CONTROLLER

Ramp/Soak Controller

PF900

High-Performance

Process/Temperature Controller

PF901

PF900

CE c(UL)us
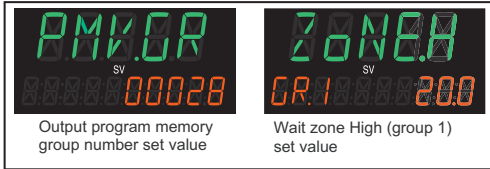
G RoHS compliant

RKC **RKC INSTRUMENT INC.**

High Intensity Display

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

Display with 11-segment characters

Output program memory group number set value

Wait zone High (group 1) set value

Program/Segment remaining time display (Unit: hour:min/min:sec)

Time signal/ Digital output indicators

Running pattern/ Segment display

Gradient state display

Program pattern/ Output bargraph display
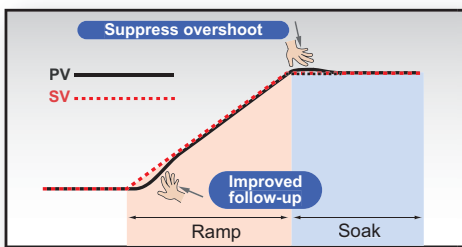
High intensity white color display

Advanced control

● 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.
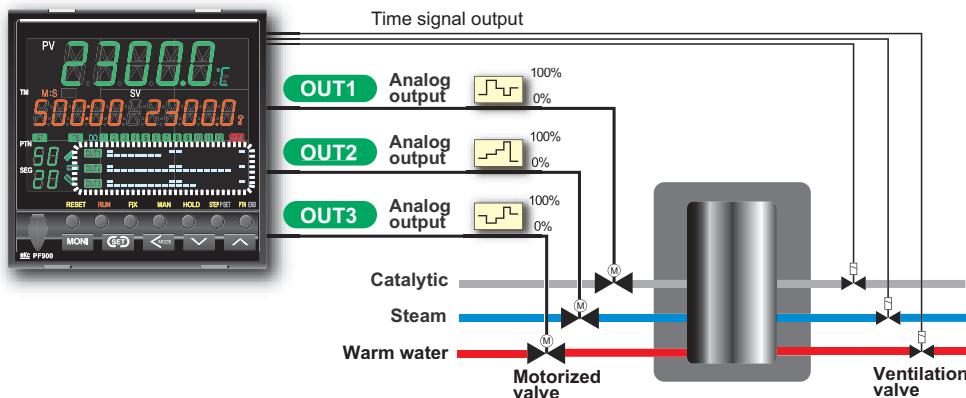
Suppress overshoot

PV
SV

Improved follow-up

Ramp   Soak

Program Control
EVOLUTION
PF900

Newest technology provides versatile functionality and features to satisfy requirements in a wide range of applications.

Multiple control

● 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.

Time signal output

OUT1 — Analog output — 100% 0%
OUT2 — Analog output — 100% 0%
OUT3 — Analog output — 100% 0%

Catalytic
Steam
Warm water
Motorized valve
Ventilation valve

### ● Fast sampling of 0.05 sec.

Meet different control requirements by switching sampling speeds. Choose 0.05 for "fast" process applications to 0.25 sec. sampling for "stable" for applications which require higher resolutions.

● Maximum of 11 digital inputs and 12 digital output

Versatile event handling is achieved with an abundance of digital input/output options including the addition of a wait release and switchover of reverse/direct action.

● Customizable keys

Direct access to major functions
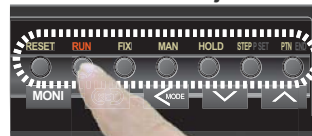
Customize the function keys you want to access at a touch by:
• Press once,
• Press twice,
• Pressing the key for 2 seconds
• Disabled

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)

Enhanced flexibility

● **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)

Time signal output

Pattern

TS1

TS8

<Time signal output within pattern>

Segment signal output

Each segment

TS1

TS8

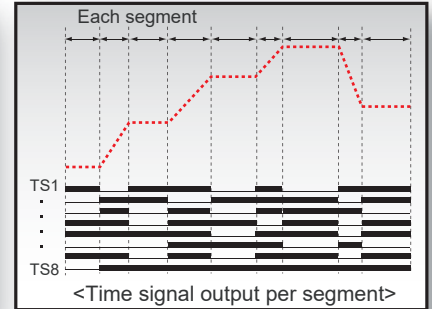<Time signal output per segment>

Selectable PID zones

● **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.
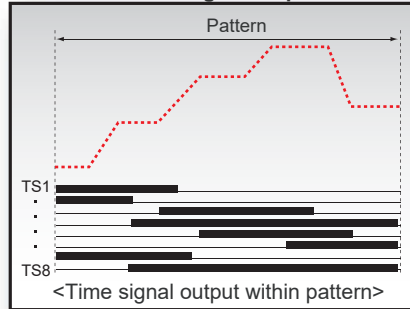
Satisfies versatile applications

● **Flexible pattern end output**
Set the end signal to the control mode after the pattern end, valve opening status, event status, or retransmission output signal status.

