FUJI ELECTRIC

Fuji Instrumentation & Control

Series Z

Digital Temperature Controller

Micro Controller X series

Large LED display

Front waterproof (NEMA 4X-IP66)

Self-tuning

Model : **PXR4**

(1/16 DIN, 48x48mm)

PID + fuzzy function

Digital input

Communication function

Timer function

Heater burnout alarm

Heating/cooling control function

Ramp/soak function

UL/CSA/CE mark

ECNO : 1136a

1/16 DIN (48 × 48 mm) temperature controller PXR

Features

Large LED display and front waterproof structure

Easy-to-see, large LED display (1.6 times larger than current models)

Easy-to-wire screw terminal design

The front display and operation section is dust-proof and waterproof conforming to NEMA-4X:IP66. The front panel is washable with water.(*NOTE)

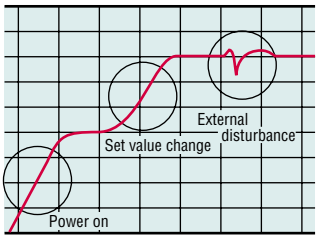
(*Note) Provided that the panel is installed with our genuine watertight packing.

PID + self-tuning, PID + fuzzy control

For calculating the optimum PID parameters, the auto tuning and self-tuning functions are installed. Also, fuzzy control function is a standard feature for suppressing the overshoot and improving the response to disturbance. Thanks to these functions, optimum control parameters suitable for each application is obtained.

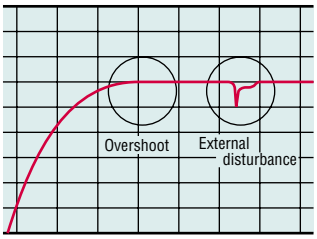
● Self-tuning

At power on, changing a set value or during external disturbance, tuning is made automatically so that the PID parameters are reoptimized.



● Fuzzy control

Suppresses the overshoot without wasting start up time.
Also, quickly reverts to set points at the event of external disturbances.



Note: For some objects to control, PID values could not be optimized.

Digital input (option)

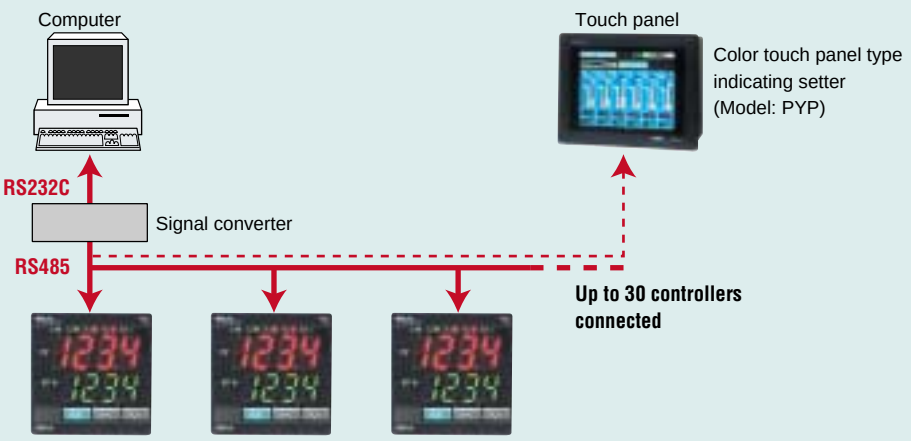
External digital input allows one of the following functions.

- Change the set value (SV0, SV1)
- Start/stop the control action
- Start/reset the ramp/soak
- Start/stop the auto tuning
- Cancel the alarm latch
- Start the incorporated timer

Note: The alarm latch means to hold the status once alarm is output.

Communication function (option)

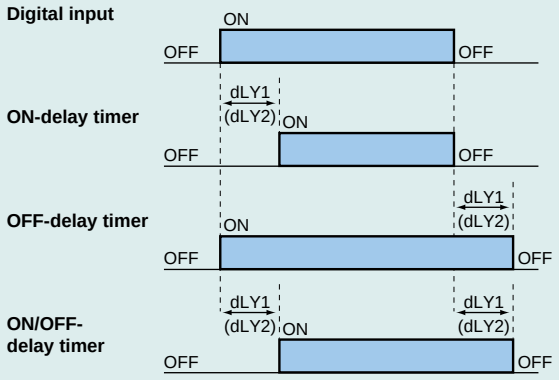
With RS-485 (Modbus™ protocol) interface, a connection with computer, touch panel or PLC is allowed.



