New-generation PXF Series

Digital Temperature Controller

Fast! Compact! User-friendly!
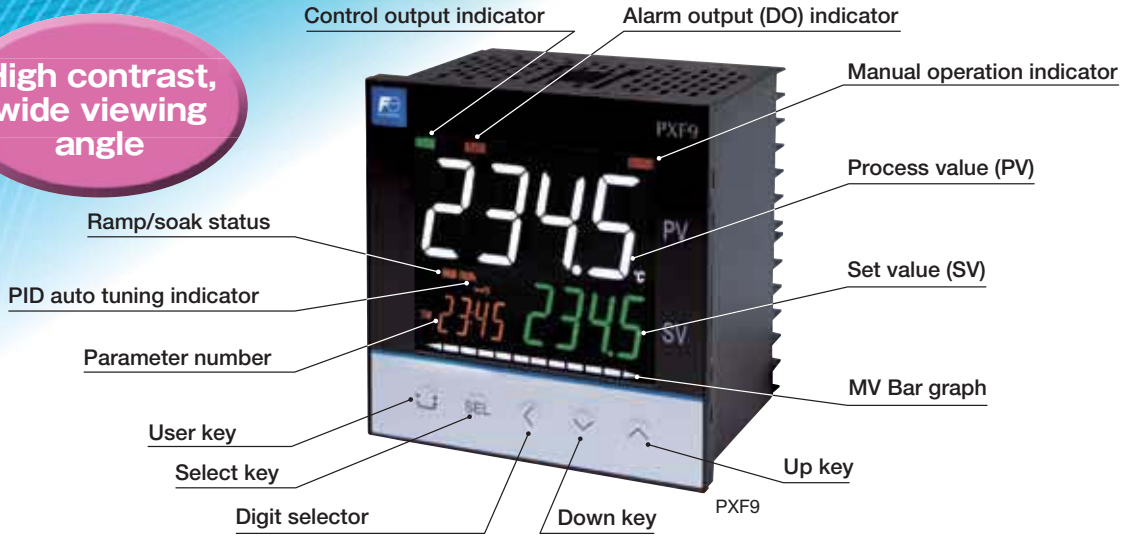
PXF9
96 × 96 mm

PXF5
48 × 96 mm

PXF4
48 × 48 mm

Features

- Largest bright color LCD in the industry
- High speed sampling : 50ms
  Fast processing : 100ms
- Universal input
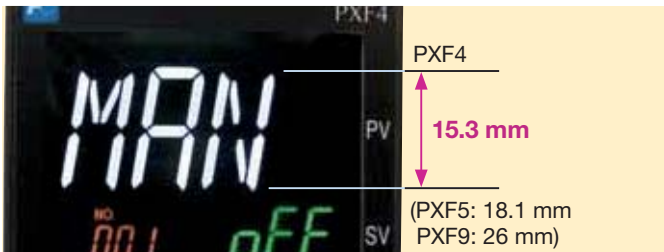- The best-in-class compact : 58mm depth
- Multidrop master fuction (option)

Easy-to-See color LCD! Fast control!
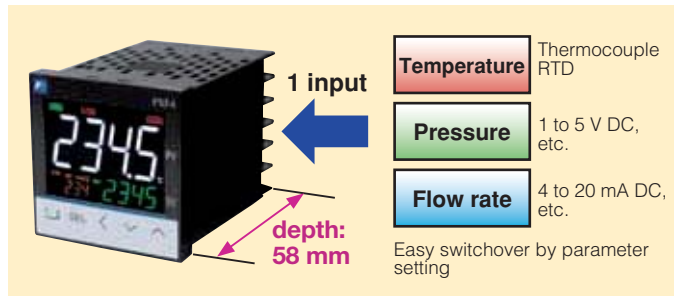
High contrast, wide viewing angle

Control output indicator

Alarm output (DO) indicator

Manual operation indicator

Process value (PV)

Set value (SV)

MV Bar graph

Up key

Down key

Digit selector

Select key

User key

Parameter number

PID auto tuning indicator

Ramp/soak status

PXF9

Tallest PV characters in the industry

Optimal bright and clear white PV display

PXF4

15.3 mm

(PXF5: 18.1 mm
PXF9: 26 mm)

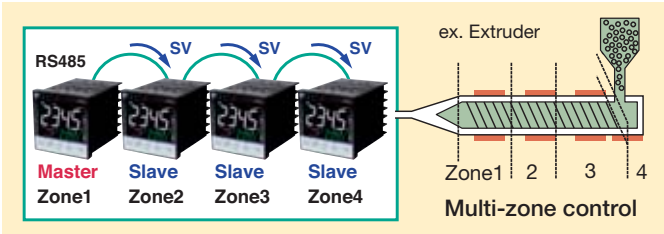## Multidrop master function

Cooperative operation function
SV can be transmitted to multi-PXFs through communication.
Synchronous temperature rise control is available in
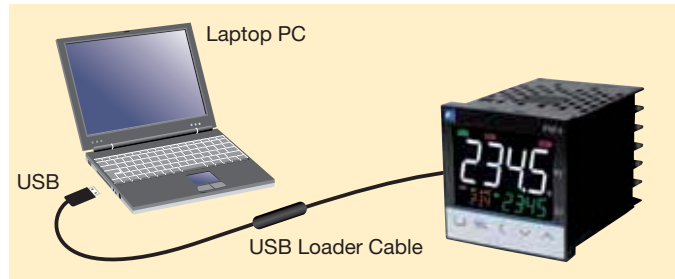combination with 2-degrees-of-freedom PID.

RS485

SV   SV   SV

ex. Extruder

Master   **Slave**   **Slave**   **Slave**
Zone1   **Zone2**   **Zone3**   **Zone4**

Zone1 | 2 | 3 | 4

Multi-zone control

Parameter copy function
Parameter settings can be copied to multi-PXFs
simultaneously and easily through communication.

Smart Ramp-Soak up to 64 segments/ 15 patterns

Simple power monitoring function/preventive maintenance alarm

Free loader software - user-friendy key operation and easy to find parameters.

Universal input

1 input

Temperature	Thermocouple RTD
Pressure	1 to 5 V DC, etc.
Flow rate	4 to 20 mA DC, etc.

depth: 58 mm

Easy switchover by parameter setting

Bus-powered USB interface equipped

Directly connectable to PC via USB port with optional cable.
No need of power supply to the PXF.

Laptop PC

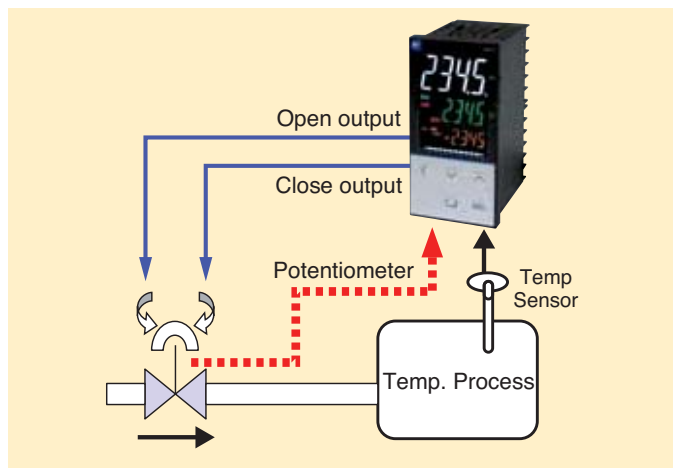USB

USB Loader Cable

Position feedback and servo control is available to valve control

Open output

Close output

Potentiometer

Temp Sensor

Temp. Process

■ Versatile controller for any applications

Type			PXF4	PXF5	PXF9
Appearance					
Front panel size			48 × 48 mm	48 × 96 mm	96 × 96 mm
Depth			58 mm		
Display digits			4-digit (PV and SV)		
Character height (PV)			15.3 mm	18.1 mm	26 mm
Indication accuracy			RTD input: ±0.2% ±1 digit or ±0.8°C±1 digit, whichever is larger Thermocouple input: ±0.3%±1 digit or ±1°C±1 digit, whichever is larger Voltage and current input: ±0.3%FS±1digit		
Sampling rate			50 ms		
Input signal		Process value input	Universal input (RTD, thermocouple, voltage/current)		
	Option	Remote SV input	Voltage/current		
		Current transformer (CT) input	Dedicated CT (1 to 100 A)		
		Motorized valve position input	-	100Ω to 2.5kΩ (3-wire)	
		Digital input (DI)	1 point (motorized valve control version : up to 3 points)	Up to 3 points	
Output signal	Control output	Relay contact	●		
		SSR/SSC drive output	●		
		Current output (linear)	●		
		Voltage output (linear)	●		
	Option	Motorized valve control output	●		
		Analog re-transmission output (voltage)	●		
		Analog re-transmission output (current)	●		
		Heater burnout alarm	●		
		Operating days alarm	●		
		Alarm/event contact output (DO)	Up to 3 points	Up to 5 points	
Control method (*with auto tuning)		ON/OFF control	●		
		PID control*	●		
		Fuzzy control*	●		
		2-degrees-of-freedom PID control*	●		
		Open-loop system supported (PID2 control)	●		
		Self tuning	●		
		Ramp/soak (simple program control)	up to 64 steps		
	Option	Heating/cooling control*	●		
		Motorized valve control	●		
Function		Number of PV/PID patterns	Up to 8		
		SV/PID switchover	●		
		Soft start	●		
		Simple power-monitoring	●		
		Operating days	●		
		Manual operation	●		
		User key	●		
Communi-cation		Loader interface	●		
	Option	RS-485 (MODBUS)	●		
Power sup-ply voltage		100 to 240 V AC, 50/60 Hz	●		
	Option	24 V DC/AC	●		
Power consumption			10 VA MAX.	13 VA MAX.	13 VA MAX.
Screw terminals for external connection			M3		

Note: Some functions may be unavailable depending on the model. For more detail, please refer to the specifications.

