuzzy PID controls act with small overshoot.
You will need to run auto-tuning to set the PID parameter the first time you use fuzzy control.

Setting fuzzy PID control

1. **Display the system menu (SYS ch7).**
2. **Display the controller parameter (CTrL) and choose fuzzy PID control(FUZY).**
3. **Press the ↵ key to set the value.**

For more details on auto-tunning, see "7-6 auto-tuning" (page 32)

7-4 Self-tuning Control

Self-tuning Control is a control which automatically calculate the value of PID, under the condition that the control target or set value (SV) changes.
Self -tuning is especially effective for situations when a high level of control is not needed, but auto-tuning cannot be run due to frequent changes on the control target conditions..

Note : When a high level of control is required, choose PID control, fuzzy PID control, or PID2 control.

Conditions where self-tuning can be used :

- When temperature rises when the power is turned on .
- When temperature rises when SV changes (or when the controller decides it is necessary).
- When the controller decides it is necessary because the controls have become unstable.

Conditions where self-tuning cannot be used :

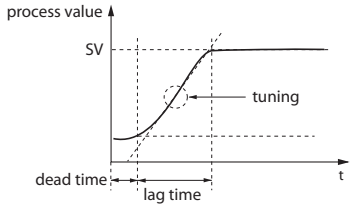
- During control standby.
- During ON/OFF (2-position) control.
- During auto-tuning.
- During ramp soak progress.
- When there is error input.
- When set for dual output.
- When any of the P, I, D or Ar parameters are set to manual.
- During manual mode
- During soft start progress

Conditions to halt self-tuning :

- When there is a change in SV (This includes the case where SV changes because of the ramp soak function, remote SV function, or ramp SV)
- When self-tuning has not finished after running for nine or more hours.

Setting self-tuning

1. **Turn on power of the controller and set the SV**
2. **Display the system menu (SYS ch7)**
3. **Display the controller parameter (CTrL) and choose self-tuning (SELF)**
4. **Press the ↵ key to set the value**
5. **Turn off power of the controller**
6. **Turn on power of the control target equipment and the controller. Turn on power of the control equipment first.**
   Self-tuning will begin.

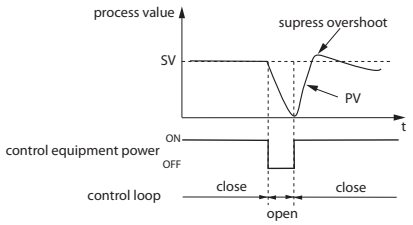


Note :
- *The equipment will not tune correctly if power of the controller is turned on first.*
- *To reset self-tuning, set the control method to PID ("PiD") once before changing back to self-tuning*

7-5 PID2 Control

In case which the power supply of the control target goes ON/OFF/ON, this PID2 control can supress the amount of overshoot.
This control introduces an algorithm to prevent the calculated PID result from becoming a miscalculation, even when the control loop is open.
You will need to run auto-tuning to set the Pid parameter when using Pid2 control.

Features of Pid2 Control



Setting PID2 control

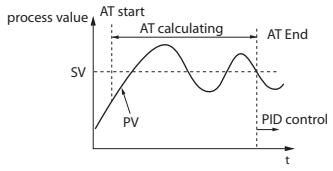
1. **Display the system menu (SYS ch7).**
2. **Display the control parameter (CTrL) and choose PID2 (Pid2).**
3. **Press the ↵ key to set the value.**

7-6 Auto-tuning

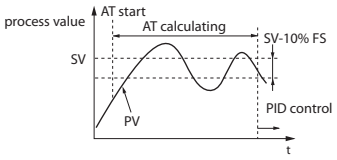
Run auto-tuning to set the PID parameter automatically.

AT set value	Behavior	Function
oFF	Stop/Finish	Stops or finishes auto-tuning
on	Normal type	The standard auto-tuning for SV reference. Choose this auto-tuning in most situations
Lo	Low PV type	Auto-tuning for SV-10% reference. Choose this when you want to supress the overshoot when tuning.

• **Normal type**



• **Low PV type**



Note : Set the following parameters before running auto-tuning:
. PV input type / PV input upper limit / PV input lower limit / Decimal point / PV input filter, in the Setup Channel menu (SET Ch6).
. OUT1 proportion cycle (OUT2 proportion cycle) in the PID channel menu (pid Ch2).

Running auto-tuning

1 **Display the operation menu (oPE Ch1)**.

2 **Display auto-tuning (AT) and choose the tuning type**
Choose the standard type ("oN") or low SV type ("Lo") according to the control target.

3 **Press the ↵ key to start auto-tuning**
A decimal point will blink at the bottom of the display during auto-tuning.
When auto-tuning has succesfully completed, blinking decimal point will turn off and overwrites the PID.

Note :

- *PID parameter which is set after auto-tuning has finished normally will be mantained even when the power is turned off. However, the PID value will not be changed if the power is turned off during auto-tuning. In this case, rerun auto-tuning.*
- *The equipment will run ON/OFF control during auto-tuning, so there may be a large change in PV according to the porcess. Do not use auto-tuning for processes that do no permit a large change in PV. Do not use auto-tuning for processes such as pressure control and flow control that have fast response.*
- *Auto-tuning is not behaving normally if it has not finished after four or more hours have passed. In these cases, recheck parameters such as input/output wiring, control output behavior (normal/Reverse), and input sensor type.*
- *Rerun auto-tuning if there is a large change in SV, PV input type or in the control target conditions that reduces the efectiveness of the controls.*
- *Yo can run auto-tuning when the control type is set to "fuzzy" or "Pid2".*
- *You can not run auto-tuning in manual mode.*
- *When using PID selection function, the auto-tuning result for the selected PID group is stored.*
- *Auto-tuning is forcibily terminated when SV changes because of the ramp soak function, remote SV function, or ramp SV.*

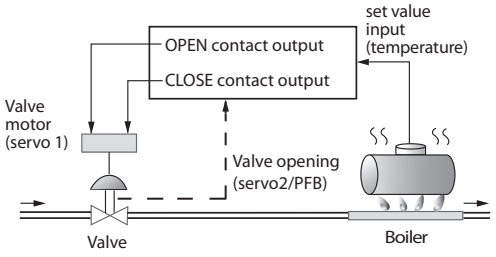
7-7 Valve Control (Servo control 1 / Servo Control 2)

Valve controls adjusts an control the valve position according to [OPEN] and [CLOSE] of the contact signal. Turn on the contact outputs in manual mode, so that pressing the ▼ key means "OPEN" and pressing the ▲ key means "CLOSE".
Servo Control 1 and servo control 2 have the following differences:

Servo control 1 : No valve position display.
Servo control 2 : Has valve position display.

Neither control can be used to control valve position itself.

Note :
Srv2 and PFb are not available in SZ48 (Motorized valve) model.



Setting Servo Control 1 or Servo Control 2

1. **Display the System menu (SYS ch7).**
2. **Display the control parameter (CTrL) and choose Servo Control 1 (Srv1).**
3. **Press the ↵ key to set value.**

⚠ Caution	*Chattering may occur if the dead band (PGAP) in the PFB (PFb Ch10) is set too small.*

Setting the valve stroke time

4. **Display the PFB menu (PFb ch10).**
5. **Display the valve stroke time parameter (Trvl) and set the stroke time for the valve in use.**
6. **Press the ↵ key to set the value.**

Note: Auto valve adjustment sets value stroke time automatically. For more details on the operation, refer to "7-8 Position Feedback Control (PFB Control)"

7-8 Position Feedback Control (PFB)

PFB uses the opening position signal from the valve in its MV output calculation for the controller, but is otherwise a similar function to " 7-7 Valve Controls (Servo Control 1 / Servo Control 2)".
Unlike the servo controls, which use estimated controls for the valve position, PFB controls allow detailed control.

Setting position feedback control

1. **Display the System menu (SYS ch7)**
2. **Display the control parameter (PrCS) and choose position feedback controls (PFB).**
3. **Press the ↵ key to set the value.**

Adjust the valve opening position

1. **Display the PFB menu (Pfb ch10)**
2. **Switch to manual control and fully close the valve.**
3. **Display "1 (zero adjustment)" in the PFB input adjustment parameter ("CAL") and press the ↵ key.**
4. **Press the ↵ key to enter the current input value as "zero".**
5. **Fully open the valve using manual control.**
6. **Display "2 (span adjustment)" in the PFB input adjustment parameter ("CAL").**
7. **Press the ↵ key to enter the current input value as "span".**

Note : To automatically adjust the valve opening, set "CAL" to 3 in step 3 above.
This setting will automatically open and close the valve to adjust it automatically.

