Fuji Electric

PX series
Digital Temperature Controller

MICRO-CONTROLLER X (24 × 48 mm)

MICRO-CONTROLLER X

DATA SHEET

PXR3-2

PXR3 is an ultra-compact temperature controller which accepts thermocouple, RTD, or 1–5 V DC as an input. It provides various control functions such as on/off control, PID control, 8-step ramp soak, and more.

FEATURES

- PID auto-tuning, self-tuning, and fuzzy control
- NEMA 4X watertight front panel
- Re-transmission output, RS-485 communication (option)
- Alarm (2 points), 8-step ramp soak (option)
- Heating/cooling control version available
- External contact input (2 points), timer function (option)

SPECIFICATIONS

1. General specifications

Power supply voltage	100 V (-15%) to 240 V (+10%) AC, 50/60 Hz or 24 V (±10%) AC, 50/60 Hz, 24 V (±10%) DC
Power consumption	≤ 6 VA (100 V AC) ≤ 8 VA (240 V AC, 24 V AC, 24 V DC)
Insulation resistance	≥ 20 MΩ (500 V DC)
Dielectric strength	Power supply↔Ground: 1500 V AC for 1 min Power supply↔Others: 1500 V AC for 1 min Ground↔Relay output: 1500 V AC for 1 min Ground↔Alarm output: 1500 V AC for 1 min Others: 500 V AC for 1 min
Input impedance	Thermocouple: 1 MΩ or more Voltage: 450 kΩ or more Current: 250 Ω (external resistor)
Allowable signal source resistance	Thermocouple: 100 Ω or less Voltage: 1 kΩ or less
Allowable wiring resistance	RTD: 10 Ω or less per wire
Reference junction compensation accuracy	±1ºC (at 23ºC)
Input value correction	±10% of measuring range
Input filter	0 to 900.0 s Configurable in 0.5 s steps (first order lag filter)
Noise reduction ratio	Normal mode noise (50/60 Hz): 50 dB or more Common mode noise (50/60 Hz): 140 dB or more
Applicable standards	UL CE mark

2. Control functions of standard type

Control action	PID control (with auto tuning, self-tuning) Fuzzy control (with auto tuning)
Proportional band (P)	0 to 999.9% of measuring range Configurable in 0.1% steps
Integral time (I)	0 to 3200 s Configurable in 1 s steps
Differential time (D)	0 to 999.9 s Configurable in 0.1 s steps
On/off action if P = 0. Proportional action when I, D = 0.	
Proportional cycle	1 to 150 s Configurable in 1 s steps Only for relay contact output or SSR/SSC drive output
Hysteresis width	0 to 50% of measuring range For on/off action only
Anti-reset windup	0 to 100% of measuring range Automatically adjusted by auto tuning
Input sampling cycle	0.5 s
Control cycle	0.5 s

3. Input section

Input signal	Thermocouple : J, K, R, B, S, T, E, N, PLII Resistance bulb : Pt100 Voltage, current: 1 to 5 V DC, 4 to 20 mA DC (For the current input, add a provided 250 Ω resistor to the input terminal.)
Measuring range	See Table 1.
Burnout	For thermocouple or RTD input, a user can select either the upper limit or lower limit as the value which the control output should transmit when a burnout occurs.

4. Output section of standard type (Control output 1)

Control output 1	Select one from the followings: • Relay contact: SPST contact: 220 V AC/30 V DC, 3A (resistive load) Mechanical life: 10 million operations (no load) Electrical life: 100,000 operations (rated load) Minimum switching current: 10 mA (5 V DC) • Voltage pulse (for SSR / SSC drive): ON: 15 V DC (12 to 16 V DC) OFF: 0.5 V DC or less Max. current: 20 mA or less • 4 to 20 mA DC: Allowable load resistance: 100 to 500 Ω

