Instruction Manual

Digital Controller
Model: PXH

INP-TN1PXH-E

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Thank you for purchasing the Fuji Digital Controller.
Once you have confirmed that this is the product you ordered, please use it in accordance with the following instructions.
For detailed information on operating this equipment, please refer to the separate operations manual (User's manual) in the supplied CD-ROM.
In addition, please keep this instruction manual within easy reach of the actual person using this equipment.

CAUTION
The content of this manual is subject to change without notice.
The greatest care has been taken with the content of this manual to ensure accuracy; however, Fuji Electric Systems and Fuji Electric Instruments shall not be held liable for damages, including indirect damages, caused by typographical errors, absence of information or use of information in this manual.

CONTENTS

Confirming Specifications and Accessories

Before using the product, confirm that it matches the type ordered.
(For model code, please refer to page 39.)
Confirm that all of the following accessories are included.

- Digital Controller ····1 unit
- Instruction Manual ····1 copy
- Mounting fixture ·····2 pcs
- Watertight packing ····1 pc
- Unit nameplate ····· 1 pc
- Terminating resistance*1 ·····1 pc
- CD-ROM ·····1 pc
  (Contents)
  Instruction Manual
  User's Manual
  Communication Functions
  Instruction Manual (Modbus)
  Communication Sample Program
  Parameter Loader
  Instruction Manual
  Parameter Loader Software

*1) Supplied only when the communications function (RS485) is selected with this model.

Option

Name	Order No.
PC loader communication cable	ZZPPXH1*TK4H4563
Terminal covers *2	ZZPPXR1-B230

*2) Two covers are required per unit.

Related Information

Refer to the following reference materials for details about the items described in this manual.

Content	Document	Reference Number
Specifications	Catalogue	ECNO: 1152
Operation Method	User's Manual for Digital Controller (type: PXH)	INP-TN514206-E
Communication Functions	Communication Functions Instruction Manual (Modbus) for Digital Controller (type: PXH)	INP-TN514207-E
Loader Functions	Parameter Loader Instruction Manual for Digital Controller (type: PXH)	INP-TN514208-E

The latest materials can also be downloaded at the following URL: http://www.fic-net.co.jp/eng

PLEASE READ FIRST SAFETY WARNINGS

Please read the section “Safety Warnings” thoroughly before using.
Please observe the warnings stated here as they contain important safety details. The safety warning items are divided into “WARNING” and “CAUTION” categories.

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, if this product is to be used for applications that require the utmost safety as described below, please take into consideration the safety of the entire system and the machine by 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 the human body
- Direct control of transportation equipment
- Airplanes
- Space equipment
- Atomic equipment, etc

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

1.2 Installation and Wiring

- This equipment is intended to be used under the following conditions.

Ambient temperature	−10°C to 50°C	
Ambient humidity	90% RH or below (with no condensation)	
Installation category	II	by IEC1010-1
Pollution level	2	

- Between the temperature sensor and the location where the voltage reaches the values 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 Vdc	0.2	1.2
Up to 100 Vrms or Vdc	0.2	1.4
Up to 150 Vrms or Vdc	0.5	1.6
Up to 300 Vrms or Vdc	1.5	3.0
Above 300 Vrms or Vdc	Please consult our distributor	

hazardous voltage

- For the above, if voltage exceeds 50Vdc (called danger voltage), grounding and basic insulation for all terminals of the equipment and auxiliary insulation for warning outputs is required.
  Note that the insulation class for this equipment is as follows. Before installing, please confirm that the insulation class for equipment meets usage requirements.

Power source	Internal Circuit
Digital output 1, 2	PC Loader interface
	Measurement value input 1 (PV1)
Digital output 3	Measurement value input 2 (PV2)
Digital output 4	Auxiliary analog Input 1 (Ai1)
Digital output 11 to 15	Output 1 (Current / SSR driver)
	Output 2 (Current)
	Digital input 1 to 4
	Digital input 11 to 15
	Transmitter power supply
	RS485

——— Basic insulation (1500VAC)
——— Functional insulation (500VAC)
- - - - - - - - - - No insulation

- In cases where damage or problems with this equipment may lead to serious accidents, install appropriate external protective circuits.
- As this equipment does not have a power switch or fuses, install them separately as necessary. (Main power switch: 2point Breaker, fuse rating: 250V 1A)
- For power supply wiring, use wire equal to 600V vinyl insulation or above.
- To prevent damage and failure of the equipment, provide the rated power voltage.
- To prevent shock and equipment failure, do not turn the power ON until all wiring is complete.
- Before feeding power, confirm that clearance space has been secured to prevent shock and fire with the equipment.
- 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 carries the risk of abnormal operation, shock and fire.

1.3 Maintenance

- When installing and removing the equipment, turn the power OFF. Failing to do so may cause shock operational errors or failures.
- Periodic maintenance is recommended for continuous and safe use of this equipment. Some components used on this equipment have a limited life and/or may deteriorate with age.
- The warranty period for this unit (including accessories) is one year, if the product is used properly.

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 50°C when equipment is in use. (If the power supply is AC200V, the recommended maximum ambient temperature is 45°C.)
- Locations in which the ambient humidity falls outside the range of 0 to 90% RH when equipment is in use
- Locations with rapid temperature changes, leading to dew condensation
- Locations with corrosive gases (especially sulfide gas, ammonia, etc.) or flammable gases
- Locations in contact with water, oil, chemicals, steam or hot water
  (If the equipment gets wet, there is a risk of electric shock or fire, so have it inspected by the distributor.)
- Locations with high concentrations of atmospheric 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 the Panels

- Please attach the PXH with the included Fixtures (2 pieces) to the top and bottom, and tighten with a screwdriver.
  The clamp torque is approximately 0.15 N·m (1.5 kg·cm)
  It is designed such that overtightening 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 as is. (However, do exercise caution in not applying too much torque because the casing is made of plastic.)
- The front of this equipment is waterproof in compliance with NEMA-4X standards (IP66-equivalent). However, regarding waterproofing between the equipment and the panel, use the included packing to ensure waterproofing and attach it according to the guidelines below. (Incorrect attachment may cause the equipment to lose its waterproof capabilities.)
  ① As shown in Fig. 1, insert the panel after attaching the packing to the equipment case.
  ② As shown in Fig. 2, tighten the fixture screws so that no gaps can remain between the equipment face, the packing and the panels. Once finished, confirm that there are no changes in shape such as displaced or improperly-fitted packing, etc. as shown in Fig. 3.
- Please exercise caution if the panel strength is weak and gaps develop between the packing and the panel, as this will result in the loss of its waterproofing capabilities.

Mounting method

Fig. 1

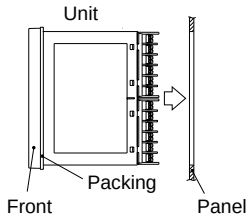


Fig. 2

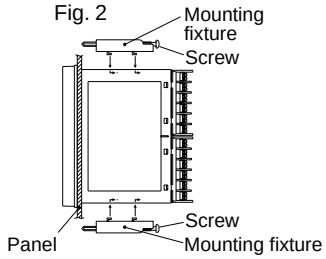


Fig. 3

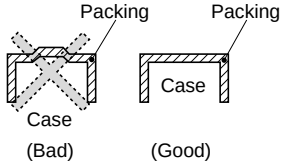
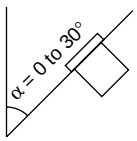


Fig. 4



Standard: vertical attachment (horizontal position fixtures)
If attached at an angle, the maximum gradient is a 30° downslope.
(Caution)

- In order not to hamper heat dissipation, do not block the sides of the equipment.
- Do not block the air vents on the upper part of the terminal.
- For the PXH9, please attach the Fixtures to the attachment holes in the center of the main unit.

2.3 Cautions for Wire Connections

- Perform wiring beginning from the left-side terminals (No. 1 to No. 12).
- Do not connect anyting to the unused terminals. (Do not use them as relay terminals.)
- For thermocouple input, use the designated compensation lead; for resistance temperature sensors, use wires with small lead wire resistance and without any resistance difference among the three wires.
- To avoid noise conductor effects, do not use input signal wires in close proximity with electric power lines or load lines.
- Use input signal lines and output signal lines that are separated from each other and are shielded.
- If there is a lot of noise from the power source, adding an insulation transducer and using a noise filter is recommended.
  (Example: TDK ZMB22R5-11 noise filter)
  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 do not attach fuses and switches, etc. to the noise filter output wiring since doing so will decrease the filter's effectiveness.
- Twisting the measuring instrument wiring is effective when connecting the wires. (The shorter the pitch of the twist, the more effective the connection is against noise.)
- 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 is high, selecting a SSR/SSC drive output type is recommended.
  [Proportionate cycles] Relay output: 30 seconds or more,
  SSR/SSC drive output: 1 second or more
- When inductive loads such as magnetic opening/closing equipment, etc. as relay output equipment are connected, use of "Zetrap," manufactured by Fuji Device Technology, Co. Ltd., is recommended in order to protect the connection points against opening/closing surges and to ensure long-term use.
  Model names : ENC241D-05A (For 100V power voltage)
  ENC471D-05A (For 200V power voltage)
  Attachment position : Please connect between the relay control output connection points. (Refer to Fig. 5.)
- If using a thermocouple input, make sure that an RCJ module is connected as shown in the diagram below. (If an RCJ module is not connected, the temperature measurement cannot function.)
  To use resistance bulb input instead of thermocouple input, remove RCJ module. Keep the removed RCJ module, and do not forget to mount it back when input is changed again.
- Take wiring resistance into consideration when using a Zener barrier.
- In applying mV voltage, do not remove the RCJ module.
- It is dangerous to make an SSR connection when the output is set at 4-20mA, because the output will be kept "ON" even when the MV display shows –5%. Make sure to confirm the setting and the wiring before making the SSR connection.
- When the transmitter power supply model is selected, the external wiring will be connected as Fig. 6.

