



PF900



General Description

The PF900 is a powerful ramp/soak controller with a large program storage capacity of 1024 segments (99 patterns with 10 segments each to 10 patterns with 99 segments each). This 1/4 DIN controller offers guaranteed soak for precise, critical temperature control requirements. With a $\pm 0.1\%$ accuracy, 0.1 sec. sampling time, five digit display, universal input and multi-level PID or segment PID, this instrument is adaptable to a wide range of process applications. Standard features include three mode operation, four digital inputs, four digital output and Wait functions, temperature alarms, and constant slope PV start.

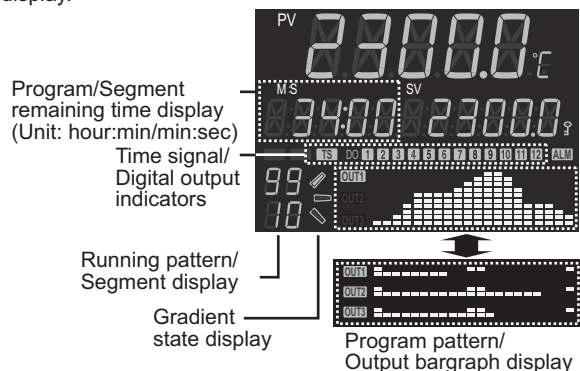
Some of the optional features include analog outputs and digital communications.

Features

- ☆ $\pm 0.1\%$ high accuracy
- ☆ Five digit display
- ☆ Three control modes
- ☆ Large program storage
- ☆ Heat/Cool PID with autotuning
- ☆ PV start selection

High Intensity Display

All necessary information is visible on the easy-to-read front display.



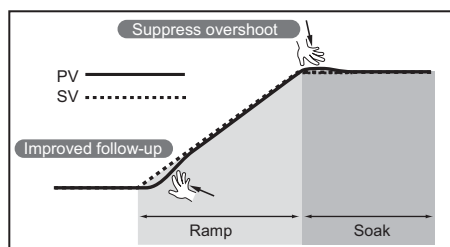
Large Memory

The PF900 can store up to 1024 segments (99 patterns with 10 segments each to 10 patterns with 99 segments each).

- 32 patterns by 32 segments, yet all patterns are linkable to form a large program

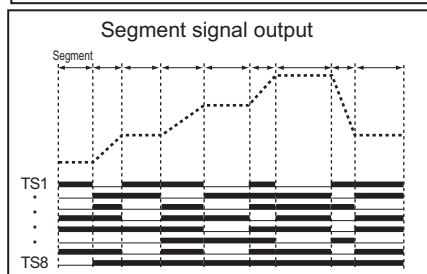
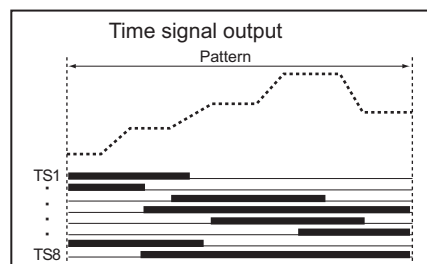
New control algorithm RSS (Ramp Soak Stabilizer)

A newly developed control algorithm designed exclusively for ramp/soak controls improves follow-up performance while simultaneously suppressing overshoot at the transition from ramp to soak.



Two types of signal modes

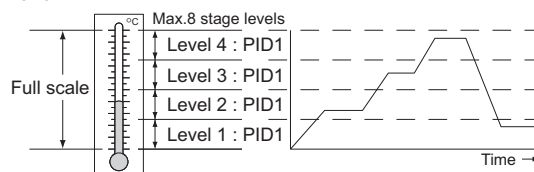
You can select a pattern mode that works within the pattern or a segment mode that works within the segment. (Please specify one of the two)



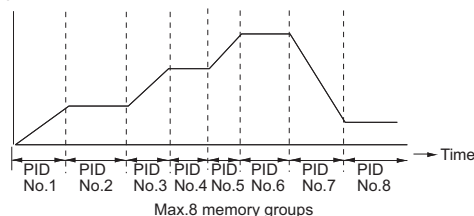
Level-PID or Segment PID

Select the best PID option for your application. The set values are stored in 8 stage levels or in 8 memory groups.

<Level-PID>



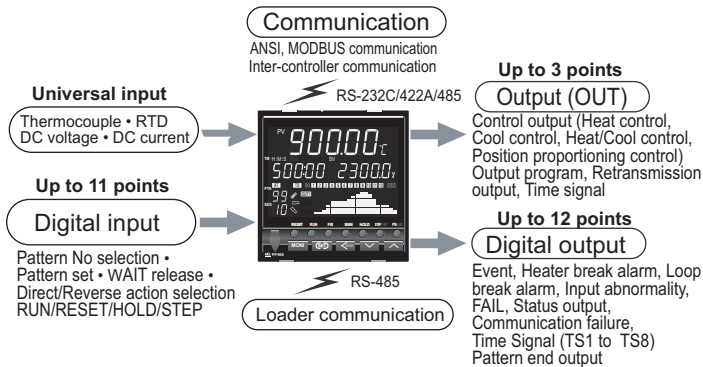
<Segment PID>



Ramp/Soak Process/Temperature Controller PF900

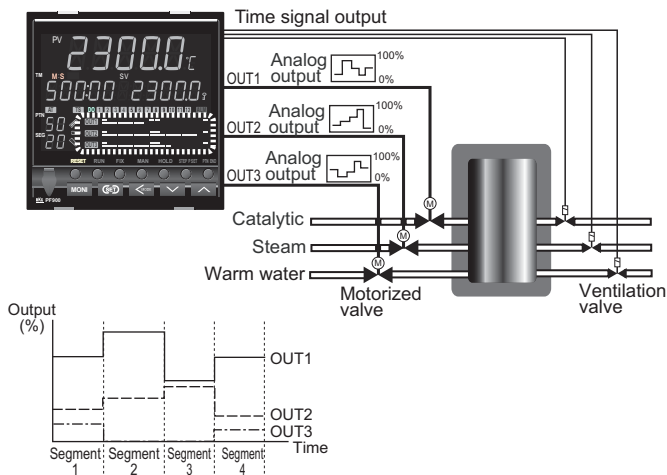
Features

Numerous inputs and outputs



Maximum of 3 point program pattern outputs (Output program function)

Up to 3 analog outputs can be used to control three types of devices (such as a motorized valve). Combining time signal outputs allows programming for complex applications.



