New-generation PXF Series

Digital Temperature Controller

**Fast!**

**Compact!**

**User-friendly!**

- 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 function (option)
Easy-to-See color LCD! Fast control!

- Control output indicator
- Alarm output (DO) indicator
- Manual operation indicator
- Process value (PV)
- Set value (SV)
- MV Bar graph
- Ramp/soak status
- PID auto tuning indicator
- Parameter number
- User key
- Select key
- Digit selector
- Up key
- Down key

Tallest PV characters in the industry
Optimal bright and clear white PV display

Universal input
- 1 input
  - Temperature: Thermocouple RTD
  - Pressure: 1 to 5 V DC, etc.
  - Flow rate: 4 to 20 mA DC, etc.
- Easy switchover by parameter setting

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

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

Bus-powered USB interface equipped
Directly connectable to PC via USB port with optional cable. No need of power supply to the PXF.

Smart Ramp-Soak up to 64 segments/15 patterns

Simple power monitoring function/preventive maintenance alarm

Free loader software - user-friendly key operation and easy to find parameters.
### Versatile controller for any applications

<table>
<thead>
<tr>
<th>Type</th>
<th>PXF4</th>
<th>PXF5</th>
<th>PXF9</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appearance</strong></td>
<td><img src="image1" alt="PXF4" /></td>
<td><img src="image2" alt="PXF5" /></td>
<td><img src="image3" alt="PXF9" /></td>
</tr>
<tr>
<td>Front panel size</td>
<td>48 × 48 mm</td>
<td>48 × 96 mm</td>
<td>96 × 96 mm</td>
</tr>
<tr>
<td>Depth</td>
<td>58 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display digits</td>
<td>4-digit (PV and SV)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Character height (PV)</td>
<td>15.3 mm</td>
<td>18.1 mm</td>
<td>26 mm</td>
</tr>
<tr>
<td>Indication accuracy</td>
<td>RTD input: ±0.2%±1 digit or ±0.8°C±1 digit, whichever is larger</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thermocouple input: ±0.3%±1 digit or ±1°C±1 digit, whichever is larger</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Voltage and current input: ±0.3%FS±1 digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sampling rate</td>
<td>50 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Input signal</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process value input</td>
<td>Remote SV input</td>
<td>Universal input (RTD, thermocouple, voltage/current)</td>
<td></td>
</tr>
<tr>
<td>Current transformer (CT) input</td>
<td>Dedicated CT (1 to 100 A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorized valve position input</td>
<td>-</td>
<td>100Ω to 2.5kΩ (3-wire)</td>
<td></td>
</tr>
<tr>
<td>Digital input (DI)</td>
<td>Up to 3 points</td>
<td>Up to 5 points</td>
<td></td>
</tr>
<tr>
<td><strong>Output signal</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control output</td>
<td>Relay contact</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SSR/SSC drive output</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current output (linear)</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Voltage output (linear)</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Option</td>
<td>Motorized valve control output</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Analog re-transmission output (voltage)</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Analog re-transmission output (current)</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heater burnout alarm</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operating days alarm</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alarm/event contact output (DO)</td>
<td>Up to 3 points</td>
<td>Up to 5 points</td>
</tr>
<tr>
<td><strong>Control method</strong></td>
<td>ON/OFF control</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PID control*</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fuzzy control*</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-degrees-of-freedom PID control*</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Open-loop system supported (PID2 control)</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Self tuning</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ramp/soak (simple program control)</td>
<td>up to 64 steps</td>
<td></td>
</tr>
<tr>
<td>Option</td>
<td>Heating/cooling control*</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Motorized valve control</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td><strong>Function</strong></td>
<td>Number of PV/PID patterns</td>
<td>Up to 8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SV/PID switchover</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soft start</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Simple power-monitoring</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operating days</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manual operation</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>User key</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td>Loader interface</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Option</td>
<td>RS-485 (MODBUS)</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td><strong>Power supply voltage</strong></td>
<td>100 to 240 V AC, 50/60 Hz</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Option</td>
<td>24 V DC/AC</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td>10 VA MAX.</td>
<td>13 VA MAX.</td>
<td>13 VA MAX.</td>
</tr>
<tr>
<td><strong>Screw terminals for external connection</strong></td>
<td>M3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Some functions may be unavailable depending on the model. For more detail, please refer to the specifications.
Parameter setting is available using the front keys or a PC with loader software.