5. Control functions of heating/cooling control type (option)

Heating side proportional band (P)	0 to 999.9 % of measuring range
Cooling side proportional band (P)	Heating side "P" × cooling side coefficient (Automatically set in auto tuning) Cooling side proportional band coefficient: 0 to 100.0 On/off action if P = 0
Integral time (I)	0 to 3200 s (common to heating and cooling sides)
Differential time (D)	0 to 999.9 s (common to heating and cooling sides)
P, I, D = 0: ON/OFF action (without dead band) for heating and cooling I, D = 0: Proportional action	
Proportional cycle	1 to 150 s For relay contact output or SSR/SSC drive output only
Hysteresis width	0.5% of measuring range, common to heating and cooling sides, for on/off action only
Anti-reset windup	0 to 100% of measuring range Automatically adjusted by auto tuning
Overlap, dead band	±50% of heating side proportional band
Input sampling cycle	0.5 s
Control cycle	0.5 s

6. Output section of heating/cooling control type (control output 2) (option)

Control output 2	Select one from the followings: • Relay contact: SPST contact: 220 V AC/30 V DC, 3 A (resistive load) Mechanical life: 10 million operations (no load) Electrical life: 100,000 operations (rated load) Minimum switching current: 10 mA (5 V DC) • Voltage pulse (for SSR/SSC drive): ON: 15 V DC (12 to 16 V DC) OFF: 0.5 V DC or less Max. current: 20 mA or less • 4 to 20 mA DC: Allowable load resistance: 100 to 500 Ω

7. Operation and display section

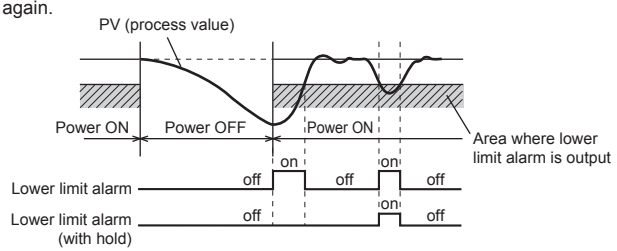
Parameter setting	Digital setting by 3 keys With key lock function
Display	4-digit, 7-segment LED (red) Process value and set value switchable
Status indicator (LED)	Control output or alarm output
Setting accuracy	0.1% or less of measuring range
Indication accuracy (at 23ºC)	Thermocouple: ± (0.5% of measuring range) ±1 digit ±1ºC Except: Thermocouple R at 0 to 500ºC: ± (1% of measuring range) ±1 digit ±1ºC Thermocouple B at 0 to 400ºC: ± (5% of measuring range) ±1 digit ±1ºC RTD, voltage, current: ± (0.5% of measuring range) ±1 digit

8. Alarm (option)

Alarm kind	Absolute alarm, deviation alarm, zone alarm with upper and lower limits for each Hold (see below explanation) and latch function available
Alarm ON-delay	0 to 9999 s Configurable in 1 s steps
Process alarm output	Relay contact: SPST contact: 220 V AC / 30 V DC, 1 A (resistive load) Mechanical life: 10 million operations (no load) Electrical life: 100,000 operations (rated load) Minimum switching current: 10 mA (5 V DC). MAX 2 points Output cycle: 0.5 s

What is alarm with hold?

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



9. Digital input (option)

Number of points	1 or 2
Contact capacity	5 V DC, approx. 2 mA ON judgment for 2 V DC or less OFF judgment for 3 V DC or more
Input pulse width	Minimum 0.5 s
Available function (select one)	Set value (front SV, SV1, SV2, or SV3, switchable) Control action start/stop Ramp soak action start/reset Auto tuning start/stop Alarm latch cancel Built-in timer start

10. Timer (option)

Startup	By digital input
Setting	0 to 9999 s Configurable in 1 s steps Default setting is 0 s.
Action	Event ON-delay or OFF-delay
Signal output	Uses alarm output relay. Up to 2 points available

11. Communication (option)

Physical specifications	EIA RS485
Protocol	Modbus® RTU mode or PXR protocol (Z-ASCII)
Communication method	2 wires, half duplex bit serial, start-stop synchronization
Data type	8 bits. Parity: odd/even/none.
Baud rate	9600 bps
Network topology	Multi-drop network Up to 32 controllers connectable including master station
Communication distance	Up to 500 m
Recommended RS232C–RS485 converter	Isolated type K3SC-10 by OMRON Co., Ltd (Japan) http://www.omron.co.jp/

12. Re-transmission output (option)

Output signal	4–20 mA DC
Load resistance	500 Ω or less
Output updating	500 ms
Output accuracy	±0.3% FS (at 23ºC)
Resolution	2000 or more
Kind of output signal	PV, SV, DV, or MV (selectable by parameter)

13. Other functions

Parameter mask	User can switch show and hide of parameters
Ramp soak (option)	2 pattern × 4 steps, or 1 pattern × 8 steps Digital input allows starting or resetting the action.