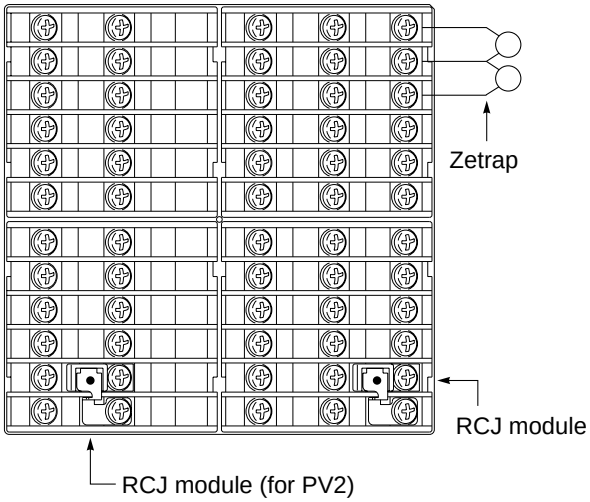


Fig. 5 Attachement position of Zetrap and RCJ module

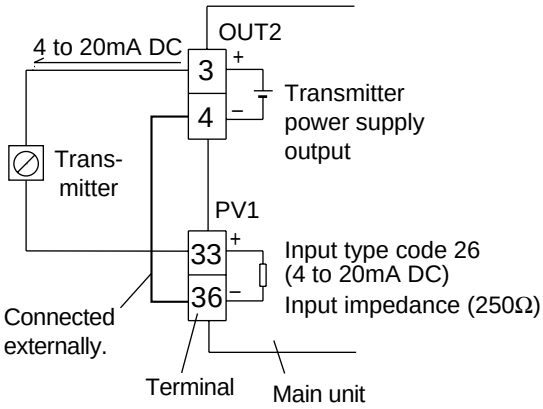


Fig. 6 External wiring for the model with the power supply to the transmitter

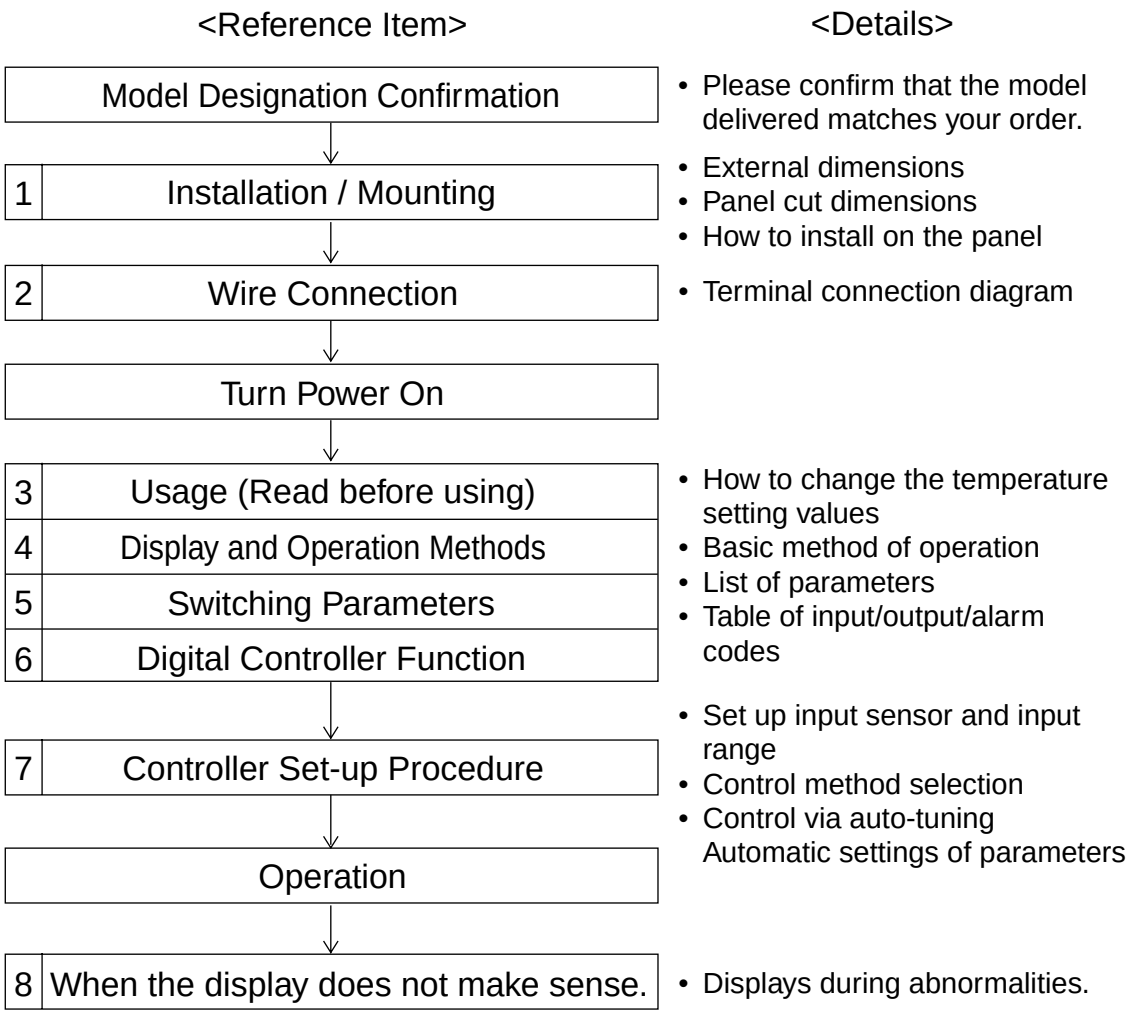
2.4 Key Operation Cautions/Operations during Abnormality

- The alarm function does not work properly when an abnormality 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.
- The PV display will read UUUU or LLLL when over range or under range during input. However, if the display limit is smaller than the over-range/under-range, the fixed number -19999 or 99999 will be displayed.

2.5 Others

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

For Proper Usage



※ Since about 15 minutes is needed until the unit becomes thermally stable, wait for 15 minutes or more after turning the power on before making measurements, etc.

※ It takes about 7 seconds from power ON to establish a stable output.

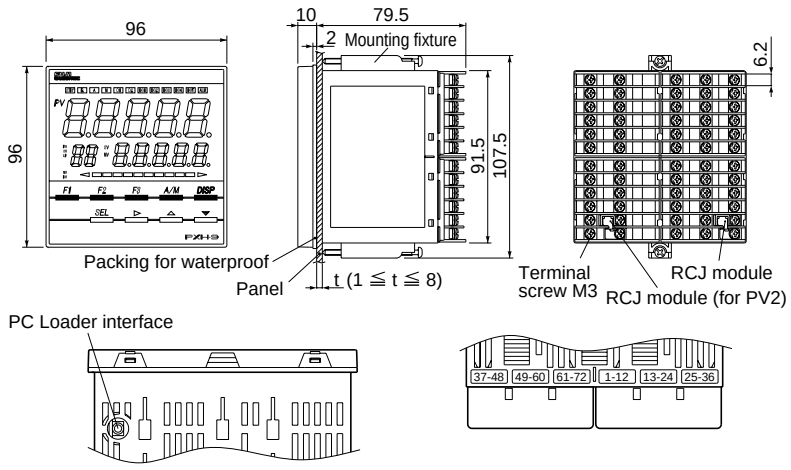
1 Installation/mounting

External/Panel Cut Dimensions

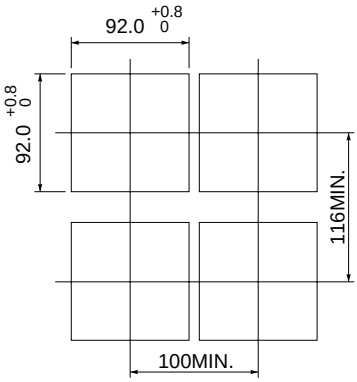
(Unit: mm)

Outline Dimensions

Outline dimensions drawing (96mm type)



Panel Cutout Dimensions



Note: in the case where paint finish will be applied after panel hole-punching, take care of the finished dimensions.

* Depending on the models, some terminals will remain unused (terminals 37 to 60). A terminal block should not be installed onto these unused terminals.
(A dummy cover will be installed.)

* Use a PC loader interface when using the parameter loader. An optional PC loader communication cable is required to use the parameter loader.

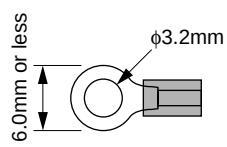
• Use wires and solderless terminals of the size shown below for connections.

Wire size

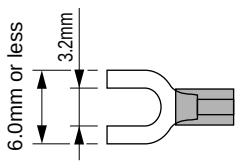
Parts	Size
Thermocouple (Compensating lead wire)	1.25mm^2 or smaller
Wire	1.25mm^2 or smaller

Solderless terminal size

Compatible wire size	Fastening torque
0.25 to 1.25mm^2	0.8N·m



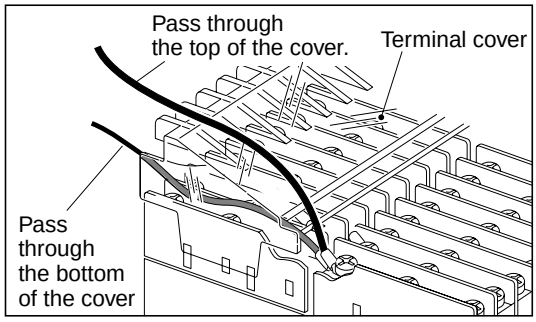
Round solderless terminal



Y-type solderless terminal

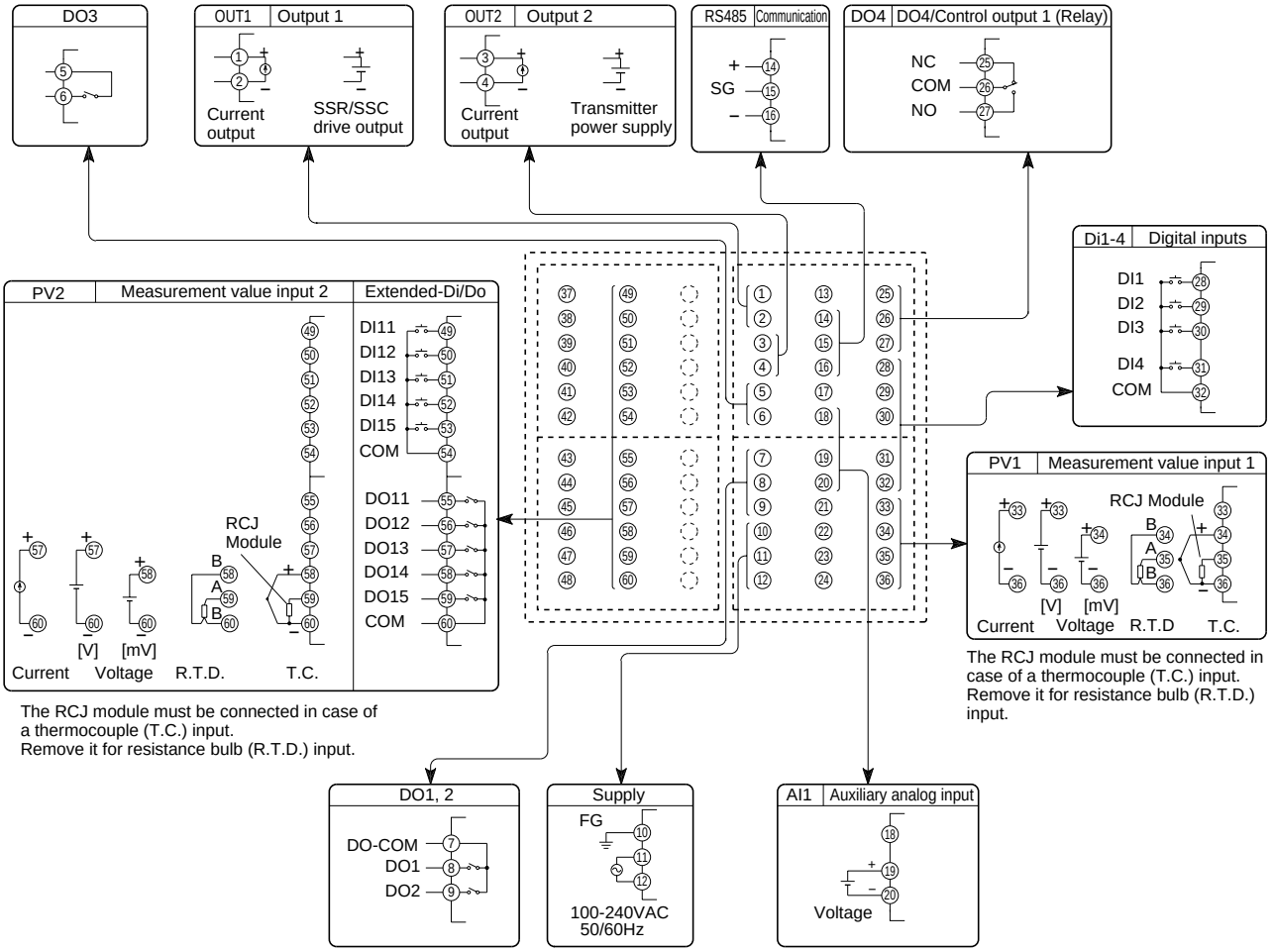
Connection using terminal cover

• Connect 2 wires of 1.25mm^2 or smaller in size together to the same terminal as shown below.



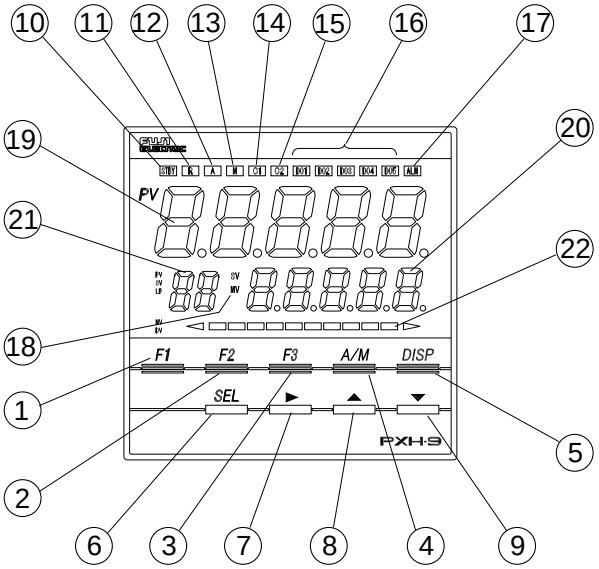
2 Wiring Connection

Terminal Connection Diagram



3 Usage (Read before using)

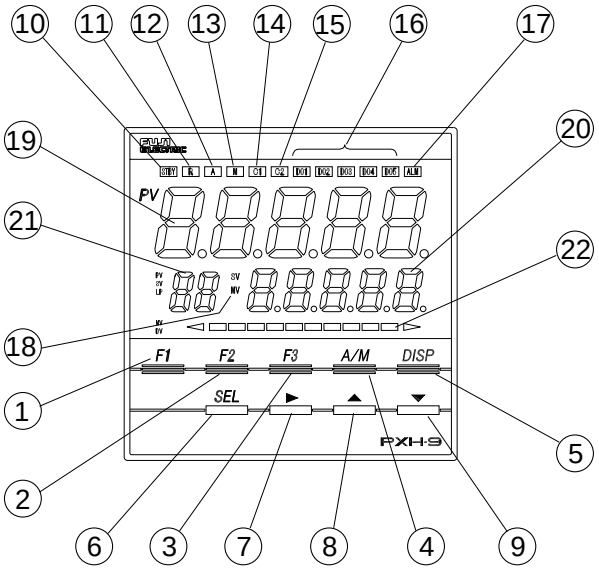
Operating parts and their functions



Operation Part

Name	Function
① F1 key	Assignable by the user.
② F2 key	Assignable by the user.
③ F3 key	Assignable by the user.
④ A/M key (AUTO/MANUAL switch key)	Switches between AUTO mode and MANUAL mode
⑤ DISP key (switch display key)	Switches display between the set value (SV) / control output (MV). Press the key to return from the setting mode to the operation mode (operation screen).
⑥ SEL key (Select key)	For parameter block selection, parameter selection, and parameter setting change.
⑦ ▶key (Digit selection key)	Select a digit of data value for a desired setting change.
⑧ ▲key (Up key)	Increases the data value of a desired setting change. Changes the value of a set value (SV) when in operation. Used to select channels and parameters and change parameter settings in the setting mode.
⑨ ▼key (Down key)	Decreases the data value of a desired setting change. Changes the value of a set value (SV) when in operation. Used to select channels and parameters and change the parameter setting in the setting mode.

∗ During the electrical current output, the lamp will not light.