Memory group

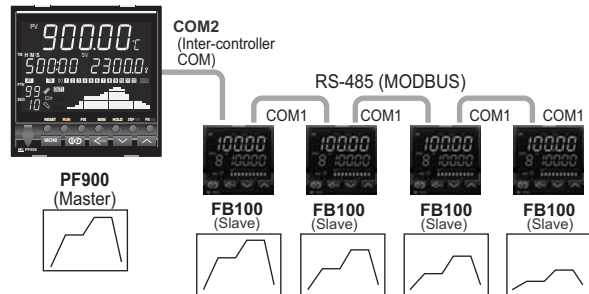
Set values of P, I, D, event, segment wait, time signal, program pattern output can be stored in memory groups and can be called up for a segment to be set.

- PID memory : 8 groups
 - Setting items: Proportional band, Integral time, Derivative time, Control response parameter, Cool side proportional band, Cool side integral time, Cool side derivative time, Deadband/overlap, Neutral zone, Manual reset, Output limiter (high/low), Cool side output limiter (high/low), ON/OFF differential gap (high/low), LBA time, LBA headband
- Event memory : 8 groups
 - Setting items: Event 1 to 4
- Segment wait memory : 8 groups
 - Setting items: Wait zone, Wait release trigger, Timeout for wait
- Time signals memory : 16 groups
 - Setting items: Time signal output destination, starting segment, time signal starting time, end segment, time signal end t
- Program pattern output : Up to 99 points
 - Setting items : Output program 1 to 3

Collaborative program operation

(Inter-controller communication)

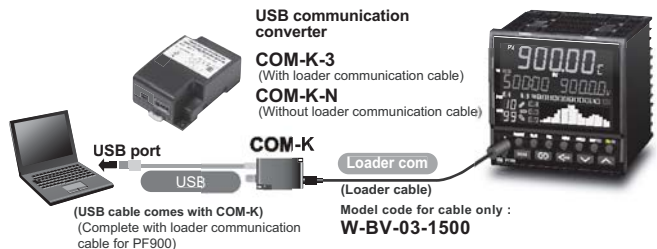
Up to 4 slave instruments (FB/RB series and PF900/901) can be connected via exclusive communication port. Digital communication gives isolated communication without setting error, ratio setting of individual slave controller, memory area selection and Run/Stop switchover.



- Memory area needs to be selected on FB series.
- If you use FB400, FB900 or PF900 for a slave device, please select Communication 1. Communication protocol among slave devices is Modbus.
 - Models available as a master device
 - PF900/PF901 : Suffix codes for communication : W, X, or Y
 - Models available as a slave device
 - FB100 : Optional codes : E, F, H, or J
 - FB400/FB900 : Suffix codes for communication : 5 or X
 - RB100/RB400/RB500/RB700/RB900 : Suffix codes for communication : 5, 6, B or C
 - PF900/901 : Suffix codes for communication : 5 or X

Easy data management Front loader interface

The PF900 comes with a front loader port and programming tool making complicated programming visual and simple to place on a PC. Downloading or Uploading large numbers of set values can be achieved with ease.

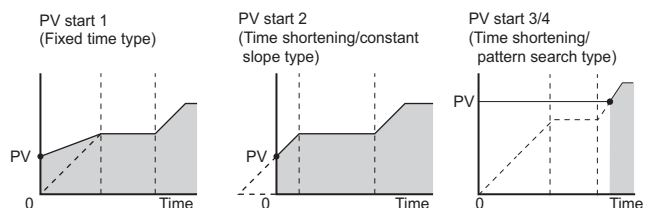


PV Start

There are four types of PV start available on the PF900.

When ramp/soak control is started:

- PV start 1: Time of segment 1 is not changed whatever the PV setting.
- PV start 2: Time of segment 1 will be shortened to keep the slope of segment 1.
- PV start 3: PF900 will search pattern for value that is the same as PV and go to that part of the pattern. Control status will be at Hold until operator presses Run key to start pattern from that point.
- PV start 4: PF900 will search pattern for value that is the same as PV and go to that part of the pattern. Control status will be at Run and the instrument will start pattern from that point.





Specifications

Input

Input

- Universal input
- a) Temperature, Current, Low voltage input group
- Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS), W5Re/W26Re (ASTM), U, L (DIN) Pt40%Rh-Pt20%Rh
- Influence of external resistance : Approx. 0.2 μ V/ Ω
 - Input break action : Up-scale / Down-scale (Selectable)
- RTD : Pt100 (JIS/IEC), JPt100 (JIS)
- Influence of input lead resistance : Approx. 0.01[%/ Ω] of reading
 - Maximum 10 Ω per wire
 - Input break action : Up-scale
- Low voltage : 0 to 1V DC, 0 to 100mV DC, 0 to 10mV DC, -1 to 1V DC, -100 to +100mV DC, -10 to +10mV DC
- Input break action : Up-scale / Down-scale (Selectable)
- b) High voltage input group
- High voltage : 0 to 5V DC, 1 to 5V DC, 0 to 10V DC -5 to +5V DC, -10 to +10V DC
- Input break action : Uncertain (indicates a value around 0V)
- c) Current : 4 to 20mA DC, 0 to 20mA DC
- Input break action : Uncertain (indicates a value around 0mA)

Sampling Time

- 0.1 sec
- 0.05sec or 0.25sec is available.

Input Digital Filter

- 0.1 to 100.0 sec (OFF when 0 is set.)

PV Bias

- span to +span

PV Ratio

- 0.001 to 9.999

Square Root Extraction

- Equation : $PV = \sqrt{\text{Input value} \times \text{PV ratio} + \text{PV bias}}$
- Low level cut OFF : 0.00 to 25.00% of span