PXR, Suitable for various temperature controls

Timer function (option)

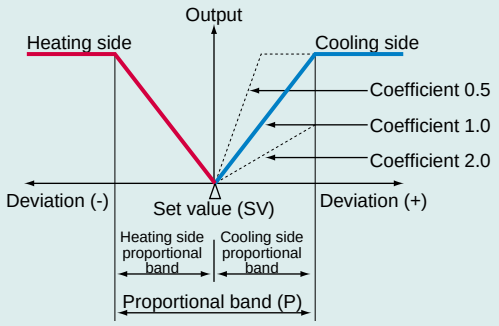
By Digital input, ON-delay or OFF delay timer can be started. That is, relay output is turned on/off after certain period of time preset in parameter dLY1/dLY2. As for relay output, alarm output relays are used. Up to 2 timer outputs can be obtained.



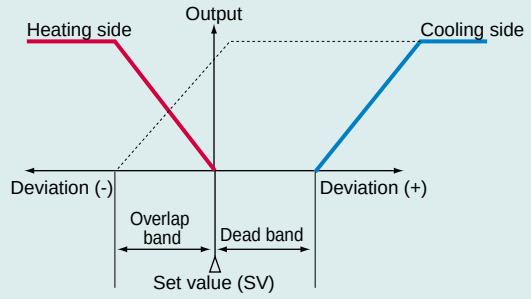
This function is available only with digital input (option).

Heating/cooling control (option)

By a single controller both heating and cooling control output are obtained. (Both control outputs 1 and 2 are used.)



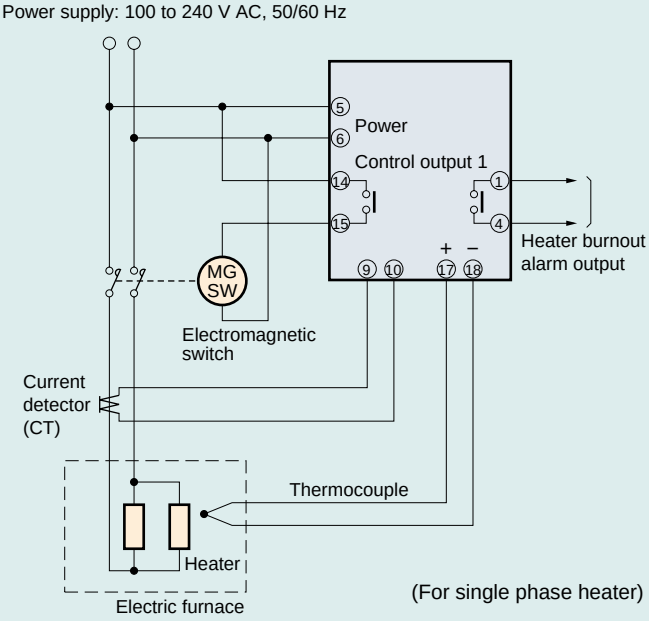
Note: For setting of the cooling side proportional band, set a coefficient with respect to the heating side proportional band (ON-OFF control if coefficient is 0).



Note 1: During heating/cooling control, the PID auto tuning cannot be used.
Note 2: "I" and "D" settings are common to heating and cooling, and cannot be selected individually.

Heater burnout alarm (option)

Using a current detector (CT) as specified below, a heater current is measured and, when the heater is found burnt out, an alarm is delivered.



Current detector model: CTL-6-SF (for 1 to 30 A)
CTL-12-S36-8F (for 20 to 50 A)

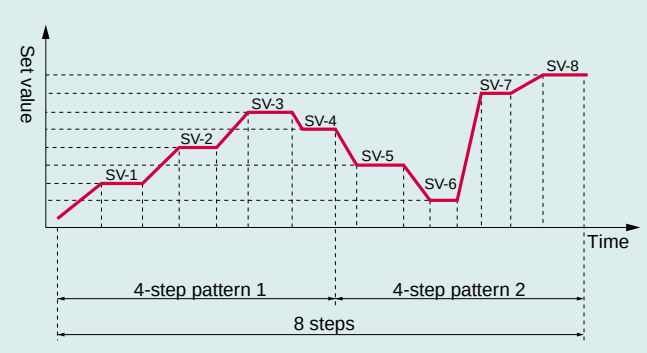
Note 1: This function cannot be used if the heater control is to be made by a thyristor phase angle control method.