14. Memory backup at power outage

Medium	Non-volatile memory

15. Self-diagnosis

Method	Program error monitoring by watchdog timer

16. Operation and storage conditions

Ambient operating temperature	-10ºC to 50ºC
Ambient operating humidity	≤ 90% RH (no condensation)
Storage temperature	-20ºC to 60ºC

17. Structure

Mounting method	Panel mount Rail or wall mount is available by using the optional DIN rail mounting adapter
External terminal	Rod terminal
Case material	Plastic (flameproof grade UL94 V-0 equivalent)
Dimensions	24 × 48 × 98 mm
Weight	Approx. 150 g
Protective structure	Front panel: NEMA 4X watertight (IEC IP66 equivalent) when mounted on panel with our genuine packing. Waterproof feature is unavailable in close mounting of multiple units. Rear case: IEC IP20
Color	Black (front frame, case)

Table 1 Measuring range

Group	Input signal		Range	
			ºC	ºF
I	RTD	Pt100	-150 to 850	-238 to 1562
	Thermocouple	J	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	-150 to 400	-238 to 752
		E	-150 to 800	-238 to 1472
		N	0 to 1300	32 to 2372
		PL-II	0 to 1300	32 to 2372
II	1–5 V DC		Scaling range (-1999 to 9999)	
	4–20 mA DC			

Notes:
1. For 4–20 mA DC input, add a 250-ohm resistor provided with the controller.
2. You cannot switch the input type across the groups.
3. When the measuring range is beyond 1000ºC, the decimal point is not indicated.