Performance

Measuring Accuracy

- a) Thermocouple
- Type : K, J, T, E, N, PLII, U, L
- Less than -100°C (-148°F) : $\pm 1.0^\circ\text{C}$ ($\pm 1.8^\circ\text{F}$)
- 100 to 500°C (-148 to 932°F) : $\pm 0.5^\circ\text{C}$ ($\pm 0.9^\circ\text{F}$)
- More than 500°C (932°F) : $\pm 0.1\%$ of Reading
- Type : N, S, R, W5Re/W26Re
- Less than 0°C (32°F) : $\pm 2.0^\circ\text{C}$ ($\pm 3.6^\circ\text{F}$)
- 0 to 1000°C (32 to 1832°F) : $\pm 1.0^\circ\text{C}$ ($\pm 1.8^\circ\text{F}$)
- More than 1000°C (1832°F) : $\pm 0.1\%$ of Reading
- Type : B
- Less than 400°C (752°F) : $\pm 70.0^\circ\text{C}$ ($\pm 126^\circ\text{F}$)
- 400 to 1000°C (752 to 1832°F) : $\pm 1.4^\circ\text{C}$ ($\pm 2.6^\circ\text{F}$)
- More than 1000°C (1832°F) : $\pm 0.1\%$ of Reading
- Type : PR40-20 (Pt40%Rh-Pt20%Rh)
- Less than 400°C (752°F) : $\pm 20^\circ\text{C}$ ($\pm 36^\circ\text{F}$)
- 400 to 1000°C (752 to 1832°F) : $\pm 10^\circ\text{C}$ ($\pm 18^\circ\text{F}$)
- More than 1000°C (1832°F) : $\pm 0.1\%$ of Reading
- Cold junction temperature compensation error
- $\pm 1.0^\circ\text{C}$ (1.8°F) [at 5 to 40°C (41 to 104°F)]
- Within $\pm 1.5^\circ\text{C}$ ($\pm 2.7^\circ\text{F}$)
- [Between -10 and 5°C (16 to 41°F), 40 and 55°C (104 to 122°F)]
- b) RTD
- Less than 200°C (392°F) : $\pm 0.2^\circ\text{C}$ ($\pm 0.4^\circ\text{F}$)
- More than 200°C (392°F) : $\pm 0.1\%$ of Reading
- c) DC voltage and DC current
- $\pm 0.1\%$ of span

Insulation Resistance

- More than 20M Ω (500V DC) between input terminals and ground
- More than 20M Ω (500V DC) between power terminals and ground

Dielectric Strength

- 1500V AC for one minute between input terminals and ground
- 1500V AC for one minute between power terminals and ground

Control

Control Method

- a) Brilliant II PID control
- Available for reverse and direct action.
- b) Brilliant PID control (Heat/Cool type)
- c) Position proportioning control
- Available for reverse and direct action.
 - Position proportional control can be used with/without FBR (feedback resistance) input.
- a), b), c) is selectable.

Autotuning Method

- a) For PID control or position proportioning control
- b) For Heat/Cool PID control (For extruder, air cooling type)
- c) For Heat/Cool PID control (For extruder, water cooling type)
- d) For Heat/Cool PID control

Autotuning with auto soak detect

- This is a function to search program soak areas and perform autotuning in the order of segments at the time of reset.
- This feature is enabled/disabled for ramp segment.

Major Setting Range

- Set value : Same as input range.
- Proportional band : 0 (0.0/0.00) to input span ($^\circ\text{C}$, $^\circ\text{F}$) (for temperature input) 0.0 to 1000.0% of input span (for voltage/current input) (ON/OFF control when P = 0)
- Differential gap at ON/OFF control (High/Low individual setting)
- Temperature input : 0 (0.0/0.00) to input span ($^\circ\text{C}$, $^\circ\text{F}$)
- Voltage/Current input : 0.0 to 100.0% of input span
- Integral time : 0 (0.0) to 3600 (3600.0)sec. (selectable) (PD control when I = 0)
- Derivative time : 0 (0.0) to 3600 (3600.0)sec. (selectable) (PI control when D = 0)
- Cool-side proportional band : 1 (0.1/0.01) to input span ($^\circ\text{C}$, $^\circ\text{F}$) (for temperature input) 0.1 to 1000.0% of input span (for voltage/current input)
- Cool-side integral time : 0 (0.0) to 3600 (3600.0)sec. (selectable) (PD control when I = 0)
- Cool-side derivative time : 0 (0.0) to 3600 (3600.0)sec. (selectable) (PI control when D = 0)
- Deadband/Overlap : -span to +span (Temperature input) -100.0 to +100.0% of span (Voltage, Current input)
- Control response : Slow, Medium, Fast
- Output limiter : -5.0 to +105.0% (High/Low individual setting)
- Cool-side output limiter : -5.0 to +105.0% (High/Low individual setting)
- Proportional cycle time : 0.1 to 100.0 sec.
- Cool-side proportional cycle time : 0.1 to 100.0 sec.
- Manual reset : -100.0 to +100.0% of proportional band
- Output at reset : -5.0 to +105.0% (Heat and cool sides are individual setting.)
- Overlap/deadband reference : 0.0 to 1.0 (heating reference at zero)
- Undershoot suppression factor (USS) for cooling : 0.000 to 1.000
- Ramp/soak stabilizer (RSS) : 0.0 to 1.0
- Selectable from enabled/disabled.
- Level-PID
- a) Number of levels: 8 levels (PID groups 1 to 8)
- b) Level setting range: Low limit of input range to high limit of input range (level settings 1 to 7)
- Motor Valve Control** (position proportioning control type only)
- Motor time : 5 to 1000 sec. (full open to full close)
- Integral output limiter : OFF, 0.1 to 200.0% of control motor time
- Neutral zone : 0.1 to 20.0%
- Differential gap : 50% of neutral zone (Fixed)
- Valve action at RESET state :
- a) CLOSE : OFF, OPEN : OFF
- b) CLOSE : ON, OPEN : OFF
- c) CLOSE : OFF, OPEN : ON
- a), b), c) is selectable.

Program

- Time Accuracy** : $\pm 0.01\%$ of reading or input sampling time (Whichever is larger)
- Storage Program Pattern** : Max. 99 patterns
- Storage Segments** : Max. 1024 segments
- Up to 99 segments per pattern.
 - Supplied with hold, step, fast forward, fast rewind features
- Time Setting** : 0 hr 0 min to 500 hs 00 min or 0 min 0 sec to 500 min 0 sec
- Segment Repeat** : 1 to 9999 repeats
- Repeat is disabled when set to 1.
- Pattern Repeat** : 1 to 10000 repeats
- Continuous repeat when set to 10,000
- Linkable Patterns** : 0 to 99 patterns
- No pattern link when set to zero
- Pattern End Output Time** : 0 hr 0 min to 500 hs 00 min or 0 min 0 sec to 500 min 0 sec
- Output remains on when set to zero.
- Time Signal Memory group Number** : 0 to 16
- No assigned groups when set to zero.
- Program Starting Mode**
- a) Starts from a desired value (SV after reset)
- b) Starts from a desired measured input (Time fixed)
- c) Starts from a desired measured input (Time shortened)
- d) Intersection of measurement input and pattern is searched and starts from there. (HOLD status when started)
- e) Intersection of measurement input and pattern is searched and starts from there. (RUN status when started)

Ramp/Soak Process/Temperature Controller PF900

WAIT Status at The Time of Program Start

WAIT condition memory number : 0~8

- No WAIT when set to zero.
- Selectable from release by wait zone, contact input (trigger), and timeout.