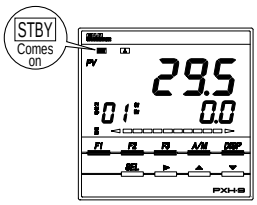
Display

Name	Function
⑩ STBY Lamp	Lamp lights when in standby mode.
⑪ R Lamp	Lamp lights when in REMOTE mode.
⑫ A Lamp	Lamp lights when in AUTO mode.
⑬ M Lamp	Lamp lights when in MANUAL mode.
⑭ C1 Lamp	Lamp lights when control output 1 is ON. ＊
⑮ C2 Lamp	Lamp lights when control output 2 is ON. ＊
⑯ DO1 Lamp DO2 Lamp DO3 Lamp DO4 Lamp DO5 Lamp	Lamp lights when digital output 1 to output 4 (DO1 to DO4) is on. The lamp functions are assignable by the user. Do5: None
⑰ ALM Lamp	Lamp lights when alarm is activated.
⑱ SV / MV Lamp	Indicates the status shown in the sub-segment display. SV : Set value MV : Control output value
⑲ Measurement value (PV) display (red)	Displays the measurement value (PV) during operation. Also displays the parameter name when setting parameters.
⑳ Set value (SV) display (orange) or Output value (MV) display (orange)	Displays the set values (SV) or control output value (MV) during operation.
㉑ Sub-segment display	During operation : When TPLT (ch8-92) is set at 10, 13, the loop number is displayed. When TPLT (ch8-92) is set at 11, 14, the SV number is displayed.
㉒ Bar graph display	Setting parameters : Parameter number is displayed. Displays a bar graph of control output (MV) during operation.

4 Displays and Operation Methods

When in Standby Operation

• To Operate standby mode : set STbY (ch1 to 5) to ON.



• Operation during standby mode:

No alarm will be activated.
Control output will be produced in accordance with the PMv1 (ch2 to 22) parameter.

Caution Be aware that in standby mode, the unit's warning alarm will not be activated either.

(Display) STBY LED lights.

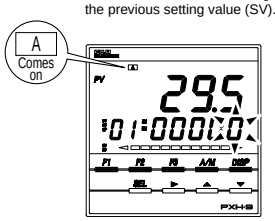
	On standby	Upon reset
Control output	Outputs value designated by PMV1	Bumpless reset
Alarm output	All OFF	–
Timer operation	All OFF	Zero start
Hold operation	–	Initial start
Latch operation	All OFF	Initial start
Reverse output operation	All OFF	Reverse operation
Communication	Normal operation (Not affected by standby.)	
AO	0mA	
DO	All OFF	–
Inverse output operation	–	Level detection: ON Edge detection: OFF
Communication	Not affected by standby.	
Communication	Display or No Display is assignable.	Display

STbY(ch1-5)=OFF

During Operation Mode

1 To change the setting values (SV)

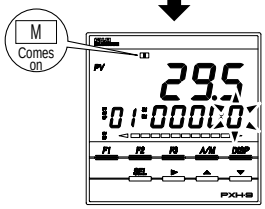
Caution If the key operation is not performed for 10 seconds while the SV value is flickering, the value returns to the previous setting value (SV).



Press the ► key to enter the setting value (SV) change mode.

A/M key

2 To change the output value (MV)



Press the ► key to enter the output value (MV) change mode.

Switch by SEL key

Parameter Setting

Operation mode (Operation display)

SEL

1 Channel selection display — Refer to the parameter changing method for details.

Select a desired channel using the ▲ or the ▼ key, and then press the SEL or the ► key.

2 Parameter selection display

Select a desired parameter using the ▲ or the ▼ key, and then press the SEL or the ► key.

3 Parameter change

Press the ►, ▲ or the ▼ key to change the setting.
Press the SEL key to register the setting.

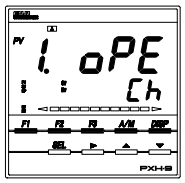
Parameter selection display

Press DISP twice.

Press DISP for 2 seconds.

Operation mode (Operation display)

1 Channel selection display



Select a desired channel and press SEL or ►.

Press DISP to return.

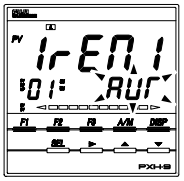
2 Parameter selection display

Press SEL to register

Press DISP to return without making registration.

After selecting a desired parameter, press SEL or ►.

3 Parameter change status



Press DISP for 2 seconds.

▲ : Increases the set value.

▼ : Decreases the set value.

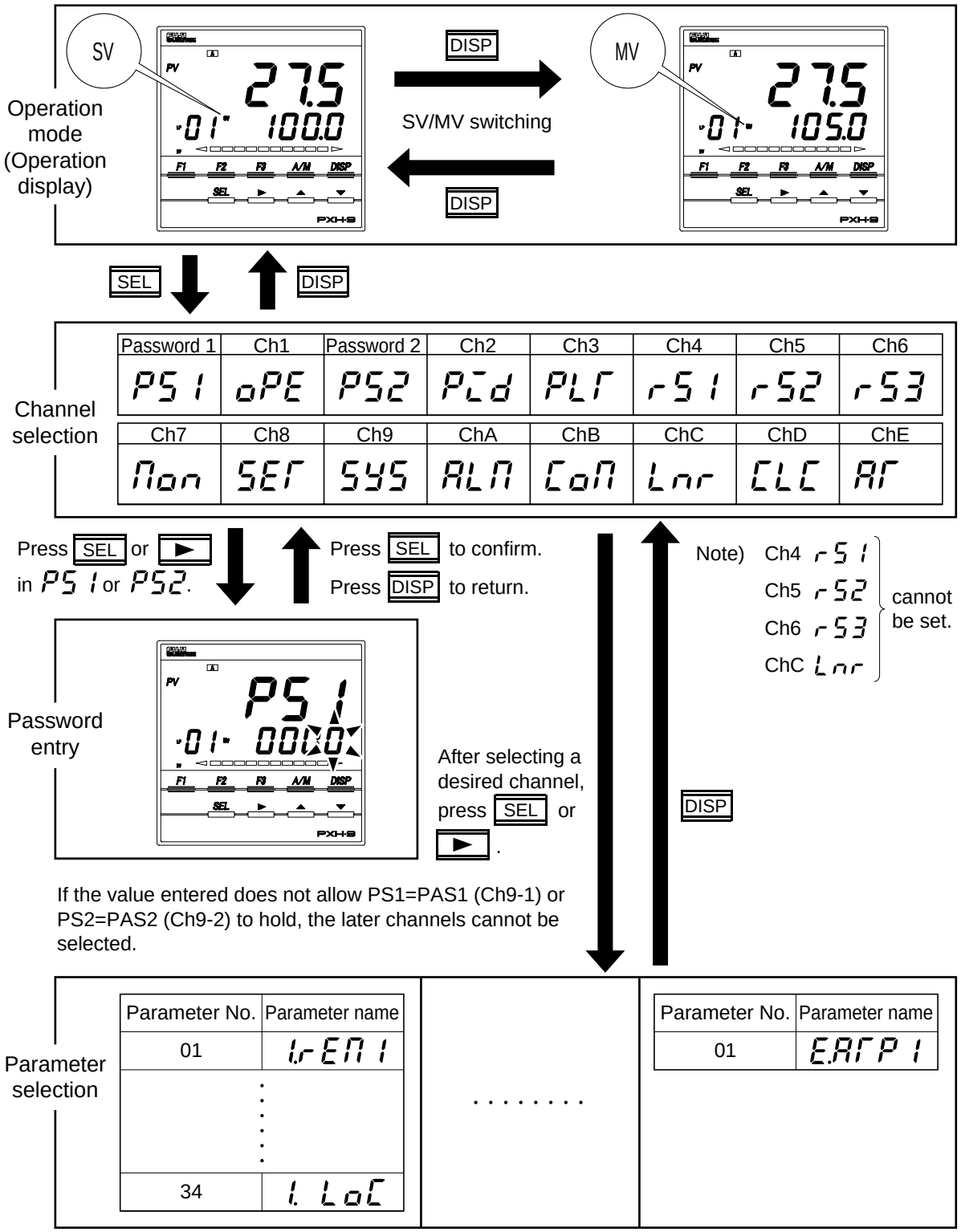
► : Moves the cursor between digits.

※ Note that the display is not automatically returned from parameter setting display, etc. to the operation display.

※ Parameter display in the text — Example) STbY (ch1-5)

Parameter symbol — Channel No. — Parameter No.

5 Switching parameters



Ch1 oPE (Operation parameter)

Parameter				Content Explanation	Factory default	Parameter mask	Notes
No.	Display	Symbol	Name				
1	rEM1	rEM1	Remote mode	Switches setting between remote/auto mode operation. REM: Remote mode AUT: Auto mode	AUT	01-1	
5	StbY	STbY	Standby command	Switches controller to RUN/Standby. ON: Control standby (output OFF, alarm OFF) OFF: Control RUN	OFF	01-5	Refer to Table 7.
7	AT	AT	Auto-tuning command	Sets auto-tuning. OFF: non action ON1: start auto-tuning.	OFF	01-7	
8	LACh	LACh	Alarm latch cancel command	Disables alarm 1 - 8 latch. OFF: Stopped CLR: Latch clear	OFF	01-8	
9	PLTn	PLTn	Palette selection	Selects a PID palette to be used to control. (Setting range: 0 to 7)	0	01-10	
10	AL 1	AL1	Alarm settings 1	Alarm 1 operation value setting. Setting possible within the input range	10%FS	02-1	Displayed when alarm operation type 1TP (chA-1) is set to 1 to 11. (See table 1.)
11	A 1-L	A1-L	Alarm lower limit settings 1	Alarm 1 lower limit operation value setting. Setting possible within the input range	10%FS	02-1	Displayed when alarm operation type 1TP (chA-1) is set to 16 to 31. (See table 1.)
12	A 1-h	A1-h	Alarm upper limit settings 1	Alarm 1 upper limit operation value setting. Setting possible within the input range	10%FS	02-1	Displayed when alarm operation type 1TP (chA-1) is set to 16 to 31. (See table 1.)
⟆							
31	AL8	AL8	Alarm settings 8	Alarm 8 operation value setting. Setting possible within the input range	10%FS	02-8	Displayed when alarm operation type 8TP (chA-36) is set to 1 to 11. (See table 1.)
32	A8-L	A8-L	Alarm lower limit settings 8	Alarm 8 lower limit operation value setting. Setting possible within the input range	10%FS	02-8	Displayed when alarm operation type 8TP (chA-36) is set to 16 to 31. (See table 1.)
33	A8-h	A8-h	Alarm upper limit settings 8	Alarm 8 upper limit operation value setting. Setting possible within the input range	10%FS	02-8	Displayed when alarm operation type 8TP (chA-36) is set to 16 to 31. (See table 1.)
34	LoC	LoC	Keylock	Selects parameter lock type (Setting range: 0 to 5)	0	01-11	

	Key operation		Communication	
No.	All Parm.	SV/MV	All Parm.	SV/MV
0	○	○	○	○
1	×	×	○	○
2	×	○	○	○
3	○	○	×	×
4	×	×	×	×
5	×	○	×	×

○: Can be set ×: Cannot be set

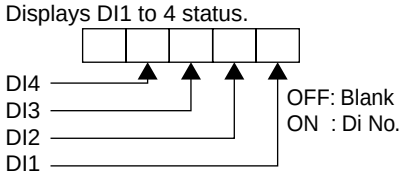
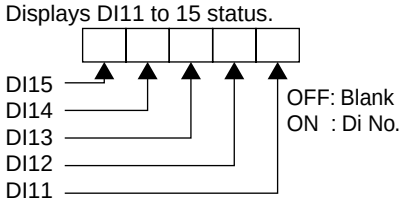
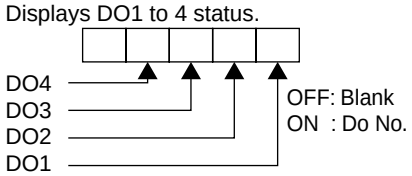
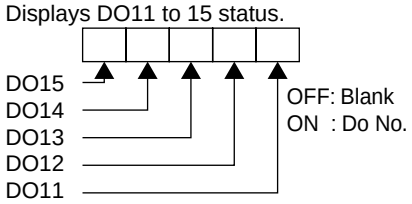
Ch2 PID (Control parameter)