● **Flexible WAIT function**
The WAIT function can be released by the out-of-wait zone determination (upper/lower sides), digital input or timeout setting.

● **Segment repeat**
Specified segment can be repeated.

Set values management

● **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 values, Wait and Events: 8 groups
• Time signals: 16 groups
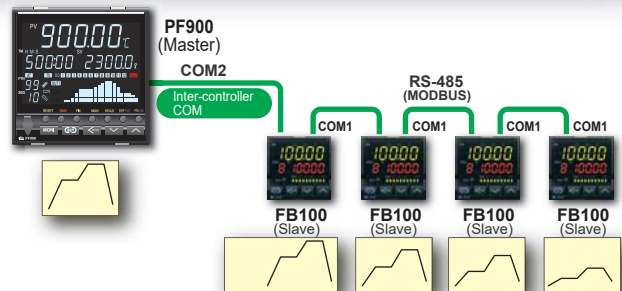• Program pattern output : Up to 99 points

Communication
EVOLUTION

Reliable collaborative operation

● **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.
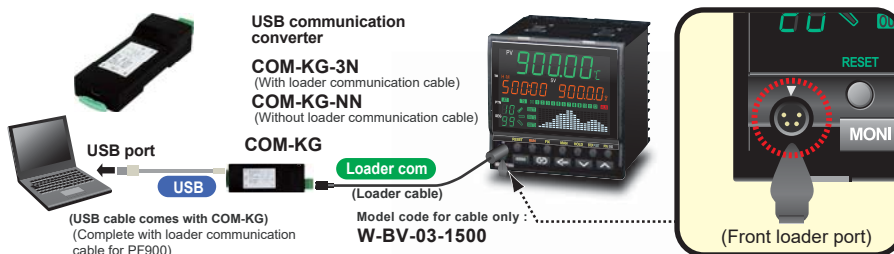
PF900 (Master)
COM2
Inter-controller COM
RS-485 (MODBUS)
COM1 COM1 COM1 COM1
FB100 (Slave) FB100 (Slave) FB100 (Slave) FB100 (Slave)

• 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 + Programming tool**
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.

USB communication converter
COM-KG-3N
(With loader communication cable)
COM-KG-NN
(Without loader communication cable)

RESET
MONI

USB port
COM-KG
USB
Loader com
(Loader cable)
(USB cable comes with COM-KG)
(Complete with loader communication cable for PF900)
Model code for cable only :
W-BV-03-1500

(Front loader port)

3

Input

Input	• Universal input a) Temperature, current, voltage (low) input group 　Thermocouple input 　　K, J, E, T, R, S, B, N, PLII, W5Re/W26Re, U, L, PR40-20 　RTD 　　Pt100, JPt100 (3-wire type) 　DC Voltage input (input impedance: 1MΩ) 　　0 to 1V, 0 to 100mV, 0 to 10mV, 　　-100 to +100mV, -10 to +10mV, -1 to +1V b) Voltage (high) input group 　DC Voltage input (input impedance: 1MΩ) 　　0 to 5V, 1 to 5V, 0 to 10V, -5 to +5V, -10 to +10V c) Current input group 　DC Current input (input impedance: 50Ω) 　　4 to 20mA, 0 to 20mA (Use dip switch to change input group.)
Sampling time	0.1 sec (0.05sec/0.25sec is selectable.)
Influence of external resistance	0.2µV/Ω (Thermocouple input)
Influence of lead resistance	Approx. 0.01% of span (for RTD) • Maximum 10Ω per leadwire maxthermocouple
Input break action	Thermocouple input : Up-scale/Down-scale (Selectable) RTD input :　　　　　Up-scale Low voltage input :　Up-scale/Down-scale (Selectable) Current input :　　　Value around 0mA High voltage input :　Value around 0V
Digital filter	0.1 to 100.0 sec. (OFF when 0 is set.)
PV bias	- input range span to + input range span
PV ratio	0.001 to 9.999
Square root extraction	PV = √(Input value) x PV ratio + PV bias Low level cut off : 0.00 to 25.00% of span

