



PRODUCT CATALOG

Temperature controllers
Process controllers
System controllers
Power controllers
Communication converters
Indicators
Sensors



An Industry Leader Since 1937

RKC INSTRUMENT INC.

Digital Control Equipment

1. Digital Controller

Single Loop Controller

(Page 1-6)



FZ Series (Page 1-6)

RZ Series (Page 1-16)



RB Series (Page 1-22)



CB Series
(Page 1-30, 1-36)



SA200
(Page 1-42)



SA100
(Page 1-48)



FB100/400/900
(Page 1-54)



REX-F9000
(Page 1-66)



GZ400/900
(Page 1-70)



REX-C100/410/700/400/900
(Page 1-78)



SB1
(Page 1-82)

Ramp/Soak Controller

(Page 1-90)



PZ400/900
(Page 1-90)



PF900
(Page 1-94)

Module Type Controller

(Page 1-102)



SRZ
(Page 1-106)



SRX
(Page 1-114)



SR Mini HG (Page 1-122)

Multi-loop Temperature Controller

(Page 1-132)



MA900/901
(Page 1-132, 1-138)

Limit Controller

(Page 1-144)



CB100L
(Page 1-144)



SA200L
(Page 1-148)



SA100L
(Page 1-154)

2. Indicator • Recorder

Panel Mounting Type Indicator

(Page 2-1)



AG500
(Page 2-1)



AE500
(Page 2-5)

Handheld Thermometer

(Page 2-9)

Handheld Thermometer
DP-350
(Page 2-9)



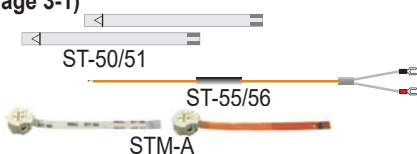
Pocket-size
Infrared Thermometer
LTM-100
(Page 2-11)

PHOTOVOLTIC POWER

SEMICONDUCTOR

3. Sensor

Temperature Sensor for Extremely Small Surface (Page 3-1)



Resin Pressure Measuring System (Page 3-7)



Level Meter (Page 3-15)



Recorder (Page 2-15)



VGR-B100
(Page 2-15)



SBR-EW Series
(Page 2-21)

4. Output Device

Power Controller (Page 4-1)



THV-10
(Page 4-1)



THV-A1
(Page 4-11)



THV-40
(Page 4-19)



THW
(Page 4-31)

Solid State Relay (Page 4-39)



SSL/SSN
(Page 4-39)



SSJ
(Page 4-41)

5. Accessories

Communication Converter (Page 5-1)



Ethernet communication
converter
COM-ME



CC-Link
Communication
Converter
COM-MC



USB Communication
Converter
COM-KG

Heater Break Alarm Module (Page 5-11)



HBA Series

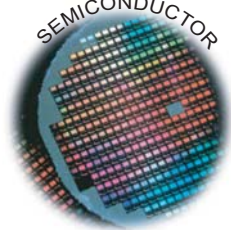
SCIENCE • MEDICAL

FOOD • CONFECTIONERY

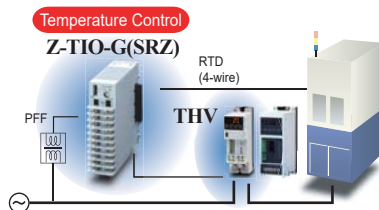
PLASTIC

Applications

Semiconductors

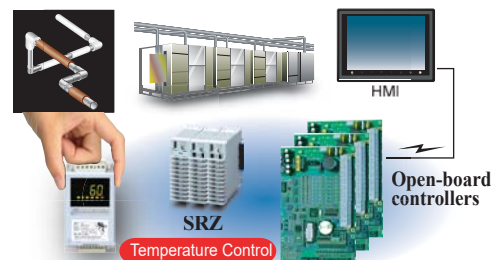


Steppers and coater developers
Stability with 1/1000 resolution and PFF



Large furnaces for PDP/LCD

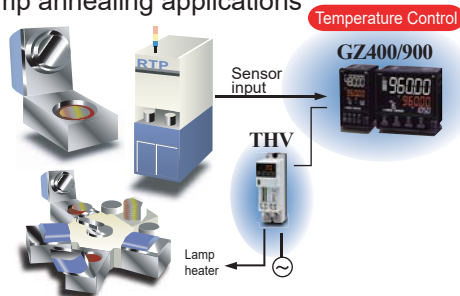
Space-saving control for over 1000 loops with open-board controllers.
System engineering using a general-purpose HMI



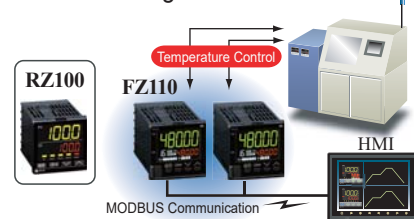
Photovoltaic Power



Fast process applications in chambers.
Lamp annealing applications



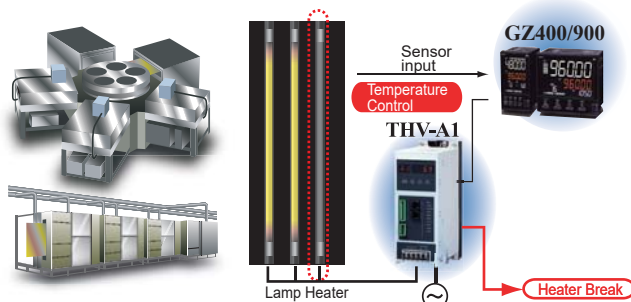
Wire bonding machines



Solar Cell Tunnel Furnace (CVD,PVD)

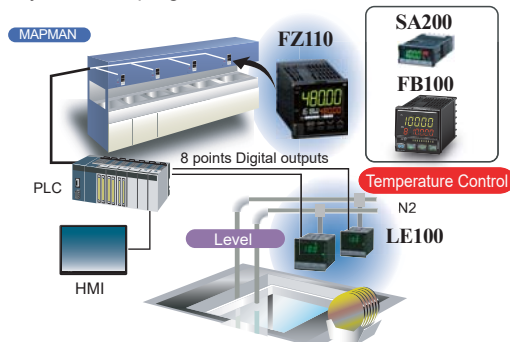
Lamp Heater Control

Detects non-linear load heater break



Wet stations

Temperature data management
by PLC with program-free connection

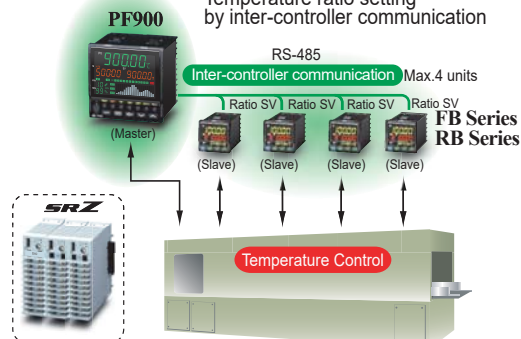


Science · Medical

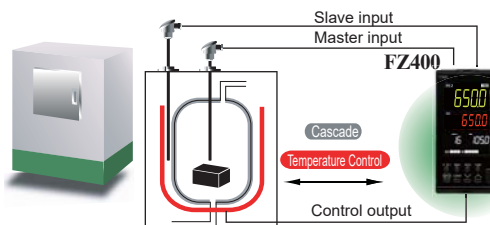


Tunnel Furnace

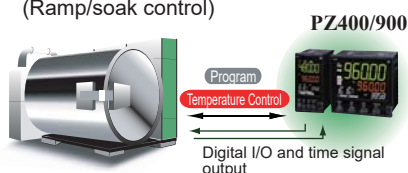
Temperature ratio setting
by inter-controller communication



Cascade temperature control of Reactor

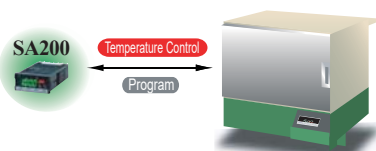


Autoclaves and environmental chambers
(Ramp/soak control)

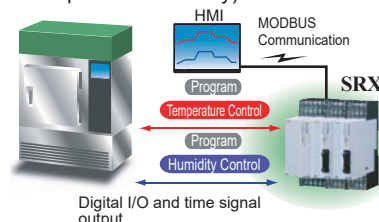


Incubators

Space-saving temperature control (SA200)



Environmental chambers
(Ramp/soak control of temperature/humidity)



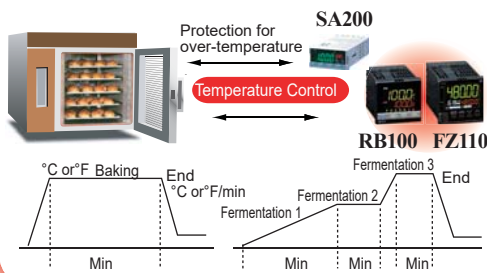
Food Processing

Available with functions related to Cascade control and dedicated Autotuning.



Ovens and Fryers

Ramp/soak control



Temperature measurement of foods

Contact type
DP-350

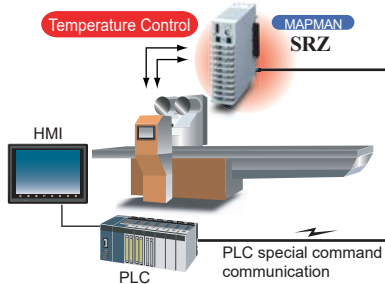


LTM-100

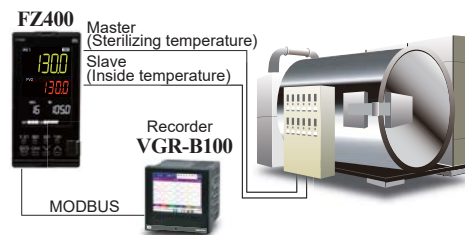
Non-contact type



Packing and Sealing machines



Cascade Control in Sterilizer/Autoclave

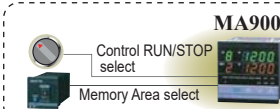
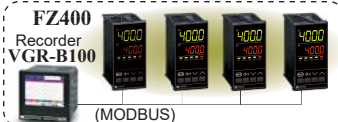
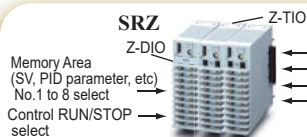


Plastic

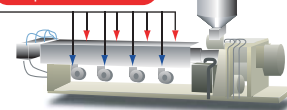
PLASTIC



Extrusion machines

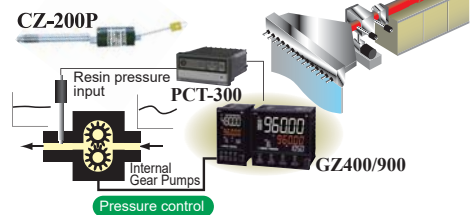


Heat/Cool
Temperature Control



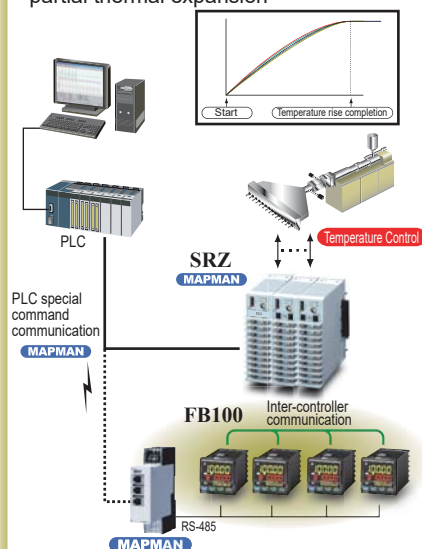
Resin pressure control

Controls main motor RPM so that the resin pressure at a nozzle can be constant.



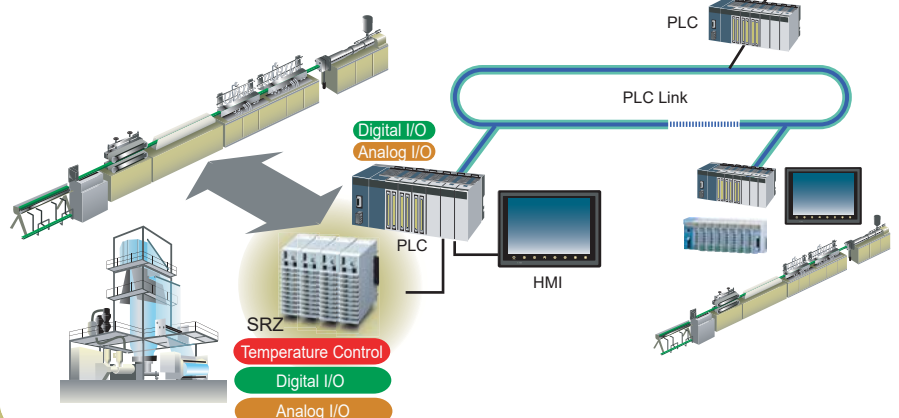
Auto-temperature-rise of Extruder

* Auto-temperature-rise function achieves temperature uniformity at ramp-up without partial thermal expansion



Automatization of Extrusion Lines

* Automatization using existing PLC instrumentation.
* Retrofitting of existing control system.



CONTENTS

1 Digital Controller

Quick Reference Guide	1-1
-----------------------	-----

Single Loop Controller

Process/Temperature Controller	FZ110/400/900	1-6
Temperature Controller	RZ100/400	1-16
Process/Temperature Controller	RB100/400/500/700/900	1-22
Temperature Controller	CB Series (CB100/400/500/700/900)	1-30
Temperature Controller	CB103/403/903	1-36
Temperature Controller	SA200	1-42
Temperature Controller	SA100	1-48
Process/Temperature Controller	FB100/400/900	1-54
High Resolution Temperature Controller	REX-F9000	1-66
High-Speed Digital Controller	GZ400/900	1-70
Temperature Controller	Century Series (REX-C100/400/410/700/900)	1-78
Temperature Controller with Built-in SSR	SB1	1-82

Ramp/Soak Controller

Ramp/Soak Process/ Temperature Controller	PZ400/900	1-90
Ramp/Soak Process/ Temperature Controller	PF900	1-94

Module Type Controller

Module Type Process/ Temperature Controller	SRZ	1-102
Module Type High-speed Digital Controller	SRX	1-114
Module Type Controller	SR Mini HG SYSTEM	1-122
Module Type Controller (MAPMAN Function)	SR Mini HG SYSTEM H-PCP-J Module	1-126

Multi-Loop Temperature Controller

Multi-Loop Temperature Controller	MA900	1-132
Multi-Loop Temperature Controller	MA901	1-138

Limit Controller

Limit Controller	CB100L	1-144
Limit Controller	SA200L	1-148
Limit Controller	SA100L	1-154

2 Indicator • Recorder

Panel Mounting Type Indicator

Digital Indicator	AG500	2-1
Digital Indicator	AE500	2-5

Handheld Thermometer

Handheld Digital Thermometer	DP-350	2-9
Pocket-size Infrared Thermometer	LTM-100	2-11

Recorder

Paperless Recorders	VGR-B100	2-15
Chart Recorders	SBR-EW100/180	2-21

3 Sensor

Temperature Sensor for Extremely Small Surface	ST-50/51	3-1
Temperature Sensor for Extremely Small Surface	ST-55/56	3-3
Magnet Mount Temperature Sensors (Thermocouple)	STM-A	3-5
Resin Pressure Measuring System	CZ-200P/PCT-300 PG500	3-7
Back-pressure Level Meter	LE100/110	3-15
Back-pressure Level Switch	LT1	3-19

4 Output Device

Power Controller • Solid State Relay

Single-Phase Power Controller	THV-10 Series	4-1
Single-Phase Power Controller	THV-A1 Series	4-11
Single-Phase Power Controller	THV-40 Series	4-19
Single-Phase Power Controller	SSNP/SSNZ	4-27
Power Controller • Solid State Relay	THYCO-10 Series	4-29
Three-Phase Power Controller	THW-A Series	4-31
Solid State Relay	SSL/SSN	4-37
Solid State Relay	SSJ	4-39

5 Accessories

Communication Converter

Communication Converter	COM-ME	5-1
CC-Link Communication converter	COM-MC	5-7
USB Communication Converter	COM-KG	5-9

Heater Break Alarm Module

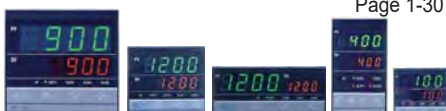
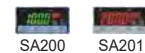
Heater Break Alarm Module	HBA Series	5-11
------------------------------	------------	------

6 Technical Information

Control Theory	6-1
Product List Confirming to International Standards	6-9
List of Discontinued Models	6-10

Quick Reference Guide

Type	Process/Temperature Controller	Temperature Controller	Process/Temperature Controller
Model	FZ900/400/110	RZ400/100	RB900/700/500/400/100
Appearance	Page 1-6 	Page 1-16 	Page 1-22 
Features	- Wide range display (5 digits) - Three indicators - Two input control (FZ400/900) - Easy-to-read with large 11-segment LCD display - Level PID function - Suppressing overshoot (Proactive function) - USB communication (Front loader communication) - Close horizontal mounting	- Large high intensity LED - Flexible Output Configuration - USB communication (Loader communication) - Close horizontal mounting	- Easy-to-read with large 11-segment LCD display - The depth of 60mm (RB100 : 63mm) 4 digital outputs (RB100 : 3 outputs) 2 digital inputs - Easy fine tuning - RUN/STOP key function - USB communication (Loader communication) - Close horizontal mounting
Input	TC, RTD, V DC, mV DC •Universal input	TC, RTD •Universal input	TC, RTD, V DC, mV DC •For DC current input, connect a 250 Ω resistor
Sampling time	50msec	250msec	250msec
Measuring accuracy	TC, RTD ±(0.1% of reading + 1 digit) V DC, mA DC ±(0.1% of span + 1 digit)	±(0.2% of reading + 1 digit)	TC, RTD ±(0.2% of reading + 1 digit) V DC, mA DC ±(0.2% of span + 1 digit)
Control method	Start-up/Autotuning brilliant II PID, PI, PD, On/Off Start-up/Autotuning brilliant II Heat/Cool PID Position proportional PID	Start-up/Autotuning PID, PI, PD, On/Off Start-up/Autotuning Heat/Cool	Start-up/Autotuning PID, PI, PD, On/Off Start-up/Autotuning Heat/Cool
Control output type	Relay, Voltage pulse for SSR, Current, Voltage, Transistor	Relay, Voltage pulse for SSR, Current, Voltage, Triac, Open collector	Relay, Voltage pulse for SSR, Current, Voltage, Triac, Open collector
Communications	RS-422A, RS-485 ANSI or Modbus protocol • FZ110 : RS-485 only	RS-485 ANSI or Modbus protocol	RS-485 ANSI or Modbus protocol
Open Network	N/A	N/A	N/A
PLC direct communication	Mapman function (MITSUBISHI PLC Protocol)	N/A	Mapman function via COM-JE
Size	FZ110 : 1/16 DIN (48x48x81mm) FZ400 : 1/8 vertical DIN (48x96x65mm) FZ900 : 1/4 DIN (96x96x65mm)	RZ100 : 1/16 DIN (48x48x63mm) RZ400 : 1/8 vertical DIN (48x96x60mm)	RB100 : 1/16 DIN (48x48x63mm) RB400 : 1/8 vertical DIN (48x96x60mm) RB500 : 1/8 horizontal DIN (96x48x60mm) RB700 : 3/16 DIN (72x72x60mm) RB900 : 1/4 DIN (96x96x60mm)
Event (Alarms) *1	4 (Temperature, Heater break, Loop break)	2 (Temperature, Heater break, Loop break)	4 (Temperature, Heater break, Loop break) • RB100 : 3
Analog retransmission outputs *1	1	N/A	1
Digital inputs *1	FZ110 : 2, FZ400/900 : 6	N/A	2
Waterproof	IP65	IP66/NEMA4X	IP66/NEMA4X
Additional optional functions	Remote setpoint setting Multi-Memory Area : 16 areas, Level PID 2-loop control, Cascade control		Timer function (Simple Program control function) 4 set values

Type	Temperature Controller	Temperature Controller	Temperature Controller
Model	CB900/700/500/400/100	CB903/403/103	SA200
Appearance	Page 1-30 	Page 1-36 	Page 1-42 
Features	- Bright, easy-to-read LED Display - Autotuning or self-tuning PID control - Autotuning Heat/Cool PID control - RUN/STOP key function - Field programmable Reverse/Direct action - Close horizontal mounting	- Bright, easy-to-read LED Display - Autotuning or self-tuning PID control - Analog retransmission output 3 alarm digital outputs - Digital input/output - Control Run/Stop key - Field programmable Reverse/Direct action - SV1/SV2 transfer	1/32 DIN with dual display - Autotuning or self-tuning PID control - Autotuning Heat/Cool PID control - Analog retransmission output - All red display (SA201) - RUN/STOP function (key and/or DI) - Ramp-to-setpoint - Close vertical or horizontal mounting
Input	TC, RTD, V DC, mV DC •For DC current input, connect a 250 Ω resistor	TC, RTD, V DC, mV DC •For DC current input, connect a 250 Ω resistor	TC, RTD, V DC, mV DC •For DC current input, connect a 250 Ω resistor
Sampling time	500msec	500msec	500msec, 250msec (Selectable)
Measuring accuracy	TC ±(0.3% of reading + 1 digit) or ±2°C (4°F) RTD ±(0.3% of reading + 1 digit) or ±0.8°C (1.6°F) V DC, mA DC ±(0.3% of span + 1 digit)	TC ±(0.3% of reading + 1 digit) or ±2°C (4°F) RTD ±(0.3% of reading + 1 digit) or ±0.8°C (1.6°F) V DC, mA DC ±(0.3% of span + 1 digit)	TC ±(0.3 % of reading + 1 digit) or ±2°C (4°F) RTD ±(0.3% of reading + 1 digit) or ±0.8°C (1.6°F) V DC, mA DC ±(0.3% of span + 1 digit)
Control method	Autotuning PID, Self-tuning PID, Autotuning Heat/Cool PID, PI, PD, On/Off	Autotuning PID, Self-tuning PID, PI, PD, On/Off	Autotuning PID, Self-tuning PID, Autotuning Heat/Cool PID, PI, PD, On/Off
Control output type	Relay, Voltage pulse for SSR, Current, Triac trigger	Relay, Voltage pulse for SSR, Current, Triac trigger	Relay, Voltage pulse for SSR, Current,
Communications	RS-485 ANSI or Modbus protocol	N/A	RS-485 ANSI or Modbus protocol
Open Network	N/A	N/A	N/A
PLC direct communication	N/A	N/A	N/A
Size	CB100 : 1/16 DIN (48x48x100mm) CB400 : 1/8 vertical DIN (48x96x100mm) CB500 : 1/8 horizontal DIN (96x48x100mm) CB700 : 3/16 DIN (72x72x100mm) CB900 : 1/4 DIN (96x96x100mm)	CB103 : 1/16 DIN (48x48x100mm) CB403 : 1/8 vertical DIN (48x96x100mm) CB903 : 1/4 DIN (96x96x100mm)	1/32 DIN (48 x 24x 100mm)
Alarms *1	2 (Temperature, Heater break, Loop break)	3 (Temperature, Heater break, Loop break)	2 (Temperature, Loop break)
Analog retransmission outputs *1	N/A	1	1
Digital inputs *1	N/A	1	1
Waterproof	IP66(CB100), IP65(CB400/500/700/900)	IP66(CB103), IP65(CB403/903)	IP66
Additional optional functions			Peak-hold/bottom-hold, Dual setpoint, PV ratio

*1 Maximum numbers of inputs/outputs vary depending on usage of other functions.

Quick Reference Guide

Type	Temperature Controller	Process/Temperature Controller	High Accuracy Temperature Controller
Model	SA100	FB100/400/900	REX-F9000
Appearance	Page 1-48 	Page 1-54 	Page 1-66 
Features	- DIN rail mounted 1/16 DIN with dual display - Autotuning or self-tuning PID control - Autotuning Heat/Cool PID control - Digital input/output - Analog retransmission output - Digital communications - RUN/STOP function (key and/or DI) - Ramp-to-setpoint	- High Accuracy with selectable sampling cycle time - The depth of 60mm (FB100 : 74mm) 4 configurable digital outputs (FB100 : 3 outputs) 7 configurable digital inputs (FB100 : 5 inputs) - Multi-memory areas (8 sets of control parameters) - Ramp/soak control - Inter-controller Communication - Universal Input - USB communication (Loader communication) - Close horizontal mounting	- Brilliant PID control with enhanced autotuning - High resolution (0.001°C) and high accuracy $\pm 0.05^{\circ}\text{C}$ 1-loop or 2-loop control - Analog retransmission output - Digital input - Auto/Manual (front panel and/or DI) - Power feed forward 3 Decimal place display - Digital communications
Input	TC, RTD, V DC, mV DC • For DC current input, connect a 250 Ω resistor	TC, RTD, V DC, mV DC	RTD (0.000 to 50.000°C)
Sampling time	500msec, 250msec (Selectable)	100msec (50msec/250msec is selectable)	100msec
Measuring accuracy	TC : $\pm(1\%$ of reading + 1 digit) or $\pm 2^{\circ}\text{C}$ (4°F) RTD : $\pm(0.3\%$ of reading + 1 digit) or $\pm 0.8^{\circ}\text{C}$ (1.6°F) V DC, mA DC : $\pm(0.3\%$ of span + 1 digit)	TC, RTD : $\pm(0.1\%$ of reading + 1 digit) V DC, mA DC : $\pm(0.1\%$ of span + 1 digit)	$\pm 0.05^{\circ}\text{C}$
Control method	Autotuning PID, Self-tuning PID, Autotuning Heat/Cool PID, PI, PD, On/Off	Start-up/Autotuning brilliant II PID, PI, PD, On/Off Start-up/Autotuning brilliant II Heat/Cool PID Position proportional PID	Autotuning brilliant PID
Control output type	Relay, Voltage pulse for SSR, Current,	Relay, Voltage pulse for SSR, Current, Voltage, Open collector	Voltage pulse for SSR, Current
Communications	RS-485 ANSI or Modbus protocol	RS-232C, RS-422A, RS-485 ANSI or Modbus protocol • FB100: RS-485 only	RS-485 ANSI protocol
Open Network	N/A	DeviceNet via COM-JH, Profibus via COM-JG, CC-Link via COM-JC, Ethernet (Modbus/TCP) via COM-JL	N/A
PLC direct communication	N/A	Mapman function via COM-JE	N/A
Size	1/16 DIN (48 x 48 x 70mm)	FB100 : 1/16 DIN (48x48x74mm) FB400 : 1/8 vertical DIN (48x96x60mm) FB900 : 1/4 DIN (96x96x60mm)	1/4 DIN (96x96x100mm)
Alarms	*1 2 (Temperature, Loop break)	4 (Temperature, Heater break, Loop break) • FB100 : 3	2 (Temperature)
Analog retransmission outputs	*1 1	1	1
Digital inputs	*1 1	7 • FB100 : 5	1
Waterproof	IP66	IP66/NEMA4X	N/A
Additional optional functions	Rear terminal socket for panel mounting Digital contact input for external switching	Remote setpoint setting (FB400/900 : Standards) Power feed forward (FB400/900 only) Inter-controller Communication (Automatic temperature rise Cascade control, Temperature ratio setting, Group STOP/RUN)	Power feed forward function

Type	Process/Temperature Controller	Temperature Controller	Temperature Controller with Built-in SSR
Model	GZ900/400	REX-C900/700/400/410/100	SB1
Appearance	Page 1-70 	Page 1-86 	Page 1-82 
Features	- Wide range display (5 digits) - Three indicators - Two input control - Easy-to-read with large 11-segment LCD display - Suppressing overshoot (Proactive function) - USB communication (Front loader communication) - Close horizontal mounting	- Autotuning Heat/Cool PID control - Field programmable Reverse/Direct action - Numerous control outputs	- Direct Connection to Load (with Built-in SSR) (Max. 7A) - Can be supplied with pipe wrapping type, pipe hanging type, DIN-rail mounting type, or panel mounting type.
Input	TC, RTD, V DC, mV DC • Universal input	TC, RTD, V DC, mV DC	TC (K, J 0 to 800°C), RTD (Pt100 0 to 400°C)
Sampling time	10msec	500msec	250msec
Measuring accuracy	TC, RTD : $\pm(0.1\%$ of reading + 1 digit) V DC, mA DC : $\pm(0.1\%$ of span + 1 digit)	TC : $\pm(0.5\%$ of reading + 1 digit) or $\pm 3^{\circ}\text{C}$ (6°F) RTD : $\pm(0.5\%$ of reading + 1 digit) or $\pm 0.8^{\circ}\text{C}$ (1.6°F) V DC, mA DC : $\pm(0.5\%$ of span + 1 digit)	$\pm(0.3\%$ of reading + 1 digit)
Control method	Start-up/Autotuning brilliant II PID, PI, PD, On/Off Start-up/Autotuning brilliant II Heat/Cool PID	Autotuning PID Autotuning Heat/Cool PID, PI, PD, On/Off	Autotuning PID
Control output type	Relay, Voltage pulse for SSR, Current, Voltage, Transistor	Relay, Voltage pulse for SSR, Current	Triac (SSR), Max 7A
Communications	RS-422A, RS-485 ANSI or Modbus protocol	N/A	RS-485 ANSI or Modbus protocol
Open Network	N/A	N/A	N/A
PLC direct communication	Mapman function (MITSUBISHI PLC Protocol)	N/A	N/A
Size	GZ400 : 1/8 vertical DIN (48x96x65mm) GZ900 : 1/4 DIN (96x96x65mm)	REX-C100 : 1/16 DIN (48x48x100mm) REX-C400 : 1/8 vertical DIN (48x96x100mm) REX-C410 : 1/8 horizontal DIN (96x48x100mm) REX-C700 : 3/16 DIN (72x72x100mm) REX-C900 : 1/4 DIN (96x96x100mm)	57x103x44mm
Alarms	*1 4 (Temperature, Heater break, Loop break)	2 (Temperature, Heater break, Loop break)	2 (Temperature, Loop break)
Analog retransmission outputs	*1 1	N/A	N/A
Digital inputs	*1 6	N/A	1
Waterproof	IP65	N/A	N/A
Additional optional functions	Remote setpoint setting Multi-Memory Area : 16 areas 2-loop control, Cascade control		Inter-controller Function (SB Link)

Quick Reference Guide

Type	Ramp/Soak Temperature Controller	Ramp/Soak Process/Temperature Controller
Model	PZ400/900	PF900
Appearance	Page 1-90 	Page 1-94 
Features	• Wide range display (5 digits) • 16-pattern x 16-segment (pattern link possible) • Autotuning PID control • Autotuning Heat/Cool PID control • Autotuning Position proportional PID control (Without FBR) • Auto/Manual, Fixed setpoint control • 4 digital outputs • 6 digital inputs • Universal input • Analog retransmission output • USB communication (Loader communication) • 8-level PID	• High accuracy ramp/soak controller • Up to 99 patterns • Up to 1024 segments (Up to 99 segments per pattern. Pattern link possible) • Autotuning PID control • Autotuning Heat/Cool PID control • Position proportional PID control for valve • 4 time-signal or 4 segment signal outputs (maximum 8 points) • 11 digital inputs • Universal input • Segment PID or 8-level PID • Auto/Manual, Fixed setpoint control • Inter-controller Communication • USB communication (Loader communication) • NEMA type 3 : IP55
Input	TC, RTD, V DC, mV DC, mA DC	TC, RTD, V DC, mV DC, mA DC
Sampling time	50msec	100msec (50msec/250msec is selectable)
Measuring accuracy	TC, RTD : $\pm(0.1\%$ of reading + 1 digit) V DC, mA DC : $\pm(0.1\%$ of span + 1 digit)	TC, RTD : $\pm(0.1\%$ of reading + 1 digit) V DC, mA DC : $\pm(0.1\%$ of span + 1 digit)
Control method	Start-up/Autotuning brilliant II PID, PI, PD, On/Off Start-up/Autotuning brilliant II Heat/Cool PID Position proportional PID	Autotuning PID, PI, PD, On/Off Autotuning Heat/Cool PID Autotuning Position proportional PID
Control output type	Relay, Voltage pulse for SSR, Current, Voltage, Transistor	Relay, Voltage pulse for SSR, Current, Voltage
Communications	RS-422A, RS-485 ANSI or Modbus protocol	RS-232C, RS-422A, RS-485 ANSI or Modbus protocol
Open Network	N/A	N/A
PLC direct communication	Mapman function (MITSUBISHI PLC Protocol)	N/A
Size	PZ400 : 1/8 vertical DIN (48x96x65mm) PZ900 : 1/4 DIN (96x96x65mm)	1/4 DIN (96x96x80mm)
Alarms *1	4 (Temperature, Heater break, Loop break)	4 (Temperature, Heater break, Loop break)
Analog retransmission outputs *1	1	1
Digital inputs *1	6	1
Waterproof	IP65	NEMA type 3 : IP55
Additional optional functions		3 point program pattern outputs (Output program function)

*1 Maximum numbers of inputs/outputs vary depending on usage of other functions.

Type	Multi-Loop Temperature Controller
Model	MA900/901
Appearance	Page 1-132 
Features	• 1/4 DIN size multi-loop controller • 4 loops MA900 (Heat/Cool available) • 8 loops MA901 • Autotuning PID control • Up to 3 alarms • Multi-memory areas (8 sets of control parameters) • Digital communications
Input	TC, RTD, V DC
Sampling time	500msec
Measuring accuracy	TC : $\pm(0.3\%$ of reading + 1 digit) or $\pm 2^{\circ}\text{C}$ (4°F) RTD : $\pm(0.3\%$ of reading + 1 digit) or $\pm 0.8^{\circ}\text{C}$ (1.6°F) V DC, mA DC : $\pm(0.3\%$ of span + 1 digit)
Control method	Autotuning brilliant PID, PI, On/Off Autotuning Heat/Cool brilliant PID
Control output type	Relay, Voltage pulse for SSR, Current, Voltage
Communications	RS-232C/RS-422A/RS-485 ANSI or Modbus protocol
Open Network	N/A
PLC direct communication	N/A
Size	1/4 DIN (96x96x100mm)
Alarms *1	3 (1 Standard, Temperature, Heater break, Loop break)
Analog retransmission outputs *1	N/A
Digital inputs	5
Waterproof *1	IP65
Additional optional functions	Three-phase Heater Break Alarm

*1 Maximum numbers of inputs/outputs vary depending on usage of other functions.

Quick Reference Guide

Type	Module type Process/Temperature Controller	Module type High-Speed sampling time Process/Temperature Controller	Modular multi-loop process/temperature controller
Model	SRZ	SRX	SR Mini HG SYSTEM
Appearance	 Page 1-106	 Page 1-118	 Page 1-126
Features	- DIN-rail mounted multi-loop controller - Maximum 4 loops per module - Maximum 64 loops per system - Start-up tuning and Autotuning Brilliant II PID control - Start-up tuning and Autotuning Heat/Cool Brilliant II PID control - Profibus, DeviceNet, CC-Link, Ethernet, MECHATROLINK communication - ANSI or Modbus protocol - USB communication (Loader communication) - DI/DO, CT, COM (Communication Extension) modules	- DIN-rail mounted high accuracy multi-loop controller 25 ms high-speed sampling time for high accuracy - Maximum 2 loops per module - Maximum 62 loops per system - Autotuning Brilliant PID control 16-pattern x 16-segment ramp soak control - ANSI or Modbus protocol - DI, DO modules	- DIN-rail mounted multi-loop controller - Maximum 2 loops per module - Maximum 320 loops per system - Autotuning Brilliant PID control - Autotuning Heat/Cool Brilliant PID control - Standard color-operation panels with preinstalled temperature control screens - ANSI or Modbus protocol - CC-Link communication - PLC direct communication (MAPMAN function) - AI, AO, DI, DO modules - Motor speed and conveyor speed control
Input	TC, RTD, V DC, mA DC	TC, RTD, V DC, mA DC	TC, RTD, V DC, mA DC
Sampling time	250msec	25msec	500ms, 100ms (high accuracy module)
Measuring accuracy	TC, RTD : $\pm(0.2\%$ of reading + 1 digit) V DC, mA DC : $\pm(0.2\%$ of span + 1 digit)	TC, RTD : $\pm(0.1\%$ of reading + 1 digit) V DC, mA DC : $\pm(0.1\%$ of span + 1 digit)	Standard type : $\pm(0.3\%$ of span + 1 digit) High accuracy type : $\pm(0.1\%$ of span + 1 digit)
Control method	Start-up/Autotuning brilliant II PID, PI, PD, On/Off Start-up/Autotuning brilliant II Heat/Cool PID Position proportional PID	Autotuning brilliant PID, PID, PI, On/Off	Autotuning brilliant PID, PI, On/Off, Autotuning Heat/Cool brilliant PID
Control output type	Relay, Voltage pulse for SSR, Current, Voltage, Open collector	Relay, Voltage pulse for SSR, Current, Voltage	Relay, Voltage pulse for SSR, Current, Voltage, Triac, Open Collector
Communications	RS-485 ANSI or Modbus protocol	RS-485 ANSI or Modbus protocol	RS-232C/RS-485 ANSI or Modbus protocol
Open Network	DeviceNet via COM-JH CC-Link via COM-JC, Ethernet (Modbus/TCP) via COM-JL Ethernet (Ethernet/IP) via COM-ML MECHATROLINK via COM-MY	DeviceNet : X-TIO-J, CC-Link : X-TIO-L	N/A
PLC direct communication	Mapman function (Z-COM or Z-TIO-C/D)	Mapman function (X-TIO-R)	H-PCP-J Mapman function
Size	Terminal Type : 30x100x85mm Connector Type : 30x100x76.9mm	X-TIO (2-loop) basic module : 40.5x125x110mm X-TIO (2-loop) extension module : 30x125x110mm	H-PCP-A module : 48x96x100mm H-TIO-B (2-loop) module : 24x48x100mm
Event (Alarms) *1	4 (Temperature, Loop break), Heater break,	2 (Temperature), Heater break, Loop break	2 (Standard: Temperature, Heater break, Loop break), additional alarms possible
Analog retransmission outputs *1	N/A	N/A	2 or 4 per AO module
Digital inputs *1	8 per DI/DO module	12 or 16 per DI module	8 per DI module
Waterproof	N/A	N/A	N/A
Additional optional functions	- Operation Panel : OPC-TS2060 - Compact setting display unit : OP10		Cascade, motor speed and conveyor speed control



FZ110 FZ400 FZ900



General Description

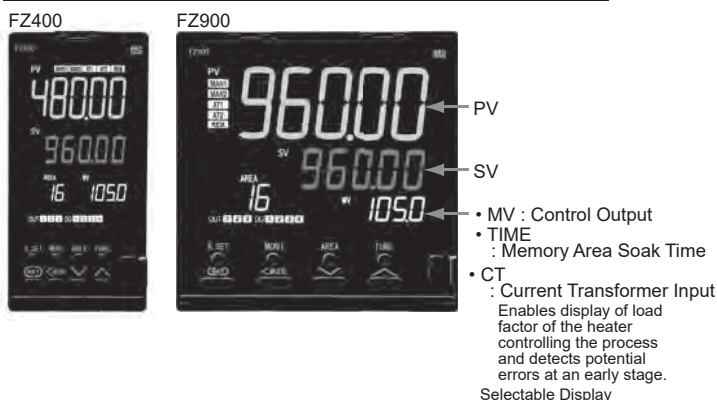
The FZ Series is a high performance process controller with 0.1% of accuracy, advanced control, loader communication, 2 inputs in short depth housing.

Applications include various plastic machines (extruders, injection machine, etc), electric furnaces, semiconductor, food processing, environmental chambers and many others.

Features

- ☆ Three Indicators (FZ400/900)
- ☆ Thin bezel
- ☆ Measuring Accuracy : $\pm 0.1\%$ of reading
- ☆ Sampling Time : 0.05 sec.
- ☆ Selectable Control method (Heat/Cool)
- ☆ Two Input Control (FZ400/900)

Three Indicators (FZ400/900)

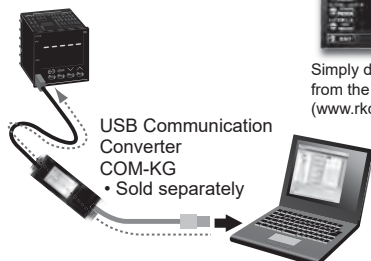


Front Loader Communication Port

All models are supplied with a front loader port as standard. Configuration software can be used without removing the controller from the panel.



Front Loader Communication Port
The power to COM-KG is supplied from the PC via the USB port so no power supply is necessary.



Easy Data Management

Communication Tool
PROTEM 2

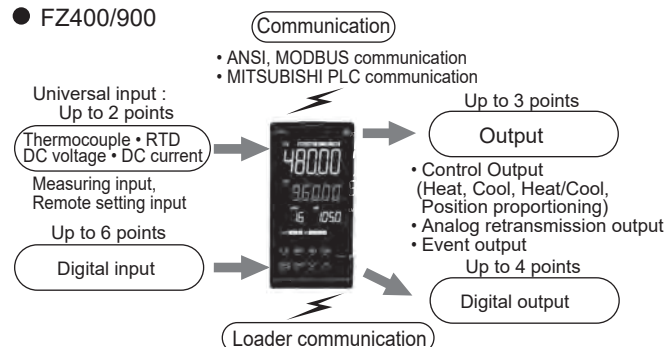
Data monitoring, setting, storage, copy, transfer, logging, and report creation



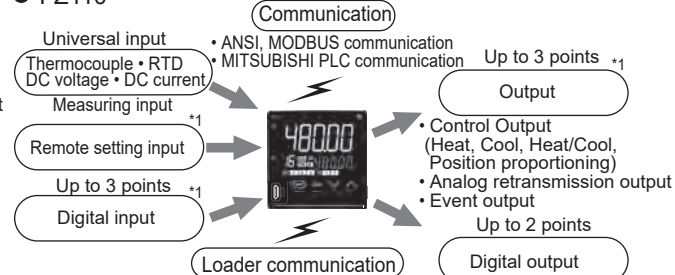
Simply download "PROTEM2" from the RKC Instrument website (www.rkcinst.com).

Numerous inputs and outputs

● FZ400/900



● FZ110

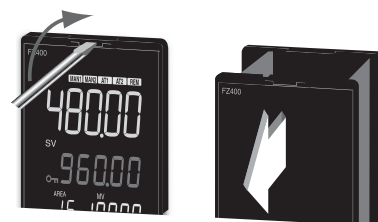


*1 The number of inputs/outputs is limited depending on the specifications.

Easy maintenance

(FZ400/900)

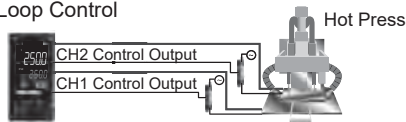
The internal assembly of the FZ400/900 Series can be removed from the front.