⚠ Caution

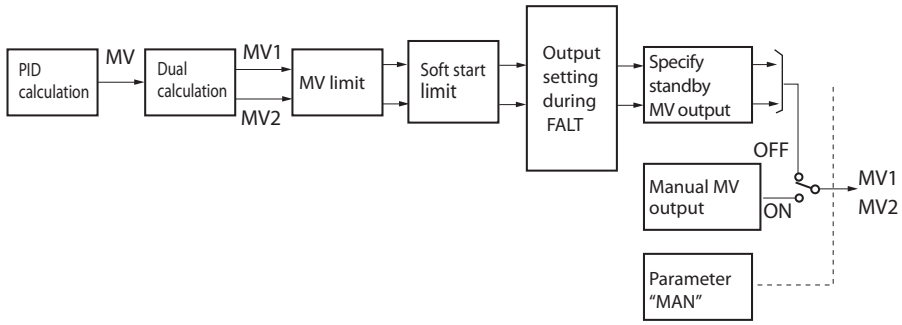
- To manually adjust the valve, carry out step 1 through 7 as written above .
- If the valve is not connected or connected incorrectly, it can still be adjusted, but will not achieve accurate results.
- There is no open-circuit judgment function for the valve opening feedback signal.

7-9 Manual Output

Allows the control output to be manually set at an arbitrary value.

- Manual mode display
  A decimal point will light up at the bottom right of the display during manual mode.
  The same decimal point appears on the parameter setting display.

- Switchover between Auto and Manual
  Modes can be changed by four modes : the front key (user key), DI function, communication function, or the parameter "Man" (oPE CH1).
- MV output flow diagram (MV output priority processing):

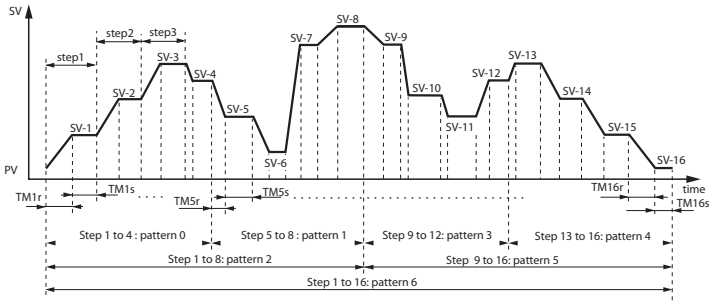


⚠ Caution

MV limits does not apply to the MV output during manual operation, FALT, or Standby. (Take extra caution when MV performs flash protection during combustion control by using the overlimit function).

7-10 Ramp Soak Function

Automatically runs after setting the times for the SV changes.
You can choose up to sixteen steps for the SV setting and seven types of ramp soak operation patterns.



Creating a ramp soak operation pattern

Pattern	Sets which steps to use from the following seven types: Step 1 to 4 ; Step 5 to 8 ; Step 9 to 12 ; Step 13 to 16 ; Step 1 to 8 ; Step 9 to 16 ; Step 1 to 16
Target SV	Sets the controlled temperature
Ramp time	Sets the time to reach the target SV from the current SV
Soak time	Sets the time to mantain the specified SV

The following steps will explain how to run the specified pattern 0 (SV-1 to SV-4) :

1. **Display the ramp soak menu (PrG ch4)**
2. **Display pattern parameter (PTn) and choose pattern 0 (0)**
   (Run SV-1 through SV-4)
3. **Display the time parameter (TimU) and choose minute:second (MM.SS)**
   Sets the units of time. Besides minute:second, you can also choose hour:minute (hh.MM)
4. **Display the target value (SV-1) and set the target temperature.**
5. **Display the ramp time parameter (Rm1r) and set the ramp time**
6. **Display the soak time parameter (RM1s) and set the soak time**
7. **Repeat steps 4 through 7 and set the remaining parameters.**

Running ramp soak

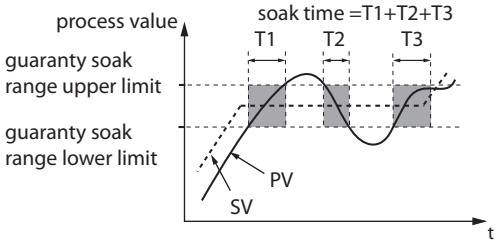
The following steps explain how to run ramp soak.

1. **Display the operation menu (oPE ch1)**
2. **Display program parameter (PrG) and choose RUN (rUn)**
3. **Ramp soak starts running from the current PV**

Note : To interrupt the ramp soak operation, choose HOLD (HLd) in step 2.
To cancel the interruption, choose RUN (rUn) again. END (End) will display when ramp soak has completed.

Guaranty soak

This function guarantees the soak time. Only soak time within the specified range of temperature for SV is counted towards soak time.
As seen in the figure below, only the sum of the shaded areas is counted as soak time.
The operation moves onto the next step when the total soak time equals the specified soak time.



The following steps will explain how to set an example guaranty soak range with an upper limit of 5ºC and a lower limit of 3ºC.

1 **Display the ramp soak menu (PrG ch4)**

2 **Display the guaranty ON/OFF parameter (GSot) and choose (on)**

3 **Display the guaranty soak lower limit parameter (GS-U) and set the lower limit (in this example, set it to 3ºC)**

4 **Display the guaranty soak upper limit parameter (GS-L) and set the upper limit (in this example, set it to 5ºC)**

5 **Press the ↵ key to set the value**

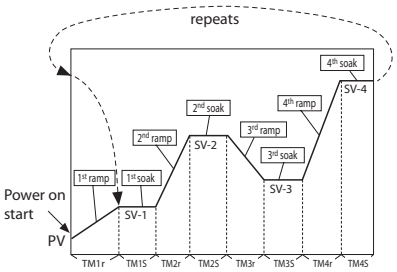
Mode setting

Sets how you want to run ramp soak ("Mod" parameter).
The following items can be set.

Power on start	Ramp soak starts running from the current PV.
Ending output	Shows the ending output after ramp soak has been completed.
OFF output	Shows the output during OFF after ramp soak has been completed.
Repeat behavior	After finishing the last step in ramp soak, the porcess starts again from 1st step

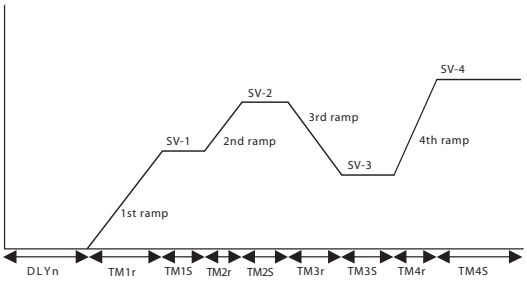
You can choose from the following 16 types of modes according to the combination of run method options.

MOD	Power on start	Ending Output	OFF output	Repeat Behavior
0	Off	Continuous control	Continuous control	Off
1	Off	Continuous control	Continuous control	On
2	Off	Continuous control	Standby	Off
3	Off	Continuous control	Standby	On
4	Off	Standby	Continuous control	Off
5	Off	Standby	Continuous control	On
6	Off	Standby	Standby	Off
7	Off	Standby	Standby	On
8	On	Continuous control	Continuous control	Off
9	On	Continuous control	Continuous control	On
10	On	Continuous control	Standby	Off
11	On	Continuous control	Standby	On
12	On	Standby	Continuous control	Off
13	On	Standby	Continuous control	On
14	On	Standby	Standby	Off
15	On	Standby	Standby	On



Delay start

Ramp soak can be automatically started (RUN) after certain period of time has elapsed since the power of the controller is turned on. This function is enabled by setting the digital input function (DI-n) and the digital output function (DonT), and setting the delay time dLYn.



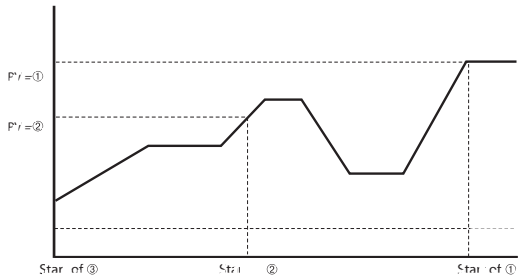
The following steps will explain how to assign the delay start to DI1 and Do2, and set the delay time to five minutes.

1. **Display the system menu (SYS ch7)**
2. **Display the DI1 function selection (dI 1) and set 44 ("44")**
3. **Display the DO1 output event type setting (do 1F) and set 35 ("35")**
4. **Display the alarm menu (ALM Ch8)**
5. **Display the ALM1 delay time (dLY 1), and set 5 (" 5 ")**
6. **Display the ALM1 delay time unit (dL 1U), and set the minute (Min)**

PV Start

When the ramp soak starts (RUN), this function searches the first point where the measurement value (PV) and the program pattern match, and starts opperation at that point.

If the measurement value does not match the pattern as with PV = 3, the normal operation starts.



7-11 Digital Input Function

Each of the digital inputs (Di1 to Di5) can be assigned to the following functions. The specified function will run when an external DI signal enters the input.