■ Advanced control functions

**Parameter setting is available using the front keys or a PC with loader software.**

Standard functions	1	On/Off control
	2	PID control with auto tuning
	3	Fuzzy control with auto tuning
	4	2-degrees-of-freedom PID control with auto tuning
	5	Open-loop supported PID2 control
	6	Self tuning
	7	Ramp soak function (simple program control)

| Optional functions	1	Heating/cooling control with auto tuning
	2	Motorized valve control

1 On/Off control

When process value (PV) is below the set value (SV), output is turned on and the heater is energized as shown below. When PV is above SV, output is turned off and the heater is de-energized. In this way, output is turned on/off repeatedly with respect to the SV to keep the temperature constant. This method of control is called "on/off action (2-position action)"

* When "0" is assigned to parameter P, the on/off action will be selected.

Control characteristic of ON/OFF action
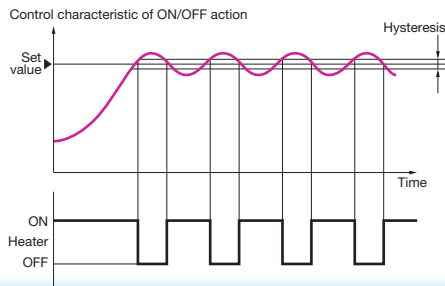
2 PID control with auto tuning

Typical PID control.
Overshoot may occur due to external disturbance.
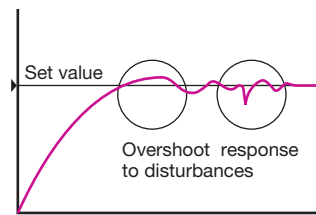
3 Fuzzy control with auto tuning

Fuzzy control is used to suppress overshoot so that the response to external disturbance is improved. By monitoring PV, overshoot is suppressed with startup time remaining unchanged. Also, disturbance can be settled quickly.

● Comparison between fuzzy control and conventional control
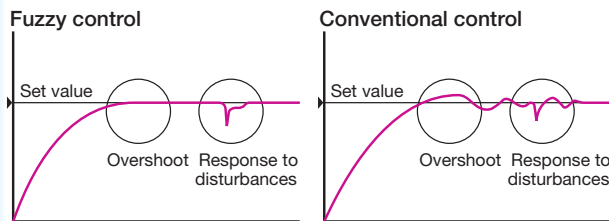
4 2-degrees-of-freedom PID control with auto tuning

This function achieves stable control against external disturbances, while suppressing overshoot and undershoot at startup or at SV change.
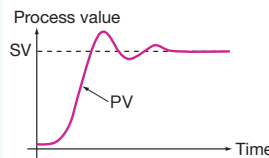
- **Conventional PID**
- **2-degrees-of-freedom PID (before adjusting α and β)**
- **2-degrees-of-freedom PID (with optimal α and β)**
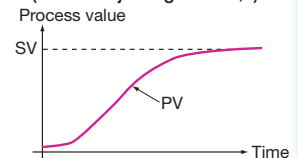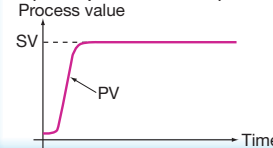
5 Open-loop supported PID2 control

Reduces overshoot in the processes where the control target is turned off and then on again.
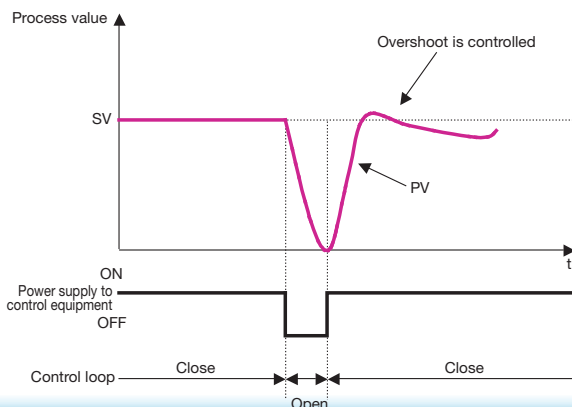
6 Self tuning

At power up, SV change, or during external disturbance, tuning is made automatically so that the PID parameters are re-optimized.
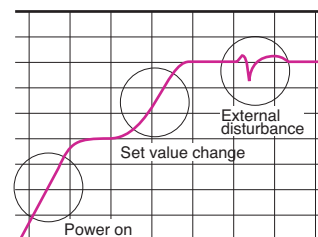
Note: For some objects of control, PID values can not be optimized.

7 Ramp soak function (simple program control)

Function of automatically changing the set point value with the elapsing of time, in accordance with the preset pattern, as shown below. This function is capable of programming 15 program patterns. Max.64 steps.

Max. 64 steps!!

Example of 16 steps x 4 patterns
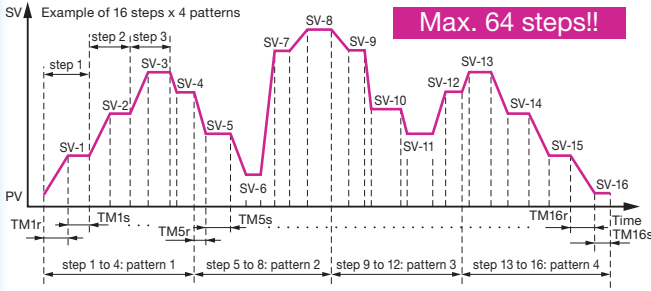
■ Basic functions
① [h · min] or [min · s]
② Guarantee soak
③ Repeat action
④ PV start
⑤ Delay start
⑥ Power failure recovery

■ Number of steps and patterns

Steps	Patterns
64	1
32	2
16	4
8	8

■ Operation
Start/stop/suspension can be performed by various ways (a user key, parameter setting, digital input, or communication)

Temperature gradient control of furnace
For control in a heat pattern

Digital input
Ramp soak action command
ON: Start
OFF: Reset

Temperature input

Thermocouple

Furnace

SSR drive output

SSR
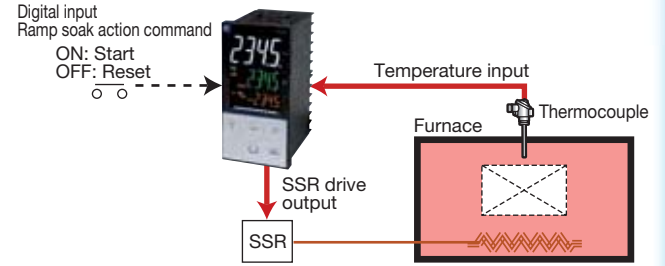
[Ramp soak function]
Temperature rise/fall pattern is controlled by setting a heat pattern having a gradient. Action start/reseting can be commanded externally.
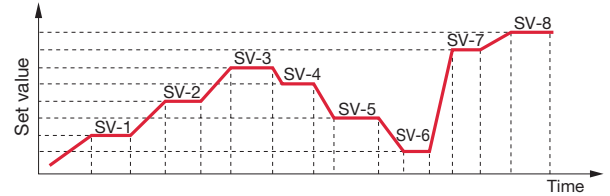
PID auto tuning

PID parameters are automatically set by the controller's measurement and computation function. This instrument provides 2 types of auto-tuning functions; the standard type (auto-tuning with SV used as reference) and the low SV type (auto-tuning with the value 10% below SV used as reference).

(a) Standard type
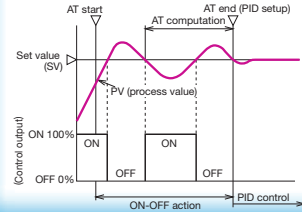
(b) Low-PV type
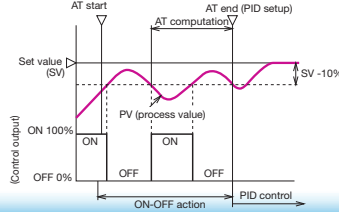
Temperature control of plastic molding machine
Start/stop of auto tuning can be commanded externally.

Digital input
Auto tuning command
ON: run
OFF: stop

Temperature alarm

Temperature input
Molding machine
Raw materials

SSR   SSR

Temperature input

Heater

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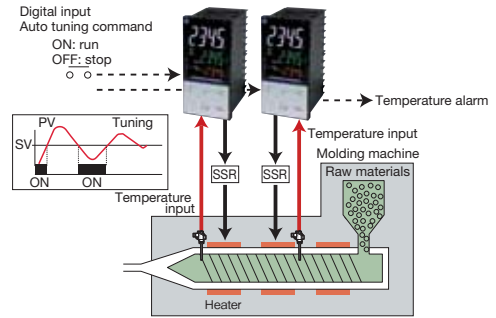
1 Heating/cooling control (option)

By a single controller, both heating and cooling control output are obtained.