Control

Control method	a) Brilliant II PID control 　• Direct action/Reverse action is selectable b) Brilliant II PID control (Heat/Cool type) c) Brilliant II position proportioning control 　• Direct action/Reverse action is selectable 　• Position proportional control can be used with/without FBR 　　(feedback resistance) input. • a), b), c) selectable
Autotuning	a) For PID control or position proportioning control b) For Heat/Cool PID control (For extruder, air cooling) c) For Heat/Cool PID control (For extruder, water cooling) 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.
Setting range	a) Proportional band: 　0 (0.0/0.00) to input span (°C,°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 (°C,°F) 　　Voltage/Current input : 0.0 to 100.0% of input span b) Integral time: 0 (0.0) to 3600 (3600.0) sec. 　　　　　　　　(PD control when I = 0) c) Derivative time: 0 (0.0) to 3600(3600.0) sec. 　　　　　　　　(PI control when D = 0) d) Cooling proportional band : 　1 (0.1/0.01) to input span (°C,°F) (for temperature input) 　0.1 to 1000.0% of input span (for voltage/current input) e) Integral time for cooling : 0 (0.0) to 3600 (3600.0) sec. 　　　　　　　　(PD control when I = 0) f) Derivative time for cooling : 0 (0.0) to 3600(3600.0) sec. 　　　　　　　　(PI control when D = 0) g) Overlap/deadband: 　-span to +span (°C,°F) (for temperature input) 　-100.0 to +100.0% of span (for DC voltage/current input) h) Control response parameter: slow, medium, fast i) Output limiter: -5.0 to +105.0% (High/Low individual setting) j) Cool side output limiter: -5.0 to +105.0% 　　　　　　　　(High/Low individual setting) k) Heat side cycle time: 0.1 to 100.0 sec. l) Cool side cycle time: 0.1 to 100.0 sec. m) Manual reset: -100.0 to +100.0% of proportional band n) Output at reset: -5.0 to +105.0% 　　　　　　(Heat and cool sides are individual setting.) o) Overlap/deadband reference: 0.0 to 1.0 (heating reference at zero) p) Undershoot suppression factor (USS) for cooling: 　0.000 to 1.000 q) 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)

Valve drive

Control motor time	5 to 1000 seconds
Integrated 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) selectable

Performance

Measuring accuracy	a)Thermocouple 　Type : K, J, T, E, PLII, U, L 　　Less than -100°C (-148°F) : ±1.0°C (±1.8°F) 　　-100 to +500°C (-148 to 932°F) : ±0.5°C (±0.9°F) 　　More than 500°C (932°F) : ±0.1% of reading 　Type : N, S, R, W5Re/W26Re 　　Less than 0°C (32°F) : ±2.0°C (±3.6°F) 　　0 to 1000°C (32 to 1832°F) : ±1.0°C (±1.8°F) 　　More than 1000°C (1832°F) : ±0.1% of reading
Measuring accuracy	Type B 　Less than 400°C (752°F) : ±70.0°C (±126°F) 　400 to 1000°C (752 to 1832°F) : ±1.4°C (±2.6°F) 　More than 1000°C (1832°F) : ±0.1% of reading Type PR40-20 　Less than 400°C (752°F) : ±20°C (36°F) 　400 to 1000°C (752 to 1832°F) : ±10°C (18°F) 　More than 1000°C (1832°F): ±0.1% of displayed value • Cold junction temperature compensation error 　±1.0°C (1.8°F) [Between 5 and 40°C (41 and 104°F)] 　±1.5°C (2.7°F) [Between -10 and 5°C (16 and 41°F), and 　　　　　　　　40 and 55°C (104 and 122°F)] b) RTD 　Less than 200°C (392°F) : ±0.2°C (±0.4°F) 　More than 200°C (392°F) : ±0.1% of reading c) DC voltage and DC current 　±0.1% of span

