DIGITAL CONTROLLER PXH

PXH9 is a 96 × 96 mm, high-performance digital controller that assures high-speed and high-accuracy control.
With its abundant and flexible input/output points and powerful math function, it can be used for wide range of applications including not only temperature control but also process control of pressure, flow rate, etc.

FEATURES

1. High-speed and high-accuracy control
   - High-speed control in sampling cycle of 50 ms
   - Highly accurate input indication of ±0.1% FS
   - Measurement resolution of 0.01°C (Resistance bulb input)
2. Multitude of input/output points (including options)
   - Universal measurement input: 2 points
        (Thermocouple/Resistance bulb/Voltage/Current)
   - Analog input: 1 point
   - Analog output: 2 points
   - Digital input: 9 points
   - Digital output: 9 points
   - Transmitter power supply
3. Substantial communication function
   - PC Loader interface equipped as standard
   - RS485 (Modbus RTU) communication function (Option)
4. Strong math function
   - It is possible to meet to various applications of the correction processing and the input switching, etc. by the numeric operation between two or three inputs.
5. Complex setting achieved by easy operation
   - The controller template function provides the automatic allocation of the input/output function and the internal control block corresponding to the control type.
6. Excellent user-friendliness
   - Multi-function, large LED display of excellent visibility
   - Provision of three function keys whose function allocation can be changed
   - IP66 waterproof front face (NEMA-4X)
   - Compact size with the depth of only 81.5 mm

SPECIFICATIONS

1. General specifications

(1) Power supply voltage:
   100V (-15%) to 240V (+10%) AC, 50/60 Hz

(2) Power consumption:
   15 VA or less (100 V AC)
   20 VA or less (220 V AC)

(3) Insulation resistance:
   20 MΩ or more (500 V DC)

(4) Withstand voltage:
   Power supply ↔ All terminals;
      1500 V AC for 1 minute
   Relay output ↔ All terminals;
      1500 V AC for 1 minute
   Others; 500 V AC for 1 minute

(5) Applicable standard (plan):
   UL, C-UL, CE Mark

2. Input section
2-1 Measurement value input

(1) Number of inputs: 1 or 2 (Option)

(2) Input signal type:

Thermocouple	:J, K, R, B, S, T, E, PR40/20, N, PL-II, WRe5-26
Resistance bulb	:Pt100Ω (3-wire)
Voltage	:0 to 10 mV DC, 0 to 50 mV DC, 1 to 5 V DC, 0 to 5 V DC, 0 to 10 V DC
Current	:4 to 20 mA DC, 0 to 20 mA DC

(3) Measurement range:
Refer to the measurement range table.

(4) Input indication accuracy (Ambient temperature: 23°C):
 • Thermocouple: (±0.1%FS±1digit±1°C) or ±1.5°C, whichever is larger

Thermocouple B: 0 to 400°C range;
±5%FS±1digit±1°C
Thermocouple R: 0 to 500°C range;
±1%FS±1digit±1°C
 • Resistance bulb input:
(±0.1%FS±1digit) or ±0.25°C, whichever is larger
 • Voltage input, current input:
±0.1%FS±1digit

(5) Input sampling cycle: 50 ms

(6) Input impedance
 • Thermocouple, voltage input (mV): 1 MΩ or more
 • Voltage input (V): 1MΩ
 • Current input: 250Ω

(7) Influence of source resistance / Permissible wiring resistance
 • Thermocouple, voltage input (mV):0.1%FS per 100Ω
 • Voltage input (V): 0.1%FS per 500Ω
 • Resistance bulb input: 10Ω or less (per cable)

(8) Permissible input voltage
 • Voltage (V) input: +35 V / -10 V DC
 • Current input: ±25 mA DC
 • Thermocouple/Resistance bulb/Voltage (mV) input: ±5 V DC

(9) Noise reduction ratio
 • Normal mode: 40 dB (50/60 Hz) or more
 • Common mode: 120 dB (50/60 Hz) or more

(10) Input value correction function (Input conditioner)
 • User adjustment:
±50%FS both for zero point and span point
 • Square-root extractor:
OFF or cut point from 0.0 to 125.0%
 • Input filter: 0.0 to 900.0 sec. for time constant.

2-2 Auxiliary analog input (Option)

(1) Number of inputs: 1

(2) Input signal
 DC voltage: 1 to 5 V DC / 0 to 5 V DC / 0 to 10 V DC

(3) Input accuracy: ±0.2%FS

(4) Sampling cycle: 100 ms

(5) Input impedance: 1 MΩ

(6) Influence of source resistance: 0.2%FS per 500Ω

(7) Permissible input voltage: +35 V / -10 V DC

(8) Noise reduction ratio
 • Normal mode: 40 dB (50/60 Hz)
 • Common mode: 120 dB (50/60 Hz)

(9) Input value correction function
 • User adjustment:
±50%FS both for zero point and span point
 • Square-root extractor:
OFF or cut point from 0.0 to 125.0%
 • Input filter: 0.0 to 900.0 sec. for time constant.

2-3 Digital input (DI)

(1) Number of points:
Basic: 4 (Di1-4)
Expansion: 5 (9 points in total at max.)

(2) Specifications: Contact or transistor input

(3) Contact capacity:
12 V DC, Approx. 2 mA (per point)

(4) Detection pulse width: 200 ms or more

(5) Function: Control mode changeover, EX-MV selection, SV changeover, Control run/standby, Auto-tuning start,Built-in timer start, Alarm latch cancel.