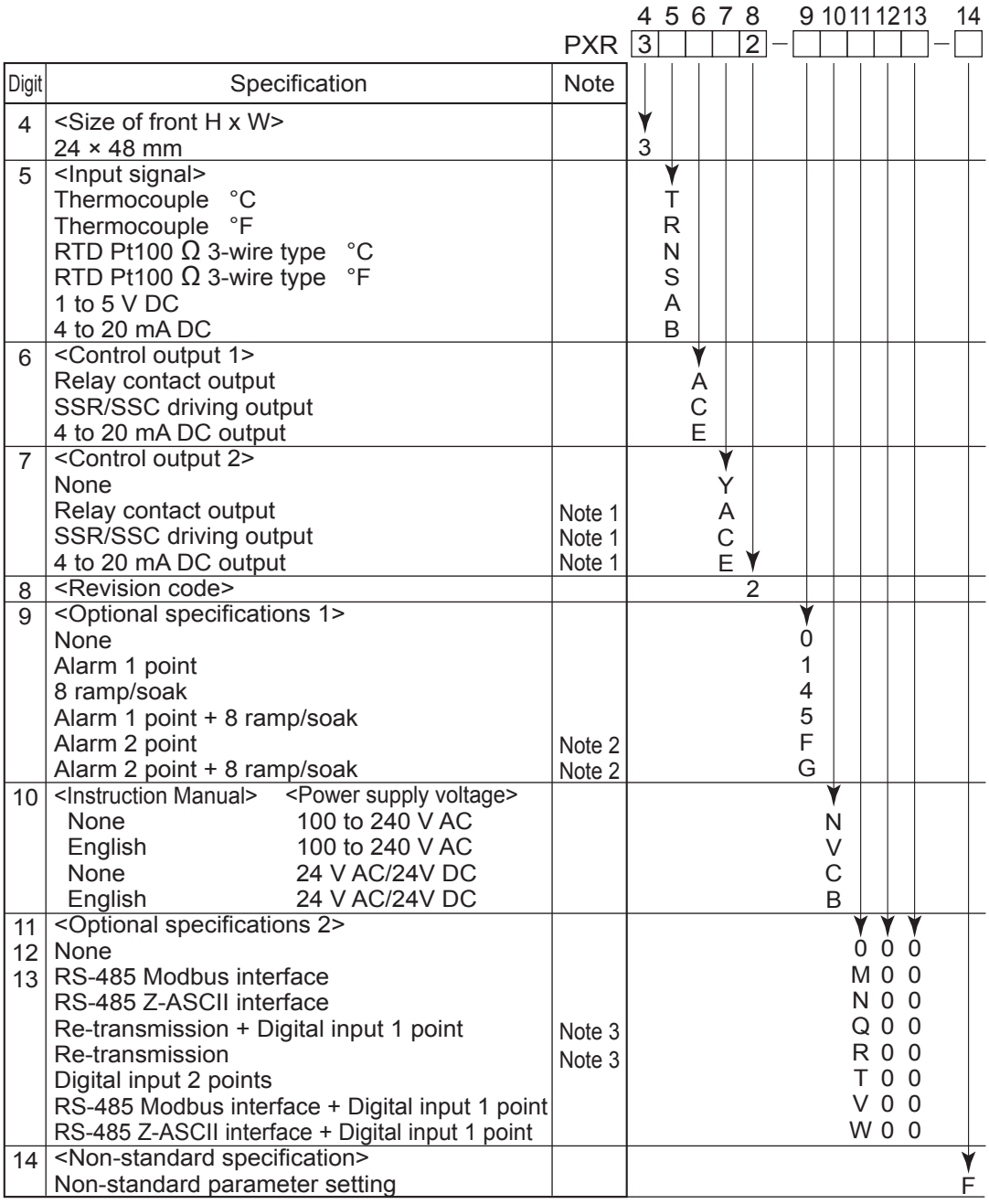
SCOPE OF DELIVERY

Controller
Panel mounting adapter
Waterproof packing
Instruction manual
250-ohm resistor (when 4–20 mA input is ordered)

OPTIONAL ITEMS

Communication manual
DIN rail mounting adapter (ZZP∗CTK368715P1)

CODE SYMBOLS



Digit	Specification	Note
4	<Size of front H x W> 24 × 48 mm	
5	<Input signal> Thermocouple °C Thermocouple °F RTD Pt100 Ω 3-wire type °C RTD Pt100 Ω 3-wire type °F 1 to 5 V DC 4 to 20 mA DC	
6	<Control output 1> Relay contact output SSR/SSC driving output 4 to 20 mA DC output	
7	<Control output 2> None Relay contact output SSR/SSC driving output 4 to 20 mA DC output	 Note 1 Note 1 Note 1
8	<Revision code>	
9	<Optional specifications 1> None Alarm 1 point 8 ramp/soak Alarm 1 point + 8 ramp/soak Alarm 2 point Alarm 2 point + 8 ramp/soak	 Note 2 Note 2
10	<Instruction Manual> <Power supply voltage> None 100 to 240 V AC English 100 to 240 V AC None 24 V AC/24V DC English 24 V AC/24V DC	
11 12 13	<Optional specifications 2> None RS-485 Modbus interface RS-485 Z-ASCII interface Re-transmission + Digital input 1 point Re-transmission Digital input 2 points RS-485 Modbus interface + Digital input 1 point RS-485 Z-ASCII interface + Digital input 1 point	 Note 3 Note 3
14	<Non-standard specification> Non-standard parameter setting	

Note 1: Incompatible with two alarms specification (9th code "F" and "G").
Note 2: Incompatible with two control outputs specification (7th code "A", "C", and "E").
Note 3: Incompatible with two control outputs (7th code "A", "C", and "E"), two alarms (9th code "F" and "G"), and 24 V power supply (10th code "B" and "C").

DEFAULT SETTINGS

Thermocouple : Type K, range 0–400°C, setpoint 0°C
RTD : Pt, range 0–150°C, setpoint 0°C
Voltage or current : Scaling 0–100%, setpoint 0%

Control action: reverse for control output 1, direct for control output 2.

Change the settings as needed. Front panel keys allow you to switch the input signal setting between thermocouple and RTD, and to switch the control action between reverse and direct.