Heating side   Output   Cooling side
Coefficient 0.5
Coefficient 1.0
Coefficient 2.0
Deviation (-)   Set value (SV)   Deviation (+)
Heating side proportional band   Cooling side proportional band
Proportional band (P)

Heating side   Output   Cooling side
Deviation (-)   Overlap band   Dead band   Deviation (+)
Set value (SV)
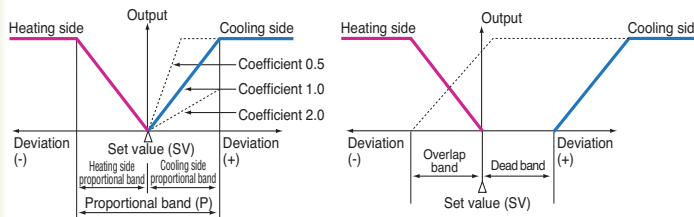
Note: For the cooling side proportional band, set a coefficient with respect to the heating side proportional band.
(ON-OFF control if coefficient is 0.)

Energy saving in livestock barns
● Both heating and cooling are controlled with only one temperature controller utilizing its 2 control outputs.
● Power consumption can be curbed by controlling a cooling fan motor with inverter.

Temperature input signal

Room temperature   Motor of cooling fan   Current output

Inverter

Current output

in shed
To heater   Heater power supply

Cattle shed   APR

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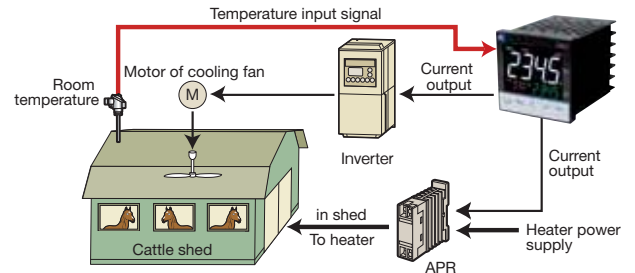
2 Motorized valve control (option)

· Position feedback control based on motorized valve position signal
· Servo control without valve position signal

Heating/cooling control of air conditioner

Command switch
Summer   Winter

Close in summer, open in winter
Switching
Summer: Normal action
Winter: Reverse action

Open in summer, close in winter

Valve control command output

Hot water

Solenoid valve

Valve position signal (resistance)   Temperature sensor

Cold water

Solenoid valve   Motorized valve   Air conditioner

5
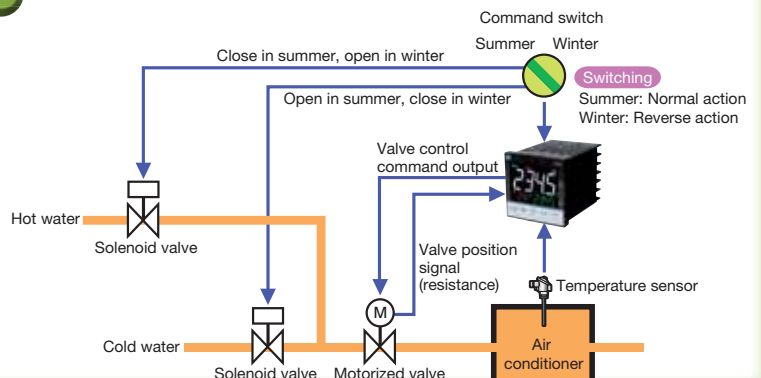
■ Even more functions which extend the possibilities of temperature controller

Standard functions		
	1	SV and PID selection
	2	Soft start
	3	Simple power-monitoring
	4	Operating days alarm

Optional functions		
	1	Re-transmission output
	2	Remote SV input
	3	Heater burnout alarm
	4	Alarm output
	5	Digital input
	6	RS-485 Communication

1 SV and PID selection

Allows you to register up to 8 sets of SV setting and PID setting, and to switch among them, enabling optimum PID setting for changing process, materials, or PV. You can perform SV selection only, or PID selection only.
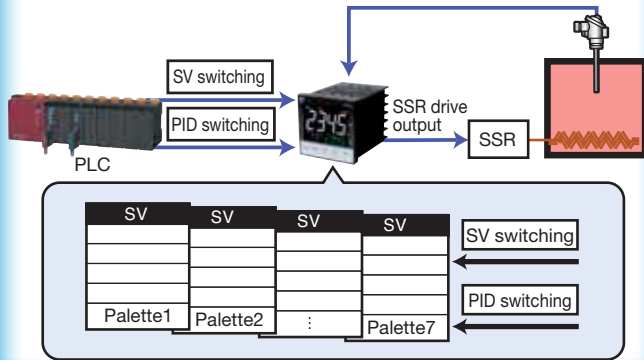
2 Soft start

This function controls the maximum output produced when turning on the equipment (including the temperature controller). This function is useful for effects such as suppressing the heater output during equipment startup, or lightening the load.
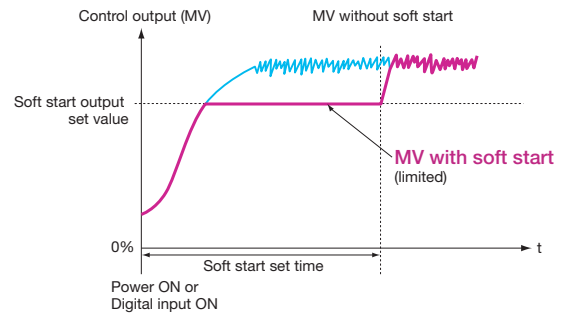
3 Simple power-monitoring

Calculates the energy consumption by connecting an optional current transformer. (See page 10.)

Voltage: estimated value set by user (220 V)
Current: value measured by CT

Voltage: estimated value set by user (220 V)
Current: estimated value set by user (0.2 A)
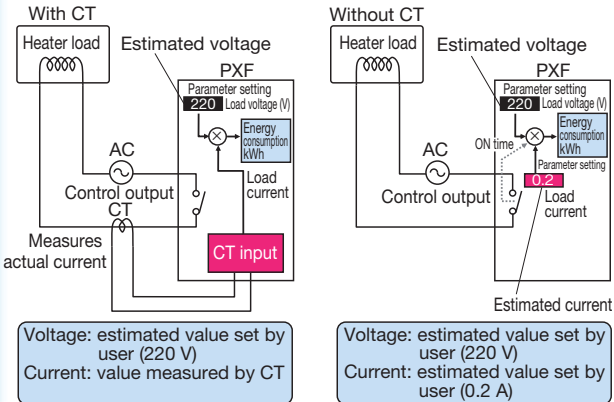
4 Operating days alarm

① Operating days indication
② Operating days alarm output

This function is useful for preventive maintenance because it let you know the appropriate time for maintenance work.

Alarm is triggered when the operated days reach the value you set.
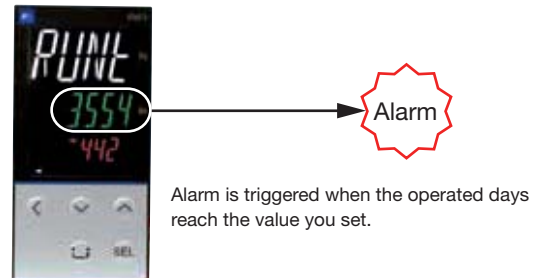
1 Re-transmission output (option)

A cost corresponding to one temperature sensor can be reduced just by connecting a PV transfer signal to a recorder.

- Output signal (any one of the followings):
  0 to 20 mA DC, 4 to 20 mA DC, 0 to 5 V DC, 1 to 5 V DC,
  0 to 10 V DC, 4 to 10 V DC
- Output type:
  process value (PV), set value (SV), control output (MV),
  or PV-SV (DV)
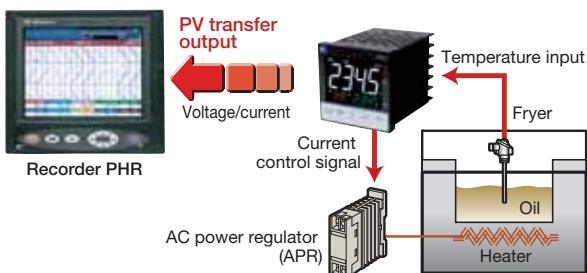
2 Remote SV input (option)

SV can be configured externally.