Display	Function name	Behavior	ON	OFF
0	No function	Nothing happen	-	-
1	Switchover standby ON/OFF	Switches between standby on and off	Standby ON	Standby OFF
2	Switchover Auto/Manu	Switches between auto and manual mode	Manu	Auto
3	Switchover Local and Remote	Switches between local and remote SV	Remote	Local
4	No function	Do not set	-	-
5	No function	Do not set	-	-
6	Auto-tuning (standard) Start	Starts standard auto-tuning	Start	Finish
7	Auto-tuning (low SV) Start	Starts low SV auto tuning sobrepasamiento de consigna	Start	Finish
8	No function	Do not set	-	-
9	No function	Do not set	-	-
10	Ramp SV on/off	Enables or disables Ramp SV	Disable	Enable
11	Ramp SV (Hold)	Switches between ramp SV HOLD and HOLD cancel	HOLD	HOLD
12	Ramp Soak OFF	Turns Ramp Soak Off	OFF	-
13	Ramp Soak Run / Hold	Switches between RUN and HOLD de consigna	RUN	HOLD
14	No function	Do not set	-	-
15	Latch release (all)	Cancels all the sources currently acting as latches	ACK	-

16	Latch release DO1	Cancels the source acting as latch on DO1	ACK	-
17	Latch release DO2	Cancels the source acting as latch on DO2		
18	Latch release DO3	Cancels the source acting as latch on DO3		
*19	Latch release DO4	Cancels the source acting as latch on DO4		
*20	Latch release DO5	Cancels the source acting as latch on DO5		
21	Start timer (DO1)	Starts the specified timer for DO1	Timer ON	Timer OFF
22	Start timer (DO2)	Starts the specified timer for DO2		
23	Start timer (DO3)	Starts the specified timer for DO3		
*24	Start timer (DO4)	Starts the specified timer for DO4		
*25	Start timer (DO5)	Starts the specified timer for DO5		
26	SV No.+1	When selecting SV No. increases SV No. by 1	+1	-
27	SV No.+2	When selecting SV No. increases SV No. by 2	+2	-
28	SV No.+4	When selecting SV No. increases SV No. by 4	+4	-
29	PID No.+1	When selecting PID No. increases PID No. by 1	+1	-
30	PID No.+2	When selecting PID No. increases PID No. by 2	+2	-
31	PID No.+4	When selecting PID No. increases PID No. by 4	+4	-
32	No function	Do not set	-	-
33	No function	Do not set	-	-
34	No function	Do not set	-	-
35	SV No.+1 PID No.+1	When selecting SV No. and PID No. increases the SV No. and the PID No. by 1	+1	-
36	SV No.+2 PID No.+2	When selecting SV No. and PID No. increases the SV No. and the PID No. by 2	+2	-
37	SV No.+4 PID No.+4	When selecting SV No. and PID No. increases the SV No. and the PID No. by 4	+4	-
38	Pattern No.+1	When selecting pattern No. increases the Pattern No. by 1	+1	
39	Pattern No.+2	When selecting pattern No. increases the Pattern No. by 2	+2	
40	Pattern No.+4	When selecting pattern No. increases the Pattern No. by 4	+4	
41	Soft Start	Starts the Soft Start	Soft Start ON	-
42	Ramp Soak RUN	Sets the Ramp Soak to RUN	RUN	-
43	Ramp Soak HOLD	Sets the Ramp Soak to HOLD	HOLD	-
44	Delay start (DO1)	Enables delay start with the delay time = dLY1	Delay start enable	
45	Delay start (DO2)	Enables delay start with the delay time = dLY2	Delay start enable	
46	Delay start (DO3)	Enables delay start with the delay time = dLY3	Delay start enable	
*47	Delay start (DO4)	...	...	
*48	Delay start (DO5)	...	...	

*Note : Only available on SZ49 model.

The following steps will explain how to set DI1 to switchover between standby ON/OFF

1 **Display the system menu (SYS ch7)**

2 **Display the DI1 (di1) parameter and choose 1 (1)**
This chooses to switchover between standby ON and OFF.

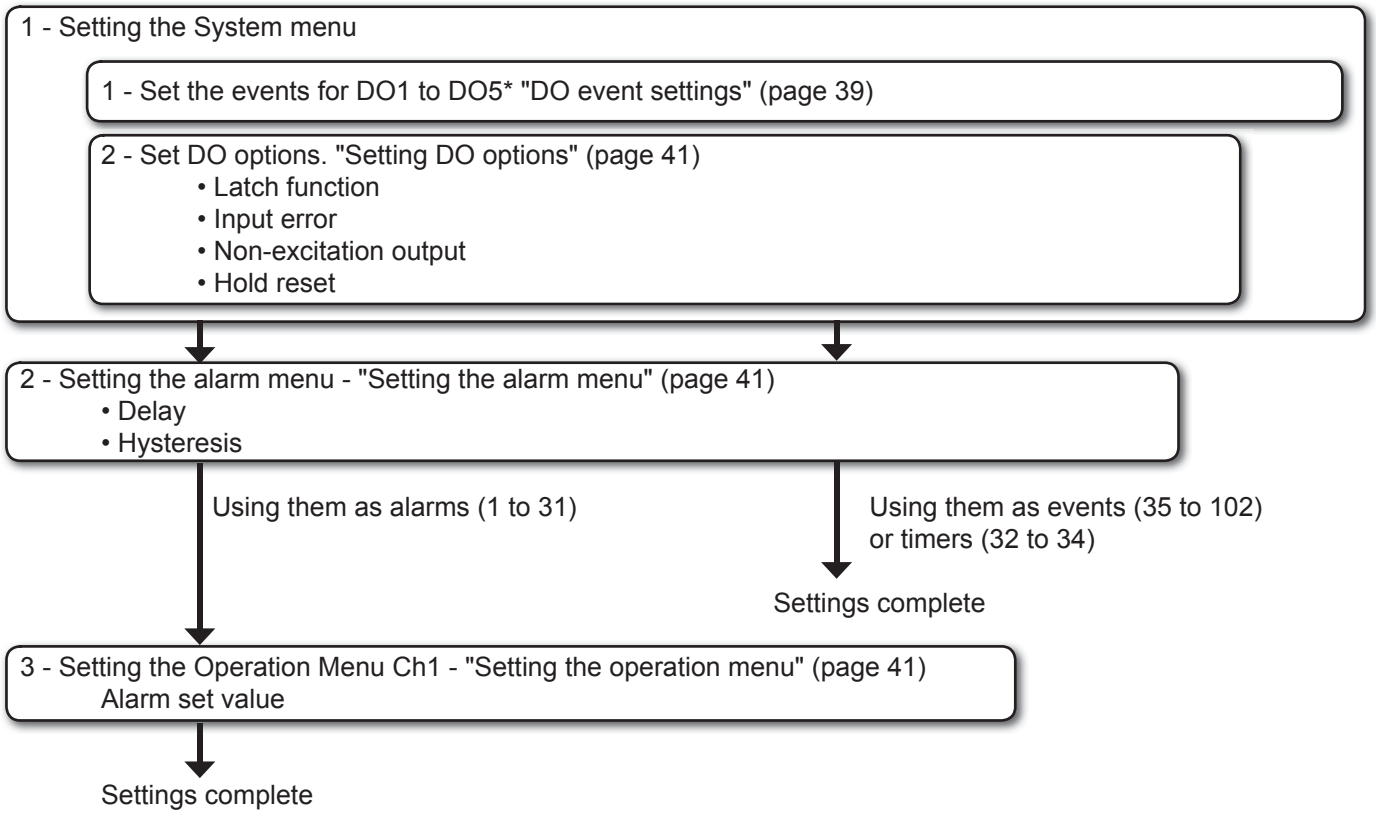
3 **Press the ↵ key to set the value.**

⚠ Caution	When "Switchover between local and remote" (DI setting value = 3) is used for the digital input function, the operation before turning off the power of the main unit affects the DI operation when the power turns on.

N°	Operation before turning off the main unit		DI status when the power is on	DI behaviour while the powe of the main unit is on
	Operation	Operation Status		
1	DI on when rEM parameter = LoCL	Remote SV operation	DI on	Remote SV operation
			DI off	Local SV operation
2	Switches to rEM parameter = rEM by key operation		DI on	Remote SV operation
			DI off	Remote SV operation
3	Switches desired parameter setting value via rs485 during rEM = rEM		DI on	Remote SV operation
			DI off	Remote SV operation
4	DI off when rEM parameter = rEM	Local SV operation	DI on	Remote SV operation
			DI off	Remote SV operation
5	Switches to rEM parameter = LoCL by key operation		DI on	Remote SV operation
			DI off	Local SV operation
6	Switches desired parameter setting value via rs485 during rEM = LoCL		DI on	Remote SV operation
			DI off	Local SV operation

7-12 Digital Output

Each of DO1 to DO5* can be assigned the following functions (events).
The functions are divided into 2 categories : alarms and events



*Note : 3 DO available only for SZ48 model

1. DO event settings

Events are divided into those related to alarms and those not related.
For more about the events related to alarms, see 11. "Alarm Action Type Codes" (page 53)
Use the following steps events other than alarms.