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.

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

<table>
<thead>
<tr>
<th>Standard functions</th>
<th>Optional functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 On/Off control</td>
<td>2 Heating/cooling control with auto tuning</td>
</tr>
<tr>
<td>2 PID control with auto tuning</td>
<td>3 Motorized valve control</td>
</tr>
<tr>
<td>3 Fuzzy control with auto tuning</td>
<td>4 2-degrees-of-freedom PID control with auto tuning</td>
</tr>
<tr>
<td>5 Open-loop supported PID2 control</td>
<td>5 Self tuning</td>
</tr>
<tr>
<td>7 Ramp soak function (simple program control)</td>
<td></td>
</tr>
</tbody>
</table>

5 Open-loop supported PID2 control

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

- Process value
- PV
- Power supply to control equipment
- Control loop
- Close

3 PID control with auto tuning

Typical PID control. Overshoot may occur due to external disturbance.

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.

- 2-degrees-of-freedom PID (with optimal α and β)

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.
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.

<table>
<thead>
<tr>
<th>Number of steps and patterns</th>
<th>Steps</th>
<th>Patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

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

SSR drive output

Furnace

Thermocouple

[Ramp soak function]

Temperature rise/fall pattern is controlled by setting a heat pattern having a gradient. Action start/resetting 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).

Temperature control of plastic molding machine

Start/stop of auto tuning can be commanded externally.

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.

Heating/cooling control (option)

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

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

Valve control command output

Valve position signal (resistance)

Temperature sensor

Solenoid valve

Motorized valve

Air conditioner

Summer: Normal action
Winter: Reverse action
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 (option)
2. Remote SV input (option)
3. Heater burnout alarm
4. Alarm output
5. Digital input
6. RS-485 Communication

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#### 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.

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#### 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.

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#### Simple power-monitoring

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

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#### Operating days alarm

1. Operating days indication
2. Operating days alarm output

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

---

#### 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 following):
  - 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

---

#### 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

---
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

4 Alarm output (option)

Up to 3 points

<table>
<thead>
<tr>
<th>Alarm type</th>
<th>Action diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper limit absolute value</td>
<td>ALn PV</td>
</tr>
<tr>
<td>Lower limit absolute value</td>
<td>ALn PV</td>
</tr>
<tr>
<td>Upper limit absolute value (with hold)</td>
<td>ALn PV</td>
</tr>
<tr>
<td>Lower limit absolute value (with hold)</td>
<td>ALn PV</td>
</tr>
<tr>
<td>Upper limit deviation</td>
<td>ALn PV</td>
</tr>
<tr>
<td>Lower limit deviation</td>
<td>ALn PV</td>
</tr>
<tr>
<td>Upper and lower limits deviation</td>
<td>ALn ALn PV</td>
</tr>
<tr>
<td>Lower limit deviation (with hold)</td>
<td>ALn PV</td>
</tr>
<tr>
<td>Upper and lower limits deviation</td>
<td>ALn ALn PV</td>
</tr>
<tr>
<td>Lower limit deviation (with hold)</td>
<td>ALn ALn PV</td>
</tr>
<tr>
<td>Range upper and lower limits absolute value</td>
<td>ALn ALn ALn ALn PV</td>
</tr>
<tr>
<td>Range upper and lower limits deviation</td>
<td>ALn ALn ALn ALn PV</td>
</tr>
<tr>
<td>Range upper limit absolute value</td>
<td>ALn ALn ALn</td>
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<tr>
<td>Range lower limit absolute value</td>
<td>ALn ALn ALn</td>
</tr>
<tr>
<td>Range upper limit deviation</td>
<td>ALn ALn ALn</td>
</tr>
<tr>
<td>Range lower limit deviation</td>
<td>ALn ALn ALn</td>
</tr>
</tbody>
</table>

5 Digital input (option)

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

6 RS-485 Communication (option)

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

- PXF's can be connected with PC, programmable operation display, or PLC.