Program control

Time accuracy	±0.01% of reading or input sampling time, whichever is larger.
Number of program patterns	Up to 99 patterns
Number of program segments	Up to 1024 segments • Up to 99 segments per pattern. • Supplied with hold, step, fast forward, fast rewind features.
Segment time	0 hr 0 min to 500 hs 00 min or 0 min 0 sec to 500 min 0 sec
Number of segment repeat	1 to 9999 repeats • Repeat is disabled when set to 1.
Number of pattern repeat	1 to 10,000 repeats • Continuous repeat when set to 10,000.
Number of 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)
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	a) Wait zone (upper) 　1) Temperature input: 0 (0.0/0.00) to 200 (200.0/200.00)(°C,°F) 　2) Voltage/current input: 0.0 to 20.0% of input span 　• Wait function off when set to zero b) Wait zone (lower) 　1) Temperature input: -200(-200.0)~0(0.0)(°C,°F) or 　　　　　　　　　-199.99~0.00(°C,°F) 　2) Voltage/current input: 20.0~0.0% of input span 　• Wait function off when set to zero c) 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. a) Time signal 　1) Number of outputs: 8 (TS1 to TS8) 　2) Output assignment: Up to 12 (including 4 relays), assignable by DO 　3) Time signal memory group: 16 groups 　4) Number of memory storage: 16 groups X 16 memories 　5) Number of storage memory: 1 to segment No. (max = 99) 　6) Starting time: 0 hr 0 min to 500 hs 00 min or 　　　　　　　　0 min 0 sec to 500 min 0 sec 　7) Ending segment: 1 to segment No. (max = 99), however, ending 　　　　　　　　segment must be equal to or larger than the starting 　　　　　　　　segment. 　8) Ending time: 0 hr 0 min to 500 hs 00 min or 　　　　　　　　0 min 0 sec to 500 min 0 sec b) 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. a) 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. b) 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	a) Memory group No : 0 to 8 (Level-PID is activated when set to zero.) b) 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	a) Memory group No.: 0 to 8 (event off when set to zero) b) Setting items : Event 1 to 4
Segment wait memory	a) Memory group No.: 0 to 8 (wait off when set to zero) b) Setting items: wait zone, wait release trigger, timeout for wait
Time signal memory	a) Memory group No.: 0 to 16 (time signal off when set to zero) b) Memory No.: 1~16 (16 set points per group) c) Setting items: Time signal output destination, starting segment, 　time signal starting time, end segment, time signal end time.
Program pattern output	a) Pattern Nos.: 1 to (128/max.segment) • Up to 99 segments b) Segment No.: 1 to max segment value. c) 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		Control continues with the SV for a fixed setpoint control.	Output continues after adjusting the final output level of the program control to the output level of manual.
	Fixed setpoint control		*1 Control continues with the SV for a program 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 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 types:	a) Relay contact output : Form 1a contact, Rating: 250V AC 3A (Resistive load) Electrical life: 300,000 cycles or more b) Voltage pulse output : 0/12V DC, Load resistance : 600Ω or more (20mA or less) * OUT1 can be 300Ω or more (40mA or less) if OUT2 is not used. c) Current output : 4 to 20mA, 0 to 20mA DC, Load resistance: 600Ω or less d) Continuous voltage output : 0 to 5V, 1 to 5V, 0 to 10V, 0 to 1V DC (Assignable to OUT3 only), Load resistance: 1KΩ or more e) Open collector output (sink method) : Load voltage 30V DC or lower Allowable load current: 100mA. ON voltage: 2V or less (For maximum load current)

Digital output (DO)

DO1 to DO4 : Standard
DO5 to DO12: Optional

Number of output	Up to 12 points (DO1up to 12 (DO1 to 12) DO1 to 4 : Relay contact output (Standards) DO5 to 12 : Open collector output (Optional)
Output function	Time signal, event, Heater break alarm, Loop break alarm, Input abnormality, RUN state, FIX mode state, MAN mode state, Ramp status, Soak status, HOLD status, WAIT status, Pattern end status, AT status, FAIL, Communication failure, FBR input abnormality
Output types	a) Relay contact output, Form 1a contact, 250VAC 1A (Resistive load) b) Open collector output (sink type), Load voltage: 30V DC or less Allowable load current : 100mA ON voltage : 2V or less (For maximum load current)

Retransmission output (AO) (Optional)

Number of output	Up to 2 points (3 for program outputs) • Depends on output assignment.
Output function	PV, SV, Control output, Output program value, Deviation, % of segment time (Selectable)
Output types	a) Current output : 4 to 20mA, 0 to 20mA DC Load resistance : 600Ω or less b) Voltage output : 0 to 1V, 0 to 5V, 1 to 5V, 0 to 10V DC Load resistance : 1KΩ or more
Scaling range	a) PV, SV : Same as input range b) Control output, Output program output: 0 to 100% c) Deviation: ±input span Output program and segment time percentage are fixed.
Additional function	Stop/continue selectable during RESET status

Event (alarm) function (Optional)

Number of event	Up to 4 points (event 1 to 4)
Event types	Process, Deviation, Band, SV, MV
Event setting range	a) Deviation/Band Event setting: -input span to +input span Differential gap for event action: 0 to input span b) PV/SV Event setting: same as input range Differential gap for event action: 0 to input span c) MV Event setting : -5.0 to +105.0% Differential gap for event action: 0 to 110%
Event output type	Freely assignable to digital outputs (DO1 to 12, OUT2, OUT3). See Output allocation table for details.
Additional features for event output:	a) Hold function (Valid when power is supplied or when even is started.) b) Event action selection at the time of abnormal input. c) Action selection at the time of RESET d) Delay timer: 0.0 to 600.0 sec. e) Event minimum ON and OFF time: 0.0 to 600.0 sec (ON/OFF individual setting) f) Interlock : Without/With/Switches into the manual mode and stops control.
Heater break alarm (HBA)	a) Number of CT input: 2 points (1 for each CT input) b) Input function: Current detector (CT) c) Input range: CTL-6-P-N: 0 to 30A CTL-12-S56-10L-N: 0 to 100A d) Heater current display range:0.0 to100.0A e) Heater current display accuracy: ±5% of input value or ±2A f) Interlock : Without/With/Switches into the manual mode and stops control. g) Output method: Freely assignable to digital outputs h) Action selection at reset status • Heater break alarm (HBA) is not available for current/continuous voltage output.