Features

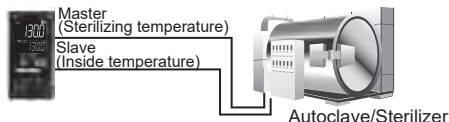
2 Inputs for various applications

2 Loop Control



Cascade Control (Control Loop Combination Function)

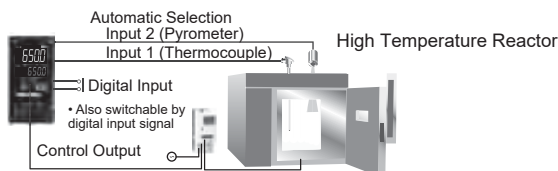
Available with functions related to Cascade control and dedicated Autotuning.



Control with PV select

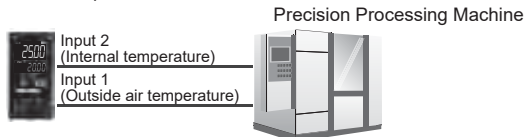
This is a function to switch between Input 1 and Input 2 at a preset temperature.

- This function may be appropriate in such an application where a thermocouple (whose operating temperature range is relatively low) and a radiation pyrometer (which can be used for high temperature applications) are used being switched between them.



Math Control

This is a function to control to maintain constant difference between PV of Input 1 and Input 2.



Display Customization (Parameter Select Function)

Select and display only necessary parameters.

"Set Value • Event 4"



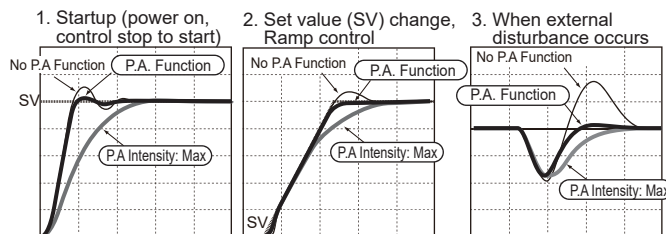
Set value
Event 1
Event 2
Event 3
Event 4
Proportional Band
Integral Time
Derivative Time
Control Response
Proactive intensity
FF Amount

Suppresses fluctuations due to overshoot and external disturbance.

Proactive Function

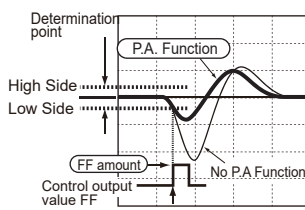
< Suppressing Overshoot >

P.A. : Proactive



Proactive Intensity setting : 0: No function, 1 (Min), 2, 3, 4(Max), Default setting : 2

<Bottom suppression function>

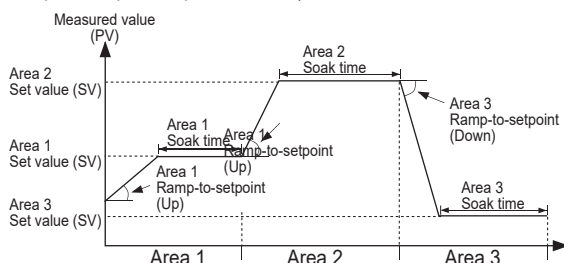


When the input fluctuation by external disturbance is detected, the amount of FF (Feed forward) is added to the output value to suppress the Bottom.

- Adding the FF amount can be triggered by either DI or communication

Ramp/Soak Program Control

Up to 16-segment ramp/soak control is available by using the Memory Area function (area soak time, link area number, ramp-to-setpoint Up and Down).



Programless connection to PLCs

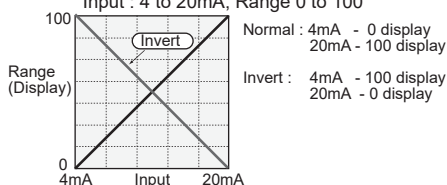
A PLC special protocol (MAPMAN) function becomes a Master Unit to PLC, and automatically stores temperature data into registers in a PLC.

This enables easy handling of temperature control system to the exiting PLC system is available.

Inverting the Input Function (DC Voltage/Current Input)

The proportional relation between the input current (voltage) and the displayed value can be inverted.

Example
Input : 4 to 20mA, Range 0 to 100



Normal : 4mA - 0 display
20mA - 100 display

Invert : 4mA - 100 display
20mA - 0 display

MITSUBISHI
MELSEC series



MAPMAN

Programless
connection

RS-422A/RS-485

(MITSUBISHI PLC Protocol :
QnA compatible, 3C frame (type 4))





Specifications

Input

Number of inputs

FZ400/FZ900 : Max. 2 points • Isolated between each channel
FZ110 : 1 point

Input

- Universal input
 - a) Group 1
 - Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS), W5Re/W26Re, PR40-20 (ASTM), U, L (DIN)
 - Influence of external resistance : Approx. 0.18μV/Ω
 - Input break action : Up-scale / Down-scale (Selectable)
 - RTD : Pt100 (JIS/IEC), JPt100 (JIS)
 - Influence of input lead resistance : Approx. 0.006[%/Ω] of reading
 - Maximum 100Ω per wire
 - Input break action : Up-scale
 - Low voltage : 0 to 10mV DC, 0 to 100mV DC
 - Input break action : Up-scale / Down-scale (Selectable)
 - b) Group 2
 - High voltage : 0 to 1V DC, 0 to 5V DC, 1 to 5V DC, 0 to 10V DC, -5 to +5V DC, -10 to +10V
 - Input break action : Value around 0V
 - c) Group 3
 - Current : 4 to 20mA DC, 0 to 20mA DC
 - Input break action : Value around 0mA

Sampling Time

0.05 sec
• When Input 2 is configured for 2-loop control or cascade control: 0.1 seconds.

Input Digital Filter

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

PV Bias

-span to +span

PV Ratio

0.500 to 1.500

Inverting the Input

If the instrument is a current/voltage input type, the proportional relation between the input current (voltage) and the displayed value can be inverted.

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, U, L
 - Less than -100°C (-148°F) : ±1.0°C [1.8°F] [Approximate value]
 - 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, PLII, W5Re/W26Re
 - Less than 0°C (32°F) : ±2.0°C (3.6°F) [Approximate value]
 - 0 to 1000°C (32 to 1832°F) : ±1.0°C [1.8°F]
 - More than 1000°C (1832°F) : ±0.1% of Reading
 - Type : B
 - Less than 400°C (752°F) : ±70.0°C [±126°F] [Approximate value]
 - 400 to 1000°C (752 to 1832°F) : ±1.4°C [2.5°F]
 - More than 1000°C (1832°F) : ±0.1% of Reading
 - Type : PR40-20
 - Less than 400°C (752°F) : ±20.0°C [±36°F] [Approximate value]
 - 400 to 1000°C (752 to 1832°F) : ±1.0°C [2.5°F]
 - More than 1000°C (1832°F) : ±0.1% of Reading
 - Cold junction temperature compensation error
±0.5°C (0.9°F) [at 23°C ±2°C (73.4°F±3.6°F)]
Within ±1.5°C (±2.7°F)
[Between -10 and +55°C (14 to 131°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
 - Display accuracy: Is equal to the above accuracy with the value below the minimum resolution rounded up.
 - Close horizontal mounting error : ±1.5°C (±2.7°F)

Insulation Resistance

More than 20MΩ (500V DC) between measured terminals and ground
More than 20MΩ (500V DC) between power terminals and ground

Dielectric Strength

1500V AC for one minute between measured 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 without feedback resistance.
- d) Cascade control (With control loop combination function)
 - a), b), c), d) is selectable.

Autotuning Method

- a) For PID control (Direct action/Reverse action)
- 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
- e) For cascade control

Startup tuning

The condition to activate Startup Tuning is selectable among a) to g)
a) At power-on, one-time tuning
b) At SV change, one-time tuning
c) At power-on and SV change, one-time tuning
d) At power-on, always on
e) At SV change, always on
f) At power-on and SV change, always on
g) Function off
(Not available for Heat/Cool PID control type)

Proactive Function

Proactive function suppresses overshoot and provides fast and stable control.

Level PID Function

8 types of PID parameters are selectable according to the position of the Set value (SV) or the Measured value (PV).
a) Number of levels : 8 levels (PID memory group 1 to 8)
b) Stored parameters :
Proportional band (Heat side/Cool side), Integral time (Heat side/Cool side), Derivative time (Heat side/Cool side), Control response, Overlap/Deadband, Manual reset, Proactive intensity, FF amount, LBA time, LBA dead band, Output limiter High/Low (Heat side/Cool side)

Major Setting Range

Set value : Same as input range.
Proportional band : 0(0.0) to input span (Temperature input)
0.0 to 1000.0% of span (Voltage, Current input)
(ON/OFF control when P = 0)
• Differential gap at ON/OFF control
(High/Low individual setting) :
Temperature input : 0(0.0) to span (°C, °F)
Voltage/Current input : 0.0 to 100.0% of span
Integral time : 0 to 3600 sec, 0.0 to 3600.0 sec or
0.00 to 360.00 sec (PD control when I = 0)
(Heat/Cool individual setting) (selectable)
Derivative time : 0 to 3600 sec, 0.0 to 3600.0 sec or
0.00 to 360.00 sec (PI control when I = 0)
(Heat/Cool individual setting) (selectable)
Cool-side proportional band : 1(0.1) to input span (Temperature input)
0.1 to 1000.0% of span (Voltage, Current input)
Deadband/Overlap : -span to +span (Temperature input)
-100.0 to +100.0% of span (Voltage, Current input)
Control response : Slow, Medium, Fast
Ramp-to-setpoint : 0 to span per Time
(Time is selectable between 1 and 3600 sec)
Output limiter : -5.0 to +105.0% (High/Low individual setting)
Cool-side output limiter : -5.0 to +105.0% (High/Low individual setting)
Output change rate limiter : 0.0 to 100.0%/sec. (Up/Down individual setting)
Cool-side output change rate limiter :
0.0 to 100.0%/sec. (Up/Down 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%
Output at control stop mode : -5.0 to 100.5% (Heat/Cool individual setting)

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 motor time
Neutral zone : 0.1 to 10.0%
Differential gap : 0.1 to 5.0%
Valve action at a stop mode : a) CLOSE : OFF, OPEN : OFF
b) CLOSE : ON, OPEN : OFF
c) CLOSE : OFF, OPEN : ON
• a), b), c) is selectable.

Cascade control (Control loop combination function) • FZ400/900 only.

The instrument with dual inputs can perform Cascade control by itself.
a) Master/Slave: Input 1: Master, Input 2: Slave
b) Control mode: Cascade control, Master single, Slave single
• Selectable.

Memory area

- a) Number of memory area : 16 memory areas
- b) Setting item : Set value (SV), Ramp-to-setpoint (Up/Down), Output limiter High/Low [Heat/Cool], Soak time, Linking area number, Event set values 1 to 4, Remote/Local select, Auto/Manual select, MV value, Area trigger select, Proportional band (Heat/Cool), Integral time (Heat/Cool), Derivative time (Heat/Cool), Control response parameter, Manual reset, Overlap/Deadband, Proactive intensity, FF amount, Control loop break alarm (LBA) time, LBA deadband
- c) Method of area select : Key operations/Communication function/External contact signal/Area soak time/Event function.
- d) Memory area link function
Area soak time : 0 hr 00 min to 99 hr 59 min, 0 min 00 sec to 199min 59 sec
0 min 00 sec to 9 hr 59 min 59 sec (FZ400/900 only)
Linking area number : 0 to 16

Process/Temperature Controller FZ110/400/900



Specifications

Output (OUT)

Number of Output

Up to 3 points (OUT1, OUT2, OUT3)

Output Signal

OUT1, 2 : Relay contact output, Voltage pulse output, Current output,
Continuous voltage, Transistor output
OUT3 : Voltage pulse, Current output (Universal output)

Output Items

Control output, HBA output, Event output

Output Type

Relay contact output (1), [OUT1, OUT2 of FZ110]
a) Contact type : 1a contact, 250V AC 3A, 30V DC 1A (Resistive load)
b) Electric life : 100,000 operations or more (Rated load)
c) Mechanical life : 20,000,000 operations or more (Switching: 300 times/min)
Relay contact output (2), [OUT1 of FZ400/900]
a) Contact type : 1c contact, 250V AC 3A, 30V DC 1A (Resistive load)
b) Electric life : 300,000 operations or more (Rated load)
c) Mechanical life : 50,000,000 operations or more (Switching: 180 times/min)
Relay contact output (3), [OUT2 of FZ400/900]
a) Contact type : 1a contact, 250V AC 3A, 30V DC 1A (Resistive load)
b) Electric life : 300,000 operations or more (Rated load)
c) Mechanical life : 50,000,000 operations or more (Switching: 180 times/min)
Voltage pulse output (1), [OUT1, OUT2 of FZ110/400/900]
0/12V DC (Load resistance : More than 500Ω)
Voltage pulse output (2), [OUT3 of FZ110/400/900]
0/14V DC (Load resistance : More than 600Ω)
Current output
4 to 20mA, 0 to 20mA (Load resistance : Less than 500Ω)
Continuous voltage output
0 to 5V DC, 1 to 5V DC, 0 to 10V DC (Load resistance : More than 1kΩ)
Transistor output
a) Load voltage : Less than 30V DC
b) Load current : Less than 100mA

Digital Output (Optional)

Number of Sub Output

FZ110: Up to 2 points (DO1, DO2) • Optional
FZ400/900: Up to 4 points (DO1 to DO4)
• DO1: Standard, DO2 to DO4 : Optional

Output Items

Event output, Heater break alarm (HBA), FAIL

Output Type

Relay contact output
a) Contact type : 1a contact, 250V AC 1A, 30V DC 0.5A (Resistive load)
b) Electric life : 150,000 operations or more (Rated load)
c) Mechanical life : 20,000,000 operations or more
(Switching: 300 times/min)

Event (Alarm)

Number of Event Setting

Up to 4 points (Event 1 to 4)

Alarms

Type : Process high, Process low, Process high/low*1, Deviation high,
Deviation low, Deviation high/low*1, Band*1, Set value high,
Set value low, Set value high/low, MV value high (Heat/Cool),
MV value low (Heat/Cool), FBR input
*1: Two types of alarm settings are field-selectable.
1. Independent high and low settings.
2. Common high/low setting
(Factory setting, unless specified in alarm code when ordering)
• Hold/Re-hold action, Delay timer, Energized/de-energized
action, Interlock (latch) function, Alarm lamp ON condition
available.

Control loop break alarm (LBA)

LBA time : 0 to 7200 sec (LBA is OFF when 0 is set.)
Dead band : 0 to input span

Heater break alarm (HBA)

a) Number of alarm : FZ110: 1 point,
FZ400/900 2 points (1 point per CT input)
b) Setting range : 0.0 to 100.0A
(0.0: HBA function OFF [Current value monitoring is still available])
• CT does not detect current value when the control output ON time
or control output OFF time is less than 250 ms.
c) Delay times : 0 to 255 times
• Heater break alarm is available for time proportioning output only.

Output logic calculation

OR logic calculation from event 1 to 4, HBA1/2, LBA1/2
Input abnormal 1/2 (High/Low)

Digital Input (Optional)

Number of Inputs

FZ110 : Up to 3 points (DI 1 to 3)
FZ400/900 : Up to 6 points (DI 1 to 6)

Input Rating

Non-voltage contact input

Functions

Run/Stop, Auto/Manual (Input 1/Input 2 : Common/Individual*)
Remote/Local (Cascade mode select*, PV select*,
2-loop control*/Differential temperature control*), Interlock release,
Peak/Bottom hold reset (Input 1/Input 2 : Common/Individual*)
Autotuning ON/OFF (Input 1/Input 2 : Common/Individual*)
Unlock/Lock, Direct/Reverse action, Area select, Area jump
* FZ400/900 only

Remote Setpoint Input (Optional)

Input

DC voltage (High) : 0 to 1V DC, 0 to 5V DC, 1 to 5V DC,
0 to 10V DC, -5 to +5V DC, -10 to +10V DC
• Input impedance : More than 1MΩ
DC current : 4 to 20mA DC, 0 to 20mA DC
• Input impedance : 50MΩ
DC voltage (Low) : 0 to 100mV DC, 0 to 10mV DC
(FZ400/900 only) • Input impedance : More than 1MΩ
• Universal input
• FZ110:PV input and remote setpoint input are not isolated.
FZ400/900:PV input and remote setpoint input are isolated.

Sampling time

0.05 sec

Accuracy

0.1% of input span

RS Digital Filter

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

RS Bias

-span to +span

RS Ratio

0.001 to 9.999

Analog Retransmission Output (Optional)

Number of Outputs

1 point

Output types

Measured value (PV), Deviation (DEV), Set value (SV), Measured
value (PV), Set value (SV), Manipulated value (MV),
Deviation (between PV and SV), Current transformer (CT) input
value, Measured value (PV) of differential temperature input
• Selectable

Output Signal

Current output (OUT1, OUT2, OUT3) • OUT3 : FZ400/900 only
4 to 20mA DC, 0 to 20mA DC (Load resistance : Less than 600Ω)
Continuous voltage output (OUT1, OUT2)
0 to 5V DC, 1 to 5V DC, 0 to 10V DC (Load resistance : More than 1kΩ)

Output Scaling

a) Measured value (PV) : Same as measured range
b) Deviation : -Input span to +Input span
c) Set value (SV) : Same as measured range
d) Manipulated value (MV) : -5.0 to +105.0%
e) Current transformer (CT) input value: 0.0 to 100.0 %
f) Measured value (PV) of differential temperature input:
-(Input 1_Input span) to +(Input 1_Input span)

Communications (Optional)

Number of communications : 1 point

Communication method : RS-485, RS-422A
• RS-422A: FZ400/900 only

Communication speed : 2400, 9600, 19200, 38400, 57600 BPS

Protocol : ANSI X3.28(1976) 2.5 A4
MODBUS
PLC communication (MAPMAN)

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 : 31 units



Specifications

Loader communication (Standard)

Protocol : ANSI X3.28 sub-category 2.5 A4
Communication speed : 38400bps
Connection : 1 unit
Method of connection : Exclusive cable (COM-K2)

Feedback resistance (FBR) input (Optional) •FZ400/900 only

Resistance value
Standard : 100 to 10kΩ (factory default 135Ω)

Sampling time
0.5 sec

General Specifications

Waterproof/Dustproof (Optional)

- IP65 (IEC60529)
- Waterproof/Dustproof protection only effective from the front in panel mounted installation.
- When the front loader connector cover is not installed: IP00

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 type
FZ110 : Max. 5.3VA (100V), Rush current : Less than 5.6A
Max. 8.3VA (240V), Rush current : Less than 13.3A
FZ400 : Max. 6.8VA (100V), Rush current : Less than 5.6A
Max. 10.1VA (240V), Rush current : Less than 13.3A
FZ900 : Max. 7.4VA (100V), Rush current : Less than 5.6A
Max. 10.9VA (200V), Rush current : Less than 13.3A
- 24V AC type
FZ110 : Max. 5.3VA (24V), Rush current : Less than 16.3A
FZ400 : Max. 6.9VA (24V), Rush current : Less than 16.3A
FZ900 : Max. 7.4VA (24V), Rush current : Less than 16.3A
- 24V DC type
FZ110 : Max. 129mA (24V), Rush current : Less than 11.5A
FZ400 : Max. 175mA (24V), Rush current : Less than 11.5A
FZ900 : Max. 190mA (24V), Rush current : Less than 11.5A

Power Failure Effect

- 100 to 240V AC, 24V AC type
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)
- 24V DC type
A power failure of 5m sec or less will not affect the control action.
If power failure of more than 5m sec occurs, controller will restart with the state of HOT start 1, HOT start 2 or COLD start (selectable)

Self-Diagnostic Function

Adjustment data check, Back-up check, A/D converter check, etc.

Operating Environments : -10 to 55°C [14 to 131°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. 1,000,000,000,000 times.
(Depending on storage and operating conditions.)

Net Weight

FZ110: Approx. 122g, FZ400 : Approx. 221g, FZ900 : Approx. 291g

External Dimensions (W x H x D)

FZ110 : 48 x 48 x 81mm, FZ400 : 48 x 96 x 65mm, FZ900 : 96 x 96 x 65mm

Compliance with Standards

- UL : UL61010-1
- cUL : CAN/CSA-C22.2 No.61010-1
- CE Mark
LVD: EN61010-1, EMC: EN61326-1, RoHS: EN50581
- RCM : EN55011

Input Range (Universal Input)

a) Group 1

Input	Measured range	Reference
K	-200.0 to +400.0°C, -328.0 to +752.0°F -200.0 to +1372.0°C, -328.0 to +2502.0°F	JIS/IEC
J	-200.0 to +400.0°C, -328.0 to +752.0°F -200.0 to +1200.0°C, -328.0 to +2192.0°F	
T	-200.0 to +400.0°C, -328.0 to +752.0°F	
S	-50.0 to +1768.0°C, -58.0 to +3214.0°F	
R	-50.0 to +1768.0°C, -58.0 to +3214.0°F	
E	-200.0 to +1000.0°C, -328.0 to +1832.0°F	
B	0.0 to 1800.0°C, 0.0 to 3272.0°F	
N	0.0 to 1300.0°C, 0.0 to 2372.0°F	
PLII	0.0 to 1390.0°C, 0.0 to 2534.0°F	NBS
W5Re/W26Re	0 to 2300°C, 0 to 4200°F	ASTM
U	-200.0 to +600.0°C, -328.0 to +1112.0°F	DIN
L	0.0 to 900.0°C, 0.0 to 1652.0°F	
PR40-20	0 to 1800°C, 0 to 3200°F	ASTM
Pt100	-200.0 to +850.0°C, -328.0 to +1562.0°F -100.00 to +850.00°C, -148.00 to +999.99°F 0.00 to 50.00°C, 32.00 to 122.00°F	JIS/IEC • 3-wire system
JPt100	-200.0 to +640.0°C, -328.0 to +1184.0°F -100.00 to +640.00°C, -148.00 to +999.99°F 0.00 to 50.00°C, 32.00 to 122.00°F	JIS • 3-wire system
Low Voltage	0 to 10mV DC, 0 to 100mV DC	

b) Group 2

Input	Measured range
High Voltage	0 to 1V DC, 0 to 5V DC, 1 to 5V DC, 0 to 10V DC -5 to +5V DC, -10 to +10V DC

c) Group 3

Input	Measured range
Current	0 to 20mA DC, 4 to 20mA DC

Process/Temperature Controller FZ110/400/900



Model and Suffix Code

Specifications		Model and Suffix Code										
Model	FZ110 (48 x 48mm 1/16DIN size)	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪
① Control Method	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 proportional PID control with AT (Direct action)	F D G A W Z C										
② Input and range	See Input range Code Table											
③ Output 1 (OUT1)	Not supplied Relay contact output Voltage pulse output (0/12V DC) DC mA, V See Output Code Table Transistor output			N M V □ B								
④ Output 2 (OUT2)	Not supplied Relay contact output Voltage pulse output (0/12V DC) DC mA, V Transistor output			N M V □ B								
⑤ Power supply	24V AC/DC 100 to 240V AC					3 4						
⑥ Digital output	Not supplied Digital output 1 point Digital output 2 points						N 1 2					
⑦ Option 1	Not supplied Digital input 1 point + Remote setting input Digital input 1 point + Output 3 (OUT3) Digital input 1 point + CT input 1 point (CTL-6-P-N) 0 to 30A Digital input 1 point + CT input 1 point (CTL-12-S56-10L-N) 0 to 100A Digital input 1 point + CT input 1 point (CTL-6-P-Z) 0 to 10A Digital input 3 points						N A B C D E F					
⑧ Option 2	Not supplied Communication RS-485							N A				
⑨ PV color	Green (Standard) White							N W				
⑩ Waterproof/ Dustproof	Not supplied Waterproof/Dustproof protection (IP65)									N 1		
⑪ Quick start code	No quick start code (Default setting) Specify quick start code (DO type)										N 1	

< Default setting of Output 1 (OUT1), Output 2 (OUT2), and Digital output >

Quick start code not specified
: Output allocation code "1".

< Default setting of Option function >

• Digital input (DI)

Option 1 : Code "A"
DI1 : Remote/Local
Option 1 : Code "B" "C" "D" "E"
DI1 : RUN/STOP*, "E"
Option 1 : Code "F"
DI1 : RUN/STOP
DI2 : AUTO/MAN
DI3 : Interlock release

• Remote setting input

When quick start code not specified
: 0 to 10V DC, The range will be same as input 1.

• CT input

CT1 assignment: Output 1 (OUT1)
Output 3 (OUT3)

Current output (4 to 20mA),
Analog retransmission output
(Input 1 measured value)

• Communication

When quick start code not specified
: RKC standard communication (ANSI X3.28-1976).
The digit of the communication data depends on the Input range code.

Input range code table (Universal input, Field-programmable)

Thermocouple

Input	Code	Range	Input	Code	Range
K	K : 01	0 to 200°C	T	T : 01	-199.9 to +400.0°C
	K : 02	0 to 400°C		T : 02	-199.9 to +100.0°C
	K : 03	0 to 600°C		T : 03	-100.0 to +200.0°C
	K : 04	0 to 800°C		T : 19	-200.0 to +400.0°C
	K : 06	0 to 1200°C	S	S : 06	-50 to +1768°C
	K : 07	0 to 1372°C		S : 07	-50.0 to +1768.0°C
	K : 08	-199.9 to +300.0°C		R : 01	0 to 1600°C
	K : 09	0.0 to 400.0°C		R : 07	-50 to +1768°C
	K : 10	0.0 to 800.0°C	R	R : 08	-50.0 to +1768.0°C
	K : 14	0 to 300°C		R : 09	0.0 to 1600.0°C
	K : 41	-200 to +1372°C		E : 01	0 to 800°C
	K : 42	-200.0 to +1372.0°C	B	E : 23	0.0 to 800.0°C
	K : A1	0 to 800°F		B : 03	0 to 1800°C
	K : A2	0 to 1600°F	N	B : 04	0.0 to 1800.0°C
J	K : A3	0 to 2502°F		N : 02	0 to 1300°C
	J : 01	0 to 200°C	PLII	N : 05	0.0 to 1300.0°C
	J : 02	0 to 400°C		A : 01	0 to 1300°C
	J : 03	0 to 600°C	W6ReW26Re	A : 05	0.0 to 1300.0°C
	J : 04	0 to 800°C		W : 03	0 to 2300°C
	J : 08	0.0 to 400.0°C	PR40-20	F : 02	0 to 1800°C
	J : 29	-200.0 to +1200.0°C		F : A2	0 to 3200°F
	J : A1	0 to 800°F	U	U : 01	-199.9 to +600.0°C
	J : A3	0 to 2192°F		L : 04	0.0 to 900.0°C
	J : A6	0 to 400°F			

RTD

Input	Code	Range	Input	Code	Range
Pt100	D : 01	-199.9 to +649.0°C	Pt100	D : 27	0.00 to 50.00°C
	D : 04	-100.0 to +100.0°C		D : 34	-100.00 to +100.00°C
	D : 05	-100.0 to +200.0°C		D : 35	-200.0 to +850.0°C
	D : 06	0.0 to 50.0°C		D : 48	-100.00 to +850.00°C
	D : 07	0.0 to 100.0°C		D : A1	-199.9 to +999.9°F
	D : 08	0.0 to 200.0°C	JPt100	D : A9	0.0 to 500.0°F
	D : 09	0.0 to 300.0°C		P : 08	0.0 to 200.0°C
	D : 10	0.0 to 500.0°C		P : 29	-100.00 to +100.00°C
	D : 12	-199.9 to +600.0°C		P : 30	-200.0 to +640.0°C
	D : 21	-200.0 to +200.0°C		P : 36	-100.00 to +640.00°C

DC Current • voltage

Input	Code	Range	Input	Code	Range
0 to 10mV	1 : 01	Scale range and decimal point are programmable	1 to 5V	6 : 01	Scale range and decimal point are programmable
0 to 100mV	2 : 01		0 to 20mA	7 : 01	
0 to 1V	3 : 01		4 to 20mA	8 : 01	
0 to 5V	4 : 01		-10 to 10V	9 : 04	
0 to 10V	5 : 01		-5 to +5V	9 : 05	

• Please see page 1-10 for full Fahrenheit temperature ranges.

Output signal code table

4	0 - 5V DC	5	0 - 10V DC	6	1 - 5V DC	7	0 - 20mA DC	8	4 - 20mA DC
---	-----------	---	------------	---	-----------	---	-------------	---	-------------

Process/Temperature Controller FZ110/400/900



Model and Suffix Code

Digital Controller

Specifications		Model and Suffix Code											
Model		① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫											
① Control Method	FZ400 (48 x 96mm 1/8 DIN Vertical size) FZ900 (96 x 96mm 1/4 DIN size) 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 proportional PID control with AT (Direct action)	F D G A W Z C				*							
② Input and range	See Input range Code Table												
③ Output 1 (OUT1) (*1)	Not supplied Relay contact output Voltage pulse output (0/12V DC) DC mA, V See Output Code Table Transistor output				N M V □ B								
④ Output 2 (OUT2) (*1)	Not supplied Relay contact output Voltage pulse output (0/12V DC) DC mA, V Transistor output				N M V □ B								
⑤ Power supply	24V AC/DC 100 to 240V AC					3 4							
⑥ Digital output (*1)	Digital output 1 point Digital output 4 points					1 4							
⑦ Option 1 (*2)	Not supplied CT input 2 points (CTL-6-P-N) 0 to 30A CT input 2 points (CTL-12-S56-10L-N) 0 to 100A CT input 2 points (CTL-6-Z) 0 to 10A Feedback resistance input (FBR)						N T U V W						
⑧ Option 2 (*2)	Not supplied Output 3 (OUT3) Digital input 1 to 6 (DI1 to 6) Communication RS-422A Communication RS-485 Output 3 (OUT3) + Digital input 1 to 6 (DI1 to 6) Output 3 (OUT3) + Communication RS-422A Output 3 (OUT3) + Communication RS-485 Output 3 (OUT3) + Digital input 1 to 4 (DI1 to 4) + Communication RS-422A Output 3 (OUT3) + Digital input 1 to 6 (DI1 to 6) + Communication RS-485						N A B C D E F G H J						
⑨ Option 3 (*2) (Caution1)	Not supplied Remote setting input Measured input 2							N 1 2					
⑩ PV color	Green (Standard) White								N W				
⑪ Waterproof/ Dustproof	Not supplied Waterproof/Dustproof protection (IP65)									N 1			
⑫ Quick start code	No quick start code (Default setting) Specify quick start code (DO type)											N 1	

Caution 1 : When Heat/Cool PID control or Position proportional PID control is selected, Select code "N" or "1".

*1 : < Default setting of Output 1 (OUT1), Output 2 (OUT2), and Digital output >
Quick start code not specified : Output allocation code "1".

*2 Default setting of Option function >

- CT input
 - CT1 assignment: Output 1 (OUT1)
 - CT2 assignment: PID control (without Measured input 2) : Output 1 (OUT1)
 - PID control (with Measured input 2) : Output 2 (OUT2)
 - Heat/Cool PID control : Output 2 (OUT2)
 - Position proportioning PID control : Output 2 (OUT2)
- Output 3 (OUT3)
 - Current output (4 to 20mA), Analog retransmission output (Input 1 measured value)
- Digital input (DI)
 - Option 2 : Code "B", "E", "J"
 - DI1 to DI3 : Memory area select (8 points, No set signal)
 - DI4 : RUN/STOP *
 - DI5 : AUTO/MAN **
 - DI6 : Interlock release,
 - Option 2 : Code "H"
 - DI1 to DI3 : Memory area select (8 points, No set signal)
 - DI4 : RUN/STOP *

- Communication
 - When quick start code not specified :
RKC standard communication (ANSI X3.28-1976).
 - The digit of the communication data depends on the Input range code
- Remote setting input
 - When quick start code not specified : 0 to 10V DC,
The range will be same as input 1.
- Measured input 2
 - 2-Loop control. Input range and the Control action will be the same as Measured input 1.

Input range code table (Universal input, Field-programmable)

Thermocouple

Input	Code	Range	Input	Code	Range
K	K : 01	0 to 200°C	T	T : 01	-199.9 to +400.0°C
	K : 02	0 to 400°C		T : 02	-199.9 to +100.0°C
	K : 03	0 to 600°C		T : 03	-100.0 to +200.0°C
	K : 04	0 to 800°C		T : 19	-200.0 to +400.0°C
	K : 06	0 to 1200°C	S	S : 06	-50 to +1768°C
	K : 07	0 to 1372°C		S : 07	-50.0 to +1768.0°C
	K : 08	-199.9 to +300.0°C	R	R : 01	0 to 1600°C
	K : 09	0.0 to 400.0°C		R : 07	-50 to +1768°C
	K : 10	0.0 to 800.0°C		R : 08	-50.0 to +1768.0°C
	K : 14	0 to 300°C		R : 09	0.0 to 1600.0°C
	K : 41	-200 to +1372°C	E	E : 01	0 to 800°C
	K : 42	-200.0 to +1372.0°C		E : 23	0.0 to 800.0°C
	K : A1	0 to 800°F	B	B : 03	0 to 1800°C
	K : A2	0 to 1600°F		B : 04	0.0 to 1800.0°C
K : A3	0 to 2502°F	N	N : 02	0 to 1300°C	
			N : 05	0.0 to 1300.0°C	
J	J : 01	0 to 200°C	PLII	A : 01	0 to 1300°C
	J : 02	0 to 400°C		A : 05	0.0 to 1300.0°C
	J : 03	0 to 600°C	W5ReW26Re	W : 03	0 to 2300°C
	J : 04	0 to 800°C		F : 02	0 to 1800°C
	J : 08	0.0 to 400.0°C	PR40-20	F : A2	0 to 3200°F
	J : 29	-200.0 to +1200.0°C		U : 01	-199.9 to +600.0°C
	J : A1	0 to 800°F	L	L : 04	0.0 to 900.0°C
	J : A3	0 to 2192°F			
	J : A6	0 to 400°F			

RTD

Input	Code	Range	Input	Code	Range
Pt100	D : 01	-199.9 to +649.0°C	Pt100	D : 27	0.00 to 50.00°C
	D : 04	-100.0 to +100.0°C		D : 34	-100.00 to +100.00°C
	D : 05	-100.0 to +200.0°C		D : 35	-200.0 to +850.0°C
	D : 06	0.0 to 50.0°C		D : 48	-100.00 to +850.00°C
	D : 07	0.0 to 100.0°C		D : A1	-199.9 to +999.9°F
	D : 08	0.0 to 200.0°C		D : A9	0.0 to 500.0°F
	D : 09	0.0 to 300.0°C	JPt100	P : 08	0.0 to 200.0°C
	D : 10	0.0 to 500.0°C		P : 29	-100.00 to +100.00°C
	D : 12	-199.9 to +600.0°C		P : 30	-200.0 to +640.0°C
	D : 21	-200.0 to +200.0°C		P : 36	-100.00 to +640.00°C

DC Current • voltage

Input	Code	Range	Input	Code	Range
0 to 10mV	1 : 01	Scale range and decimal point are programmable	1 to 5V	6 : 01	Scale range and decimal point are programmable
0 to 100mV	2 : 01		0 to 20mA	7 : 01	
0 to 1V	3 : 01	in the range of -19999 to +99999	4 to 20mA	8 : 01	in the range of -19999 to +99999
0 to 5V	4 : 01	Factory set value	-10 to 10V	9 : 04	Factory set value
0 to 10V	5 : 01	0.0 to 100.0%	-5 to +5V	9 : 05	0.0 to 100.0%

Output signal code table

4 0 - 5V DC	5 0 - 10V DC	6 1 - 5V DC	7 0 - 20mA DC	8 4 - 20mA DC
---------------	----------------	---------------	-----------------	-----------------

Process/Temperature Controller FZ110/400/900

Quick Start Code

- Quick start code 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	Initial Setting Code				
Output logic selection	See Output Allocation Code Table	☐	☐	☐	☐
Remote setpoint input signal	None 0 to 1V DC 0 to 5V DC 0 to 10V DC 1 to 5V DC 0 to 20mA DC 4 to 20mA DC -5 to +5V DC -10 to +10V DC	N 3 4 5 6 7 8 9 A			
Event 1 type	None See Event Code Table	☐	N		
Event 2 type	None See Event Code Table	☐	N		
Event 3 type	None See Event Code Table	☐	N		
Event 4 type	None See Event Code Table	☐	N		
Communication	None ANSI/RKC standard protocol MODBUS protocol PLC communication: MITSUBISHI MELSEC series special protocol				N 1 2 3

Output allocation code table

Code	OUT1	OUT2	DO1	DO2	DO3	DO4
1	Input 1 Control output (Heat side)/(Open side)	HBA1 HBA2	Event 1	Event 2	Event 3	Event 4
2	Input 1 Control output (Heat side)/(Open side)	HBA1 HBA2	Event 1	LBA1 LBA2	Event 3	Event 4
3	Input 1 Control output (Heat side)/(Open side)	FAIL	Event 1	HBA1 HBA2	Event 3	LBA1 LBA2
4	Input 1 Control output (Heat side)/(Open side)	HBA1 HBA2	Event 1	FAIL	Event 3	Event 4
5	Input 1 Control output (Heat side)/(Open side)	Event 1	LBA1 LBA2	HBA1 HBA2	Event 3	Event 4
6	Input 1 Control output (Heat side)/(Open side)	HBA1 HBA2	LBA1 LBA2	FAIL	Event 3	Event 4
7	Input 1 Control output (Heat side)/(Open side)	Event 1	LBA1 LBA2	FAIL	Event 3	Event 4
8	Input 1 Control output (Heat side)/(Open side)	Event 2 Event 4	Event 1 Event 3	HBA1 HBA2	LBA1 LBA2	FAIL
Note	When "Output 1 (OUT1)" is specified "N (None)", Allocation is None.	When "Output 2 (OUT2)" is specified "N (None)", Allocation is None.	[FZ110] When "Digital output" is specified "N (None)", Allocation is None.	[FZ110] When "Digital output" is specified "N (None)" or "1 (1 point)", Allocation is None.	[FZ110] No allocation	[FZ110] No allocation

- If two or more items are allocated to the same output, the resultant output is OR. The output allocation depends on the Control action and the selection of Option 3.

OUT2 allocation

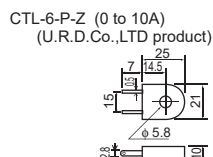
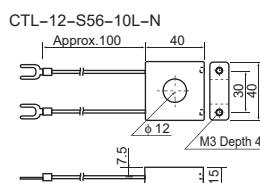
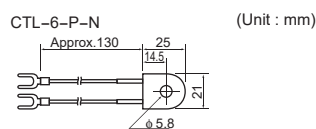
Control Action	Option 3 (FZ400/900)	OUT2 allocation
PID control	None or Remote setting input	Output Allocation Code Table
Heat/Cool PID control or Position proportioning PID control	None or Remote setting input	Input 1 Control output Heat/Cool PID control: Cool-side Position proportioning PID control : Close-side
PID control	Measured input 2	Input 2 Control output (FZ400/900)

- Loop break alarm (LBA) Initial setting code:
The output allocation has LBA output : 480
The output allocation has no LBA output: 0

Accessory

Current transformer for heater break alarm (HBA) (Sold separately)

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



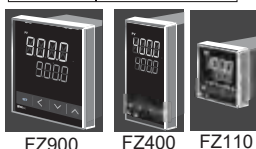
Terminal cover (Sold separately)

Type	Model Code
FZ400/900	KFB400-58
FZ110	KCA100-517



Front cover (Sold separately)

Type	Model Code
FZ900	KRB900-36
FZ400	KRB400-36
FZ110	KFZ100-314



Process/Temperature Controller FZ110/400/900

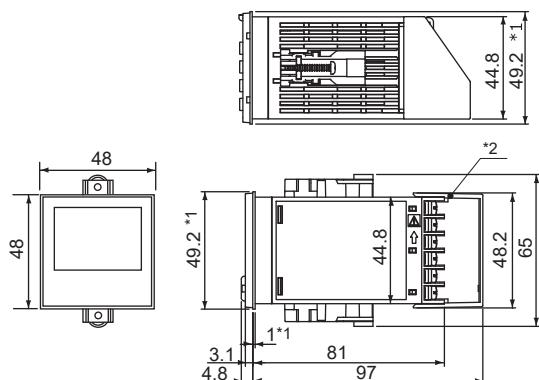


External Dimensions

Unit : mm

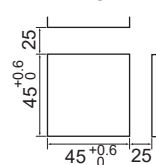
Digital Controller

FZ110



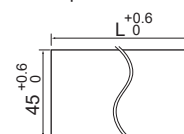
*1: Rubber packing for waterproof/dustproof.
*2: Terminal cover.

Panel Cutout



(Panel thickness must be between 1 to 10mm)

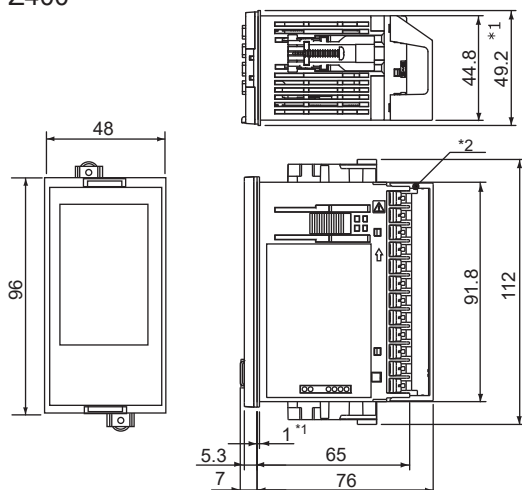
(Close horizontal mounting)
* Up to 6 units



$$L = 48Xn - 3$$

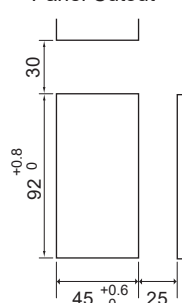
n : Number of controllers
(2 ≤ n ≤ 6)

FZ400



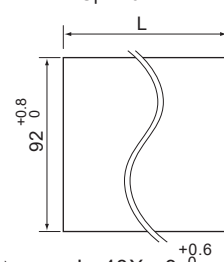
*1: Rubber packing for waterproof/dustproof.
*2: Terminal cover.

Panel Cutout



(Panel thickness must be between 1 to 10mm)

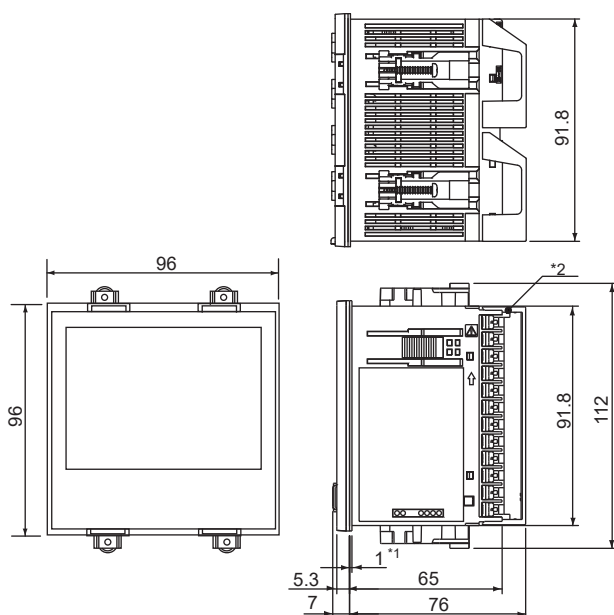
(Close horizontal mounting)
* Up to 6 units



$$L = 48Xn - 3$$

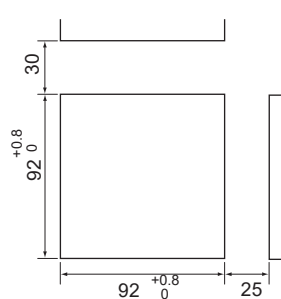
n : Number of controllers
(2 ≤ n ≤ 6)

FZ900



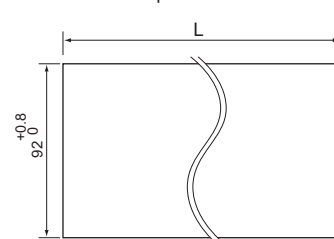
*1: Rubber packing for waterproof/dustproof.
*2: Terminal cover.