● Ramp soak delay start

Type	Setting (Do1 to Do5)	Function
Ramp soak delay start	35	Delay start enable

● Wire burnout circuit alarm

Type	Setting (Do1 to Do5)	Function
Wire burnout circuit alarm	41	Loop break Alarm 1
	44	Heather burnout
Alarm 1 Wire break/short circuit alarm	47	Load short-circuit alarm

● **Conditional outputs**

Type	Setting (Do1 to Do5*)	Function
Conditional outputs	51	During auto-tuning
	52	Normal
	53	During Standby
	54	During manual mode
	55	Durnig remote SV operation
	56	During Ramp SV
Ramp Soak event output	60	OFF state
	61	RUN state
	62	HOLD state
	63	GS (guaranty soak) state
	65	END state
Time signal	71	Time signal (1st segment)
	72	Time signal (2nd segment)
	73	Time signal (3rd segment)
	74	Time signal (4th segment)
	75	Time signal (5th segment)
	76	Time signal (6th segment)
	77	Time signal (7th segment)
	78	Time signal (8th segment)
	79	Time signal (9th segment)
	80	Time signal (10th segment)
	81	Time signal (11th segment)
	82	Time signal (12th segment)
	83	Time signal (13th segment)
	84	Time signal (14th segment)
	85	Time signal (15th segment)
	86	Time signal (16th segment)
	87	Time signal (17th segment)
	88	Time signal (18th segment)
	89	Time signal (19th segment)
	90	Time signal (20th segment)
	91	Time signal (21st segment)
	92	Time signal (22nd segment)
	93	Time signal (23rd segment)
	94	Time signal (24th segment)
	95	Time signal (25th segment)
	96	Time signal (26th segment)
	97	Time signal (27th segment)
	98	Time signal (28th segment)
	99	Time signal (29th segment)
	100	Time signal (30th segment)
	101	Time signal (31st segment)
	102	Time signal (32nd segment)

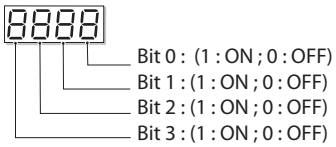
Use the following steps to set DO.

1. **Display the system menu (SYS Ch7)**
2. **Set the event you want to specify under the DO1 output event setting type (do1T)**
3. **Set the option function under the DO1 output event setting type (doP1)**
   For the contents of this setting, see 2- "Setting DO option functions" (page 41)
4. **Set DO2 to DO5* as necessary.**
5. **Press the ↵ key to set the value.**

2. Setting DO option functions

Allows you to set not just even settings, but option functions for each DO.

The DO events are set
by each digit.



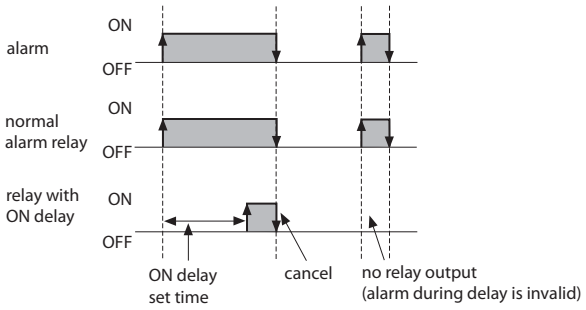
Bit	Function	Description
Bit 0	Event output latch function	Latches (mantains) the DO when event starts
Bit 1	Error alarm function	Outputs when the unit receives an input error
Bit 2	Non-excitation output alarm	Reverses the output signal and outputs it through DO
Bit 3	Hold reset function	When using an alarm with hold, the hold function will reset when any of the following operations occur: SV change, Alarm type change, Alarm set value change, Standby cancel, Power reset.

3. Setting the alarm menu

● **Hysteresis function**
The hysteresis band is preserved during alarm output

● **Delay function**
When events (including alarms) occur,
the DO does not begin outputting immediately.
Instead, the event continues for a specified period
of time before outputting DO.
This is called a delay function because there is a
delay between the event and outputting to DO.

(Ex.) Alarm on delay function



Use the following steps to set an alarm delay and hysteresis

1. **Display the alarm menu (ALM Ch8)**
2. **Display hysteresis 1 (A1hY) and set the hysteresis**
3. **Display delay time 1 (dLY1) and set the delay**
4. **Display delay time units 1 (dL1U) and set the units to minutes or seconds**
5. **Set the values for alarm 2 to alarm 5* as necessary**
6. **Press the ↵ key to set the value**

4. Setting the operation menu

Sets the alarm value so that DO is used as the alarm output.
Use the following steps to set this function.

1. **Display the operation menu (oPE Ch1)**
2. **Set the alarm 1 set value (AL1) or AL1L and AL1h**
   The parameters displayed will vary according to the type of alarm
3. **Set up to alarm 5 as necessary**
4. **Press the ↵ key to set the value.**

7-13 Communication Functions

Set the following to communicate with the host.

Display	Parameter	Function
Stno	ST No. setting	Sets the station number
CoM	Parity / Baud rate setting	Choose the configuration of parity and baud rate
PCoL	Protocol selection	Choose MODBUS protocol
SCC	Setting permissions	Set whether or not the host has permission to overwrite

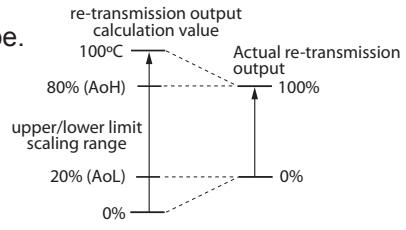
Setting communication functions

1. **Display the communication menu (CoM Ch9)**
2. **Display ST No. setting parameter (Stno) and choose 1, and then display Parity/baud rate setting parameter (CoM) and choose 9600 bps, even (96Ev).**
   This sets the baud rate to 9600 bps and the parity to "even"
3. **Display the communications permisions (SCC) and choose to allow read and overwrite (rW)**
   This sets the host to be allowed to read and overwrite the controller
4. **Press the ↵ key to set the value**
5. **Turn the controller off and on again**

> ⚠ Caution — The communication function settings will not be active until the power for the controller is turned OFF/ON.

7-14 Re-transmission Output Function

The re-transmission output function delivers an analog output signal from the controller.
The following values can be output :
PV, SV, MV, DV (PV-SV)
Depending on the type of output, you can choose the voltage type or current type.
The re-transmission output also contains a scaling function.
The following example shows a re-transmission output of 100%
when PV=960ºC (80%FS) and a re-transmission output of 0%
when PV=240°C for a PV range of 0 to 1200ºC.



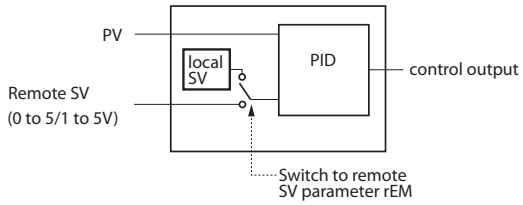
Setting re-transmission output function

1. **Display the setup menu (SET Ch6)**
2. **Display the AO output function parameter (AoT) and choose PV.**
   This selects PV as the re-transmission output.
3. **Display the AO lower limit scaling (AoL) and set the lower limit scaling (in this example, set it to 20%)**
4. **Display the AO upper limit scaling (AoH) and set the upper limit scaling (in this example, set it to 80%)**
5. **Press the ↵ key to set the value.**

7-15 Remote SV Function

The remote SV function controls the analog input signal coming into the controller as SV. The input terminal becomes RSV1 or RSV2.
The remote SV function contains a zero/span adjustment function, as well as an input filter function.
The setup menu (SET Ch6) must be set in the following manner before using the remote SV function.

Display	Parameter	Function
rEMo	RSV Zero adjustment	Adjusts the zero of the RSV input
rEMS	RSV Span adjustment	Adjusts the span of the RSV input
rEMr	RSV input range	Sets the range for RSV input
rTF	RSV input filter	Sets the time constant for the RSV input filter



Switching to remote SV operation

1 **Display the operation menu (oPE Ch1)**

2 **Display the switching to remote SV parameter (rEM) and choose the remote (rEM)**

3 **Press the ↵ key to set the value**

> **Caution** Soft start is not displayed during the remote SV operation.
> Do not use remote SV and the SV selction function at the same time.

7-16 Heater Break Alarm Functions

The heater wiring passes through the CT, allowing the current value to be monitored and detect errors in the heater line.
Heater break are detected by drops in the heater current. Setting detection values activates this function.
Related parameters : "hb1 ", "hb1H" ("ALM Ch8"), "CT1 ", "Lc1 " ("Mon Ch5")

7-17 Loop Break Alarm

Detects when the control loop is open (break) without using the CT, but instead observing the control output and PV.
Related parameters : "LbTM", "TbAb" ("ALM Ch9")

7-18 Load Short-circuit Alarm

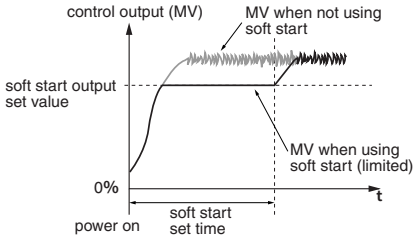
The heater wiring passes through the CT, allowing the current value to be monitored and detect errors in the heater line.
The load short-circuit is detected by drops in the geater current.
Setting the detection values activates this function.
Related parameters : "hS1 ", "hS1H" ("ALM Ch8")

7-19 Other Functions

1 . Soft Start Function

When turning on the equipment (including the temperature controller), the Soft Start function supresses the MV to become maximum output.It places an upper limit on MV output for a specified amount of time after power is turned on.This function is useful for effects such as supressing the heater output during equipment startup, and makes load lighthened.
After the specified time has passed after switching on the equipment (or SFTM=0), the soft start function ends and normal controls begin.