Loop break alarm (LBA)

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

Digital input (DI)

DI1 to DI6 : Optional
DI7 to DI11: Standard

Number of input	Up to 11 points (DI1 to 6, DI7 to 11)
Input type	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.

Feedback resistance (FBR) input (Optional)

Not available when CT input is supplied

Allowable resistance	100 to 10KΩ (135Ω as standard)
Sampling time	0.1 sec. (For measurement input sampling 0.05 sec.) 0.2 sec. (For measurement input sampling 0.1 sec.) 0.5 sec. (For measurement input sampling 0.25 sec.)

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

Communication (Optional) [COM1]

Communication method	RS-485/RS-422A/RS-232C (To be specified at the time of ordering)
Protocol:	a) RKC standard (ANSI X3.28 subcategory 2.5 A4) b) Modbus RTU (selectable)
Communication speed	2400, 4800, 9600, 19200, 38400, 57600 bps. (selectable)
Bit structure	a) RKC protocol: Start bit:1, Data bit: 7 or 8, Parity bit: 1 (even or odd) or none Stop bit: 1 or 2 b) Modbus protocol Start bit: 1, Data bit: 8, Parity bit: 1 (even or none), Stop bit: 1 or 2 • a) or b) selectable
Maximum connection:	RS-485/RS-422A : 31 units RS-232C : 1 unit

Inter-controller communication (Optional) [COM2]

Communication type	Function to send target value to slave controllers.
Communication method	RS-485
Protocol	Modbus RTU
Communication speed	9600, 19200, 38400 bps. (selectable)
Bit structure	Start bit: 1, Data bit: 8, Parity bit: none, Stop bit: 1
Maximum slaves	4 units
Slave controllers	PF900/PF901/FB series (With memory area), RB series (with memory area)

Loader communication

Communication method	RS-485
Protocol	RKC standard (ANSI X3.28 subcategory 2.5 A4)
Communication speed	38400 bps
Bit structure	Start bit:1, data bit: 8. parity bit: none, 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.

General specifications

Supply voltage	a) 85 to 264V AC (50/60Hz), Rating: 100 to 240V AC b) 20.4 to 26.4V AC (50/60Hz), Rating: 24V AC c) 20.4 to 26.4V DC, Rating: 24V DC
Power consumption	a) 100 to 240V AC : 13.5VA <10.9VA> (at 240V AC), 9.5VA <7.1VA> (at 100V AC) b) 24V AC : 8.5VA <6.2VA> c) 24V DC : 230mA <173mA> < > : Power saving mode
Rush current	a) 100 to 240V AC : Less than 17.5A (at 240V AC), Less than 7.5A (at 100V AC) b) 24V AC : Less than 8.5A c) 24V DC : Less than 6.0A
Power failure	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)
Memory backup	Backed up by Nonvolatile memory (FRAM) • Data retaining period : Approx. 10 years • Number of writing : Approx. 10,000,000,000 times. (Depending on storage and operating conditions.)
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.
Insulation resistance	20MΩ or more (500V DC) between input and ground terminals. 20MΩ or more (500V DC) between power and ground terminals. 20MΩ or more (500V DC) between input and power terminals.
Dielectric strength	1500V AC for one minute between input and ground terminals. 1500V AC for one minute between power and ground terminals. 2300V AC for one minute between input and power terminals.
Ambient temperature	-10 to +55℃
Ambient humidity	5 to 95%RH (Non condensing) • Absolute humidity : MAX.W.C29.3g/m³ dry air at 101.3kPa
Weight	Approx. 470g,
Waterproof/ Dustproof	NEMA type 3 : IP55 (When mounted in a panel, front direction)
Safety standards	CE marking, UL, cUL, RCM