Panel Cutout



(Panel thickness must be between 1 to 10mm)

(Close horizontal mounting)
* Up to 6 units



$$L = 96Xn - 4$$

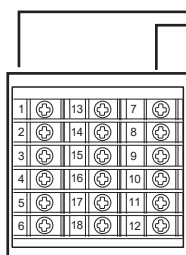
n : Number of controllers
(2 ≤ n ≤ 6)

• Waterproof/dustproof is not available for close horizontal mounting.

Process/Temperature Controller FZ110/400/900

Rear Terminals

FZ110



• Use a solderless terminal for screw size M3, width 5.9mm or less.

No	Description
1	AC L DC +
2	100-240V 24V N
3	Output 2 (OUT2)
4	(1) Relay contact output (2) Voltage pulse/Current/Voltage (3) Transistor
5	Output 1 (OUT1)
6	(1) Relay contact output (2) Voltage pulse/Current/Voltage (3) Transistor

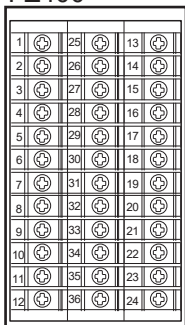
No	Description
7	DO2
8	DO1
9	COM
10	Measured input
11	(A) Thermocouple (B) RTD
12	(C) Voltage/ Current

Optional function terminals

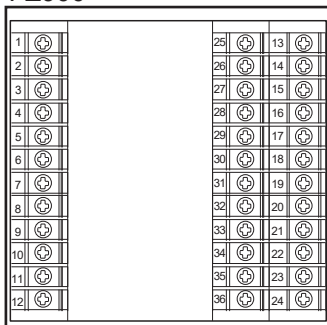
No	Description	No	Description	No	Description	No	Description
13	Remote setpoint input	13	Output 3 (OUT3)	13	CT Input	13	Digital input (DI1 to 3)
14	Voltage/Current	14	Voltage pulse/ Current	14	CT	14	Non voltage contact input
15	Digital input (DI1)	15	Digital input (DI1)	15	Digital input (DI1)	15	Non voltage contact input
16	Non voltage contact input	16	Non voltage contact input	16	Non voltage contact input	16	Communication
17	Communication	17	Communication	17	Communication	17	RS-485
18	RS-485	18	RS-485	18	RS-485	18	RS-485

CT : Current transformer for heater break alarm

FZ400



FZ900



• Use a solderless terminal for screw size M3, width 6mm or less.

No	Description
1	AC L DC +
2	100-240V 24V N
3	Output 2 (OUT2) (*)
4	(1) Relay contact output (2) Voltage pulse/Current/Voltage (3) Transistor
5	Output 1 (OUT1)
6	(1) Relay contact output (2) Voltage pulse/Current/Voltage (3) Transistor
7	Digital output 1 (DO1)
8	Relay contact output
9	Measured input 1
10	(1) Thermocouple (2) RTD (3) Voltage/Current

No	Description
25	Output 3 (OUT3) (*)
26	Voltage pulse/ Current
27	Digital input (DI1 to 6) or (DI1 to 4)
28	Non voltage contact input
29	Communication (*)
30	(1) RS-485 (2) RS-422A
31	Communication (*)
32	(1) RS-485 (2) RS-422A
33	Communication (*)
34	(1) RS-485 (2) RS-422A
35	Communication (*)
36	(1) RS-485 (2) RS-422A

(*) Optional

No	Description
13	Digital output 2 (*) (DO 2)
14	Relay contact output
15	Digital output 3 (*) (DO 3)
16	Relay contact output
17	Digital output 4 (*) (DO 4)
18	Relay contact output
19	(A) CT1,CT2 input
20	(B) Feedback resistance input
21	(C) Feedback resistance input
22	Measured input 2 (Remote setting input)
23	(1) Thermocouple (2) RTD (3) Voltage/Current
24	(1) Thermocouple (2) RTD (3) Voltage/Current

CT : Current transformer for heater break alarm

RZ100 RZ400



General Description

The RZ Series is a high performance budget friendly temperature controller. Save space and save money with RZ series that gives outstanding control capability and comprehensive functions incorporated into a slim body case.

Applications include various plastic machines (extruders, injection machine, etc), electric furnaces, semiconductor, food processing, environmental chambers and many others.

Features

- ☆ Large high intensity LED
- ☆ The depth of 60mm
- ☆ Sampling 0.25 sec
- ☆ Flexible Output Configuration
- ☆ Start-up tuning and Autotuning

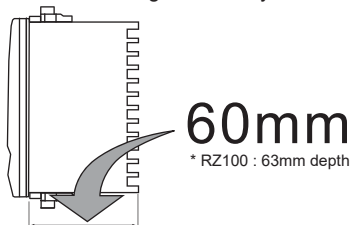
Clear Display

Uses large high intensity LED.
Clear wide view angle provides outstanding visibility



Panel space saving : 60mm depth

The RZ Series has very short depth.
The series was designed with a mounting bracket that allows close horizontal mounting of as many as six units. .



Easy Maintenance

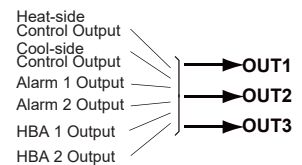
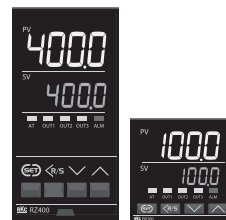
The internal assembly of the RZ Series can be removed from the front.



Flexible Output Configuration

This controller can incorporate up to 2 of relay contact output, Voltage pulse output, or current output as OUT1 and OUT2, and 1 relay output as OUT3.

Each of these outputs can be configured to control output (heat or cool), alarm output (alarm 1 or 2), and HBA output (HBA1 or 2). Output type is freely changeable to meet the requirements of different applications.

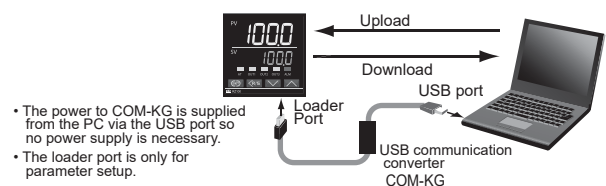


Output 1 (OUT1) : Relay contact, Voltage pulse, DC current
Output 1 (OUT1) Assignment
: Heat-side Control Output, Cool-side Control Output
Alarm 1/Alarm 2 Output, HBA1/HBA2 Output
Output 2 (OUT2) : Relay contact, Voltage pulse, DC current
Output 2 (OUT2) Assignment
: Heat-side Control Output, Cool-side Control Output
Alarm 1/Alarm 2 Output, HBA1/HBA2 Output
Output 3 (OUT3) : Relay contact
Output 3 (OUT3) Assignment
: Cool-side Control Output
Alarm 1/Alarm 2 Output, HBA1/HBA2 Output

Please specify the output type (relay contact, voltage pulse or current) at the time of ordering.

Easy parameter setup via USB loader port

The RZ series has a standard loader port to connect to a PC USB port via COM-KG (USB communication converter). Using PROTEM2 software on the PC, parameter settings can be easily saved on the PC in CSV format, and the same parameter settings are easily copied to other controllers.



- The power to COM-KG is supplied from the PC via the USB port so no power supply is necessary.
- The loader port is only for parameter setup.

USB communication converter
COM-KG

- Model code :
COM-KG-1 (With loader communication cable)
COM-KG-N (Without loader communication cable)
- Sold separately



Specifications

Input

Input

- Universal input
- Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS), W5Re/W26Re (ASTM), U, L (DIN)
 - Influence of external resistance : Approx. 0.2μV/Ω
 - Input break action : Up-scale
- RTD : Pt100 (JIS/IEC), JPt100 (JIS)
 - Influence of input lead resistance : Approx. 0.02[%/Ω] of reading
 - Maximum 10Ω per wire
 - Input break action : Up-scale

Sampling Time

0.25 sec

Input Digital Filter

0 to 100 sec (OFF when 0 is set.)

PV Bias

-1999(-199.9) to +9999(999.9)°C(°F)

Performance

Measuring Accuracy

- Thermocouple
 - Type : K, J, T, E, PLII, U, L *1
 - Less than -100°C (-148°F) : $\pm(2.0^{\circ}\text{C}[\pm 3.6^{\circ}\text{F}] + 1 \text{ digit})$
 - 100 to 500°C (-148 to 932°F) : $\pm(1.0^{\circ}\text{C}[\pm 1.8^{\circ}\text{F}] + 1 \text{ digit})$
 - More than 500°C (932°F) : $\pm(0.2\% \text{ of Reading} + 1 \text{ digit})$
 - Type : N, S, R, PLII, W5Re/W26Re *2
 - Less than 0°C (32°F) : $\pm(4.0^{\circ}\text{C}[\pm 7.2^{\circ}\text{F}] + 1 \text{ digit})$
 - 0 to 1000°C (-148 to 1832°F) : $\pm(2.0^{\circ}\text{C}[\pm 3.6^{\circ}\text{F}] + 1 \text{ digit})$
 - More than 1000°C (1832°F) : $\pm(0.2\% \text{ of Reading} + 1 \text{ digit})$
 - Type : B *2
 - Less than 400°C (752°F) : $\pm(70^{\circ}\text{C}[\pm 126^{\circ}\text{F}] + 1 \text{ digit})$
 - 400 to 1000°C (752 to 1832°F) : $\pm(2^{\circ}\text{C}[\pm 3.6^{\circ}\text{F}] + 1 \text{ digit})$
 - More than 1000°C (1832°F) : $\pm(0.2\% \text{ of Reading} + 1 \text{ digit})$
 - RTD
 - Less than 200°C (392°F) : $\pm(0.4^{\circ}\text{C}[\pm 0.7^{\circ}\text{F}] + 1 \text{ digit})$
 - More than 200°C (392°F) : $\pm(0.2\% \text{ of Reading} + 1 \text{ digit})$
- *1 : Accuracy is not guaranteed for less than -100°C.
 *2 : Accuracy is not guaranteed for less than 400°C (752°F) for Input Type R, S, B and W5Re/W26Re.
- Close horizontal mounting error : $\pm 1.5^{\circ}\text{C} (2.7^{\circ}\text{F})$ [Less than -100°C (-146°F) input : $\pm 3.0^{\circ}\text{C} (5.4^{\circ}\text{F})$]
 - Cold junction temperature compensation error : $\pm 0.5^{\circ}\text{C} (-10 \text{ to } +55^{\circ}\text{C} (14 \text{ to } 131^{\circ}\text{F}))$

Insulation Resistance

- More than 20MΩ (500V DC) between measured terminals and ground
- More than 20MΩ (500V DC) between power terminals and ground

Dielectric Strength

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

Control

Control Method

- PID control
 - P, PI, PD, ON/OFF control selectable
 - Direct action/Reverse action is selectable
- Heat/Cool type PID control

Autotuning Method

- For PID control (Direct action/Reverse action)
- For Heat/Cool PID control (For extruder, air cooling type)
- For Heat/Cool PID control (For extruder, water cooling type)
- For Heat/Cool PID control

Startup tuning

- The condition to activate Startup Tuning is selectable among a) to g)
- At power-on and stop-to-run, one-time tuning
 - At SV change, one-time tuning
 - At power-on, stop-to-run and SV change, one-time tuning
 - At every power-on and stop-to-run
 - At every SV change
 - At every power-on, stop-to-run and SV change
 - Function off

Fine tuning

- Setting range : -3 to +3 (6 levels, OFF when set to 0.)
- 3 to -1 : Faster response
 - 1 to 3 : Slower response
 - OFF : Function OFF

Major Setting Range

- Set value : Same as input range.
- Proportional band :
- 0(0.0) to input span
 - When 0.1°C(°F) resolution, within 999.9°C(°F) (ON/OFF control when P = 0)
 - Differential gap at ON/OFF control (High/Low individual setting) : 0(0.0) to 9999(999.9) (°C,°F)
 - 0 to 3600sec (P + D action when I = 0)
 - 0 to 3600sec (P + I action when D = 0)
- Integral time :
- Derivative time :

Control

- Cool-side proportional band : 1 to 1000% of heat side proportional band
- Anti-Reset Windup(ARW) : 1 to 100% of heat side proportional band (Integral action is OFF when ARW = 0)
- Deadband/Overlap : -10 (-10.0) to 10 (10.0) °C(°F)
 - Minus setting : Overlap
- Output limiter : -5.0 to +105.0% (PID control) (High/Low individual setting) 0.0 to 105.0%Heat/Cool type PID control (Only limiter high) (Heat side/Cool side individual setting)
- Proportional cycle time : 1 to 100 sec

Output

Number of outputs

Up to 3 points (OUT1 to OUT3)

Output function

Control output, Alarm output, HBA (Heater break alarm) output

Output type

- Relay contact output (1) [OUT1,2 of RZ400 : Control output]
- Contact type : 1a contact
 - Contact rated : 250V AC 3A, 30V DC 1A (Resistive load)
 - Electric life : 300,000 operations or more (Rated load)
 - Mechanical life : 50,000,000 operations or more
- Relay contact output (2) [OUT2 and 3 of RZ100 : Control output, OUT3 of RZ400 : Control output]
- Contact type : 1a contact
 - Contact rated : 250V AC 3A, 30V DC 1A (Resistive load)
 - Electric life : 100,000 operations or more (Rated load)
 - Mechanical life : 20,000,000 operations or more
- Relay contact output (3) [RZ100 and RZ400 : Alarm output, HBA output]
- Contact type : 1a contact
 - Contact rated : 250V AC 1A, 30V DC 0.5A (Resistive load)
 - Electric life : 150,000 operations or more (Rated load)
 - Mechanical life : 20,000,000 operations or more
- Voltage pulse output : 0/12V DC (Load resistance : More than 500Ω)
- Current output : 4 to 20mA DC, 0 to 20mA DC (Load resistance : Less than 500Ω)

Alarm

(Optional)

Number of Alarm

Up to 4 points (Event 1 to 4)

Alarm Type

Process high, Process low, Deviation high, Deviation low, Deviation high/low*1, Band, Set value high, Set value low, LBA (Control loop break alarm), RUN status monitor

*1: Two types of alarm settings are field-selectable.

- Independent high and low settings.
- Common high/low setting (Factory setting, unless specified in alarm code when ordering)

Other Functions

- Hold/Re-hold action
 - Hold action is activated at power-on and stop-to-run.
 - Re-hold action is activated at power-on, stop-to-run, and the control set value change.
- Action at over-scale/under-scale
- Energized/de-energized action is configurable.
- Differential gap : 0 (0.0) to span
- Delay timer : 0 to 600 sec
- Interlock (latch) function is configurable.

Loop Break Alarm (LBA)

- LBA timer : 0.1 to 200.0 min
- LBA deadband : 0 to 9999(999.9)°C(°F)

Heater Break Alarm

(Optional)

Number of CT Input

2 points

CT Input Type

CTL-6-P-N (30A), CTL-12-S56-10L-N (100A) * Selectable

Accuracy

$\pm(5\% \text{ of input value} + 1 \text{ digit})$ or 2A (whichever is larger)

Display Range

0.0 to 100.0A

Delay times

0 to 255 times



Specifications

Communications (Optional)

Communication method :	RS-485
Communication speed :	2400, 4800, 9600, 19200, 38400bps
Protocol :	ANSI X3.28(1976) 2.5 A4 MODBUS-RTU
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 :	31 units
Terminating resistor :	External installation is necessary (120Ω 1/2W)

Waterproof/Dustproof (Standard)

- IP66
- Waterproof/Dustproof protection only effective from the front in panel mounted installation.

General Specifications

Supply Voltage

85 to 264V AC (Including supply voltage variation)
[Rating : 100 to 240V AC] (50/60Hz selectable)

Power Consumption

RZ100 : 5.1VA (100V), 7.6VA (240V)
RZ400 : 5.9VA (100V), 8.4VA (240V)

Rush Current

Less than 13.3A (240V), Less than 5.6A (100A)

Power Failure Effect

A power failure of 20m sec or less will not affect the control action.

Operating Environments

-10 to 55°C [14 to 131°F]
5 to 95% RH (Non condensing)
Absolute humidity : MAX. W.C 29.3g/m³ dry air at 101.3kPa.

Memory Backup

Backed up by non-volatile memory

- Data retaining period : Approx. 10 years
- Number of writing : Approx. 1,000,000 times.

(Depending on storage and operating conditions.)

Net Weight

RZ100 : Approx. 115g
RZ400 : Approx. 165g

Compliance with standards

UL : UL61010-1
cUL : CAN/CSA-22.2 NO.61010-1
CE : LVD : EN61010-1
OVERVOLTAGE CATEGORYII, POLLUTION DEGREE 2,
Class II (Reinforced insulation)
EMC: EN61326-1
RCM: EN55011

Temperature Controller RZ100/400



Model and Suffix Code

Specifications		Model and Suffix Code										
		RZ100 (48 X 48mm, 1/16 DIN)	RZ400 (48 X 96mm, 1/8 DIN, Vertical type)	①	②	③	④	⑤	⑥	⑦	⑧	⑨
①	Output 1 (OUT1)	Not supplied Relay contact output Voltage pulse output 0 to 20mA DC 4 to 20mA DC	N M V 7 8									
②	Output 2 (OUT2)	Not supplied Relay contact output Voltage pulse output 0 to 20mA DC 4 to 20mA DC	N M V 7 8									
③	Output 3 (OUT3)	Not supplied Relay contact output		N M								
④	CT input *1, *2	Not supplied For CTL-6-P-N (0 to 30A) 2 point For CTL-12-S56-10L-N (0 to 100A) 2 point			N T U							
⑤	Communication *3	Not supplied RS-485 (ANSI/RKC standard protocol) RS-485 (MODBUS protocol)						N 5 6				
⑥	Waterproof/ Dustproof	Not supplied Waterproof/Dustproof protection (IP66)						N 1				
⑦	Initial Setting (Quick start code)	No Quick Start Code 1 and 2 (Default setting) Specify Quick Start Code 1 Specify Quick Start Code 1 and 2							N 1 2			
Quick Start Code 1	⑧ Control Method	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)								F D G A W		
	⑨ Input and range	See Input range Code Table									□ □ □	

*1 : Default setting (No Quick Start Code 1)

Specification	Output type	OUT1 supplied OUT2 not supplied	OUT1 supplied OUT2 supplied
Control Method		PID control with AT (Reverse action)	Heat/Cool PID control with AT for extruder (Air cooling type)
Input Range		Thermocouple K, 0 to 400°C	

• OUT3 : Deviation high alarm.

*2 : Default setting (No Quick Start Code 2)

• PID control with AT (Code:F/D) type

Output	OUT1	Supplied	Supplied	Supplied	Supplied
	OUT2	Not supplied	Supplied	Not supplied	Supplied
	OUT3	Not supplied	Not supplied	Supplied	Supplied
Output assignment	OUT1	Control output (Reverse action)	Control output (Reverse action)	Control output (Reverse action)	Control output (Reverse action)
	OUT2	Not supplied	Alarm1 output (deviation high)	Not supplied	Alarm1 output (deviation high)
	OUT3	Not supplied	Not supplied	Alarm1 output (deviation high)	Alarm2 output (deviation low)

• Heat/Cool PID control with AT (Code:G/A/W) type

Output	OUT1	Supplied	Supplied
	OUT2	Supplied	Supplied
	OUT3	Not supplied	Supplied
Output assignment	OUT1	Control output (Heat control)	Control output (Heat control)
	OUT2	Control output (Cool control)	Control output (Cool control)
	OUT3	Not supplied	Alarm1 output (deviation high)

Input Range Codes

Input	Range	Code
Thermocouple	K (JIS/IEC)	0 to 200°C K 01
		0 to 400°C K 02
		0 to 600°C K 03
		0 to 800°C K 04
		0 to 1000°C K 05
		0 to 1200°C K 06
		0 to 1372°C K 07
		0.0 to 400.0°C K 09
		0.0 to 800.0°C K 10
		0 to 100°C K 13
		0 to 300°C K 14
		0 to 450°C K 17
		0 to 500°C K 20
		-200 to +1372°C K 41
		-199.9 to +400.0°C K 43
		0 to 800°F K A1
		0 to 1600°F K A2
		0 to 2502°F K A3
		-100.0 to +752.0°F K C8
	J (JIS/IEC)	0 to 200°C J 01
		0 to 400°C J 02
		0 to 600°C J 03
		0 to 800°C J 04
		0 to 1000°C J 05
		0 to 1200°C J 06
		-199.9 to +300.0°C J 07
		0 to 450°C J 10
		0 to 800°F J A1
		0 to 1600°F J A2
		0 to 2192°F J A3
		0 to 300°F J A6
		0 to 800°F J A7
		-328 to +2192°F J B9
		-199.9 to +550.0°F J C8
	T (JIS/IEC)	-199.9 to +400.0°C T 01
		-199.9 to +100.0°C T 02
		-100.0 to +200.0°C T 03
		0.0 to 350.0°C T 04
		-199.9 to +300.0°C T 05
		0.0 to 400.0°C T 06
	R (JIS/IEC)	0 to 1600°C R 01
		0 to 1769°C R 02
		0 to 1350°C R 04
		0 to 3200°F R A1
	S (JIS/IEC)	0 to 1600°C S 01
		0 to 1769°C S 02
	B (JIS/IEC)	400 to 1800°C B 01
		0 to 1820°C B 02
RTD	Pt100 (JIS/IEC)	-199.9 to +649.0°C D 01
		-199.9 to +200.0°C D 02
		-100.0 to +50.0°C D 03
		-100.0 to +100.0°C D 04
		-100.0 to +200.0°C D 05
		0.0 to 50.0°C D 06
		0.0 to 100.0°C D 07
		0.0 to 200.0°C D 08
		0.0 to 300.0°C D 09
		0.0 to 500.0°C D 10
	JPT100 (JIS)	-199.9 to +999.9°F D A1
		-199.9 to +200.0°F D A3
		-199.9 to +100.0°F D A4
		-199.9 to +300.0°F D A5
		0.0 to 100.0°F D A6
		0.0 to 400.0°F D A8
		0.0 to 500.0°F D A9
		-199.9 to +900.0°F D B2
		-199.9 to +649.0°C P 01
		-199.9 to +200.0°C P 02
		-199.9 to +100.0°C P 04
		-100.0 to +200.0°C P 05
		0.0 to 50.0°C P 06
		0.0 to 100.0°C P 07
		0.0 to 200.0°C P 08
		0.0 to 300.0°C P 09
		0.0 to 500.0°C P 10

Quick Start Code 2

- Quick start code 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		(1)	(2)	(3)	(4)	(5)	(6)	(7)
		☐	☐	☐	☐	☐	☐	☐
(1) Alarm1 Type	None	N	N					
	Deviation High	A	A					
	Deviation Low	B	B					
	Deviation High/Low (Common high/low setting)	C	C					
	Band (Common high/low setting)	D	D					
	Deviation High with Hold	E	E					
	Deviation Low with Hold	F	F					
	Deviation High/Low with Hold (Common high/low setting)	G	G					
	Process High	H	H					
	Process Low	J	J					
(2) Alarm2 Type	Process High with Hold	K	K					
	Process Low with Hold	L	L					
	Deviation High with Alarm Re-hold	Q	Q					
	Deviation Low with Alarm Re-hold	R	R					
	Deviation High/Low with Re-Hold (Common high/low setting)	T	T					
	Band (Individual high and low settings)	U	U					
	Set value High	V	V					
	Set value Low	W	W					
	Deviation High/Low (Individual high and low settings)	X	X					
	Deviation High/Low with Alarm Hold (Individual high and low settings)	Y	Y					
(3) Control Output Assignment	Deviation High/Low with Alarm Re-Hold (Individual high and low settings)	Z	Z					
	Loop break alarm	Can not be specified	2					
	RUN status	4	4					
	a) PID control type : Output 1 (OUT1)			1				
	b) Heat/Cool PID control : Heat-side output : Output 1 (OUT1)							
	Cool-side output : Output 2 (OUT2)							
	a) PID control type : Output 2 (OUT2)			2				
	b) Heat/Cool PID control : Heat-side output : Output 2 (OUT2)							
	Cool-side output : Output 1 (OUT1)							
	Heat/Cool PID control : Heat-side output : Output 1 (OUT1)							
(4) Alarm1 Output Assignment	(Can be specified only for Heat/Cool PID control)							
	Heat/Cool PID control : Heat-side output : Output 2 (OUT2)							
	Cool-side output : Output 3 (OUT3)							
	(Can be specified only for Heat/Cool PID control)							
	Heat/Cool PID control : Heat-side output : Output 2 (OUT2)							
	Cool-side output : Output 3 (OUT3)							
	(Can be specified only for Heat/Cool PID control)							
	No assignment				N			
	Output 1 (OUT1)				1			
	Output 2 (OUT2)				2			
(5) Alarm2 Output Assignment	Output 3 (OUT3)				3			
	No assignment					N		
	Output 1 (OUT1)					1		
	Output 2 (OUT2)					2		
	Output 3 (OUT3)					3		
	No assignment						N	
	Output 1 (OUT1)						1	
	Output 2 (OUT2)						2	
	Output 3 (OUT3)						3	
	No assignment							N
(6) HBA1 Output Assignment	Output 1 (OUT1)							1
	Output 2 (OUT2)							2
	Output 3 (OUT3)							3
	No assignment							
	Output 1 (OUT1)							
	Output 2 (OUT2)							
	Output 3 (OUT3)							
	No assignment							
	Output 1 (OUT1)							
	Output 2 (OUT2)							
(7) HBA2 Output Assignment	Output 3 (OUT3)							
	No assignment							
	Output 1 (OUT1)							
	Output 2 (OUT2)							
	Output 3 (OUT3)							
	No assignment							
	Output 1 (OUT1)							
	Output 2 (OUT2)							
	Output 3 (OUT3)							
	No assignment							

*1 : Cannot be specified if the output terminal is already specified for control output.

*2 : Cannot be specified if the output terminal is already specified for control output.

Example of Model Code and Quick start code

Specifications	
Input/Range : Thermocouple K 0 to 400°C	Alarm 1 : Deviation High (Output 3(OUT3))
Control Method : Heat/Cool PID control (Water Cooling)	Alarm 2 : Deviation Low with Alarm Hold (Output 3(OUT3))
Heat-side Output : Output 1 (OUT1)	• OUT3 : OR logic output of Alarm 1 and Alarm 2
Cool-side Output : Output 2 (OUT2)	

Factory Setting Codes

Model and Suffix Codes /N2 -WK02	
Control Method	Heat/Cool PID Control (Water Cooling) Code : W
Input/Range	Thermocouple K 0 to 400°C Code : K02

Quick Start Codes

Alarm1	Deviation High	(1) Code : A	
Alarm2	Deviation Low with Alarm Hold	(2) Code : F	
OUT1	Heat-side Control Output	(3) Code : 1	
OUT2	Cool-side Control Output	(4) Code : 3	
OUT3	Alarm 1 and Alarm 2	(5) Code : 3	
HBA	None	(6) Code : N	
		(7) Code : N	

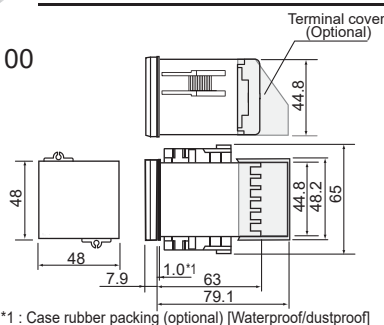
AF-1-33-NN

Temperature Controller RZ100/400

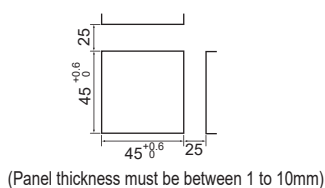
External Dimensions and Rear Terminals

Unit : mm

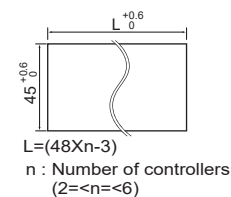
RZ100



Panel Cutout

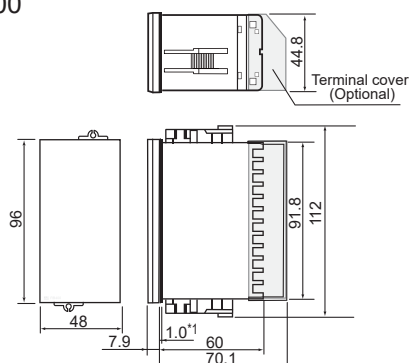


(Close horizontal mounting)
* Up to 6 units

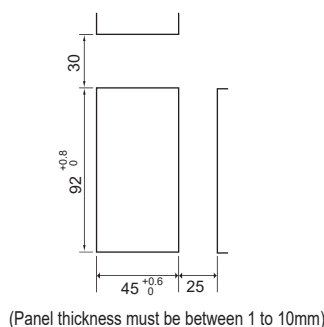


• Waterproof/dustproof is not available for close horizontal mounting.

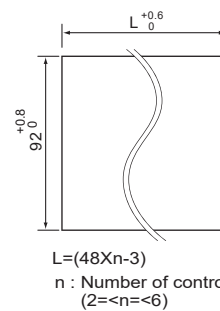
RZ400



Panel Cutout

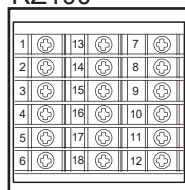


(Close horizontal mounting)
* Up to 6 units



• Waterproof/dustproof is not available for close horizontal mounting.

RZ100

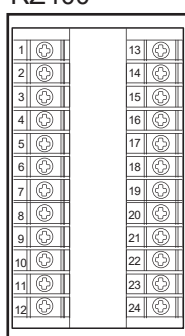


No	Contents
1	L 100 to 240V
2	N
3	Output 2 (OUT2) (1) Relay contact output (2) Voltage pulse / Current
4	NO (1) (2)
5	Output 1 (OUT1) (1) Relay contact output (2) Voltage pulse / Current
6	NO (1) (2)

No	Contents
13	SG
14	T/R(A)
15	T/R(B)
16	CT2
17	CT1
18	CT1,CT2 input

No	Contents
7	
8	Output 3 (OUT3) Relay contact output
9	NO (1) (2)
10	A
11	B
12	B (2)

RZ400



No	Contents
1	L 100 to 240V
2	N
3	Output 2 (OUT2) (1) Relay contact output (2) Voltage pulse / Current
4	NO (1) (2)
5	Output 1 (OUT1) (1) Relay contact output (2) Voltage pulse / Current
6	NO (1) (2)
7	
8	Output 3 (OUT3) Relay contact output
9	NO (1) (2)
10	A
11	B
12	B (2)

No	Contents
13	SG
14	T/R(A)
15	T/R(B)
16	
17	
18	
19	
20	
21	
22	CT2
23	CT1
24	CT1,CT2 input

Accessory

Terminal Cover

RZ400

RZ100



Model Code :
KFB400-58



Model Code :
KCA100-517

Front Cover

RZ400

RZ100



Model Code :
KRB400-36

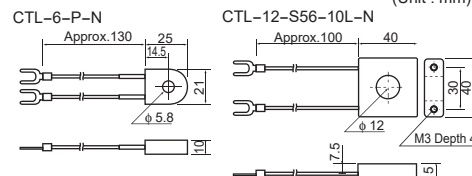


Model Code :
KRB100-36A
*1: Soft cover (Silicone rubber)
type is available.
Only for RZ100.
Model Code : KRB100-315(1)

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)



RB100
RB400
RB500
RB700
RB900



Digital Controller

General Description

The RB Series is a high performance budget friendly temperature controller. Save space and save money with RB series that gives outstanding control capability and comprehensive functions incorporated into a slim body case.

Applications include various plastic machines (extruders, injection machine, etc), electric furnaces, semiconductor, food processing, environmental chambers and many others.

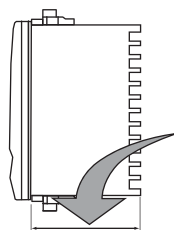
Features

- ☆ Easy-to-read with large 11-segment LCD display
- ☆ The depth of 60mm
- ☆ Sampling 0.25 sec
- ☆ Brilliant II PID control
- ☆ Start-up tuning and Autotuning

Panel space saving : 60mm depth

The RB Series has very short depth.

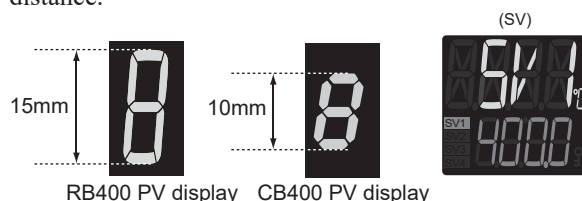
The series was designed with a mounting bracket that allows close horizontal mounting of as many as six units. .



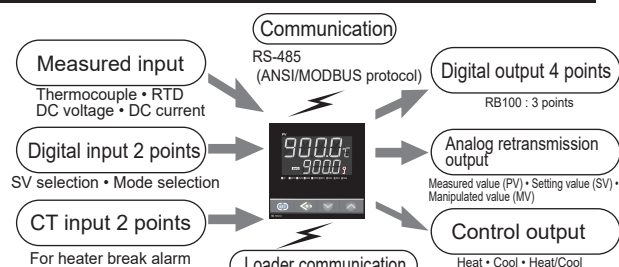
60mm
* RB100 : 63mm depth

Easy-to-read with large 11-segment LCD display

So bright and so large it is easy to read from a greater distance.



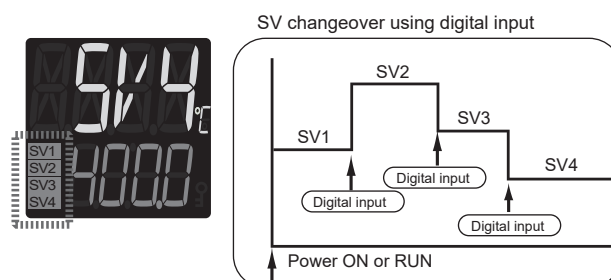
Numerous inputs and outputs



- The number of digital outputs is limited depending on the model and specifications.
- Analog Output is not available for some control types and models
- On the RB100, either communication or digital input can be selected.

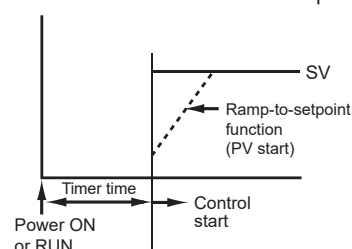
Store up to 4 Set Values

Set value changeover is also possible by digital input.

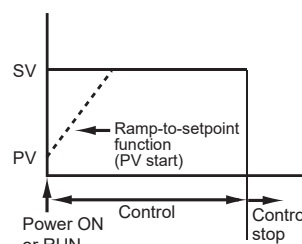


Timer Function

Control starts after the timer time elapses.



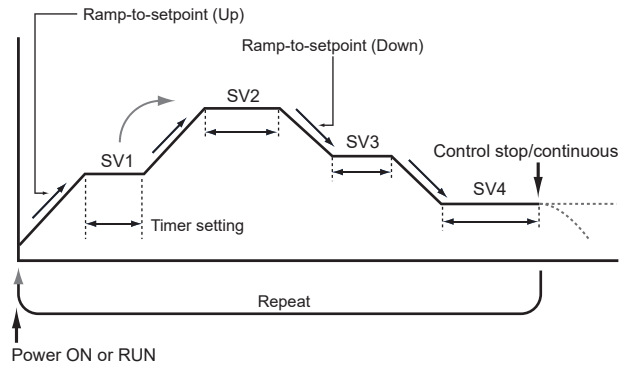
Control is performed during the timer time and stops after the timer time elapses.



Features

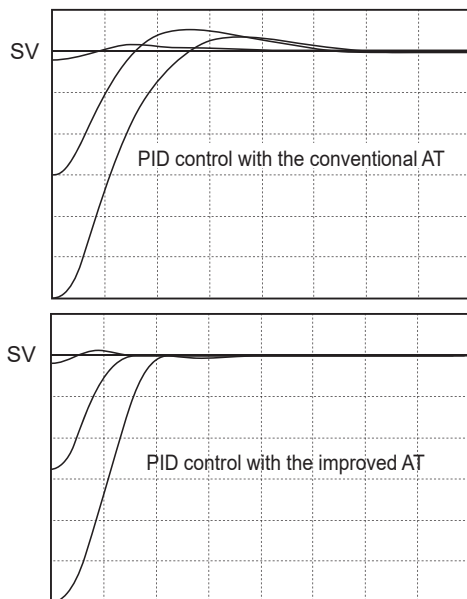
Simple program control

Simple program control using a timer function / setting change proportion limiter



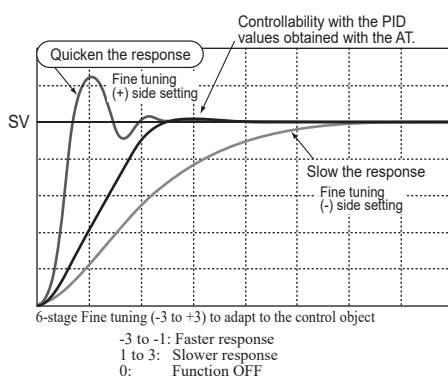
Calculates optimum PID values to stabilize control faster than ever

The improved autotuning algorithm calculates optimum PID values that shortens the time to reach stable control at the set value as well as eliminating overshoot/undershoot. The new PID algorithm also suppress overshoot/undershoot against external disturbance.



Easy Fine tuning with 6-level of control response adjustment

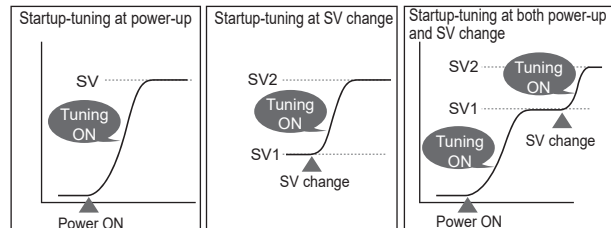
After the PID values have been autotuned, the Fine tuning (FT) function allows the operator to adjust the control response speed with a 6-level adjustment parameter (-3 to +3) without changing PID value.



Startup tuning

Startup tuning eliminates time required for conventional autotuning as it calculates optimum PID values by temperature characteristics at start up. It is useful in applications which require a long time for conventional autotuning.

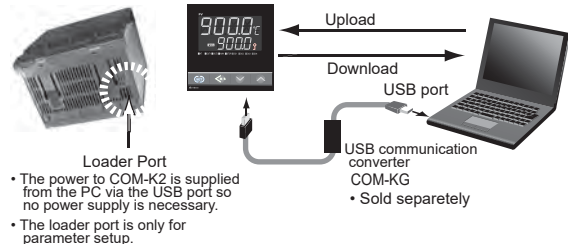
The timing of activation of start-up tuning can be selected from at power-up, at setpoint change, and at power-up/setpoint change. It is also settable to Only-once or always-ON.



- Startup tuning function can be set ON/OFF.
- Heater power needs to be turned on simultaneously with or before turning on power to the temperature controller.
- If startup tuning does not calculate suitable PID values due to characteristics of application, use Autotuning function.

Easy parameter setup via USB loader port

The RB series has a standard loader port to connect to a PC USB port via COM-KG (USB communication converter). Using Win-UCI software on the PC, parameter settings can be easily saved on the PC in CSV format, and the same parameter settings are easily copied to other controllers.



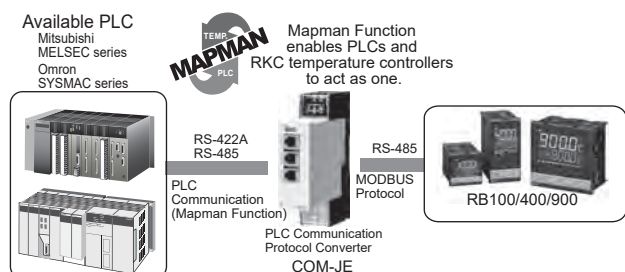
- The power to COM-K2 is supplied from the PC via the USB port so no power supply is necessary.
- The loader port is only for parameter setup.

PLC Communication Protocol Converter : COM-JE

A communication protocol converter becomes a Master Unit to PLC, and automatically stores temperature data into registers in a PLC. This enables easy handling of temperature control system to the existing PLC system is available.

Available PLC

Mitsubishi
MELSEC series
Omron
SYSMAC series





Specifications

Input

Input

- Temperature input group
 - Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS), W5Re/W26Re (ASTM)
 - Influence of external resistance : Approx. 0.25μV/Ω
 - Input break action : Up-scale / Down-scale (Selectable)
 - RTD : Pt100 (JIS/IEC), JPt100 (JIS)
 - Influence of input lead resistance : Approx. 0.02[%/Ω] of reading
 - Maximum 10Ω per wire
 - Input break action : Up-scale
- Voltage • current input group
 - Voltage : 0 to 1V DC, 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
 - Input break action : Uncertain (indicates a value around 0V)
 - Current : 4 to 20mA DC, 0 to 20mA DC
 - Inputs is selectable within each group.

Sampling Time

0.25 sec

Input Digital Filter

0 to 100 sec (OFF when 0 is set.)

PV Bias

Temperature input : -1999(-199.9) to +9999(999.9)°C(°F)
Voltage/Current input : -span to +span

Performance

Measuring Accuracy

- Thermocouple
 - Type : K, J, T, E, N,
 - Less than -100°C (-148°F) : ±(2.0°C[±3.6°F] + 1 digit)
 - 100 to 500°C (-148 to 932°F) : ±(1.0°C[±1.8°F] + 1 digit)
 - More than 500°C (932°F) : ±(0.2% of Reading + 1 digit)
 - Type : N, S, R, PLII, W5Re/W26Re
 - Less than 0°C (32°F) : ±(4.0°C[±7.2°F] + 1 digit)
 - 0 to 1000°C (-148 to 1832°F) : ±(2.0°C[±3.6°F] + 1 digit)
 - More than 1000°C (1832°F) : ±(0.2% of Reading + 1 digit)
 - Type : B
 - Less than 400°C (752°F) : ±(7.0°C[±12.6°F] + 1 digit)
 - 400 to 1000°C (752 to 1832°F) : ±(2°C[±3.6°F] + 1 digit)
 - More than 1000°C (1832°F) : ±(0.2% of Reading + 1 digit)
- RTD
 - Less than 200°C (392°F) : ±(0.4°C[±0.7°F] + 1 digit)
 - More than 200°C (392°F) : ±(0.2% of Reading + 1 digit)
- DC voltage and DC current
 - ±(0.2% of span + 1 digit)
 - Close horizontal mounting error :
 - ±2°C (3.6°F) [Less than -100°C (-146°F) input : ±3.5°C (6.3°F)]

Insulation Resistance

More than 20MΩ (500V DC) between measured terminals and ground
More than 20MΩ (500V DC) between power terminals and ground

Dielectric Strength

1000V AC for one minute between measured terminals and ground
1500V AC for one minute between power terminals and ground

Setting

SV limiter

Scaling low to scaling high (High/Low individual setting)

Ramp-to-setpoint

1(0.1) to span per Time
(Time : 1 minute/1 hour (Selectable) Up/Down individual setting)

SV step function

Number of SV : 4 points (Default : 1 point)
SV selecting method : Front key, Communication,
Digital input (External contact input)

Timer function

Timer setting : 0 min 01 sec to 99 min 59 sec or
0 hr 01 min to 99 hr 59 min (selectable)

Function

- Control starts after the timer time elapses.
- Control is performed during the timer time and stops after the timer time elapses.
- Link function from SV1 to SV4
(After the timer time elapses, control is continued using SV4.)
- Link function from SV1 to SV4
(After the timer time elapses, control is stopped.)