Note 2: Use the control output 1 as relay contact or voltage pulse output. Set the proportional cycle (TC) to 20 seconds or more.

Note 3: Control output 2 cannot detect a heater burnout.

Ramp/soak function (option)

Changes the set value (SV) as the time elapses according to a predetermined program pattern. The instrument can program up to 8 ramp/soak steps.



Specifications and performance

<General specifications>

Power supply voltage	100 V (- 15%) to 240 V (+ 10%) AC, 50/60 Hz
Power consumption	8 VA or less (100 V AC) or 10 VA or less (220 V AC)
Insulation resistance	20 MΩ or more (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: 100Ω or less Voltage: 1 kΩ or less
Allowable wiring resistance	Resistance bulb: 10Ω or less per wire
Reference junction compensation accuracy	±1°C (at 23°C)
Input value correction	±10% of measuring range
Set value correction	±50% of measuring range
Input filter	0 to 900.0 sec settable in 0.5 sec 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 ore more

<Control function 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 settable in 0.1% steps
Integral time (I)	0 to 3200 sec settable in 1 sec steps
Differential time (D)	0 to 999.9 sec settable in 0.1 sec steps
On/off action if P = 0. Proportional action when I, D = 0.	
Proportional cycle	1 to 150 sec settable in 1 sec steps For relay contact output or voltage pulse output only
Hysteresis width	1 to 50% of measuring range For On/off action only
Anti-reset windup	0 to 100% of measuring range Automatically validated at auto tuning
Input sampling cycle	0.5 sec
Control cycle	0.5 sec

<Input section>

Input signal	Thermocouple : J, K, R, B, S, T, E, N, PL2 Resistance bulb : Pt100 Voltage, current: 1 to 5 V DC, 4 to 20 mA DC (apply current input via supplied 250Ω resistor)
Measuring range	See measuring range table
Burnout	For thermocouple or resistance bulb input Control output upper direction/lower direction is selectable

<Output section of standard type (control output 1)>

Control output 1	Designate one type out of 3 below. Relay contact: SPDT 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 100 mA (24 V DC) Voltage pulse: ON ... 17 to 25 V DC/OFF ... 0.5 V DC or less 20 mA or less 4 to 20 mA DC: Allowable load resistance 600Ω or less

<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 proportional band × cooling side proportional band coefficient Cooling side proportional band coefficient: 0 to 100.0 On/off action if P=0
Integral time (I)	0 to 3200 sec common to heating and cooling sides
Differential time (D)	0 to 999.9 sec common to heating and cooling sides
On/off action (without dead band) for heating and cooling sides if P, I, D = 0 / Proportional action if I, D = 0	
Proportional cycle	1 to 150 sec For relay contact output or voltage pulse 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 validated at auto tuning
Overlap, dead band	± 50% of heating side proportional band
Input sampling cycle	0.5 sec
Control cycle	0.5 sec

<Output section of heating/cooling control type (control output 2) (option)>

Control output 2	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 100 mA (24 V DC)

<Operation and display section>

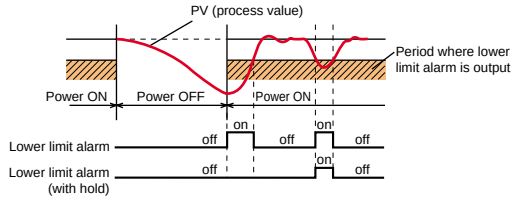
Parameter setting method	Digital setting by 3 keys Key lock function provided
Display unit	Process value/set value displayed individually 4 digits, 7-segment LED
Status display LED	Control output, process alarm output, heater burnout alarm output
Setting accuracy	0.1% or less of measuring range
Indication accuracy (at 23°C)	Thermocouple: ± (0.5% of measuring range) ± 1 digit ± 1°C For thermocouple R at 0 to 500°C ... ± (1% of measuring range) ±1 digit ±1°C For thermocouple B at 0 to 400°C ... ± (5% of measuring range) ±1 digit ±1°C Resistance bulb, voltage/current: ± (0.5% of measuring range) ±1 digit

<Alarm (option)>

Alarm kind	Absolute alarm, deviation alarm, zone alarm with upper and lower limits for each Hold function available (see figure below) Alarm latch function provided
Alarm ON-delay	Delay setting 0 to 9999 sec settable in 1 sec 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 100 mA (24 V DC) 1 or 2 output points, output cycle 0.5 sec
Heater burnout 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 100 mA (24 V DC) 1 output point, output cycle 0.5 sec

What is the hold function?