2-4 Math function

(1) Kind of formula:
Select by the parameter setting.
(flow compensation, Average, Hi/Lo selector, input selector)

(2) Operation parameter:
Analog input (PV1, PV2, Ai1),
Constant (K01 - K16)

(3) Data type: Engineering unit (with floating point)

3. Output section

3-1 Control output

(1) Number of points: 1

(2) Type: Select one as follows.

1. Relay contact output
- Contact structure: SPDT contact (Do4 used)
- Contact capacity:
  - 220V AC / 30 V DC, 3A (Resistive load)
  - 220V AC / 30 V DC, 1A (Inductive load)
- Life: 100,000 operations (rated load)

2. SSR/SSC driver output (Voltage pulse)
- Rating: 12 V DC (10 to 15 V DC) / Maximum current: 20mA (provided with protection against short circuit)
- Load resistance: 600Ω or more

3. Current output (4 to 20 mA DC)
- Accuracy: ±0.2%FS
- Linearity: ±0.2%FS
- Load resistance: 600Ω or less

3-2 Digital output

(1) Number of points:
- Basic: 2 (Do3, 4)
- Expansion: Maximum 7 (9 points in total at max.)

(2) Specifications:
- Contact structure:
  - SPST contact (except for Do4)
  - SPDT contact (Do4)
- Contact capacity:
  - 220 V AC / 30 V DC, 1A (Resistive load)
- Life: 100,000 operations (rated load)

(3) Function: Alarm output, timer output, control output (Do4)

(4) Others: Do4 is control output when relay is selected as control output.

3-3 Analog re-transmission output

(1) Number of points: 2 at max.

(2) Type: Current output (4 to 20 mA DC)
- Accuracy: ±0.2%FS
- Linearity: ±0.2%FS
- Load resistance: 600Ω or less

(3) Output contents: PV, SV, MV, DV

(4) Restriction: The sum of control output (current or SSR/SSC drive), analog re-transmission output and transmitter power supply output are 2 points at maximum.

3-4 Transmitter power supply output

(1) Number of points: 1 at max.

(2) Rating: 24 V DC (17 to 30 V DC), Maximum current; 23 mA (with short circuit protection)

(3) Restriction: The sum of control output (current or SSR/SSC drive), analog re-transmission output and transmitter power supply output are 2 points at maximum.

4. Control function

4-1 Controller type

(1) Control system
- Advanced PID control with Auto-tuning

(2) Controller template

By selecting parameter, control blocks and I/O definitions suitable for the target of control can be selected from the various types of templates provided.
- 1 loop fixed setpoint controller
- 1 loop fixed setpoint controller (SV selectable)

4-2 Control parameter

- Proportional band (P): 0.0 to 999.9%, ON/OFF (2-position) operation at P=0
- Integral time (I): 0.0 to 3200.0 sec., Integral operation OFF at I=0
- Derivative time (D): 0.0 to 999.9 sec., Derivative operation OFF at D=0
- Anti-reset windup: 0 to 100% of measurement range
- Proportion cycle: 1 to 150 sec., For SSR/SSC drive or relay output only
- Hysteresis width: 50% of measurement range, For ON/OFF operation only
- Control cycle: 50 ms
- Number of SV and PID sets: 7sets
- Method of changing PID sets: Selected by parameter, SV reference, PV reference

4-3 Control mode

(1) Type of mode: Auto/Manual/Remote

(2) Changeover: Available via key, Digital input and Communication.

Auto ↔ Manual: With balanceless, bumpless

Auto/Manual ↔ Remote: With balance, bumpless

5. Alarm function

5-1 Number of alarm points
• 8 points for setting

5-2 Type of alarm
• PV value (upper/lower limit, absolute/deviation, band), PV variation ratio, SV upper/lower limit, main unit error

<Optional operation>
- Hold (standby) function
- Alarm latching
- Excitation/non-excitation
- Operation delay: 0 to 9999 sec., 0 to 9999 min.

5-3 Alarm output
• Allocated to DO1 - DO4 and DO11 - DO15 (Allocation change available.)

6. Communication function

6-1 PC Loader interface
(1) Number of points: 1

(2) Physical specifications: EIA RS232C

(3) Protocol: Modbus-RTU

(4) Communication method:
              3-wire, half-duplex, bit serial asynchronous communication

(5) Data type, Data length:
              8 bits, Parity; Odd/Even/None

(6) Communication speed:
              9600 bps, 19200 bps, 38400 bps

(7) Connector: 3-pole, 2.5 mm dia. Sub-miniature jack
              * Special cable is prepared as option.

6-2 RS-485 interface
(1) Number of points: 1

(2) Physical specifications: EIA RS485

(3) Protocol: Modbus-RTU

(4) Communication method:
              2-wire, half-duplex, bit serial asynchronous communication

(5) Data type, Data length:
              8 bits, Parity; Odd/Even/None

(6) Communication speed:
              9600 bps, 19200 bps, 38400 bps

(7) Connection topology:
              Multi-drop, Up to 32 units can be connected including master device

(8) Communication distance:
              500 m max. (Total length of connection)

7. Operation/display section

7-1 Parameter setting
• Digital setting by UP/DOWN key
• Key-lock function provided
• User function key (3 keys) provided

7-2 Display
(1) Type: LED

(2) Display contents
  Measurement value display:
              7 segments, 5 digits (red), Character height; 20 mm
  Setting display: 7 segments, 5 digits (orange), Character height; 13 mm
  Auxiliary display:
              7 segments, 2 digits (orange), Character height; 12 mm
  Bar graph: 12 segments (orange)
  Status display indicator lamp:
              Standby, control mode (R/A/M), output, alarm