Repeat : 0 to 9999 (Continuous when 9999 is set.)

Setting data lock

Lock level : 1 to 10 level (0 : No lock)

Control

Control Method

- PID control
 - P, PI, PD, ON/OFF control selectable
 - Direct action/Reverse action is selectable
- Heat/Cool type PID control

Autotuning Method

- For PID control (Direct action/Reverse action)
- For Heat/Cool PID control (For extruder, air cooling type)
- For Heat/Cool PID control (For extruder, water cooling type)
- For Heat/Cool PID control

Startup tuning

- The condition to activate Startup Tuning is selectable among a) to g)
- At power-on and stop-to-run, one-time tuning
 - At SV change, one-time tuning
 - At power-on, stop-to-run and SV change, one-time tuning
 - At every power-on and stop-to-run
 - At every SV change
 - At every power-on, stop-to-run and SV change
 - Function off

Fine tuning

Setting range : -3 to +3 (6 levels, OFF when set to 0.)
-3 to -1 : Faster response
1 to 3 : Slower response
OFF : Function OFF

Major Setting Range

- Set value : Same as input range.
Proportional band : 0(0.0) to input span (Temperature input)
• When 0.1°C (°F) resolution, within 999.9°C (°F)
0.0 to 1000.0% of span (Voltage, Current input)
(ON/OFF control when P = 0)
• Differential gap at ON/OFF control
(High/Low individual setting) :
Temperature input : 0(0.0) to 100 (100.0) (°C, °F)
Voltage/Current input : 0.0 to 10.0% of span
0 to 3600sec (P + D action when I = 0)
Integral time : 0 to 3600sec (P + I action when D = 0)
Derivative time : 0 to 3600sec (P + I action when D = 0)
Cool-side proportional band : 1 to 100% of heat side proportional band
Anti-Reset Windup(ARW) : 1 to 100% of heat side proportional band
(Integral action is OFF when ARW = 0)
Deadband/Overlap : -10 (-10.0) to 10 (10.0) °C (°F) (Temperature input)
-10.0 to +10.0% of span (Voltage, Current input)
• Minus setting : Overlap
Derivative time action select : 0 : PV derivative, 1 : Deviation derivative
Output limiter : -5.0 to +105.0% (PID control)
(High/Low individual setting)
0.0 to 105.0%Heat/Cool type PID control
(Only limiter high)
(Heat side/Cool side individual setting)
Proportional cycle time : 0.1sec, 0.25sec, 0.5sec, 1 to 100 sec
Manual output : Output limiter low to Output limiter high
• Auto/Manual transfer action selection
With bumpless/Without bumpless

Control output

- Relay output : Form A contact, 250V AC 3A (resistive load)
• Electric life : 100,000 cycles or more
Voltage pulse output : 0/12V DC
(Load resistance : more than 600Ω <less than 20mA>)
• When OUT2 is no use, load resistance is more than 300Ω <less than 40mA>.
See page 1-11 "Maximum number of digital outputs (DO) by combinations of output (OUT1 and OUT2)
Current output : 4 to 20mA DC, 0 to 20mA DC
(Load resistance : less than 500Ω)
SSR (Triac) output : Rated current : 0.5A
(Ambient temperature : Less than 40°C)
Voltage output : 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
(Load resistance : More than 1kΩ)
(Output impedance : Less than 0.1Ω)
Open collector output : Sink type
Load current : Less than 100mA
Load voltage : Less than 30V DC
Minimum load current : 0.5mA
ON voltage : Less than 2V
(at maximum load current)
Power OFF leakage current : Less than 0.1mA



Specifications

Event (Alarm) Output (Optional)

Number of Event

Up to 4 points (Event 1 to 4)
(RB100 : Up to 3 points, Heat/Cool type : Up to 2 points)

Event

Type : Deviation High, Low, High/Low*, Band,
Process High, Low
Set value High, Low
Control Loop Break Alarm (LBA)
Heater break alarm (HBA),
Output of the communication monitoring result,
RUN status monitor
*1: Two types of alarm settings are field-selectable.
1. Independent high and low settings.
2. Common high/low setting
(Factory setting, unless specified in alarm code
when ordering)

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, FBR valued : -5.0 to +105.0%
Control loop break alarm (LBA)
: LBA time : 0 to 7200 sec. (OFF by setting zero)
LBA deadband : 0 to input span

Other Functions

- Hold/Re-hold action
 - Hold action is activated at power-on and stop-to-run.
 - Re-hold action is activated at power-on, stop-to-run, and the control set value change.
- Alarm output ON/OFF at stop mode is selectable.
- Energized/de-energized action is configurable.
- Differential gap : 0 (0.0) to span
- Delay timer : 0 to 600 sec
- Interlock (latch) function is configurable.

Heater Break Alarm

Number of CT Input : 2 points
CT Input type : CTL-6-P-N (30A), CTL-12-S56-10L-N (100A)
• Selectable
Accuracy : $\pm(5\%$ of input value + 1 digit) or 2A (whichever is larger)
Display range : 0.0 to 100.0A
Delay times : 0 to 255 times
• Heater break alarm is not available for current / Voltage continuous output.

Output

Relay contact output, Form a contact, 250V AC 1A (Resistive load)

Analog Retransmission Output (Optional)

Number of Outputs

1 point

Output types

Measured value (PV), Set value (SV), Manipulated output value (MV)

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)

Output Resolution

Approx. more than 1/2000

Digital Input (Optional)

Number of Sub Output

2 points (DI1, DI2)

Input method

Non-voltage contact output

Function

SV selection, STOP/RUN, Auto/Manual, Alarm interlock reset,
• Selectable

Communications (Optional)

Communication method : RS-485

Communication speed : 2400, 4800, 9600, 19200, BPS

Protocol : ANSI X3.28(1976) 2.5 A4
MODBUS-RTU

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 : 31 units

Terminating resistor : External installation is necessary (120 Ω 1/2W)

Buffer mode : Correspond
(Mode in which writing to EEPROM is not
performed for setting changes)

Waterproof/Dustproof (Standard)

NEMA4X, IP66

- Waterproof/Dustproof protection only effective from the front in panel mounted installation.

General Specifications

Supply Voltage

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

Power Consumption

100 to 240V AC type : RB100 : 8.5VA (240V), RB400 : 8.7VA (240V)
RB500 : 8.7VA (240V), RB700 : 8.7VA (240V)
RB900 : 9.0VA (240V)
24V AC type : RB100 : 4.7VA, RB400 : 5.8VA
RB500 : 5.8VA, RB700 : 5.8VA
RB900 : 6.0VA
24V DC type : RB100 : 108mA, RB400 : 141mA
RB500 : 141mA, RB700 : 141mA
RB900 : 147mA

Rush Current

100 to 240V AC type : Less than 13.3A (240V), Less than 5.6A (100A)
24V AC type : Less than 16.3A
24V DC type : Less than 11.5A

Power Failure Effect

- A power failure of 20m sec or less will not affect the control action.
- RB100, 24V AC/DC type : 10msec or less

Operating Environments : 0 to 50°C [32 to 122°F]
10 to 90% RH (Non condensing)
Absolute humidity : MAX. W.C 29.3g/m³ dry
air at 101.3kPa.

Memory Backup

- Backed up by non-volatile memory
- Data retaining period : Approx. 10 years
- Number of writing : Approx. 1,000,000 times.
(Depending on storage and operating conditions.)

Net Weight

RB100 : Approx. 120g, RB400 : Approx. 185g, RB400 : Approx. 190g
RB700 : Approx. 200g, RB900 : Approx. 250g

External Dimensions (W x H x D)

RB100 : 48 x 48 x 60mm
RB400 : 48 x 96 x 60mm
RB500 : 96 x 48 x 60mm
RB700 : 72 x 72 x 60mm
RB900 : 96 x 96 x 63mm

e-con type Controller

RB410/RB910



(easy and economy
connector)



Model and Suffix Code

[illegible]

*2 On the RB100, the event 3 output function can be specified for output 2.

*3 The number of DO points is limited in some combinations of OUT1 and OUT2 (control output) types.

*3 Heater break alarm is not available for current or voltage continuous output.

Input range code table

Temperature Input Group (Field-programmable)

Thermocouple

Input	Code	Range
K (JIS/IEC)	1 K_01	0 to 200°C
	K_02	0 to 400°C
	K_03	0 to 600°C
	K_04	0 to 800°C
	K_05	0 to 1000°C
	K_06	0 to 1200°C
	K_41	-200 to +1372°C
	K_09	0.0 to 400.0°C
	K_10	0.0 to 800.0°C
	K_43	-199.9 to +400.0°C
	K_A1	0 to 800°F
	K_A2	0 to 1600°F
	K_C7	-328 to +2501°F
	K_C8	-100.0 to +752.0°F
J (JIS/IEC)	1 J_01	0 to 200°C
	J_02	0 to 400°C
	J_03	0 to 600°C
	J_04	0 to 800°C
	J_05	0 to 1000°C
	J_06	0 to 1200°C
	J_15	-200 to +1200°C
	J_07	-199.9 to +300.0°C
	J_A1	0 to 800°F
	J_A2	0 to 1600°F
R (JIS/IEC)	2 R_02	0 to 1769°F
	R_A2	0 to 3216°F
S (JIS/IEC)	2 S_02	0 to 1769°C
	S_A2	0 to 3216°F
	2 B_01	400 to 1800°C
	B_02	0 to 1820°C
	B_A1	800 to 3200°F
	B_A2	0 to 3308°F
	1 E_01	0 to 800°C
	E_02	0 to 1000°C
	E_A1	0 to 1600°F
	E_A2	0 to 1832°F
	N_01	0 to 1200°C
	N_02	0 to 1300°C
	N_A1	0 to 2300°F
	N_A2	0 to 2372°F
T (JIS/IEC)	1 T_02	-199.9 to +100.0°C
	T_03	-100.0 to +200.0°C
	T_05	-199.9 to +300.0°C
	T_06	0.0 to 400.0°C
	T_C7	0.0 to 600.0°F
	T_C8	-199.9 to +300.0°F
	T_C9	-328 to +752°F
	2 W_01	0 to 2000°C
	W_02	0 to 2320°C
	W_A4	0 to 4208°F
PLII (NBS)	A_01	0 to 1300°C
	A_02	0 to 1390°C
	A_A1	0 to 2400°F
	A_A2	0 to 2534°F

*1 : Accuracy is not guaranteed for less than -100°C (-146°F)

*2 : Accuracy is not guaranteed for less than 400°C (752°F) for Input Type R, S, B, and W5Re/W26Re.

RTD

Input	Code	Range
Pt100 (JIS/IEC)	D '01	-199.9 to +649.0°C
	D '02	-200.0 to +200.0°C
	D '03	-100.0 to +50.0°C
	D '04	-100.0 to +100.0°C
	D '05	-100.0 to +200.0°C
	D '06	0.0 to 50.0°C
	D '07	0.0 to 100.0°C
	D '08	0.0 to 200.0°C
	D '09	0.0 to 300.0°C
	D '10	0.0 to 500.0°C
	D 'A2	-199.9 to +400.0°F
	D 'A3	-199.9 to +200.0°F
	D 'A4	-199.9 to +100.0°F
	D 'A5	-199.9 to +300.0°F
	D 'A6	0.0 to 100.0°F
	D 'A7	0.0 to 200.0°F
D 'A8	0.0 to 400.0°F	
D 'A9	0.0 to 500.0°F	
D 'B2	-199.9 to +900.0°F	
JPt100 (JIS)	P '01	-199.9 to +649.0°C
	P '02	-199.9 to +200.0°C
	P '03	-100.0 to +50.0°C
	P '04	-100.0 to +100.0°C
	P '05	-100.0 to +200.0°C
	P '06	0.0 to 50.0°C
	P '07	0.0 to 100.0°C
	P '08	0.0 to 200.0°C
	P '09	0.0 to 300.0°C
	P '10	0.0 to 500.0°C

DC Current • Voltage Group

(Field-programmable)

Input	Code	Range
0 to 1V DC	3 01	-1999 to +9999 (Programmable)
0 to 5V DC	4 01	
0 to 10V DC	5 01	
1 to 5V DC	6 01	
0 to 20mA DC	7 01	Factory set value : 0.0 to 100.0
4 to 20mA DC	8 01	

- For current input, connect is a 250Ω shunt resistor to the input terminals.
Model code : KD100-55

Output signal code table

Output 1 Code Table

Output Type	Code
Relay contact output	M
Voltage pulse output	V
0 to 5V DC	4
0 to 10V DC	5
1 to 5V DC	6
0 to 20mA DC	7
4 to 20mA DC	8
Triac output	T
Open collector output	D

Output 2 Code Table

Output Type	Code
Relay contact output (Cool side output)	M
Voltage pulse output (Cool side output)	V
0 to 5V DC (Cool side output)	4
0 to 10V DC (Cool side output)	5
1 to 5V DC (Cool side output)	6
0 to 20mA DC (Cool side output)	7
4 to 20mA DC (Cool side output)	8
Triac output (Cool side output)	T
Open collector output (Cool side output)	D

Output Type

Relay contact output	(Event 3 [DO3] output)	P	Only RB100
0 to 20mA DC (Analog retransmission output [AO])		R	Only PID control
4 to 20mA DC (Analog retransmission output [AO])		S	Only PID control
0 to 5V DC (Analog retransmission output [AO])		X	Only PID control
0 to 10V DC (Analog retransmission output [AO])		Y	Only PID control
1 to 5V DC (Analog retransmission output [AO])		Z	Only PID control

Maximum number of digital outputs (DO) by combinations of output (OUT1 and OUT2)

Process/Temperature Controller RB100/400/500/700/900

● Maximum number of digital outputs (DO) by combinations of output (OUT1 and OUT2)

		OUT2 (including transmission output)					
OUT1	M, T, D	No OUT2 output	M, T, D	V (10 mA)	V (20 mA)	Current output	Voltage output
	V (Load: 10 mA)	4	4	4	4	2	2
OUT1	V (Load: 20 mA)	4	4	4	2	2	2
	Current output	4	4	2	2	2	2
	Voltage output	4	4	2	2	2	2

(): Represents selection of digital outputs
-DO3 and DO4 are not available.)

*1 When the instrument has two digital outputs (DO1 and DO2) and no OUT2 output, "V" type output (load: 40mA) can be specified for OUT1.

Quick Start Code

- 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.

● Event Code Table (Programmable)

Specifications	Quick start code					
Digital output 1 (DO1) (Event 1 type)	None See event code table	N				
Digital output 2 (DO2) (Event 2 type)	None See event code table		N			
Digital output 3 (DO3) (Event 3 type) *1	None See event code table			N		
Digital output 4 (DO4) (Event 4 type) *2	None See event code table				N	
Digital input (DI)	None					N
	SV1 to SV4 select					1
	SV1/SV2 select + STOP/RUN					2
	SV1 to SV2 select + MANUAL/AUTO					3
	SV1 to SV2 select + Alarm interlock reset					4
	STOP/RUN + MANUAL/AUTO					5
	STOP/RUN + Alarm interlock reset					6
	MANUAL/AUTO + Alarm interlock reset					7

*1: On the RB100, this can be specified when event 3 (Code : "P") is selected in output 2.

*2: On the RB100, this is fixed at "none".

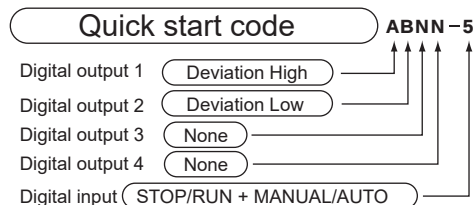
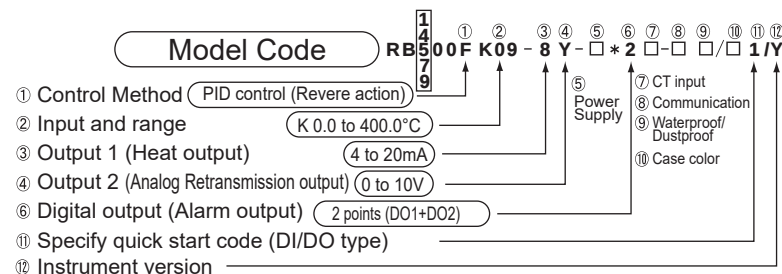
Code	Event Type
A	Deviation High
B	Deviation Low
C	Deviation High/Low (Common high/low setting)
D	Band (Common high/low setting)
E	Deviation High with Hold
F	Deviation Low with Hold
G	Deviation High/Low with Hold (Common high/low setting)
H	Process High
J	Process Low
K	Process High with Hold
L	Process Low with Hold
Q	Deviation High with Alarm Re-hold
R	Deviation Low with Alarm Re-hold
T	Deviation High/Low with Re-Hold (Common high/low setting)
U	Band (Individual high and low settings)
V	Set value High
W	Set value Low
X	Deviation High/Low (Individual high and low settings)
Y	Deviation High/Low with Alarm Hold (Individual high and low settings)
Z	Deviation High/Low with Alarm Re-Hold (Individual high and low settings)
1 *1	Heater break alarm (HBA)
2 *2	Loop break alarm
3	FAIL
4	RUN status
5	Output of the communication monitoring result

*1 Heater break alarm is not available for current / Voltage continuous output.

*2 Loop break alarm is not available for Heat/Cool PID control type.

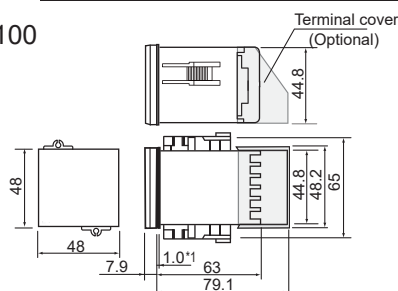
Example of Model Code and Quick start code

Specifications
Input : Thermocouple K 0.0 to 400.0°C
Control : PID control for Heating, (Output : 4 to 20mA DC)
Digital output (Alarm) : 2 point (Deviation High, Deviation Low)
Analog retransmission output : 0 to 10V DC
Digital input : 2 point (STOP/RUN, MANUAL/AUTO)



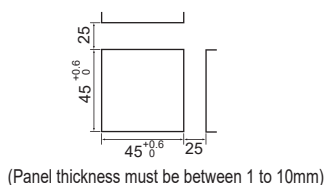
External Dimensions

RB100



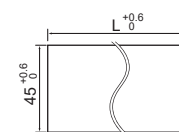
*1 : Case rubber packing (optional) [Waterproof/dustproof]

Panel Cutout



Unit : mm

(Close horizontal mounting)
* Up to 6 units

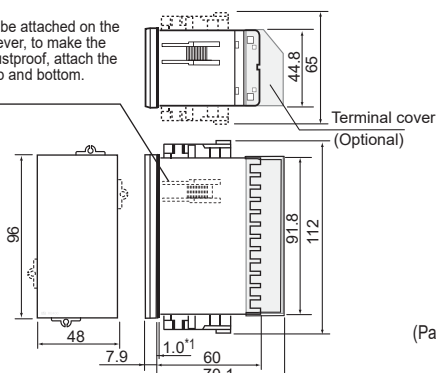


$L = (48 \times n - 3)$
n : Number of controllers
($2 \leq n \leq 6$)

• Waterproof/dustproof is not available for close horizontal mounting.

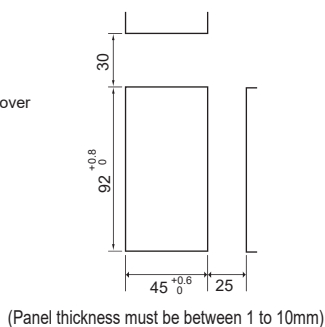
RB400

The mounting brackets can be attached on the sides of the controller. However, to make the controller waterproof and dustproof, attach the mounting brackets to the top and bottom. (2 places).

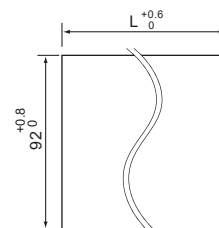


*1 : Case rubber packing (optional) [Waterproof/dustproof]

Panel Cutout



(Close horizontal mounting)
* Up to 6 units

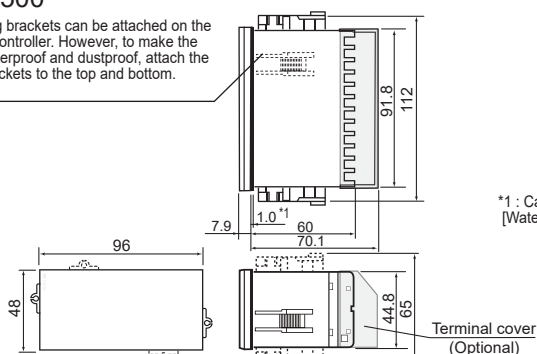


$L = (48 \times n - 3)$
n : Number of controllers
($2 \leq n \leq 6$)

• Waterproof/dustproof is not available for close horizontal mounting.

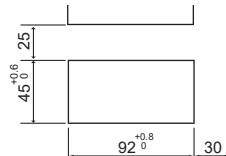
RB500

The mounting brackets can be attached on the sides of the controller. However, to make the controller waterproof and dustproof, attach the mounting brackets to the top and bottom. (2 places).

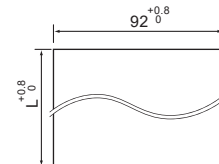


*1 : Case rubber packing (optional)
[Waterproof/dustproof]

Panel Cutout



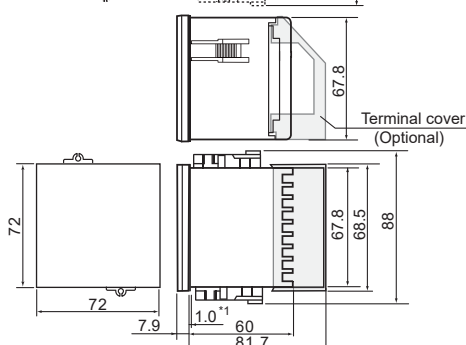
(Close vertical mounting)
* Up to 6 units



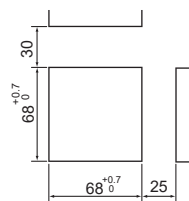
$L = 48 \times n - 3$
n : Number of controllers
($2 \leq n \leq 6$)

• Waterproof/dustproof is not available for close horizontal mounting.

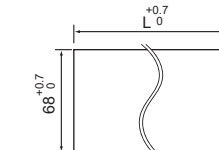
RB700



Panel Cutout



(Close horizontal mounting)
* Up to 6 units

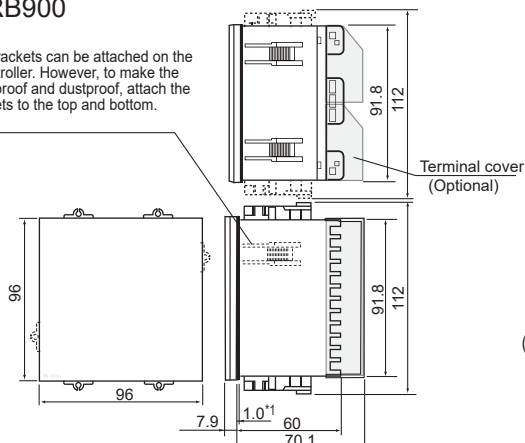


$L = 72 \times n - 4$
n : Number of controllers
($2 \leq n \leq 6$)

• Waterproof/dustproof is not available for close horizontal mounting.

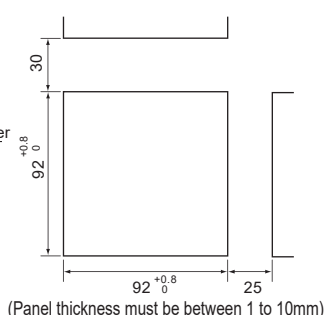
RB900

The mounting brackets can be attached on the sides of the controller. However, to make the controller waterproof and dustproof, attach the mounting brackets to the top and bottom. (4 places).

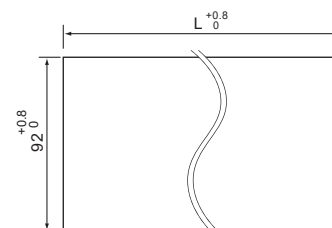


*1 : Case rubber packing (optional) [Waterproof/dustproof]

Panel Cutout



(Close horizontal mounting)
* Up to 6 units



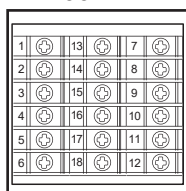
$L = (96 \times n - 4)$
n : Number of controllers
($2 \leq n \leq 6$)

• Waterproof/dustproof is not available for close horizontal mounting.

Process/Temperature Controller RB100/400/500/700/900

Rear Terminals

RB100



RB100

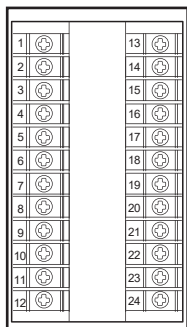
No	Contents
1	100 to 240V 24V AC 24V DC
2	Power supply
3	Control output 1, 2 (OUT1,2) or Analog retransmission output, Digital output (AO)
4	(1) Relay contact output (2) Voltage pulse / Current/Voltage (3) SSR (Triac) (4) Open collector
5	Control output 1, 2 (OUT1,2) or Analog retransmission output, Digital output (AO)
6	(1) Relay contact output (2) Voltage pulse / Current/Voltage (3) SSR (Triac) (4) Open collector

No	Contents
13	SG
14	T/R(A)
15	T/R(B)
16	CT2
17	CT1
18	CT1,CT2 input

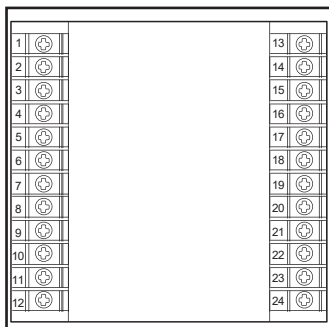
(*) Optional

No	Contents
7	DO2
8	DO1
9	COM
10	Measuring input
11	(1) Thermocouple (2) RTD (3) Voltage/Current
12	Measuring input

RB400



RB900



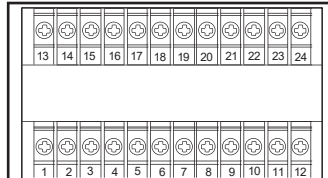
RB400/RB500/RB900

No	Contents
1	100 to 240V 24V AC 24V DC
2	Power supply
3	Control output 1, 2 (OUT1,2) or Analog retransmission output (AO)
4	(1) Relay contact output (2) Voltage pulse / Current/Voltage (3) SSR (Triac) (4) Open collector
5	Control output 1, 2 (OUT1,2) or Analog retransmission output (AO)
6	(1) Relay contact output (2) Voltage pulse / Current/Voltage (3) SSR (Triac) (4) Open collector
7	DO2
8	DO1
9	COM
10	Measuring input
11	(1) Thermocouple (2) RTD (3) Voltage/Current
12	Measuring input

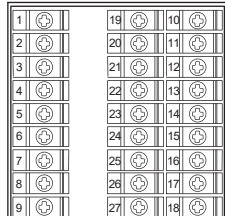
(*) Optional

No	Contents
13	SG
14	T/R(A)
15	T/R(B)
16	DO2
17	DO1
18	COM
19	DO4
20	DO3
21	COM
22	Measuring input
23	CT2
24	CT1

RB500



RB700



RB700

No	Contents
1	100 to 240V 24V AC 24V DC
2	Power supply
3	Control output 1, 2 (OUT1,2) or Analog retransmission output (AO)
4	(1) Relay contact output (2) Voltage pulse / Current/Voltage (3) SSR (Triac) (4) Open collector
5	Control output 1, 2 (OUT1,2) or Analog retransmission output (AO)
6	(1) Relay contact output (2) Voltage pulse / Current/Voltage (3) SSR (Triac) (4) Open collector
7	DO4
8	DO3
9	COM
10	Measuring input
11	(1) Thermocouple (2) RTD (3) Voltage/Current
12	Measuring input

No	Contents
19	SG
20	T/R(A)
21	T/R(B)
22	DO2
23	DO1
24	COM
25	DO4
26	DO3
27	COM
28	Measuring input
29	CT2
30	CT1

No	Contents
10	DO2
11	DO1
12	COM
13	DO4
14	DO3
15	COM
16	Measuring input
17	(1) Thermocouple (2) RTD (3) Voltage/Current
18	Measuring input

• Use a solderless terminal for screw size M3, width 5.8mm or less.

Accessory

Terminal Cover

RB900

RB400/500

RB700

RB100



Model Code : KFB400-58
(RB900 uses 2 unit)

Model Code : KCA700-53
Model Code : KCA100-517

Front Cover

RB900

RB400/500

RB100



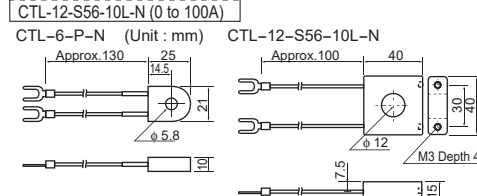
Model Code : KRB900-36

Model Code : KRB400-36

Model Code : KRB100-36A

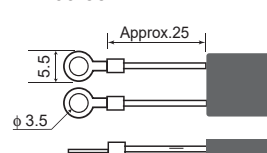
Current transformer for heater break alarm (HBA)

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



250Ω shunt resistor for current input

Model code
KD100-55



CB100 CB700 CB400 CB900 CB500



General Description

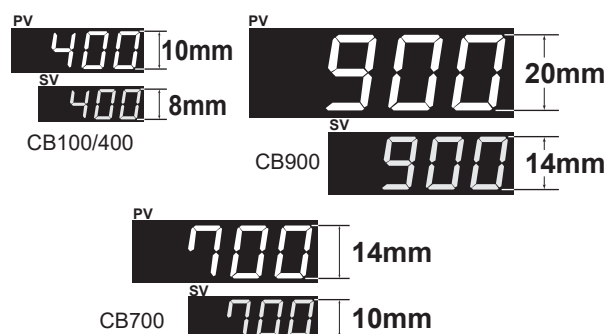
The CB Series combines easy-to-use operation with the latest temperature control advances at a competitive price. With powerful new features such as RKC's new self-tuning for precise automatic control, digital communications for networking, IP66(IP65) for waterproof/dustproof protection and heater and loop break alarm capabilities to detect system failures, these controllers deliver exceptional process performance for the most demanding industrial applications.

Features

- ☆ Bright, easy-to-read LED Displays
- ☆ Advanced self-tuning
- ☆ Digital communications
- ☆ Heat/Cool action
- ☆ Heater/Loop break alarms
- ☆ IP66 (65) - Waterproof/dustproof protection

Bright, Easy-To-Read LED Displays

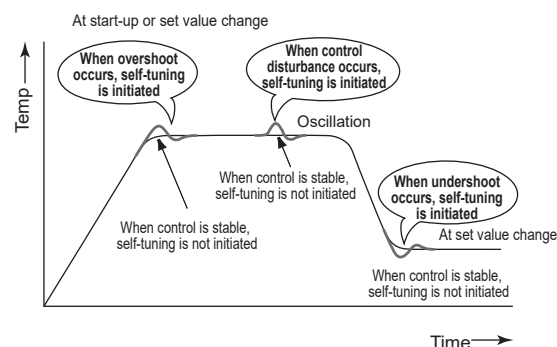
The CB Series features large, bright LED displays that have been designed to be easy-to-read from greater distances.



Self-Tuning Algorithm

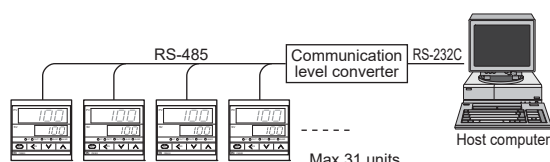
The CB Series offers a new self-tuning feature that is initiated at start-up and when process parameters or conditions change. In these situations, the controller evaluates whether the preset PID parameters should be maintained or replaced by the latest self-tuning parameters to achieve the best control for the process. Self-tuning can be manually turned ON/OFF in the parameter setting mode. This feature is not available with the Heat/Cool control.

In addition to self-tuning, the CB Series has standard autotuning (AT) so that either function can be selected to achieve optimum process control.



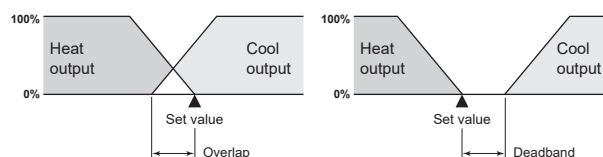
Digital Communications (Optional)

The CB series offers an optional RS-485 communications interface for networking to computers, PLCs and SCADA software in your plant. Up to 31 units can be interfaced on one RS-485 communication line. MODBUS protocol is also available.



Heat/Cool Control (Optional)

The Heat/Cool PID control features heat and cool outputs for use where process-generated heat exists. This allows the input of overlap or deadband settings which contribute to energy savings.



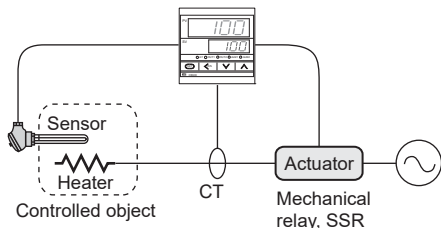
Temperature Controller CB Series

Features

Heater Break Alarm (HBA) (Optional)

The HBA detects a fault in the heating or cooling circuit and displays actual amperage on the display on the front panel. If the measured value becomes lower than the preset value, the alarm is activated.

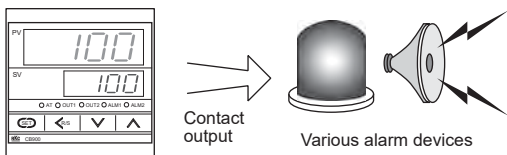
The HBA function requires a current detector for measuring and monitoring the current load.



CTL-6-P-N (0 to 30A)	CTL-12-S56-10L-N (0 to 100A)
Length of lead wire : Approx. 130mm (standard)	Length of lead wire : Approx. 100mm (standard)
 φ 5.8	 φ 12

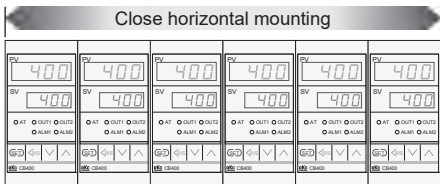
Temperature Alarms (Optional)

The CB Series provides a wide selection of alarm types to configure up to two alarm contacts. The alarm Hold action is configured in the controller. The alarm action is suppressed by the Hold function at start-up until the process value has entered the non-alarm range.



Close Horizontal Mounting

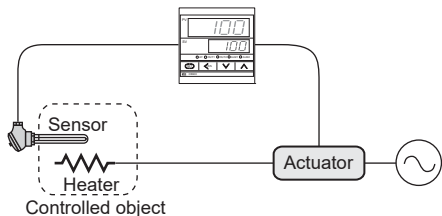
The CB Series has been designed with a unique mounting bracket that allows close horizontal mounting of multiple instruments to save valuable panel space.



Loop Break Alarm (LBA) (Optional)

The loop break alarm (LBA) monitors and protects an entire temperature control system. The LBA detects heater breaks, thermocouple or RTD failures, short circuits, or the failure of an operating device such as a mechanical or solid state relay.

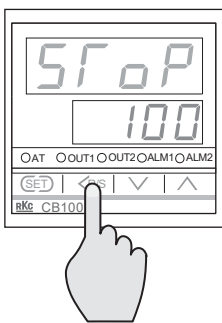
When the PID computed value reaches 100% and the temperature does not respond in a set time, the loop break alarm is activated. Conversely, when the PID value reaches 0% and the temperature does not respond accordingly, the loop break alarm is turned on. In this example, the LBA uses reverse action to control heat. For cool control, the LBA action is reversed and becomes direct. LBA deadband is available to suppress the influence of external disturbances.



RUN/STOP Mode (Optional)

When it is necessary to turn off the control output, the STOP mode is available to suspend control operation. To go between these two modes, it is necessary to press the R/S key for one second. When the control output is turned back on, the controller returns to normal operation. The instrument monitors the process value in the lower display in the STOP mode.

The RUN/STOP feature can be enabled/disabled in the parameter setting mode.



Waterproof/Dustproof (Optional)

For operation in severe environments or when washdown is required, the IP66(65) rating is available for waterproof/dustproof protection.



Specifications

Input

Input

- a) Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS) W5Re/W26Re (ASTM), U, L (DIN)
 - Influence of external resistance : Approx. 0.2μV/Ω
 - Input break action : Up-scale
- b) RTD : Pt100 (JIS/IEC), JPt100 (JIS)
 - Influence of input lead resistance : Approx. 0.01[%/Ω] of reading
 - Maximum 10Ω per wire
 - Input break action : Up-scale
- c) DC voltage : 0 to 5V, 1 to 5V (0.0 to 100.0% (Default value))
 - Input break action : Down scale
- d) DC current : 0 to 20mA, 4 to 20mA (0.0 to 100.0% (Default value))
 - For DC current input, connect a 250 Ω resistor to the input terminals.
 - Input break action : Down-scale

Sampling Time

0.5 sec

PV Bias

Temperature input : -1999(-199.9) to 9999(999.9)°C[°F]
DC voltage, DC current : - span to +span

Performance

Measuring Accuracy

- a) Thermocouple
 - ±(0.3% of reading + 1 digit) or ±2°C (4°F) whichever is larger
 - Accuracy is not guaranteed between 0 and 399°C (0 and 749°F) for type R, S and B.
 - Accuracy is not guaranteed between -199.9 and -100.0°C (-199.9 and -158.0°F) for type T and U.
- b) RTD
 - ±(0.3% of reading + 1 digit) or ±0.8°C (1.6°F) whichever is larger
- c) DC voltage and DC current
 - ±(0.3% of span + 1 digit)

Insulation Resistance

More than 20MΩ (500V DC) between measured terminals and ground
More than 20MΩ (500V DC) between power terminals and ground

Dielectric Strength

1000V AC for one minute between measured terminals and ground
1500V AC for one minute between power terminals and ground

Control

Control Method

- a) PID control (with autotuning and self-tuning function)
 - Available for reverse and direct action. (Specify when ordering.)
- b) Heat/Cool PID control (with autotuning function)
 - Air and water cooling types are available. (Specify when ordering.)

Major Setting Range

Set value : Same as input range.
Heat side proportional band : 1 to span or 0.1 to span (Temperature input)
When 0.1°C (°F) resolution, within 999.9°C (°F) or 0.1 to 100.0% of span (voltage, current input) (ON/OFF action when P=0)
• Differential gap at ON/OFF action is 2°C (°F).
Cool side proportional band : 0 to 1000% of heat side proportional band (Heat/Cool ON/OFF action when Pc=0)
Integral time : 0 to 3600sec.(P + D action when I=0)
Derivative time : 0 to 3600sec.(P + I action when D=0)
Anti-Reset Windup(ARW) : 1 to 100% of heat side proportional band
Deadband/Overlap : -10 to 10°C (°F) or -10.0 to 10.0°C (°F)
-10.0 to +10.0% of span (Voltage, current input)
Proportional cycle time : 1 to 100 sec.

Control Output

Relay output : Form C contact, 250V AC 3A (resistive load) (Form A contact : Heat/Cool PID type)
Voltage pulse output : 0/12V DC (Load resistance : More than 600Ω)
Current output : 4 to 20mA DC (Load resistance : Less than 600Ω)
Triac trigger output : Zero-cross method for medium capacity triac drive (less than 100A)
• Not available for Heat/Cool PID type.

Alarm (Up to 2 points)

(Optional)

Temperature Alarm

- a) Type : Deviation High, Low, High/Low, Band, Process High, Low
Set value High, Low
- b) Differential gap : 2°C (°F) or 2.0°C (°F) (Temperature input)
0.2% (Voltage, current input)

Heater Break Alarm (For single phase)

- a) CT type : CTL-6-P-N(30A), CTL-12-S56-10L-N(100A)
- b) Display range : 0.0 to 100.0A
- c) Accuracy : ± 5% of input value or ± 2A (whichever is larger)
• Output from Alarm 2 terminal.

Control Loop Break Alarm (LBA)

- a) LBA time setting : 0.1 to 200.0 min.
- b) LBA deadband : 0 to 9999 °C[°F] or 100% of span (OFF by setting zero)
• Not available for heat/cool type.

Alarm Output

Relay output, Form A contact 250V AC 1A (resistive load)

Communications

(Optional)

- a) Communication method : RS-485 (2-wire)
- b) Communication speed : 1200, 2400, 4800, 9600, 19200 BPS
- c) Bit format
 - Start bit : 1
 - Data bit : 7 or 8
 - Parity bit : Even, odd or without parity
 - Stop bit : 1 or 2
- d) Communication code : ASCII(JIS) 7-bit code
- e) Maximum connection : 31 (Address can be set from 0 to 99.)

Waterproof/Dustproof

(Optional)

CB100 : IP66
CB400/500/700/900 : IP65

- Waterproof/dustproof protection only effective from the front in panel mounted installations.
- Waterproof/dustproof protection is not available for close horizontal mounting installations.

General Specifications

Supply Voltage

- a) 85 to 264V AC (Including supply voltage variation)
[Rating : 100 to 240V AC] (50/60Hz common)
- b) 21.6 to 26.4V AC(Including supply voltage variation)
[Rating : 24V AC] (50/60Hz common)
- c) 21.6 to 26.4V DC(Ripple rate 10% p-p or less) [Rating : 24V DC]

Power Consumption

Less than 10VA for standard AC type
Less than 5VA for 24V AC type
Less than 160mA for 24V DC type

Power Failure Effect

Not affected by power failure shorter than 20msec, otherwise reset to the initial state.

Operating Environments : 0 to 50°C [32 to 122°F] , 45 to 85% RH

Memory Backup : Backed up by non-volatile memory.