Even if the process value is within the alarm range when turning on power, the alarm does not turn on immediately but only after it leaves and then returns to the alarm range.



<Digital input (option)>

Points	1
Electrical specifications	5 V DC, approx. 2 mA
Input pulse width	0.5 sec or more
Function (1 of the 6 function is selected.)	Set value (SV0, SV1) changeover Control action start/stop Ramp/soak action start/reset Auto tuning start/stop Alarm latch cancel Incorporated timer start

<Timer function (option)>

Start	By digital input
Setting	0 to 9999 sec settable in 1 sec steps
Action	Event ON-delay or OFF-delay
Signal output	Alarm output relay used. Up to 2 points available.

<Communication function (option)>

Physical specifications	EIA RS485
Communication protocol	Modbus (RTU)
Communication method	2 wire method. Half duplex bit serial, start-stop sync type.
Data type	8 bits. Parity: odd/even/none.
Communication rate	9600bps
Connection aspect	multi-drop/up to 32 controllers connectable including master station
Communication distance	Total extension 500 m or less.
RS232C / RS485 Signal converter (recommendation)	Isolated type Manufacturer: Sekisui Electronics Co., Ltd.(Japan) Model: SI-30A Non-isolated type Manufacturer: System Sakom Co., Ltd.(Japan) Model: KS485 Note: Contact Fuji Electric for additional information.

<Other functions>

Parameter mask function	Parameter display is disabled by software.
Ramp/soak function (option)	Totally 8 ramps/8 soaks. 1 or 2 program patterns. Digital input allows to start/reset the action.
Heater current detection	Current detector For 1 to 30 A ... CTL-6-SF For 20 to 50 A ... CTL-12-S36-8F Alarm setting range: 1 to 50 A Proportional cycle of voltage pulse output or relay contact must be 20 sec or more
Applied standards	UL, CSA, CE Mark (pending)

<Power failure processing>

Memory protection	Held by non-volatile memory

<Self-check>

Method	Program error supervision by watchdog timer

<Operation and storage conditions>

Ambient operating temperature	-10°C to 50°C
Ambient operating humidity	Less than 90% RH (no condensation)
Storage temperature	-20°C to 60°C

<Structure>

Mounting method	Panel flush mounting
External terminal	Screw terminal (M3 screw)
Case material	Plastic (non-combustible grade UL94VG-0 equivalent)
Dimensions	48 × 48 × 79.8mm
Mass	Approx. 200 g
Protective structure	Front waterproof structure NEMA4X (IEC standard IP66 equivalent) (mounted on panel with our genuine packing) Rear case: IEC IP20
Outer color	Black (front frame, case)

Note: Rear terminal cover is an available option. White outer color is optionally available.

<Scope of delivery>

Scope of delivery	Controller, panel mounting bracket, watertight packing, hardware instruction manual (as designated), 250Ω resistor (for current input)

<Optional items>

Current detector (CT)	For 1 to 30 A: CTL-6-SF For 20 to 30 A: CTL-12-S36-8F
Instruction manual	For communication function

<Measuring range table>

input signal		measuring range(°C)	measuring range(°F)
resistance bulb	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
	PL2	0 to 1300	32 to 2372
DC voltage	1 to 5V	scaling range	-1999 to 9999
DC current	4 to 20mA		

Note 1: For current input connect the supplied 250Ω resister at the input terminal.

Note 2: When the measuring range exceeds 1000°C (1832°F), decimal point cannot be used.

<Insulation block diagram>

Power supply	Process variable input Heater current detector input Internal circuit
Relay contact control output 1	
Relay contact control output 2	Voltage pulse, 4 to 20 mA DC control output 1
Process alarm relay output 1	
Process alarm relay output 2	Communication (RS-485) Digital input
Heater burnout alarm output	

Note: Basic insulation (dielectric strength 1500 V AC) between blocks delimited by line —.
Functional insulation (dielectric strength 500 V AC) between blocks delimited by line —.
Non isolated between blocks which are not delimited from each other.