- Input signal (any one of the followings):
  0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, 0 to 20 mA DC,
  4 to 20 mA DC
- Input impedance: About 1 MΩ

The temperature of each cell is set by the sequencer.
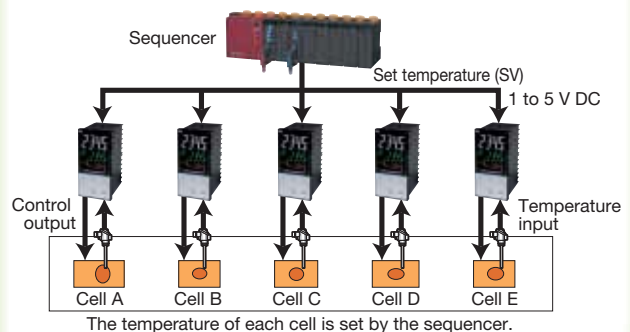
3 Heater burnout alarm (option)

- A current transformer (CT) is required. (See page 10, optional items).
- The power supply voltage and the alarm action point need to be configured beforehand.
- Available only for single-phase heater
- Not available when using thyristor phase angle control

[Example of PXF5/PXF9]
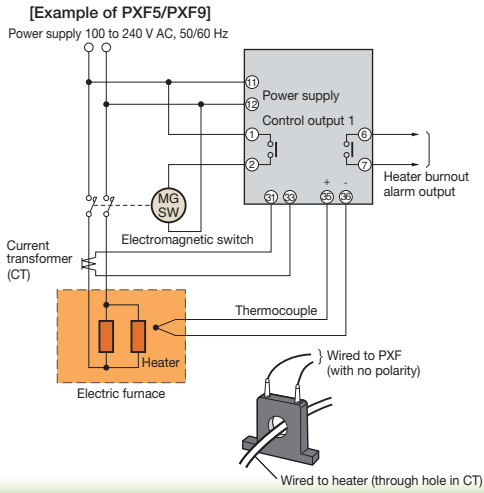
5 Digital input (option)

For SV changeover, AT startup, timer startup, program selection, start/stop/reset, PID changeover, etc.

Digital input SV change command

Changeover of 4 set values (front SV, SV1 to SV3) can be commanded externally.

4 Alarm output (option)

Up to 3 points

	Alarm type	Action diagram
Absolute value alarms	Upper limit absolute value	
	Lower limit absolute value	
	Upper limit absolute value (with hold)	
	Lower limit absolute value (with hold)	
Deviation alarms	Upper limit deviation	
	Lower limit deviation	
	Upper and lower limits deviation	
	Upper limit deviation (with hold)	
	Lower limit deviation (with hold)	
	Upper and lower limits deviation (with hold)	
Range alarms	Range upper and lower limits deviation (ALM1/2 independent operation)	
	Range upper and lower limits absolute value	
	Range upper and lower limits deviation	
	Range upper limit absolute value and lower limit deviation	
	Range upper limit deviation and lower limit absolute value	

6 RS-485 Communication (option)

- High-speed communication (user address mapping function)
  You can make a list of your most necessary parameters (max. 32 words) to quickly acquire those data at a time.
  Communication speed: max. 115.2 kbps

Address	Parameter
30001	PV
30002	SV(Read)
30003	DV
30004	MV1
⋮	⋮
40003	SV(Write)
40004	STBY
40005	AT
40006	P
40007	I
40008	D
⋮	⋮

Max.32 words

Address	Parameter
30001	PV
30002	SV(Read)
40003	SV(Write)
30004	MV1
40006	P
40007	I
40008	D
⋮	⋮
–	–
–	–
–	–

- Programless communication
  PXF can be connected with PLC without a program.

Program-less host communication

Temperature control

Reflow soldering device

PXF4   PXF5   PXF9
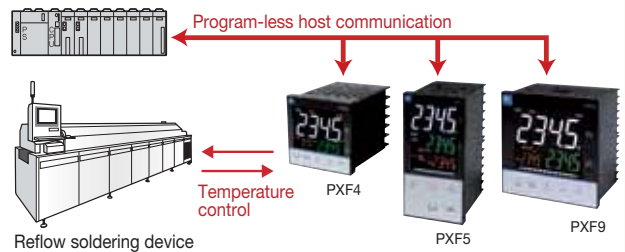
- PXFs can be connected with PC, programmable operation display, or PLC.

Programmable operation display

RS-232C

Signal converter

RS-485 (MODBUS)

Max. 32 controllers connectable

PXF4   PXF5   PXF5   PXF9
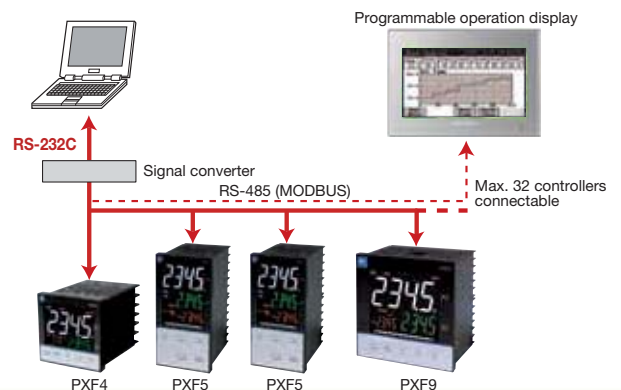
Specifications

General specifications

Power supply voltage	100 (-15%) V to 240 (+10%) V AC, 50/60Hz		
	24 V DC/AC (±10%)		
Power consumption	Type	100 to 240 V AC	24 V DC/AC
	PXF4	10 VA MAX.	3 VA MAX.
	PXF5 & 9	13 VA MAX.	8 VA MAX.
Insulation resistance	20 MΩ or more (at 500 V DC)		
Withstand voltage	Power source ⇔ all terminals: 1500 V AC for 1 min		
	Relay contact output ⇔ all terminals: 1500 V AC for 1 min		
	Between others: 500 V AC for 1 min		

Process value input

Number of input	1
Input setting	Programmable scale
Input signal	See Table 1
	(Universal input: thermocouple/RTD/voltage/current)
Standard measurement range and input type	See Table 1
Indication accuracy (at Ta = 23°C)	• Thermocouple input: either ±1°C ±1 digit or ±0.3% ±1 digit of indicated value, whichever is larger
	*except:
	Thermocouple B: 0 to 400°C: no accuracy assurance
	Thermocouple R: 0 to 500°C: ±3°C ±1 digit
	All thermocouples: -200 to -100°C: ±2°C ±1 digit
	• RTD input: ±0.8°C ±1 digit or ±0.2% ±1 digit of indicated value, whichever is larger
	• mV input, voltage input, current input: ±0.3%FS ±1 digit
Temperature effect on sensitivity	±0.3%FS/10°C
Indication resolution	See Table 1
Sampling rate	50 ms
Input impedance	• Thermocouple, mV input: 1 MΩ or more
	• Current input: 150 Ω or less (built-in diode)
	• Voltage input: About 1 MΩ
Variation by signal source resistance	• Thermocouple, mV input: ±0.3%FS ±1 digit per 100 Ω
	• Voltage input: ±0.3%FS ±1 digit per 500 Ω
Allowable wiring resistance	• RTD: 10 Ω MAX. (per wire)
Allowable input voltage:	• DC voltage input: within ±35 V
	• Current input: within ±25 mA
	• Thermocouple, RTD, mV input: within ±5 V
Noise reduction ratio	• Normal mode: 40 dB (50/60 Hz)
	• Common mode: 120 dB (50/60 Hz)
	• Between input and power supply: ±1°C at 220 V AC, 50/60 Hz
Input correction:	(a) User adjustment: ±50%FS for each of zero and span point
	(b) Process value shift: ±10%FS
	(c) Input filter: 0.0 to 120.0 s (filter OFF if set at 0.0)
	(d) Square root extraction: -0.1 to 105% (OFF if set to -0.1%)
Overrange · underrange	Out of the range between -5 to 105% of FS
	(accuracy not guaranteed between -5 and 0, and between 100 and 105%FS)
	*except:
	• JPt (-199.9°C to 600.0°C) input: ⎫ Out of the range between
	• Pt (-200°C to 850°C) input: ⎬ -2% to 105% of FS
	• 0 to 10 V DC input: ⎭
	• Thermocouple E: Out of the range between -5 to 102% of FS

Remote SV input (option)

Number of input	1
Input signal	Voltage: 0 to 5 V DC/1 to 5 V DC/0 to 10 V DC
	Current: 0 to 20 mA DC/4 to 20 mA DC
	(an external 250-ohm resistor is required for current input)
Input impedance	Approx. 1 MΩ
Sampling rate	50 ms

Current transformer (CT) input (option)

Input type	Single phase CT, 1 point
	For 1 A to 30 A: CTL-6-S-H
	For 20 A to 100 A: CTL-12-S36-8
Range of detected current	1 A to 100A
Detected current accuracy	Setpoint ±5%FS
Detected current resolution	0.1 A
ON time necessary for detection	300 ms MIN.

Digital input (DI) (option)

Number of point	PXF5, PXF9 : Max. 3 points
	PXF4 standard version: 1 point
	PXF4 motorized valve control version : 3 points
Specification	No-voltage contact or transistor input
Contact capacity:	5 V DC, about 2 mA (per point)
Input judgment:	ON voltage: 2 V DC or lower
	OFF voltage: 3 V DC or higher
Sampling pulse width	50 ms MIN.
Function	Remote mode selection, SV changeover, control standby, AT startup, timer startup, alarm unlatch, program selection, start/stop/reset, PID switching (normal/reverse), etc.