<table>
<thead>
<tr>
<th>Address</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>30001</td>
<td>PV</td>
</tr>
<tr>
<td>30002</td>
<td>SV(Read)</td>
</tr>
<tr>
<td>30003</td>
<td>SV</td>
</tr>
<tr>
<td>30004</td>
<td>MV1</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>40003</td>
<td>SV(Write)</td>
</tr>
<tr>
<td>40004</td>
<td>STBY</td>
</tr>
<tr>
<td>40005</td>
<td>AT</td>
</tr>
<tr>
<td>40006</td>
<td>P</td>
</tr>
<tr>
<td>40007</td>
<td>I</td>
</tr>
<tr>
<td>40008</td>
<td>D</td>
</tr>
<tr>
<td>...</td>
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</tbody>
</table>

Max.32 words

<table>
<thead>
<tr>
<th>Address</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>30001</td>
<td>PV</td>
</tr>
<tr>
<td>30002</td>
<td>SV(Read)</td>
</tr>
<tr>
<td>30003</td>
<td>SV(W/Is)</td>
</tr>
<tr>
<td>30004</td>
<td>MV1</td>
</tr>
<tr>
<td>40002</td>
<td>P</td>
</tr>
<tr>
<td>40006</td>
<td>D</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>
### Specification

#### General specifications

- **Power supply voltage**: 100 (15%) V to 240 (+10%) V AC, 50/60 Hz
- **Power consumption**: 24 V DC (±10%)
- **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/RTC/voltage/current)

#### Standard measurement range and input type

- See Table 1

#### Indicator accuracy

- **(at Ta = 23°C)**
  - Thermocouple input: either ±1°C ±1 digit or ±0.3% ±1 digit of indicated value, whichever is larger
  - Thermocouple B: 0 to 400°C: no accuracy assurance
  - 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% ±1 digit

#### Temperature effect on sensitivity

- ±0.3°F/°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% ±1 digit per 100 Ω
- Voltage input: ±0.3% ±1 digit per 500 Ω

#### Allowable wiring resistance

- RTD: 10 Ω MAX. (per wire)

#### Allowable input voltage:

- DC voltage input: ±35 V
- Current input: ±25 mA
- Thermocouple, RTD, mV: within ±5 V

#### Noise reduction ratio

- *Current input: ±0.3% ±1 digit
- Voltage input: ±0.3% ±1 digit
- Thermocouple input: ±0.3% ±1 digit

#### Input correction:

- User adjustment: ±20%FS for each of zero and span point
- Process value shift: ±1%FS
- Input filter: 0.0 to 120.0 s (filter off if set at 0)
- 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)
- ±0.1% to 0.0% (FS ±1 digit)

#### Remote SV input (option)

- **Number of input**: 1
- **Input signal**: Voltage: 0 to 5 V DC/0 to 5 V DC/0 to 10 V DC
- Current: 0 to 20 mA DC/4 to 20 mA DC
- Load resistance: 500 Ω MAX. (current), 10 kΩ MIN. (voltage)
- Accuracy: ±0.2% ±5%FS

#### Current transformer (CT) input (option)

- **Input type**: Single phase CT, 1 point
- **Range of detected current**: 1 to 100A
- **Detected current accuracy**: ±1%FS
- **Detected current resolution**: 0.1 A
- **ON time necessary for detection**: 300 ms MIN.

#### Digital input (DI) (option)

- **Number of point**: up to 3 (PXFS: up to 9)
- **Specification**: No-voltage contact or transistor input
- **Contact capacity**: 5 V DC, about 2 mA (per point)
- **Input judgment**: ON voltage: 2.0 V DC or lower
  - OFF voltage: 3.0 V DC or higher
- **Sampling pulse width**: 50 ms MIN.
- **Function**: Remote mode selection, SV changeover, control standby, AT startup, alarm unlatch, program selection, start/stop/reset, PID switching (normal/reverse), etc.