Ordering code

PXR 4 5 6 7 8 – 9 10 11 12 13

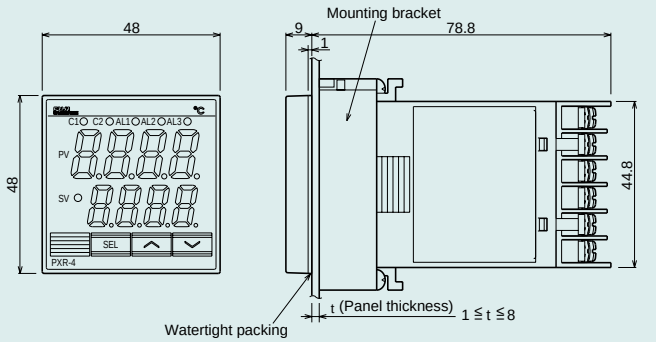
Digit	Specification	Note	Code
4	<Front panel size WxH>		
	48x48mm Screw terminal type		4
5	<Input signal>		
	Thermocouple(°C)		T
	Thermocouple(°F)		R
	Resistance bulb Pt100 3-wire(°C)		N
	Resistance bulb Pt100 3-wire(°F)		S
	4 to 20 mA DC		B
	1 to 5 V DC		A
6	<Control output 1>		
	Contact output		A
	Voltage pulse output		C
	4 to 20 mA DC output	Note1	E
7	<Control output 2>		
	None		
	Contact output	Note2	A
8	<Version number>		1
9	<Additional specifications 1>		
	None		0
	With process alarm(1 point)		1
	With heater burnout alarm	Note3	2
	With process alarm(1 point) + heater burnout alarm	Note3	3
	With ramp / soak		4
	With process alarm(1 point) + ramp / soak		5
	With heater burnout alarm + ramp / soak	Note3	6
	With process alarm(1 point) + heater burnout alarm + ramp / soak	Note3	7
	With process alarm(2 points)		F
	With process alarm(2 points) +ramp / soak		G
10	<Instruction manual><power supply voltage>		
	Without 100 to 240 V AC		N
	With 100 to 240 V AC		V
11	<Additional specifications 2>		
12	None		0 0
13	With RS485(Modbus)		M 0
	With digital input(1 point)		S 0
	With RS485(Modbus) + digital input(1 point)		V 0

Note 1 Not available with heater burnout alarm.
The code 2,3,6,7 of 9th digit should not be ordered.
Note 2 Not available with process alarm(1 point) + heater burnout alarm, and process alarm(2 points) The code 3,7,F,G of 9th digit should not be ordered.
Note 3 Not available with RS485 + digital input(1 point).
The code V00 of 11th, 12th and 13th digits should not be ordered.

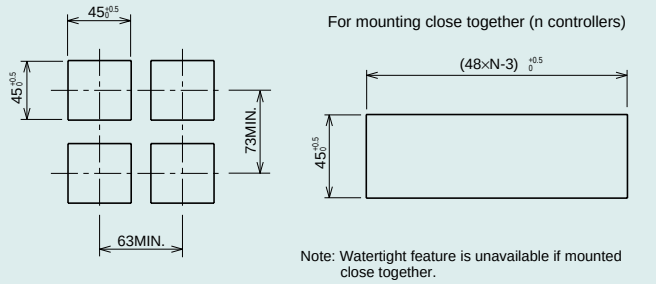
When delivering, the input signal, measuring range and set value are as follows:
Thermocouple input : type K, 0 to 400°C, set value at 0°C
Resistance bulb input : 0 to 150°C, set value at 0°C
Voltage or current input : 0 to 100%, set value at 0%
The input signal of thermocouple and each measuring range should be specified except for the above specifications.

When delivering, the control output action is set at reverse for control output 1, set at direct for control output 2.
Use the front key to change the control action between reverse and direct.