8. Processing at power failure
• Memory protection: Non-volatile memory

9. Self diagnosis
• System: Program error monitoring by watchdog timer

10. Operation and storage conditions
(1) Ambient operating temperature: -10 to 50°C

(2) Storage temperature: -20 to 60°C

(3) Ambient humidity for use/storage:
              90% RH or less (non-condensing)

(4) Warm-up time: 15 min. or longer

11. Structure
(1) Mounting method: Panel flush mounting

(2) External terminal: M3 screw terminal

(3) Case
• Material: Plastic (Flame-resistant, UL94V-0)
• Color: Gray

(4) Protection
• Faceplate: IEC IP66, NEMA-4X-equivalent (When mounted on panel with our genuine packing. Waterproof feature unavailable in side-by-side mounting.)
• Body: IEC IP20 (Provided with slits on top and bottom faces)
• Terminal section: IEC IP00. Terminal cover can be mounted (option).

(5) External dimension:
              96 (W) x 96 (H) x 81.5 (D) mm
              * "D" is the depth from the front face of the panel (not including terminal cover).

(6) Mass: Approx. 500 g

12. Range of delivery

- Controller   ...... 1 piece
- Instruction manual   ...... 1 piece
- CD-ROM   ...... 1 piece
  - Contents: User's Manual
    - Communication function Manual
    - PC Loader software
    - PC Loader software Manual
- Mounting bracket   ...... 2 pieces
- Packing for waterproof ...... 1 piece
- Terminator(100Ω)   ...... 1 piece (only for the model with communication function)

13. PC Loader Software

(1) System requirements
- PC: IBM PC-AT or Compatible.
- Operation System:
  - Confirmed on
    - Windows 2000 (English)
    - Windows XP (English)
- RAM: 128MB or more (Recommended)
- HDD capacity: 100MB or more (Empty area)
- CD-ROM drive: Required
- Display Resolution: 1024×768 dots

(2) Connection to the PXH controller
- Via PC Loader interface (Cable: option)
  or
  Via RS485 communication (RS485 function is necessary for PXH)

BLOCK DIAGRAMS (CONTROLLER TEMPLATES)

Template No. 10   1-Loop Basic PID controller with Math function
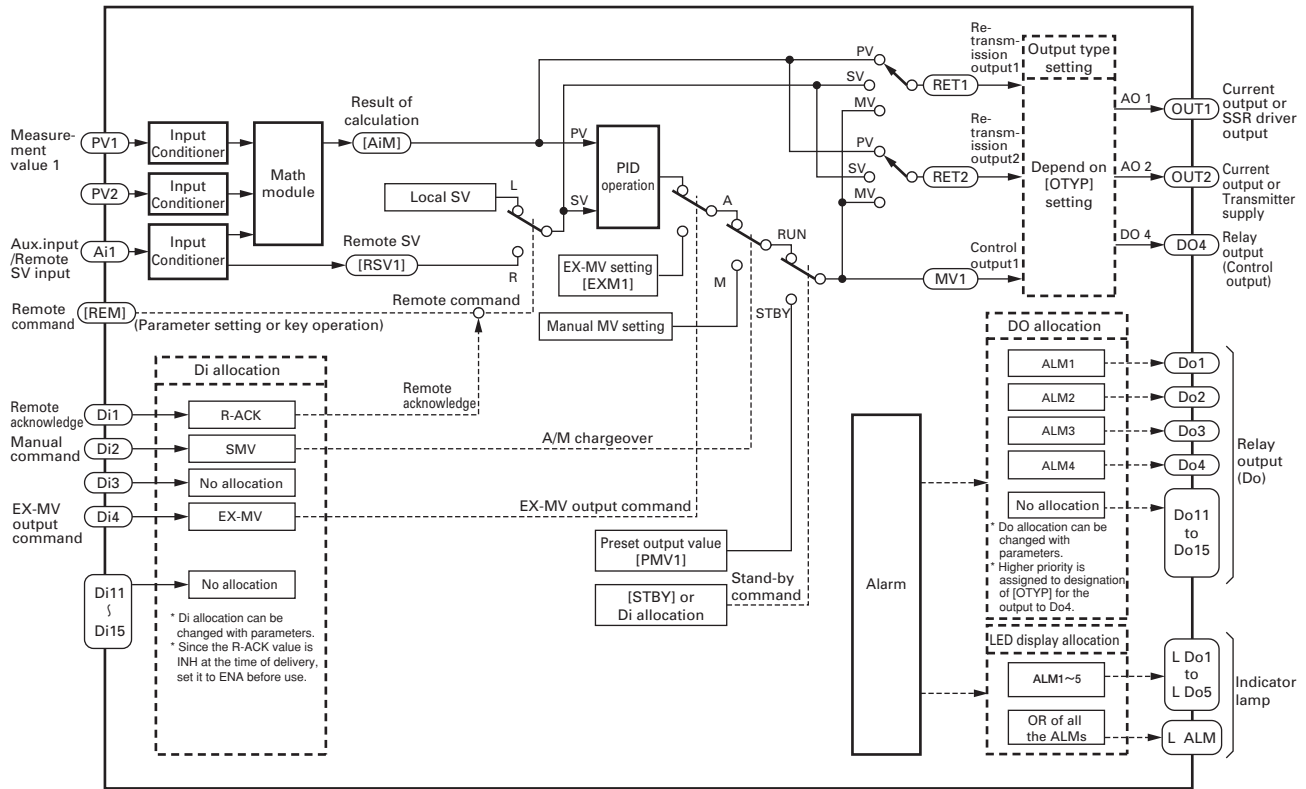
Template No. 11   1-Loop PID controller (SV selectable) with Math function