Model code

Model and Suffix Code

Specifications		96 x 96mm DIN sized ramp/soak controller PV : Green, SV : Orange, Pattern : White **PF900-** PV : White, SV : White, Pattern : White **PF901-**	Hardware coding only ① ② ③ ④ ⑤ ⑥ ⑦ ⑧	Quick start code 1 ⑨ ⑩	⑪ /Y
①	Output 1 (OUT 1) Control output or Output program *1	Relay contact output	M		
		SSR drive voltage pulse output (0/12V DC)	V		
		DC current/voltage output See output table	□		
		Open collector output	D		
②	Output 2 (OUT 2) Control output, Output program, Retransmission output or Digital output *1	None	N		
		Relay contact output	M		
		SSR drive voltage pulse output (0/12V DC)	V		
		DC current/voltage output See output table	□		
		Open collector output	D		
③	Output 3 (OUT 3) Output program, Retransmission output or Digital output *1	None	N		
		SSR drive voltage pulse output (0/12V DC)	V		
		DC current/voltage output See output table	□		
		Open collector output	D		
④	Supply voltage	24V AC/DC	3		
		100 to 240V AC	4		
⑤	Digital output	DO: 4 points, Relay : DO 1 to 4	4		
		DO:12 points, Relay DO 1 to 4, Open collector: DO 5 to 12	C		
⑥	CT input or FBR input *2, *3	None	N		
		CT input: 2 points	T		
		FBR (FeedBack Resistance) input	F		
⑦	Communication <Note 1> Digital input (DI 1 to 6) • DI7 to 11 supplied as standard	None	N		
		COM1:RS-232C COM2:Not supplied • Digital input: 6 points, DI 1 to 6	1		
		COM1:RS-422A COM2:Not supplied • Digital input: 6 points, DI 1 to 6	4		
		COM1:RS-485 COM2:Not supplied • Digital input: 6 points, DI 1 to 6	5		
		COM1:RS-232C COM2:RS-485 • Digital input: 6 points, DI 1 to 6	W		
		COM1:RS-485 COM2:RS-485 • Digital input: 6 points, DI 1 to 6	X		
		COM1:Not supplied COM2:RS-485 • Digital input: 6 points, DI 1 to 6	Y		
		Digital input: 6 points, DI 1 to 6	D		
⑧	Quick start code	None	N		
		Specify quick start code 1	1		
		Specify quick start code 1 and 2 (See page 7)	2		
⑨	Quick start code 1 — Control Method	No quick start code		No code	
		PID control with AT (Reverse action)		F	
		PID control with AT (Direct action)		D	
		Heat/Cool PID control with AT		G	
		Heat/Cool PID control with AT for extruder (Air cooling type)		A	
		Heat/Cool PID control with AT for extruder (Water cooling type)		W	
		Position proportioning PID control with AT (Reverse action)		Z	
		Position proportioning PID control with AT (Direct action)		C	
⑩	Input and range	No quick start code		No 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 or 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.

Output Code Table

Output Type	Code	Output Type	Code
0 to 1V DC *1	3	1 to 5V DC	6
0 to 5V DC	4	0 to 20mA DC	7
0 to 10V DC	5	4 to 20mA DC	8

*1: 0 to 1 V DC output can be specified only for Output 3 (Analog retransmission output).

Input Range Code Table

Thermocouple

Input	Code	Range	Input	Code	Range	Input	Code	Range
K	35	-200.0 to +400.0℃	T	19	-200.0 to +400.0℃	PLII (NBS)	A	06	0.0 to 1390.0℃
	42	-200.0 to +1372.0℃		13	-200.0 to +200.0℃		A	05	0.0 to 1300.0℃
	23	0.0 to 1300.0℃		06	0.0 to 400.0℃		A	02	0 to 1390℃
	09	0.0 to 400.0℃	T	16	-200 to +400℃		A	A7	0.0 to 2534.0℉
	41	-200 to +1372℃		C2	-328.0 to +752.0℉		A	A5	0.0 to 2300.0℉
K	02	0 to 400℃		B7	-300.0 to +700.0℉		A	A2	0 to 2534℉
	06	0 to 1200℃		A7	0.0 to 700.0℉	W5Re/W26Re (ASTM)	W	04	0.0 to 2300.0℃
	C9	-328.0 to +2502.0℉		C9	-328 to +752℉		W	06	0.0 to 1200.0℃
	B4	0.0 to +2400.0℉	S	04	0.0 to 1700.0℃		W	03	0 to 2300℃
	A4	0.0 to 800.0℉		07	-50.0 to +1768.0℃		W	A8	0.0 to 4200.0℉
	C5	-328 to +2502℉		06	-50 to +1768℃		W	A6	0.0 to 2200.0℉
J	27	-200.0 to +400.0℃		A8	-58.0 to +3214.0℉		W	A2	0 to 4200℉
	29	-200.0 to +1200.0℃		A5	0.0 to 3200.0℉	L (DIN)	L	04	0.0 to 900.0℃
	16	0.0 to 1200.0℃		A7	-58 to +3214℉		L	05	0 to 900℃
J	15	-200 to +1200℃	R	05	0.0 to 1700.0℃		L	A6	0.0 to 1600.0℉
	C9	-328.0 to +2192.0℉		08	-50.0 to +1768.0℃		L	B1	0.0 to 1652.0℉
	B5	0.0 to 2100.0℉		07	-50 to +1768℃		L	A3	0 to 1652℉
	B6	0.0 to 800.0℉		A8	-58.0 to +3214.0℉	U (DIN)	U	04	0.0 to 600.0℃
	B9	-328 to +2192℉		A5	0.0 to 3200.0℉		U	08	0 to 600℃
E	20	-200.0 to +1000.0℃		A7	-58 to +3214℉		U	B1	0.0 to 1100.0℉
	17	-200.0 to +1200.0℃	B	04	0.0 to 1800.0℃		U	B3	0.0 to 1112.0℉
	08	0.0 to 1000.0℃		03	0 to 1800℃		U	B4	0 to 1112℉
E	06	-200 to +1000℃		A9	0.0 to 3200.0℉	PR40-20	F	01	0.0 to 1800.0℃
	B3	-328.0 to +1832.0℉		B3	0.0 to 3272.0℉		F	02	0 to 1800℃
	A6	0.0 to 1800.0℉		B2	0 to 3272℉		F	A1	0.0 to 3200.0℉
	B1	-328 to +1832℉	N	05	0.0 to 1300.0℃		F	A2	0 to 3200℉
				02	0 to 1300℃				
				A8	0.0 to 2372.0℉				
				A4	0.0 to 2300.0℉				
				A7	0 to 2372℉				

