

ZSeries Digital Temperature Controller
Micro Controller X Series

Large LED display

Front waterproof structure (NEMA-4X/IP66)

Self-tuning

PID + fuzzy function

Digital input

Communication function

Re-Transmission output

Timer function

Heating/cooling control function

Ramp/soak function

UL/C-UL/CE mark



Model: **PXR3**
(1/32 DIN, 24×48mm)

1/32 DIN (24 × 48 mm) temperature controller PXR3

Features

Large LED display and front waterproof structure



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.



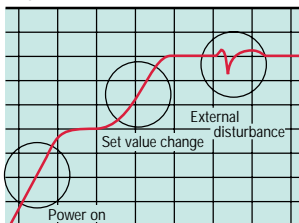
Easy-to-see, large LED display (1.3 times larger than current models)

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

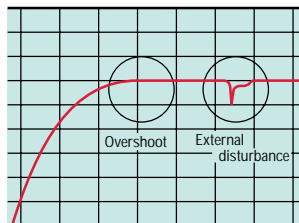
At power on, changing a set value or during external disturbance, tuning is made automatically so that the PID parameters are reoptimized.



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

● Fuzzy control

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



Digital input (option)

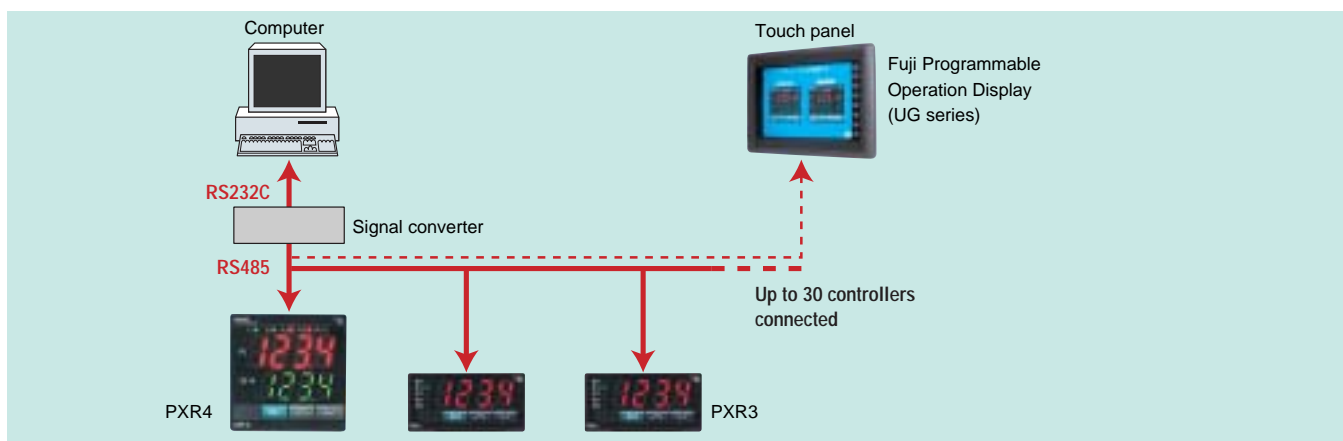
External digital input allows one of the following functions.

- Change the set value (front SV0, SV1 to 3)
- 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)

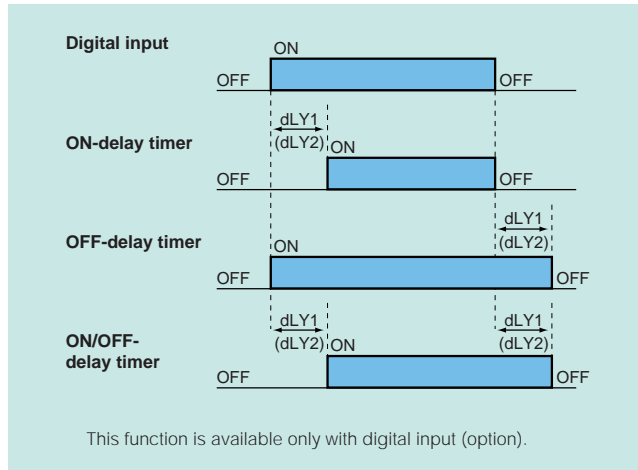
With RS-485 (Modbus™ protocol) interface, a connection with computer, touch panel or PLC is allowed.