Data retaining period : Approx. 10 years

Number of writing : Approx. 1,000,000 times

Net Weight

CB100 : Approx. 170g CB700 : Approx. 290g
CB400 : Approx. 250g CB900 : Approx. 340g
CB500 : Approx. 250g

External Dimensions (W x H x D)

CB100 : 48 x 48 x 100mm CB700 : 72 x 72 x 100mm
CB400 : 48 x 96 x 100mm CB900 : 96 x 96 x 100mm
CB500 : 96 x 48 x 100mm

Compliance with Standards

- CE Mark
- UL/cUL Recognized



- Triac trigger output type and triac output are not CE Mark or UL/cUL Recognized.

Temperature Controller CB Series

Model and Suffix Code

Specifications	Model and Suffix Code															
Size	CB100 (1/16 DIN size) CB400 (1/8 DIN Vertical size) CB500 (1/8 DIN Horizontal size) CB700 (3/16 DIN size) CB900 (1/4 DIN size)															
Control method	PID control with AT (reverse action) PID control with AT (direct action) Heat/Cool PID with AT (water cooling) Heat/Cool PID with AT (air cooling)															
Input type	See Range and Input Code Table															
Range	See Range and Input Code Table															
Control output (OUT1)	Relay output Voltage pulse DC current : 4 to 20mA Triac trigger															
Control output (OUT2)	Control method : F, D Relay output Voltage pulse DC current : 4 to 20mA															
Alarm 1	No alarm See Alarm Code Table ²															
Alarm 2	No alarm See Alarm Code Table ²															
Digital communications ¹	Not supplied RS-485 (2-wire system)															
Waterproof/Dustproof	Not supplied Waterproof/Dustproof protection • Body color is only available in black.															
Body color	Black White															
Instrument version	Version symbol															

¹ MODBUS protocol is also available. Specify "Z-1021" along with full model code. For additional information, contact RKC.

² Order current transformers separately, see accessories below to part number.

Range and Input Code Table

Thermocouple (Field-programmable)

Input	Code	Range
K	K 01	0 – 200°C
	K 02	0 – 400°C
	K 03	0 – 600°C
	K 04	0 – 800°C
	K 05	0 – 1000°C
	K 06	0 – 1200°C
	K 07	0 – 1372°C
	K 13	0 – 100°C
	K 14	0 – 300°C
	K 17	0 – 450°C
	K 20	0 – 500°C
	K A1	0 – 800°F
	K A2	0 – 1600°F
	K A3	0 – 2502°F
	K A9	20 – 70°F
J	J 01	0 – 200°C
	J 02	0 – 400°C
	J 03	0 – 600°C
	J 04	0 – 800°C
	J 05	0 – 1000°C
	J 06	0 – 1200°C
	J A1	0 – 800°F
	J A2	0 – 1600°F
	J A3	0 – 2192°F
	J A6	0 – 400°F
R ¹	R 01	0 – 1600°C
	R 02	0 – 1769°C
	R 04	0 – 1350°C
	R A1	0 – 3200°F
	R A2	0 – 3216°F
S ¹	S 01	0 – 1600°C
	S 02	0 – 1769°C
	S A1	0 – 3200°F
	S A2	0 – 3216°F
B ¹	B 01	400 – 1800°C
	B 02	0 – 1820°C
	B A1	800 – 3200°F
	B A2	0 – 3308°F

¹ Type R, S and B input : Accuracy is not guaranteed between 0 to 399°C (0 to 799°F)

² Type T and U input : Accuracy is not guaranteed between -199.9 to -100.0°C (-199.9 to -158.0°F)

³ DC current input : A 250 Ω resistor is externally connected at the input terminals.

Alarm Code Table

Code	Type
A	Deviation High
B	Deviation Low
C	Deviation High/Low
D	Band Alarm
E	Deviation High with Alarm Hold
F	Deviation Low with Alarm Hold
G	Deviation High/Low with Alarm Hold
H	Process High

¹ Loop break alarm is not available for Heat/Cool PID control type.

² Heater break alarm is allocated to Alarm 2. Heater break alarm is not available for current output.

Input	Code	Range
E	E 01	0 – 800°C
	E 02	0 – 1000°C
	E A1	0 – 1600°F
N	N 01	0 – 1832°F
	N 02	0 – 1200°C
	N A1	0 – 2300°F
T ²	T 01	-199.9 – 400.0°C
	T 02	-199.9 – 100.0°C
	T 03	-100.0 – 200.0°C
	T 04	0.0 – 350.0°C
	T A1	-199.9 – 752.0°F
	T A2	-100.0 – 200.0°F
	T A3	-100.0 – 400.0°F
	T A4	0.0 – 450.0°F
	T A5	0.0 – 752.0°F
	T A6	0.0 – 100.0°F
W5Re /W26Re	W 01	0 – 2000°C
	W 02	0 – 2320°C
	W A1	0 – 4000°F
PL II	A 01	0 – 1300°C
	A 02	0 – 1390°C
	A 03	0 – 1200°C
	A A1	0 – 2400°F
	A A2	0 – 2534°F
U ²	U 01	-199.9 – 600.0°C
	U 02	-199.9 – 100.0°C
	U 03	0.0 – 400.0°C
	U A1	-199.9 – 999.9°F
	U A2	-100.0 – 200.0°F
L	L 01	0 – 400°C
	L 02	0 – 800°C
	L A1	0 – 800°F
	L A2	0 – 1600°F

RTD (Field-programmable)

Input	Code	Range
Pt100	D 01	-199.9 – 649.0°C
	D 02	-199.9 – 200.0°C
	D 03	-100.0 – 50.0°C
	D 04	-100.0 – 100.0°C
	D 05	-100.0 – 200.0°C
	D 06	0.0 – 50.0°C
	D 07	0.0 – 100.0°C
	D 08	0.0 – 200.0°C
	D 09	0.0 – 300.0°C
	D 10	0.0 – 500.0°C
	D A1	-199.9 – 999.9°F
	D A2	-199.9 – 400.0°F
	D A3	-199.9 – 200.0°F
	D A4	-199.9 – 100.0°F
	D A5	-100.0 – 300.0°F
	D A6	0.0 – 100.0°F
JPt100	D A7	0.0 – 200.0°F
	D A8	0.0 – 400.0°F
	D A9	0.0 – 500.0°F
	P 01	-199.9 – 649.0°C
	P 02	-199.9 – 200.0°C
	P 03	-100.0 – 50.0°C
	P 04	-100.0 – 100.0°C
	P 05	-100.0 – 200.0°C
	P 06	0.0 – 50.0°C
	P 07	0.0 – 100.0°C
	P 08	0.0 – 200.0°C
	P 09	0.0 – 300.0°C
	P 10	0.0 – 500.0°C

Voltage and Current ³ (Field-programmable)

Input	Code	Range
0 – 5V DC	4 01	0.0 – 100.0 (Default)
0 – 10V DC	5 01 ¹	0.0 – 100.0 (Default)
1 – 5V DC	6 01	0.0 – 100.0 (Default)
0 – 20mA DC	7 01	0.0 – 100.0 (Default)
4 – 20mA DC	8 01	0.0 – 100.0 (Default)

¹ Specify Z-1010 when ordering

Supply Voltage

100 – 240V AC	24V AC	24V DC
---------------	--------	--------

Accessories

Current transformer for heater break alarm

CTL-6P-N (0 – 30A)

CTL-12-S56-10L-N (0 – 100A)

Shunt resistor for DC current input

KD100-55

Terminal cover

KCA100-517 (CB100) KCA400-513 (CB400/500)

KCA700-53 (CB700) KCA900-58 (CB900)

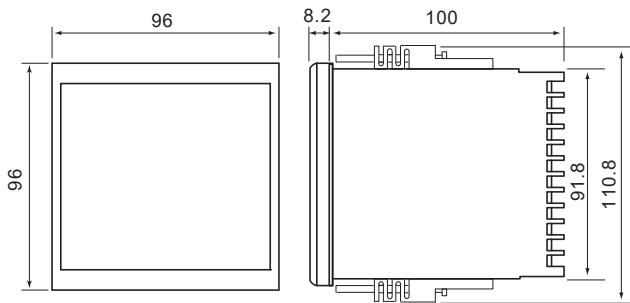


External Dimensions

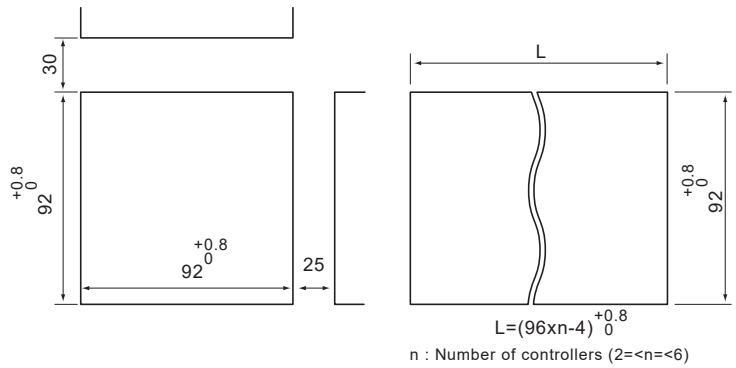
Units : mm

•External dimensions

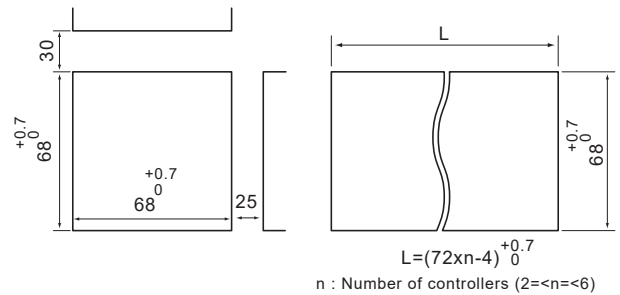
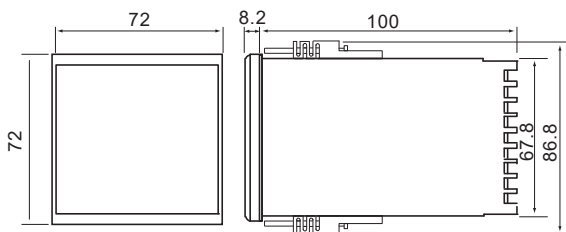
CB900



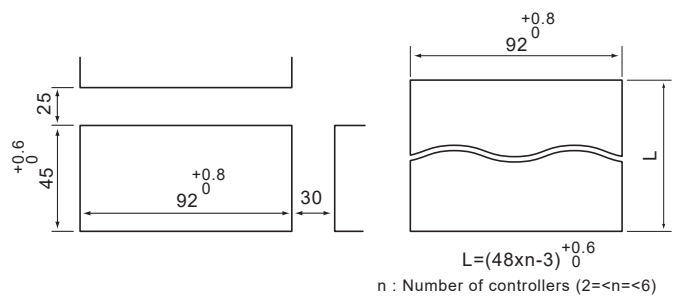
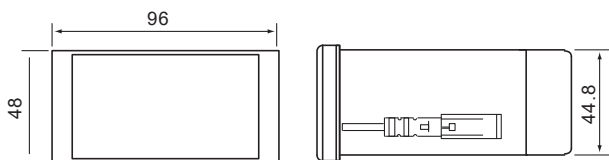
•Panel cutouts



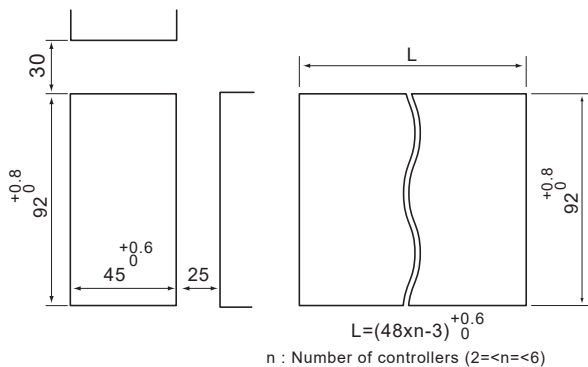
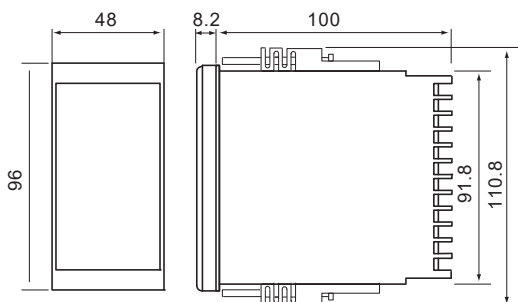
CB700



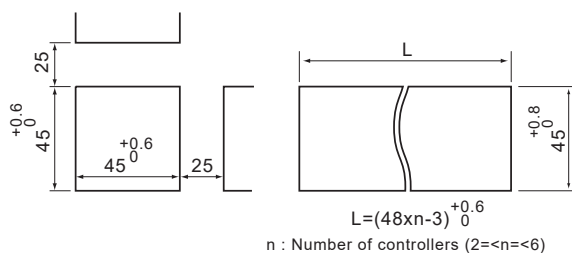
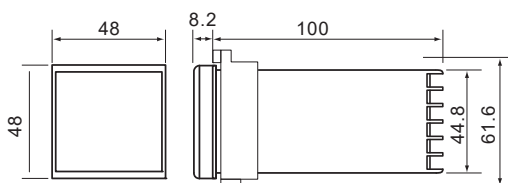
CB500



CB400



CB100



Temperature Controller CB Series

Rear Terminals

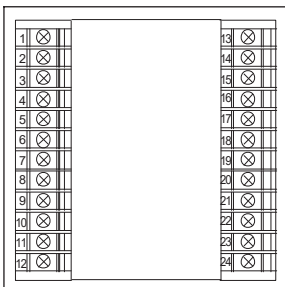
CB400



CB500



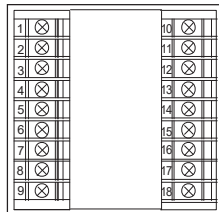
CB900



No.	Description
1	AC 100 to 240V
2	AC/DC + 24V -
3	PID Control (OUT1)
4	Heat/coo PID Control (OUT2)
5	(1) C NO (2) T1 (3) T2
6	NC G
7	Alarm 2 NO
8	Alarm 1 NO
9	
10	A
11	B (1) (2) (3)
12	

No.	Description
13	SG RS-485
14	T/R(A)
15	T/R(B)
16	
17	
18	
19	
20	
21	
22	
23	CT input for heater break alarm
24	

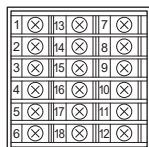
CB700



No.	Description
1	AC 100 to 240V
2	AC/DC + 24V -
3	PID Control (OUT1)
4	Heat/coo PID Control (OUT2)
5	(1) C NO (2) T1 (3) T2
6	NC G
7	SG RS-485
8	T/R(A)
9	T/R(B)

No.	Description
10	Alarm 2 NO
11	Alarm 1 NO
12	
13	
14	CT input for heater break alarm
15	
16	A
17	B (1) (2) (3)
18	

CB100



No.	Description
1	AC 100 to 240V
2	AC/DC + 24V -
3	PID Control (OUT1)
4	Heat/coo PID Control (OUT2)
5	(1) C NO (2) T1 (3) T2
6	NC G
7	Alarm 2 NO
8	Alarm 1 NO
9	
10	A
11	B (1) (2) (3)
12	

No.	Description
13	SG RS-485
14	T/R(A)
15	T/R(B)
16	
17	CT input for heater break alarm
18	

CB103 CB403 CB903



General Description

A new set of controllers has been added to the CB Series to provide additional configuration flexibility. These instruments have a third contact that can be configured as an analog retransmission output, a digital contact output for RUN/STOP status or a third alarm and a contact input for SV1/SV2 or RUN/STOP functions.

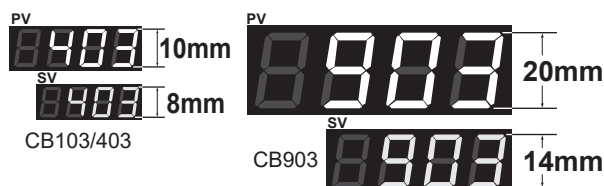
These instruments are designed for heat only operation and are available in either reverse or direct control action. The Heat/Cool output or digital communications are not available on this series.

Features

- ☆ Bright, easy-to-read LED displays
- ☆ Digital contact input/output
- ☆ Analog retransmission output
- ☆ Three separate alarms
- ☆ Dual set points
- ☆ Advanced self-tuning
- ☆ IP66 (65) Waterproof/Dustproof protection

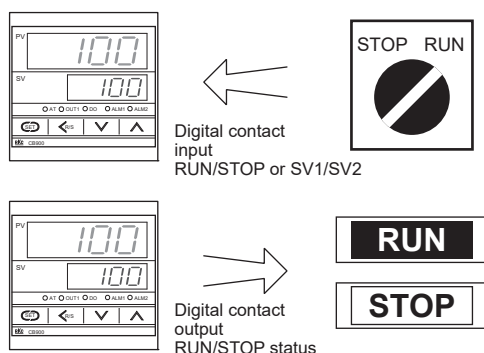
Bright, Easy-To-Read LED Displays

The CB Series features large, bright LED displays that have been designed to be easy-to-read from greater distances.



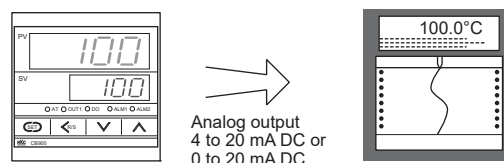
Digital Contact Input/Output (Optional)

The contact input can be selected to run either the RUN/STOP or SV1/SV2 functions. The third output can be configured to view the RUN/STOP status.



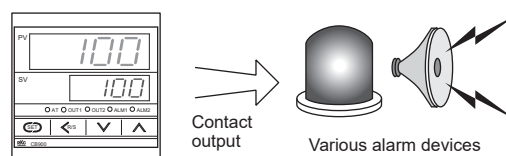
Analog Retransmission Output (Optional)

The third output can be configured as an analog retransmission output. With this function, the process value can be retransmitted as an analog current signal (4-20mA).



Three Separate Alarms (Optional)

The third output can be configured for a third alarm.



CB Series Feature Comparison

Functions	Series	CB Series CB100/400/500/700/900	CB Series CB103/403/903
Alarms (2 points) (Select two)	Temperature	☆	☆
	Heater break	☆	☆
	Control loop break	☆	☆
Aux. output (1 point) (Select one)	Temperature alarm	—	☆
	Analog output RUN/STOP status output	—	☆
Contact input (Select one)	RUN/STOP switching	—	☆
	SV1/SV2 switching	—	☆
Heat/Cool control		☆	—
Communications		☆	—
Waterproof/Dustproof		☆	☆

☆ : Selectable — : Not selectable

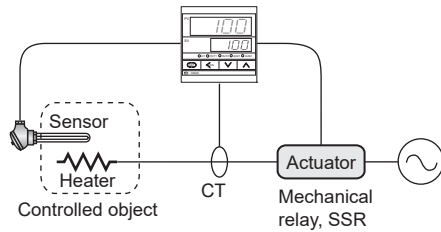
Features

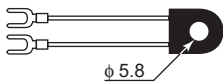
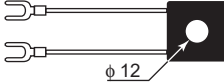
Heater Break Alarm

(Optional)

The heater break alarm (HBA) detects a fault in the heating or cooling circuit and displays actual amperage in the display on the front panel. If the measured value becomes lower than the preset value, the alarm is activated.

The HBA function requires a current detector for measuring and monitoring the current load.



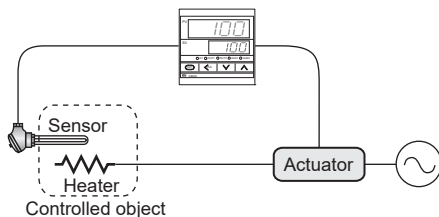
CTL-6-P-N (0 to 30A)	CTL-12-S56-10L-N (0 to 100A)
Length of lead wire : Approx. 130mm (standard)	Length of lead wire : Approx. 100mm (standard)
 φ 5.8	 φ 12

Loop Break Alarm

(Optional)

The loop break alarm (LBA) monitors and protects an entire temperature control system. The LBA detects heater breaks, thermocouple or RTD failures, short circuits, or the failure of an operating device such as a mechanical or solid state relay.

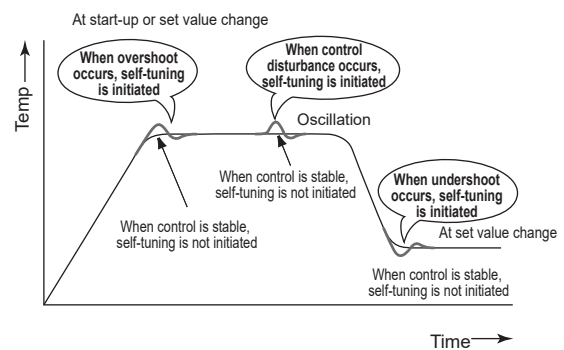
When the PID computed value reaches 100% and the temperature does not respond in a set time, the loop break alarm is activated. Conversely, when the PID value reaches 0% and the temperature does not respond accordingly, the loop break alarm is turned on. In this example, the LBA uses reverse action to control heat. For cool control, the LBA action is reversed and becomes direct. LBA deadband is available to suppress the influence of external disturbances.



Self-Tuning Algorithm

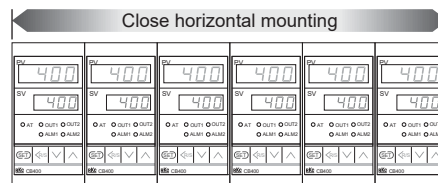
The CB Series offers a new self-tuning feature that is initiated at start-up and when process parameters or conditions change. In these situations, the controller evaluates whether the preset PID parameters should be maintained or replaced by the latest self-tuning parameters to achieve the best control for the process. Self-tuning can be manually turned ON/OFF in the parameter setting mode. This feature is not available with the Heat/Cool control.

In addition to self-tuning, the CB Series has standard autotuning (AT) so that either function can be selected to achieve optimum process control.



Close Horizontal Mounting

The CB Series has been designed with a unique mounting bracket that allows close horizontal mounting of multiple instruments to save valuable panel space.



Waterproof/Dustproof

(Optional)

For operation in severe environments or when washdown is required, the IP66(65) rating is available for aterproof/dustproof protection.

Specifications

Input

Input

- a) Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS) W5Re/W26Re (ASTM), U, L (DIN)
 - Influence of external resistance : Approx. 0.2μV/Ω
 - Input break action : Up-scale
- b) RTD : Pt100 (JIS/IEC), JPt100 (JIS)
 - Influence of input lead resistance : Approx. 0.01[%/Ω] of reading
 - Maximum 10Ω per wire
 - Input break action : Up-scale
- c) DC voltage : 0 to 5V, 1 to 5V (0.0 to 100.0% (Default value))
 - Input break action : Down scale
- d) DC current : 0 to 20mA, 4 to 20mA (0.0 to 100.0% (Default value))
 - For DC current input, connect a 250 Ω resistor to the input terminals.
 - Input break action : Down-scale

Sampling Time

0.5 sec

PV Bias

Temperature input : -1999 (-199.9) to 9999 (999.9)°C [°F]
DC voltage, DC current : - span to +span

Performance

Measuring Accuracy

- a) Thermocouple
 - ±(0.3% of reading + 1 digit) or ±2°C (4°F) whichever is larger
 - Accuracy is not guaranteed between 0 and 399°C (0 and 749°F) for type R, S and B.
 - Accuracy is not guaranteed between -199.9 and -100.0°C (-199.9 and -158.0°F) for type T and U.
- b) RTD
 - ±(0.3% of reading + 1 digit) or ±0.8°C (1.6°F) whichever is larger
- c) DC voltage and DC current
 - ±(0.3% of span + 1 digit)

Insulation Resistance

More than 20MΩ (500V DC) between measured terminals and ground
More than 20MΩ (500V DC) between power terminals and ground

Dielectric Strength

1000V AC for one minute between measured terminals and ground
1500V AC for one minute between power terminals and ground

Control

Control Method

- a) PID control (with autotuning and self-tuning function)
 - Available for reverse and direct action. (Specify when ordering.)

Major Setting Range

Set value : Same as input range.
Proportional band : 1 to span or 0.1 to span (Temperature input)
When 0.1°C (°F) resolution, within 999.9°C (°F) or 0.1 to 100.0% of span (voltage, current input) (ON/OFF action when P=0)
• Differential gap at ON/OFF action is 2°C (°F).
Integral time : 0 to 3600sec.(P + D action when I=0)
Derivative time : 0 to 3600sec.(P + I action when D=0)
Anti-Reset Windup(ARW) : 1 to 100% of proportional band
Proportional cycle time : 1 to 100 sec.

Control Output

Relay output : Form A contact, 250V AC 3A (resistive load)
Voltage pulse output : 0/12V DC
(Load resistance : More than 600Ω)
Current output : 4 to 20mA DC
(Load resistance : Less than 600Ω)
Triac trigger output : Zero-cross method for medium capacity triac drive (less than 100A)

Waterproof/Dustproof (Optional)

CB103 : IP66
CB403/903 : IP65

- Waterproof/dustproof protection only effective from the front in panel mounted installations.
- Waterproof/dustproof protection is not available for close horizontal mounting installations.

Alarms (Up to 2 points) (Optional)

Temperature Alarm

- a) Type : Deviation High, Low, High/Low, Band, Process High, Low, Set value High, Low
- b) Differential gap : 2°C (°F) or 2.0°C (°F) (Temperature input) 0.2% (Voltage, current input)

Heater Break Alarm (For single phase)

- a) CT type : CTL-6-P-N(30A), CTL-12-S56-10L-N(100A)
- b) Display range : 0.0 to 100.0A
- c) Accuracy : ± 5% of input value or ± 2A (whichever is larger)
- Output from Alarm 2 terminal.

Control Loop Break Alarm (LBA)

- a) LBA time setting : 0.1 to 200.0 min.
- b) LBA deadband : 0 to 9999 °C[°F] or 100% of span (OFF by setting zero)

Alarm Output

Relay output, Form A contact 250V AC 1A (resistive load)

Auxiliary Output (Up to 1 point) (Optional)

Temperature Alarm

- a) Type : Deviation High, Low, High/Low, Band, Process High, Low
- b) Differential gap : 2°C (°F) or 2.0°C (°F) (Temperature input) 0.2% (Voltage, current input)
- c) Alarm output : Relay output, Form A contact 250V AC 3A (resistive load)

Analog Output

- a) Type : Process value, Set value, Deviation, Manipulation value
- b) Output type : DC current : 0 to 20mA, 4 to 20mA (Load resistance : Less than 600Ω)
- c) Accuracy : ± 0.3% of span (Output ripple : ± 0.1% of span)
- d) Output resolution : More than 10bits

RUN/STOP Status Output

- a) Status : RUN : Close STOP : Open
- b) Output : Relay output, Form A contact 250V AC 3A (resistive load)

Contact Inputs (Optional)

Number of Inputs : 1 point

Contact Input Type

- a) RUN/STOP switching (OPEN : STOP, CLOSE : RUN)
- b) STEP function (OPEN : SV1, CLOSE : SV2)

Input Rating

Non-voltage contact input (OPEN : 500kΩ or more, CLOSE : 10Ω or less)

General Specifications

Supply Voltage

- a) 85 to 264V AC (Including supply voltage variation) [Rating : 100 to 240V AC] (50/60Hz common)
- b) 21.6 to 26.4V AC (Including supply voltage variation) [Rating : 24V AC] (50/60Hz common)
- c) 21.6 to 26.4V DC (Ripple rate 10% p-p or less) [Rating : 24V DC]

Power Consumption

Less than 10VA for standard AC type
Less than 5VA for 24V AC type
Less than 160mA for 24V DC type

Power Failure Effect

A power failure of 20ms or less will not affect the control action.
If power failure of more than 20ms occurs, controller will restart.

Operating Environments : 0 to 50°C [32 to 122°F] , 45 to 85% RH

Memory Backup : Backed up by non-volatile memory.
Data retaining period : Approx. 10 years

Net Weight

CB103 : Approx. 170g, CB403 : Approx. 250g, CB903 : Approx. 340g

External Dimensions (W x H x D)

CB103 : 48 x 48 x 100mm, CB403 : 48 x 96 x 100mm
CB903 : 96 x 96 x 100mm

Compliance with Standards

- CE Mark
- UL/cUL Recognized



- Triac trigger output type and triac output are not CE Mark or UL/cUL Recognized.

Temperature Controller CB103/403/903

Model and Suffix Code

Specifications	Model and Suffix Code															
Size	CB103 (1/16 DIN size) ☐ ☐ ☐ - ☐ * ☐ ☐ ☐ - ☐ ☐ / ☐ / Y CB403 (1/8 DIN size) CB903 (1/4 DIN size)															
Control method	PID control with AT (reverse action) F ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ PID control with AT (direct action) D ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐															
Input type	See Range and Input Code Table ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐															
Range	See Range and Input Code Table ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐															
Control output	Relay output M Voltage pulse V DC current : 4 to 20mA 8 Triac trigger G															
Alarm 1	No alarm N See Alarm Code Table ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐															
Alarm 2	No alarm N See Alarm Code Table ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐															
Auxiliary output ¹	No auxiliary output N See Alarm Code Table (Code : A to L) ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ RUN/STOP status output Y Analog output : 0 to 20mA 7 Analog output : 4 to 20mA 8															
Contact input (DI)	Not supplied N STEP function (Select SV1/SV2) 1 RUN/STOP transfer 2															
Waterproof/Dustproof	Not supplied N Waterproof/Dustproof protection 1 • Body color is only available in black.															
Body color	Black A White N															
Instrument version	Version symbol Y															

¹ The auxiliary output is not available for the triac trigger output.

² Order current transformers separately, see accessories below to part number.

Range and Input Code Table

Thermocouple (Field-programmable)

Input	Code	Range
K	K 01	0 - 200°C
	K 02	0 - 400°C
	K 03	0 - 600°C
	K 04	0 - 800°C
	K 05	0 - 1000°C
	K 06	0 - 1200°C
	K 07	0 - 1372°C
	K 13	0 - 100°C
	K 14	0 - 300°C
	K 17	0 - 450°C
	K 20	0 - 500°C
	K A1	0 - 800°F
	K A2	0 - 1600°F
	K A3	0 - 2502°F
	K A9	20 - 70°F
J	J 01	0 - 200°C
	J 02	0 - 400°C
	J 03	0 - 600°C
	J 04	0 - 800°C
	J 05	0 - 1000°C
	J 06	0 - 1200°C
	J A1	0 - 800°F
	J A2	0 - 1600°F
	J A3	0 - 2192°F
	J A6	0 - 400°F
R ¹	R 01	0 - 1600°C
	R 02	0 - 1769°C
	R 04	0 - 1350°C
	R A1	0 - 3200°F
	R A2	0 - 3216°F
S ¹	S 01	0 - 1600°C
	S 02	0 - 1769°C
	S A1	0 - 3200°F
	S A2	0 - 3216°F
B ¹	B 01	400 - 1800°C
	B 02	0 - 1820°C
	B A1	800 - 3200°F
	B A2	0 - 3308°F

Input	Code	Range
E	E 01	0 - 800°C
	E 02	0 - 1000°C
	E A1	0 - 1600°F
	E A2	0 - 1832°F
N	N 01	0 - 1200°C
	N 02	0 - 1300°C
	N A1	0 - 2300°F
	N A2	0 - 2372°F
T ²	T 01	-199.9 - 400.0°C
	T 02	-199.9 - 100.0°C
	T 03	-100.0 - 200.0°C
	T 04	0.0 - 350.0°C
	T A1	-199.9 - 752.0°F
	T A2	-100.0 - 200.0°F
	T A3	-100.0 - 400.0°F
	T A4	0.0 - 450.0°F
	T A5	0.0 - 752.0°F
	T A6	0.0 - 2534°F
W5Re /W26Re	W 01	0 - 2000°C
	W 02	0 - 2320°C
	W A1	0 - 4000°F
	W A2	0 - 1300°C
PL II	A 01	0 - 1390°C
	A 02	0 - 1200°C
	A A1	0 - 2400°F
	A A2	0 - 2534°F
U ²	U 01	-199.9 - 600.0°C
	U 02	-199.9 - 100.0°C
	U 03	0.0 - 400.0°C
	U A1	-199.9 - 999.9°F
	U A2	-100.0 - 200.0°F
	U A3	0.0 - 999.9°F
L	L 01	0 - 400°C
	L 02	0 - 800°C
	L A1	0 - 800°F
	L A2	0 - 1600°F

RTD (Field-programmable)

Input	Code	Range
Pt100	D 01	-199.9 - 649.0°C
	D 02	-199.9 - 200.0°C
	D 03	-100.0 - 50.0°C
	D 04	-100.0 - 100.0°C
	D 05	-100.0 - 200.0°C
	D 06	0.0 - 50.0°C
	D 07	0.0 - 100.0°C
	D 08	0.0 - 200.0°C
	D 09	0.0 - 300.0°C
	D 10	0.0 - 500.0°C
	D A1	-199.9 - 999.9°F
	D A2	-199.9 - 400.0°F
	D A3	-199.9 - 200.0°F
	D A4	-199.9 - 100.0°F
	D A5	-100.0 - 300.0°F
	D A6	0.0 - 100.0°F
JPt100	P 01	-199.9 - 649.0°C
	P 02	-199.9 - 200.0°C
	P 03	-100.0 - 50.0°C
	P 04	-100.0 - 100.0°C
	P 05	-100.0 - 200.0°C
	P 06	0.0 - 50.0°C
	P 07	0.0 - 100.0°C
	P 08	0.0 - 200.0°C
	P 09	0.0 - 300.0°C
	P 10	0.0 - 500.0°C

Voltage and Current ³ (Field-programmable)

Input	Code	Range
0 - 5V DC	4 01	0.0 - 100.0 (Default value)
1 - 5V DC	6 01	0.0 - 100.0 (Default value)
0 - 20mA DC	7 01	0.0 - 100.0 (Default value)
4 - 20mA DC	8 01	0.0 - 100.0 (Default value)

¹ Type R, S and B input : Accuracy is not guaranteed between 0 to 399°C (0 to 799°F)

² Type T and U input : Accuracy is not guaranteed between -199.9 to -100.0°C (-199.9 to -158.0°F)

³ DC current input : A 250 Ω resistor is externally connected at the input terminals.

Alarm Code Table

Code	Type
A	Deviation High
B	Deviation Low
C	Deviation High/Low
D	Band Alarm
E	Deviation High with Alarm Hold
F	Deviation Low with Alarm Hold
G	Deviation High/Low with Alarm Hold
H	Process High

Code	Type
J	Process Low
K	Process High with Alarm Hold
L	Process Low with Alarm Hold
R 1	Loop break alarm (LBA)
P 2	Heater break alarm (CTL-6-P-N [30A])
S 2	Heater break alarm (CTL-12-S56-10L-N [100A])
V	Set value High
W	Set value Low

¹ Loop break alarm is not available for Heat/Cool PID control type.

² Heater break alarm can only be assigned to Alarm 2. Heater break alarm is not available for current output.

Supply Voltage

100 - 240V AC	24V AC	24V DC
---------------	--------	--------

Accessories

Current transformer for heater break alarm

CTL-6P-N (0 - 30A)

CTL-12-S56-10L-N (0 - 100A)

Shunt resistor for DC current input

KD100-55

Terminal cover

KCA100-517 (CB103) KCA400-513 (CB403)

KCA900-58 (CB903)

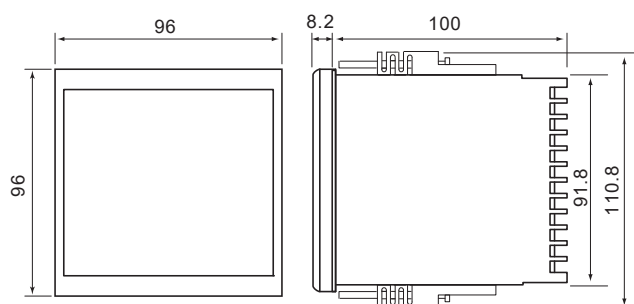


External Dimensions

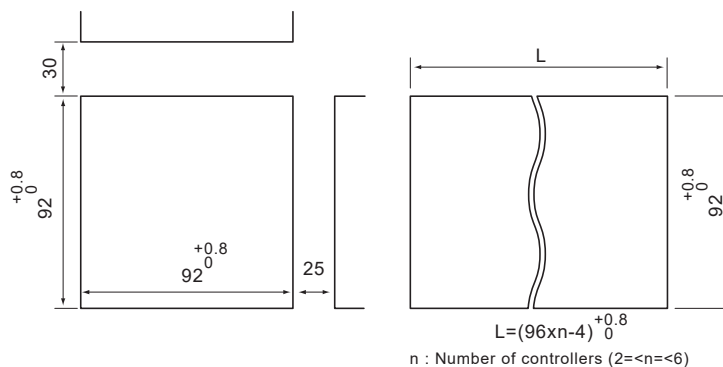
Units : mm

•External dimensions

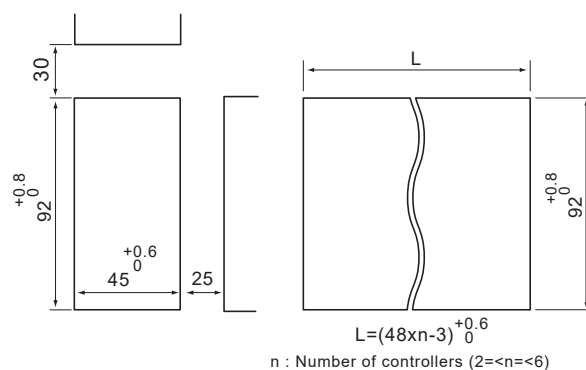
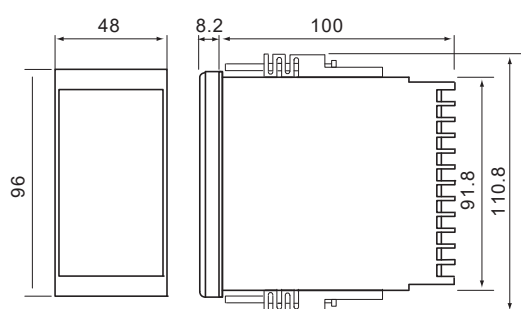
CB903



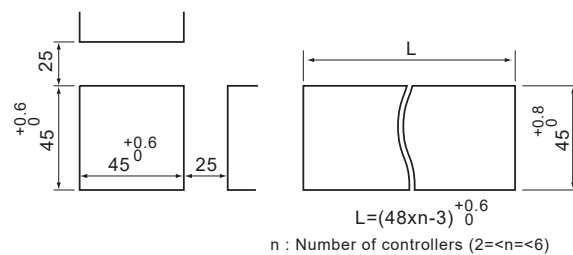
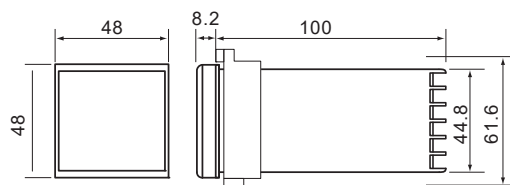
•Panel cutouts



CB403



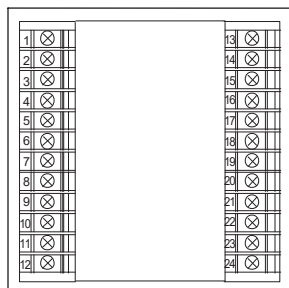
CB103



Temperature Controller CB103/403/903

Rear Terminals

CB903



CB403



No.	Description
1	AC 100 to 240V
2	AC 24V
3	DC+ 24V
4	DC- 24V
5	(1) NO (2) NC
6	(3) T2
7	(1) NO (2) NC
8	(3) T1
9	G
10	Alarm 2
11	Alarm 1
12	Measured input (1) Thermocouple (2) RTD (3) Voltage/Current

No.	Description
13	DI
14	Contact input
15	+
16	
17	
18	
19	
20	
21	
22	
23	CT input for heater break alarm
24	Current transformer input

CB103



No.	Description
1	AC 100 to 240V
2	AC 24V
3	DC+ 24V
4	DC- 24V
5	(1) NO (2) NC
6	(3) T2
7	(1) NO (2) NC
8	(3) T1
9	G
10	Alarm 2
11	Alarm 1
12	Measured input (1) Thermocouple (2) RTD (3) Voltage/Current

No.	Description
13	DI
14	Contact input
15	+
16	
17	CT input for heater break alarm
18	Current transformer input

SA200



General Description

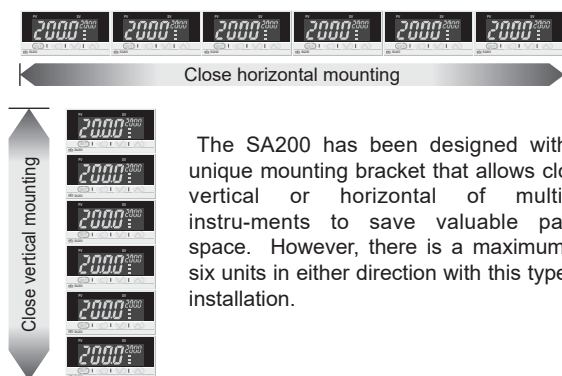
The SA200 is a high performance 32nd DIN controller that has been specifically designed for applications where panel space is critical. Though small in size, this controller has exceptional features such as dual display of process and set value, mounting flexibility, advanced self-tuning, alarms and MODBUS communications.

Features

- ☆ 1/32 DIN size with dual display
- ☆ 4-20mA output for control/retransmission
- ☆ Dual setpoint
- ☆ PV ratio, Peak/Bottom hold, Ramp-to-setpoint¹
- ☆ Loop break alarm and temperature alarms
- ☆ Digital communications

¹ Contact RKC or RKC distributors.

Close Vertical or Horizontal Mounting



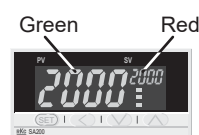
Self-Tuning Algorithm

The SA200 offers a new self-tuning feature that is initiated at start-up and when process parameters or conditions change. In these situations, the controller evaluates whether the preset PID parameters should be maintained or replaced by the latest self-tuning parameters to achieve the best control for the process. Self-tuning can be manually turned ON/OFF in the parameter setting mode. This feature is not available with the Heat/Cool control.

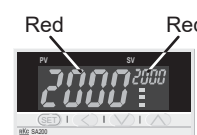
In addition to self-tuning, the SA200 has standard autotuning (AT) so that either function can be selected to achieve optimum process control.

Two types of Dual-Display Color

The SA200 has a dual-display with a larger green display (PV) and small orange display (SV). Red/Red display is also available with SA201.



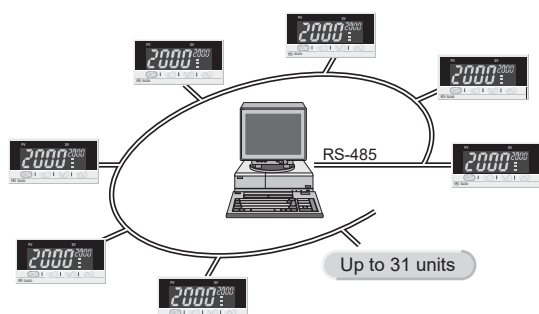
SA200



SA201

Digital Communications (Optional)

The SA200 offers an optional RS-485 communications interface for networking to computers, PLCs and SCADA software. MODBUS or ANSI protocol can be selected. Up to 32 units, including host computer, can be multi-dropped on one RS-485 communication line. When the communication feature is selected, the external contact input is not available.