RTD

Input	Code	Range
Pt100	D	34	-100.00 to +150.00℃
	D	35	-200.0 to +850.0℃
	D	21	-200.0 to +200.0℃
	D	25	-200.0 to +600.0℃
	D	36	-200.0 to +850.0℃
	D	C9	-328.0 to +1562.0℉
	D	B8	-300.0 to +1200.0℉
	D	D2	-328 to +1562℉
JPt100	P	29	-100.00 to +150.00℃
	P	21	-200.0 to +200.0℃
	P	26	-200.0 to +600.0℃
	P	30	-200.0 to +640.0℃
	P	10	0.0 to 500.0℃
	P	31	-200 to +640℃

DC Current • voltage

Input	Code	Range
0 to 10mV	1	01	
0 to 100mV	2	01	
0 to 1V	3	01	
0 to 5V	4	01	-19999 to +32000 (Programmable)
0 to 10V	5	01	
1 to 5V	6	01	
0 to 20mA	7	01	Factory set value:
4 to 20mA	8	01	0.0 to 100.0%
-100 to +100mV	9	01	
-1 to +1V	9	02	
-10 to +10mV	9	03	
-10 to +10V	9	04	
-5 to +5V	9	05	

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	□
②	Digital output 1 type	See Digital output code table	□
③	Digital output 2 type	See Digital output code table	□
④	Digital output 3 type	See Digital output code table	□
⑤	Digital output 4 type	See Digital output code table	□
⑥	CT types	No CT1 and CT2	N
		CT1 : CTL-6-P-N,　　　CT2 : No use	P
		CT1 : CTL-12-S56-10L-N, CT2 : No use	S
		CT1 : CTL-6-P-N,　　　CT2 : CTL-6-P-N	T
		CT1 : CTL-12-S56-10L-N, CT2 : CTL-12-S56-10L-N	U
⑦	Communication 1	No communication 1 (COM1)	N
		ANSI/RKC standard protocol	1
		MODBUS protocol	2

- 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 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

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

Specifications

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
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: COM1: RS-232C, COM2 : Inter-controller DI : 6 points (DI1 to 6)　Code : W　• DI7 to 11 as standard
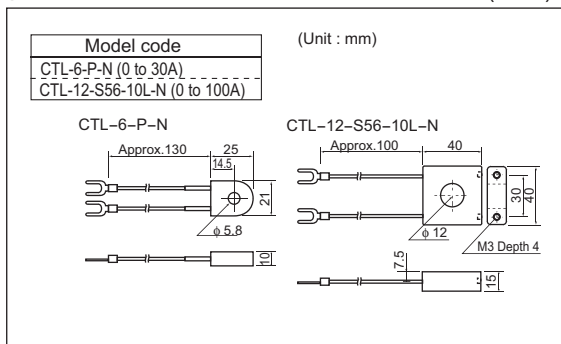
Initial setting code

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

Accessories (Sold separately)

● Current transformer for heater break alarm (HBA)

Model code
CTL-6-P-N (0 to 30A)
CTL-12-S56-10L-N (0 to 100A)

(Unit : mm)

CTL-6-P-N
Approx.130　25
14.5
21
φ 5.8
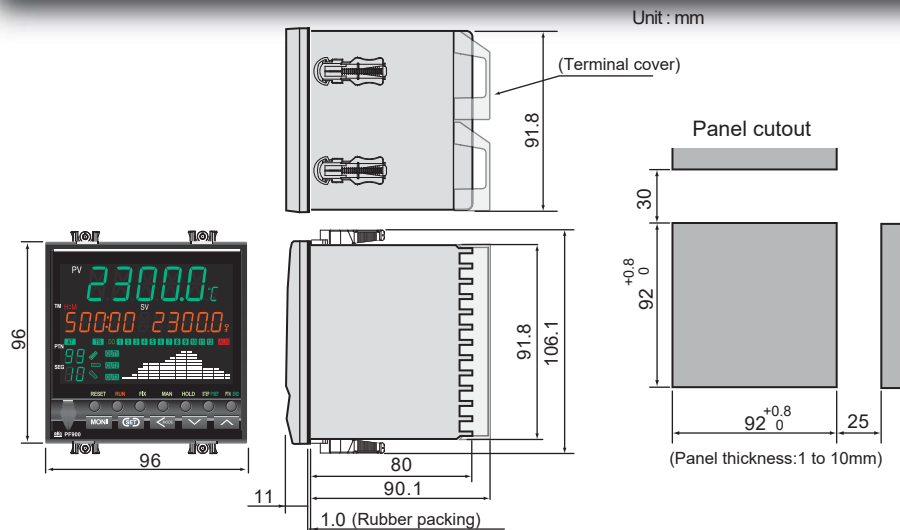
CTL-12-S56-10L-N
Approx.100　40
30 40
φ 12
7.5
M3 Depth 4
15