Valve position feedback signal (Potentiometer) input (option)

Model	PXF5 and PXF9 (not available for PXF4)
Resistance range	100 Ω to 2.5 kΩ (three-wire)
Resolution	0.5%FS
Accuracy	±1.0%FS
Temperature effect on sensitivity	±0.5%FS/10°C
Burnout function	Not provided

Control output

Number of point	Up to 2 (2 points: Heating/cooling control)
Type	① Relay contact output (SPST)
Select among	• Proportional cycle: 1 to 150 s
① to ⑥ below	• Contact structure: 1 SPST contact *SPST: single pole single throw
	• Contact capacity: 250 V AC/30 V DC, 3 A (resistive load)
	• Minimum ON/OFF current: 10 mA (5 V DC)
	• Mechanical life: 20 million operations MIN. (100 operations/min)
	• Electrical life: 100,000 operations MIN. (rated load)
	② Relay contact output (SPDT)
	• Proportional cycle: 1 to 150 s
	• Contact structure: 1 SPDT contact *SPDT: single pole double throw
	• Contact capacity: 250 V AC/30 V DC, 5A (resistive load)
	• Mechanical life: 50 million operations MIN. (100 operations/min)
	• Electrical life: 100,000 operations MIN. (rated load)
	③ SSR/SSC drive output
	• Proportional cycle: 1 to 150 s
	• ON voltage: 12 V DC (between 10.7 and 13.2 V DC)
	• OFF voltage: 0.5 V DC or lower
	• Maximum current: 20 mA DC
	• Load resistance: 600 Ω MIN.
	④ Current output (0 to 20 mA DC/4 to 20 mA DC)
	• Accuracy: ±5%FS
	• Load resistance: 500 Ω MAX.
	⑤ Voltage output (0 to 5 V DC/1 to 5 V DC/0 to 10 V DC/2 to 10 V DC)
	• Accuracy: ±5%FS
	• Load resistance: 10 kΩ MIN.
	⑥ Motorized valve control output
	• Contact structure: 2 SPST contacts without interlock circuit *SPST: Single Pole Single Throw
	• Contact capacity: 250 V AC/30 V DC, 3 A (resistive load) Minimum ON/OFF current: 100 mA (24 V DC)
	• Mechanical life: 20 million operations MIN. (100 operations/min)
	• Electrical life: 100,000 operations MIN. (rated load)

Alarm output (DO) (option)

Number of outputs	Relay contact output: up to 5 (shared common) PXF4: up to 3
	up to 3 (independent common) PXF4: up to 2
Output specifications	Relay contact output
	Contact structure: 1 SPST contact *SPST: single pole single throw
	Contact capacity: 250 V AC/30 V DC, 1A (resistive load)
	Minimum ON/OFF current: 10 mA (5 V DC)
	Mechanical life: 20 million operations MIN. (100 operations/min)
	Electrical life: 100,000 operations MIN. (rated load)
Output functions	Alarm output (see "Alarm function"), main unit control mode output, program status output, control output 1 and 2, etc.
Output cycle	100 ms

Re-transmission output (option)

Number of point	1
Type	Current/voltage output (0 to 20 mA DC/4 to 20 mA DC/0 to 5 V DC/ 1 to 5 V DC/0 to 10 V DC/ 2 to 10 V DC)
	• Guaranteed output range: 0 to 21mA DC/0 to 10.5 V DC
	• Accuracy: ±0.2%FS (±5%FS at 1 mA or smaller)
	• Resolution: 10,000 MIN.
	• Load resistance: 500 Ω MAX. (current), 10 kΩ MIN. (voltage)
Output cycle	100 ms
Output contents	PV, SV, DV, MV
Additional function	Scaling function

Display unit

Type	LCD (with backlight)
Indication contents	Process value indication: 11-segment, 4-digit [white]
	Setpoint indication: 11-segment, 4-digit [green]
	Screen No. indication: 7-segment, 4-digit [orange]
	Indication status: 42 indicator lamps
Luminance setting	possible (4 steps)

Setting section

Type and number of keys	Sheet type keys (with emboss), 5 keys

Control functions

ON/OFF control	Refer to page 4.
PID control	• Dual control (heating/cooling)
	• PID parameters determination: Auto tuning
Fuzzy PID control	• Dual control (heating/cooling)
	• PID parameters determination: Auto tuning
Self tuning control	Refer to page 4.
PID2 control	• Dual control (heating/cooling)
	• PID parameters determination: Auto tuning
2-degrees-of-freedom PID	• PID parameters determination: Auto tuning
Position proportional PID (servo) with position feedback	• Full stroke time: 30 seconds MIN. (not available for PXF4)

Control parameters

Proportional band (P)	0.1% to 999.9%
Integration time (I)	0 to 3200 s (invalidated when I = 0)
Differential time (D)	0.0 to 999.9 s (invalidated when D = 0)
Control cycle	100 to 900 ms (in 100 ms), 1 to 99 s (in seconds)
Anti-reset windup	0 to 100% of measurement range
Hysteresis band	50% of measurement range (at 2-position control only)
Number of SV and PID patterns	8: Changed by any of parameter setting, digital input, communication, user function keying, zone change.

■ Control mode

Mode	Auto/Manual/Remote *During 2-position control in Manual mode, 2-position manual operation with MV = 100% or 0% is operated.
Mode changeover:	• Auto <=> Manual: Balanceless·bumpless • Auto/Manual→Remote: Balance·bumpless • Auto/Manual→Remote: Balance·bumpless

■ Alarm function

Number of alarm setting points	Up to 5 (depends on the number of DO)
Alarm type	Process value (upper limit/lower limit, absolute/deviation, range), main unit error, etc. (non-excitation, delay, latch, timer function option provided)
Heater current alarm function (optional)	*Current detector(CT) is to be prepared separately (see page 10.)
Detectable range	1 A to 100 A
Detected current resolution	0.1 A
Setting resolution	0.1 A
Hysteresis	0.0 to 100.0 A

■ RS-485 communication (option)

No. of points	1
Physical specifications	EIA-485
Protocol	Modbus-RTU
Communication method	Half-duplex bit serial, asynchronous communication
Code type	Data length: 8 data bits. Parity: Odd, even, none.
Baud rate	9600 bps, 19200 bps, 38.4 kbps, 115.2 kbps
Connection	Up to 32 units connectable including multidrop master function
Communication distance	Up to 500 m (total connection length)
Additional functions	• Cooperative operation The function in which slave devices can be operated via master device by connecting several temperature controllers. • Programless communication The function in which a temperature controller can be connected to a PLC without program. Supported PLCs: Mitsubishi PLC Q series Siemens PLC S7 series

■ Operation and storage conditions

Operating temperature	-10°C to 50°C
Storage temperature	-20°C to 60°C
Operating/storage humidity	90%RH or less (Non condensation)
Warm-up time	30 min MIN.
Vibration	during transportation: 9.8 m/s^2 (1 G) or less
Impact	during transportation: 294m/s^2 (30 G) or less

■ Structure

Mounting method	Panel mount
External terminals	Screw terminals, M3
Case	• Material: ABS, PPO • Non-combustibility grade: UL94V-0 equivalent • Color: Black
Protection structure	• Panel front side: IP66, NEMA-4X equivalent (When the panel is mounted using our genuine packing. Not water-proof if mounted closely together.) • Body: IP20 equivalent (slits on top and bottom) • Terminals: IP00 equivalent. Terminal cover can be provided optionally.
Dimensions	Refer to page 14.
Weight	PXF4: approx. 100 g, PXF5: approx. 170 g, PXF9: approx. 220 g

■ User customize function and Program (ramp/soak) function

Number of program steps	64 steps x 1 patterns, 32 steps x 2 pattern, 16 steps x 4 pattern, or 8 steps x 8 patterns (1 step = 2 segments)
Control option:	Control by digital input Status output by digital output
Basic functions	[1] Segment time can be set in "Hour, Minutes" or "Minutes, Seconds" ② Guarantee soak ③ Repeat action ④ PV start ⑤ Delay start ⑥ Power restoring function
Memory backup	EEPROM

■ User functions

User key assignment	Auto/Manual change, Standby ON/OFF change, remote SV change.

■ Password function

3-level password

■ Simple power-monitoring function and operating days alarm

Simple power-monitoring function	• By connecting a current transformer (to be prepared separately), electric power consumption of the heater can be displayed. (Electric power is calculated based on the fixed voltage value you set.) • Current detector(CT) is to be prepared separately (see page 10.) • Current detection range: 1 A to 100 A
Operating days alarm	• Indicates the number of days the controller has been operated and activates alarm output (optional) when it exceeds the setpoint. • Useful for preventive maintenance because it let you know the appropriate time for maintenance work.