WAIT Function :

- Wait zone (upper)
 - Temperature input: 0 (0.0/0.00) to 200 (200.0/200.00) (°C, °F)
 - Voltage/current input: 0.0 to 20.0% of input span
 - Wait function off when set to zero
- Wait zone (lower)
 - Temperature input: -200(-200.0)~0(0.0) (°C, °F) or -199.99~0.00 (°C, °F)
 - Voltage/current input: 20.0~0.0% of input span
 - Wait function off when set to zero
- Wait timeout
(Time counting resumes unconditionally after the set time has elapsed)
0 hr 0 min to 500 hs 00 min or 0 min 0 sec to 500 min 0 sec
 - Function is disabled when set to zero.

Pattern End Output :

- DO can be assigned (turns on for 0.5 second for each pattern repeat).

Time Signal Output :

Time signal or segment signal, whichever is specified.

- Time signal
 - Number of outputs: 8 (TS1 to TS8)
 - Output assignment: Up to 12 (including 4 relays), assignable by DO
 - Time signal memory group: 16 groups
 - Number of memory storage: 16 groups X 16 memories
 - Number of storage memory: 1 to segment No. (max = 99)
 - Starting time: 0 hr 0 min to 500 hs 00 min or 0 min 0 sec to 500 min 0 sec
 - Ending segment:
 - 1 to segment No. (max = 99), however, ending segment must be equal to or larger than the starting segment.
 - Ending time: 0 hr 0 min to 500 hs 00 min or 0 min 0 sec to 500 min 0 sec
- Segment signal:
 - TS1 to TS8 can be independently turned ON and OFF at each segment.

Programmed Preset Manual Output (Output program Function)

Fixed value is produced at each segment.

The function is activated by assigning outputs 1 to 3 to the program output.

- Number of output program patterns:
 - 1 to (128/max. segments number)

For example, in case of 99 segments, it is "1".

 - Max. segment No.: Number of segments by number of patterns multiplied by number of segments.
- Setting items: Output program 1 to 3 : -5.0 to +105.0%
(Independently adjustable).

Other Features :

Pattern/segment copy function, tag name edit function (for each pattern), data clear (to initial state), remaining time display of pattern.

Memory Group

PID Memory

- Memory group No. : 0 to 8 (Level-PID is activated when set to zero.)
- Setting items:
 - Proportional band, Integral time, Derivative time, Control response parameter, Cool side proportional band, Cool side integral time, Cool side derivative time, Deadband/overlap, Neutral zone, Manual reset, Output limiter (high/low), Cool side output limiter (high/low), ON/OFF differential gap (high/low), LBA time, LBA headband

Event Memory

- Memory group No.: 0 to 8 (event off when set to zero)
- Setting items : Event 1 to 4

Segment Wait Memory

- Memory group No.: 0 to 8 (wait off when set to zero)
- Setting items: wait zone, wait release trigger, timeout for wait

Time Signal Memory

- Memory group No.: 0 to 16 (time signal off when set to zero)
- Memory No. : 1~16 (16 set points per group)
- Setting items: Time signal output destination, starting segment, time signal starting time, end segment, time signal end time.

Program pattern output

- Pattern Nos.: 1 to (128/max.segment) . Up to 99 segments
- Segment No.: 1 to max segment value.
- Setting items : Output program 1 to 3

Mode Selection

Operation Mode

Reset (RESET), program (RUN), fixed setpoint control (FIX), and manual control (MAN)

Action when operation mode is selected.

Mode transfer	After transfer			
	Reset mode	Program control	Fixed setpoint	Manual control
Before transfer	Reset mode		Control continues with the calculated value of the control.	Control starts with the control output at reset as the manual setpoint.
	Program control mode	Provide control output at the time of reset	*1 Control continues with the SV for a program control.	Control continues after adjusting the final output level of the program control to the output level of manual.
	Fixed setpoint control			Output continues after adjusting the final output level of the fixed setpoint control to the output level of manual.
	Manual control		Control continues after bumpless transfer to manual output	

*1 Program status is retained unless the instrument is reset. If program control is selected, control starts from the retained status.

• Output may result in a bump in spite of a bumpless transfer action if the selected control mode is P action, PD action, or ON/OFF action.

Output (OUT)

Number of Main Output

Up to 3 points (OUT1 to OUT3)

Output Function

Control output (MV), Output program, Retransmission output. OUT2 and OUT3 can be used as event outputs.

- See output assignment table for details.

Output Type

Relay output : Form A contact, 250V AC 3A (resistive load)
Voltage pulse output : 0/12V DC
(Load resistance : More than 600Ω, 20mA or less)
* OUT1 can be more than 300Ω (40mA or less) if OUT2 is not used
Current output : 4 to 20mA DC, 0 to 20mA DC
(Load resistance : Less than 600Ω)
Continuous voltage output : 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
0 to 1V DC (Assignable to OUT3 only)
(Load resistance : More than 1kΩ)
Rated current : 0.5A
SSR (Triac) output : Load voltage : Less than 30V DC,
Maximum load current : Less than 100mA
ON voltage : Less than 2V DC (at 100mA)

Digital Output

- DO1 to DO4 : Standard
- DO5 to DO12: Optional

Number of Output

Up to 12 points (DO1 up to 12 (DO1 to 12)
DO1 to 4 : Relay contact output (Standards)
DO5 to 12 : Open collector output (Optional)

Output Items

Time signal, event, Heater break alarm, Loop break alarm, Input abnormality, RUN state, FIX mode state, MAN mode status, Ramp status, Soak status, HOLD status, WAIT status, Pattern end status, AT status, FAIL, Communication failure, FBR input abnormality

Output Type

- Relay contact output, Form 1a contact, 250VAC 1A (Resistive load)
- Open collector output (sink type), Load voltage: 30V DC or less
Allowable load current : 100mA
ON voltage : 2V or less (For maximum load current)

Event (Alarm)

Optional

Number of Event Setting

Up to 4 points (Event 1 to 4)

Event type

Process, Deviation, Band, SV, MV

Setting range

Deviation : - (Input span) to + (input span)
Differential gap : 0 to input span
Process, Set value : Same as input range
Differential gap : 0 to input span
MV value : -5.0 to +105.0%
Differential gap : -5.0 to +105.0%

Output

Freely assignable to digital outputs (DO1 to 12, OUT2, OUT3).
See Output allocation table for details



Specifications

Other Functions

- Hold function (Valid when power is supplied or when even is started.)
- Event action selection at the time of abnormal input.
- Action selection at the time of RESET
- Delay timer: 0.0 to 600.0 sec.
- Event minimum ON and OFF time : 0.0 to 600.0 sec
(ON/OFF individual setting)
- Interlock : Without/With/Switches into the manual mode and stops control.