● Terminal Cover

(two pieces necessary)
Model code : KFB400-58

External Dimensions

Unit : mm

(Terminal cover)

91.8

Panel cutout

30

92 +0.8 / 0

PV 2300.0℃
SV 50000 23000.0℉

96

96

11

80

90.1

91.8

106.1

92 +0.8 / 0   25

(Panel thickness:1 to 10mm)

1.0 (Rubber packing)
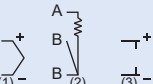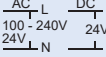
Rear Terminals

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

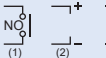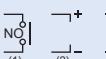| No.	Functions						
	COM	Code 0	Code 1	Code 2	Code 3	Code 4	Code 5
13							Standard
14	DI 7	RESET	RESET	(1)	(1)	RESET	RESET	Digital inputs
15	DI 8	RUN	RUN	(2)	(2)	RUN	RUN	(DI 7 to 11)
16	DI 9	STEP	STEP	(4) Ptn. No	(4) Ptn. No	STEP	STEP	
17	DI10	HOLD	HOLD	(8)	(8)	HOLD	HOLD	
18	DI11	(32) Ptn.No.	(64) Ptn. No	Ptn. SET	(16)	Dir/Rev	Ptn. INC	
19	COM CT1				Open (O)			(Optional)
20	CT2	CT1,CT2 inputs			(W)			Feedback resistance
21					Close (C)			
22	A							Measuring input
23	B							(1)Thermocouple
24	(1) B (2) (3)							(2)RTD (3)Voltage/Current

No.	Functions		
1	AC L DC +		Power supply
2	100 - 240V 24V 24V N		
3	COM	Standard	
4	DO4 NO	Digital outputs 3, 4 (DO 3, 4)	
5	DO3 NO	• Relay contact output	
6	COM	Standard	
7	DO2 NO	Digital outputs 1, 2 (DO 1, 2)	
8	DO1 NO	• Relay contact output	
9	NO	Output 2 (OUT2)	
10	(1) (2) (3)	(1) Relay output (2) Voltage pulse/Voltage/Current (3) Open collector	
11	NO	Output 1 (OUT1)	
12	(1) (2) (3)	(1) Relay output (2) Voltage pulse/Voltage/Current (3) 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	• Open collector output	
41	DO 8		
42	COM(-)	(Optional)	
43	DO 9	Digital outputs 9 to12 (DO 9 to 12)	
44	DO10		
45	DO11	• Open collector output	
46	DO12		
47	+	Output 3 (OUT3)	
48	(1) (2)	(1) Voltage pulse/Voltage/Current (2) Open collector	

No.	Functions			
25	SG SG	SG COM1	SG COM2	(Optional)
26	SD	T/R(A)	T(A)	Communication 1
27	RD	T/R(B)	T(B)	RS-485	(1) RS-232C *1 (2) RS-485 (3) RS-422A
28	(1) (2)		R(A)	T/R(A)	
29		(3)	R(B)	T/R(B)	Communication 2 (Inter-controllers)
30	COM	Code : 0,1	Code : 2,3,4,5	(Optional)
31	DI 1	(1)	WAIT release	
32	DI 2	(2)	WAIT release	
33	DI 3	(4) Pattern	WAIT release	Digital inputs
34	DI 4	(8) No.	WAIT release	(DI 1 to 6)
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.

⚠ Safety Warning
- Before operating this product, read the instruction manual carefully to avoid incorrect operation.
- This product is intended for use with industrial machines, test and measuring equipment. It is not designed for use with medical equipment.
- If it is possible that an accident may occur as a result of the failure of the product or some other abnormality, an appropriate independent protection device must be installed.

Caution for the export trade

All transactions must comply with laws, regulations, and treaties.

Caution : Avoid imitated products

Imitation of RKC products are appearing in the marketplace. RKC will not warrant such products nor bear the responsibility for any damage and/or accident caused by their use and urge caution when making your purchase.

RKC® RKC INSTRUMENT INC.
(RIKA KOGYO CO.,LTD)

HEAD OFFICE : 16-6, KUGAHARA 5 CHOME OHTA-KU TOKYO 146-8515 JAPAN
PHONE : 03-3751-9799 (+81 3 3751 9799)
Email : info@rkcinst.co.jp
https://www.rkcinst.com/

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