■ Processing at power failure

Memory protection	Protect by non-volatile memory

■ Self-diagnosis

Method: Program error supervision by watchdog timer

Table 1 input type and range

Input type		Code (PvT)	Measurement range [°C]	Minimum input increment [°C]
	Pt 100	PT1	0.0 to 150.0	0.1
		PT2	0.0 to 300.0	0.1
		PT3	0.0 to 500.0	0.1
		PT4	0.0 to 600.0	0.1
		PT5	−50.0 to 100.0	0.1
		PT6	−100.0 to 200.0	0.1
		PT7	−199.9 to 600.0	0.1
		PT8	-200 to 850	1
DC voltage	0 to 5 V DC	0-5V		
	1 to 5 V DC	1-5V		
	0 to 10V DC	0-10	−1999 to 9999 (Range where scaling is allowed)	-
	2 to 10V DC	2-10		
	0 to 100mV DC	MV		
DC current	0 to 20mA DC	0-20		
	4 to 20mA DC	4-20		

Input type		Code (PvT)	Measurement range [°C]	Minimum input increment [°C]
Thermocouple	J	J1	0.0 to 400.0	0.1
		J2	−20.0 to 400.0	0.1
		J3	0.0 to 800.0	0.1
		J4	−100 to 1000	1
	K	K1	0 to 400	0.1
		K2	−20.0 to 500.0	0.1
		K3	0.0 to 800.0	0.1
		K4	−200 to 1300	1
	R	R	0 to 1700	1
	B	B	0 to 1800	1
	S	S	0 to 1700	1
	T	T1	−199.9 to 200.0	0.1
		T2	−199.9 to 400.0	0.1
	E	E1	0.0 to 800.0	0.1
		E2	−150.0 to 800.0	0.1
		E3	−200 to 800	1
	L	L	−100 to 850	1
	U	U1	−199.9 to 400.0	0.1
		U2	−200 to 400	1
	N	N	−200 to 1300	1
	W	W	0 to 2300	1
	PL-II	PL-2	0 to 1300	1

■ ORDERING CODE

<48 x 48 mm size>
Motorized valve control type (base model: PXF4)

Digit	Specifications	Code
1-4	<Front panel size W x H> 48 × 48 mm	PXF4
5	-	A
6	<Control output 1>	
	Relay contact (SPST) Note 1	A
	Relay contact (SPDT) Note 1	B
	SSR drive output	C
	Current output	E
	Voltage output	P
7	<Control output 2>	
	None	Y
	Relay contact (SPST)	A
	SSR drive output	C
	Current output	E
	Voltage output	P
	Re-transmission output (current)	R
	Re-transmission output (voltage)	S
8	<Revision code>	2
9	<Alarm output>	
	None	0
	1 point	1
	2 points	F
	3 points	M
	2 points (independent common)	J
10	<Power supply voltage/instruction manual>	
	100 to 240 V AC, Japanese & English instruction manual	Y
	100 to 240 V AC, English instruction manual	V
	100 to 240 V AC, Chinese & English instruction manual	W
	24 V AC/DC, Japanese & English instruction manual	A
	24 V AC/DC, English instruction manual	B
	24 V AC/DC, Chinese & English instruction manual	D
11	<Option>	
	None	Y
	RS-485 Communication	M
	Digital input (DI1)	S
	RS-485 communication + Digital input (DI1)	V
	RS-485 communication + Remote SV input Note 2	K
	RS-485 Communication + CT input Note 3	J
12 13	-	00

Note 1: Not available for the 7th code "C", "E", "P", "R", "S".
Note 2: When using current for the remote SV input, add a 250-ohm resistor to the input terminal.
Note 3: When using the CT input for heater burnout alarm, add one alarm output for it in the 9th code.

<48 x 48 mm size>
Motorized valve control type (base model: PXF4)

Digit	Specifications	Code
1-4	<Front panel size W x H> 48 × 48 mm	PXF4
5	-	A
6	<Control output 1>	
	Motorized valve control output (with PFB input)	T
7	<Control output 2>	
	None	Y
8	<Revision code>	2
9	<Alarm output>	
	None	0
	1 point	1
	2 points	F
	2 points (independent common)	J
10	<Power supply voltage/instruction manual>	
	100 to 240 V AC, Japanese & English instruction manual	Y
	100 to 240 V AC, English instruction manual	V
	100 to 240 V AC, Chinese & English instruction manual	W
	24 V AC/DC, Japanese & English instruction manual	A
	24 V AC/DC, English instruction manual	B
	24 V AC/DC, Chinese & English instruction manual	D
11	<Option>	
	None	Y
	Digital input (DI 1, 2, 3)	D
	RS-485 communication + Digital input (DI1)	V
12 13	-	00

Optional Items

Name	Model
Current detector (CT) 1 A to 30 A	ZOZ∗CCTL-6-S-H
20 A to 100A	ZOZ∗CCTL-12-S36-8
Terminal cover	ZZPPXR1-A230
Parameter loader interface cable	ZZP∗TQ501923C3
Shunt resistor (250 Ω±0.1%)	ZZPPXR1-A190
Panel mounting adapter for replacement from PXR7 to PXF4	ZZP∗TQ502732C1

Outline diagram of optional items

Panel mounting adapter for replacement from PXR7 to PXF4 (ZZP*TQ502732C1)

Panel mounting adapter

How to install PXF4 with the adapter

Current detector (CT)

- Specification: 1 A to 30 A
- Type: CTL-6-S-H

- Specification: 20 A to 100 A
- Type: CTL-12-S36-8

- Detection is available only for single-phase heater
- Cannot be used when the heater is controlled using thyristor phase angle control.

10

<48 x 96 mm size> <96 x 96 mm size>
Motorized valve control type (base model: PXF5 or PXF9)

Digit	Specifications	Code
1-4	<Front panel size W x H>	
	48 × 96 mm	PXF5
	96 × 96 mm	PXF9
5	-	A
6	<Control output 1>	
	Relay contact (SPST)	A
	Relay contact (SPDT)	B
	SSR drive output	C
	Current output	E
	Voltage output	P
7	<Control output 2>	
	None	Y
	Relay contact (SPST)	A
	SSR drive output	C
	Current output	E
	Voltage output	P
	Re-transmission output (current)	R
	Re-transmission output (voltage)	S
8	<Revision code>	2
9	<Alarm output>	
	None	0
	1 point	1
	2 points	F
	3 points	M
	2 points (independent common)	J
10	<Power supply voltage/instruction manual>	
	100 to 240 V AC, Japanese & English instruction manual	Y
	100 to 240 V AC, English instruction manual	V
	100 to 240 V AC, Chinese & English instruction manual	W
	24 V AC/DC, Japanese & English instruction manual	A
	24 V AC/DC, English instruction manual	B
	24 V AC/DC, Chinese & English instruction manual	D
11	<Option>	
	None	Y
	RS-485 Communication	M
	Digital input (DI1, DI2)	T
	Remote SV input + Digital input (DI3) Note1	H
	CT input + Digital input (DI1) Note 2	G
	RS-485 communication + Digital input (DI1)	V
	RS-485 communication + Digital input (DI3, DI4, DI5) + Auxiliary alarm output (AL4, AL5)	C
12	-	00
13		

Note 1: When using current for the remote SV input, add a 250-ohm resistor to the input terminal.
Note 2: When using the CT input for heater burnout alarm, add one alarm output for it in the 9th code.

Motorized valve control type

Digit	Specifications	Code
1-4	<Front panel size W x H>	
	48 × 96 mm	PXF5
	96 × 96 mm	PXF9
5	-	A
6	<Control output 1>	
	Motorized valve control output (with PFB input)	S
	Motorized valve control output (without PFB input)	V
7	<Control output 2>	
	None	Y
8	<Revision code>	2
9	<Alarm output>	
	None	0
	1 point	1
	2 points	F
	3 points	M
	2 points (independent common)	J
10	<Power supply voltage/instruction manual>	
	100 to 240 V AC, Japanese & English instruction manual	Y
	100 to 240 V AC, English instruction manual	V
	100 to 240 V AC, Chinese & English instruction manual	W
	24 V AC/DC, Japanese & English instruction manual	A
	24 V AC/DC, English instruction manual	B
	24 V AC/DC, Chinese & English instruction manual	D
11	<Option>	
	None	Y
	RS-485 communication + Digital input (DI1, DI2, DI3)	U
12	-	00
13		

Optional Items

Name	Model
Current detector (CT) 1 A to 30 A	ZOZ∗CCTL-6-S-H
20 to 100A	ZOZ∗CCTL-12-S36-8
Terminal cover (note)	ZZPPXF1-B100
Parameter loader interface cable	ZZP∗TQ501923C3
Shunt resistor (250 Ω±0.1%)	ZZPPXR1-A190

Note: For PXF9, two covers are necessary for one unit.

Scope of delivery

- Controller x 1
- Instruction manual x 1
- Panel mounting adapter x 2
- Water-proof packing x 1

■ INSULATION BLOCK DIAGRAM

● PXF4
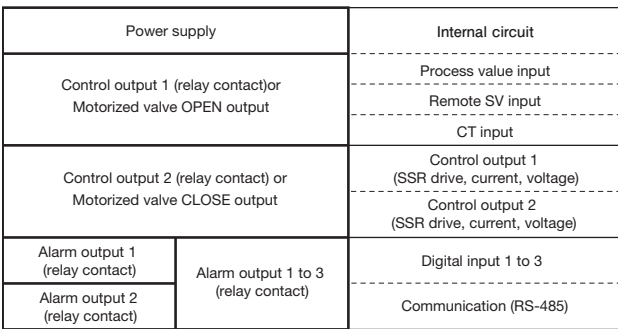
When the 9th code is "J" (AL1 and AL2: independent common)
When the 9th code is other than "J" (AL1 to AL3: shared common)

——— : basic insulation
——— : functional insulation
--------- : no insulation

● PXF5, PXF9

· When the 9th code is "J" (AL1 and AL2: independent common)
· When the 9th code is other than "J" (AL1 to AL3: shared common)