Waterproof/Dustproof (Optional)

For operation in severe environments or when washdown is required, the IP66 (NEMA4) rating is available for waterproof /dustproof protection.



Temperature Controller SA200

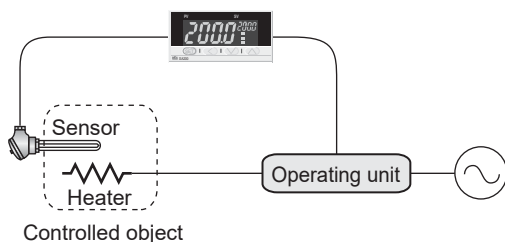
Features

Loop Break Alarm and Temperature Alarms (Optional)

The loop break alarm (LBA) monitors and protects an entire temperature control system. The LBA detects heater breaks, thermocouple or RTD failures, short circuits, or the failure of an operating device such as a mechanical or solid state relay.

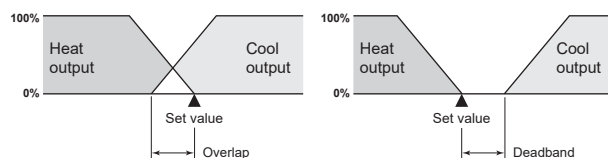
When the PID computed value reaches 100% and the temperature does not respond in a set time, the loop break alarm is activated. Conversely, when the PID value reaches 0% and the temperature does not respond accordingly, the loop break alarm is turned on. In this example, the LBA uses reverse action to control heat. For cool control, the LBA action is reversed and becomes direct. LBA deadband is available to suppress the influence of external disturbances.

In addition to the loop break alarm, the SA200 offers field-programmable temperature alarms. Deviation (High, Low, High/Low), process (High, Low), set value (High, Low) and band alarms can be selected.



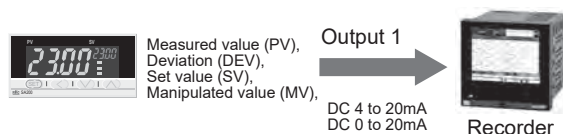
Heat/Cool Control (Optional)

The Heat/Cool PID control features heat and cool outputs for use where process-generated heat exists. This allows the input of overlap or deadband settings which contribute to energy savings.



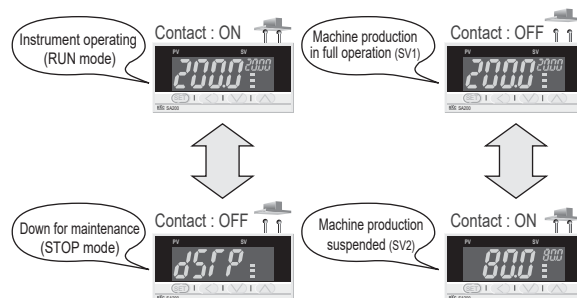
Analog Retransmission Output (Optional)

The output 1 can be configured as an analog retransmission output. With this function, the measured value can be retransmitted as an analog current signal (4-20mA / 0-20mA).



Digital Contact Input for External Switching (Optional)

An optional digital contact input is available for RUN/STOP and SV1/SV2, alarm interlock release switching. (RUN/STOP switching can also be completed at the front key panel.) This function can be used with the output from a timer, PLC, etc. When the communication feature is selected, the external contact input is not available.



Easy Maintenance

The internal assembly of the SA200 can be removed from the front of a control board. It is easy to inspect, maintain or replace the instrument because it does not require access from the back of the panel.





Specifications

Input

Input

- a) Thermocouple : K, J, E, T, R, S, B, N (JIS/IEC), PLII (NBS)
W5Re/W26Re(ASTM), U, L (DIN)
 - Input impedance : Approx. 1MΩ
 - Influence of external resistance : Approx. 0.2μV/Ω
 - Input break action : Up-scale *1
- b) RTD : Pt100(JIS/IEC), JPt100(JIS)
 - Influence of lead resistance : Approx. 0.01[%/Ω] of span
 - Maximum 10Ω per wire
 - Input break action : Up-scale *1
 - Input short action : Down-scale
- c) DC voltage : 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
- d) DC current : 0 to 20mA DC, 4 to 20mA DC
 - For DC current input, connect a 250 Ω resistor to the input terminals.
 - Input break action : Down-scale *1
 - Reading is around zero for 0 to 5V DC input, 0 to 10V DC input and 0 to 20mA DC input.

*1:Both Heat/Cool control outputs are OFF for Heat/Cool PID action.

Sampling Time

0.5 sec. 0.25sec (Selectable)

Input Digital Filter

1 to 100 sec (OFF when 0 is set.)

PV Bias

- span to +span (Within -1999 to 9999)

Performance

Measuring Accuracy

- a) Thermocouple
 - ±(0.3% of reading + 1 digit) or ±2°C (4°F) whichever is larger
 - Accuracy is not guaranteed less than 399°C (0 and 799°F) for type R, S and B.
 - Accuracy is not guaranteed less than -100.0°C (-158.0°F) for type T and U.
- b) RTD
 - ±(0.3% of reading + 1 digit) or ±0.8°C (1.6°F) whichever is larger
- c) DC voltage and DC current
 - ±(0.3% of span + 1 digit)

Insulation Resistance

More than 20MΩ (500V DC) between measured terminals and ground
More than 20MΩ (500V DC) between power terminals and ground

Dielectric Strength

1500V AC for one minute between measured terminals and ground
1500V AC for one minute between power terminals and ground

Control

Control Method

- a) PID control (with autotuning and self-tuning function)
 - Available for reverse and direct action.
 - ON/OFF, P, PI and PD control are also selectable.
- b) Heat/Cool PID control (with autotuning function)
 - Air cooling and water cooling type are available. (Specify when ordering.)

Major Setting Range

Set value : Same as input range.
Heat side proportional band : 1 to span or 0.1 to span
(ON/OFF action when P=0)
Cool side proportional band : 1 to 1000% of heat side proportional band
Integral time : 1 to 3600sec.(PD action when I=0)
Derivative time : 1 to 3600sec.(PI action when D=0)
Anti-Reset Windup(ARW) : 1 to 100% of heat side proportional band
(Integral action is OFF when ARW=0)
Proportional cycle time : 1 to 100 sec.
Deadband/Overlap : -span to +span (Within -1999 to 9999)

Outputs

Output

- Can be set for control or alarm functions.
- Alarm output can be set for energized/de-energized action.
- Alarm output can be set for AND/OR logic calculation.
- Number of outputs : 2 points

Output Type

- Relay contact output : 240V AC, 30V DC 2A (resistive load),
Form A contact
- Voltage pulse output : 0/12V DC (Load resistance : more than 600Ω)
 - Operational Insulation between measurement input terminals and output terminals.
- Current output : 0 to 20mA, 4 to 20mA DC
(Load resistance : less than 400Ω)
 - Operational Insulation between measurement input terminals and output terminals.
 - Available for output 1.

Alarms (Up to 2 points)

(Optional)

Alarm Type

Deviation High, Deviation Low, Deviation High-Low, Deviation Band
Process High, Process Low, Set value High, Set value Low
Loop break alarm(LBA)

Setting Range

- a) Deviation alarm : -span to +span (Within -1999 to 9999)
- b) Process alarm : Same as set value (SV).
- c) Set value alarm : Same as set value (SV).
- d) Loop break alarm : 0.0 to 200.0 min.

Differential Gap

2°C (°F) or 2.0°C (°F) (Temperature input), 0.2% (Voltage, current input)

Contact Input

(Optional)

Number of Inputs : 2 points

Contact Input Type

- a) RUN/STOP switching (OPEN : STOP, CLOSE : RUN)
- b) STEP function (OPEN : SV1, CLOSE : SV2)
- c) Alarm interlock release ON or OFF.

Input Rating

Non-voltage contact input. (OPEN : 500kΩ or more, CLOSE : 10Ω or less)

Analog Retransmission Output (Optional)

Number of Outputs

1 point (Output 1)

Output types

Measured value (PV), Deviation (DEV), Set value (SV),
Manipulated value (MV),
• Selectable

Output Signal

Current output (Output 1)
4 to 20mA DC, 0 to 20mA DC (Load resistance : Less than 400Ω)

Communications

(Optional)

- a) Communication method :Based on RS-485 (2-wire)
- b) Communication speed : 2400, 4800, 9600, 19200, 38400, 57600 BPS
- c) Protocol : ANSI X3.28(1976) 2.5 A4, MODBUS
- d) 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
- e) Maximum connection : 31 (Address can be set from 0 to 99.)

Waterproof/Dustproof

(Optional)

Dustproof and waterproof protection : IP66

- Waterproof/dustproof protection only effective from the front in panel mounted installations.
- Waterproof/dustproof protection is not available when controllers are closely mounted.

General Specifications

Supply Voltage

- a) 85 to 264V AC (Including supply voltage variation)
[Rating : 100 to 240V AC] (50/60Hz common)
- b) 21.6 to 26.4V AC(Including supply voltage variation)
[Rating : 24V AC] (50/60Hz common)
- c) 21.6 to 26.4V DC(Ripple rate 10% p-p or less)
[Rating : 24V DC]

Power Consumption

Less than 4VA (at 100V AC), 7VA (at 240V AC) for standard AC type
Less than 4VA for 24V AC type
Less than 100mA for 24V DC type

Power Failure Effect

A power failure of 20 ms or less will not affect the control action.
If power failure of more than 20 ms occurs, controller will restart.

Operating Environments : -10 to 55°C [14 to 131°F] , 5 to 95% RH

Memory Backup : Backed up by non-volatile memory.

Number of writing : Approx. 100,000 times

Net Weight : Approx. 110g

External Dimensions (W x H x D) : 48 x 24 x 100mm (1/32 DIN)

Compliance with Standards

- UL : UL 61010-1
- cUL : CAN/CSA-C22.2 No.61010-1
- CE Mark
- LVD : EN61010-1, EMC: EN61326-1, RoHS: EN IEC 63000
- RCM : EN55011
- UKCA Mark
- Electrical Safety: EN61010-1, EMC: EN61326-1, RoHS: EN IEC 63000



Temperature Controller SA200



Model and Suffix Code

Specifications	Model and Suffix Code																	
Model	SA200 (1/32 DIN size)																	
Control method	PID control with AT (reverse action)	F																
	PID control with AT (direct action)	D																
	Heat/cool PID control with AT (water cooling)	W																
	Heat/cool PID control with AT (air cooling)	A																
Input and Range	See Range and Input Code Table																	
Output 1 (OUT 1) (Control, alarm or re-transmission output)	Relay contact output																	
	Voltage pulse output																	
	0-20mA output																	
	4-20mA output																	
Output 2 (OUT 2) (Control or alarm output)	No output																	
	Relay contact output																	
	Voltage pulse output																	
Power supply voltage	24V AC/DC																	
	100 to 240V AC																	
Alarm 1	No alarm																	
	See Alarm Code Table																	
Alarm 2	No alarm																	
	See Alarm Code Table																	
Communication Contact input	Not supplied																	
	Digital communications : RS-485 (RKC standard)																	
	Digital communications : RS-485 (MODBUS)																	
	External contact input																	
Waterproof/Dustproof	Not supplied																	
	Waterproof/Dustproof protection																	
Body color	White																	
	Black																	
Output allocation code ¹	Standard output																	
	See Output Allocation Code Table																	
Instrument version	Version symbol																	

¹ When standard output is selected with control method F or D, Out 1 will always be the control output and Out 2 will either be unused, Alarm 1 or OR logic output of Alarm 1 and Alarm 2. Standard output is automatically selected with control method W or A. Out 1 will become heat-side control output and Out 2 will be cool-side control output.

Range and Input Code Table

Thermocouple input (Field-programmable)

Input	Code	Range
K (JIS/IEC)	K : 01	0 – 200°C
	K : 02	0 – 400°C
	K : 03	0 – 600°C
	K : 04	0 – 800°C
	K : 05	0 – 1000°C
	K : 06	0 – 1200°C
	K : 07	0 – 1372°C
	K : 13	0 – 100°C
	K : 14	0 – 300°C
	K : 20	0 – 500°C
	K : 17	0 – 450°C
	K : 08	-199.9 – 300.0°C
	K : 09	0.0 – 400.0°C
	K : 10	0.0 – 800.0°C
	K : 29	0.0 – 200.0°C
	K : 37	0.0 – 600.0°C
	K : 38	-199.9 – 800.0°C
	K : A1	0 – 800°F
	K : A2	0 – 1600°F
	K : A3	0 – 2502°F
	K : A9	20 – 70°F
	K : A4	0.0 – 800.0°F
	K : B2	-199.9 – 999.9°F
J (JIS/IEC)	J : 01	0 – 200°C
	J : 02	0 – 400°C
	J : 03	0 – 600°C
	J : 04	0 – 800°C
	J : 05	0 – 1000°C
	J : 06	0 – 1200°C
	J : 10	0 – 450°C
	J : 07	-199.9 – 300.0°C
	J : 08	0.0 – 400.0°C
	J : 09	0.0 – 800.0°C
	J : 22	0.0 – 200.0°C
	J : 23	0.0 – 600.0°C
	J : 30	-199.9 – 600.0°C
	J : A1	0 – 800°F
	J : A2	0 – 1600°F
	J : A3	0 – 2192°F
	J : A6	0 – 400°F
	J : B6	0.0 – 800.0°F
	J : A9	-199.9 – 999.9°F
¹ R (JIS/IEC)	R : 01	0 – 1600°C
	R : 02	0 – 1769°C
	R : 04	0 – 1350°C
	R : A1	0 – 3200°F
	R : A2	0 – 3216°F

Input	Code	Range
¹ S (JIS/IEC)	S : 01	0 – 1600°C
	S : 02	0 – 1769°C
	S : A1	0 – 3200°F
	S : A2	0 – 3216°F
B (JIS/IEC)	B : 01	400 – 1800°C
	B : 02	0 – 1820°C
	B : A1	800 – 3200°F
	B : A2	0 – 3308°F
E (JIS/IEC)	E : 01	0 – 800°C
	E : 02	0 – 1000°C
	E : A1	0 – 1600°F
	E : A2	0 – 1832°F
N (JIS/IEC)	N : 01	0 – 1200°C
	N : 02	0 – 1300°C
	N : 06	0.0 – 800.0°C
	N : A1	0 – 2300°F
	N : A2	0 – 2372°F
	N : A5	0.0 – 999.9°F
	T : 01	-199.9 – 400.0°C
	T : 02	-199.9 – 100.0°C
	T : 03	-100.0 – 200.0°C
	T : 04	0.0 – 350.0°C
² T (JIS/IEC)	T : A1	-199.9 – 752.0°F
	T : A2	-100.0 – 200.0°F
	T : A3	-100.0 – 400.0°F
	T : A4	0.0 – 450.0°F
	T : A5	0.0 – 752.0°F
	W : 01	0 – 2000°C
	W : 02	0 – 2320°C
	W : A1	0 – 4000°F
	A : 01	0 – 1300°C
	A : 02	0 – 1390°C
PLII (NBS)	A : 03	0 – 1200°C
	A : A1	0 – 2400°F
	A : A2	0 – 2534°F
² U (DIN)	U : 01	-199.9 – 600.0°C
	U : 02	-199.9 – 100.0°C
	U : 03	0.0 – 400.0°C
	U : A1	-199.9 – 999.9°F
	U : A2	-100.0 – 200.0°F
	U : A3	0.0 – 999.9°F
L (DIN)	L : 01	0 – 400°C
	L : 02	0 – 800°C
	L : A1	0 – 800°F
	L : A2	0 – 1600°F

¹ Type R, S and B input : Accuracy is not guaranteed between 0 and 399°C (0 and 799°F).

² Type T and U input : Accuracy is not guaranteed less than -100.0°C (-158.0°F).

³ DC current input : A 250 Ω resistor is externally connected at the input terminals.

RTD input (Field-programmable)

Input	Code	Range
Pt100 (JIS/IEC)	D : 01	-199.9 – 649.0°C
	D : 02	-199.9 – 200.0°C
	D : 03	-100.0 – 50.0°C
	D : 04	-100.0 – 100.0°C
	D : 05	-100.0 – 200.0°C
	D : 06	0.0 – 50.0°C
	D : 07	0.0 – 100.0°C
	D : 08	0.0 – 200.0°C
	D : 09	0.0 – 300.0°C
	D : 10	0.0 – 500.0°C
	D : A1	-199.9 – 999.9°F
	D : A2	-199.9 – 400.0°F
	D : A3	-199.9 – 200.0°F
	D : A4	-100.0 – 100.0°F
	D : A5	-100.0 – 300.0°F
	D : A6	0.0 – 100.0°F
	D : A7	0.0 – 200.0°F
	D : A8	0.0 – 400.0°F
	D : A9	0.0 – 500.0°F
JPt100 (JIS)	P : 01	-199.9 – 649.0°C
	P : 02	-199.9 – 200.0°C
	P : 03	-100.0 – 50.0°C
	P : 04	-100.0 – 100.0°C
	P : 05	-100.0 – 200.0°C
	P : 06	0.0 – 50.0°C
	P : 07	0.0 – 100.0°C
	P : 08	0.0 – 200.0°C
	P : 09	0.0 – 300.0°C
	P : 10	0.0 – 500.0°C

Voltage/Current DC input ³(Field-programmable)

Input	Code	Range
0 to 5V	4 : 01	0.0 – 100.0%
0 to 10V	5 : 01	0.0 – 100.0%
1 to 5V	6 : 01	0.0 – 100.0%
0 to 20mA	7 : 01	0.0 – 100.0%
4 to 20mA	8 : 01	0.0 – 100.0%

Model and Suffix Code

Alarm Code Table

A	Deviation High	B	Deviation Low	C	Deviation High/Low	D	Deviation Band
E	Deviation High with Hold	F	Deviation Low with Hold	G	Deviation High/Low with Hold	H	Process High
J	Process Low	K	Process High with Hold	L	Process Low with Hold	R	Loop break alarm ¹
V	Set value High	W	Set value Low				

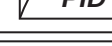
¹ Loop break alarm is not available with Heat/Cool PID control type. Loop break alarm is not available with Alarm 2.

Output Allocation Code Table

Code	Specifications		
	Control methods	Output 1	Output 2
0 3	PID control + Alarm 1	Control output	Alarm 1 output (De-energized)
0 4	PID control + Alarm 1, 2	Control output	AND logic output of Alarm 1 and Alarm 2 (Energized)
0 5	PID control + Alarm 1, 2	Control output	OR logic output of Alarm 1 and Alarm 2 (De-energized)
0 6	PID control + Alarm 1, 2	Control output	AND logic output of Alarm 1 and Alarm 2 (De-energized)
0 7	PID control + Alarm 1, 2 or only Alarm 1 ¹	Control output	No output
0 8	PID control + Alarm 1, 2	1 Control output	Only Alarm 1 output (Energized)
0 9	Alarm 1 + Alarm 2	2 Alarm 1 output (Energized)	Alarm 2 output (Energized)
1 0	Alarm 1 + Alarm 2	2 Alarm 1 output (Energized)	Alarm 2 output (De-energized)
1 1	Alarm 1 + Alarm 2	2 Alarm 1 output (De-energized)	Alarm 2 output (De-energized)
1 2	Retransmission + PID control	Retransmission output	Control output
1 3	Retransmission + Alarm 1, 2	Retransmission output	OR logic output of Alarm 1 and Alarm 2 (Energized)
1 4	Retransmission + Alarm 1, 2	Retransmission output	OR logic output of Alarm 1 and Alarm 2 (De-energized)
1 5	Retransmission + Alarm 1, 2	Retransmission output	AND logic output of Alarm 1 and Alarm 2 (Energized)
1 6	Retransmission + Alarm 1, 2	Retransmission output	AND logic output of Alarm 1 and Alarm 2 (De-energized)
1 7	Retransmission + Alarm 1	Retransmission output	Alarm 1 output (Energized)
1 8	Retransmission + Alarm 1	Retransmission output	Alarm 1 output (De-energized)
1 9	Heat-Cool PID control	Cool output (DC current output)	Heat output (Relay contact or Voltage pulse output)

¹ The alarm monitor can only be confirmed by front LCD display or serial communication.

² Specify control action F to use both outputs as alarms.

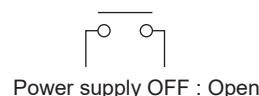
Standard Output 1 ☐ OUT1  PID Output 2 No alarm	Standard Output 1 ☐ OUT1  PID Output 2 Energized alarm ☐ ALM1   Alarm ON Alarm OFF	Standard Output 1 ☐ OUT1  PID Output 2 Energized alarm ☐ ALM1 ☐ ALM2   "OR" logic Alarm ON Alarm OFF	Standard Output 1 ☐ OUT1  Heat-side PID Output 2 Cool-side ☐ OUT2  PID	Code 0 3 Output 1 ☐ OUT1  PID Output 2 De-energized alarm ☐ ALM1   Alarm ON Alarm OFF
Code 0 4 Output 1 ☐ OUT1  PID Output 2 Energized alarm ☐ ALM1 ☐ ALM2   "AND" logic Alarm ON Alarm OFF	Code 0 5 Output 1 ☐ OUT1  PID Output 2 De-energized alarm ☐ ALM1 ☐ ALM2   "OR" logic Alarm ON Alarm OFF	Code 0 6 Output 1 ☐ OUT1  PID Output 2 De-energized alarm ☐ ALM1 ☐ ALM2   "AND" logic Alarm ON Alarm OFF	Code 0 7 Output 1 ☐ OUT1  PID Output 2 Only display ☐ ALM1	Code 0 7 Output 1 ☐ OUT1  PID Output 2 Only display ☐ ALM1 ☐ ALM2
Code 0 8 Output 1 ☐ OUT1  PID Output 2 Energized alarm ☐ ALM1 ☐ ALM2   Output alarm 1 only Alarm ON Alarm OFF	Code 0 9 Output 1 Energized alarm ☐ ALM1   Alarm ON Alarm OFF Output 2 Energized alarm ☐ ALM2   Alarm ON Alarm OFF	Code 1 0 Output 1 Energized alarm ☐ ALM1   Alarm ON Alarm OFF Output 2 De-energized alarm ☐ ALM2   Alarm ON Alarm OFF	Code 1 1 Output 1 De-energized alarm ☐ ALM1   Alarm ON Alarm OFF Output 2 De-energized alarm ☐ ALM2   Alarm ON Alarm OFF	Code 1 2 Output 1  Retransmission Output 2 ☐ OUT2  PID
Code 1 3 Output 1  Retransmission Output 2 Energized alarm ☐ ALM1 ☐ ALM2   "OR" logic Alarm ON Alarm OFF	Code 1 4 Output 1  Retransmission Output 2 De-energized alarm ☐ ALM1 ☐ ALM2   "OR" logic Alarm ON Alarm OFF	Code 1 5 Output 1  Retransmission Output 2 Energized alarm ☐ ALM1 ☐ ALM2   "AND" logic Alarm ON Alarm OFF	Code 1 6 Output 1  Retransmission Output 2 De-energized alarm ☐ ALM1 ☐ ALM2   "AND" logic Alarm ON Alarm OFF	Code 1 7 Output 1  Retransmission Output 2 Energized alarm ☐ ALM1   Alarm ON Alarm OFF
Code 1 8 Output 1  Retransmission Output 2 De-energized alarm ☐ ALM1   Alarm ON Alarm OFF	Code 1 9 Output 1 ☐ OUT1  Cool-side PID Output 2 Heat-side ☐ OUT2  PID			

Note: Relay contact output : 250V AC 2A (resistive load), Form A contact



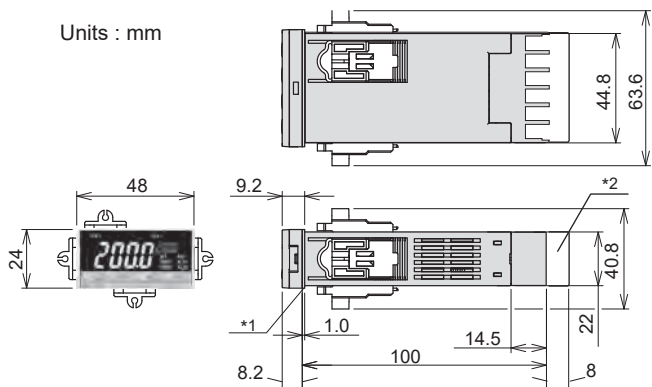
Power supply OFF : Open

Note: Relay contact output : 250V AC 2A (resistive load), Form A contact


Accessories

Name	Model code
Shunt resistor for DC current input	KD100-55
Terminal cover	KSA200-56A

External Dimensions and Rear Terminals



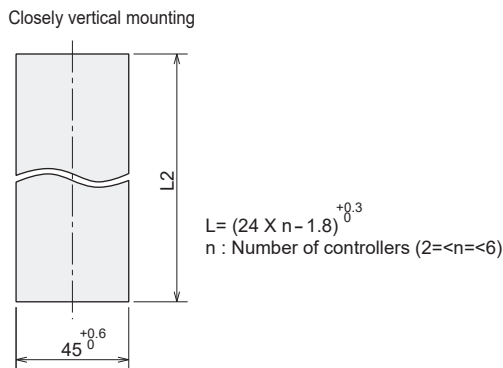
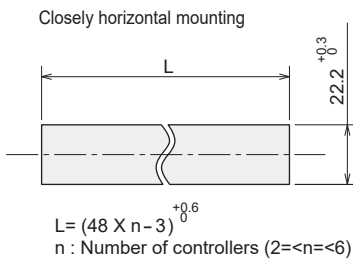
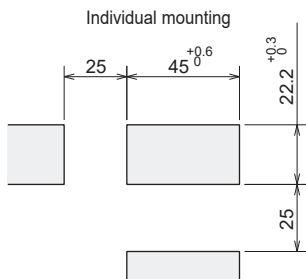
*1 For Waterproof/Dustproof models, a rubber gasket is added.

*2 Terminal cover is optional.

For mounting of the SA200, panel thickness must be between 1-10 mm. When mounting multiple SA200s close together, the panel strength should be checked to ensure proper support.

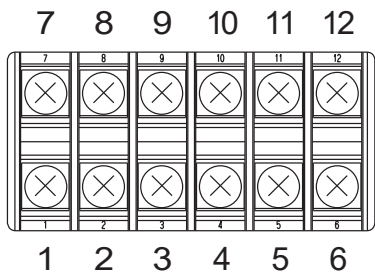
Two mounting brackets will be furnished for installation of the instrument at either the top and bottom or sides.

Close vertically and horizontally mounted instruments cannot be combined in one installation.



Warning

If the SA200s have waterproof/dustproof option, protection may be compromised by close mounting. Close vertical mounting is not available when a shunt resistor for current input is used.



No.	1	2	3	4	5	6
Contents	100 to 240V AC	24V AC/DC	Voltage pulse	Voltage pulse	Voltage pulse	Voltage pulse
			Relay contact	Relay contact	Relay contact	Relay contact
	Power supply		Output 1	Output 2		

No.	7	8	9	10	11	12
Contents	① Thermocouple	② RTD	③ Voltage / Current *	SG	T/R(A)	T/R(B)
				RS-485		
				DI1	DI2	
	Measured input			Communications / Contact inputs		

*A 250Ω resistor is externally connected at the input terminals.

e-con type Controller

SA220



(easy and economy connector)



SA100



General Description

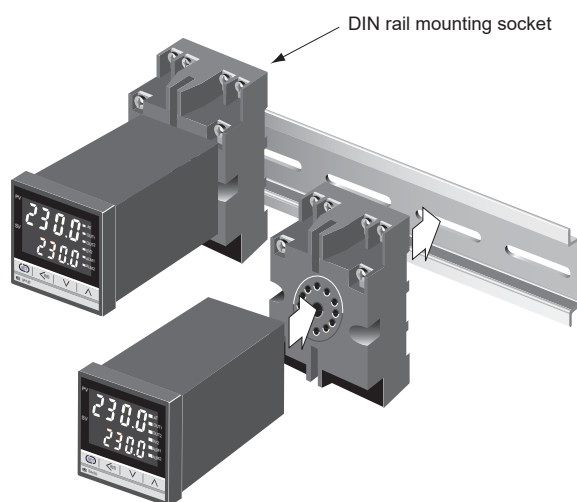
The SA100 is a socket mounting type temperature controller and is available for mounting inside the panel or by easily mounting on DIN rail. The SA100 has features such as analog retransmission output, advanced self-tuning, alarms, digital communications for networking and digital contact for SV1/SV2 or RUN/STOP functions..

Features

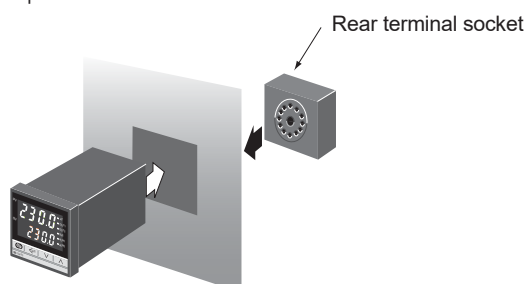
- ☆ Simple mounting on DIN Rail
- ☆ Corresponding to various applications
- ☆ Analog retransmission output
- ☆ Digital communications
- ☆ Advanced self-tuning

Simple Mounting on DIN Rail

The SA100 can be simply mounted on a DIN rail with DIN rail mounting socket. The maintenance is also simple, as the unit can be removed from socket.



- The rear terminal socket allows the unit to be mounted on a panel board.



Corresponding to Various Applications

Two points of output can be used as control, alarm or analog retransmission. The SA100 corresponds to various applications such as temperature controller and overheat protection unit.

- As a temperature controller

1. Temperature alarm controller

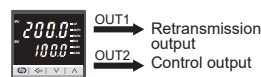


- As a overheat protection unit or alarm unit

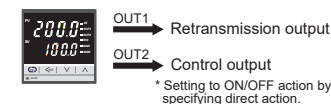
1. Overheat protection unit



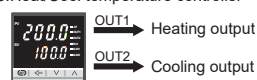
2. Temperature retransmitting controller



2. Overheat protection unit with transmitting function



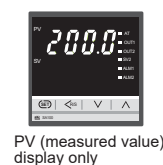
3. Heat/Cool temperature controller



3. Alarm unit



- The change of display for PV/SV can be configurable. For the details of it, contact our sales office.



PV (measured value) display only



SV (set value) display only

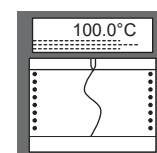
The SV is displayed on PV display. Parameters are displayed on SV display.

Analog Retransmission Output (Optional)

An analog output is available so that the process value can be retransmitted an analog signal to a remote instrument such as a recorder or data-logging equipment.



Analog output
4 to 20 mA DC or
0 to 20 mA DC



Temperature Controller SA100

Features

Alarms (Optional)

Two alarm points can be configured for specific applications.

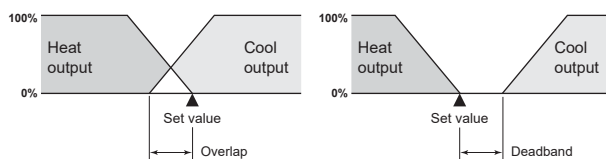
Alarm Type

- Temperature Alarm
Deviation High, Deviation Low, Deviation High/Low, Band, Process High, Process Low
(Hold action can be added to deviation and process type)
- Set Value Alarm
High, Low
- Loop Break Alarm

Temperature Alarm		Δ : SV	$\blacktriangle$: Alarm
Deviation High	(Alarm Set Value is a positive (+) setting)		
Deviation Low	(Alarm Set Value is a negative (-) setting)		
Deviation High/Low	(Alarm Set Value is the absolute deviation value)		
Band	(Alarm Set Value is the absolute deviation value)		
Process High			
Process Low			
Set Value Alarm		Δ : SV	
Set Value High			
Set Value Low			

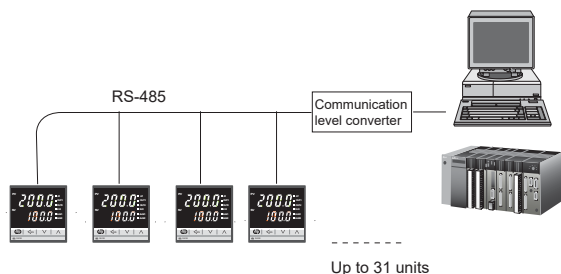
Heat/Cool Control (Optional)

The Heat/Cool PID control features heat and cool outputs for use where process-generated heat exists. This allows the input of overlap or deadband settings which contribute to energy savings.



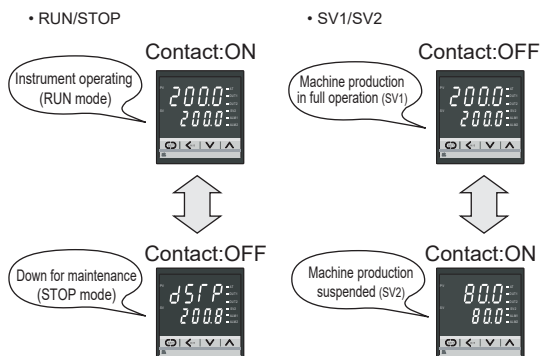
Digital Communications (Optional)

The SA100 offers an optional RS-485 communications interface for networking to computers, PLCs and SCADA software. MODBUS or ANSI protocol can be selected. Up to 32 units, including host computer, can be multi-dropped on one RS-485 communication line. When the communication feature is selected, the external contact input is not available.



Digital Contact Input for External Switching (Optional)

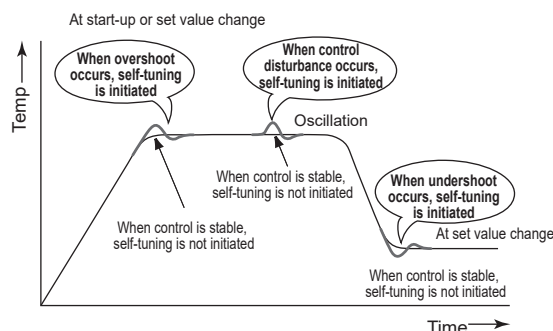
An optional digital contact input is available for RUN/STOP and SV1/SV2, alarm interlock release switching. (RUN/STOP switching can also be completed at the front key panel.) This function can be used with the output from a timer, PLC, etc. When the communication feature is selected, the external contact input is not available.



Self-Tuning Algorithm

The SA100 offers a new self-tuning feature that is initiated at start-up and when process parameters or conditions change. In these situations, the controller evaluates whether the preset PID parameters should be maintained or replaced by the latest self-tuning parameters to achieve the best control for the process. Self-tuning can be manually turned ON/OFF in the parameter setting mode. This feature is not available with the Heat/Cool control.

In addition to self-tuning, the SA100 has standard autotuning (AT) so that either function can be selected to achieve optimum process control.





Specifications

Input

Input

- a) Thermocouple : K, J, E, T, R, S, B, N (JIS/IEC), PLII (NBS) W5Re/W26Re(ASTM), U, L (DIN)
 - Input impedance : Approx. 1MΩ
 - Influence of external resistance : Approx. 0.2μV/Ω
 - Input break action : Up-scale
- b) RTD : Pt100(JIS/IEC), JPt100(JIS)
 - Influence of lead resistance : Approx. 0.01[%/Ω] of reading
 - Maximum 10Ω per wire
 - Input break action : Up-scale
 - Input short action : Down-scale
- c) DC voltage : 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
- d) DC current : 0 to 20mA DC, 4 to 20mA DC
 - For DC current input, connect a 250 Ω resistor to the input terminals.
 - Refer to the Input and Range and Input Code Table for details.
 - Input break action : Down-scale
 - Both Heat/Cool control outputs are OFF for Heat/Cool PID action.
 - Reading is around zero for 0 to 5V DC input, 0 to 10V DC input and 0 to 20mA DC input.

Sampling Time

0.5 sec. 0.25 sec (Selectable)

PV Bias

- span to +span (Within -1999 to 9999)

PV Ratio

0.500 to 1.500

Input Digital Filter

1 to 100 sec (OFF when 0 is set.)

Performance

Measuring Accuracy

- a) Thermocouple
 - ±(1% of reading + 1 digit) or ±2°C (4°F) whichever is larger
 - Accuracy is not guaranteed between 0 and 399°C (0 and 799°F) for type R, S and B.
 - Accuracy is not guaranteed less than -100.0°C (-158.0°F) for type T and U.
- b) RTD
 - ±(0.3% of reading + 1 digit) or ±0.8°C (1.6°F) whichever is larger
- c) DC voltage and DC current
 - ±(0.3% of span + 1 digit)

Insulation Resistance

More than 20MΩ (500V DC) between measured terminals and ground
More than 20MΩ (500V DC) between power terminals and ground

Dielectric Strength

1500V AC for one minute between measured terminals and ground
1500V AC for one minute between power terminals and ground

Control

Control Method

- a) PID control (with autotuning and self-tuning function)
 - Available for reverse and direct action. (Specify when ordering.)
 - ON/OFF, P, PI and PD control are also selectable.
 - ON/OFF action differential gap : 0 (0.0) to span
- b) Heat/Cool PID control (with autotuning function)
 - Air cooling and water cooling type are available. (Specify when ordering.)

Major Setting Range

Set value : Same as input range.
Heat side proportional band : 1 to span or 0.1 to span
(ON/OFF action when P=0)
Cool side proportional band : 0 to 1000% of heat side proportional band
Integral time : 0 to 3600sec. (PD action when I=0)
Derivative time : 0 to 3600sec. (PI action when D=0)
Anti-Reset Windup (ARW) : 1 to 100% of heat side proportional band
(Integral action is OFF when ARW=0)
Proportional cycle time : 1 to 100 sec.
Deadband/Overlap : -span to +span (Within -1999 to 9999)

Outputs

Output

- Can be set for control, alarm or retransmission functions.
- Alarm output can be set for energized/de-energized action.
- Alarm output can be set for AND/OR logic calculation.

Number of outputs : 2 points

Output Type

Relay contact output : 240V AC 3A, 30V DC 1A (resistive load)
Form C contact
Voltage pulse output : 0/12V DC (Load resistance : more than 600Ω)
• Measurement terminals and output terminal are not isolated.
Current output : 0 to 20mA, 4 to 20mA DC
(Load resistance : less than 400Ω)
• Measurement terminals and output terminal are not isolated.

Alarms (Up to 2 points)

(Optional)

Alarm Type

Deviation High, Deviation Low, Deviation High-Low, Deviation Band
Process High, Process Low, Set value High, Set value Low
Loop break alarm (LBA)

Setting Range

- a) Deviation alarm : -span to +span (Within -1999 to 9999)
- b) Process alarm : Same as set value (SV).
- c) Set value alarm : Same as set value (SV).
- d) Loop break alarm : 0.0 to 200.0 min.

Differential Gap

0 (0.0) to span

Contact Input

(Optional)

Number of Inputs : 2 points

Contact Input Type

- a) RUN/STOP switching (OPEN : STOP, CLOSE : RUN)
- b) STEP function (OPEN : SV1, CLOSE : SV2)
- c) Alarm interlock release ON or OFF.

Input Rating

Non-voltage contact input. (OPEN : 500kΩ or more, CLOSE : 10Ω or less)

Communications

(Optional)

- a) Communication method : Based on RS-485 (2-wire)
- b) Communication speed : 2400, 4800, 9600, 19200, 38400, 57600 bps
- c) Protocol : ANSI X3.28(1976) 2.5 A4 MODBUS
- d) 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
- e) Communication code : ASCII(JIS) 7-bit code
- f) Maximum connection : 31 (Address can be set from 0 to 99.)

Retransmission Output

(Optional)

Retransmission output is allocated to OUT1.

- a) Type : Process value, Set value, Deviation, Manipulated value
- b) Output type : 0 to 20mA DC, 4 to 20mA DC
(Load resistance : less than 400Ω)
- c) Output resolution : More than 10bits
• Measurement terminals and output terminal are not isolated.

Waterproof/Dustproof

(Optional)

Dustproof and waterproof protection : IP66

- Waterproof/dustproof protection only effective from the front in panel mounted installations.

General Specifications

Supply Voltage

- a) 85 to 264V AC (Including supply voltage variation)
[Rating : 100 to 240V AC] (50/60Hz common)
- b) 21.6 to 26.4V AC (Including supply voltage variation)
[Rating : 24V AC] (50/60Hz common)
- c) 21.6 to 26.4V DC (Ripple rate 10% p-p or less)
[Rating : 24V DC]

Power Consumption

Less than 4VA (at 100V AC), 7VA (at 240V AC) for standard AC type
Less than 4VA for 24V AC type
Less than 100mA for 24V DC type

Power Failure Effect

A power failure of 20 ms or less will not affect the control action.
If power failure of more than 20 ms occurs, controller will restart.

Operating Environments : 0 to 50°C [32 to 122°F], 45 to 85% RH

Memory Backup : Backed up by non-volatile memory.

Number of writing : Approx. 100,000 times

Net Weight : Approx. 110g

External Dimensions (W x H x D) : 48 x 48 x 70mm (1/16 DIN)

Compliance with Standards

- CE Mark
- UL/cUL Recognized
- C-Tick Mark
- UKCA Mark



Temperature Controller SA100



Model and Suffix Code

Specifications	Model and Suffix Code																	
Model	SA100 (1/16 DIN size, socket mounting type)																	
Control method	PID control with AT (reverse action)	F																
	PID control with AT (direct action)	D																
	Heat/cool PID control with AT (water cooling)	W																
	Heat/cool PID control with AT (air cooling)	A																
Input and Range	See Range and Input Code Table																	
OUT 1 (Control, alarm or retransmission output)	Relay contact output																	
	Voltage pulse output																	
	DC current output : 0 to 20mA																	
	DC current output : 4 to 20mA																	
OUT 2 (Control or alarm output)	No output																	
	Relay contact output																	
	Voltage pulse output																	
Power supply voltage	24V AC/DC																	
	100 to 240V AC																	
Alarm 1	No alarm																	
	See Alarm Code Table																	
Alarm 2	No alarm																	
	See Alarm Code Table																	
Communication Contact input	Not supplied																	
	Digital communications : RS-485 (RKC standard)																	
	Digital communications : RS-485 (MODBUS)																	
	External contact input																	
Waterproof/Dustproof	Not supplied																	
	Waterproof/Dustproof protection																	
Output allocation code ¹	Standard output																	
	See Output Allocation Code Table																	
Instrument version	Version symbol																	

¹ When standard output is selected with control method F or D, Out 1 will always be the control output and Out 2 will either be unused, Alarm 1 or OR logic output of Alarm 1 and Alarm 2. Standard output is automatically selected with control method W or A. Out 1 will become heat-side control output and Out 2 will be cool-side control output.