Display	Parameter	Function
SFo1 SFo1	MV1 Soft Start output set value	Places a limit on MV1 output after power is turned on for a time period set in SFTM.
SFTM SFTM	Soft Start set time	Sets the time for soft start to function after turning power on. Setting "0" will turn off soft start.



Caution The soft start function cannot be used simultaneously with the valve control functions, and cannot be used simultaneously with the dual control.

Note : During manual mode, the manual output valve has priority, but soft start will continue to keep track of the set time period.

Use the following steps to set the soft start output set value and set time.

1. **Display the setup menu (SET Ch6)**
2. **Display soft start output 1 (SFo1) and set the output value.**
3. **Display the soft start set time (SFTM) and set the time.**
4. **Press the ↵ key to set the value.**
5. **Turn off the power once, and then re-start the controller to begin soft start.**
   (When the soft start function is turned on, the lower display will alternate showing SoFT and SV)

   Note : Do not use auto tuning at the same time.

2 . Error output function

When the error output specification function has concluded that the equipment has an error, it halts the temperature controls and mantains the control output at a previously specified value. There is an error in PV if any of the following conditions occur:
Burnout upper limit / burnout lower limit / underage (PV<-5% FS) / overage (PV>105% FS)

Use the following steps to set this funcion:

1. **Display the setup menu (SET Ch6)**
2. **Display FALT output 1 set value (FLo1) and set the output value.**
   For dual control, set FLo2 the same way.
3. **Press the ↵ key to set the value.**

3 . Standby output function

Sets the control output value, alarm output, re-transmission output (ON/OFF), and PV/SV display for standby mode.

Use the following steps to set this function :

1 **Display the setup menu (SET Ch6)**

2 **Display the Standby mode setting (SbMd) and set the alarm output, re-transmission output, and PV/SV display for standby mode.**

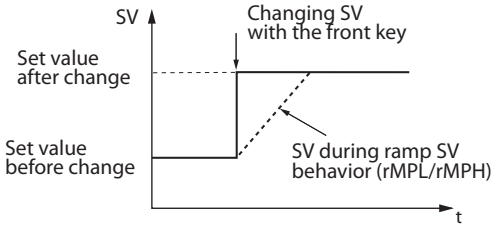
Note : For the possible ON/OFF combinations, see "6-6 Setup (Ch6)" (page 23)

3 **Display the standby control output 1 set value (Sbo1) and set the output value.**
For dual control, set Sbo2 the same way.

4 **Press the key to set the value**

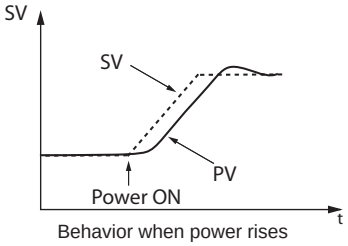
4. Ramp SV function

The ramp SV function supresses a sudden change in SV when changing SV. It allows SV to change smoothly according to the set slope of temperature per unit of time. This smooth change allows you to minimize the effect of the change on the controls. You can set both inclining and declining temperature slopes, and choose from "minutes" or "hours" for the time units.You can also choose for the SV display to show the current value of the target during ramp SV.

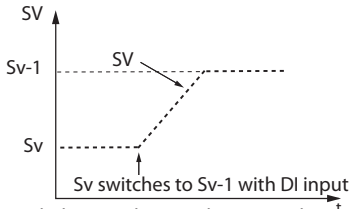


The SV lamp will blink while ramp SV is running. (When not displaying parameters or Ch)

When you turn on the power while ramp SV is in effect, ramp SV will begin using the starting value of PV (PV Start)



Behavior when power rises



behavior when SV changes with DI

Use the following steps to set ramp SV :

1 **Display the system menu (SYS Ch 7)**

2 **Set both ramp SV decline (rMPL) and incline (rMPH)**

3 **Set the unit of time for the slope (rMPU) during ramp SV**

4 **Press the key to set the value**

Note : • Ramp SV can be used with remote SV or SV selection functions.
• Ramp SV cannot be used at the same time with a ramp soak.
• Coming out of a standby state will begin PV start.
• Make sure to check the controller's parameters after changing PV scale.

5. SV selection function

The SV selection function can record and switch up up to eight sets of SV information to the palette menu settings. It is effective when the SV used during a process are numerous and the set values have been previously decided.

Use the following steps to save SV information :

1. **Display the palette menu (PLT Ch 3)**
2. **Display SV setting 1 (Sv1) and set SV1.**
3. **Set SV setting 2 through SV setting 7 in the same way as necessary.**
4. **Press the ↵ key to set the value**

The following four methods can switch SV.
- Parameter "Svn" / press the user key / DI function / overwrite parameter "Svn" via the communication function.

- **Switch using parameter "SVn"**

1. **Display the operation menu (oPE Ch 1)**
2. **Display the selected SV number (Svn) and choose the SV No.**
3. **Press the ↵ key to set the value.**

- **Switch using the user key**

1. **Display the palette menu (PLT Ch 3)**
2. **Display the max selected SV number (SvMH) and set the SV number by choosing it with the user key.**
3. **Display the user key function setting (UtEY) and set it to SV selection function.**
4. **On the PV/SV display, pressing the user key will switch you from the currently slected SV to the next SV.**

- **Switch using DI function**

1. **Display the operation menu (oPE Ch 1)**
2. **Display the selected SV number (Svn) and choose "di".**
3. **Display the DI function setting (di1 to di5) and set the SV selection function.**

- **Switch using parameter Svn via the communication function.**

1. **In the communication, overwrite the set value to the selected SV number (Svn).**

6. PID selection function

Note : When switching the normal and reverse operation by using the PID selection function, be sure to turn off the system power beforehand for safety reasons (Do not switch normal and reverse operation during control)

The PID selection function can record and switch up to eight sets of PID parameters from the palette menu settings.
It is effective when the control equipment changes the target often and must frequently change the PID parameters.

Use the following steps to save PID information :

1. **Display the palette menu (PLT Ch 3)**
2. **Display proportional bandwith setting 1 (P1) and set P1.**
3. **Set "i1" and "d1" in the same way.**
   Set the following parameters as necessary: ON/OFF control hysteresis (hys1), cooling proportional band (coL1), dead band (db1), balance (bAL1), anti-reset windup (Ar1) and normal/reverse setting (rEv1).
4. **Press the ↵ to set the value-**

The PID parameter selection can be changed by the same four methods as the SV selection function:

- **Switch using parameter "PLn1"**

1. **Display the operation menu (oPE Ch 1)**
2. **Display the selected PID number (PLn1) and choose the PID No.**
3. **Press the ↵ key to set the value.**

- **Switch using the User Key**

1. **Display the palette menu (PLT Ch 3)**
2. **Display max selected PID number (PL1M) and set the PID number by choosing it with the user key.**
3. **Display the user key function setting (UtEY) and set it to PID selection function.**
4. **On the PV/SV display, pressing the user key will switch you from the currently selected PID to the next PID.**

Note : When the user key function code is 27 (SV N°+1, Pid N°+1 (send)) and the initial PID and SV No. are diferent, the first time you press the user key, PID No. will become the same as SV No. Also the SVMX parameter value becomes the maximum selectable number for PID No. and SV No.

- **Switch using DI function**

1. **Display the operation menu (oPE Ch 1)**
2. **Display the selected PID number (PLn1) and choose (di).**
3. **Display the DI function setting (di1 to di5) and set the PID selection function.**

● **Switch Using parameter "PLn1" via the communication channel.**

1 **In the communication, overwrite the set value for the selected PID number "PLn1".**

7 . Startup mode function

The startup mode specification function sets the controller to start up in either auto mode, manual mode, remote mode or standby mode.
It is used when you want to start up in manual mode.

Use the following steps to set this function :

1 **Display the system menu (SyS Ch7)**

2 **Display the startup mode (STMd) and choose the operational mode.**
Choose from auto or manual.

3 **Press the ↵ key to set the value**
After changing the above setting, restarting the controller will start in the selected mode.

Note : When starting up in manual, the MV becomes 0%.

8. User function key

Pressing the A/M key in the monitor screen display, channel screen display, or parameter screen display will immediately return to the PV / SV display, regardless of assigned function. Holding the A/M key down for about a second in PV / SV display or PV / MV display (only during manual mode) will run the assigned function.
The standard factory default fot that key is switchover between auto and manual modes.

Note : For the functions that can be assigned, see "6-7 System Ch7".