Template No. 13 1-Loop Basic PID controller

Measurement value 1 — (PV1) — Input Conditioner — PV

Remote SV input — (Ai1) — Input Conditioner — Remote SV [RSV1] — R

Remote command — [REM] — (Parameter setting or key operation)

Local SV — L

Remote command

PID operation — SV

EX-MV setting [EXM1]

Manual MV setting

Remote acknowledge

A/M chargeover

A — RUN — M — STBY

PV / SV / MV — RET1 — Re-transmission output1
PV / SV / MV — RET2 — Re-transmission output2
MV1 — Control output1

Output type setting
Depend on [OTYP] setting

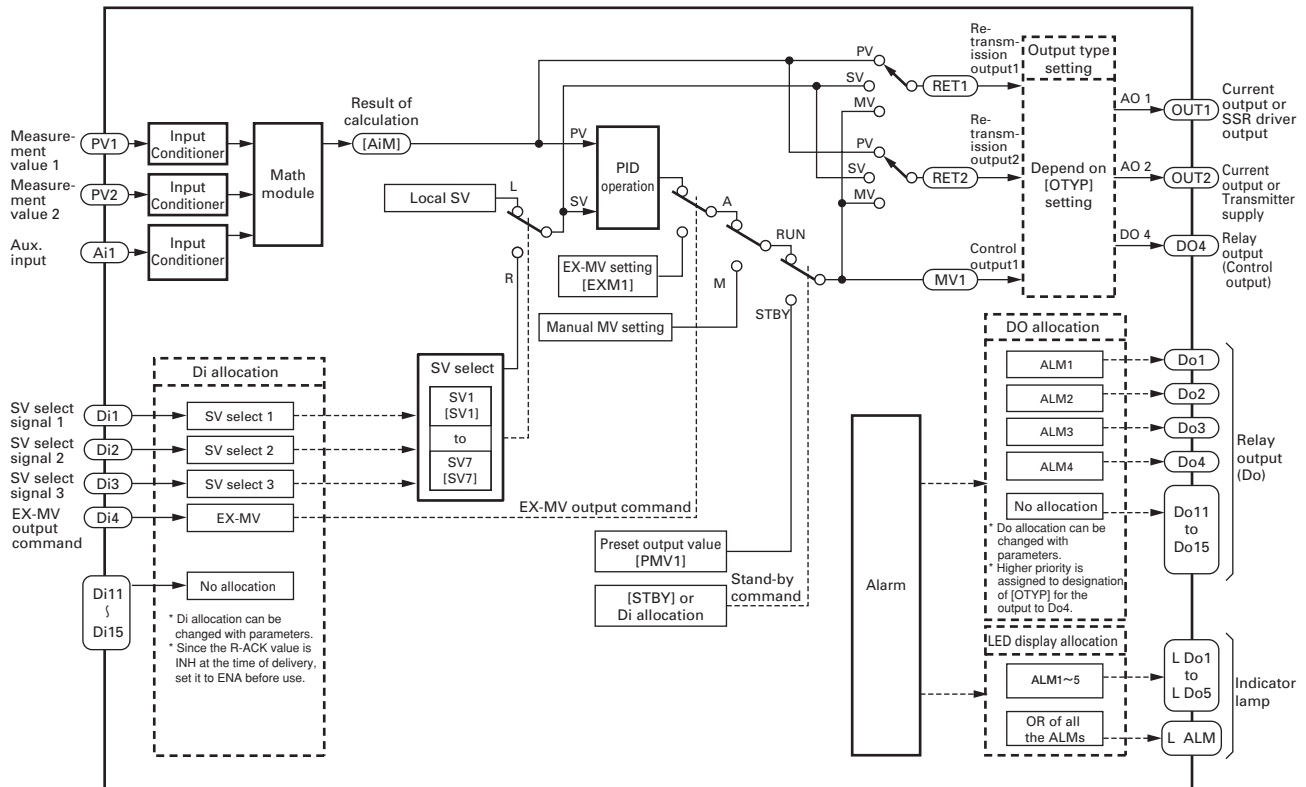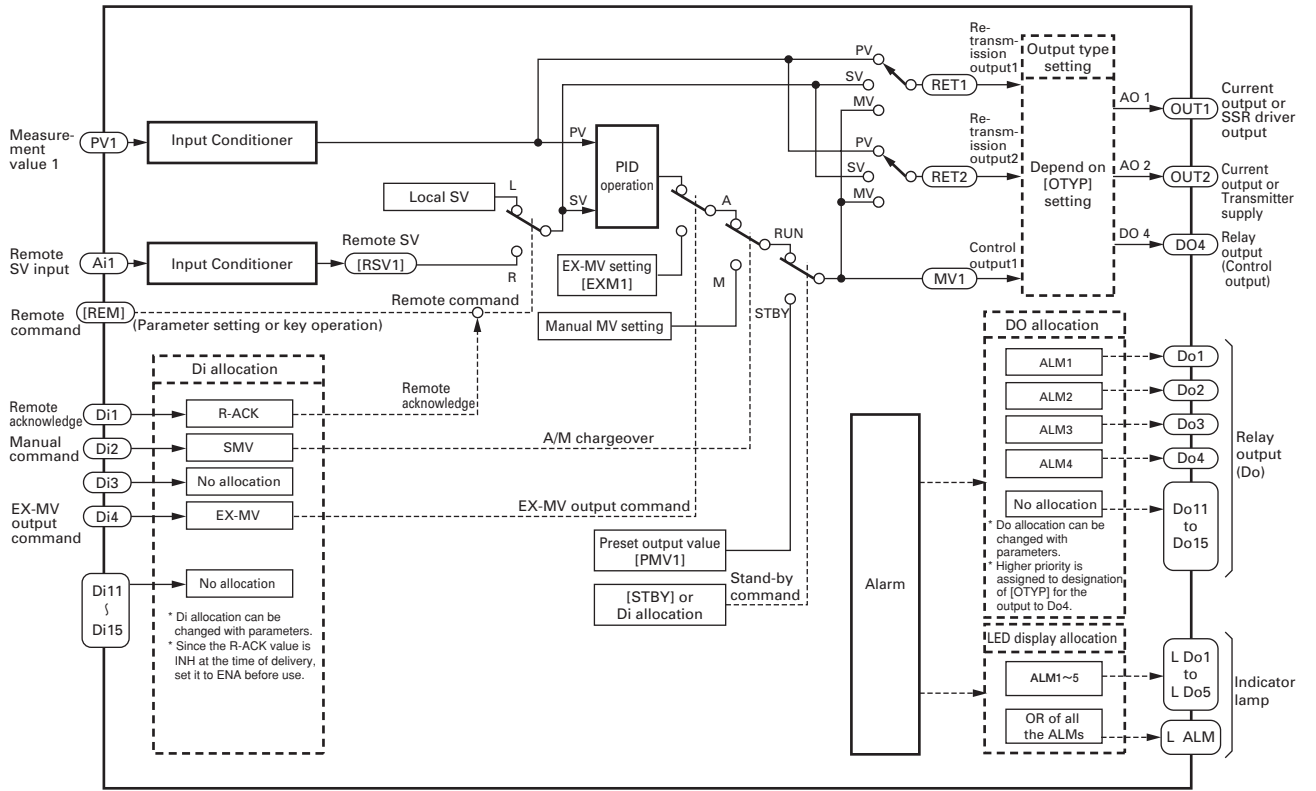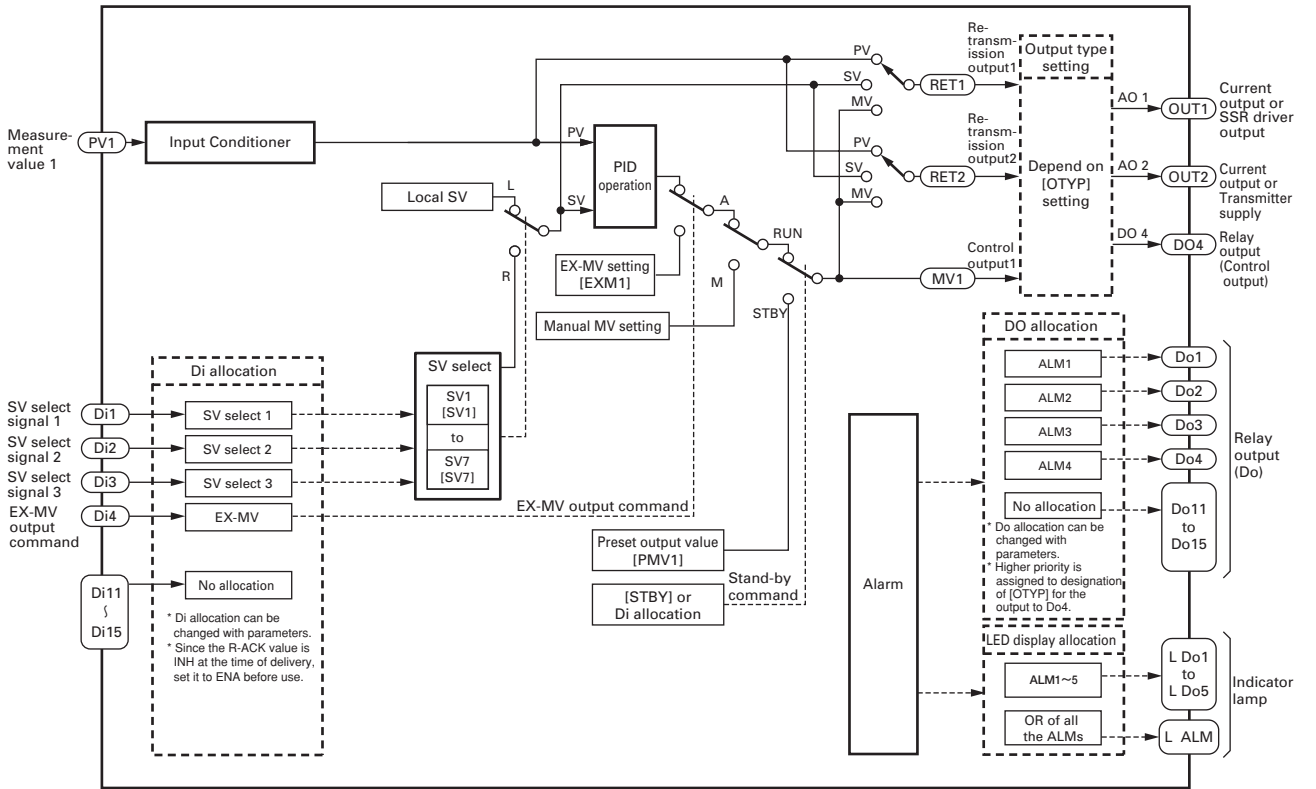AO 1 — (OUT1) — Current output or SSR driver output
AO 2 — (OUT2) — Current output or Transmitter supply
DO 4 — (DO4) — Relay output (Control output)

Di allocation

Remote acknowledge — (Di1) — R-ACK
Manual command — (Di2) — SMV
(Di3) — No allocation
EX-MV output command — (Di4) — EX-MV
(Di11 ∿ Di15) — No allocation

EX-MV output command

* Di allocation can be changed with parameters.
* Since the R-ACK value is INH at the time of delivery, set it to ENA before use.