Heater break alarm (HBA)

- Number of CT input: 2 points (1 for each CT input)
- Input function: Current detector (CT)
- Input range: CTL-6-P-N: 0 to 30A
CTL-12-S56-10L-N: 0 to 100A
- Heater current display range: 0.0 to 100.0A
- Heater current display accuracy: $\pm 5\%$ of input value or $\pm 2A$
- Interlock : Without/With/Switches into the manual mode and stops control.
- Output method: Freely assignable to digital outputs
- Action selection at reset status
 - Heater break alarm (HBA) is not available for current/continuous voltage output.

Loop break alarm (LBA)

- LBA time: 0 to 7200 sec. (OFF when set to zero)
 - LBD setting: 0 to input span
 - Interlock : Without/With/Switches into the manual mode and stops control.
 - Output method: Freely assignable to digital outputs
See output assignment table.
- Loop break alarm (LBA) is not available for heat/cool PID control type.

Analog Retransmission Output (Optional)

Number of Outputs

- Up to 2 points (3 for program outputs)
- Depends on output assignment.

Output types

- Measured value (PV), Deviation (DEV), Set value (SV), Manipulated output value (MV), Output program value, % of segment time (Selectable)

Output Signal

- Current output : 4 to 20mA DC, 0 to 20mA DC
(Load resistance : Less than 600 Ω)
- Continuous voltage output : 0 to 1V DC, 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
(Load resistance : More than 1k Ω)

Scaling Range

- PV, SV : Same as input range
 - Control output, Output program output: 0 to 100%
 - Deviation: \pm input span
- Output program and segment time percentage are fixed.

Additional Function

Digital Input

(DI 1 to 6 : Optional, DI 7 to 11 : Standard)

Number of Inputs

- Up to 11 points (DI 1 to 6, DI 7 to 11)

Input Rating

- Non-voltage contact input

Functions

- DI1 to DI6 : Pattern No. selection + Pattern set, WAIT release
- DI7 to DI11 : Pattern No selection + Pattern set,
Mode selection (RESET, RUN), Direct/Reverse action selection
Refer to Digital Input table for details.

Communication (Optional) [COM1]

Communication method :	RS-485, RS-232C, RS-422A
Communication speed :	2400, 9600, 19200, 38400, 57600 bps • Selectable
Protocol :	RKC standard (ANSI X3.28 2.5 A4) MODBUS RTU • Selectable
Bit format	
Start bit :	1
Data bit :	7 or 8 •For MODBUS 8 bit only
Parity bit :	Without, Odd or Even
Stop bit :	1 or 2
Maximum connection :	RS-485/RS-422A : 32 units (Including host) RS-232C : 1 unit

Inter-Controller Communication (Optional) [COM2]

Communication type :	Function to send target value to slave controllers
Communication method :	RS-485
Communication speed :	9600, 19200, 38400 bps • Selectable
Protocol :	MODBUS RTU
Bit format :	Start bit : 1, Data bit : 8 Parity bit : Without, Stop bit : 1
Maximum slaves :	4 units
Maximum slaves :	PF900/PF901/FB series (With memory area) RB series (Without memory area)

Loader Communication [COM2]

Communication method :	RS-485
Communication speed :	38400 bps
Protocol :	RKC standard (ANSI X3.28 2.5 A4)
Bit format :	Start bit : 1, Data bit : 8 Parity bit : Without, Stop bit : 1
Connection method :	Front: Connected to COM-K with an exclusive cable (W-BV-03-1500) • Front loader interface is available only while instrument is powered.

Feedback Resistance (FBR) Input

Resistance value	Standard : 100 to 10k Ω (factory default 135 Ω)
Sampling time	(Optional) 0.1 sec (with measuring input sampling time of 0.05 sec) 0.2 sec (with measuring input sampling time of 0.1 sec) 0.5 sec (with measuring input sampling time of 0.25 sec) • Position proportional control can be used with/without FBR (feedback resistance) input.

General Specifications

Supply Voltage

- 85 to 264V AC (Including supply voltage variation)
[Rating : 100 to 240V AC] (50/60Hz selectable)
- 20.4 to 26.4V AC (Including supply voltage variation)
[Rating : 24V AC] (50/60Hz selectable)
- 20.4 to 26.4V DC (Ripple rate 10% p-p or less) [Rating:24VDC]

Power Consumption

- 100 to 240V AC : 13.5VA <10.9VA> (at 240V AC),
9.5VA <7.1VA> (at 100V AC)
- 24V AC : 8.5VA <6.2VA>
- 24V DC : 230mA <173mA>
< > : Power saving mode

Rush Current

- 100 to 240V AC : Less than 17.5A (at 240V AC),
Less than 7.5A (at 100V AC)
- 24V AC : Less than 8.5A
- 24V DC : Less than 6.0A

Power Failure Effect

- A power failure of 20m sec or less will not affect the control action.
- If power failure of more than 20m sec occurs, controller will restart with the state of HOT start 1, HOT start 2 or COLD start (selectable)

Power Saving Mode

- If any key is not pressed during the user set time period, the backlight LED is turned off except PV and ALM displays.
- Setting time: 0 to 60 min (0 for no power saving mode)
- Back to normal display if any key is pressed during the power saving mode.

Waterproof/Dustproof : NEMA type 3 : IP55
(When mounted in a panel, front direction)

Operating Environments : -10 to 55°C [14 to 132°F]
5 to 95% RH.
Absolute humidity : MAX. W.C 29.3g/m³ dry air at 101.3kPa.

Memory Backup : Backed up by non-volatile memory (FRAM)
• Data retaining period : Approx. 10 years
• Number of writing : Approx. 10,000,000 times.
(Depending on storage and operating conditions.)