Range and Input Code Table

Thermocouple input (Field-programmable)

Input	Code	Range
K (JIS/IEC)	K : 01	0 to 200°C
	K : 02	0 to 400°C
	K : 03	0 to 600°C
	K : 04	0 to 800°C
	K : 05	0 to 1000°C
	K : 06	0 to 1200°C
	K : 07	0 to 1372°C
	K : 13	0 to 100°C
	K : 14	0 to 300°C
	K : 20	0 to 500°C
	K : 17	0 to 450°C
	K : 08	-199.9 to 300.0°C
	K : 09	0.0 to 400.0°C
	K : 10	0.0 to 800.0°C
	K : 29	0.0 to 200.0°C
	K : 37	0.0 to 600.0°C
	K : 38	-199.9 to 800.0°C
	K : A1	0 to 800°F
	K : A2	0 to 1600°F
	K : A3	0 to 2502°F
J (JIS/IEC)	J : 01	0 to 200°C
	J : 02	0 to 400°C
	J : 03	0 to 600°C
	J : 04	0 to 800°C
	J : 05	0 to 1000°C
	J : 06	0 to 1200°C
	J : 10	0 to 450°C
	J : 07	-199.9 to 300.0°C
	J : 08	0.0 to 400.0°C
	J : 09	0.0 to 800.0°C
	J : 22	0.0 to 200.0°C
	J : 23	0.0 to 600.0°C
	J : 30	-199.9 to 600.0°C
	J : A1	0 to 800°F
	J : A2	0 to 1600°F
	J : A3	0 to 2192°F
R (JIS/IEC)	R : 01	0 to 1600°C
	R : 02	0 to 1769°C
	R : 04	0 to 1350°C
	R : A1	0 to 3200°F
	R : A2	0 to 3216°F

Input	Code	Range
S (JIS/IEC)	S : 01	0 to 1600°C
	S : 02	0 to 1769°C
	S : A1	0 to 3200°F
	S : A2	0 to 3216°F
B (JIS/IEC)	B : 01	400 to 1800°C
	B : 02	0 to 1820°C
	B : A1	800 to 3200°F
	B : A2	0 to 3308°F
E (JIS/IEC)	E : 01	0 to 800°C
	E : 02	0 to 1000°C
	E : A1	0 to 1600°F
	E : A2	0 to 1832°F
N (JIS/IEC)	N : 01	0 to 1200°C
	N : 02	0 to 1300°C
	N : 06	0.0 to 800.0°C
	N : A1	0 to 2300°F
	N : A2	0 to 2372°F
T (JIS/IEC)	T : 01	-199.9 to 400.0°C
	T : 02	-199.9 to 100.0°C
	T : 03	-100.0 to 200.0°C
	T : 04	0.0 to 350.0°C
	T : A1	-199.9 to 752.0°F
W5Re/W26Re (ASTM)	W : 01	0 to 2000°C
	W : 02	0 to 2320°C
	W : A1	0 to 4000°F
PLII (NBS)	A : 01	0 to 1300°C
	A : 02	0 to 1390°C
	A : 03	0 to 1200°C
	A : A1	0 to 2400°F
	A : A2	0 to 2534°F
U (DIN)	U : 01	-199.9 to 600.0°C
	U : 02	-199.9 to 100.0°C
	U : 03	0.0 to 400.0°C
	U : A1	-199.9 to 999.9°F
	U : A2	-100.0 to 200.0°F
L (DIN)	L : 01	0 to 400°C
	L : 02	0 to 800°C
	L : A1	0 to 800°F
	L : A2	0 to 1600°F

¹ Type R, S and B input : Accuracy is not guaranteed between 0 and 399°C (0 and 799°F).

² Type T and U input : Accuracy is not guaranteed less than -100.0°C (-158.0°F).

³ DC current input : A 250 Ω resistor is externally connected at the input terminals.

RTD input (Field-programmable)

Input	Code	Range
Pt100 (JIS/IEC)	D : 01	-199.9 to 649.0°C
	D : 02	-199.9 to 200.0°C
	D : 03	-100.0 to 50.0°C
	D : 04	-100.0 to 100.0°C
	D : 05	-100.0 to 200.0°C
	D : 06	0.0 to 50.0°C
	D : 07	0.0 to 100.0°C
	D : 08	0.0 to 200.0°C
	D : 09	0.0 to 300.0°C
	D : 10	0.0 to 500.0°C
JPt100 (JIS)	D : A1	-199.9 to 999.9°F
	D : A2	-199.9 to 400.0°F
	D : A3	-199.9 to 200.0°F
	D : A4	-100.0 to 100.0°F
	D : A5	-100.0 to 300.0°F
	D : A6	0.0 to 100.0°F
	D : A7	0.0 to 200.0°F
	D : A8	0.0 to 400.0°F
	D : A9	0.0 to 500.0°F
	P : 01	-199.9 to 649.0°C
	P : 02	-199.9 to 200.0°C
	P : 03	-100.0 to 50.0°C
	P : 04	-100.0 to 100.0°C
	P : 05	-100.0 to 200.0°C
	P : 06	0.0 to 50.0°C
	P : 07	0.0 to 100.0°C
	P : 08	0.0 to 200.0°C
	P : 09	0.0 to 300.0°C
	P : 10	0.0 to 500.0°C

Voltage/Current DC input ³ (Field-programmable)

Input	Code	Range
0 to 5V	4 : 01	0.0 to 100.0%
0 to 10V	5 : 01	0.0 to 100.0%
1 to 5V	6 : 01	0.0 to 100.0%
0 to 20mA	7 : 01	0.0 to 100.0%
4 to 20mA	8 : 01	0.0 to 100.0%



Model and Suffix Code

Alarm Code Table

A	Deviation High	B	Deviation Low	C	Deviation High/Low	D	Deviation Band
E	Deviation High with Hold	F	Deviation Low with Hold	G	Deviation High/Low with Hold	H	Process High
J	Process Low	K	Process High with Hold	L	Process Low with Hold	R	Loop break alarm ¹
V	Set value High	W	Set value Low				

¹ Loop break alarm is not available with Heat/Cool PID control type. Loop break alarm is not available with Alarm 2.

Output Allocation Code Table

Code	Specifications		
	Control methods	Output 1	Output 2
0 3	PID control + Alarm 1	Control output	Alarm 1 output (De-energized)
0 4	PID control + Alarm 1, 2	Control output	AND logic output of Alarm 1 and Alarm 2 (Energized)
0 5	PID control + Alarm 1, 2	Control output	OR logic output of Alarm 1 and Alarm 2 (De-energized)
0 6	PID control + Alarm 1, 2	Control output	AND logic output of Alarm 1 and Alarm 2 (De-energized)
0 7	PID control + Alarm 1, 2 or only Alarm 1 ¹	Control output	No output
0 8	PID control + Alarm 1, 2	1 Control output	Only Alarm 1 output (Energized)
0 9	Alarm 1 + Alarm 2	2 Alarm 1 output (Energized)	Alarm 2 output (Energized)
1 0	Alarm 1 + Alarm 2	2 Alarm 1 output (Energized)	Alarm 2 output (De-energized)
1 1	Alarm 1 + Alarm 2	2 Alarm 1 output (De-energized)	Alarm 2 output (De-energized)
1 2	Retransmission + PID control	Retransmission output	Control output
1 3	Retransmission + Alarm 1, 2	Retransmission output	OR logic output of Alarm 1 and Alarm 2 (Energized)
1 4	Retransmission + Alarm 1, 2	Retransmission output	OR logic output of Alarm 1 and Alarm 2 (De-energized)
1 5	Retransmission + Alarm 1, 2	Retransmission output	AND logic output of Alarm 1 and Alarm 2 (Energized)
1 6	Retransmission + Alarm 1, 2	Retransmission output	AND logic output of Alarm 1 and Alarm 2 (De-energized)
1 7	Retransmission + Alarm 1	Retransmission output	Alarm 1 output (Energized)
1 8	Retransmission + Alarm 1	Retransmission output	Alarm 1 output (De-energized)
1 9	Heat-Cool PID control	Cool output (DC current output)	Heat output (Relay contact or Voltage pulse output)

¹ The alarm monitor can only be confirmed by front LCD display or serial communication.

² Specify control action F to use both outputs as alarms.

Standard Output 1 ☐ OUT1 Output 2 No alarm	Standard Output 1 ☐ OUT1 Output 2 Energized alarm ☐ ALM1 Alarm ON Alarm OFF	Standard Output 1 ☐ OUT1 Output 2 Energized alarm ☐ ALM1 ☐ ALM2 "OR" logic Alarm ON Alarm OFF	Standard Output 1 ☐ OUT1 Output 2 Cool-side ☐ OUT2 ☐ ALM1 ☐ ALM2 "AND" logic Alarm ON Alarm OFF	Code 0 3 Output 1 ☐ OUT1 Output 2 De-energized alarm ☐ ALM1 ☐ ALM2 Alarm ON Alarm OFF
Code 0 4 Output 1 ☐ OUT1 Output 2 Energized alarm ☐ ALM1 ☐ ALM2 "AND" logic Alarm ON Alarm OFF	Code 0 5 Output 1 ☐ OUT1 Output 2 De-energized alarm ☐ ALM1 ☐ ALM2 "OR" logic Alarm ON Alarm OFF	Code 0 6 Output 1 ☐ OUT1 Output 2 De-energized alarm ☐ ALM1 ☐ ALM2 "AND" logic Alarm ON Alarm OFF	Code 0 7 Output 1 ☐ OUT1 Output 2 Only display ☐ ALM1 ☐ ALM2 Alarm ON Alarm OFF	Code 0 7 Output 1 ☐ OUT1 Output 2 Only display ☐ ALM1 ☐ ALM2 Alarm ON Alarm OFF
Code 0 8 Output 1 ☐ OUT1 Output 2 Energized alarm ☐ ALM1 ☐ ALM2 Output alarm 1 only Alarm ON Alarm OFF	Code 0 9 Output 1 Energized alarm ☐ ALM1 Alarm ON Alarm OFF Output 2 Energized alarm ☐ ALM2 Alarm ON Alarm OFF	Code 1 0 Output 1 Energized alarm ☐ ALM1 Alarm ON Alarm OFF Output 2 De-energized alarm ☐ ALM2 Alarm ON Alarm OFF	Code 1 1 Output 1 De-energized alarm ☐ ALM1 Alarm ON Alarm OFF Output 2 De-energized alarm ☐ ALM2 Alarm ON Alarm OFF	Code 1 2 Output 1 Retransmission ☐ OUT1 Output 2 ☐ OUT2 ☐ ALM1 ☐ ALM2 Alarm ON Alarm OFF
Code 1 3 Output 1 Retransmission ☐ OUT1 Output 2 Energized alarm ☐ ALM1 ☐ ALM2 "OR" logic Alarm ON Alarm OFF	Code 1 4 Output 1 Retransmission ☐ OUT1 Output 2 De-energized alarm ☐ ALM1 ☐ ALM2 "OR" logic Alarm ON Alarm OFF	Code 1 5 Output 1 Retransmission ☐ OUT1 Output 2 Energized alarm ☐ ALM1 ☐ ALM2 "AND" logic Alarm ON Alarm OFF	Code 1 6 Output 1 Retransmission ☐ OUT1 Output 2 De-energized alarm ☐ ALM1 ☐ ALM2 "AND" logic Alarm ON Alarm OFF	Code 1 7 Output 1 Retransmission ☐ OUT1 Output 2 Energized alarm ☐ ALM1 ☐ ALM2 Alarm ON Alarm OFF
Code 1 8 Output 1 Retransmission ☐ OUT1 Output 2 De-energized alarm ☐ ALM1 Alarm ON Alarm OFF	Code 1 9 Output 1 Cool-side ☐ OUT1 Output 2 Heat-side ☐ OUT2 ☐ ALM1 ☐ ALM2 Alarm ON Alarm OFF	Note: Relay contact output : 250V AC 2A (resistive load), Form A contact Power supply OFF : Open		

Accessories

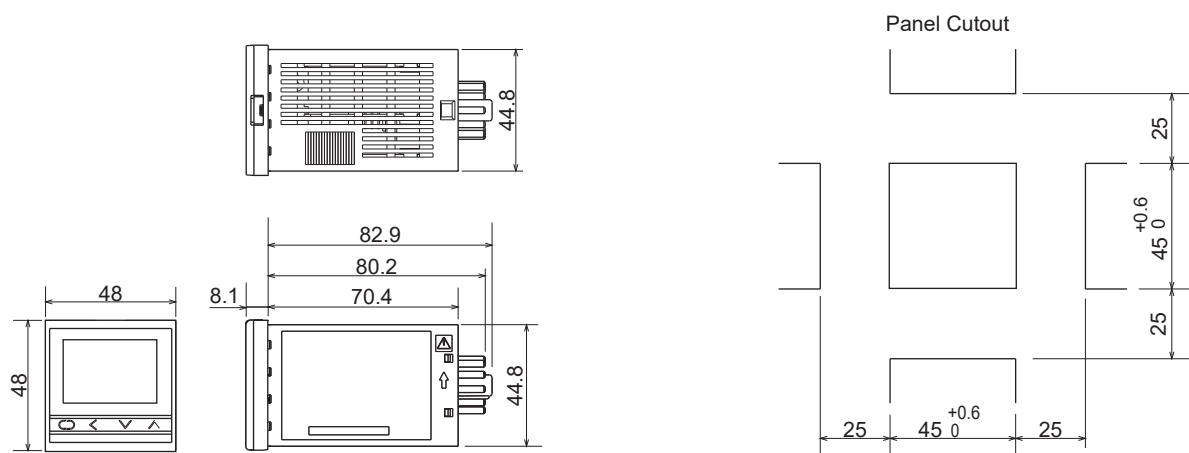
Name	Model code
Shunt resistor for DC current input	KD100-55
A panel-mounting frame	KCA100-526
Socket (FUJI ELECTRIC product)	
Name	Model code
DIN rail mounting socket	TP411X
Rear terminal socket	TP411SBA

Communication cable with connector

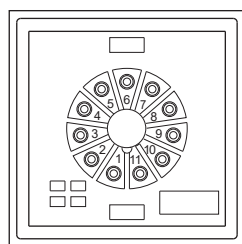
Name	Model code
With terminating resistor and no connector on open end. (Length : 1m)	W-BO-01-1000
Without terminating resistor and no connector on open end. (Length : 1m)	W-BO-02-1000
Contact input cable with connector	
Name	Model code
No connector on open end. (Length : 1m)	W-BO-03-1000

External Dimensions and Rear Layout

Units : mm



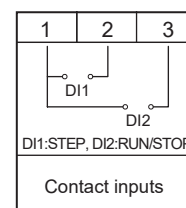
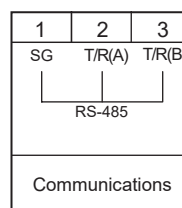
- Panel thickness must be between 1-10mm.
- Mounting frame (Model code : KCA100-526) is optional.



PIN	1	2	3	4	5	6	7	8	9	10	11
Contents											
	① Thermocouple ② RTD ③ Voltage / Current *			① Relay contact ② Voltage pulse ③ DC Current			① Relay contact ② Voltage pulse			100 to 240V AC 24V AC/DC	
	Measured input			Output 1			Output 2			Power supply	

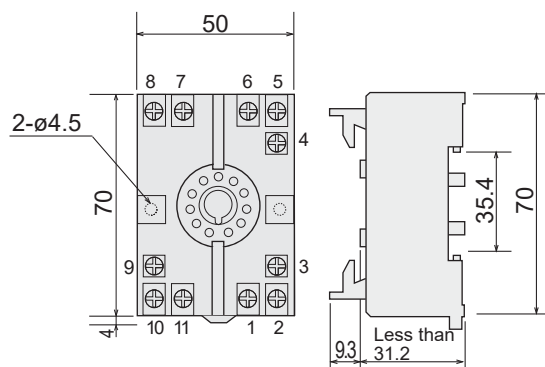
*A 250Ω resistor is externally connected at the input terminals.

Communication function and contact input are optional.
 Connect connector to bottom of instrument.
 A connector and connector cable for connecting the input block is necessary to be prepared by the customer.
 Housing: XHP-3 (J.S.T. Mfg. Co., Ltd. product)
 Recommended cable size: AWG30 to 22
 Optional cable with connector is available.
 For Communication
 1. With terminating resistor and no connector on open end. (Length : 1m)
 Model : W-BO-01-1000
 2. Without terminating resistor and no connector on open end. (Length : 1m)
 Model : W-BO-02-1000
 For Contact input
 No connector on open end. (Length : 1m)
 Model : W-BO-03-1000

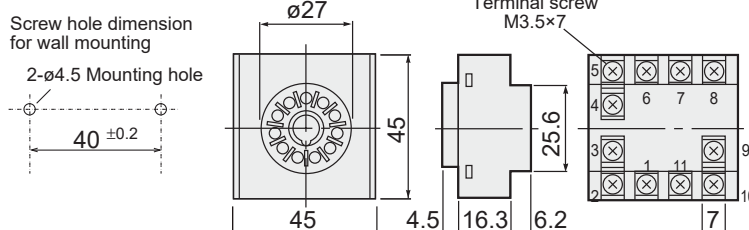


• Socket (Optional) External Dimensions

DIN rail mounting socket type
 Model : TP411X (FUJI ELECTRIC product)



Rear terminal socket type
 Model : TP411SBA (FUJI ELECTRIC product)



FB100 FB400 FB900



General Description

The FB Series is a high performance process controller with a more advanced Brilliant II PID, autotuning, selectable sampling cycle time of 0.05/0.1/0.25 second and 0.1% of accuracy in short depth housing.

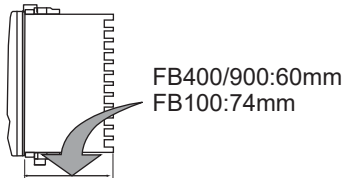
Applications include various plastic machines (extruders, injection machine, etc), electric furnaces, semiconductor, food processing, environmental chambers and many others.

Features

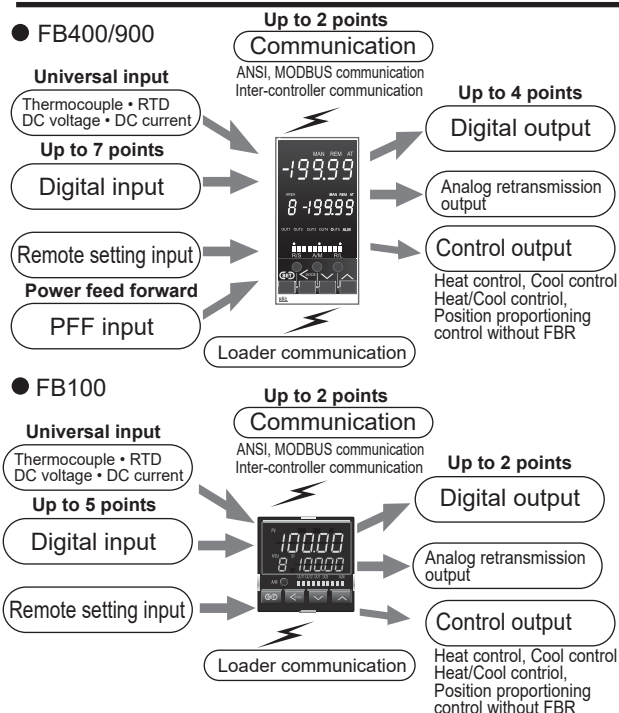
- ☆ High Accuracy with selectable sampling cycle time
- ☆ The depth of 60mm (FB100 : 74mm)
- ☆ Inter-controller Communication
- ☆ Brilliant II PID control
- ☆ Start-up tuning and Autotuning

Panel space saving

The FB Series has very short depth as a 1/16, 1/8 or 1/4 DIN size controller. The series was designed with a mounting bracket that allows close horizontal mounting of as many as six units.

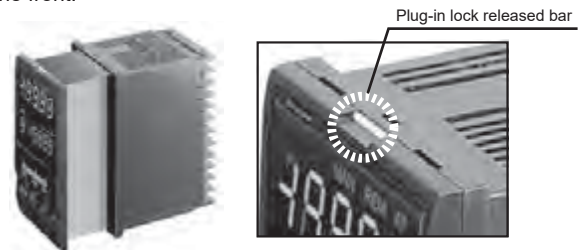


Numerous inputs and outputs



Easy maintenance

The internal assembly of the FB Series can be removed from the front.



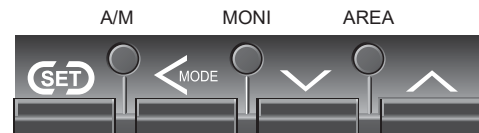
Direct Function Keys

Three direct function keys enable one-touch operation on frequently used functions such as Auto/Manual, Monitoring display scroll, and Memory area selection.

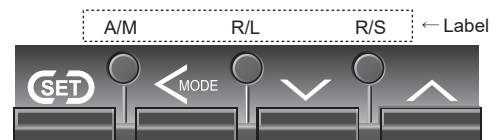
The keys can also be configured as RUN/STOP, Remote/Local, and Auto/Manual keys.

FB400/900

1. Auto/Manual, Monitoring display scroll, Memory area selection



2. Auto/Manual, Remote/Local, RUN/STOP



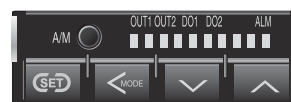
* Also possible to invalidate the direct mode selection key function.

FB100

One function can be selected from the following list and assignable to the key:

Auto/Manual, Monitoring display scroll, Memory area selection, Remote/Local, RUN/STOP

(Default setting : Auto/Manual)



Process/Temperature Controller FB100/400/900

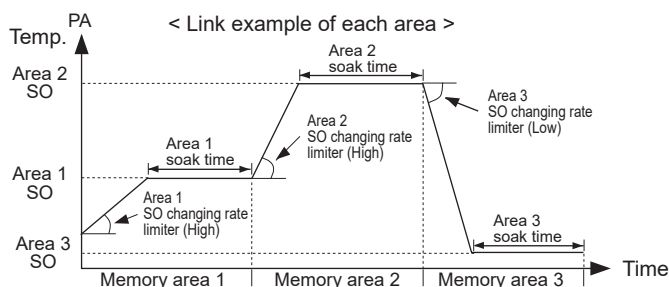
Features

Ramp / Soak Program Control

The FB900/400 Series temperature controller has Recipe (Multi-memory Area) function which stores up to 8 sets of control parameters.

1	2	3	4	5	6	7	8
Set value	Control response						
Event 1 to 4 Set Value	Overlap/Deadband						
Proportional band	Manual reset						
(Heat and Cool)	Ramp-to-setpoint						
Integral time	(Up and Down)						
(Heat and Cool)	LBA time Set value						
Derivative time	Area soak time						
(Heat and Cool)	Link area number						
Link area number							

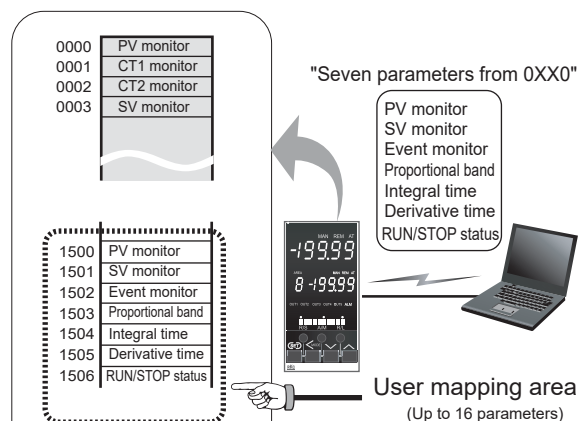
Up to 16-segment ramp/soak control is available by using the memory area function (ramp-to-set point UP and DOWN, soak time, link area number).



Numerous Inputs and Outputs

A maximum of seven event inputs can be specified. A maximum of five outputs can be specified, and various output functions (control output, analog retransmission, event up to 4) can be allocated in output logic operation.

- Available inputs and outputs depend on the specifications.



Inter-controller Communication

The FB Series has a second communication port (COM2) for inter-controller communication. It achieves more precise cascade control and ratio control by sending data via digital communication while conventional cascade controllers send data to slave controllers by analog signal with less resolution.

Auto-temperature-rise with Learning Function

Auto-temperature-rise with learning function achieves temperature uniformity at ramp-up without partial thermal expansion even when using multiple FB Series controllers.

- Up to 32 controllers with 16 groups can be configured.

Temperature Ratio Setting

If the master controller changes the control set value, the slave controllers will also change the set values by following preset ratios to the master.

- Up to 32 controllers with 16 groups can be configured.

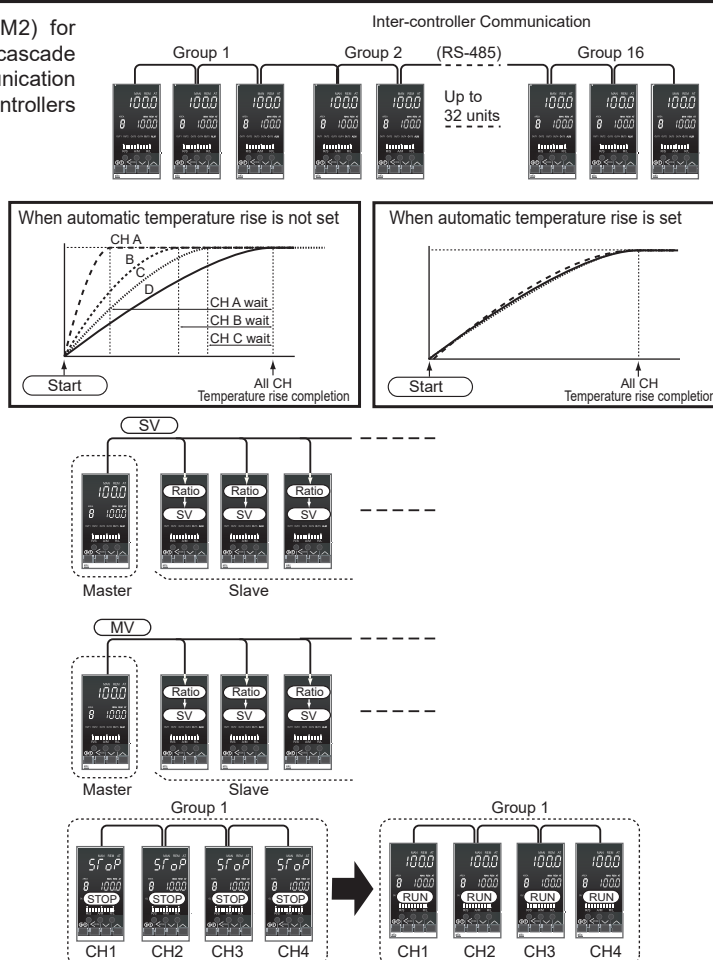
Cascade Control

It is effective when a thermal time-delay exists between the heat source and a control point. A maximum of 30 slave controllers can be connected to one master controller.

Group RUN/STOP Function

When RUN/STOP mode is changed on one controller in a group, the mode of all the other controllers in the same group will be also automatically changed.

- Up to 32 controllers with 16 groups can be configured.



(Note) Time lag among controllers caused by inter-controller communication is (Max.70ms) x (number of controllers connected).

Please consider the time lag of inter-controller communication for high-speed process control in which process changes rapidly.

Features

Brilliant II PID Control

● Selectable PID control algorithm

PID control algorithm is selectable in the FB Series to achieve the most precise control for various applications.

PV Derivative PID : suitable for fixed setpoint control (Factory setting)

Deviation Derivative PID : suitable for ramp control using ramp-to-setpoint function and cascade control.

● Selectable sampling time among 50ms, 100ms, and 250ms.

Selectable sampling time makes the FB Series suitable for any application ranging from pressure control requiring fast response to precise control requiring highest resolution. The selections are 100ms (factory setting) usually suitable for most of standard applications, 50ms for fast response applications, and 250ms for precise control requiring high-resolution. The PID parameters can be set in 1/10 unit which supports fast and accurate control. Ramp-to-setpoint and output-change-limiter functions are each settable for UP and DOWN so that a special heater can be controlled precisely.

• When the sampling time is set to 100ms or 50ms, the following input ranges cannot be used :

Pt100 -100.00 to +100.00°C, -199.99 to +199.99°F

JPt100 -100.00 to +100.00°C, -199.99 to +199.99°F

● Advanced Heat/Cool PID algorithm with Undershoot Suppression

Advanced Heat/Cool PID algorithm achieves stable control by the Undershoot Suppression (USS) function, and independent P-I-D settings for both Heat and Cool which are effective for applications with strong cooling gain. Control Response type selection is settable to avoid overshoot at start-up and against external disturbance. The FB Series also offers selection of water cool and air cool PID control algorithm.

● Configurable control type

The control type is configurable among Heat, Cool, Heat/Cool, and position proportioning.

Autotuning

● Autotuning to calculate optimum PID parameters

The improved Autotuning algorithm calculates optimum PID parameters. For Heat/Cool control, PID parameters for both sides (Heat and Cool) are calculated.

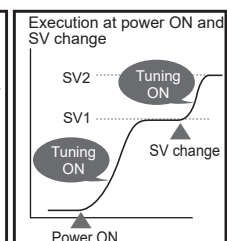
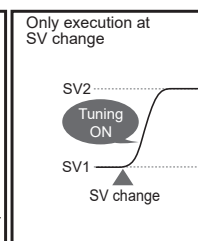
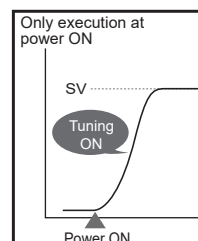
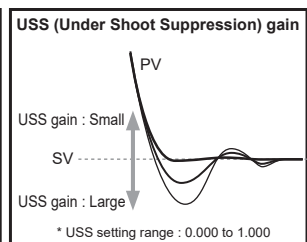
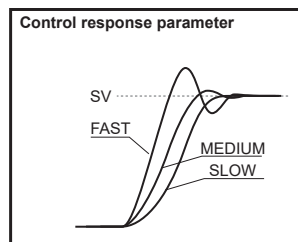
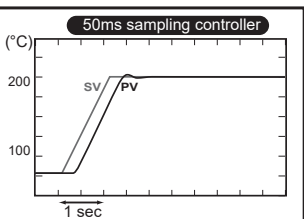
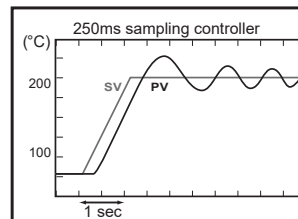
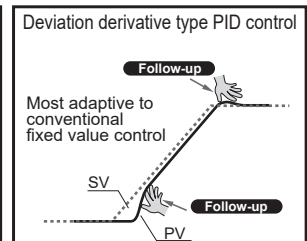
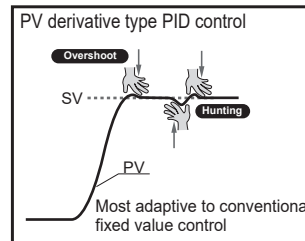
● Start-up tuning to eliminate time for autotuning

Start-up tuning eliminates time required for conventional autotuning as it calculates optimum PID values by temperature characteristics at start up. It is useful in applications which require a long time for conventional autotuning. The timing of activation of start-up tuning can be selected from at power-up, at setpoint change, and at power-up/setpoint change. It is also settable to Only-once or always-ON.

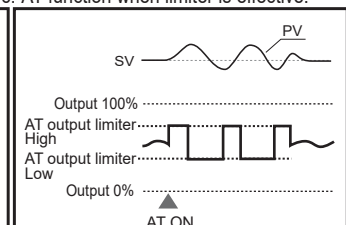
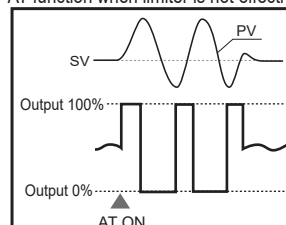
- Validity/invalidity of the startup tuning function can be set.
- Heater power needs to be turned on simultaneously with or before turning on power to the temperature controller.
- If start-up tuning does not calculate suitable PID values due to characteristics of application, use Autotuning function.

● Output limiters high and low for autotuning

Output limiters high and low for autotuning enables autotuning to be used with any application in which the output has to be within limited range, even during autotuning. High and low are independently settable.



AT function when limiter is not effective. AT function when limiter is effective.



Features

Setup and Data Monitoring

The FB Series has the loader port (provided as standard) to connect to a PC USB port. The standard port allows setup and data logging to be managed by the PC. The FB Series is recognized as an external device on the PC.

● Easy setup with PROTEM2

Using the PROTEM2, the controller setup and parameter settings can be done from a PC. The parameter settings can be stored on the PC making it easy to copy the same parameters to other FB Series controllers.

- The instrument must have a hardware required for selected functions.

Easy Data Management

Communication Tool

PROTEM2

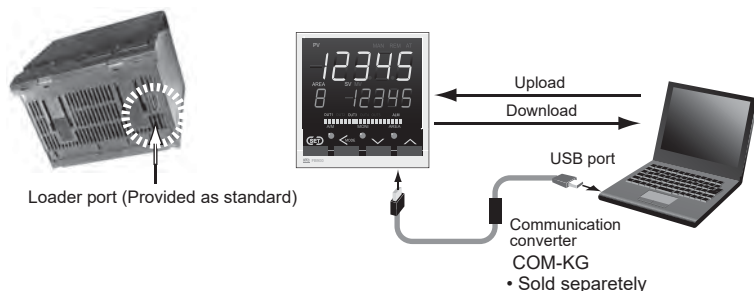
Data monitoring, setting, storage, copy, transfer, logging, and report creation



Simply download "PROTEM2" from the RKC Instrument website (www.rkcinst.com).

● No power supply cable necessary at setup

When setting up the FB Series via the loader port, the power can be supplied from the PC via the USB port so no power supply cable is necessary. Just connect the cable to the FB Series and setup is ready to go.



Reinforced Insulation, Lead-free PCBs, Low Power Consumption

● Reinforcement Insulated Power Supply Circuit

Power supply circuit of the FB Series has been designed to be reinforcement insulated. It saves cost to perform basic insulation on the equipment side.

<Requirements for electrical equipment according to safety standards>

The safety standards on electrical equipment (IEC 61010-1 and JISC 1010-1) request that the secondary side of the equipment which may be touched by the operator should be double insulated or reinforcement insulated* from high voltage causing electric shock.

- Insulation safeguarding personnel from electric shock which is equal to double insulation or higher is called "reinforced insulation".

● Lead-free Design complying with EU Directive

The FB Series uses lead-free PCBs complying with EU Directive *.

* WEEE Directive (Waste Electronics/Electrical Equipment Directive) and RoHS Directive (Directive of Restricting the use of Harmful Materials for Electrical Products)

● Low Power Consumption, Low Heat Generation

The power consumption is 30% less than the equivalent model of RKC REX-F900. The saving is 5VA per controller at 240VAC. It also generates less heat and it helps keep temperature low inside the control cabinet.



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)
 - Influence of external resistance : Approx. 0.2μV/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 10Ω per wire
 - Input break action : Up-scale
 - Low voltage : 0 to 1V DC, 0 to 100mV DC, 0 to 10mV DC, -100 to +100mV DC, -10 to +10mV DC
 - Input break action : Up-scale / Down-scale (Selectable)
 - Current : 4 to 20mA DC, 0 to 20mA DC
 - Input break action : Uncertain (indicates a value around 0mA)
- b) High voltage input group
 - High voltage : 0 to 5V DC, 1 to 5V DC, 0 to 10V DC, -1 to +1V DC
 - Input break action : Uncertain (indicates a value around 0V)

Sampling Time

- 0.1 sec
 - 0.05sec or 0.25sec is available.
 - When the sampling time is set to 0.1 sec or 0.05 sec, the following input ranges cannot be used: Pt100 / JPt100 -100.00 to +100.00°C, -199.99 to +199.99°F

Input Digital Filter

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

PV Bias

- span to +span

PV Ratio

- 0.500 to 1.500

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) : ±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 + 1 digit)
 - Type : N, S, R, W5Re/W26Re
 - Less than 0°C (32°F) : ±2.0°C (±3.6°F)
 - 0 to 1000°C (-148 to 1832°F) : ±1.0°C (±1.8°F)
 - More than 1000°C (1832°F) : ±(0.1% of Reading + 1 digit)
 - Type : B
 - Less than 400°C (752°F) : ±70.0°C (±126°F)
 - 400 to 1000°C (752 to 1832°F) : ±1.4°C (±2.5°F)
 - More than 1000°C (1832°F) : ±(0.1% of Reading + 1 digit)
- Cold junction temperature compensation error
 - ±1.0°C (1.8°F) [at 5 to 40°C (41 to 104°F)]
 - Within ±1.5°C (±2.7°F)
 - [Between -10 and 5°C (14 to 41°F), 40 and 50°C (104 to 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 + 1 digit)
- c) DC voltage and DC current
 - ±(0.1% of span)
 - Close horizontal mounting error : ±1.5°C (±2.7°F)

Insulation Resistance

- More than 20MΩ (500V DC) between measured terminals and ground
- More than 20MΩ (500V DC) between power terminals and ground

Dielectric Strength

- 1000V AC for one minute between measured 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 without feedback resistance.
- a), b), c) is selectable.

Autotuning Method

- a) For PID control (Direct action/Reverse action)
- 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

Startup tuning

- The condition to activate Startup Tuning is selectable among a) to g)
 - a) At power-on, one-time tuning
 - b) At SV change, one-time tuning
 - c) At power-on and SV change, one-time tuning
 - d) At power-on, always on
 - e) At SV change, always on
 - f) At power-on and SV change, always on
 - g) Function off
- (Not available for Heat/Cool PID control type)

Major Setting Range

- Set value : Same as input range.
- Proportional band : 0 to input span (Temperature input) 0.0 to 1000.0% of span (Voltage, Current input) (ON/OFF control when P = 0)
- Integral time : 0 to 3600sec. or 0.0 to 1999.9sec. (selectable)
- Derivative time : 0 to 3600sec. or 0.0 to 1999.9sec. (selectable)
- Cool-side proportional band : 1 to input span (Temperature input) 0.1 to 1000.0% of span (Voltage, Current input)
- Cool-side integral time : 0 to 3600sec. or 0.0 to 1999.9sec. (selectable)
- Cool-side derivative time : 0 to 3600sec. or 0.0 to 1999.9sec. (selectable)
- Deadband/Overlap : -span to +span (Temperature input) -100.0 to +100.0% of span (Voltage, Current input)
- Control response : Slow, Medium, Fast
- Ramp-to-setpoint : 0 to span per Time (Time is selectable between 1 and 3600 sec) (Up/Down individual setting)
- Output limiter : -5.0 to +105.0% (High/Low individual setting)
- Cool-side output limiter : -5.0 to +105.0% (High/Low individual setting)
- Output change rate limiter : 0.0 to 100.0%/sec. (Up/Down individual setting)
- Cool-side output change rate limiter : 0.0 to 100.0%/sec. (Up/Down 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%
- Output at control stop mode : -5.0 to 100.5% (Heat/Cool individual setting)

Motor Valve Control (position proportioning control type only)

- Motor time : 5 to 1000 sec. (full open to full close)
- Integral output limiter : OFF, 100.0 to 200.0% of motor time
- Neutral zone : 0.1 to 10.0%
- Differential gap : 0.1 to 5.0%
- Valve action at a stop mode : a) CLOSE : OFF, OPEN : OFF b) CLOSE : ON, OPEN : OFF c) CLOSE : OFF, OPEN : ON
- a), b), c) is selectable.

Memory area

- Number of memory area : 8 memory areas
- Setting item : Set value (SV), Proportional band, Integral time, Derivative time, Cool-side proportional band, Cool-side integral time, Cool-side derivative time, Deadband/Overlap, Control response, Manual reset, Ramp-to-setpoint (Up/Down), Event set vale, LBA time, LBA deadband, Soak time : 0 min 0.00 sec to 199 min 59 sec or 0 hr 00 min to 9 hr 59 min (selectable)
- Linking area number : OFF, 1 to 8

Main Output

Number of Main Output

- Up to 2 points (OUT1, OUT2)

Output Items

- Control output, HBA output, FAIL output

Output Type

- Relay output : Form A contact, 250V AC 3A, 30V DC 1A, (resistive load)
- Voltage pulse output : 0/12V DC (Load resistance : More than 600Ω)
- Current output : 4 to 20mA DC, 0 to 20mA DC (Load resistance : Less than 600Ω)
- Continuous voltage output : 0 to 1V DC, 0 to 5V DC, 1 to 5V DC, 0 to 10V DC (Load resistance : More than 1kΩ)
- SSR (Triac) output : Rated current : 0.5A
- Open collector output : Load voltage : Less than 30V DC, Maximum load current : Less than 100mA (Sink type) ON voltage : Less than 2V DC (at 100mA)

Process/Temperature Controller FB100/400/900



Specifications

Digital Input

•FB100 (DI 1 to 5 : Optional)
•FB400/900 (DI 1 to 4 : Optional, DI 5 to 7 : Standard)

Number of Inputs

FB100 : Up to 5 points (DI 1 to 5)
FB400/900 : Up to 7 points (DI 1 to 4, DI 5 to 7)

Input Rating

Non-voltage contact input

Functions

Memory area selection (Area set/No area set is selectable)
RUN/STOP, Remote/Local, Auto/Manual, Alarm interlock reset
• Selectable (See digital input allocation table)

Remote Setpoint Input

•FB100: Optional
•FB400/900: Standard

Input

DC voltage (Low), Current : 0 to 1V DC, 0 to 100mV DC, 0 to 10mV DC
4 to 20mA DC, 0 to 20mA DC
DC voltage (High) : 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
• PV input and remote setpoint input are not isolated for each other.
• Universal input

Sampling time

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)

Accuracy

0.1% of span

Digital Output

•FB100: Standard
•FB400/900: Optional

Number of Sub Output

FB100: Up to 2 points (DO1, DO2)
FB400/900: Up to 4 points (DO1 to DO4)

Output Items

Event output, Heater break alarm (HBA), FAIL

Output Type

Relay output : Form A contact, 250V AC 1A (resistive load)

Event (Alarm)

•FB100: Standard
•FB400/900: Optional

Number of Event Setting

Up to 4 points (Event 1 to 4)

Alarms

Type : Deviation High, Low, High/Low, Band,
Process High, Low
Set value High, Low
MV value High, Low
Cool side MV value (MV) High, Low
FBR value High, Low
Control Loop Break Alarm (LBA)

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, FBR valued : -5.0 to +105.0%
Control loop break alarm (LBA)
: LBA time : 0 to 7200 sec. (OFF by setting zero)
LBA deadband : 0 to input span

Output

Assignable to digital output

Other Functions

- Hold/Re-hold action (Valid for deviation/band/process alarm only)
 - Hold action is activated at Power-up and STOP to RUN.
 - Re-hold action is activated at Power-up, STOP to RUN, and the control set value change.
- Event action is configurable in case of input abnormality.
- Energized/de-energized action is configurable.
- Delay timer : 0.0 to 600.0 sec
- Interlock (latch) function is configurable.

Heater Break Alarm

(Optional)

Number of CT Input

Up to 2 points

CT Input type

CTL-6-P-N (30A), CTL-12-S56-10L-N(100A)
• Selectable

Accuracy

± 5% of input value or ± 2A (whichever is larger)

Display range

0.0 to 100.0A

Output

Assignable to output 2 or digital output (DO2 to 4).

Power feed forward input

(FB400/900 only, Optional)

• Exclusive power feed transformer is required.