#### Valve position feedback signal (Potentiometer) input (option)

- **Model**: PXFS and PXF9 (not available for PXF4)
- **Resistance range**: 100 Ω to 2.5 kΩ (three-wire)
- **Resolution**: 0.5 mV
- **Accuracy**: ±1%FS
- **Temperature effect on sensitivity**: ±0.5%FS/°C
- **Burned winding**: Not provided

### Control output

#### Control output

- **Number of point**: Up to 2 (2 points: Heating/cooling control)
- **Select among**: (1) Relay contact output (SPST), (2) 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 (V DC)
- **Mechanical life**: 20 million operations MIN. (100 operations/mini)
- **Electrical life**: 500,000 operations MIN. (rated load)
- **Output cycle**: 100 ms

#### Re-transmission output

- **Number of point**: 6
- **Type**: Current/voltage output 0 to 20 mA DC/4 to 20 mA DC/0 to 5 V DC
- **Guaranteed output range**: 0 to 21 mA DC/0 to 10.5 V DC
- **Accuracy**: ±0.2% ±5%FS
- **Resolution**: 500 µA MIN. (current), 10 kΩ MIN. (voltage)

#### Display unit

- **Additional function**: Scaling function

#### 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**: Dual PID parameters determination: Auto tuning
- **Position proportional**: Full stroke time: 30 seconds MIN. (Not available for PXF4)

#### Control parameters

- **Proportional band**: 0.1% to 999.9% (adjustable)
- **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
- **Number of SV and PID patterns**: Changed by any of parameter setting, digital input, communica-
  - user function keying, zone change.

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**Table 1**

<table>
<thead>
<tr>
<th>Input type</th>
<th>Universal input: thermocouple/RTC/voltage/current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermocouple, mV</td>
<td>±0.3% ±1 digit of indicated value, whichever is larger</td>
</tr>
<tr>
<td>Thermocouple B</td>
<td>No accuracy assurance</td>
</tr>
<tr>
<td>All thermocouples</td>
<td>±2°C ±1 digit</td>
</tr>
<tr>
<td>RTD</td>
<td>±0.8°C ±1 digit or ±0.2% ±1 digit of indicated value, whichever is larger</td>
</tr>
<tr>
<td>mV input, voltage input, current input</td>
<td>±0.3% ±1 digit</td>
</tr>
</tbody>
</table>

**Table 2**

<table>
<thead>
<tr>
<th>Relay contact output (SPST)</th>
<th>Relay contact output (SPDT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact structure: 1 SPST contact</td>
<td>Contact structure: 1 SPST contact</td>
</tr>
<tr>
<td><em>SPST</em>: single pole single throw</td>
<td><em>SPDT</em>: single pole double throw</td>
</tr>
<tr>
<td>Contact capacity: 250 V AC/30 V DC, 3 A (resistive load)</td>
<td>Contact capacity: 250 V AC/30 V DC, 3 A (resistive load)</td>
</tr>
<tr>
<td>Minimum ON/OFF current: 10 mA (V DC)</td>
<td>Minimum ON/OFF current: 10 mA (V DC)</td>
</tr>
<tr>
<td>Mechanical life: 20 million operations MIN. (100 operations/mini)</td>
<td>Mechanical life: 20 million operations MIN. (100 operations/mini)</td>
</tr>
<tr>
<td>Electrical life: 500,000 operations MIN. (rated load)</td>
<td>Electrical life: 500,000 operations MIN. (rated load)</td>
</tr>
</tbody>
</table>