Net Weight : Approx. 470g

External Dimensions (W x H x D) : 96 x 96 x 80mm

Model and Suffix Code

Specifications		Model and Suffix Code	Hardware coding										Quick start code 1	
			①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩		⑪
Model		PF900 (PV : Green, SV : Orange, Pattern : White) PF901 (PV : White, SV : White, Pattern : White)	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	
① Output 1 (OUT1)	*1 Control output or Output program	Relay contact output Voltage pulse output : 0/12V DC DC mA, V (See Output Signal Code Table, Code : 4 to 8) Triac (SSR) output Open collector output	M											
② Output 2 (OUT2)	*1 Control output, Output program, Retransmission output or Digital output	No supplied Relay contact output Voltage pulse output : 0/12V DC DC mA, V (See Output Signal Code Table, Code : 4 to 8) Triac (SSR) output Open collector output	N											
③ Output 3 (OUT3)	*1 Output program, Retransmission output or Digital output	No supplied Voltage pulse output : 0/12V DC DC mA, V (See Output Signal Code Table, Code : 3 to 8) Open collector output	N											
④ Power supply		24V AC/DC 100 to 240V AC				3								
⑤ Digital output		DO: 4 points, Relay : DO 1 to 4 DO:12 points, Relay DO 1 to 4, Open collector: DO 5 to 12							4					C
⑥ CT input or FBR input	*2, *3	None CT input: 2 points FBR (FeedBack Resistance) input									N			T
⑦ Communication	<Note 1> Digital input (DI 1 to 6) • DI7 to 11 supplied as standard	Not supplied COM1:RS-232C COM2:Not supplied COM1:RS-422A COM2:Not supplied COM1:RS-485 COM2:Not supplied COM1:RS-232C COM2:RS-485 COM1:RS-485 COM2:RS-485 COM1:Not supplied, COM2:RS-485												
⑧ Initial setting		No quick start code (Default setting) Specify quick start code 1 Specify quick start code 1 and 2												
⑨ Quick start code 1	Control Method	No quick start code PID control with AT (Reverse action) PID control with AT (Direct action) Heat/Cool PID control with AT Heat/Cool PID control with AT for extruder (Air cooling type) Heat/Cool PID control with AT for extruder (Water cooling type) Position proportional PID control with AT (Reverse action) Position proportioning PID control with AT (Direct action)												
⑩	Input and range	No quick start code See Input range Code Table												
⑪	Instrument version	Version symbol												Y

<Note 1>
If inter-controller communication (master-slave operation) is used, select code: W, X, or Y (that means "with communication 2") for a master device, and 5 or X (communication 1: RS-485) for a slave device.

*1 For program or retransmission output, specify voltage or current.
For digital output, specify relay or open collector output.

*2 Heater break alarm (HBA) is not available for current/continuous voltage output.
Loop break alarm (LBA) is not available for heat/cool PID control type.

*3 Position proportional control can be used with/without FBR (feedback resistance) input.

• Control output (OUT1, OUT2) assignment by control action

PID control action:
Control output is produced from OUT1. OUT2 can be used as retransmission output or digital output.

Heat/Cool PID control action:
Heating output is produced from OUT1 and cooling output from OUT2.

Position proportioning PID control action:
Opening output is produced from OUT1 and closing output from OUT2.

Input range code table

Thermocouple

Input	Code	Range	Input	Code	Range
K	K :35	-200.0 to +400.0°C	T	T :19	-200.0 to +400.0°C
	K :42	-200.0 to +1372.0°C		T :13	-200.0 to +200.0°C
	K :23	0.0 to 1300.0°C		T :06	0.0 to 400.0°C
	K :09	0.0 to 400.0°C		T :16	-200 to +400°C
	K :41	-200 to +1372°C		T :C2	-328.0 to +752.0°F
	K :02	0 to 400°C		T :B7	-300.0 to +700.0°F
	K :06	0 to 1200°C		T :A7	0.0 to 700.0°F
	K :C9	-328.0 to +2502.0°F		T :C9	-328 to +752°F
	K :B4	0.0 to +2400.0°F		S :04	0.0 to 1700.0°C
	K :A4	0.0 to 800.0°F		S :07	-50.0 to +1768.0°C
J	J :27	-200.0 to +400.0°C	S :06	-50 to +3214°F	
	J :29	-200.0 to +1200.0°C	S :A8	-58.0 to +3214.0°F	
	J :16	0.0 to 1200.0°C	S :A5	0.0 to 3200.0°F	
	J :15	-200 to +1200°C	S :A7	-58 to +3214°F	
	J :C9	-328.0 to +2192.0°F	R :05	0.0 to 1700.0°C	
	J :B5	0.0 to 2100.0°F	R :08	-50.0 to +1768.0°C	
	J :B6	0.0 to 800.0°F	R :07	-50 to +1768°C	
	J :B9	-328 to +2192°F	R :A8	-58.0 to +3214.0°F	
	E	E :20	-200.0 to +1000.0°C	R :A5	0.0 to 3200.0°F
E :17		-200.0 to +200.0°C	R :A7	-58 to +3214°F	
E :08		0.0 to 1000.0°C	B :04	0.0 to 1800.0°C	
E :06		-200 to +1000°C	B :03	0 to 1800°C	
E :B3		-328.0 to +1832.0°F	B :A9	0.0 to 3200.0°F	
E :A6		0.0 to 1800.0°F	B :B3	0.0 to 3272.0°F	
E :B1		-328 to +1832°F	B :B2	0 to 3272°F	
N	N :05	0.0 to 1300.0°C	N :02	0 to 1300°C	
	N :02	0 to 1300°C	N :A8	0.0 to 2372.0°F	
	N :A8	0.0 to 2372.0°F	N :A4	0.0 to 2300.0°F	
	N :A4	0.0 to 2300.0°F	N :A7	0 to 2372°F	
	N :A7	0 to 2372°F			

RTD

Input	Code	Range	Input	Code	Range		
PLII (NBS)	A :06	0.0 to 1390.0°C	W5Re/W26Re (ASTM)	W :04	0.0 to 2300.0°C		
	A :05	0.0 to 1300.0°C		W :06	0.0 to 1200.0°C		
	A :02	0 to 1390°C		W :03	0 to 2300°C		
	A :A7	0.0 to 2534.0°F		W :A8	0.0 to 4200.0°F		
	A :A5	0.0 to 2300.0°F		W :A6	0.0 to 2200.0°F		
	A :A2	0 to 2534°F		W :A2	0 to 4200°F		
	L (DIN)	L :04		0.0 to 900.0°C	L :05	0 to 900°C	
	L (DIN)	L :A6		0.0 to 1600.0°F	L :B1	0.0 to 1652.0°F	
	L (DIN)	L :A3		0 to 1652°F	U (DIN)	U :04	0.0 to 600.0°C
	U (DIN)	U :08		0 to 600°C	U :B1	0.0 to 1100.0°F	
U (DIN)	U :04	0.0 to 600°C	U :B3	0.0 to 1112.0°F			
U (DIN)	U :B1	0.0 to 1100.0°F	U :B4	0 to 1112°F			
U (DIN)	U :B3	0.0 to 1112.0°F	F :01	0.0 to 1800.0°C			
PR40-20	F :02	0 to 1800°C	F :02	0 to 1800°C			
PR40-20	F :A1	0.0 to 3200.0°F	F :A1	0.0 to 3200.0°F			
PR40-20	F :A2	0 to 3200°F	F :A2	0 to 3200°F			