PXR, Suitable for various temperature controls

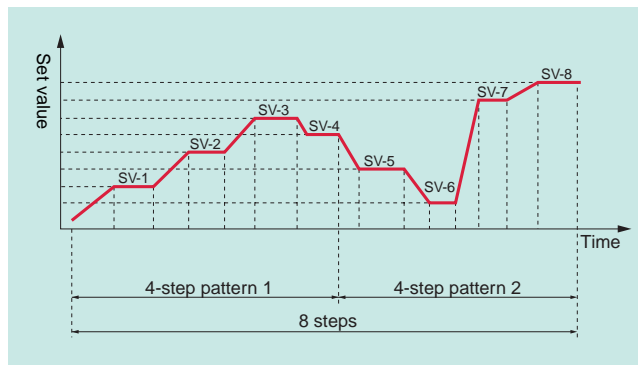
Timer function (option)

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.



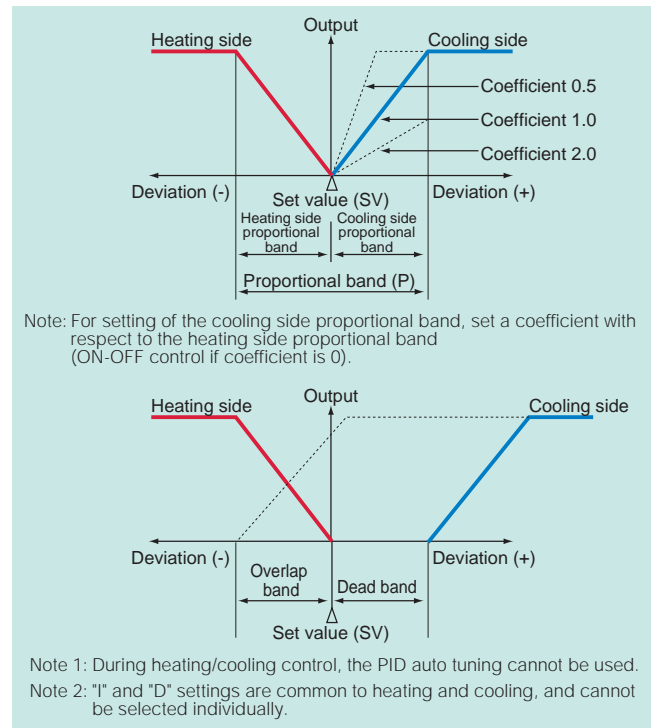
Ramp/soak function (option)

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.

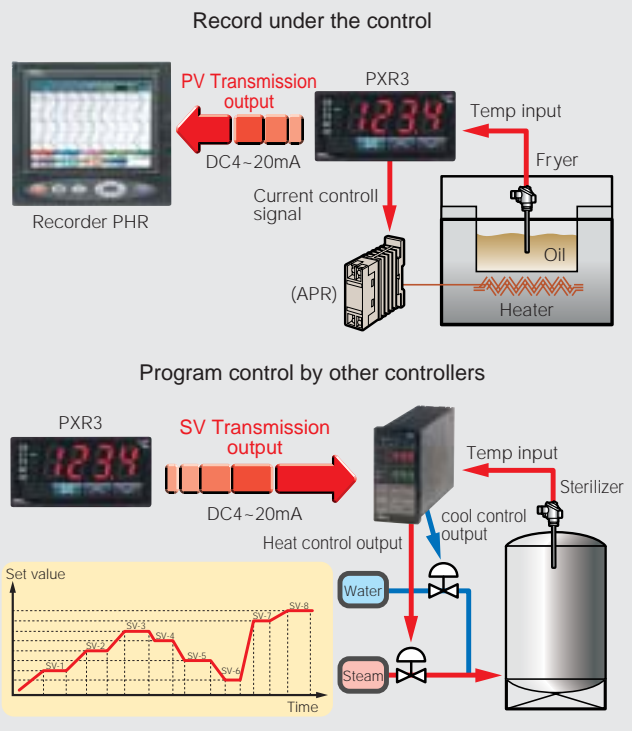


Heating/cooling control (option)

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



Re-Transmission output : 4-20mA (option)
 With this function, it is possible to use as below.