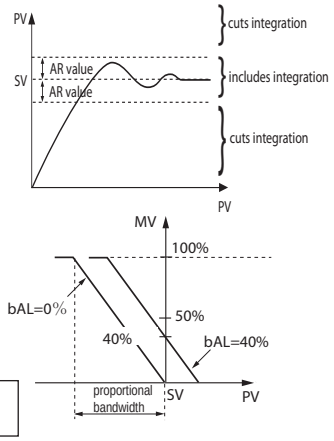
Use the following steps to set this function :

1 **Display the system menu (SyS Ch7)**

2 **Display the assign user key specification (UtEY) and choose the function**

3 **Press the ↵ key to set the value**

9. bAL and Ar functions



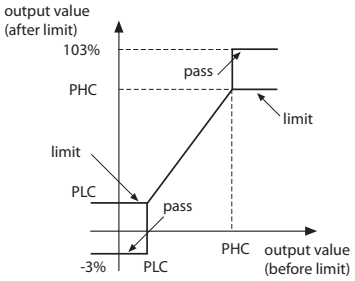
Yhe anti-reset windup function (Ar) cuts integration that falls outside of the Ar set range that is centered arround SV.
Running auto-tuning will set the optimum values for P,i and d parameters as well as Ar..

The output convergence value function "bAL" outputs to PV and SV a calculated result of the PID computed MV plus the bAL offset.
(The factory setting of bAL is 0% for single output, 50% for dual output)

Note : Ar1 to Ar7 and bAL1 to bAL7 have the same function as in each PID group.

10 . MV limit function

MV limit function allows you to choose whether to limit the MV or let it pass through maximum and minimum MV.



PCUT	MV1		MV2	
	PHC1	PLC1	PHC2	PLC2
"0"	103%	-3%	103%	-3%
"1"	103%	limit	103%	-3%
"2"	limit	-3%	103%	-3%
"3"	limit	limit	103%	-3%
"4"	103%	-3%	103%	limit
"5"	103%	limit	103%	limit
"6"	limit	-3%	103%	limit
"7"	limit	limit	103%	limit
"8"	103%	-3%	limit	-3%
"9"	103%	limit	limit	-3%
"10"	limit	-3%	limit	-3%
"11"	limit	limit	limit	-3%
"12"	103%	-3%	limit	limit
"13"	103%	limit	limit	limit
"14"	limit	-3%	limit	limit
"15"	limit	limit	limit	limit

8 Setting the Temperature Controller

8-1 Input Setting

Set the time and the range for input sensor.
Input can be set in the setup menu (SET Ch6)
For more on input types, input scaling, decimal point location, and input codes, see "10 Input range and codes (standard range)" (page 52)

1 Choose an input type (PvT)
Check the type of the thermocouple or resistance bulb which is used.

2 Set the PV scaling (input range) (Pvb/PvF)
Set Pvb to the lower limit of the temperature range and PvF to the upper limit. It is recommended to set the values at the standard range, even though they can be set at values beyond it.
There is not standard range for DC voltage and DC current input (-1999 to 1999, lower limit < upper limit)

3 Set the decimal point location (Pud)
Sets wether or not to display digits after the decimal point. Two digits can also be displayed after the decimal point when using 1 to 5V DC, and 4 to 20mA DC.

Note : PV scaling and decimal point location can be used with the factory settings

8-2 Output Setting

Sets the control output. (Only when the output is current or voltage)

1 Sets the range of the control output (OUT1/OUT2) (C1r/C2r)
Choose any of 0 to 5V, 1 to 5V, 0 to 10V, 2 to 10V, 0 to 20mA, 4 to 20mA DC.

8-3 Controls Setting

Sets controls to normal operation or reverse operation.

- Reverse operation : As the process value (PV) rises, the control output (MV) becomes smaller. Used to heat the control object.
- Normal operation : As the process value (PV) rises, the control output (MV) becomes larger. Used to cool the control object.

1. Set the normal or reverse operation (rEv)
   Choose any of the following combinations.

rEv	Control output 1	Control output 2
rv--	reverse	-
no--	normal	-
rvno	reverse	normal
norv	normal	reverse
rvrv	reverse	reverse
nono	normal	normal

9 Error Indications

9-1 Display During Equipment Error

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

Display	Possible cause	Control output
"UUUU"	1 - Thermocouple burnout 2 - Resistance bulb sensor (A) wire burnout. 3 - PV exceeds upper limit of the range by 5% FS.	Output as setting when an error occurs (set in parameter Flo 1 or Flo2)
"LLLL"	1 - Resistance bulb sensor (B or C) wire burnout. 2 - Resistance bulb sensot (between A and B or A and C) short. 3 - PV is below lower limit of the range by 5% FS. 4 - Burnout or short in the voltage input	
"LLLL"	1 - PV < -199.9	
"Err" (Sv flickers)	Incorrect setting (Pvb / PvF)	
PV is not displayed	1 - H'4000 is added into the dP30 set value 2 - STbM set value is set at 4 to 7, and STbY is ON	Normal control The controller does not have to be restarted.
SV is not displayed	1 - H'2000 is added into the dP30 set value 2 - STbM set value is set at 4 to 7, and STbY is ON	
Parameters may not be displayed	1- Check the settings of dP01 to dP30. 2- Check the password function	

Note:
The error display does not appear even when it must appear depending on the setting of parameter SbMd (SET Ch6)

10 Input Range and Codes

Input type		Measurement range [°C]	Measurement range [°F]	Smallest input increment °C	Input Code
Resistance Bulb JIS (IEC)	Pt 100Ω	0 to 150	32 to 302	0.1	"1"
		0 to 300	32 to 572	0.1	
		0 to 500	32 to 932	0.1	
		0 to 600	32 to 1112	1	
		-50 to 100	-58 to 212	0.1	
		-100 to 200	-148 to 392	0.1	
		-150 to 600	-238 to 1112	1	
		-200 to 850	-328 to 1562	1	
Thermocouple	J	0 to 400	32 to 752	0.1	"2"
		0 to 1000	32 to 1832	1	
	K	0 to 400	32 to 752	0.1	"3"
		0 to 800	32 to 1472	0.1	
		0 to 1200	32 to 2192	1	
	R	0 to 1600	32 to 2912	1	"4"
	B	0 to 1800	32 to 3272	1	"5"
	S	0 to 1600	32 to 2912	1	"6"
	T	-200 to 200	-328 to 392	0.1	"7"
		-200 to 400	-328 to 752	0.1	
	E	0 to 800	32 to 1472	0.1	"8"
		-200 to 800	-328 to 1472	1	
	N	0 to 1300	32 to 2372	1	"12"
	PL-2	0 to 1300	32 to 2372	1	"13"
DC Voltage	0 to 5V DC	-1999 to 9999			"15"
	1 to 5V DC				"16"
	0 to 10V DC				"17"
	2 to 10V DC				"18"
	0 to 100mV DC				"19"
DC Current	0 to 20mA DC				"15"
	4 to 20mA DC				"16"

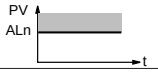
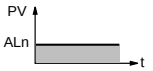
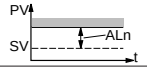
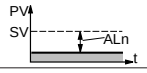
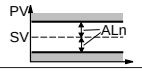
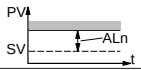
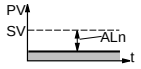
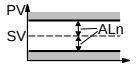
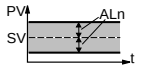
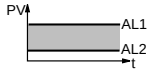
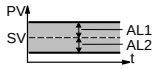
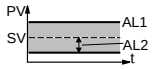
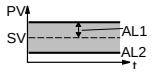
Note 1 : For DC current input, attach a 250 ohms resistance (provided).

Note 2 : Input accuracy is +/-3% FS +/- 1 digit +/- 1°C or 2°C whichever greater
B Thermocouple 0°C to 400°C : +/-5% FS +/- 1 digit +/-1°C
R Thermocouple 0°C to 500°C : +/-1% FS +/- 1 digit +/-1°C
T Thermocouple -200 to -150°C : +/- 0.5% FS +/- 1 digit +/- 1°C

Note 3 : Input accuracy cannot be ensured when using an input smaller than the minimum range.

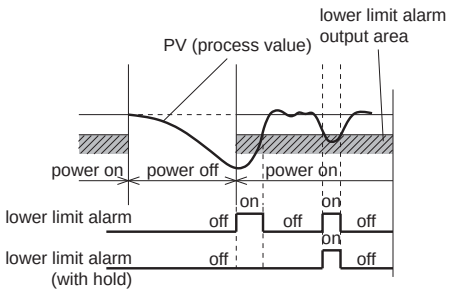
FS : full scale

11 Alarm Action Type Codes

Type	DO1 to DO5*	Alarm Type	Action diagram
	0	No alarm	–
Absolute value alarm	1	High alarm	
	2	Low alarm	
	3	High alarm (with hold)	
	4	Low alarm (with hold)	
Deviation alarm	5	High alarm	
	6	Low alarm	
	7	High/Low alarm	
	8	High alarm (with hold)	
	9	Low alarm (with hold)	
	10	High/Low alarm (with hold)	
Zone alarm	11	High/Low deviation alarm	
	12 (Note1)	High/Low absolute alarm	
	13 (Note1)	High/Low deviation alarm	
	14 (Note1)	High absolute / Low deviation alarm	
	15 (Note1)	High deviation / Low absolute alarm	

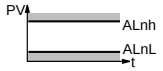
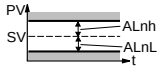
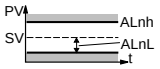
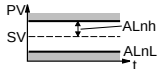
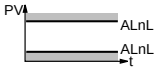
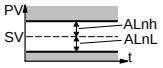
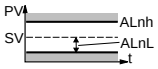
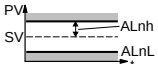
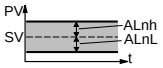
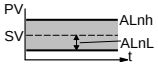
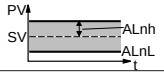
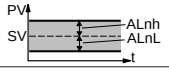
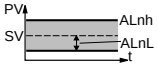
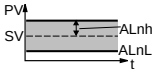
(Note1) Available only for DO2
Other than the alarm setting, each of the event outputs can be assigned to DO1 to DO5.
For more details on each of the event output functions,
refer to "7-12 Digital output" – "1. DO event setting".