Preset output value [PMV1]

[STBY] or Di allocation

Stand-by command

Alarm

DO allocation

ALM1 — Do1
ALM2 — Do2
ALM3 — Do3
ALM4 — Do4
No allocation — Do11 to Do15

Relay output (Do)

* Do allocation can be changed with parameters.
* Higher priority is assigned to designation of [OTYP] for the output to Do4.

LED display allocation

ALM1~5 — L Do1 to L Do5
OR of all the ALMs — L ALM

Indicator lamp

Template No. 14 1-Loop PID controller (SV selectable)

Measurement value 1 — (PV1) — Input Conditioner — PV

Local SV — L

PID operation — SV

EX-MV setting [EXM1]

Manual MV setting

R

A — RUN — M — STBY

PV / SV / MV — RET1 — Re-transmission output1
PV / SV / MV — RET2 — Re-transmission output2
MV1 — Control output1

Output type setting
Depend on [OTYP] setting

AO 1 — (OUT1) — Current output or SSR driver output
AO 2 — (OUT2) — Current output or Transmitter supply
DO 4 — (DO4) — Relay output (Control output)

Di allocation

SV select signal 1 — (Di1) — SV select 1
SV select signal 2 — (Di2) — SV select 2
SV select signal 3 — (Di3) — SV select 3
EX-MV output command — (Di4) — EX-MV
(Di11 ∿ Di15) — No allocation

SV select

SV1 [SV1] to SV7 [SV7]

EX-MV output command

* Di allocation can be changed with parameters.
* Since the R-ACK value is INH at the time of delivery, set it to ENA before use.

Preset output value [PMV1]

[STBY] or Di allocation

Stand-by command

Alarm

DO allocation

ALM1 — Do1
ALM2 — Do2
ALM3 — Do3
ALM4 — Do4
No allocation — Do11 to Do15

Relay output (Do)

* Do allocation can be changed with parameters.
* Higher priority is assigned to designation of [OTYP] for the output to Do4.

LED display allocation

ALM1~5 — L Do1 to L Do5
OR of all the ALMs — L ALM

Indicator lamp

CODE SYMBOLS

```
                              1 2 3 4 5 6 7 8   9 10 11 12 13  ← Digit
                              P X H 9       1 –     V       0
```

Digit	Description	Notes												
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	*3							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)	*2 *1										0 A B	
13	<Additional specifications> Not fitted.												0

*1: Universal input 2 points and DI 9 points/DO 9 points (the codes "2" in the 6th digit and the codes "B" in the 12th digit) cannot be specified.

*2: One digital output (Do4) is occupied when relay is allocated as control output.

*3: Explanation of the 9th digit of type code and output terminal function is below.

Terminal	Do4	OUT1		OUT2	
Output Kind	Relay	Current	SSR/SSC driver	Current	
Function* Code	Control output or Digital output	Control output or Re-transmission output	Control output	Re-transmission output	Trensmitter suupply
9th digit 1	○	○	—	—	—
2	○	○	—	○	—
5	○	○	—	—	○
A	○	—	○	—	—
B	○	—	○	○	—

— : Not fitted
○ : Fitted

* The selection of "Function" is specified according to the parameter.
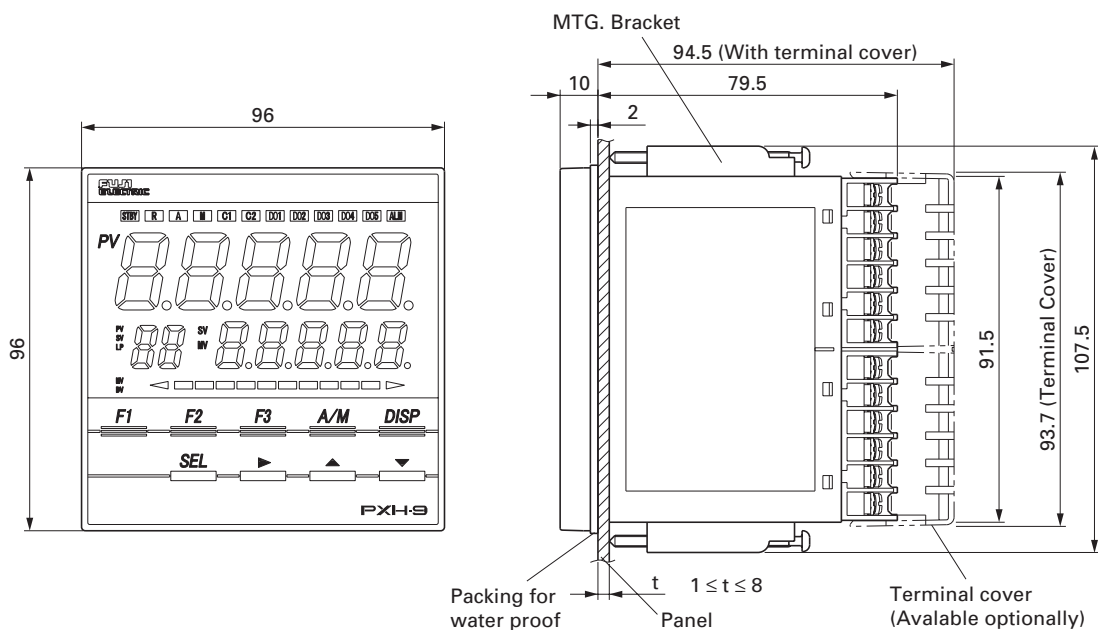
Optional Items