**Table 3**

<table>
<thead>
<tr>
<th>Alarm output (DO) (option)</th>
<th>Relay contact output: up to 5 (shared common) PXF4: up to 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output specifications</td>
<td>Relay contact output</td>
</tr>
<tr>
<td>Contact structure: 1 SPST contact</td>
<td>Contact structure: 1 SPST contact</td>
</tr>
<tr>
<td><em>SPST</em>: single pole single throw</td>
<td><em>SPST</em>: single pole single throw</td>
</tr>
<tr>
<td>Contact capacity: 250 V AC/30 V DC, 1 A (resistive load)</td>
<td>Contact capacity: 250 V AC/30 V DC, 1 A (resistive load)</td>
</tr>
<tr>
<td>Minimum ON/OFF current: 10 mA (V DC)</td>
<td>Minimum ON/OFF current: 10 mA (V DC)</td>
</tr>
<tr>
<td>Mechanical life: 20 million operations MIN. (100 operations/mini)</td>
<td>Mechanical life: 20 million operations MIN. (100 operations/mini)</td>
</tr>
<tr>
<td>Electrical life: 500,000 operations MIN. (rated load)</td>
<td>Electrical life: 500,000 operations MIN. (rated load)</td>
</tr>
</tbody>
</table>

**Table 4**

<table>
<thead>
<tr>
<th>Display unit</th>
<th>LCD (with backlight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indication contents</td>
<td>Process value indication: 11-segment, 4-digit [white]</td>
</tr>
<tr>
<td>Setpoint indication: 11-segment, 4-digit [green]</td>
<td></td>
</tr>
<tr>
<td>Screen No. indication: 7-segment, 4-digit [green]</td>
<td></td>
</tr>
<tr>
<td>Output contents</td>
<td>PV, SV, DV, MV</td>
</tr>
<tr>
<td>Additional function</td>
<td>Scaling function</td>
</tr>
</tbody>
</table>

**Table 5**

<table>
<thead>
<tr>
<th>Setting section</th>
<th>Possible (4 steps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON/OFF control</td>
<td>Refer to page 4.</td>
</tr>
<tr>
<td>PID control</td>
<td>Dual control (heating/cooling), PID parameters determination: Auto tuning</td>
</tr>
<tr>
<td>Fuzzy PID control</td>
<td>Dual control (heating/cooling), PID parameters determination: Auto tuning</td>
</tr>
<tr>
<td>Self tuning control</td>
<td>Refer to page 4.</td>
</tr>
<tr>
<td>PID2 control</td>
<td>Dual control (heating/cooling), PID parameters determination: Auto tuning</td>
</tr>
<tr>
<td>2-degrees-of-freedom PID</td>
<td>Dual PID parameters determination: Auto tuning</td>
</tr>
<tr>
<td>Position proportional</td>
<td>Full stroke time: 30 seconds MIN. (Not available for PXF4)</td>
</tr>
</tbody>
</table>

**Table 6**

<table>
<thead>
<tr>
<th>Control parameters</th>
<th>Proportional band (P) 0.1% to 999.9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integration time (I)</td>
<td>0 to 3200 s (invalidated when I = 0)</td>
</tr>
<tr>
<td>Differential time (D)</td>
<td>0.0 to 999.9 s (invalidated when D = 0)</td>
</tr>
<tr>
<td>Control cycle</td>
<td>100 to 900 ms (in 100 ms), 1 to 99 s (in seconds)</td>
</tr>
<tr>
<td>Anti-reset windup</td>
<td>0 to 100% of measurement range</td>
</tr>
</tbody>
</table>
| Number of SV and PID patterns | Changed by any of parameter setting, digital input, communica-
- 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.)

### Additional functions

- **Detectable range**: 1 A to 100 A
- **Detected current 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
- **Baud rate**: 9600 bps, 19200 bps, 38.4 kbps, 115.2 kbps
- **Code type**: Data length: 8 data bits. Parity: Odd, even, none.
- **Communication method**: Half-duplex bit serial, asynchronous communication
- **Protocol**: Modbus-RTU
- **Physical specifications**: EIA-485

### 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/s² (1 G) or less
- **Impact**: during transportation: 294 m/s² (30 G) or less

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

- **Number of program steps**: 64 steps x 1 pattern, 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

- **Basic functions**: [1] Segment time can be set in “Hour, Minutes” or “Minutes, Seconds”
  - [1] Segment time can be set in “Hour, Minutes” or “Minutes, Seconds”
  - Guarantee soak
  - Repeat action
  - PV start
  - Delay start
  - Power restoring function

### Memory backup

- **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 and operating days alarm