Specifications and performance

<General specifications>

Power supply voltage	100 V (- 15%) to 240 V (+ 10%) AC, 50/60 Hz or 24 V DC/24V AC
Power consumption	6 VA or less (100 V AC) or 8 VA or less (240 V AC, 24V AC, 24V DC)
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 or 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: SPST contact: 220V AC/30V DC, 3A (resistive load) Mechanical life 10 million operations (no load) Electrical life 100,000 operations (rated load) Minimum switching current 10mA (5V DC) Voltage pulse (for SSR drive): ON...15V DC (12 to 16V DC) OFF...0.5V DC or less Max. current: 20mA 4 to 20mA DC: Allowable load resistance 500Ω or less
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<Control functions of heating/cooling control type (option)>

Heating side proportional band (P)	0 to 999.9 % of measuring range
Cooling side proportional band (P)	Heating side "P" × cooling side coefficient 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	Designate one type out of 3 below Relay contact: SPST contact: 220V AC/30V DC, 3A (resistive load) Mechanical life 10 million operations (no load) Electrical life 100,000 operations (rated load) Minimum switching current 10mA (5V DC) Voltage pulse (for SSR drive): ON...15V DC (12 to 16V DC) OFF...0.5V DC or less Max. current: 20mA 4 to 20mA DC: Allowable load resistance 500Ω or less
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<Operation and display section>

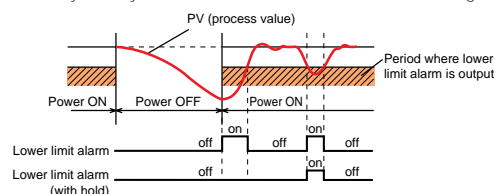
Parameter setting method	Digital setting by 3 keys Key lock function provided
Display unit	Process value/set value Selective display 4 digits, 7-segment LED Character height 11mm
Status display LED	Control output, process alarm output
Setting accuracy	0.1% or less of measuring range
Indication accuracy (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 10 mA (5 V DC) 1 or 2 output points, 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	2
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 (front SV0, SV1 to 3) 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) or PXR protocol (Z-ASCII)
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: Lineeye Co., Ltd.(Japan) Model: SI-30A Non-isolated type Manufacturer: System Sakom Co., Ltd.(Japan) Model: KS485 Note: Contact Fuji Electric for additional information.

<Re-Transmission output : 4 to 20mA (option)>

Output signal	4 to 20mA DC
Load resistance	500Ω or less
Output renewal cycle	500ms
Output accuracy	±0.3%FS(23°C)
Analysis	2000 or more
Output signal variety	PV,SV,DV,MV (selectable one signal by using the parameter)

<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.
Applied standards	UL, C-UL, CE Mark

<Power failure processing>

Memory protection	Held by non-volatile memory
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<Self-check>



Method	Program error supervision by watchdog timer
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<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

<Insulation block diagram>

Power supply	Measured value input Internal circuit
Relay contact control output 1	
Relay contact control output 2	Voltage pulse, 4 to 20mA DC control output 1 Voltage pulse, 4 to 20mA DC control output 2 Re-Transmission
Process alarm relay output 1	Communication (RS-485) Digital input
Process alarm relay output 2	

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.

<Structure>

Mounting method	Panel flush mounting
External terminal	Plug-in terminal
Case material	Plastic (non-combustible grade UL94VG-0 equivalent)
Dimensions	24 × 48 × 98mm
Mass	Approx. 150 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

<Scope of delivery>

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

Instruction manual	For communication function
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<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 resistor at the input terminal.

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

<Caution in use>

The following table shows the differences among PX-series models. When replacing the device, be sure to use the one with identical output specifications.