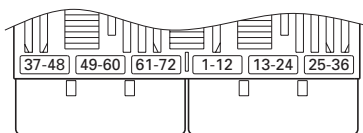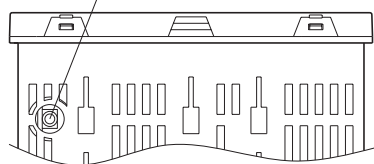| Contents	Model	Notes
Terminal Cover	ZZP PXR1-B230	It is 2 pieces per 1 unit necessary.
PC Loader cable	ZZP PXH1*TK4H4563	RS232C Interface

INSULATION BLOCK DIAGRAM

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	Analog Input 1 (Ai1)
Digital output 11 - 15	Output 1 (Current / SSR driver)
	Output 2 (Current)
	Digital input 1 - 4
	Digital input 11 - 15
	Transmitter power supply
	RS485

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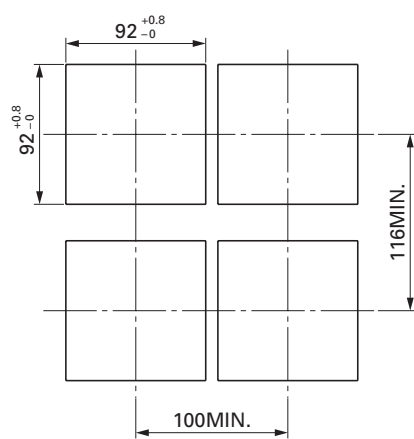
——— Functional insulation (500VAC)
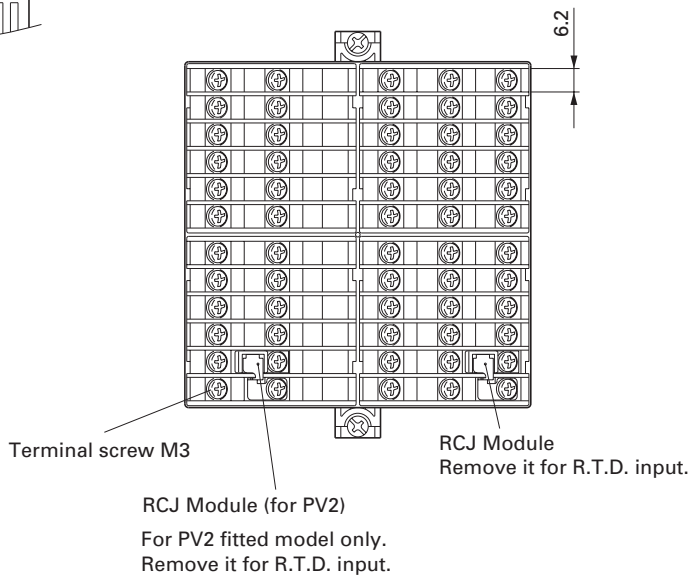
- - - - - - - - No insulation

OUTLINE DIAGRAM (Unit:mm)

MTG. Bracket

94.5 (With terminal cover)

10   79.5

2

96

96

91.5

93.7 (Terminal Cover)

107.5

Packing for water proof

t   1 ≤ t ≤ 8

Panel

Terminal cover (Avalable optionally)

PC Loader Interface

37-48 | 49-60 | 61-72 | 1-12 | 13-24 | 25-36

6.2

PANEL CUTOUT

$92^{+0.8}_{-0}$

$92^{+0.8}_{-0}$

116MIN.

100MIN.

Mounting n units

Terminal screw M3

RCJ Module (for PV2)

For PV2 fitted model only.
Remove it for R.T.D. input.

RCJ Module
Remove it for R.T.D. input.

The dummy cover will be fitted instead of terminal blocks (part of No.37-60) according to the model code not using these terminals.