Parameter				Content Explanation	Factory default	Parameter mask	Notes
No.	Display	Symbol	Name				
1	P 1	P1	Proportional band	Setting range: 0.0 to 999.9% ON/OFF control at setting = 0.	5.0	03-1	
2	I 1	i1	Integral time	Setting range: 0.0 to 3200.0 seconds Integral control OFF at setting = 0.	240.0	03-1	
3	d 1	d1	Derivative time	Setting range: 0.0 to 999.9 seconds Derivative control OFF at setting = 0.	60.0	03-1	
5	ArH 1	Arh1	Anti - reset windup Upper limit setting value	Integration cut point upper limit setting value (Setting range: 0 to 100%FS)	100%FS	03-3	Sets by deviation from SV.
6	ArL 1	ArL1	Anti - reset windup Lower limit setting value	Integration cut point lower limit setting value (Setting range: 0 to 100%FS)	100%FS	03-3	Sets by deviation from SV.
7	SH 1	Sh1	SV value upper limit	Sets upper limit SV (Setting range: −25 to 125%FS)	100%FS	03-4	
8	SL 1	SL1	SV value lower limit	Sets lower limit SV (Setting range: −25 to 125%FS)	0%FS	03-4	
9	MvH 1	Mvh1	MV value upper limit	Sets upper limit MV (Setting range: −25.0 to 125.0%FS)	105.0	03-5	
10	MvL 1	MvL1	MV value lower limit	Sets lower limit MV (Setting range: −25.0 to 125.0%FS)	-5.0	03-5	
13	dMv 1	dMv1	MV change ratio limit	Sets the limit value of deviation of MV (DMV) in one control cycle (50ms.) (Setting range: 0.0 to 150.0%) 0.0: No limit	0.0%	03-7	Limit is not applied to the deviation of MV by EX-MV operation.
14	dT 1	dT1	Sampling cycle	Sets sampling cycle for PID operation. (Setting range: 5 to 1000)	5	03-8	The actual cycle is (Set value × 10) ms.
15	HS 1	hS1	Hysteresis setting	Hysteresis value during ON/OFF control time. (Setting range: 0 to 50%FS)	0.3%FS	03-9	
18	bAL 1	bAL1	Operation output convergence value	Sets output convergence value (Setting range: −100.0 to 100.0%)	0.0%	03-12	
19	TC 1	TC1	Cycle time of Control output (MV1)	Sets proportional cycle for control output. (Setting range: 1 to 150 sec)	By designation at the time of ordering	03-13	Effective only for RY output and SSR drive output
20	rEv 1	rEv1	Control operation setting	Sets a control operation method. NRML: Normal operation REV: Reverse operation	REV	03-14	
22	PMv 1	PMv1	Preset value for control output	Sets MV for stanby. (Setting range: -25.0 to 125.0%)	0.0	03-16	Refer to Table 7.
23	ALP 1	ALP1	Alpha	Sets 2 degrees of freedom coefficient α. (Setting range: −300.0 to 300.0%)	100.0	40-1	
24	bET 1	bET1	Beta	Sets 2 degrees of freedom coefficient β. (Setting range: 0.0 to 999.9%)	0.0	40-1	
97	EXM 1	EXM1	External control amount	Sets external output value. (Setting range: −25.0 to 125.0%)	0.0	07-1	
99	kF 1	kF1	FF gain	Sets Feed Forward gain and bias 1, bias 2. [FF = KF1 × (Input − B1F) + B2F] (Setting range: −1000.0 to 1000.0)	0.0	40-2	
A0	b1F 1	b1F1	FF bias1		0.0	40-2	
A1	b2F 1	b2F1	FF bias2		0.0	40-2	

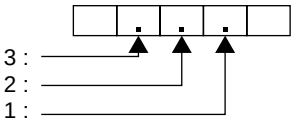
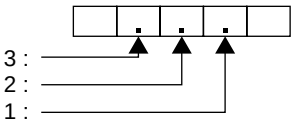
Ch3 PLT (Control palette)

Parameter				Content Explanation	Factory default	Parameter mask	Notes
No.	Display	Symbol	Name				
1	Sv1	Sv1	Setting value 1	palette 1 SV (Setting range: SV lower limit value to SV upper limit value)	0%FS	08-1	
2	P-1	P-1	Proportional band 1	palette 1 proportional band (Setting range: 0.0 to 999.9%) ON/OFF control at setting = 0.	5.0	08-1	
3	i-1	i-1	Integral time 1	palette 1 integral time (Setting range: 0.0 to 3200.0 sec) Integral control OFF at setting = 0.	240.0	08-1	
4	d-1	d-1	Derivative time 1	palette 1 derivative time (Setting range: 0.0 to 999.9 sec) Derivative control OFF at setting = 0.	60.0	08-1	
6	Arh1	Arh1	Anti - reset windup upper limit value 1	palette 1 Anti - reset windup upper limit value setting. (Setting range: 0 to 100%FS)	100%FS	08-1	
7	ArL1	ArL1	Anti - reset windup lower limit value 1	palette 1 Anti - reset windup lower limit value setting. (Setting range: 0 to 100%FS)	100%FS	08-1	
8	hYS1	hYS1	Hysteresis setting 1	palette 1 hysteresis setting (Setting range: 0 to 50%FS)	0.3%FS	08-1	
11	bL-1	bL-1	Output convergence value 1	palette 1 Output convergence value (Setting range: −100.0 to 100.0%)	0.0%	08-1	
⟆							
67	Sv7	Sv7	Setting value 7	palette 7 SV (Setting range: SV lower limit value to SV upper limit value)	0%FS	14-1	
68	P-7	P-7	Proportional band 7	palette 7 proportional band (Setting range: 0.0 to 999.9%) ON/OFF control at setting = 0.	5.0	14-1	
69	i-7	i-7	Integral time 7	palette 7 integral time (Setting range: 0.0 to 3200.0 sec) Integral control OFF at setting = 0.	240.0	14-1	
70	d-7	d-7	Derivative time 7	palette 7 derivative time (Setting range: 0.0 to 999.9 sec) Derivative control OFF at setting = 0.	60.0	14-1	
72	Arh7	Arh7	Anti - reset windup upper limit value 7	palette 7 Anti - reset windup upper limit value setting. (Setting range: 0 to 100%FS)	100%FS	14-1	
73	ArL7	ArL7	Anti - reset windup lower limit value 7	palette 7 Anti - reset windup lower limit value setting. (Setting range: 0 to 100%FS)	100%FS	14-1	
74	hYS7	hYS7	Hysteresis setting 7	palette 7 hysteresis setting (Setting range: 0 to 50%FS)	0.3%FS	14-1	
77	bL-7	bL-7	Output convergence value 7	palette 7 Output convergence value (Setting range: −100.0 to 100.0%)	0.0%	14-1	
78	rEF1	rEF1	PID switch point 1	palette 1 PID switch point (Setting range: −25 to 125%FS)	0%FS	08-1	
⟆							
84	rEF7	rEF7	PID switch point 7	palette 7 PID switch point (Setting range: −25 to 125%FS)	0%FS	14-1	

Ch7 Mon (Monitor)

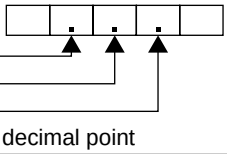
Parameter				Content Explanation	Factory default	Parameter mask	Notes
No.	Display	Symbol	Name				
1	PV1	Pv1	PV1 monitor	Displays Process value 1 input.	–	17-1	Reading of the signal input to the terminal (before input correction)
2	PV2	Pv2	PV2 monitor	Displays Process value 2 input.	–	17-2	
4	AI 1	Ai1	AI1 monitor	Displays Analog input 1 input.	–	17-5	
6	rSV1	rSv1	RSV1 monitor	Displays REMOTE set value 1 temperature.	–	17-9	Control RSV value (after input correction)
10	LSV1	LSV1	Local SV1 monitor	Display Local set value 1	–	17-9	
14	rCJ1	RCJ1	RCJ1 monitor	Displays RCJ1 input.	–	17-1	
15	rCJ2	RCJ2	RCJ2 monitor	Displays RCJ2 input.	–	17-2	
17	Ao 1	Ao1	AO1 monitor	Displays Analog output 1 output value.	–	18-1	
18	Ao2	Ao2	AO2 monitor	Displays Analog output 2 output value.	–	18-1	
21	dI01	Di01	DI monitor 1	Displays DI1 to 4 status. 	–	19-1	
22	dI 11	Di11	DI monitor 2	Displays DI11 to 15 status. 	–	19-1	
24	doO1	DO01	DO monitor 1	Displays DO1 to 4 status. 	–	19-1	
25	do 11	DO11	DO monitor 2	Displays DO11 to 15 status. 	–	19-1	
27	AIM	AiM	Calculation result monitor	Displays user's calculation result.	–	19-3	
28	TM1	TM1	Alarm delay remaining time monitor	Displays the remaining time for the alarm delay of ALM1 to ALM8.	–	34-1	The alarm option will select the unit.
29	TM2	TM2				34-2	
30	TM3	TM3				34-3	
31	TM4	TM4				34-4	
32	TM5	TM5				34-5	
33	TM6	TM6				34-6	
34	TM7	TM7				34-7	
35	TM8	TM8				34-8	
36	AMV1	AMV1	EXMV value	Displays the value to be output as EXMV.	–	17-9	
40	FFV1	FFV1	Feed Forward value	Displays the value of Feed Forward element.	–	17-9	

Ch8 SET (Input/output definition)

Parameter				Content Explanation	Factory default	Parameter mask	Notes
No.	Display	Symbol	Name				
1	Pv 1F	Pv1F	PV1 full-scale	Sets the full-side scale of PV1 input. (Setting range: −19999 to 99999)	As ordered	20-1	For details see Table 3.
2	Pv 1b	Pv1b	PV1 base scale	Sets the base-side scale of PV1 input. (Setting range: −19999 to 99999)	As ordered	20-1	For details see Table 3.
3	Pv 1d	Pv1d	PV1 decimal point position	Specifies the decimal point position of PV1 input. (Setting range: 0 to 3)  3 : 2 : 1 : 0 : No decimal point	1	20-1	
4	Pv 1T	Pv1T	PV1 input type	Sets the type of PV1 input. (Setting range: 0 to 27)	As ordered	20-1	For details see Table 2.
5	Pv 1U	Pv1U	Unit	Sets the measurement unit. non : No unit ˚F : ˚F unit ˚C : ˚C unit	As ordered	20-2	
6	Pv 1Z	Pv1Z	PV1 input zero point adjustment	Sets the correction value of a zero point for PV1 input. (Setting range: -50 to 50%FS)	0%FS	20-3	
7	Pv 1S	Pv1S	PV1 input span point adjustment	Sets the correction value of a span point for PV1 input. (Setting range: -50 to 50%FS)	0%FS	20-3	
11	P1CU	P1CU	PV1 input rooter cut point	Sets the cut point of square-root extraction calculation for PV1 input. In case of OFF, the square-root extraction is not calculated. (Setting range: OFF, 0.0 to 125.0%)	OFF	20-7	
12	P1TF	P1TF	Time constant of PV1 input filter	Sets the constant during filter for PV1 input. (Setting range: 0.0 to 900.0 sec)	0.0	20-8	
14	Pv2F	Pv2F	PV2 full-scale	Sets the full-side scale of PV2 input. (Setting range: −19999 to 99999)	As ordered	20-1	For details see Table 3.
15	Pv2b	Pv2b	PV2 base scale	Sets the base-side scale of PV2 input. (Setting range: −19999 to 99999)	As ordered	20-1	For details see Table 3.
16	Pv2d	Pv2d	PV2 decimal point position	Specifies the decimal point position of PV2 input. (Setting range: 0 to 3)  3 : 2 : 1 : 0 : No decimal point	1	20-1	
17	Pv2T	Pv2T	PV2 input type	Sets the type of PV2 input. (Setting range: 0 to 27)	3	20-1	For details see Table 2.
18	Pv2U	Pv2U	Unit	Sets the measurement unit for PV2 input. non : No unit ˚F : ˚F unit ˚C : ˚C unit	˚C	20-2	
19	Pv2Z	Pv2Z	PV2 input zero point adjustment	Sets the correction value of a zero point for PV2 input. (Setting range: -50 to 50%FS)	0%FS	20-3	
20	Pv2S	Pv2S	PV2 input span point adjustment	Sets the correction value of a span point for PV2 input. (Setting range: -50 to 50%FS)	0%FS	20-3	
24	P2CU	P2CU	PV2 input rooter cut point	Sets the cut point of square-root extraction calculation for PV2 input. In case of OFF, the square-root extraction is not calculated. (Setting range: OFF, 0.0 to 125.0%)	OFF	20-7	
25	P2TF	P2TF	Time constant of PV2 input filter	Sets the constant during filter for PV2 input. (Setting range: 0.0 to 900.0 sec)	0.0	20-8	

Note) Be sure to reset or turn on the power after the parameter setting is changed.

Ch8 SET (Input/output definition)

Parameter				Content Explanation	Factory default	Parameter mask	Notes
No.	Display	Symbol	Name				
40	AI 1F	Ai1F	Ai1 full scale	Sets the full-side scale of analog (Ai1) input. (Setting range: −19999 to 99999)	As ordered	23-1	
41	AI 1b	Ai1b	Ai1 base scale	Sets the scale of base-side analog (Ai1) input. (Setting range: −19999 to 99999)	As ordered	23-1	
42	AI 1d	Ai1d	Ai1 decimal point position	Specifies the decimal point position for analog (Ai1) input. (Setting range: 0 to 3)  3 : 2 : 1 : 0 : No decimal point	1	23-1	
43	AI 1T	Ai1T	Ai1 input type	Sets the type of Ai1 input. (Setting range: 16 to 18)	16	23-1	For details see Table 2.
45	AI 1Z	Ai1Z	Ai1 input zero point adjustment	Sets the correction value of a zero point for Ai1 input. (Setting range: -50 to 50%FS)	0%FS	23-3	
46	AI 1S	Ai1S	Ai1 input span point adjustment	Sets the correction value of a span point for Ai1 input. (Setting range: -50 to 50%FS)	0%FS	23-3	
49	A1CU	A1CU	Ai1 input rooter cut point	Sets the cut point of the square-root extraction calculation for Ai1 input. In case of OFF, the square-root extraction is not calculated. (Setting range: OFF, 0.0 to 125.0%)	OFF	23-7	
50	A1TF	A1TF	Time constant of Ai1 input filter	Sets the constant during filter for Ai1 input. (Setting range: 0.0 to 900.0sec)	0.0	23-8	
64	Ao1T	Ao1T	AO1 output type	Switches the AO1 (re-transmission output) signal. Setting range: PV, SV, MV, DV, AiM, S1, S2, S3	PV	25-1	It is invalid when the control output is chosen.
66	Ao1h	Ao1h	AO1 output scale upper limit	Sets the scale upper limit value of the AO1 output. (Setting range: −130.0 to 130.0%)	100.0%	25-1	
67	Ao1L	Ao1L	AO1 output scale lower limit	Sets the scale lower limit value of the AO1 output. (Setting range: −130.0 to 130.0%)	0.0%	25-1	
68	A1Lh	A1Lh	AO1 output limit upper limit	Sets the upper limt value of the AO1 output limit. (Setting range: -25.0 to 105.0%)	105.0%	25-1	
69	A1LL	A1LL	AO1 output limit lower limit	Sets the lower limt value of the AO1 output limit. (Setting range: −25.0 to 105.0%)	−5.0%	25-1	
70	Ao2T	Ao2T	AO2 output type	Switches the AO2 (re-transmission output) signal. Setting range: PV, SV, MV, DV, AiM, S1, S2, S3	PV	25-2	It is invalid when the XPS is attached.
72	Ao2h	Ao2h	AO2 output scale upper limit	Sets the scale upper limit value of the AO2 output. (Setting range: −130.0 to 130.0%)	100.0%	25-2	
73	Ao2L	Ao2L	AO2 output scale lower limit	Sets the scale lower limit value of the AO2 output. (Setting range: −130.0 to 130.0%)	0.0%	25-2	
74	A2Lh	A2Lh	AO2 output limit upper limit	Sets the upper limt value of the AO2 output limit. (Setting range: −25.0 to 105.0%)	105.0%	25-2	
75	A2LL	A2LL	AO2 output limit lower limit	Sets the lower limt value of the AO2 output limit. (Setting range: −25.0 to 105.0%)	−5.0%	25-2	

Note) Be sure to reset or turn on the power after the parameter setting is changed.