Control output

Model	Voltage puls (for SSR drive)		DC 4 to 20 mA Allowable load resistance
	Voltage	Max. Current	
PXR3	15V DC	20mA	100 to 500Ω
PXR4	24V DC	20mA	600Ω or less
PXV3	5.5V DC	20mA	600Ω or less
PXV	24V DC	60mA	600Ω or less
PXW	24V DC	60mA	600Ω or less
PXZ	24V DC	60mA	600Ω or less



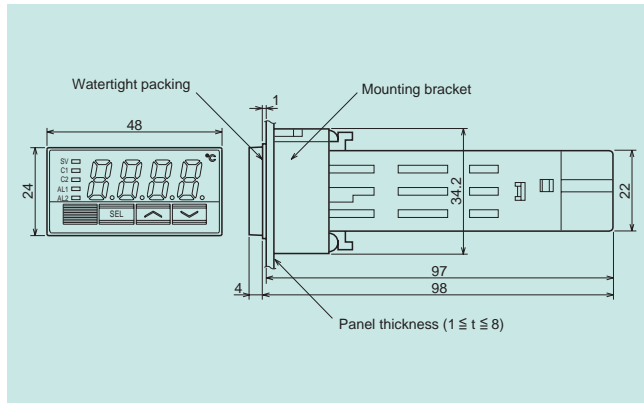
Ordering code

Digit	Specification	Note	4	5	6	7	8	9	10	11	12	13
4	<Front panel size HxW> 24x48mm		3									
5	<Input signal> Thermocouple(°C) Thermocouple(°F) Resistance bulb Pt100 3-wire(°C) Resistance bulb Pt100 3-wire(°F) 4 to 20 mA DC 1 to 5 V DC		T R N S B A									
6	<Control output 1> Contact output Voltage pulse output(for SSR drive) 4 to 20 mA DC output		A C E									
7	<Control output 2> None Contact output Voltage pulse output(for SSR drive) 4 to 20 mA DC output	Note1	Y A C E									
8	<Version number>						1					
9	<Additional specifications 1> None With process alarm(1 point) With ramp / soak With process alarm(1 point)+ramp / soak With process alarm(2 points) With process alarm(2 points)+ramp / soak	Note2 Note2						0 1 4 5 F G				
10	<Instruction manual><Power supply> Without 100 to 240 V AC With 100 to 240 V AC Without 24 V DC / AC With 24 V DC / AC								N V C B			
11	<Additional specifications 2> None									0 0 0		
12	With RS485(Modbus)									M 0 0		
13	With RS485(Z-ASC II)									N 0 0		
	With Re-Transmission output+ digital input(1point)	Note3								R 0 0		
	With Re-Transmission output	Note3								Q 0 0		
	With digital input(2point)									T 0 0		
	With RS485(Modbus)+ digital input(1point)									V 0 0		
	With RS485(Z-ASC II)+ digital input(1point)									W 0 0		

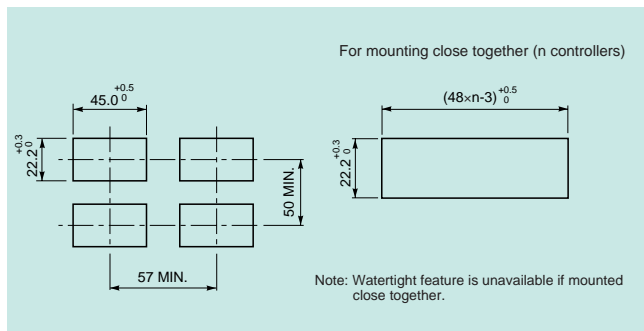
- Note 1** No combination with alarm (2 points) (The code F, G of 9th digit should not be ordered.)
- Note 2** No combination with control output 2 (A, C, E of 7th digit should not be ordered.)
- Note 3** Control output 2, communication, external input 2, 24V power supply. The code A, C, E of 7th digit, A, B, C of 10th digit, M, N, T, V, W of 11th digit 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.