- **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.**

### Process 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

<table>
<thead>
<tr>
<th>Input type</th>
<th>Code (PVT)</th>
<th>Measurement range [°C]</th>
<th>Minimum input increment [°C]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DC voltage</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 to 5 V DC</td>
<td>0.0 to 150.0</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>1 to 5 V DC</td>
<td>0.0 to 50.0</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>2 to 10 V DC</td>
<td>0.0 to 600.0</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>4 to 20 mA DC</td>
<td>-1999 to 9999 (Range where scaling is allowed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DC current</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 to 20 mA DC</td>
<td>0.0 to 100.0</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>4 to 20 mA DC</td>
<td>0.0 to 200.0</td>
<td>0.1</td>
<td></td>
</tr>
</tbody>
</table>

### Thermocouple

<table>
<thead>
<tr>
<th>Input type</th>
<th>Code (PVT)</th>
<th>Measurement range [°C]</th>
<th>Minimum input increment [°C]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>J</strong></td>
<td>J1</td>
<td>0.0 to 400.0</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>J2</td>
<td>-200 to 400.0</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>J3</td>
<td>-200 to 800.0</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>J4</td>
<td>-100 to 1000</td>
<td>1</td>
</tr>
<tr>
<td><strong>K</strong></td>
<td>K1</td>
<td>0 to 400</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>K2</td>
<td>-200 to 1000</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>K3</td>
<td>0.0 to 800.0</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>K4</td>
<td>-200 to 1500</td>
<td>1</td>
</tr>
<tr>
<td><strong>R</strong></td>
<td>R1</td>
<td>0 to 1500</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>R2</td>
<td>0 to 1500</td>
<td>1</td>
</tr>
<tr>
<td><strong>S</strong></td>
<td>S1</td>
<td>0 to 1700</td>
<td>1</td>
</tr>
<tr>
<td><strong>T</strong></td>
<td>T1</td>
<td>-199.9 to 200.0</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>T2</td>
<td>-199.9 to 400.0</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>E</strong></td>
<td>E1</td>
<td>0.0 to 800.0</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>E2</td>
<td>-199.9 to 800.0</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>E3</td>
<td>-200 to 800</td>
<td>1</td>
</tr>
<tr>
<td><strong>L</strong></td>
<td>L1</td>
<td>-100 to 1500</td>
<td>1</td>
</tr>
<tr>
<td><strong>U</strong></td>
<td>U1</td>
<td>-199.9 to 200.0</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>U2</td>
<td>-200 to 400</td>
<td>1</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>N</td>
<td>-200 to 1300</td>
<td>1</td>
</tr>
<tr>
<td><strong>W</strong></td>
<td>W</td>
<td>0 to 2300</td>
<td>1</td>
</tr>
<tr>
<td><strong>PL-R</strong></td>
<td>PL-R</td>
<td>0 to 1300</td>
<td>1</td>
</tr>
</tbody>
</table>
Panel mounting adapter for replacement from PXR7 to PXF4

Current detector (CT)
- Specification: 1 A to 30 A
- Type: CTL-6-S-H

Optional Items
- Current detector (CT) 1 A to 30 A
- Parameter loader interface cable ZZP
- Terminal cover ZZPPXR1-A230
- Shunt resistor (250 Ωx0.1%) ZZPPXR1-A190
- Panel mounting adapter for replacement from PXR7 to PXF4 ZZP"
Motorized valve control type (base model: PXF5 or PXF9)

### Specifications

<table>
<thead>
<tr>
<th>Digit</th>
<th>Code</th>
<th>Description</th>
<th>Specification</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>PXF5</td>
<td>Front panel size W x H</td>
<td>48 × 96 mm</td>
<td>PXF5</td>
</tr>
<tr>
<td>5</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Control output 1</td>
<td>Relay contact (SPST)</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Voltage output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Control output 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Alarm output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>Power supply/voltage/instruction manual</td>
<td>100 to 240 V AC, Japanese &amp; English instruction manual</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>24 VAC/DC, English instruction manual</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>24 V AC/DC, Chinese &amp; English instruction manual</td>
<td>D</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>Option</td>
<td>Option</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td>Option</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td>Option</td>
<td></td>
</tr>
</tbody>
</table>