Ch8 SET (Input/output definition)

Parameter				Content Explanation	Factory default	Parameter mask	Notes
No.	Display	Symbol	Name				
88	CALC	CALC	Calculation	Selects the calculation type. (Setting range: 0 to 11)	0	25-9	For details see Table 9.
89	UCF1	UCF1	UCAL full scale	Sets the scale on the full side which is utilized for mathematical calculations. (Setting range: −19999 to 99999)	As ordered	25-9	
90	UCb1	UCb1	UCAL base scale	Sets the scale on the base side which is utilized for mathematical calculations. (Setting range: −19999 to 99999)	As ordered	25-9	
91	UCd1	UCD1	UCAL decimal point position	Sets the decimal point position for mathematical calculations. (Setting range: 0 to 3)	1	25-9	
92	TPLT	TPLT	Template	Specifies the template. The range of effective setting. 10 : Single-loop basic PID control (with Math function) 11 : Single-loop SV selection PID control (with Math function) 13 : Single-loop basic PID control 14 : Single-loop SV selection PID control 16 : Single-loop input selection PID control (with Math function) Setup other than the above is forbidden.	13	25-10	
93	oTYP	oTYP	Output type	Selects the control output selector type. (Setting range: 10 to 13)	As ordered	25-11	For details see Table 4.
98 ∫ b3	Cn01 ∫ Cn16	CN01 ∫ CN16	Constant 1 ∫ Constant 16	Sets a constant value used for templates. The meaning of the value varies depending on template. Make the setting after checking the description of each template. (Setting range: −19999 to 99999)	0	25-15	

Note) Be sure to reset or turn on the power after the parameter setting is changed.

Ch9 SYS (Sysytem definition)

Parameter				Content Explanation	Factory default	Parameter mask	Notes
No.	Display	Symbol	Name				
1	PAS1	PAS1	Security setting 1	Sets security (passwords). (Setting range: 0000 to FFFF)	0000	26-1	
2	PAS2	PAS2	Security setting 2	Sets security (password). (Setting range: 0000 to FFFF)	0000	26-2	
3	PAS3	PAS3	Security setting 3	Sets security (password). (Setting range: 0000 to FFFF)	0000	26-3	
7	rih1	rih1	Remote mode setting prevention	Prevents switching to the REMOTE mode. (Setting range: ON/OFF)	OFF	27-1	
11	rAC1	rAC1	R_ACK use selection	Selects use or non-use of R_ACK. (Setting range: INH, ENA)	INH	27-5	
15	A-M1	A-M1	A/M mode	Selects the A/M mode. (Setting range: A-M, A)	A-M	27-9	
19	Cnd1	Cnd1	Mode settings when the power turns ON.	Sets the mode when the power turns ON. (Setting range: A, R, M)	A	28-1	
23	Trk1	Trk1	Tracking method selection (SV)	Selects ON or OFF for tracking the local set value (SV)	ON	28-9	
30	STBo	STBo	Operation settings when in standby mode	Sets the front display operation in the standby mode. (Setting range: 0: lighting, 1: extinction)	0	29-4	For details see Table 7.
31	PLTS	PLTS	palette switching method selection	Selects a palette switching factor. (Setting range: PLTn, SV, PV)	PLTn	29-6	
32	F1	F1	User designation key-1 (F1)	Sets user assignments for function keys. [F1] - [F3]. (Setting range: 0 - 27)	0	29-7	For details see Table 8.
33	F2	F2	User designation key-2 (F2)		0	29-8	
34	F3	F3	User designation key-3 (F3)		0	29-9	
35	brd1	brd1	Burn out direction specification (MV1)	Specifies the direction of the control output during a burnout. (Setting range: HOLD, LO, UP, EXMV)	Lo	30-1	
39	di01	di01	Assignment for digital input 1	Sets assignments for DI1-DI4, DI11-DI15. (Setting range: 0 - 255)	di01 : 60 di02 : 70 di03 : 0 di04 : 103	31-1	For details see Table 5.
∫	∫	∫	∫				
42	di04	di04	Assignment for digital input 4				
43	di11	di11	Assignment for digital input 11		0	31-2	
∫	∫	∫	∫				
47	di15	di15	Assignment for digital input 15				
53	do1	do1	Assignment for digital output 1	Sets assignments for DO1-DO4, DO11-DO15. (Setting range: 0 - 255)	do1 : 1 do2 : 2 do3 : 3 do4 : 4	31-9	For details see Table 6.
∫	∫	∫	∫				
56	do4	do4	Assignment for digital output 4				
57	do11	do11	Assignment for digital output 11		0	31-10	
∫	∫	∫	∫				
61	do15	do15	Assignment for digital output 15				

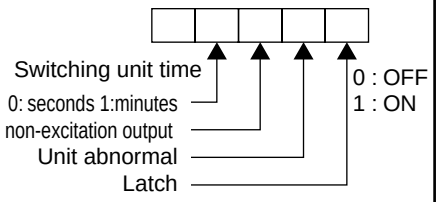
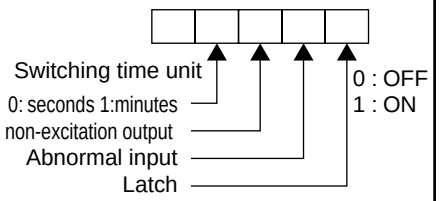
Note) Be sure to reset or turn on the power after the parameter setting is changed.

Ch9 SYS (Sysytem definition)

Parameter				Content Explanation	Factory default	Parameter mask	Notes
No.	Display	Symbol	Name				
67	C1	C1	LED C1 assignment	Allocates indicator LEDs. (Setting range: 0 to 255)	21	32-1	For details see Table 6.
68	C2	C2	LED C2 assignment		22	32-2	
69 ⟆ 73	Ldo1 ⟆ Ldo5	Ldo1 ⟆ Ldo5	LED DO1 assignment ⟆ LED DO5 assignment		Ldo1 : 1 Ldo2 : 2 Ldo3 : 3 Ldo4 : 4 Ldo5 : 0	32-3 32-4 32-5 32-6 32-7	
74	LALN	LALM	LED ALM assignment		17	32-8	
80 ⟆ C3	dS00 ⟆ dS43	dS00 ⟆ dS43	Parameter mask setting	Skips (not display) unnecessary parameters.	–	0-1 ⟆ 0-15	
E3	rES	rES	Reset command	Resets the main unit. ON : Reset OFF : Normal	OFF	33-1	

Note) Be sure to reset or turn on the power after the parameter setting is changed.

ChA ALn (Alarm setting)

Parameter				Content Explanation	Factory default	Parameter mask	Notes
No.	Display	Symbol	Name				
1	1TP	1TP	Alarm 1 type setting	Sets the alarm type for alarm 1. (Setting range: 0 to 38)	0	34-1	For details see Table 1.
2	1oP	1oP	Alarm 1 option setting	Sets alarm options for alarm 1. (Setting range: 0000 to 1111)  	0000	34-1	
3	1hYS	1hYS	Alarm 1 hysteresis setting	Sets alarm hysteresis for alarm 1. (Setting range: 0.00 to 50.00%FS)	0.3%FS	34-1	
4	1dLY	1dLY	Alarm 1 delay time setting	Sets delay time for alarm 1. (Setting range: 0 to 9999) ∗ Sets alarm options for time units. The unit of time is selected by alarm options.	0	34-1	
∫							
36	8TP	8TP	Alarm 8 type setting	Sets the alarm type for alarm 8. (Setting range: 0 to 38)	0	34-8	
37	8oP	8oP	Alarm 8 option setting	Sets alarm options for alarm 8. (Setting range: 0000 to 1111)  	0000	34-8	
38	8hYS	8hYS	Alarm 8 hysteresis setting	Sets alarm hysteresis for alarm 8. (Setting range: 0.00 to 50.00%FS)	0.3%FS	34-8	
39	8dLY	8dLY	Alarm 8 delay time setting	Sets delay time for alarm 8. (Setting range: 0 to 9999) ∗ Sets alarm options for time units. The unit of time is selected by alarm options.	0	34-8	

ChB CoM (Communication)

Parameter				Content Explanation	Factory default	Parameter mask	Notes
No.	Display	Symbol	Name				
2	STn4	STn4	RS485 station No.	Specifies the RS485 communication station No. (Setting range: 0 to 255) ∗ does not operate with STn4=0.	1	36-2	
3	SPd4	SPd4	RS485 communication speed	Selects the communication speed for RS485 communication. (Setting range) 96 : 9600 bps 192 : 19200 bps 384 : 38400 bps	384	36-3	
4	biT4	biT4	RS485 bit format	Selects the bit format for RS485 communication. (Setting range) 8n: Data length 8, Parity None 8o: Data length 8, Parity Odd 8E: Data length 8, Parity Even	8o	36-4	
7	SPd2	SPd2	PC Loader communication speed	Selects the communication speed for PC Loader communication. (Setting range) 96 : 9600 bps 192 : 19200 bps 384 : 38400 bps	384	36-9	
8	biT2	biT2	PC Loader bit format	Selects the bit format for PC Loader communication. (Setting range) 8n: Data length 8, Parity None 8o: Data length 8, Parity Odd 8E: Data length 8, Parity Even	8o	36-10	

Note) Be sure to reset or turn on the power after the parameter setting is changed.

ChD CLC (Mathematical Calculation)

Parameter				Content Explanation	Factory default	Parameter mask	Notes
No.	Display	Symbol	Name				
1 ∫ 16	K01 ∫ K16	K01 ∫ K16	Constant for mathematical calculation	Sets the constant used for mathematical calculation	0.0000	38-1 ∫ 38-4	Floating-point setting

ChE AT (Tuning)

Parameter				Content Explanation	Factory default	Parameter mask	Notes
No.	Display	Symbol	Name				
1	ATP1	ATP1	Auto tuning type	Specifies the auto-tuning method. (Setting range) NRML : Standard type AT LPV : Low PV type AT	NRML	39-1	

6 Digital Controller Functions

6-1 Alarm functions

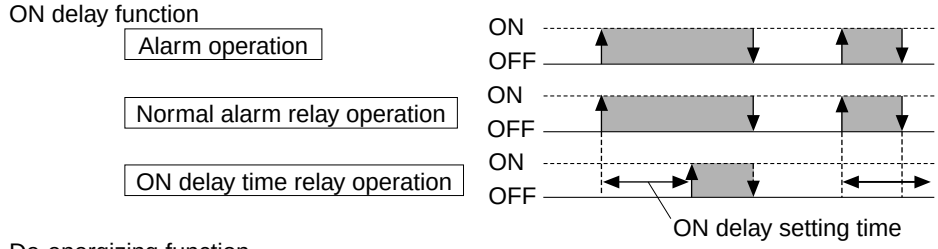
1) Alarm Types

• The alarm types are an absolute value alarm, a deviation alarm, an upper/lower limit alarm and a range alarm. (For details see [Table 1 Alarm Operation Type Codes])