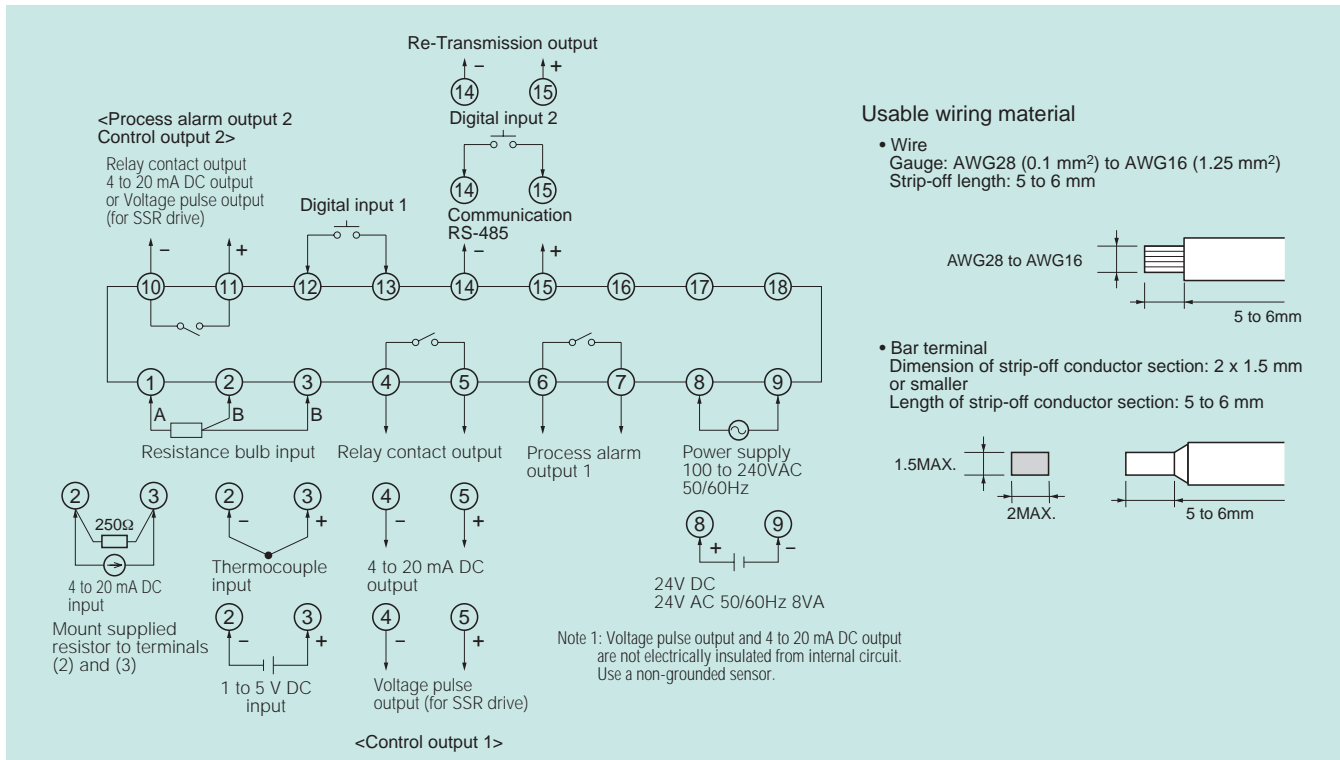
Dimensions (unit: mm)



Panel cutout (unit: mm)