Dimensions (unit: mm)



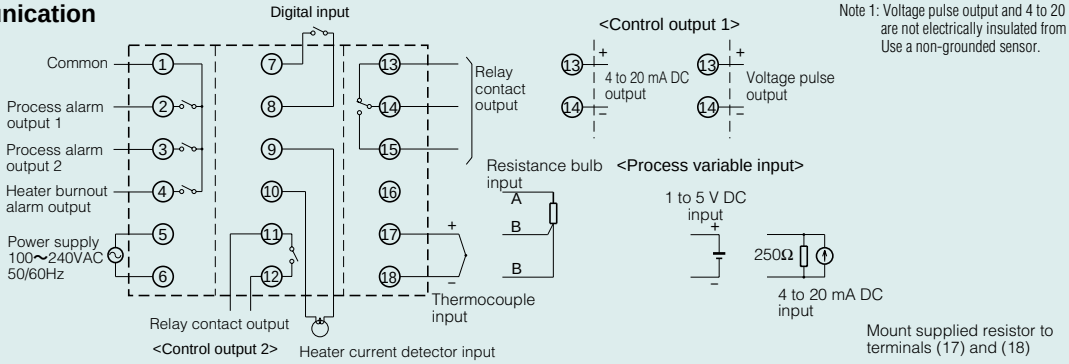
Panel cutout (unit: mm)



Note: If mounting close together is required at power supply voltage of 240 V AC, arrange the specifications so that more than 3 relay contact outputs will not be used.
(Relay contact outputs include control outputs 1 and 2, process alarm outputs 1 and 2 and heater burnout alarm output.)

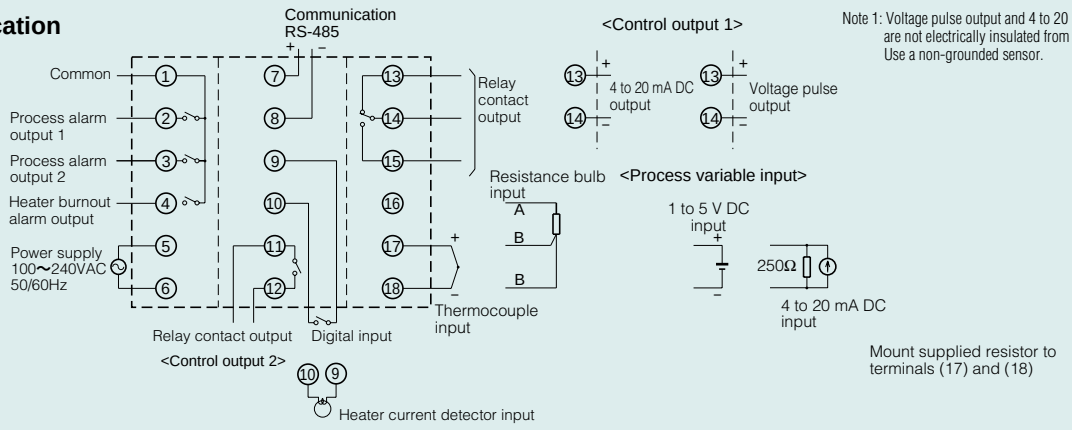
External connection diagram

Without communication function



Note 1: Voltage pulse output and 4 to 20 mA DC output are not electrically insulated from internal circuit. Use a non-grounded sensor.

With communication function

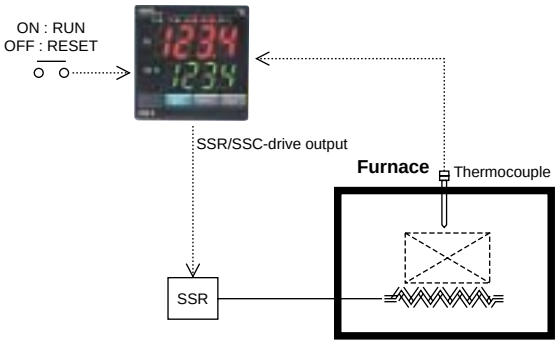


Note 1: Voltage pulse output and 4 to 20 mA DC output are not electrically insulated from internal circuit. Use a non-grounded sensor.