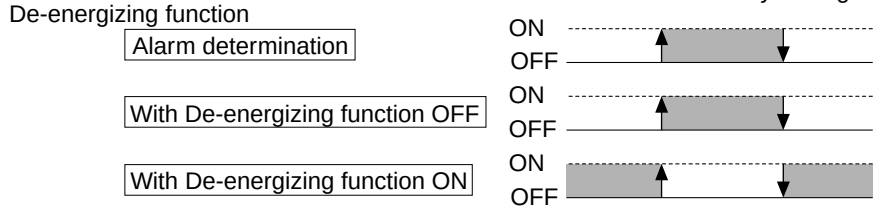
2) Alarm function

No.	Function Name	Function	Parameter set
①	Hysteresis function	Alarm operation can be set for operation dead band (hysteresis).	alarm 1: 1hYS (chA-3) ⟆ alarm 8: 8hYS (chA-38)
②	ON delay function	After alarm ON conditions are established, the alarm is ON after the ON delay setting time.	alarm 1: 1dLY (chA-4) ⟆ alarm 8: 8dLY (chA-39)
③	Alarm latch function	Alarm goes ON once, and alarm ON function status is maintained. To release the alarm latch, the following methods are used.	alarm 1: 1oP (chA-2) ⟆ alarm 8: 8oP (chA-37)
		I) Turns power ON again on the controller.	
		II) Turns alarm latch settings OFF once.	
		III) Releases latch on the alarm latch release screen.	LACH (ch1-8)
		IV) Executes release with DI input.	di01 (ch9-39) to di04 (ch9-42)
		V) Executes release with communication.	
④	Abnormal alarm function	Sets alarm relay to ON when abnormality occurs in equipment. (For unit abnormalities, see the page on “Troubleshooting”.)	alarm 1: 1oP (chA-2) ⟆ alarm 8: 8oP (chA-37)
⑤	De-energizing function	Transmits to the alarm relay by excitation/non-excitation of an alarm output. (When function is ON, output will be by non-excitation.)	alarm 1: 1oP (chA-2) ⟆ alarm 8: 8oP (chA-37)

ON delay function



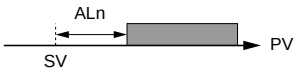
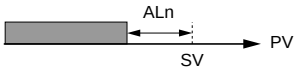
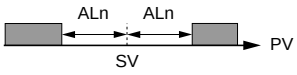
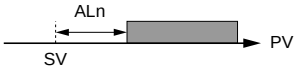
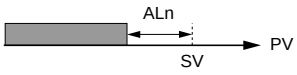
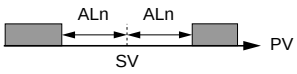
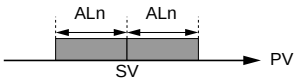
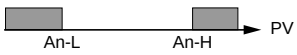
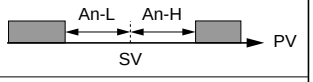
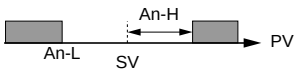
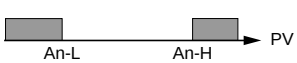
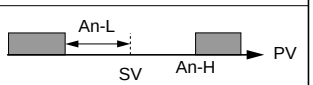
De-energizing function

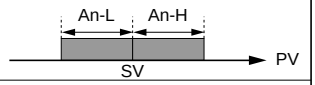
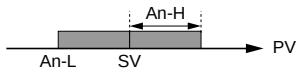
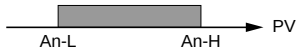
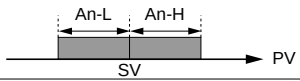
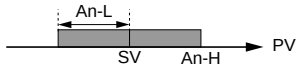
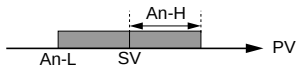
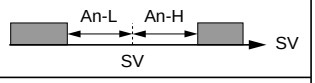
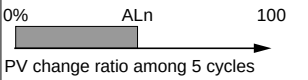
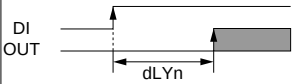
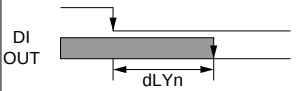
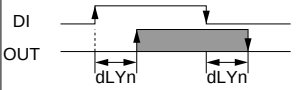


Caution When the power is off, even when the non-excitation function is ON, there will be no output during standby. (Function will be OFF.)

[Table 1] Alarm Operation Type Codes

Parameter: 1TP (chA-1) to 8TP (chA-36)

	1TP to 8TP	Alarm Type	Operation Diagram
	0	No alarm	
Absolute value Alarm	1	Upper limit absolute	
	2	Lower limit absolute	
	3	Upper limit absolute (w/hold)	
	4	Lower limit absolute (w/hold)	
Deviation Alarm	5	Upper limit deviation	
	6	Lower limit deviation	
	7	Upper/lower limit deviation	
	8	Upper limit deviation (w/hold)	
	9	Lower limit deviation (w/hold)	
	10	Upper/lower limit deviation (w/hold)	
Range Alarm	11	Range upper/lower limit deviation	
Upper/ lower limit Alarm	16	Upper/lower limit absolute	
	17	Upper/lower limit deviation	
	18	Upper limit absolute Lower limit deviation	
	19	Lower limit absolute Upper limit deviation	
	20	Upper/lower limit absolute (w/hold)	
	21	Upper/lower limit deviation (w/hold)	
	22	Upper limit absolute Lower limit deviation (w/hold)	
	23	Upper limit deviation Lower limit absolute (w/hold)	

	1TP to 8TP	Alarm Type	Operation Diagram
Range Alarm	24	Range upper/lower limit absolute	
	25	Range upper limit/lower limit deviation	
	26	Range upper limit absolute Lower limit deviation	
	27	Range upper limit deviation Lower limit absolute	
Range Alarm	28	Range upper limit/lower limit absolute (w/hold)	
	29	Range upper limit/lower limit deviation (w/hold)	
	30	Range upper limit absolute Lower limit deviation (w/hold)	
	31	Range upper limit deviation Lower limit absolute (w/hold)	
Limit	32	SV upper/lower limit	
Rate of change	35	PV rate of change Upper/lower limit	
Timer	36	ON delay timer	
	37	OFF delay timer	
	38	ON/OFF delay timer	

Caution The Hold Function:

This is an alarm for a situation when the alarm does not turn ON immediately, and the value shifts to outside the range once and then reenters within the range, even when the measured value is within the range of the alarm at the time the power is turned on.

Notes)

- After changing the alarm type, confirm the alarm setting values.
  Alarm setting values may change by this change of the alarm type, but this is normal.
- Caution: The alarm latch function cannot be used when using the OFF delay timer.
- ALn : Indicates the AL1 (ch1-10) to AL8 (ch1-31) alarm setting values.
- An-H : Indicates the A1-H (ch1-12) to A8-H (ch1-33) alarm setting values.
- An-L : Indicates the A1-L (ch1-11) to A8-L (ch1-32) alarm setting values.
- dLYn : Indicates the 1dLY (chA-4) to 8dLY (chA-39) alarm ON delay setting values.

7 Setup Procedures of the Controller

1 Input settings

∗ Not necessary if input was specified when ordered.

① Does the input sensor type match the sensor in use?

Select the sensor in use from Table 2 and set to PV1T (ch8-4).

(Example) Set Pv1T (ch8-4) to “7” in the case of a T thermocouple.

↓

② Are the input range settings in the appropriate range for the sensor in use?

The standard ranges for each sensor are shown in Table 2. Select the appropriate temperature range for the equipment in use and set the upper and lower limit values. Lower limit → Pv1b (ch8-2), Upper limit → Pv1F (ch8-1).

(Example) If the temperature range is 0 to 800 [°C]: Set 0 → Pv1b (ch8-2), 800 → Pv1F (ch8-1)

(Note) While it is possible to set outside the standard range, the standard range settings are recommended.

(Note) There are no standard ranges for DC Volt (and DC Current) input. Set the upper and lower limits as you wish. (within the range -19999 to 99999, lower limit < upper limit)

Note 1) Set input sensor type PV1T (ch8-4) and input range settings (Pv1b (ch8-2), Pv1F (ch8-1), and Pv1U (ch8-5)) in advance of all the other settings, and then reset the instrument without fail.
Other parameters may change when these parameters are changed, but this is normal.
Confirm all parameter values. Be sure to reset the instrument after setting the input range. Otherwise improper values may be displayed. Be sure to check the setting after the reset.

2 Control Settings

* Please read if controls are not responding as you expect.

① What is the control purpose? (To heat? To cool?)

Objective	Operation Method	Explanation	Method
To heat	Reverse operation	Raising the measurement value will reduce operation output.	Set rEv1 (ch2-20) to REV.
To cool	Direct operation	Raising the measurement value will increase operation output.	Set rEv1 (ch2-20) to NRML.

② What kind of control is it? (PID, ON/OFF)

Control Type	Explanation	Method
PID control	The output signal changes within the range of 0 to 100% according to PID calculation. A stable control without a control offset can be achieved.	Please execute auto-tuning manually. The optimal P.I.D will be calculated automatically. (The PID value may also be set manually.)
ON/OFF control (2-position control)	Output is either ON (100%) or OFF (0%). (Suitable when frequent output switching is inconvenient.)	Set ch2 P1 (ch2-1) to “0.0”.

[Table 2] Input Codes

Parameter: PV1T, PV2T, AI1T

Input Type	Code
Resistance bulb	
• Pt100Ω (IEC)	1
For thermocouple	
• J	2
• K	3
• R	4
• B	5
• S	6
• T	7
• E	8
• PR40/20	9

Input Type	Code
• N	12
• PL-II	13
• WRe5-26	14
DC voltage	
• 1 to 5V DC	16
• 0 to 5V DC	17
• 0 to 10V DC	18
• 0 to 10mV DC	19
• 0 to 50mV DC	20
DC current	
• 4 to 20mA DC	26
• 0 to 20mA DC	27

Note 2) For Ai1, only DC voltage (code 16 to 18) settings are possible.

[Table 3] Input Range Table (Standard Range)

Parameter: PV1F/PV1B, PV2F/PV2B, AI1F/AI1B

Input Type		Measurement Range (°C)	Measurement Range (°F)
Resistance bulb IEC	Pt100Ω	0 to 150	32 to 302
		0 to 300	32 to 572
		0 to 500	32 to 932
		0 to 600	32 to 1112
		−50 to 100	−58 to 212
		−100 to 200	−148 to 392
		−150 to 600	−238 to 1112
		−150 to 850	−238 to 1562

Input Type		Measurement Range (°C)	Measurement Range (°F)
Thermocouple	J	0 to 400	32 to 752
	J	0 to 1000	32 to 1832
	K	0 to 400	32 to 752
	K	0 to 800	32 to 1472
	K	0 to 1200	32 to 2192
	R	0 to 1600	32 to 2912
	B	0 to 1800	32 to 3272
	S	0 to 1600	32 to 2912
	T	−200 to 200	−328 to 392
	T	−200 to 400	−328 to 752
	E	0 to 800	32 to 1472
	E	−200 to 800	−328 to 1472
	PR40/20	0 to 1800	32 to 3272
	N	0 to 1300	32 to 2372
	PL-II	0 to 1300	32 to 2372
	WRe5-26	0 to 2300	32 to 4172
DC voltage	1 to 5V DC	−19999 to 99999 (Scaling is possible)	
	0 to 5V DC		
	0 to 10V DC		
	0 to 10mV DC		
	0 to 50mV DC		
DC current	4 to 20mA DC		
	0 to 20mA DC		

• To use the Zener barrier for a PT input, user adjustment is required.

Note 1)

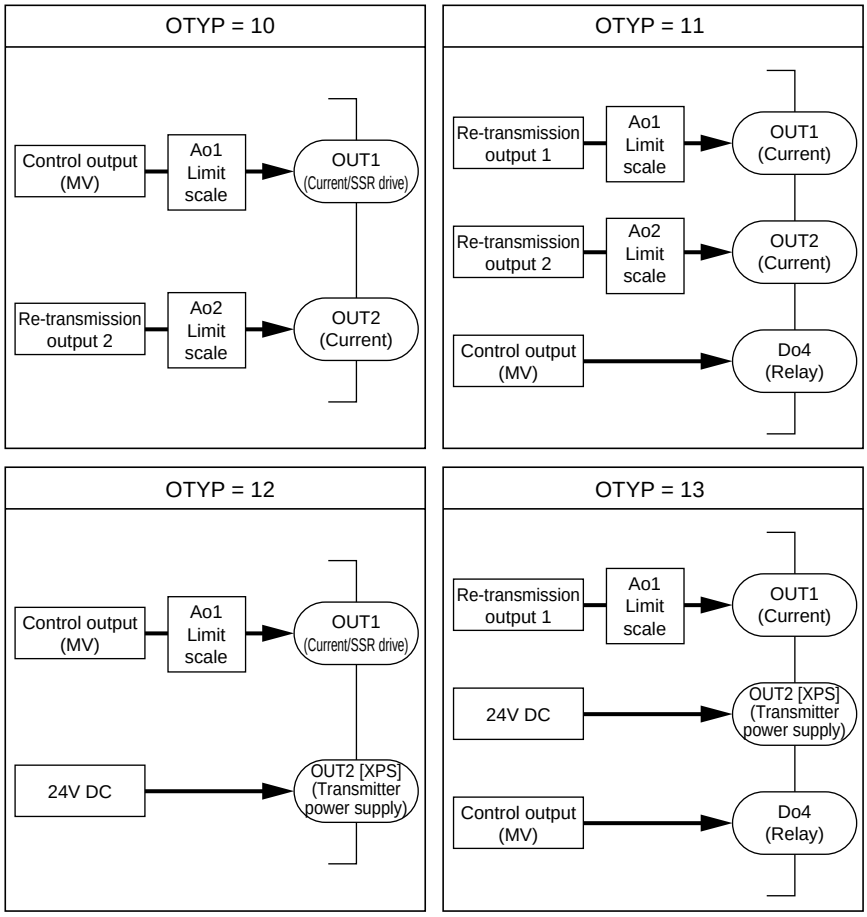
R thermocouple 0 to 500°C
B thermocouple 0 to 400°C
} Proper values may not be displayed within these ranges due to the sensor's characteristics.