DC Current - voltage

Input	Code	Range
Pt100	D :34	-100.0 to +150.00°C
	D :35	-200.0 to +850.0°C
	D :21	-200.0 to +200.0°C
	D :25	-200.0 to +600.0°C
	D :36	-200 to +850°C
	D :C9	-328.0 to +1562.0°F
	D :B8	-300.0 to +1200.0°F
	D :D2	-328 to +1562°F
	JPt100	P :29
P :21		-200.0 to +200.0°C
P :26		-200.0 to +600.0°C
P :30		-200.0 to +640.0°C
P :10		0.0 to 500.0°C
P :31		-200 to +640°C
	I :01	0 to 10mV
	I :01	0 to 100mV
	I :01	0 to 1V
	I :01	0 to 5V
	I :01	0 to 10V
	I :01	1 to 5V
	I :01	0 to 20mA
	I :01	4 to 20mA
	I :01	-100 to +100mV
	I :01	-1 to +1V
I :02	-10 to +10mV	
I :03	-10 to +10V	
I :04	-5 to +5V	

Output signal code table

3	0 - 1V DC	*	4	0 - 5V DC	5	0 - 10V DC	6	1 - 5V DC	7	0 - 20mA DC	8	4 - 20mA DC
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* : 0 to 1 V DC output can be specified only for Output 3 (Analog retransmission output).

Ramp/Soak Process/Temperature Controller PF900

Quick Start Code 2

- Quick start code 2 tells the factory to ship with each parameter preset to the values detailed as specified by the customer. Quick start code is not necessarily specified when ordering, unless the preset is requested. These parameters are software selectable items and can be re-programmed in the field via the manual.

Specifications	Quick start code 2 (Initial setting code)						
	①	②	③	④	⑤	⑥	⑦
① Digital input allocation	See Digital Input Allocation table	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
② Digital output 1 type	See Digital output code table	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
③ Digital output 2 type	See Digital output code table	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
④ Digital output 3 type	See Digital output code table	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
⑤ Digital output 4 type	See Digital output code table	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
⑥ CT types	No CT1 and CT2 CT1 : CTL-6-P-N, CT2 : No use CT1 : CTL-12-S56-10L-N, CT2 : No use CT1 : CTL-6-P-N, CT2 : CTL-6-P-N CT1 : CTL-12-S56-10L-N, CT2 : CTL-12-S56-10L-N						N P S T U
⑦ Communication 1	Not supplied ANSI/RKC standard MODBUS						N 1 2

Digital output code table (Programmable)

Event types	Code
No event	N
Deviation High	A
Deviation Low	B
Deviation High/Low (Common high/low setting)	C
Band (Common high/low setting)	D
Deviation High with Hold	E
Deviation Low with Hold	F
Deviation High/Low with Hold (Common high/low setting)	G
Process High	H
Process Low	J
Process High with Hold	K
Process Low with Hold	L
Heater Break Alarm (HBA) 1 *1	P
Heater Break Alarm (HBA) 2 *1	Q
Loop Break Alarm (LBA) *2	R
FAIL	S
FBR Input Abnormality	T
Band (Individual high and low settings)	U
Set value High	V
Set value Low	W
Deviation High/Low (Individual high and low settings)	X
Deviation High/Low with Alarm Hold (Individual high and low settings)	Y
MV value High	1
MV value Low	2
Cool side MV value High	3
Cool side MV value Low	4
Time signal 1	5
Time signal 2	6
Time signal 3	7
Time signal 4	8
Pattern end output	9

- COM2 is used exclusively for inter-controller communication.
- Default setting value of Digital output type
 Digital output 1 : Deviation High
 Digital output 2 : Deviation Low with Hold
 Digital output 3 : Time signal 1
 Digital output 4 : Pattern end output
- *1 Heater break alarm (HBA) is not available for current/continuous voltage output.
- *2 Loop break alarm (LBA) is not available for heat/cool PID control type.

Digital Input allocation table

Code	DI1	DI2	DI3	DI4	DI5	DI6	DI7	DI8	DI9	DI10	DI11
0	Pattern No. Selection					Pattern No. Set	RESET	RUN	STEP	HOLD	Pattern No. Selection
1	Pattern No. Selection					Pattern No. Set	RESET	RUN	STEP	Pattern No. Selection	
2	WAIT release	WAIT release	WAIT release	WAIT release	WAIT release	WAIT release	Pattern No. Selection			Pattern No. Set	
3	WAIT release	WAIT release	WAIT release	WAIT release	WAIT release	WAIT release	Pattern No. Selection				
4	WAIT release	WAIT release	WAIT release	WAIT release	WAIT release	WAIT release	RESET	RUN	STEP	HOLD	Direct/Reverse selection
5	WAIT release	WAIT release	WAIT release	WAIT release	WAIT release	WAIT release	RESET	RUN	STEP	HOLD	Pattern No. Selection (Increment)

Example of Model Code and Quick start code

Input: Thermocouple PR40-20, Max. 1800°C, resolution 0.1°C
 Control: Heating control (Output: 4 to 20mA DC)
 Digital output : 4 points (Relay contact output)
 Digital output 1 : Deviation high, Digital output 2 : Pattern end output
 Digital output 3 : Time signal 1 output, Digital output 4 : Time signal 2 output

Specifications

Retransmission output: 0 to 10V DC
 Time signal output: 8 points (open collector)
 Digital input: WAIT release + Pattern No. Selection, (With Pattern No. Set)
 Communication: RS-232C (MODBUS) + inter-controller communication