INSULATION BLOCK DIAGRAM

Power supply	Measured value input Internal circuit
Control output 1 (relay contact)	Control output 1 (voltage pulse or 4–20 mA) Control output 2 (voltage pulse or 4–20 mA) Re-transmission output Digital input (when re-transmission output is used)
Control output 2 (relay contact)	
Alarm relay output 1	RS-485 communication Digital input (re-transmission output unused)
Alarm relay output 2	

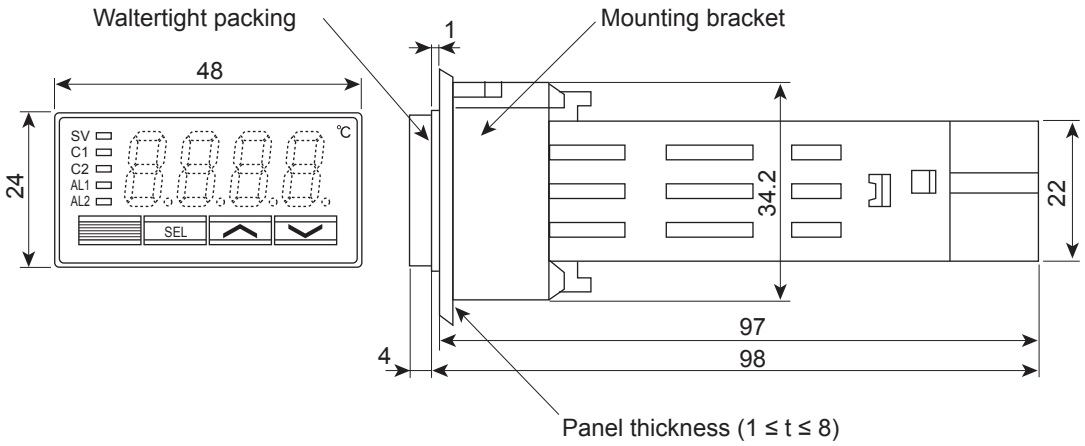
Solid line (—) indicates basic insulation (withstand voltage 1500 V AC)
Dotted line (-----) indicates functional insulation (withstand voltage 500 V AC)

IMPORTANT NOTICE

The specification of control output differs with models. When you replace temperature controllers, be sure to check if the specification matches with your application.

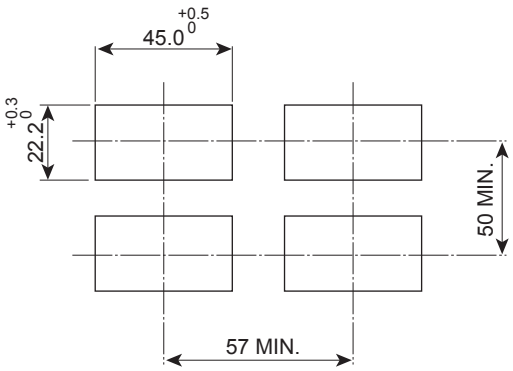
Model	SSR/SSC drive output		4–20 mA output allowable load resistance
	Voltage	Max. current	
PXR3	15 V DC	20 mA	100–500 Ω
PXR4	24 V DC	20 mA	≤ 600 Ω
PXV3	5.5 V DC	20 mA	≤ 600 Ω
PXV	24 V DC	60 mA	≤ 600 Ω
PXW	24 V DC	60 mA	≤ 600 Ω
PXZ	24 V DC	60 mA	≤ 600 Ω

OUTLINE DIAGRAM (Unit : mm)

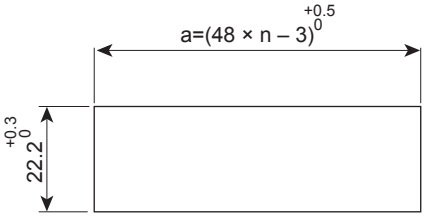


PANEL CUTOUT (Unit : mm)