Note 2) When using at the setting below the minimum range stated in the table above, the input accuracy is not guaranteed.

Note 3) In the −50%FS to +50%FS display, values under −199.99 will not be displayed.

[Table 4] Output Type Code Table

Parameter: OTYP



[Table 5] Di Input Assignments (Di1 to Di15)

Di1 to Di15 Setting Value	Function	Operating Conditions			
		Status		Edge	
		ON	OFF	↑	↓
0	None	–	–	–	–
1	STBY (standby)	Standby	Normal	–	–
30	AT (Auto tuning)	–	–	AT start	AT stop
40	Alarm latch reset (Alarm1) to (Alarm 8) Release all	–	–	Release all	Latch hold
50 to 57	Timer operating (Alarm1) to (Alarm 8)	ON	OFF	–	–
60	R-ACK (Remote acknowledgement)	Remote	Local	–	–
70	SMV (Manual command)	Manual mode	Auto mode	–	–
80	PV-TRK command (PV tracking)	ON	OFF	–	–
103	EX-MV (External control amount)	EX-MV	MV	–	–
200 to 249	Binary data setting to constant parameter CN01 to CN05 1st digit : Bit position 10th digit : Parameter No.	1 (1bit)	0 (1bit)	–	–

[Table 6] DO and LED display Assignments

DO output	LED display	Type
DO01 to DO04 DO11 to DO15	C1, C2 LDO1 to LDO5	
0	0	No setting
1	1	ALM1
2	2	ALM2
3	3	ALM3
4	4	ALM4
5	5	ALM5
6	6	ALM6
7	7	ALM7
8	8	ALM8
17	17	OR ALM (OR of all the ALMs)
–	21	Output (MV) 1
–	22	Output (MV) 2
29	29	System fault
80	80	Manual MV
81	81	EX-MV command
82	82	Remote SV
83	83	Local SV
84	84	PV tracking
85	85	NORMAL operating
86	86	Auto tuning (AT)
87	87	Remote request
88	88	Remote ACK (R-Ack)
89	89	NOT-A

[Table 7] Standby Operation

STBY setting value	STBO setting value	Operation during Standby		
		MV output	Output other than MV	Display
ON	0	Value of PMv1 (−25% to 125%)	OFF or −25%	ON
	1	Value of PMv1 (−25% to 125%)	OFF or −25%	OFF
OFF	–	Normal	Normal	ON

[Table 8] User Assignable Function Keys

F1 to F3 setting value	Key operation
0	No function
1	DSV display Switches Remote/Auto. (Press for 2 seconds.) Note 1
2	Standby switching (1 second)
3	Alarm latch clear
10	AT (Auto tuning) START/STOP
20	Alarm timer start/stop (ALM1)
21	Alarm timer start/stop (ALM2)
22	Alarm timer start/stop (ALM3)
23	Alarm timer start/stop (ALM4)
24	Alarm timer start/stop (ALM5)
25	Alarm timer start/stop (ALM6)
26	Alarm timer start/stop (ALM7)
27	Alarm timer start/stop (ALM8)

Note 1) Do not use this when TPLT=11,14 (SV select template) is in use, because it shifts to the remote-mode for a moment.

[Table 9] Type of Math function

CALC set value	Name of operation	Math function
0	No operation	PV1
1	Expression 1	$M1= k01\times \sqrt[*1]{PV1} \times \sqrt[*2]{\frac{Ai1+k02}{k03} \times \frac{k04}{PV2+k05}}$
2	Expression 2	$M1= k01\times PV1\times \sqrt[*1]{\frac{Ai1+k02}{k03} \times \frac{k04}{PV2+k05}}$
3	Expression 3	$M1= k01\times PV1\times \frac{Ai1+k02}{k03} \times \frac{k04}{PV2+k05}$
4	Expression 4	$M1= \frac{(k01\times(k02\times PV1+k03\times PV2+k04\times Ai1)+k05)}{(k06\times(k07\times PV1+k08\times PV2+k09\times Ai1)+k10)}$
5	Expression 5	$M1= \frac{(k01\times((k02\times PV1+k03)\times(k04\times PV2+k05)\times(k06\times Ai1+k07))+k08)}{(k09\times((k10\times PV1+k11)\times(k12\times PV2+k13)\times(k14\times Ai1+k15))+k16)}$
6	Expression 6	$M1= k01\times PV1\times(k02\times PV2+k03\times Ai1)+k04\times Ai1+k05$
7	H selector, 2 points	Max (PV1, PV2)
8	L selector, 2 points	Min (PV1, PV2)
9	H selector, 3 points	Max (PV1, PV2, Ai1)
10	L selector, 3 points	Min (PV1, PV2, Ai1)
11	Input switching, 2 points	PV1 when PV1<= k01, PV2 when PV1>k01

*1 Square root extraction cut point can be set at k06.

*2 Square root extraction cut point can be set at k07.

[Table 10] Controller Templates

TPLT = 10 Single-loop basic PID control (with Math function)

Contents of input conditioner
- User adjustment
- Square root extractions
- Input filter

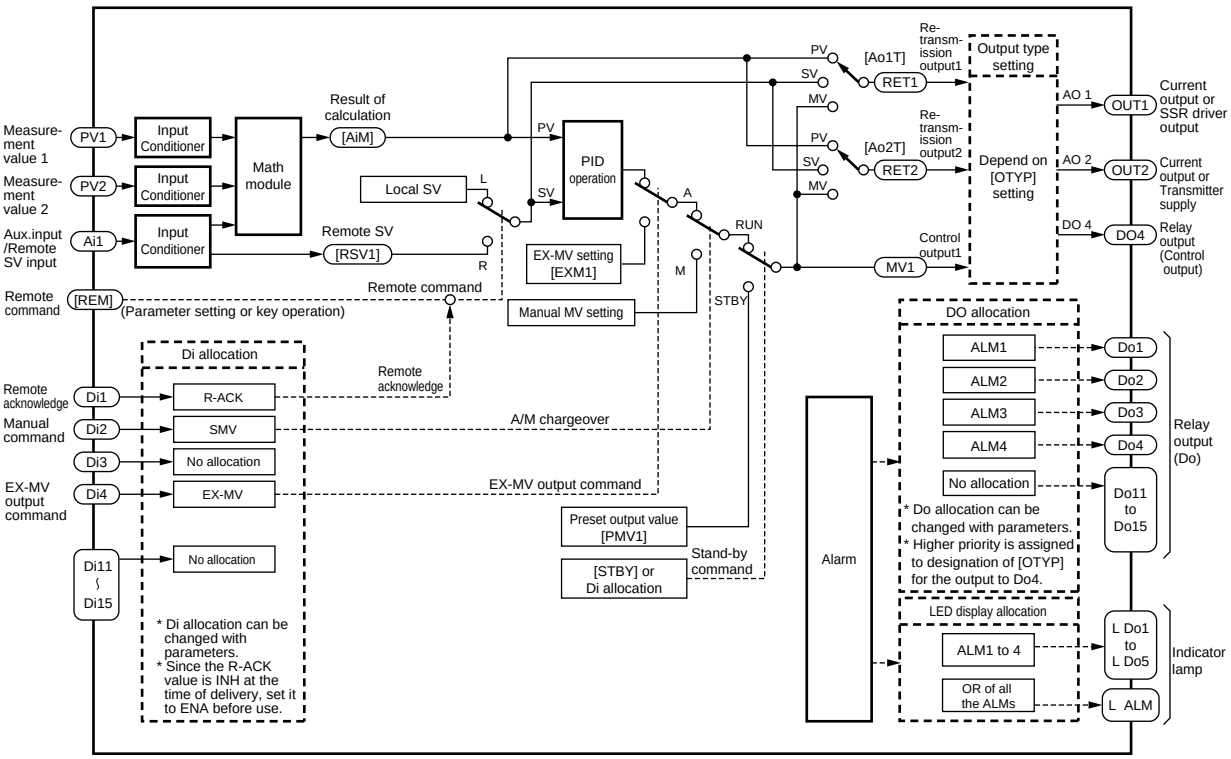
1 The value obtained by calculating the input value for PV1, PV2, and Ai1 can be controlled as PV.

<Operations allowed>
- Flow rate/temperature/pressure corrections
- Averaging (Weighting allowed)
- Maximum/minimum selector
- Input signal switching

(See table 9 for details of mathematical expressions.)

2 The same as Template No.13 except for Math function.

Note) A scale setting [UCF1, UCB1, UCD1 (ch8: 89-91)] must be made in accordance with the range resulting from the Math function.



rPLr = 11 Single-loop SV selection PID control (with Math function)

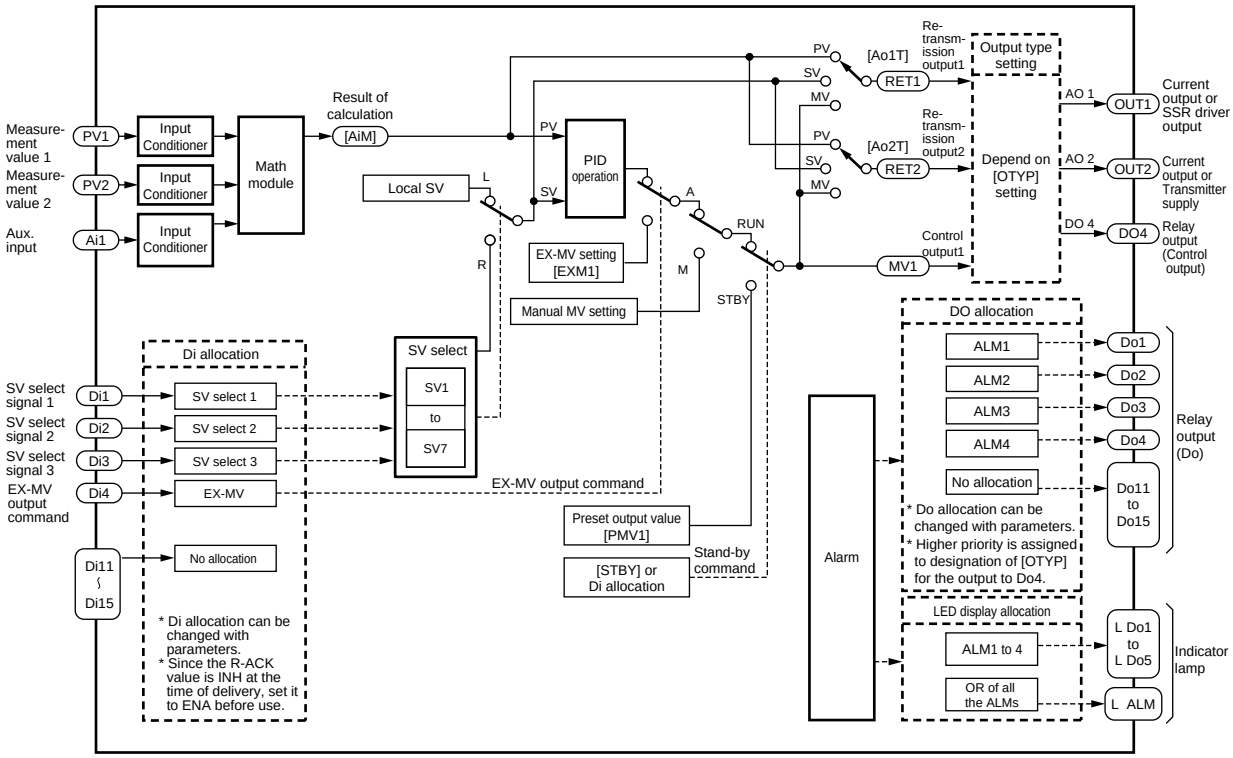
1 The template is used to perform Math function with PV1, PV2, and Ai1 in SV selection type control. (See item **1** in template No.10 for Math function.)

2 The same as template No.14 except for the Math function.

Note) Scale setting [UCF1, UCB1, UCD1 (ch8: 89-91)] must be made in accordance with the range resulting from the Math function.