Application examples

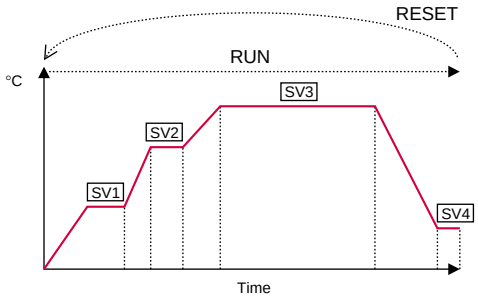
FURNACE / Heat Pattern Control

HEAT PATTERN CONTROL ≥ Ramp/Soak function



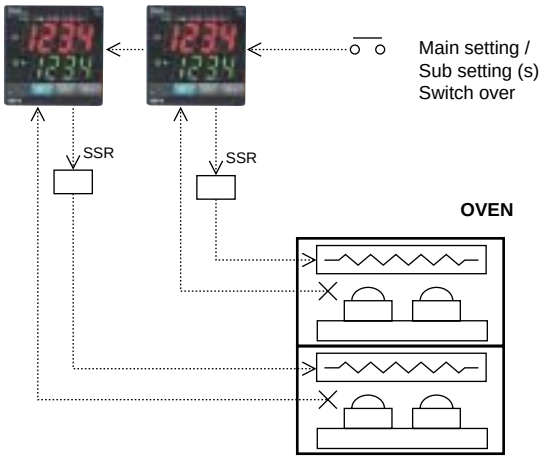
Ramp/Soak Function

- ■ Control temperature according to "Heat pattern with ramp".
- ■ Keep temperature stable for a certain period with "Heat pattern" and then cool down.
- ■ "Heat pattern" can be Started (RUN) /Reset by a external digital input.



Oven

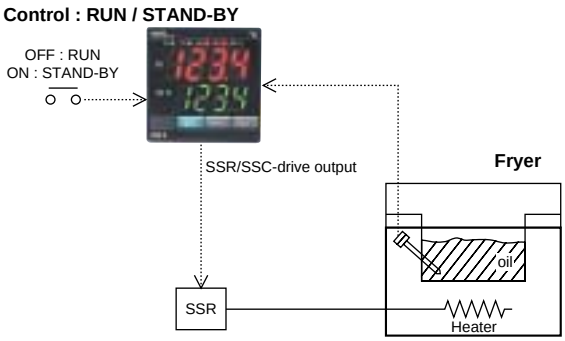
☼To change SV easily



Set Value (SV) can be selected / changed externally.

FRYER

☼To keep oil temperature stable during fryer operation



Control RUN / Stand-by selectable through external digital input.

Plastic Molding Machine

☼Stable Temperature control requied

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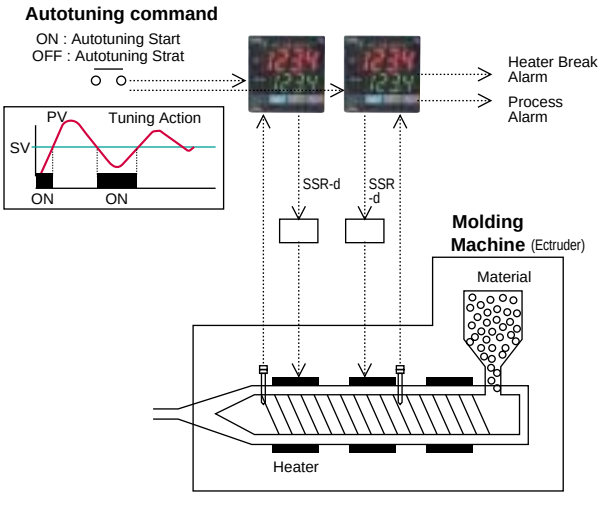
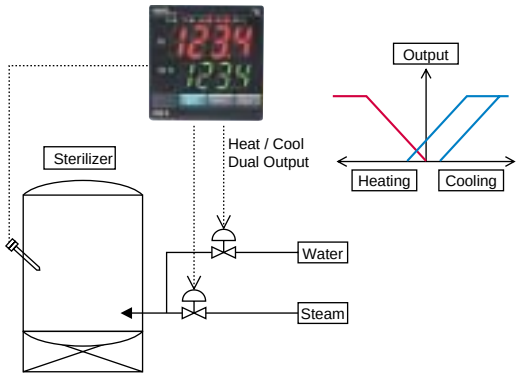
FUZZY + PID Control



Auto-Tuning can be started/stopped through external digital input.

COOLING + HEATING CONTROL



Cooling output and Heating output can be overlapped.
On the other hand, "Dead-band" can also be set.

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