Model code PF900-8N5-□*4NW2-FF01

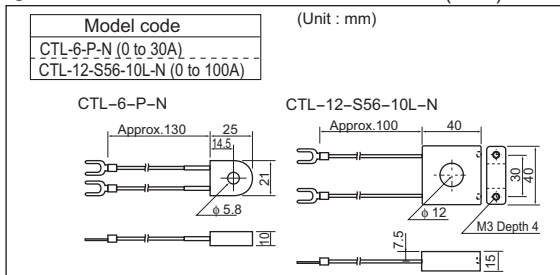
- ① OUT1 (Heat output) : 4 to 20mA DC Code : 8
- ② OUT2 (Cool output) : None Code : N
- ③ OUT3 (Retransmission) : 0 to 10V DC Code : 5
- ④ Supply voltage
- ⑤ Digital output: Relay (event) 4 points (DO1 to 4) Code : 4
- ⑥ CT/FBR input: None Code : N
- ⑩ Input/Scale range : PR20-40 0.0 to 1800.0°C Code : F01
- ⑨ Control action: PID with AT (reverse) Code : F
- ⑧ Specify quick start code Code : 2
- ⑦ Communication/Digital input: Code : W • DI7 to 11 as standard
 COM1: RS-232C, COM2 : Inter-controller
 DI : 6 points (DI1 to 6)

Quick start code 2 2-A956-N2

- ① Digital input : WAIT release, PTN.No Select, PTN No.Set Code : 2
- ② Digital output 1 : Deviation high Code : A
- ③ Digital output 2 : Pattern end output Code : 9
- ④ Digital output 3 : Time signal 1 Code : 5
- ⑤ Digital output 4 : Time signal 2 Code : 6
- ⑦ COM1 protocol : MODBUS Code : 2
- ⑥ CT type : None Code : N

Accessory

● Current transformer for heater break alarm (HBA)

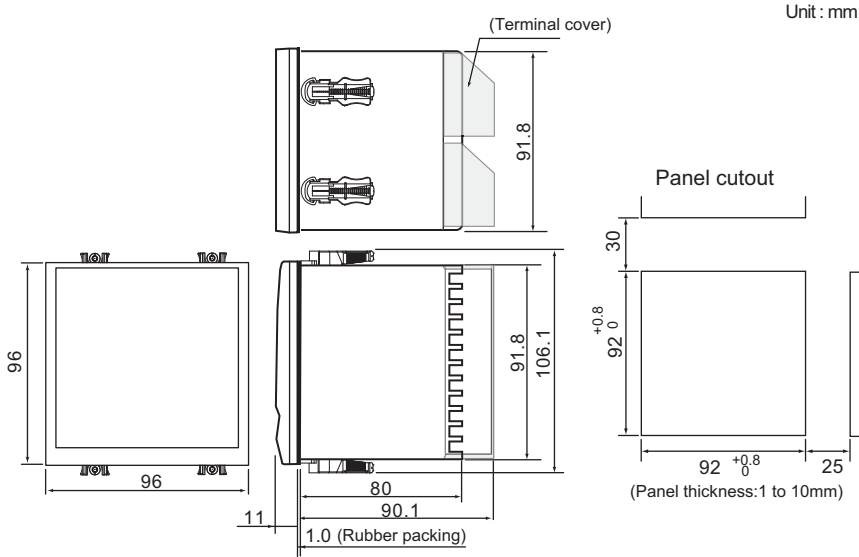


● Terminal Cover

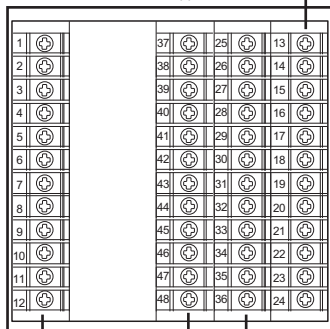


Ramp/Soak Process/Temperature Controller PF900

External Dimensions and Rear Terminals



Please use M3 solderless terminal with width smaller than 5.9mm.
Unused terminals are not supplied with screws.



No.	Functions							
13	COM	Code 0	Code 1	Code 2	Code 3	Code 4	Code 5	Standard
14	DI 7	RESET	RESET	(1) Ptn. No	(1) Ptn. No	RESET	RESET	Digital inputs (DI 7 to 11)
15	DI 8	RUN	RUN	(2) Ptn. No	(2) Ptn. No	RUN	RUN	
16	DI 9	STEP	STEP	(4) Ptn. No	(4) Ptn. No	STEP	STEP	
17	DI 10	HOLD	(32) Ptn. No	(8) Ptn. No	(8) Ptn. No	HOLD	HOLD	
18	DI 11	(32) Ptn. No	(64) Ptn. No	Ptn. SET	(16) Ptn. No	Dir/Rev	Ptn. INC	
19	COM	(Optional)		Open (O)				(Optional)
20	CT1	CT1,CT2 inputs		W				Feedback resistance
21	CT2			Close (C)				
22								Measuring input
23	A							(1) Thermocouple
24	B							(2) RTD
	(1)							(3) Voltage/Current

No.	Functions	
1	AC L	DC T +
2	100 - 240V	24V
	24V L N	- -
3	COM	Standard
4	DO4	Digital outputs 3, 4 (DO 3, 4)
5	DO3	• Relay contact output
6	COM	Standard
7	DO2	Digital outputs 1, 2 (DO 1, 2)
8	DO1	• Relay contact output
9	NO	Output 2 (OUT2)
10	(1) (2) (3) (4)	(1) Relay output (2) Voltage pulse/Voltage/Current (3) SSR (Triac), (4) Open collector
11	NO	Output 1 (OUT1)
12	(1) (2) (3) (4)	(1) Relay output (2) Voltage pulse/Voltage/Current (3) SSR (Triac), (4) Open collector

No.	Functions	
37	COM (-)	(Optional)
38	DO 5	Digital outputs 5 to 8 (DO 5 to 8)
39	DO 6	
40	DO 7	
41	DO 8	
42	COM(-)	(Optional)
43	DO 9	Digital outputs 9 to 12 (DO 9 to 12)
44	DO 10	
45	DO 11	
46	DO 12	
47		Output 3 (OUT3)
48	(1) (2)	(1) Voltage pulse/Voltage/Current (2) Open collector

No.	Functions			
25	SG	SG	SG COM1	SG COM2
26	SD	T/R(A)	T(A)	RS-485
27	RD	T/R(B)	T(B)	
28	(1)	(2)	R(A)	Communication 2 (Inter-controllers)
29	(3)	(4)	R(B)	
30	COM	Code : 0, 1	Code : 2, 3, 4, 5	(Optional)
31	DI 1	(1)	WAIT release	Digital inputs (DI 1 to 6)
32	DI 2	(2)	WAIT release	
33	DI 3	(4)	WAIT release	
34	DI 4	(8)	WAIT release	
35	DI 5	(16)	WAIT release	
36	DI 6	Pattern SET	WAIT release	

*1 : To use communication 2 (inter-controller communication), please specify RS-232C or RS-485 for communication 1.