TERMINAL ALLOCATION
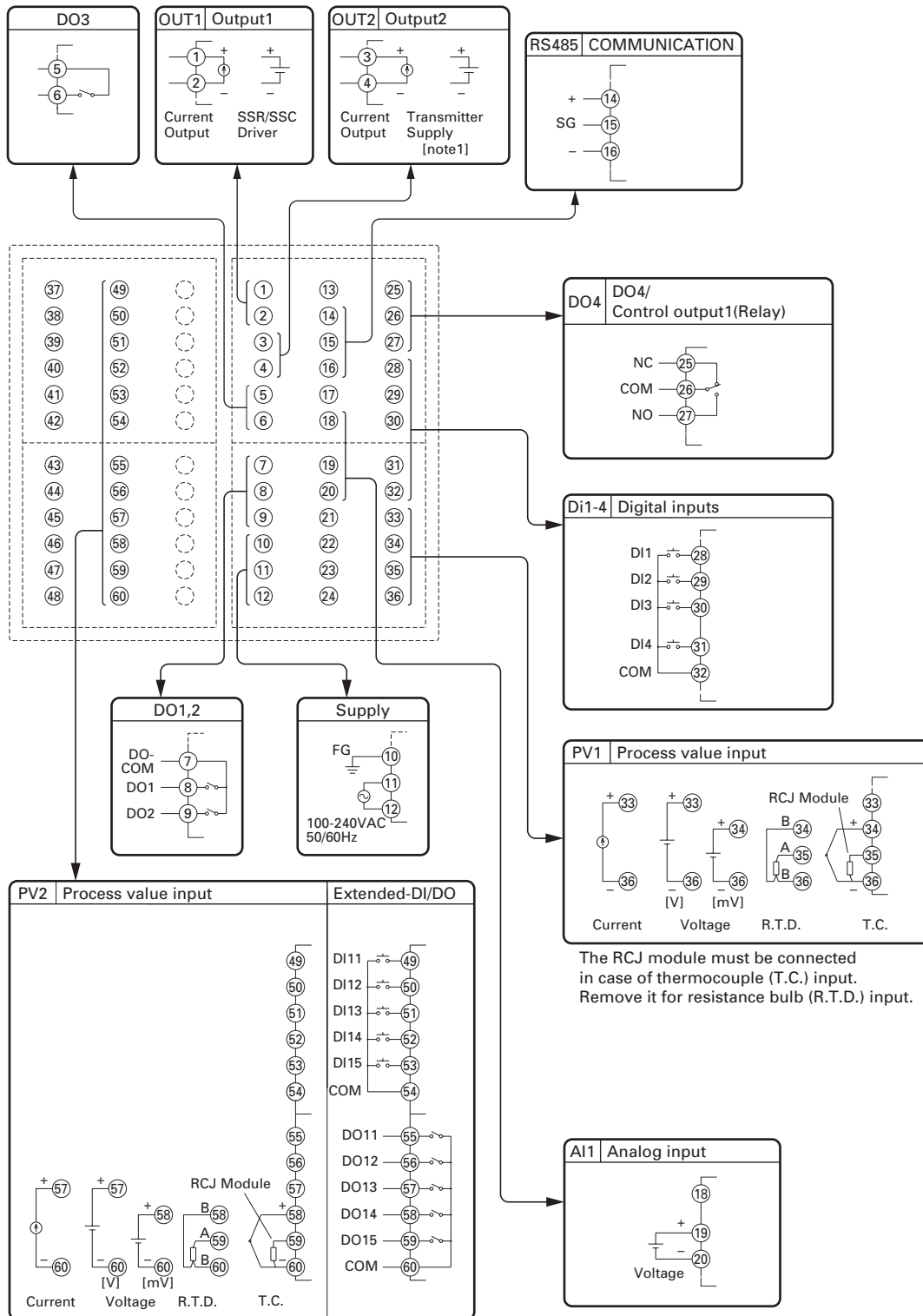
The RCJ module must be connected
in case of thermocouple (T.C.) input.
Remove it for resistance bulb (R.T.D.) input.

The RCJ module must be connected in case of thermocouple (T.C.) input.
Remove it for resistance bulb (R.T.D.) input.

[note1] Connection to the transmitter
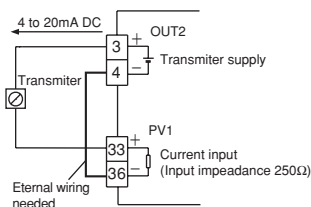
MEASUREMENT RANGE TABLE

① Unit of temperature : ˚C

Input type		Measurement range [˚C]		Reading/setting resolution (˚C)
		Max.	Min.	
Resistance bulb	Pt100Ω	-150 to 850	0 to 150	0.01
Thermocouple	J	0 to 1000	0 to 400	0.1
	K	0 to 1200	0 to 400	0.1
	R	0 to 1600	0 to 1600	0.1
	B	0 to 1800	0 to 1800	0.1
	S	0 to 1600	0 to 1600	0.1
	T	-200 to 400	-200 to 200	0.1
	E	-200 to 800	0 to 800	0.1
	PR40/20	0 to 1800	0 to 1800	0.1
	N	0 to 1300	0 to 1300	0.1
	PL-II	0 to 1300	0 to 1300	0.1
	WRe5-26	0 to 2300	0 to 2300	0.1
DC voltage	1 to 5V DC	-19999 to 99999 (Range where scaling is allowed)		1 / 10000 digit
	0 to 5V DC			
	0 to 10V DC			
	0 to 10mV DC			
	0 to 50mV DC			
Current	4 to 20mA DC			
	0 to 20mA DC			

② Unit of temperature : ˚F

Input type		Measurement range [˚F]		Reading/setting resolution (˚F)
		Max.	Min.	
Resistance bulb	Pt100Ω	-238 to 1562	32 to 302	0.01
Thermocouple	J	32 to 1832	32 to 752	0.1
	K	32 to 2192	32 to 752	0.1
	R	32 to 932	32 to 932	0.1
	B	32 to 3272	32 to 3272	0.1
	S	32 to 2912	32 to 2912	0.1
	T	-328 to 752	-328 to 392	0.1
	E	-328 to 1472	32 to 1472	0.1
	PR40/20	32 to 3272	32 to 3272	0.1
	N	32 to 2372	32 to 2372	0.1
	PL-II	32 to 2372	32 to 2372	0.1
	WRe5-26	32 to 4172	32 to 4172	0.1
DC voltage	1 to 5V DC	-19999 to 99999 (Range where scaling is allowed)		1 / 10000 digit
	0 to 5V DC			
	0 to 10V DC			
	0 to 10mV DC			
	0 to 50mV DC			
Current	4 to 20mA DC			
	0 to 20mA DC			

⚠ Caution on Safety

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