——— : basic insulation
——— : functional insulation
--------- : no insulation

■ CONNECTION DIAGRAM

Standard type

48 x 48 mm <PXF4>

Control output 1	Relay output (form A contact)	Relay output (SPDT)	SSR	Current	Voltage	Relay output (form A contact)	Relay output (SPDT)	SSR	Current	Voltage
Control output 2	None	None	None	None	None	Relay output (SPST)	Relay output (SPST)	Relay output (SPST)	Relay output (SPST)	Relay output (SPST)
	⑬⑭ OUT1	⑬ OUT1 NC / ⑭ COM / ⑮ No.	⑬+ OUT1 / ⑭− COM	⑬+ OUT1 / ⑭− COM	⑬+ OUT1 / ⑭− COM	⑬⑭ OUT1	⑬ OUT1 NC / ⑭ COM / ⑮ No.	⑬+ OUT1 / ⑭− COM	⑬+ OUT1 / ⑭− COM	⑬+ OUT1 / ⑭− COM
						⑪⑫ OUT2	⑪⑫ OUT2	⑪⑫ OUT2	⑪⑫ OUT2	⑪⑫ OUT2

Control output 1	SSR	Current	Voltage	SSR	Current	Voltage	SSR	Current	Voltage
Control output 2	SSR	SSR	SSR	Current or re-transmission output (current)	Current or re-transmission output (current)	Current or re-transmission output (current)	Voltage or re-transmission output (voltage)	Voltage or re-transmission output (voltage)	Voltage or re-transmission output (voltage)
	⑬+ OUT1 / ⑭ COM / ⑮+ OUT2	⑬+ OUT1 / ⑭ COM / ⑮+ OUT2	⑬+ OUT1 / ⑭ COM / ⑮+ OUT2	⑬+ OUT1 / ⑭ COM / ⑮+ OUT2 or re-transmission	⑬+ OUT1 / ⑭ COM / ⑮+ OUT2 or re-transmission	⑬+ OUT1 / ⑭ COM / ⑮+ OUT2 or re-transmission	⑬+ OUT1 / ⑭ COM / ⑮+ OUT2 or re-transmission	⑬+ OUT1 / ⑭ COM / ⑮+ OUT2 or re-transmission	⑬+ OUT1 / ⑭ COM / ⑮+ OUT2 or re-transmission

Alarm output

2 points (independent common)	3 points	1 or 2 points
AL1 ① / AL1 COM ② / AL2 ③ / AL2 COM ④ Note 1)	AL1 ① / AL2 ② / AL3 ③ / COM ④	AL1 ① / Non-C ② / AL2 ③ / COM ④

Note 1: Power supplies for AL1 and AL2 must be of the same type, either AC or DC.

Power supply

24 V AC/24 V DC	100-240 V AC
⑤⑥ 50/60Hz	⑤⑥ 50/60Hz

M3 terminals

① ⑦ ⑬
② ⑧ ⑭
③ ⑨ ⑮
④ ⑩ ⑯
⑤ ⑪ ⑰
⑥ ⑫ ⑱

<PXF4>

Process value input

Universal input

⑰+ ⑱ Thermocouple | ⑯ A ⑰ B ⑱ B RTD | ⑯+ ⑰ ⑱ Current input | ⑰+ ⑱ Voltage input

Option

RS485

⑦+ ⑧ RS485

Digital input	Remote SV input	CT input
⑨ DI1 / ⑩ DI-COM	⑨+ ⑩− RSV1	⑨ ⑩ CT1

Motorized valve control type

Valve control output 1

Valve control

⑪ Close / ⑫ COM

Valve control

⑬ Open / ⑭ COM

Option

Digital input	RS485
⑦ DI3 / ⑧ DI2 / ⑨ DI1 / ⑩ DI-COM	⑦+ ⑧ RS485

Digital input

⑨ DI1 / ⑩ DI-COM

Alarm output

2 points (independent common) Note 3	1 or 2 points
AL1 ① / AL1 COM ② / AL2 ③ / ALM2 COM ④ Note 1)	AL1 ① / Non-C ② / AL2 ③ / COM ④

Note 1: Power supplies for AL1 and AL2 must be of the same type, either AC or DC.

M3 terminals

① ⑦ ⑬
② ⑧ ⑭
③ ⑨ ⑮
④ ⑩ ⑯
⑤ ⑪ ⑰
⑥ ⑫ ⑱

<PXF4>

Power supply

24 V AC/24 V DC	100-240 V AC
⑤⑥ 50/60Hz	⑤⑥ 50/60Hz

Process value input

Universal input

⑰+ ⑱ Thermocouple | ⑯ A ⑰ B ⑱ B RTD | ⑯+ ⑰ ⑱ Current input | ⑰+ ⑱ Voltage input

Standard type

48 x 96 mm <PXF5> **96 x 96 mm <PXF9>**

Control output 1

Relay output (SPST)	Relay output (SPDT)	SSR	Current	Voltage
①② OUT1	① OUT1 No. / ② COM / ③ NC	①+ ②− OUT1 COM	①+ ②− OUT1 COM	①+ ②− OUT1 COM

Control output 2

Relay output (form A contact)	SSR	Current	Voltage	Re-transmission output (current)	Re-transmission output (voltage)
④⑤ OUT2	④+ ⑤− OUT2 COM	④+ ⑤− OUT2 COM	④+ ⑤− OUT2 COM	④+ ⑤− OUT2 COM	④+ ⑤− OUT2 COM

M3 terminals

① ⑬ ㉕
② ⑭ ㉖
③ ⑮ ㉗
④ ⑯ ㉘
⑤ ⑰ ㉙
⑥ ⑱ ㉚
⑦ ⑲ ㉛
⑧ ⑳ ㉜
⑨ ㉑ ㉝
⑩ ㉒ ㉞
⑪ ㉓ ㉟
⑫ ㉔ ㊱

<PXF5 or PXF9>

Alarm output

2 points (independent common)	3 points	1 or 2 points
AL1 ⑥ / AL1 COM ⑦ / AL2 ⑧ / AL2 COM ⑨ Note 1)	AL1 ⑥ / AL2 ⑦ / AL3 ⑧ / COM ⑨	AL1 ⑥ / Non-C ⑦ / AL2 ⑧ / COM ⑨

Note 1: Power supplies for AL1 and AL2 must be of the same type, either AC or DC.

Power supply

24 V AC/24 V DC	100-240 V AC
⑪⑫	⑪⑫
50/60Hz	50/60Hz

Option

Digital output	Digital input	Remote SV input
⑬ AL4 / ⑭ COM / ⑮ AL5	⑰ DI3 / ⑱ DI-COM / ⑲ DI4 / ⑳ DI5	㉓+ ㉔− RSV1

Option

RS-485	Digital input	CT input
㉕+ ㉖− RS485	㉗ DI1 / ㉘ DI-COM / ㉙ DI2	㉛ ㉜ ㉝ CT1

Process value input

Universal input			
㉟ ㊱ Thermocouple	㉞ A / ㉟ B / ㊱ B RTD	㉞+ ㉟ ㊱ Current input	㉟+ ㊱− Voltage input

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Motorized valve control type

Motorized valve control type

Valve control output 1

Valve control
① Open / ② COM
Valve control
④ Close / ⑤ COM

M3 terminals

① ⑬ ㉕
② ⑭ ㉖
③ ⑮ ㉗
④ ⑯ ㉘
⑤ ⑰ ㉙
⑥ ⑱ ㉚
⑦ ⑲ ㉛
⑧ ⑳ ㉜
⑨ ㉑ ㉝
⑩ ㉒ ㉞
⑪ ㉓ ㉟
⑫ ㉔ ㊱

<PXF5 or PXF9>

Alarm output

2 points (independent common)	3 points	1 or 2 points
AL1 ⑥ / AL1 COM ⑦ / AL2 ⑧ / AL2 COM ⑨ Note 1)	AL1 ⑥ / AL2 ⑦ / AL3 ⑧ / COM ⑨	AL1 ⑥ / Non-C ⑦ / AL2 ⑧ / COM ⑨

Note 1: Power supplies for AL1 and AL2 must be of the same type, either AC or DC.

Option

RS-485	Digital input	PFB input
㉕+ ㉖− RS485	㉗ DI1 / ㉘ DI-COM / ㉙ DI2	㉚ I+ / ㉛ PFB / ㉜ / ㉝ I−

Power supply

24 V AC/24 V DC	100-240 V AC
⑪⑫	⑪⑫
50/60Hz	50/60Hz

Option

Digital input
⑰ DI3 / ⑱ DI-COM

Process value input

Universal input			
㉟ ㊱ Thermocouple	㉞ A / ㉟ B / ㊱ B RTD	㉞+ ㉟ ㊱ Current input	㉟+ ㊱− Voltage input

■ OUTLINE DIAGRAM

PXF4

Outer dimensions	Panel cutout

73.2 (if with terminal cover)
58
7.7
1
48
48
Mounting fixture
PV
SV
SEL
Water-proof packing
Panel
t (panel thickness)
$1 \leq t \leq 8$
44.8
48 (terminal cover)
57
Terminal cover (option)

Panel cutout

$45^{+0.5}_{0}$ For mounting "n" units
$45^{+0.5}_{0}$
73 MIN.
63 MIN.

For close mounting in horizontal direction ("n" units) (Waterproof property is lost in this case)

$(48 \times n\text{-}3)^{+0.5}_{0}$
$45^{+0.5}_{0}$

This mounting does not meet NEMA-4X/IP66 (front waterproof specification). (Because the packing cannot be used in horizontal close mounting.)

* Dimensions include coating thickness.