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

### Optional Items

- Current detector (CT) 1 A to 30 A: ZOZ+CC1TL-9-9-H
- Terminal cover (note): ZPXPX1-8100
- Parameter loader interface cable: ZZP+TQ50153C3
- Shunt resistor (250 ±0.1%): ZPXPXH-AT190

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**

- Power supply
- Control output 1 (relay contactor) or Motorized valve OPEN output
- Control output 2 (relay contactor) or Motorized valve CLOSE output

**Internal circuit**

- Process value input
- Remote SV input
- CT input
- Control output 1 (SSR drive, current, voltage)
- Control output 2 (SSR drive, current, voltage)
- Digital input 1 to 3
- Communication (RS-485)

**PXF5, PXF9**

- Power supply
- Control output 1 (relay contact) or Motorized valve OPEN output
- Control output 2 (relay contact) or Motorized valve CLOSE output

**Internal circuit**

- Process value input
- Remote SV input
- Current transformer (CT) input
- Valve position feedback (FPF) input
- Digital input 1 to 3
- Communication (RS-485)
## Standard type

<table>
<thead>
<tr>
<th>Control output 1</th>
<th>Relay output (form A contact)</th>
<th>Relay output (SPDT)</th>
<th>SSR</th>
<th>Current</th>
<th>Voltage</th>
<th>Control output 2</th>
<th>Relay output (form A contact)</th>
<th>Relay output (SPDT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

### Motorized valve control type

- **Valve control**
  - Close
  - Open

### Alarm output

- **2 points (independent common)**
  - AL1 COM
  - AL2
- **1 or 2 points**
  - AL1 COM
  - AL2

### M3 terminals

1. AL1 COM
2. AL2
3. COM

### Power supply

- **24 V AC/24 V DC**
- **100-240 V AC**

### Process value input

- **Universal input**
  - Thermocouple
  - RTD
  - Current input
  - Voltage input

### Option

- **Digital input**
  - RS485
  - DI-DI

---

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

**PXF4**

**Outer dimensions**

- Panel cutout

**Panel cutout**

- For close mounting in horizontal direction (‘Y’ units)
- (Waterproof property is lost in this case)

* Dimensions include coating thickness.

**PXF5**

**Outer dimensions**

- Panel cutout

**Panel cutout**

- For close mounting in horizontal direction (‘Y’ units)
- (Waterproof property is lost in this case)

* Dimensions include coating thickness.

**PXF9**

**Outer dimensions**

- Panel cutout

**Panel cutout**

- For close mounting in horizontal direction (‘Y’ units)
- (Waterproof property is lost in this case)

* Dimensions include coating thickness.

### Rear view

**<PXF4>**

- Terminal

**<PXF5>**

- Terminal

**<PXF9>**

- Terminal
**Efficient solution that meets your expectations**

- Up to 64 control loops
- Heater break alarm CT (8 points) per module
- Detachable terminal
- Bilingual loader
- Simple loader operation
- High-speed data communication (RS485/200.4 kbps)
- High-speed data sampling (200 m/s)

**Wide selection of modules**

<table>
<thead>
<tr>
<th>Control Module</th>
<th>Event input/output</th>
<th>Analog input/output</th>
<th>Analog output</th>
<th>CC-LINK communication</th>
<th>Mitsubishi PLC communication</th>
<th>PROFIBUS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Application examples**

- Programmable operating display
- Communication Module
- Control Module, Event IO Module
- Multi-stage baking furnace
- Optimal control simulator
- Programmable operating display

**Easy maintenance**

- Just fitting into a socket
- Easy wiring and installation!
- 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 (optional)

**Related products**

**Module type temperature controllers (PUM)**

**Socket type Temperature Controller PXR4**

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

**Digital Temperature Controller (PXE4)**

**Various functions in compact body**

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

**Slim! Easy operation! Compact**

- Input signal 1 point
  - Capable of changing over temperature type (resistance-bulb, 9 types of thermocouples) with front key.

- Control output 1 point
  - 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.

Fuji Electric Co., Ltd.

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