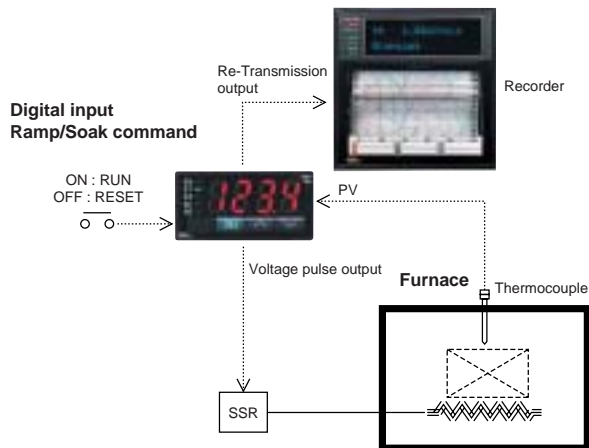
External connection diagram



Application examples

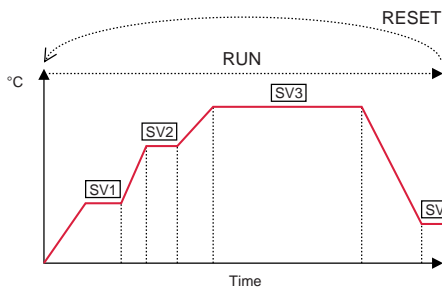
FURNACE / Heat Pattern Control

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.



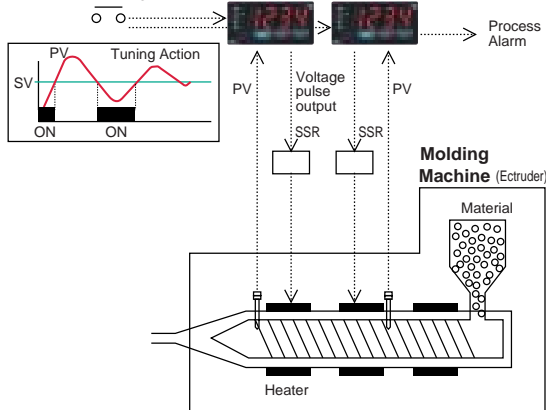
Plastic Molding Machine

Stable Temperature control required

FUZZY + PID Control

Digital input
Autotuning command

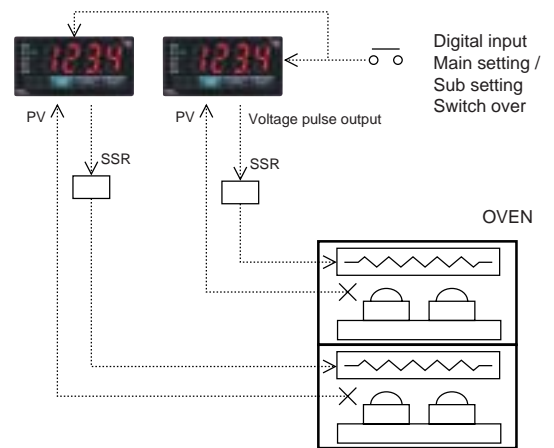
ON : Autotuning Start
OFF : Autotuning Strat



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

Oven

To change SV easily



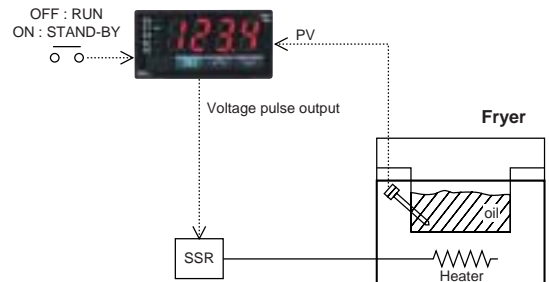
Set Value (SV) can be selected / changed externally.
<front SV, SV1 to 3 change over>

FRYER

To keep oil temperature stable during fryer operation

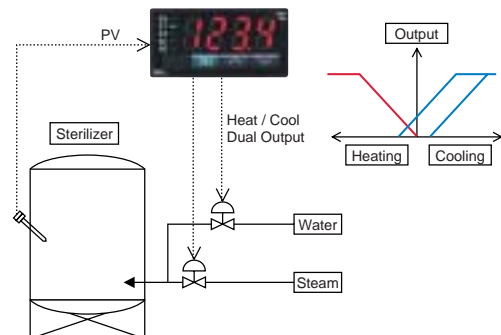
Digital input
Control : RUN / STAND-BY

OFF : RUN
ON : STAND-BY



Control RUN / Stand-by selectable 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.

SPECIAL ATTENTION NEEDED for all Micro Controller X series products

(Please read carefully the following instructions.)



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.

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