What is alarm with hold?:
Alarm will not turn ON immediately when the process value gets into the alarm band and enters again. If without hold, alarm may turn ON when starting up.

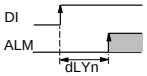
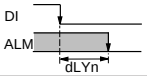
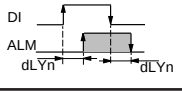


Caution :
- When alarm action code is changed, alarm set value may also became different from previous settings.
- When alarm action type code is changed, turn off the power once, and then re-start the controller, before starting control.
- ALn : AL1 to AL5* show the alarm set values.
- ALnh : AL1h to AL5h* show the alarm set values.
- ALnL : AL1L to AL5L* show the alarm set values
- dLYn : dIY1 to dIY5 show the alarm delay on set values.

● Dual set value alarm codes

Type	DO1 to DO5*	Alarm type	Action diagram
High/Low limit alarm	16	High/Low absolute alarm	
	17	High/Low deviation alarm	
	18	High absolute / Low deviation alarm	
	19	High deviation / Low absolute alarm	
	20	High/Low absolute alarm (with hold)	
	21	High/Low deviation alarm (with hold)	
	22	High absolute / Low deviation alarm (with hold)	
	23	High deviation / Low absolute alarm (with hold)	
Zone alarm	24	High/Low absolute alarm	
	25	High/Low deviation alarm	
	26	High absolute / Low deviation alarm	
	27	High deviation / Low absolute alarm	
	28	High/Low absolute alarm (with hold)	
	29	High/Low deviation alarm (with hold)	
	30	High absolute / Low deviation alarm (with hold)	
	31	High deviation / Low absolute alarm (with hold)	

● Timer code

Type	DO1 to DO5*	Alarm type	Action diagram
Timer	32	ON delay timer	
	33	OFF delay timer	
	34	ON/OFF delay timer	

12 Model Specifications

12-1 SZ48 Model

INPUT (A)	
Pt100 / TC, J,K,R,S,B,T,N,PL-II /0-100mV	**SZ48-1_ _ _ _ _ _**
1-5V, 0-5V, 0-10V, 2-10V	
0-20mA, 4-20mA	
CONTROL OUTPUT 1 (B)	
Relay	**SZ48- _ 1 _ _ _ _ _**
Pulse (SSR)	**SZ48- _ 2 _ _ _ _ _**
0-20mA, 4-20mA	**SZ48- _ 3 _ _ _ _ _**
0-5Vdc, 1-5Vdc, 0-10Vdc, 2-10Vdc	**SZ48- _ 4 _ _ _ _ _**
Motorized valve control without position feedback	**SZ48- _ 5 _ _ _ _ _**
OUTPUT CONTROL 2 (C)	
None	**SZ48- _ _ 0 _ _ _ _**
Relay	**SZ48- _ _ 1 _ _ _ _**
Pulse (SSR)	**SZ48- _ _ 2 _ _ _ _**
0-20mA, 4-20mA	**SZ48- _ _ 3 _ _ _ _**
Re-transmission (0-20mA, 4-20mA)	**SZ48- _ _ 4 _ _ _ _**
0-5Vdc, 1-5Vdc, 0-10Vdc, 2-10Vdc	**SZ48- _ _ 5 _ _ _ _**
Re-transmission (0-5Vdc, 1-5Vdc, 0-10Vdc, 2-10Vdc)	**SZ48- _ _ 6 _ _ _ _**
ALARMS (D)	
None	**SZ48- _ _ _ 0 _ _ _**
1 Relay Alarm (#1)	**SZ48- _ _ _ 1 _ _ _**
2 Relay Alarm (#1 + #2)	**SZ48- _ _ _ 2 _ _ _**
3 Relay Alarm (#1 + #2 + #3)	**SZ48- _ _ _ 3 _ _ _**
2 Relay independant Alarms (#1) + (#2)	**SZ48- _ _ _ 4 _ _ _**
OPTIONAL FUNCTIONS 1 (E)	
None	**SZ48- _ _ _ _ 0 _ _**
RS485	**SZ48- _ _ _ _ 1 _ _**
2x Digital inputs DI (#1 + #2)	**SZ48- _ _ _ _ 2 _ _**
1xDI (#1) + Remote Setpoint SPV1 (mA/V)	**SZ48- _ _ _ _ 3 _ _**
1xDI (#1) + Heater Break CT1	**SZ48- _ _ _ _ 4 _ _**
1xDI (#1) + RS485	**SZ48- _ _ _ _ 5 _ _**
RS485 + Remote Setpoint SPV1 (mA/V)	**SZ48- _ _ _ _ 6 _ _**
RS485 + Heater break CT1	**SZ48- _ _ _ _ 7 _ _**
RS485 + Remote Setpoint SPV1 (mA/V) + 1xDI (#1)	**SZ48- _ _ _ _ 8 _ _**
2xDI (#1 + #2) + Remote Setpoint SPV1 (mA/V)	**SZ48- _ _ _ _ 9 _ _**
3xDI (#1 + #2 + #3)	**SZ48- _ _ _ _ A _ _**
OPTIONAL FUNCTIONS 2 (F)	
None	**SZ48- _ _ _ _ _ 0 _**
POWER SUPPLY (G)	
100 to 240 V AC	**SZ48- _ _ _ _ _ _ 1**
24 V AC/DC	**SZ48- _ _ _ _ _ _ 2**

Note: Motorized valve control with position feedback output is not available on SZ48 model (48x48mm).

12-3 SZ49 Model

INPUT (A)	
Pt100 / TC, J,K,R,S,B,T,N,PL-II /0-100mV	**SZ49-1_ _ _ _ _ _**
1-5V, 0-5V, 0-10V, 2-10V	
0-20mA, 4-20mA	
CONTROL OUTPUT 1 (B)	
Relay	**SZ49- _ 1 _ _ _ _ _**
Pulse (SSR)	**SZ49- _ 2 _ _ _ _ _**
0-20mA, 4-20mA	**SZ49- _ 3 _ _ _ _ _**
0-5Vdc, 1-5Vdc, 0-10Vdc, 2-10Vdc	**SZ49- _ 4 _ _ _ _ _**
Motorized valve control without position feedback	**SZ49- _ 5 _ _ _ _ _**
Motorized valve control with position feedback	**SZ49- _ 6 _ _ _ _ _**
CONTROL OUTPUT 2 (C)	
None	**SZ49- _ _ 0 _ _ _ _**
Relay	**SZ49- _ _ 1 _ _ _ _**
Pulse (SSR)	**SZ49- _ _ 2 _ _ _ _**
0-20mA, 4-20mA	**SZ49- _ _ 3 _ _ _ _**
Re-transmission (0-20mA, 4-20mA)	**SZ49- _ _ 4 _ _ _ _**
0-5Vdc, 1-5Vdc, 0-10Vdc, 2-10Vdc	**SZ49- _ _ 5 _ _ _ _**
Re-transmission (0-5Vdc, 1-5Vdc, 0-10Vdc, 2-10Vdc)	**SZ49- _ _ 6 _ _ _ _**
Auxiliar Digital Output	**SZ49- _ _ 7 _ _ _ _**
ALARMS (D)	
None	**SZ49- _ _ _ 0 _ _ _**
1 Relay Alarm (#1)	**SZ49- _ _ _ 1 _ _ _**
2 Relay Alarm (#1 + #2)	**SZ49- _ _ _ 2 _ _ _**
3 Relay Alarm (#1 + #2 + #3)	**SZ49- _ _ _ 3 _ _ _**
2 Relay independant Alarms (#1) + (#2)	**SZ49- _ _ _ 4 _ _ _**
OPTIONAL FUNCTIONS 1 (E)	
None	**SZ49- _ _ _ _ 0 _ _**
RS485	**SZ49- _ _ _ _ 1 _ _**
2x Digital Inputs DI (#1 + #2)	**SZ49- _ _ _ _ 2 _ _**
1xDI (#1) + Remote Setpoint SPV1 (mA/V)	**SZ49- _ _ _ _ 3 _ _**
1xDI (#1) + Heater Break CT1	**SZ49- _ _ _ _ 4 _ _**
1xDI (#1) + RS485	**SZ49- _ _ _ _ 5 _ _**
RS485 + Remote Setpoint SPV1 (mA/V)	**SZ49- _ _ _ _ 6 _ _**
RS485 + Heater Break CT1	**SZ49- _ _ _ _ 7 _ _**
RS485 + Remote Setpoint SPV1 (mA/V) + 1xDI (#1)	**SZ49- _ _ _ _ 8 _ _**
2xDI (#1 + #2) + Remote Setpoint SPV1 (mA/V)	**SZ49- _ _ _ _ 9 _ _**
3xDI (#1 + #2 + #3)	**SZ49- _ _ _ _ A _ _**
3xDI (#1 + #2 + #3) + Remote Setpoint SPV1 (mA/V)	**SZ49- _ _ _ _ B _ _**
3xDI (#1 + #2 + #3) + RS485	**SZ49- _ _ _ _ C _ _**
OPTIONAL FUNCTIONS 2 (F)	
None	**SZ49- _ _ _ _ _ 0 _**
3xDI (#3 + #4 + #5) + Heater Break CT2	**SZ49- _ _ _ _ _ 1 _**
3xDI (#3 + #4 + #5)	**SZ49- _ _ _ _ _ 3 _**
3xDI (#3 + #4 + #5) + 2DO (#4 + #5) (Tr)	**SZ49- _ _ _ _ _ 4 _**
3xDI (#3 + #4 + #5) + Remote Setpoint SPV2 (mA/V)	**SZ49- _ _ _ _ _ 5 _**
POWER SUPPLY (G)	
100 to 240 V AC	**SZ49- _ _ _ _ _ _ 1**
24 V AC/DC	**SZ49- _ _ _ _ _ _ 2**