PXF5

Outer dimensions	Panel cutout

72.2 (terminal cover included)
57
8.7
2
48
96
Mounting fixture
PV
SV
SEL
Water-proof packing
Panel
t (panel thickness)
$1 \leq t \leq 8$
91.4
93.7 (terminal cover)
110.4
Terminal cover (option)

$45^{+0.6}_{0}$ For mounting "n" units
$92^{+0.8}_{0}$
116 MIN.
50 MIN.

For close mounting in horizontal direction ("n" units) (Waterproof property is lost in this case)

$(48 \times n\text{-}3)^{+0.8}_{0}$
$92^{+0.8}_{0}$

This mounting does not meet NEMA-4X/IP66 (front waterproof specification). (Because the packing cannot be used in horizontal close mounting.)

* Dimensions include coating thickness.

PXF9

Outer dimensions	Panel cutout

72.2 (terminal cover included)
57
8.7
2
96
96
Mounting fixture
PV
SV
SEL
Water-proof packing
Panel
t (panel thickness)
$1 \leq t \leq 8$
91.4
93.7 (terminal cover)
110.4
Terminal cover (option)

$92^{+0.8}_{0}$
$92^{+0.8}_{0}$
116 MIN.
100 MIN.

* Dimensions include coating thickness.

■ Rear view

\<PXF4\>

| 1-6 | 7-12 | 13-18 |

6.2
Terminal

\<PXF5\>

| 1-12 | 13-24 | 25-36 |

6.2
Terminal

\<PXF9\>

| 1-12 | 13-24 | 25-36 |

6.2
Terminal
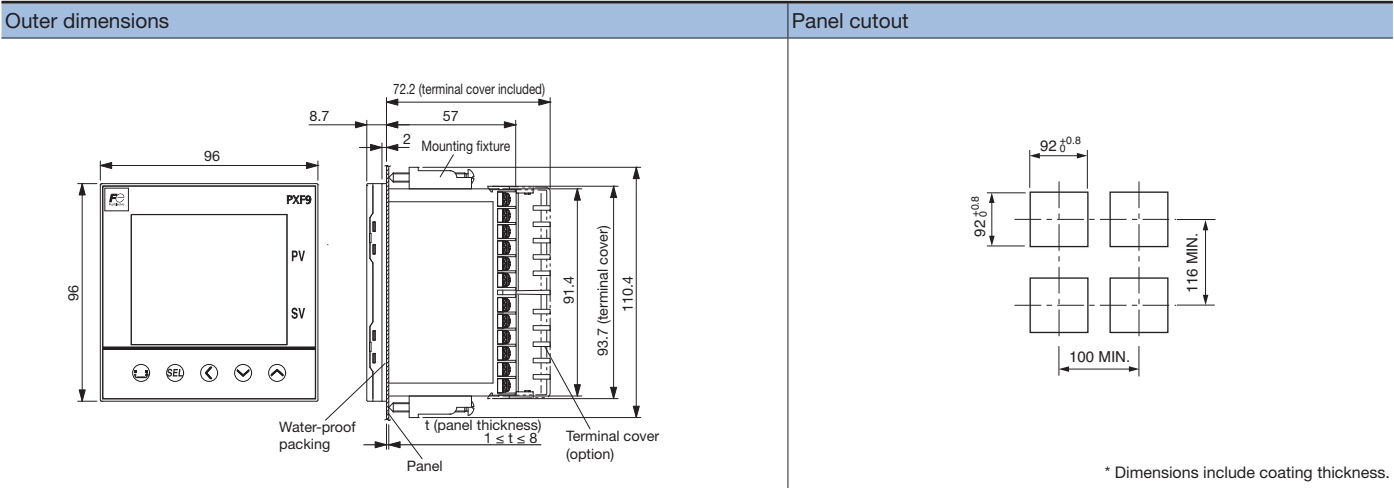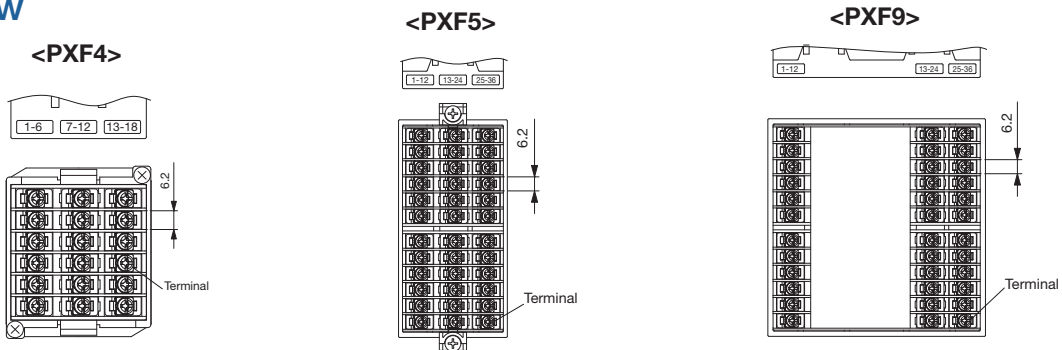
■ Related products

Module type temperature controllers (PUM)

Efficient solution that meets your expectations

Smart
- ■ Up to 64 control loops
- ■ Heater break alarm CT (8 points) per module

Sweet
- ■ Detachable terminal
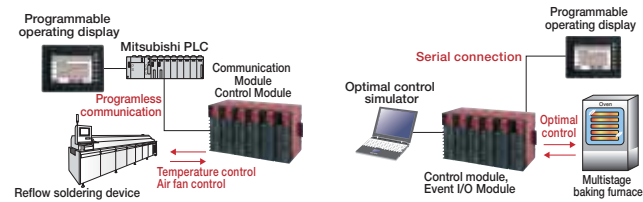- ■ Bilingual loader
- ■ Simple loader operation

Speedy
- ■ High-speed data communication (RS485/230.4 kbps)
- ■ High-speed data sampling (200 m/s)

Wide selection of modules
- ○ Control Module
- ○ Event input/output
- ○ Analog input/output
- ○ Analog input
- ○ Analog output
- ○ CC-LINK communication
- ○ Mitsubishi PLC communication
- ○ PROFIBUS
- ○ Ethernet

Application examples

Programmable operating display
Mitsubishi PLC
Communication Module Control Module
Programless communication
Reflow soldering device
Temperature control Air fan control

Programmable operating display
Serial connection
Optimal control simulator
Optimal control
Control module, Event I/O Module
Multistage baking furnace
Oven

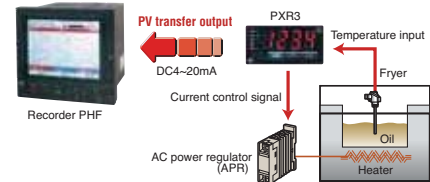## 24 x 48 mm sized Temperature Controller (PXR3)

Various functions in compact body

- ■ Front dimension 24×48 mm
- ■ Multiple input: RTD, thermocouple, voltage/current
- ■ Heating/cooling control
- ■ Optional functions: Alarm output, 8-step ramp doak, re-transmission output, RS-485 communication, digital input

DIN rail mounting

Optional DIN rail mounting adapter allows you to mount PXR3 to DIN rail or wall.

Re-transmission output in 4 to 20 mA DC

PV transfer output
PXR3
Temperature input
DC4~20mA
Current control signal
Fryer
Recorder PHF
AC power regulator (APR)
Oil
Heater

Socket type Temperature Controller PXR4

Easy maintenance

Just fitting into a socket

Easy wiring and installation!

Detachable structure of socket and controller enables you to:
- • Perform wiring on new socket previously
- • Replace controllers without wiring work

- • 48 x 48 mm sized front panel with large display
- • DIN rail mounting available
- • PID auto tuning, self tuning, fuzzy control provided as standard
- • Three type of control output: relay contact, SSR/SSC, current
- • Two alarm outputs (optional), 8-step ramp soak (optinal)

Digital Temperature Controller (PXE4)

Slim! Easy operation! Compact

(Size:48×48mm)

Input signal 1point

Capable of changing over temperature type (resistance-bulb, 9 types of thermocouples) with front key.

Control output 1point

Relay contact output, SSR/SSC drive output, ON/OFF control and Fuzzy control (with auto-tuning)

- • Designed for simplicity and ease-of-use
- • Thin panel: 1.6 mm
- • Short depth: 62 mm
- • Alarm output up to 2 points
- • Standby and soft-start functions
- • Front water proof structure (IP66)

SPECIAL ATTENTION NEEDED for all Digital Temperature Controllers

(Please read carefully the following instructions.)

⚠WARNING   Over-temperature Protection

Any control system design should take into account that any part of the system has the potential to fail.

For temperature control systems, continued heating should be considered the most dangerous condition, and the machine should be designed to automatically stop heating if unregulated due to the failure of the control unit or for any other reason.

The following are the most likely causes of unwanted continued heating:

1) Controller failure with heating output constantly on
2) Disengagement of the temperature sensor from the system
3) A short circuit in the thermocouple wiring
4) A valve or switch contact point outside the system is locked to keep the heat switched on.

In any application where physical injury or destruction of equipment might occur, we recommend the installation of independent safety equipment, with a separate temperature sensor, to disable the heating circuit in case of overheating.

The controller alarm signal is not designed to function as a protective measure in case of controller failure.

⚠ **Caution on Safety**

* Before using products in this catalog, be sure to read their instruction manuals in advance.