For separate mounting

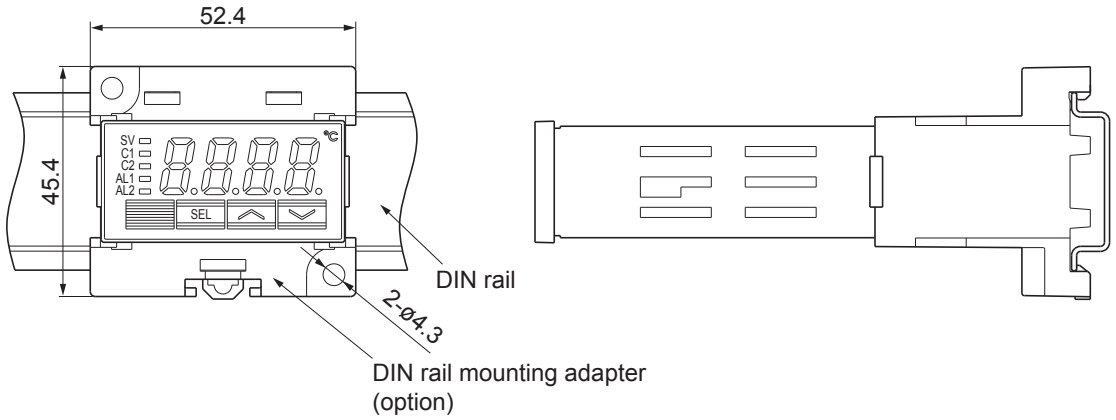


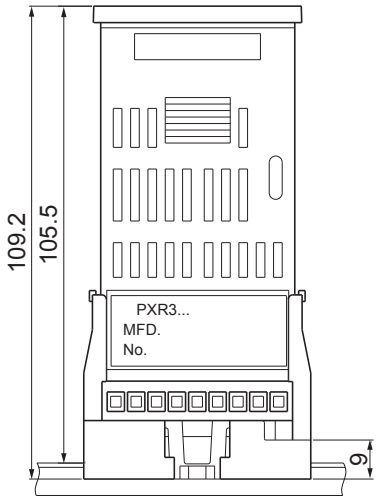
For mounting close together (n controllers)



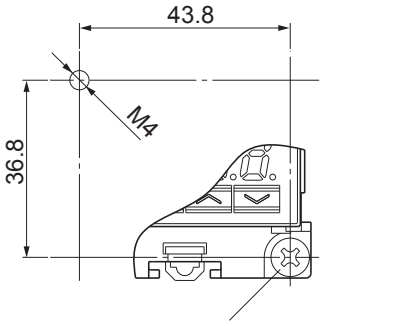
Note: Watertight feature is unavailable if mounted close together.

WITH DIN RAIL MOUNTING ADAPTER



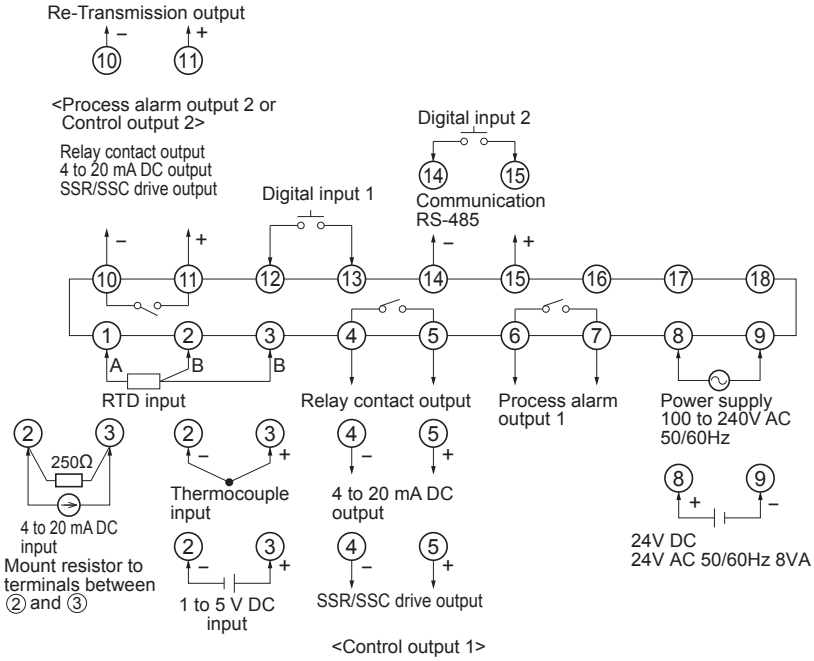


For mounting on wall



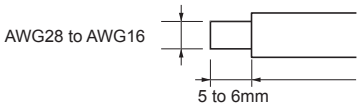
Tightening torque 0.49 Nm or less

EXTERNAL CONNECTION DIAGRAM



Usable wiring material

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



- Bar terminal
  Dimension of strip-off conductor section: 2 × 1.5 mm or smaller
  Strip-off length: 5 to 6 mm