SV selection signal and SV number to be selected

Selection / SV No.	SV selection Signal 1	SV selection Signal 2	SV selection Signal 3
Local SV	OFF	OFF	OFF
SV1	ON	OFF	OFF
SV2	OFF	ON	OFF
SV3	ON	ON	OFF
SV4	OFF	OFF	ON
SV5	ON	OFF	ON
SV6	OFF	ON	ON
SV7	ON	ON	ON



rPLr = 13 Single-loop basic PID control

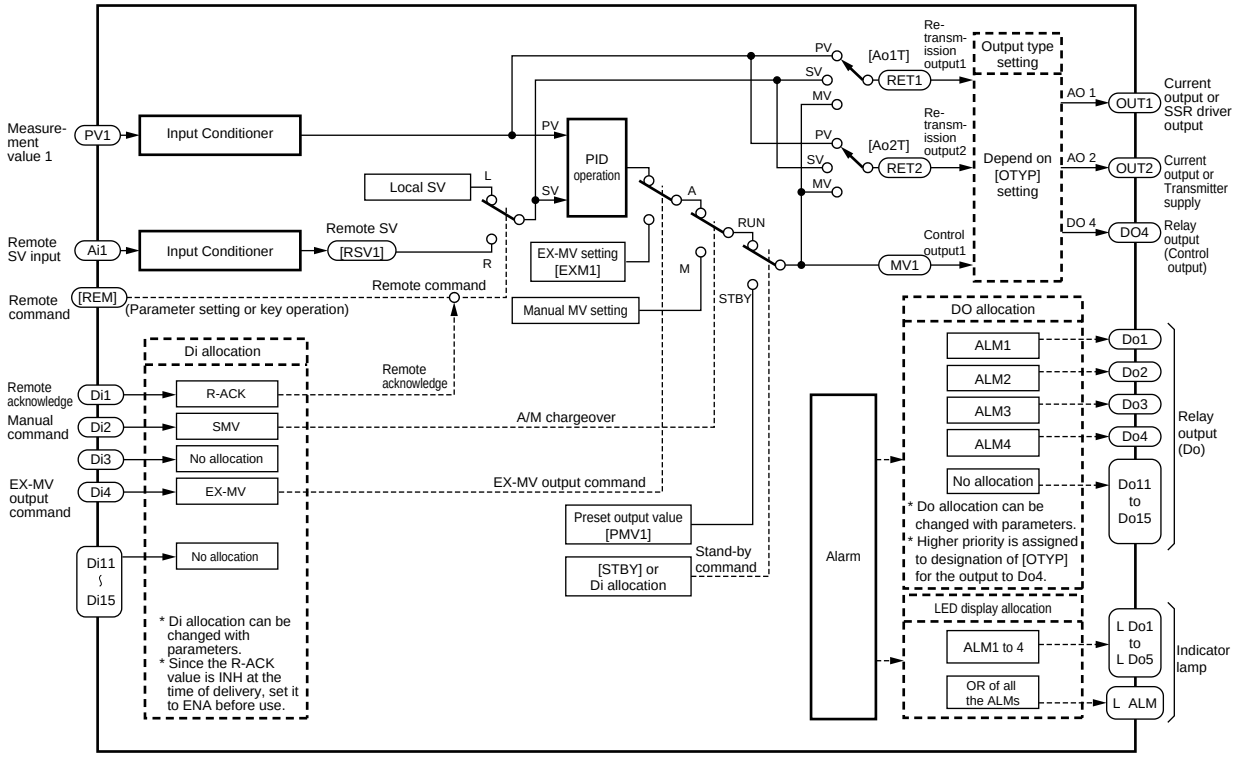
1 This is the most basic control template.

2 Control is allowed in an auto/manual/remote operation mode and by digital input.

3 Set the control output and transfer output with a parameter [OTYP]. (See Table 4 for details.)

4 By changing the digital input (Di) allocations, a standby operation, etc. can be performed. (See Table 5 for details.)

5 Digital output (Do) and LED lamp allocations can be changed. (See Table 6 for details.)



rPLr = 14 Single-loop SV selection PID control

1 Setting value (SV) can be selected by digital input. The SV can be selected from the local (front panel) setting value and 7 pairs of palette setting values (SV of ch3), 8 points in total.

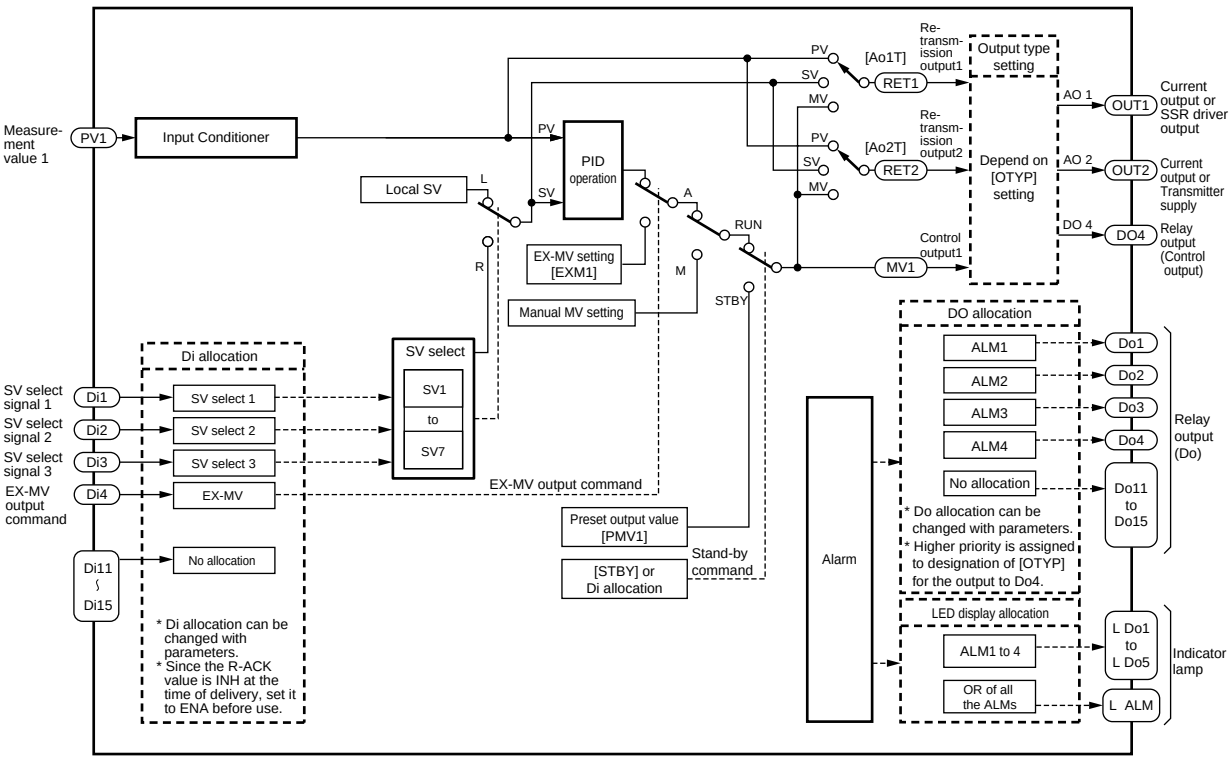
2 PID parameters can be switched according to the SV. (Set PLTS (ch9-31) at SV.)

3 Set control output and transfer output by parameters [OTYP]. (See Table 4 for details.)

4 By changing the allocation of the digital input (Di), a standby operation, etc. can be performed. (See Table 5 for details.)

5 Digital output (Do) and LED lamp allocations can be changed. (See Table 6 for details.)

- SV selection signals and selected SV Nos. are the same as those of template No.11.



8 Troubleshooting
[Please read when the display does not make sense]

Error indications

This Controller has a display function to notify when the equipment is not functioning properly. When a problem occurs, remove the cause immediately.
Once the cause has been removed, turn the power OFF then ON again.

Display	Cause	Control Output
UUUU	① Thermocouple sensor wire broken ② RTD wiring broken ③ PV value above upper limit +5%FS or more ④ RCJ sensor not attached (thermocouple input)	The value of brd1 (CH9-35) is to be the control output (MV). (Kind of output) ① HOLD, ② LO (OFF or lower limit value of the AO) ③ UP (ON or upper limit value of the AO), ④ EXMV
LLLL	① RTD sensor (between A-B) short circuited ② The PV value is at the lower limit of −5%FS or lower.	
LLLL	① When PV value is under −199.99. Note) When a resistance bulb is used, "LLLL" is not displayed even if under −150°C.	Control continues Note) Control continues until below −5%FS. Burnout occurs at below −5%FS.
PV not displaying	Standby mode (STbo (ch9-30) = 1)	The value of PMv1 (CH2-22) is to be the control output (MV).
-19999 or 99999	Display limit is smaller than over range or under range value.	Control continues Note) Control continues until under −5%FS or 105%FS.
Correct PV not displayed	The main unit was not reset or the power was not turned on after the scale setting was changed.	———

When the key operation is not functioning properly.

Key operation may not be performed in the following cases.

Status	Remedy
LoC setting does not allow the parameter the display.	Set LoC (ch1-34) at "0."
Forgot password.	Set the parameter of PS1 at "F1C3." ※ Set parameters PAS1 and PAS2 (ch9:1-2) at 0000 to reset the password.

※ Setting the paremater to "F1C3" displays all parameters.
Please do not change the parameters unnecessarily. It may cause a failure of this main unit.

Model Specification

PXH Model Code

Digit	Description	Notes	Digit → 1 2 3 4 5 6 7 8 9 10 11 12 13
			P X H 9 A 1 – V 0
4	**<Dimension of front face H x W>** 96 x 96 mm		9
5	**<Number of control loops/Function>** 1 loop, PID controller		A
6	**<Measurement value input>** Universal input: 1 point Universal input: 2 points	*1	1 2
7	**<Auxiliary input>** Without DC voltage: 1 point		0 1
8	**<Version No.>**		1
9	**<Output>** OUT1 / OUT2 Current / Not fitted Current / Current Current / Transmitter supply SSR/SSC driver / Not fitted SSR/SSC driver / Current		1 2 5 A B
10	**<Power supply>** 100 to 240 V AC		V
11	**<Communication interface>** Without RS-485		0 R
12	**<Digital input/output>** Digital input / Digital output (Includes control output (Relay)) 4 points (Di1-4) / 2 points (Do3, Do4) 4 points (Di1-4) / 4 points (Do1-4) 9 points (Di1-4, Di11-15) / 9 points (Do1-4, Do11-15)	*1	0 A B
13	**<Additional specifications>** Not fitted.		0

*1: “2” at the 6th digit and “B” at the 12th digit cannot be assigned simultaneously.

Specificaitons

(1) Power voltage	100 (−15%) to 240V AC (+10%) 50/60Hz		
(2) Power consumption	100V AC	:	15VA or less
	220V AC	:	20VA or less
(3) Normal operation conditions	Ambient temperature	:	−10°C to 50°C
	Ambient humidity	:	90%RH or less (no dew condensation)
	Storage temperature	:	−20°C to 60°C
	Warm-up time	:	15 min. or longer
(4) Input	Input signal	:	RTD, thermocouple, DC voltage, DC current (multi input) Refer to Table 3.
	Input indication accuracy		
	Thermocouple	:	±0.1% of FS ±1digit ±1°C or ±1.5°C whichever is higher. however, Thermocouple B : 0 to 400°C, ±5% of FS ±1digit ±1°C Thermocouple R : 0 to 500°C, ±1% of FS ±1digit ±1°C
	Resistance bulb	:	±0.1% of FS ±1digit or ±0.25 °C whichever is higher
	DC voltage, DC current	:	±0.1% of FS 1digit
	Input sampling cycle	:	50ms
	Input impedance		
	Thermocouple/voltage (mV)	:	1MΩ or more
	Voltage	:	1MΩ
	Current	:	250Ω
	Allowance input voltage		
	Voltage (V)	:	+35V/−10V DC
	Current	:	±25mA DC
	Thermocouple/resistance bulb/voltage (mV)	:	±5V
	Noise reduction ratio		
	Normal mode	:	40dB (50/60Hz) or more
	Common mode	:	120dB (50/60Hz) or more
	Input value correction		
	User adjustment	:	±50% of FS each at zero, span
	Square-root extraction	:	0.0 to 125.0 at OFF or cut point
	First-order lag filter	:	0.0 to 900.0 seconds
	Effect of source resistance/permissible wiring resistance		
	Thermocouple, voltage input (mV)	:	0.1% FS per 100Ω
	Power supply input (V)	:	0.1%FS per 500Ω
	Resistance bulb input	:	10Ω or less (per cable)
(5) Relay contact output	Contact capacity	:	220V AC / 30V DC, 3A (resistance load) 220V AC / 30V DC, 1A (induction load)
(6) SSR/SSC drive output (voltage pulse output)	ON	:	12V DC (10 to 15V DC)
	OFF	:	0.5V DC or less
	Max. current	:	20mA DC
	Load resistance	:	600Ω or over

(7) DC output (4 to 20mA DC)	No. of points	: Max. 2 points (with re-transmission output)
	Accuracy	: ±0.2%FS
	Linearity	: ±0.2%FS
	Load resistance	: under 600Ω
(8) Digital input	No. of Input	: Max. 9 points
	Specifications	: Non-voltage contact or transistor input
	Contact capacity	: 12V DC, 2mA
	Input pulse width	: 200ms or more
(9) Digital output	Digital output1 to 3	: 1a (SPST) contact, 220V AC / 30V DC, 1A (resistance load)
	Digital output 4	: 1c (SPDT) contact, 220V AC / 30V DC, 1A (resistance load)
	Digital output 11 to 15	: 1a (SPST) contact, 220V AC / 30V DC, 1A (resistance load)
(10) Auxiliary analog input	No. of Input	: 1 point
	Input signal	: 1 to 5V DC / 0 to 5V DC / 0 to 10V DC
	Input accuracy	: ±0.2%FS
(11) Analog re-transmission output	No. of output	: 2 point at max.
	Output signal	: Current output (4 to 20mA DC)
	Accuracy	: ±0.2%FS
	Linearity	: ±0.2%FS
	Load resistance	: under 600Ω
	Output contents	: PV, SV, DV, MV re-transmssion
	Scaling function	: Provided
(12) Transmitter power supply output	No. of output	: 1 point
	Rating	: 24V DC (17 to 30V DC), max. current 23mA (short circuit protection)
(13) Communications functions *1	RS-485 Interface	
	Protocol	: Modbus-RTU standard
	Transmission speed	: 9600bps, 19200bps, 38400bps
	Transmission distance	: Max. 500m (total connected length)
	Transmission method	: Asynchronous (Half-duplex bit serial)
	Data format	: Data length: 8 bits odd/even/none

*1 Recommended converter

RC-77 (insulted) from RA Systems Corp. http://www.ras.co.jp

K3SC-10 (insulted) from Omron Corp. http://www.omron.co.jp

Modbus RTU is a trademark of Modicom.