Incompatibilities between Options

Incompatibilities of SZ48 Model

- The options E4 and E7 are not available when combined with any of the options B3, B4 or B5.
- The option D3 is not available when combined with any of the options C and the option B5.
- The option B5 is incompatible with any of the options C.
- The options E4 and E7 does not allow option D to be 0.
- The options E8 and E9 are not available when combined with any of the options C.
- The option EA is only available when Control Output 1 is B5.
- The options E1, E2, E3, E4, E5, E6, E7, E9 and EA are not available combined with option B5.

Incompatibilities of SZ49 Model

- The options E4, E7 and F1 are not available when combined with B3, B4, B5 and B6.
- The option F4 is incompatible with any of the options E3, E6, E8, E9 and EB.
- The options E8 and E9 are incompatible with any of the options C.
- The options E4, E7 and F1 does not allow option D to be 0.
- The options E4 and E7 are not compatible with option F1.
- The option C7 is only available when combined with option B6.
- The options B5 and B6 are incompatible with any of the options from C1 to C6.
- The options E1, E2, E3, E4, E5, E6, E7, E9 and EA are not available combined with option B5 and B6.
- The options F are not compatible with options B5 and B6.

13 Specifications

13-1 SZ48 Model

Power Supply	100 VAC (-15%) to 240 VAC (+10%), 50/60 Hz or 24 VAC (±10%) 50/60 Hz, 24 VDC (±10%)	
Power Consumption	12VA or less	
Control Output	Relay Contact output :	
	1A (contact) 220 VAC/30 VDC, 3A (resistance load)	
	SSR/SSC drive output	
	ON :	20 VDC (18V to 24VDC)
	OFF :	0.5VDC max
	Max Current :	20 mA DC max (both OUT1 and OUT2)
	Load resistance :	850 Ω or more
	Current output :	
	0 to 20mA DC / 4 to 20mA DC	
	Load resistance :	600 Ω max
	Accuracy :	+/- 5% FS
	Voltage output :	
	0V to 5VDC / 1V to 5VDC / 0V to 10VDC / 2V to 10VDC	
	Load resistance:	10kΩ or more
	Accuracy :	+/- 5% FS
Process value input	Input accuracy :	
	Thermocouple :	+/- 0.3% FS +/- 1 digit and +/- 1°C or 2°C
	Resistance bulb :	+/- 0.3% FS +/- 1 digit and +/- 0.5°C
	mV, voltage, current :	+/- 0.3% FS +/- 1 digit and +/- 1°C or 2°C
	Indication resolution :	+/- 0.3% FS or less
Digital Input	contact or transistor type	
	Max. 3 Inputs 30 VDC, 3 mA (1 input)	
	ON : 1kΩ max (contact), or 5VDC max (transistor)	
	OFF : 100kΩ max (contact) or 18VDC max (transistor)	
Digital Output	relay contact output (DO1 to DO3), 1A contact 220VAC/30VDC, 3A (resistance load)	
Re-transmission output	0 to 20mA DC/4 to 20mA DC/0V to 5VDC/1V to 5VDC/0V to 10VDC/2V to 10VDC	
	Re-transmission data : PV, SV, DV, MV	
	PFB (not available)	
	Accuracy :	+/- 0.2 %FS
	Load resistance :	600Ω max (current), 10kΩ max (voltage)
Remote SV input	1V to 5VDC/0V to 5VDC/0 to 20mA DC/4 to 20mA DC (use 250Ω resistor)	
Heater break detector (CT) input	Single phase type CT 1 input, 1 to 30A / 20 to 50A	
Motorized valve control output	2 x Contacts 1A , 220VAC / 30VDC, 1A	
Communication functions	RS485 interface	
	Communication method :	Half Duplex bit serial asynchoronous cycle
	Communication rate :	9600bps, 19200bps
	Communication protocol :	Modbus RTU
	Communication distance :	Max 500m (total connection length)
	Connectable units:	31 units max.
Loader interface	RS-232C interface	
	Connection method :	Ø2.5 mini-jack
	Communication method :	Full Duplex bit serial asynchoronous cycle
	Communication rate :	9600bps parity/none
	Communication protocol :	Modbus RTU
Operation and storage conditions	Range of usable temperatures :	-10°C to 50°C
	Ambient humidity :	90% RH or less (non condensing)
	Storage temperature :	-20°C to +60°C

13-2 SZ49 Model

Power Supply	100 VAC (-15%) to 240 VAC (+10%), 50/60 Hz or 24 VAC (±10%) 50/60 Hz, 24 VDC (±10%)	
Power Consumption	12VA or less	
Control Output	Relay contact output :	1A contact 220 VAC/30 VCC, 3 A (resistance load)
	SSR/SSC drive output (voltage pulse output)	
	ON :	20 VDC (18V to 24VDC)
	OFF :	0.5VDC max
	Max current :	20 mA DC or less (both OUT1 and OUT2)
	Load resistance :	850 Ω or more
	Current output :	0 to 20mA DC / 4 to 20mA DC
	Load resistance:	600 Ω max
	Accuracy :	+/- 5% FS
	Voltage output :	0V to 5VDC/1V to 5VDC/0V to 10VDC/2V to 10VDC
	Load resistance:	10kΩ min
	Accuracy :	+/- 5% FS
Process value input	Input accuracy :	
	Thermocouple :	+/- 0.3% FS +/- 1 digit and +/- 1°C or 2°C
	Resistance bulb :	+/- 0.3% FS +/- 1 digit and +/- 0.5°C
	mV, voltage, current :	+/- 0.3% FS +/- 1 digit and +/- 1°C or 2°C
	Indication resolution :	+/- 0.3% FS
Digital output	Relay contact output (DO1 to DO3), 1A contact 220VAC/30VDC, 3A (resistance load)	
	Transistor output (DO4, DO5)	
	Open collector 30VDC, 100mA, max 2 contacts	
	Judged ON 1VDC or less	
Digital input	Contact or transistor type	
	Max. 5 inputs 30 VDC, 3 mA (1 input)	
	ON : 1kΩ max (contact), or 5VDC max (transistor)	
	OFF : 100kΩ max (contact) or 18VDC max (transistor)	
Re-transmission output	0 to 20mA DC/4 to 20mA DC/0V to 5VDC/1V to 5VDC/0V to 10VDC / 2V to 10VDC	
	Re-transmition data :PV, SV, DV, MV, PFB	
	Accuracy :	+/- 0.2 % FS
	Load resistance :	600Ω máx (current), 10kΩ max (voltage)
Remote SV input	1V to 5VDC/0V to 5VDC/0 to 20mA DC/4 to 20mA DC (use 250Ω resistor)	
Heater break detector (CT) input	Single phase type CT 1 input, 1 to 30A / 20 to 50A	
Valve feedback signal (potentiometer) input	Resistance range :	100 to 2.5kΩ (3 three line type)
	Resolution :	0.5% FS
	Input accuracy :	+/-1.0% FS
	Corresponding full stroke time :	30sec to 180sec
Motorized valve control output	2 Contacts 1A , 220VAC / 30VDC, 3A (resistance load)	
Communication functions	RS485 Interface	
	Communication method :	Half Duplex bit serial asynchoronous cycle
	Communication rate :	9600bps, 19200bps
	Communication protocol :	Modbus RTU
	Communication distance :	Max 500m (total connection length)
	Connectable units:	31 units max.
Loader interface	RS-232C Interface	
	Connection method :	Ø2.5 mini-jack
	Communication method :	Full Duplex bit serial asynchoronous cycle
	Communication rate :	9600bps parity/none
	Communication protocol :	Modbus RTU
Operation and storage temperature	Range of usable temperatures :	-10°C to 50°C
	Ambient humidity :	90% RH max (non condensing)
	Storage temperature :	-20°C to +60°C

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