Analog Retransmission Output (Optional)

Number of Outputs

1 point

Output types

Measured value (PV), Deviation (DEV), Set value (SV), Manipulated output value (MV)

Output Signal

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

Feedback Resistance (FBR) Input (Optional)

Resistance value

Standard : 100 to 10kΩ (factory default 135Ω)

Sampling time

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)

• Not available with PFF or CT 2 input.

Communications

(Optional)

Number of communications : Up to 2 points

Communication method : COM1: RS-485, RS-232C, RS-422A
•RS-232C: FB400/900 only
COM2: For Inter-controller communication

Communication speed : 2400, 9600, 19200, 38400 BPS

Protocol : ANSI X3.28(1976) 2.5 A4
MODBUS

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 : 32 units (Including host)
RS-422A : 16 units (Including host)
RS-232C : 1 unit

Communication to Controller : Automatic temperature rise, Cascade control,
Temperature ratio setting, Group STOP/RUN

Waterproof/Dustproof

(Standard)

NEMA4X, IP66

• Waterproof/Dustproof protection only effective from the front in panel mounted installation.

General Specifications

Supply Voltage

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

Power Consumption

FB100 : Less than 8.1VA for AC type (at 240V AC)
Less than 5.3VA for 24V AC type
Less than 142mA for 24V DC type
FB400 : Less than 11.9VA for AC type (at 240V AC)
Less than 8.2VA for 24V AC type
Less than 250mA for 24V DC type
FB900 : Less than 13.0VA for AC type (at 240V AC)
Less than 9.3VA for 24V AC type
Less than 300mA for 24V DC type

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)

Self-Diagnostic Function

Adjustment data check, Back-up check, A/D converter check, etc.

Operating Environments : -10 to 50°C [14 to 122°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. 1,000,000,000,000,000 times.
(Depending on storage and operating conditions.)

Net Weight

FB100: Approx. 150g, FB400 : Approx. 230g, FB900 : Approx. 290g

External Dimensions (W x H x D)

FB100 : 48 x 48 x 740mm, FB400 : 48 x 96 x 60mm, FB900 : 96 x 96 x 60mm

Specifications		Model and Suffix Code								
		Hardware coding only				Quick start code 1				
Model	FB100 (48 x 48mm 1/16 DIN size)		-□□-□*□/□□-□□□□/							
Output 1 (OUT1)	Relay contact output	M								
	Voltage pulse output : 0/12V DC	V								
	DC mA, V (See Output Signal Code Table, Code : 4 to 8)	□								
	Triac (SSR) output	T								
Output 2 (OUT2)	Open collector output	D								
	No supplied	N								
	Relay contact output	M								
	Voltage pulse output : 0/12V DC	V								
	DC mA, V (See Output Signal Code Table, Code : 3 to 8)	□								
	Triac (SSR) output	T								
	Open collector output	D								
	Power supply	24V AC/DC 100 to 240V AC		3 4						
Optional function	*	Not supplied	N	A						
		Digital input 5 points	A	B						
		Digital input 2 points + Remote setpoint input	B	C						
		Digital input 2 points + Feedback resistance input	C	D						
	**	Digital input 2 points + CT input 2 points	D	E						
		Digital input 3 points + Communication 1 point	E	F						
		Digital input 1 point + Communication 1 point + CT input 1 point	F	G						
		Communication 2 points	G	H						
		Communication 1 point + CT input 2 points	H	I						
		Digital input 1 point + Remote setpoint input + Analog retransmission output 0 to 1V DC	3							
		Digital input 1 point + Remote setpoint input + Analog retransmission output 0 to 5V DC	4							
		Digital input 1 point + Remote setpoint input + Analog retransmission output 0 to 10V DC	5							
		Digital input 1 point + Remote setpoint input + Analog retransmission output 1 to 5V DC	6							
		Digital input 1 point + Remote setpoint input + Analog retransmission output 0 to 20mA	7							
Digital input 1 point + Remote setpoint input + Analog retransmission output 4 to 20mA	8									
Case color	White case Black case			N A						
Initial setting	No quick start code (Default setting) Specify quick start code 1 Specify quick start code 1 and 2					N 1 2				

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
	Input and range	Position proportional PID control without FBR	Z
		No quick start code See Input range Code Table	No code □□□
Instrument version	Version symbol		

- ◆ Default settings

- *1 : When Heat Control or Cool Control is selected, output 2 is available for Event Output, HBA Output and FAIL Output.

*2 : See Digital Input (DI) Allocation Table (page 7).

*3 :When HBA (heater break alarm) is used , select the "CT input" from the model code.

Input range code table

Thermocouple

Input	Code	Range	Input	Code	Range	Input	Code	Range	Input	Code	Range			
K	K┘35	-200.0 to +400.0°C	J	J┘C7	-200.0 to +700.0°F	PLII (NBS) W5Re/W26Re (ASTM)	A┘02	0 to 1390°C	Pt100	D┘34	-100.00 to +100.00°C			
	K┘40	-200.0 to +800.0°C		J┘C6	-328.0 to +1200.0°F		A┘A2	0 to 2534°F		D┘35	-200.0 to +850.0°C			
	K┘09	0.0 to 400.0°C		J┘B6	0.0 to 800.0°F		W┘03	0 to 2300°C		D┘21	-200.0 to +200.0°C			
	K┘10	0.0 to 800.0°C		J┘B9	-328 to +2192°F		W┘A2	0 to 4200°F		D┘C8	-199.99 to +199.99°F			
	K┘41	-200 to +1372°C		J┘A1	0 to 800°F		U┘04	0.0 to 600.0°C		D┘C9	-328.0 to +1562.0°F			
	K┘14	0 to 300°C	J┘A2	0 to 1600°F	(DIN) U┘B2	0.0 to 1112.0°F	P┘29	-100.00 to +100.00°C						
	K┘02	0 to 400°C	T	T┘19	-200.0 to +400.0°C	L┘04	0.0 to 900.0°C	P┘30	-200.0 to +640.0°C					
	K┘04	0 to 800°C		T┘C2	-328.0 to +752.0°F	L┘A3	0.0 to 1652.0°F	P┘C8	-199.99 to +199.99°F					
	K┘C6	-250.0 to +800.0°F	S	S┘06	-50 to +1768°C	DC Current • voltage	Input	Code	Range	Input	Code	Range		
	K┘C4	-328.0 to +400.0°F		S┘A7	-58 to +3214°F								0 to 10mV	1┘01
K┘A4	0.0 to 800.0°F	R┘07	-50 to +1768°C	0 to 100mV	2┘01								4 to 20mA	8┘01
K┘C5	-328 to +2502°F	R┘A7	-58 to +3214°F	0 to 1V	3┘01								-100 to +100mV	9┘01
K┘A1	0 to 800°F	E	E┘21	-200.0 to +700.0°C	0 to 5V								4┘01	-1 to +1V
K┘A2	0 to 1600°F		E┘06	-200 to +1000°C	0 to 10V		5┘01	-10 to 10mV	9┘03					
J┘27	-200.0 to +400.0°C		E┘A9	-328.0 to +1292.0°F	1 to 5V		6┘01							
J┘32	-200.0 to +800.0°C	E┘B1	-328 to +1832°F	Pt100	0.0 to 100.0%									
J┘08	0.0 to 400.0°C	B┘03	0 to 1800°C											
J┘09	0.0 to 800.0°C	B┘B2	0 to 3272°F											
J┘15	-200 to +1200°C	N	N┘02			0 to 1300°C								
J┘02	0 to 400°C		N┘A7			0 to 2372°F								
J┘04	0 to 800°C													

* If you wish to use the 1/100°C(°F) input range please set the sampling time to 0.25 second

Output signal code table

4	0 - 5V DC	5	0 - 10V DC	6	1 - 5V DC	7	0 - 20mA DC	8	4 - 20mA DC
---	-----------	---	------------	---	-----------	---	-------------	---	-------------

Process/Temperature Controller FB100/400/900



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							
Output allocation	See output allocation table	□□	□□	□□	□□	□□	□□	□□	□□
Digital input allocation	See Digital input allocation table	□□	□□	□□	□□	□□	□□	□□	□□
Remote setpoint input signal	No Remote setpoint input signal 0 to 10mV DC 0 to 100mV DC 0 to 1V DC 0 to 5V DC 0 to 10V DC 1 to 5V DC 0 to 20mA DC 4 to 20mA DC		N	1					
			2						
			3						
			4						
			5						
			6						
			7						
			8						
Event 1 type	No event 1 See event type code table		N	□					
Event 2 type	No event 2 See event type code table			N	□				
Event 3 type	No event 3 See event type code table				N	□			
Event 4 type	No event 4 See event type code table Control loop break alarm (LBA)					N	□	5	
CT type	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
Communication 1	No communication 1 (COM1) ANSI/RKC standard protocol MODBUS protocol Inter-controller protocol							N	1
									2
									A

Event Code Table (Programmable)

Code	Event type
A	Deviation High
B	Deviation Low
C	Deviation High/Low
D	Band
E	Deviation High with Alarm Hold
F	Deviation Low with Alarm Hold
G	Deviation High/Low with Alarm Hold
H	Process High
J	Process Low
K	Process High with Alarm Hold
L	Process Low with Alarm Hold
Q	Deviation High with Alarm Re-Hold
R	Deviation Low with Alarm Re-Hold
T	Deviation High/Low with Alarm Re-Hold
V	Set value High
W	Set value Low
1	MV value High
2	MV value Low
3	Cool side MV value High
4	Cool side MV value Low

- Default setting when no quick start code is specified.
CT type : CTL-6-P-N
Communication 2 : ANSI/RKC standard protocol
- Communication 2 is for inter-controller communication.

Output Allocation Table (Programmable) ♦ Default setting

Code	Output 1 (OUT 1)	Output 2 (OUT 2)	Digital Output 1 (DO 1)	Digital Output 2 (DO 2)
01 ♦	Control output 1	Control output 2	Event 1	Event 2
02	Control output 1	Control output 2	Event 1	Event 4
03	Control output 1	Control output 2	Event 1	HBA
04	Control output 1	Control output 2	Event 1	FAIL (De-energized)
05	Control output 1	Control output 2	Event 4	HBA
06	Control output 1	Control output 2	Event 4	FAIL (De-energized)
07	Control output 1	Control output 2	HBA	FAIL (De-energized)
08	Control output 1	HBA	Event 1	Event 2
09	Control output 1	HBA	Event 1	Event 4
10	Control output 1	HBA	Event 1	FAIL (De-energized)
11	Control output 1	HBA	Event 4	FAIL (De-energized)
12	Control output 1	FAIL (De-energized)	Event 1	Event 2
13	Control output 1	FAIL (De-energized)	Event 1	Event 4
14	Control output 1	Event 1	Event 2	Event 3
15	Control output 1	Event 4	Event 1	Event 2

- Energized/De-energized is configurable except for the FAIL output. (Factory default setting: Energized)
- (Caution)
- Invalid for a non-existing output/input function.
- When used as heating/cooling control/position proportioning control, select any code of 01 to 07.
- Remote/Local transfer can be done during cascade control and ratio control by inter-controller communication.

Digital input (DI) Allocation Table (Programmable) ♦ Default setting

Code	DI 1	DI 2	DI 3	DI 4	DI 5	Selectable optional Code
01 ♦	Unused					—
02	Memory area selection (1 to 8)		Area set	RUN/STOP		A
03	Memory area selection (1 to 8)		Area set			
04	Memory area selection (1 to 8)		Area set	AUTO/MANUAL		
05	Memory area selection (1 to 8)		Area set	Alarm interlock reset		
06	Memory area selection (1 to 8)		RUN/STOP			
07	Memory area selection (1 to 8)		RUN/STOP	AUTO/MANUAL		
08	Memory area selection (1 to 8)		RUN/STOP	Alarm interlock reset		
09	Memory area selection (1 to 8)			AUTO/MANUAL		
10	Memory area selection (1 to 8)			Alarm interlock reset		
11	Memory area selection (1 to 8)		AUTO/MANUAL	Alarm interlock reset		
12	Memory area selection (1 to 8)					A, E
13	RUN/STOP	REMOTE/LOCAL	AUTO/MANUAL			
14	RUN/STOP	REMOTE/LOCAL	Alarm interlock reset			
15	RUN/STOP	AUTO/MANUAL	Alarm interlock reset			
16	REMOTE/LOCAL	AUTO/MANUAL	Alarm interlock reset			
17	RUN/STOP	REMOTE/LOCAL				
18	RUN/STOP	AUTO/MANUAL				
19	RUN/STOP	Alarm interlock reset				
20	REMOTE/LOCAL	AUTO/MANUAL				
21	REMOTE/LOCAL	Alarm interlock reset				
22	AUTO/MANUAL	Alarm interlock reset				A, B, C, D, E
23	RUN/STOP					
24	REMOTE/LOCAL					
25	AUTO/MANUAL					
26	Alarm interlock reset					

A, B, C, D, E, F
3, 4, 5, 6, 7, 8



Model and Suffix Code

Specifications		Model and Suffix Code	
		Hardware coding only	Quick start code 1
Model	FB400 (48 x 96mm 1/8 DIN size) FB900 (96 x 96mm 1/4 DIN size)	-□□-□*□□□□/□□-□ □□□/Y	
Output 1 (OUT1)	Relay contact output Voltage pulse output : 0/12V DC DC mA, mV, V (See Output Signal Code Table, Code : 4 to 8) Triac (SSR) output Open collector output	M V □ T D	
Output 2 (OUT2)	No supplied Relay contact output Voltage pulse output : 0/12V DC DC mA, mV, V (See Output Signal Code Table, Code : 3 to 8) Triac (SSR) output Open collector output	N M V □ T D	
Power supply	24V AC/DC 100 to 240V AC	3 4	
Digital output	No supplied DO 4 points (DO1 to DO4)	N 4	
CT input, Power feed forward (PFF) input, Feedback resistance	Not supplied CT input : 2 points PFF input (Within transformer 100 to 120V AC type) PFF input (Within transformer 200 to 240V AC type) CT input : 1 point + PFF input (Within transformer 100 to 120V AC type) CT input : 1 point + PFF input (Within transformer 200 to 240V AC type) Feedback resistance input	N T 1 2 3 4 F	
Retransmission output	No retransmission output DC mA, mV, V (See Output Signal Code Table, Code : 3 to 8) • With digital input (DI1 to 4) Area selection	N □	
Communication	Not supplied Communication 1 : RS-232C, Communication 2 : Not supplied • With digital input (DI1 to 4) Area selection Communication 1 : RS-422A, Communication 2 : Not supplied • With digital input (DI1 to 4) Area selection Communication 1 : RS-485, Communication 2 : Not supplied • With digital input (DI1 to 4) Area selection Communication 1 : RS-232C, Communication 2 : RS-485 • With digital input (DI1 to 4) Area selection Communication 1 : RS-485, Communication 2 : RS-485 • With digital input (DI1 to 4) Area selection Communication 1 : Not supplied, Communication 2 : RS-485 • With digital input (DI1 to 4) Area selection Digital input : 4 points (DI1 to DI4) <Area selection>	N 1 4 5 W X Y D	
Case color	White case Black case	N A	
Initial setting	No quick start code (Default setting) Specify quick start code 1 Specify quick start code 1 and 2	N 1 2	

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 without FBR	No code F D G A W Z
	Input and range	No quick start code See Input range Code Table	No code □□□
Instrument version	Version symbol		Y

• Universal input, no model code required on hardware code.

* When HBA (heater break alarm) is used, select the "CT input" from the model code.

** When inter-controller communication is used, please specify code "W, X or Y (COM2 : RS-485).

Input range code table

Thermocouple

Input	Code	Range
K	K : 35	-200.0 to +400.0°C
	K : 40	-200.0 to +800.0°C
	K : 09	0.0 to 400.0°C
	K : 10	0.0 to 800.0°C
	K : 41	-200 to +1372°C
	K : 14	0 to 300°C
	K : 02	0 to 400°C
	K : 04	0 to 800°C
	K : C6	-250.0 to +800.0°F
	K : C4	-328.0 to +400.0°F
	K : A4	0.0 to 800.0°F
	K : C5	-328 to +2502°F
J	J : A1	0 to 800°F
	J : A2	0 to 1600°F
	J : 27	-200.0 to +400.0°C
	J : 32	-200.0 to +800.0°C
	J : 08	0.0 to 400.0°C
	J : 09	0.0 to 800.0°C
	J : 15	-200 to +1200°C
	J : 02	0 to 400°C
	J : 04	0 to 800°C
	J : C7	-200.0 to +700.0°F
	J : C6	-328.0 to +1200.0°F
	J : B6	0.0 to 800.0°F
T	T : B9	-328 to +2192°F
	T : A1	0 to 800°F
	T : A2	0 to 1600°F
	T : 19	-200.0 to +400.0°C
	T : C2	-328.0 to +752.0°F
	T : 06	-50 to +1768°C
	T : A7	-58 to +3214°F
	T : 07	-50 to +1768°C
	T : A7	-58 to +3214°F
	T : 21	-200.0 to +700.0°C
	T : 06	-200 to +1000°C
	T : A9	-328.0 to +1292.0°F
S	S : B1	-328 to +1832°F
	S : 03	0 to 1800°C
	S : B2	0 to 3272°F
	S : 02	0 to 1300°C
	S : A7	0 to 2372°F
	S : 02	0 to 1300°C
	S : A7	0 to 2372°F
	S : 02	0 to 1300°C
	S : A7	0 to 2372°F
	S : 02	0 to 1300°C
	S : A7	0 to 2372°F
	S : 02	0 to 1300°C
	S : A7	0 to 2372°F

RTD

Input	Code	Range
Pt100	D : 34	-100.00 to +100.00°C*
	D : 35	-200.0 to +850.0°C
	D : 21	-200.0 to +200.0°C
	D : C8	-199.99 to +199.99°F*
	D : C9	-328.0 to +1562.0°F
JPt100	P : 29	-100.00 to +100.00°C*
	P : 30	-200.0 to +640.0°C
	P : C8	-199.99 to +199.99°F*
	P : C9	-328.0 to +1184.0°F
	P : D1	-200.0 to +200.0°F

* If you wish to use the 1/100°C(°F) input range, please set the sampling time to 0.25 seconds.

DC Current • voltage

Input	Code	Range
0 to 10mV	1 : 01	0.0 to 100.0%
0 to 100mV	2 : 01	
0 to 1V	3 : 01	
0 to 5V	4 : 01	
0 to 10V	5 : 01	
1 to 5V	6 : 01	
0 to 20mA	7 : 01	0.0 to 100.0%
4 to 20mA	8 : 01	
-100 to +100mV	9 : 01	
-1 to +1V	9 : 02	
-10 to 10mV	9 : 03	

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
---	-----------	---	---	-----------	---	------------	---	-----------	---	-------------	---	-------------

* 0 to 1 VDC output can be specified only for analog retransmission output.

Process/Temperature Controller FB100/400/900

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	Initial Setting Code									
	□ □ - □ □ □ □ - □ □ □									
Output logic selection	See output logic code table. □									
Remote setpoint input signal	0 to 10mV DC	1								
	0 to 100mV DC	2								
	0 to 1V DC	3								
	0 to 5V DC	4								
	0 to 10V DC	5								
	1 to 5V DC	6								
	0 to 20mA DC	7								
	4 to 20mA DC	8								
Event 1 type	Not supplied									
	See event type code table	□								
Event 2 type	Not supplied									
	See event type code table		□							
Event 3 type	Not supplied									
	See event type code table			□						
Event 4 type	Not supplied									
	See event type code table				□					
	LBA (Control loop break alarm)					□				
CT type	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									
Communication 1 protocol	Not supplied									
	ANSI/RKC standard									
	MODBUS									

* Please specify "8" when the remote setpoint input signal is not used.

Output Logic Code Table.

Output 1 (OUT 1)	Output 2 (OUT 2)	Digital Output 1 (DO 1)	Digital Output 2 (DO 2)	Digital Output 3 (DO 3)	Digital Output 4 (DO 4)	Code
Control output 1	Control output 2	Event 1	Event 2	Event 3	Event 4	1
Control output 1	Control output 2	Event 1	Event 2	Event 3	HBA	2
Control output 1	Control output 2	Event 1	Event 2	HBA	FAIL (De-energized)	3
Control output 1	Control output 2	Event 1	HBA	Event 3	Event 4	4
Control output 1	HBA	Event 1	Event 2	Event 3	Event 4	5
Control output 1	HBA	Event 1	Event 2	Event 3	FAIL (De-energized)	6
Control output 1	FAIL (De-energized)	Event 1	Event 2	Event 3	Event 4	7

- Energized/De-energized is configurable except for the FAIL output. (Factory default setting: Energized)
- Invalid for a non-existing output/event function.
- (Caution)
- When used as heating/cooling control/position proportioning control, select any code of 1 to 4.

Event Type Code Table.

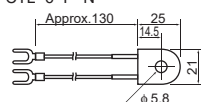
Event type	Code
Deviation High	A
Deviation Low	B
Deviation High/Low	C
Band	D
Deviation High with Alarm Hold	E
Deviation Low with Alarm Hold	F
Deviation High/Low with Alarm Hold	G
Process High	H
Process Low	J
Process High with Alarm Hold	K
Process Low with Alarm Hold	L
Deviation High with Alarm Re-Hold	Q
Deviation Low with Alarm Re-Hold	R
Deviation High/Low with Alarm Re-Hold	T
Set value High	V
Set value Low	W
MV value High	1
MV value Low	2
Cool side MV value High	3
Cool side MV value Low	4

Accessory

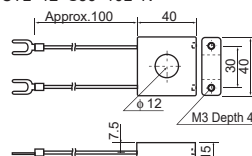
Current transformer for heater break alarm (HBA) (Sold separately)

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

CTL-6-P-N (Unit : mm)



CTL-12-S56-10L-N



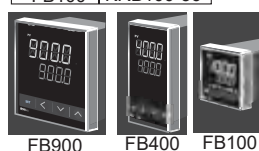
Terminal cover (Sold separately)

Type	Model Code
FB400/900	KFB400-58
FB100	KCA100-517



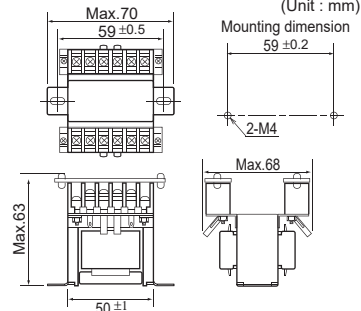
Front cover (Sold separately)

Type	Model Code
FB900	KF9-35
FB400	KF4-34
FB100	KRB100-36



(For Power feed forward input)

- * Supplied when power feed forward function is specified. (Unit : mm)



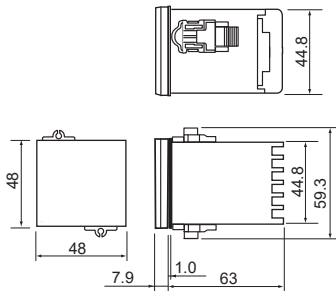
- * When ordering transformer for replacement, please specify one of the following model codes.
100 to 120V AC type : PFT-01
200 to 240V AC type : PFT-02



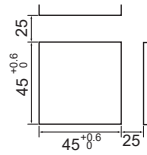
External Dimensions

Unit : mm

FB100

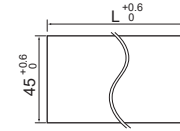


Panel Cutout



(Panel thickness must be between 1 to 10mm)

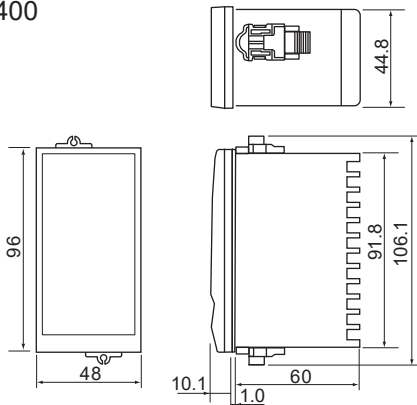
(Close horizontal mounting)
* Up to 6 units



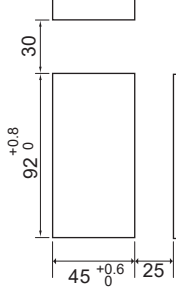
$$L = (48 \times n - 3) + 0.6$$

n : Number of controllers
(2 ≤ n ≤ 6)

FB400

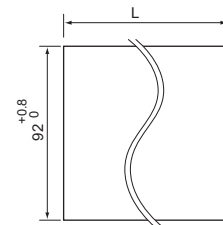


Panel Cutout



(Panel thickness must be between 1 to 10mm)

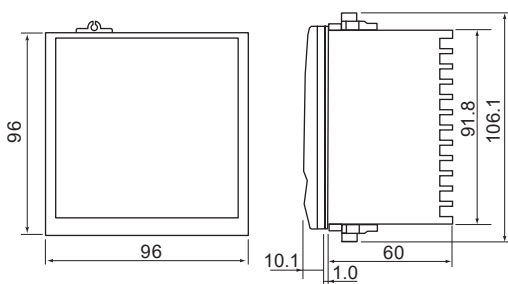
(Close horizontal mounting)
* Up to 6 units



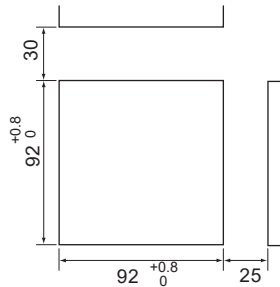
$$L = (96 \times n - 4) + 0.8$$

n : Number of controllers
(2 ≤ n ≤ 6)

FB900

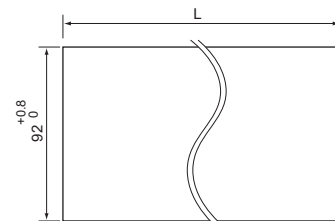


Panel Cutout



(Panel thickness must be between 1 to 10mm)

(Close horizontal mounting)
* Up to 6 units



$$L = (96 \times n - 4) + 0.8$$

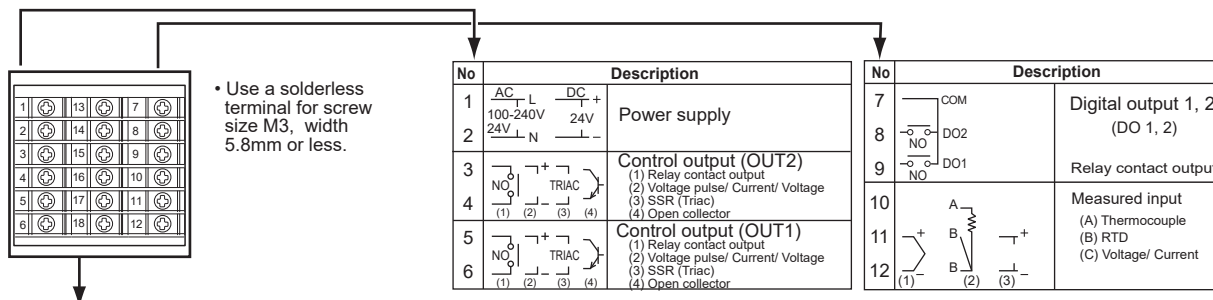
n : Number of controllers
(2 ≤ n ≤ 6)

• Waterproof/dustproof is not available for close horizontal mounting.

Process/Temperature Controller FB100/400/900

Rear Terminals

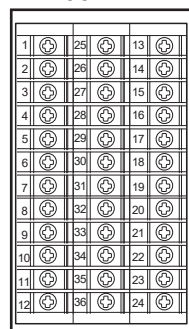
FB100



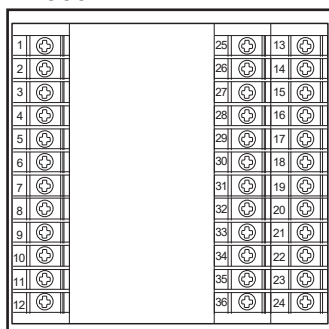
Optional function terminals

Optional function: Code A			Optional function: Code B			Optional function: Code C			Optional function: Code D			Optional function: Code E			
No	Description		No	Description		No	Description		No	Description		No	Description		
13	COM	Digital input DI1 to DI5 Non voltage contact input	13	COM	Digital input	13	COM	Digital input	13	COM	Digital input	13	SG COM	Communication 1 RS-485	
14	DI1		14	DI1	DI1 to DI2 Non voltage contact input	14	DI1	DI1 to DI2 Non voltage contact input	14	DI1	DI1 to DI2 Non voltage contact input	14	T/R(A)		
15	DI2		15	DI2		15	DI2		15	DI2		15	T/R(B)		
16	DI3			16			16			16	COM	CT1,CT2 input	16	DI1	Digital input
17	DI4			17	+	Remote setpoint input	17	→	Feedback resistance input	17	CT1		17	DI2	DI1 to DI3 Non voltage contact input
18	DI5			18	IN		18	→			18	CT2		18	DI3
Optional function: Code F			Optional function: Code G			Optional function: Code H			Optional function: Code 3,4,5,6,7,8			CT : Current transformer for heater break alarm			
No	Description		No	Description		No	Description		No	Description					
13	SG COM	Communication 1 RS-485	13	SG	Communication 1	13	SG	Communication 1	13	COM	Digital input (DI1) Non voltage contact input				
14	T/R(A)		14	T/R(A)	RS-485	14	T/R(A)	RS-485	14	DI1					
15	T/R(B)	Digital input (DI1) Non voltage contact input	15	T/R(B)		15	T/R(B)		15	+	Remote setpoint input				
16	DI1		16	SG	Communication 2	16	COM	CT1,CT2 input	16	IN					
17	CT1	CT1 input	17	T/R(A)	RS-485	17	CT1		17	+	Analog retransmission output				
18			18	T/R(B)		18	CT2		18	AO					

FB400



FB900



• Use a solderless terminal for screw size M3X6.

No	Description	No	Description	No	Description
1	AC 100-240V L	25	SG	13	COM
2	DC 24V N	26	SD	14	DI 5
3	COM	27	T/R(A)	15	DI 6
4	DO4	28	T/R(B)	16	DI 7
5	DO3	29	R(A)	17	COM (A)
6	COM	30	R(B)	18	CT1
7	DO2	31	T/R(A)	19	CT2
8	DO1	32	T/R(B)	20	OPEN (O)
9	OUT2	33	R(A)	21	COM (B)
10	OUT2	34	T/R(A)	22	CT1
11	OUT1	35	R(B)	23	CT2
12	OUT1	36	T/R(B)	24	CT1

(*) Optional

CT : Current transformer for heater break alarm
PFF : Power feed forward transformer

REX-F9000



General Description

The REX-F9000 is a high resolution temperature controller that has been specifically designed for applications where precise process control with three decimal places (0.001°C) is required. This instrument is easy-to-use and offers versatile functions such as dual loop control, bar-graph display, autotuning, communications, analog outputs and contact inputs. The REX-F9000 combines a wide range of features with optimum PID values for fast, accurate response to process changes for maximum control performance.

Features

- ☆ High resolution
- ☆ High accuracy
- ☆ Power feed forward function
- ☆ 2-channel control
- ☆ Brilliant PID
- ☆ Digital communications

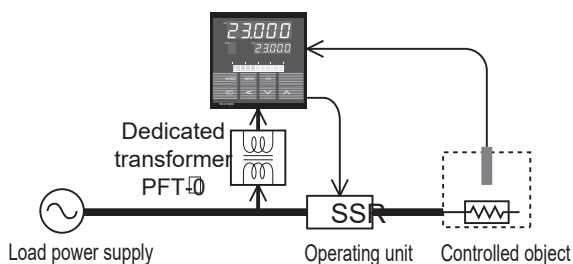
High Resolution

REX-F9000 has a high resolution of 0.001°C over an input range of 0.000 to 50.000°C.

0.001°C

Power Feed Forward Function

The REX-F9000 constantly monitors the electrical load through a dedicated transformer. It then adjusts PID outputs relative to power supply fluctuations to prevent sudden load output changes to the electrical heating elements.



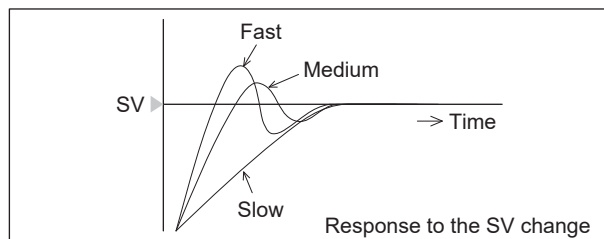
High Accuracy

Primary industrial applications are semiconductor equipment and laboratory equipment or anywhere that extremely accurate temperature is required.

±0.05°C

Brilliant PID

The Brilliant PID combines stable control with quick response. With conventional PID control, there is a conflict between control stability and quick response time. Response to set point changes may be compromised when stability is improved; conversely, stability may be compromised when quick response to SV change is achieved. Brilliant PID retains optimum PID values for stability, while offering the flexibility to choose the control response type that is needed such as Fast, Medium and Slow. Select the Fast response type when quick response is required or the Slow response to avoid overshooting.



2-Channel Control

The REX-F9000 is available with 2-channel input for dual channel control.

Digital Temperature Controller REX-F9000



Specifications

Input

Number of Inputs

1 or 2 points

Input

RTD : Pt100 (JIS/IEC), JPt100 (JIS)

• 3 or 4 wire system

• Influence of input lead resistance : Less than 0.04°C
(Less than 10Ω per wire)

• Input break action : Up-scale

• Input short action : Down-scale

Input Range

0.000 to 50.000°C

Sampling Time

0.1 sec

PV Bias

-19.999 to 19.999°C

Digital Filter

0.1 to 100.0 sec (No filter when 0.0 is set)

Performance

Setting Accuracy

a) Temperature : $\pm 0.05^\circ\text{C}$

b) Other setting : Within $\pm 0.1\%$ of setting range

Measuring Accuracy

$\pm 0.05^\circ\text{C}$ (Ambient temperature $23^\circ\text{C} \pm 5^\circ\text{C}$)

Insulation Resistance

More than 20MΩ (500V DC) between measured and ground terminals.

More than 20MΩ (500V DC) between power and ground terminals.

Dielectric Strength

1000V AC for one minute between measured and ground terminals.

1500V AC for one minute between power and ground terminals.

Control

Control Method

Brilliant PID control with autotuning

• Direct / Reverse action (Selectable)

Major Setting Range

Set value : 0.000 to 50.000°C

Proportional band : 0.001 to 50.000°C

Integral time : 0.1 to 3600.0 sec. (Zero is not settable)

Derivative time : 0.1 to 3600.0 sec. (PI action when D=0)

Control response : 0 (Slow), 1 (Medium), 2 (Fast)

Proportional cycle : 0.1 to 100.0 sec. (Only voltage pulse output)

Control Output

Voltage pulse output : 0/12V DC

(Load resistance : More than 600Ω)

Current output : 4 to 20mA DC

(Load resistance : Less than 600Ω)

• Output resolution : More than 13 bits

• Output impedance : More than 5MΩ

Alarms

Temperature Alarm

a) Number of alarms : 2 points / channel

b) Type : Deviation High, Low, High/Low, Band

Process High, Low

Set value High, Low

c) Setting range : Deviation and band alarm : -19.999 to 19.999°C
(Action is not guaranteed in the case of an alarm setting that is outside of the input range.)

Process alarm : 0.000 to 50.000°C

d) Alarm differential gap : 0.000 to 5.000°C

e) Alarm timer : 0 to 600 sec.

Alarm Output

Relay output, Form A contact 250V AC 1A (resistive load)

Energized or de-energized output

Communications

Communication Method : RS-485 (2-wire)

Communication Speed : 1200, 2400, 4800, 9600, 19200 BPS

Bit Format

Start bit : 1

Data bit : 7 or 8

Parity bit : Without, Odd or Even

Stop bit : 1 or 2

Communication Code : ASCII (JIS) 7-bit code

Maximum Connection : 31 (Address can be set from 0 to 99.)

Contact Input

Number of Inputs : 1 point

Type : RUN/STOP

Input Rating : Non-voltage contact input

a) OPEN : 500kΩ or more

b) CLOSE : 10Ω or less

Analog Output

(Optional)

Number of Outputs : 1 point / channel

Output Types : a) Measured value (PV)

b) Deviation (DV)

c) Set value (SV)

d) Manipulated output value (MV)

Output Scaling : High limit and Low limit are available.

Output Resolution : 13 bits or more

Output Accuracy : 0.1% of span

Output Ripple : 0.1% of span (When resistive load)

NO	Output Signal	Output Impedance	Allowable Load Resistance
4	0 – 5 V	Less than 0.1Ω	More than 1kΩ
6	1 – 5 V	Less than 0.1Ω	More than 1kΩ
7	0 – 20mA	Less than 5MΩ	Less than 600Ω
8	4 – 20mA	Less than 5MΩ	Less than 600Ω

General Specifications

Supply Voltage

a) 85 to 264V AC (Including supply voltage variation)

[Rating : 100 to 240V AC] (50/60Hz common)

b) 21.6 to 26.4V AC (Including supply voltage variation)

[Rating : 24V AC] (50/60Hz common)

c) 21.6 to 26.4V DC (Ripple rate 10% p-p or less) [Rating:24VDC]

Power Consumption

Less than 13VA for standard AC type (at 100V AC)

Less than 19VA for standard AC type (at 240V AC)

Less than 11VA for 24V AC type

Less than 340mA for 24V DC type

Power Failure Effect

Not affected by power failure shorter than 20msec, otherwise reset to the initial state.

FAIL Output

a) Check item : MCU trouble, MCU supply voltage trouble, watchdog timer, EEPROM error, input circuit trouble, adjustment error, sensor break

b) Output : Relay output, Form A contact 250V AC 1A (resistive load) Abnormal time open.

Operating Environments : 0 to 50°C [32 to 122°F] , 45 to 85% RH

Memory Backup : Backed up by non-volatile memory.

Number of writing : Approx. 100,000 times

Net Weight

Approx. 530g

External Dimensions (W x H x D)

96 x 96 x 100mm

Compliance with Standards

- CE Mark
- UL/cUL Recognized



Digital Temperature Controller REX-F9000

Model and Suffix Code

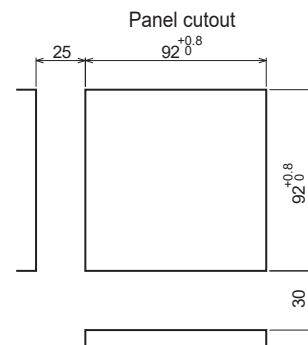
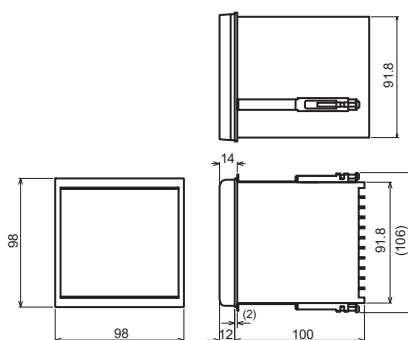
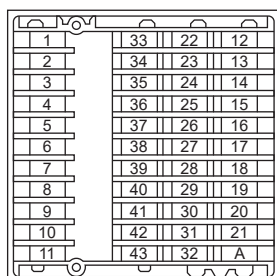
Digital Controller

Specifications	Model and Suffix Code									
Model	F9000	—	□	□	□	—	□	*	□	□ / □
Type	1 channel type 2 channels type	1 2								
Control output (CH1)	Voltage pulse output Current output		V 8							
Control output (CH2)	Not supplied (1 channel type) Voltage pulse output Current output		N V 8							
Power supply	24V AC/DC 100 to 240V AC					3 4				
Analog output (CH1)	Not supplied 0 to 5V DC 1 to 5V DC 0 to 20mA DC 4 to 20mA DC						N 4 6 7 8			
Analog output (CH2)	Not supplied 0 to 5V DC 1 to 5V DC 0 to 20mA DC 4 to 20mA DC							N 4 6 7 8		
Power feedback transformer *	Not supplied Load power supply 100V (100 to 120V AC) Load power supply 200V (200 to 240V AC)								N 1 2	

* Power feedback transformer not required when replacing the F9000. Select (N).
When ordering transformer for replacement, specify one of the following model codes.
100 to 120V AC type : **PFT-01**
200 to 240V AC type : **PFT-02A**

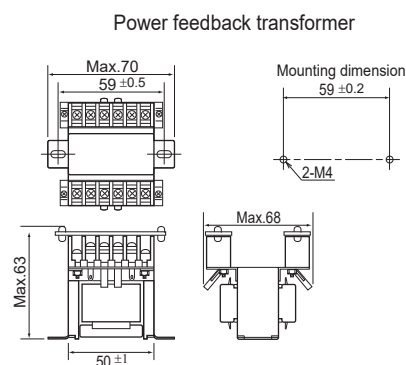
External Dimensions and Rear Terminals

Unit : mm



No.	Description	
1	Ground	Ground
2	Power Supply	AC 100 to 240V, AC 24V, DC 24V +
3	FAIL Output	NO, FAIL
4	Digital Input	DI, RUN/STOP
5	Communications	SG, RS-485
6	Feedback Transformer Input	T/R(A), T/R(B)
7		
8		
9		
10		
11		

No.	Description	
12	Control Output	+
13	Control Output	-
14	Alarm Output	NO
15	Alarm Output	NO
16	Measured Input	A'
17	Measured Input	A
18	Measured Input	B
19	Measured Input	B
20	Measured Input	RTD
21	Measured Input	A
22	Measured Input	B
23	Measured Input	A
24	Measured Input	B
25	Measured Input	A
26	Measured Input	B
27	Measured Input	A
28	Measured Input	B
29	Measured Input	A
30	Measured Input	B
31	Measured Input	A
32	Measured Input	B



No.	Description	
40	Analog Output	AO, For channel 2
41	Analog Output	AO, For channel 1
42	Analog Output	AO, For channel 1
43	Analog Output	AO, For channel 1



GZ400 GZ900



General Description

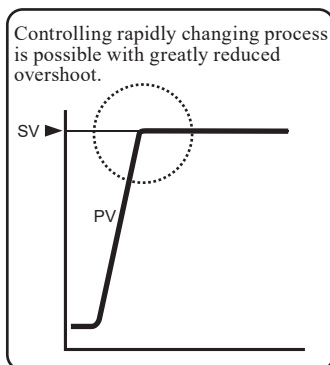
The GZ series are digital PID controllers with a high speed sampling time of 10 ms (0.01 sec) with high-resolution thermocouple, RTD or current voltage input, supplied with parameters settable in 1/100 sec. Applications in RTP (Rapid Thermal Process), RTA (Rapid Thermal Anneal) and temperature control of semiconductor manufacturing can be controlled by the GZ series. The high speed sampling function also makes it suitable for other applications requiring fast control such as pressure or flow rate.

Features

- ☆ Three Indicators
- ☆ Thin bezel
- ☆ Measuring Accuracy : $\pm 0.1\%$ of reading
- ☆ Sampling Time : 0.01 sec.
- ☆ Selectable Control method (Heat/Cool)
- ☆ Two Input Control

High Speed Sampling Time (FZ400/900)

Feedback control with 100 samplings per second enables controlling a fast changing process that was difficult to control. Such applications include pressure, flow rate, and pulse heat.



Front Loader Communication Port

All models are supplied with a front loader port as standard. Configuration software can be used without removing the controller from the panel.



Front Loader Communication Port

The power to COM-KG is supplied from the PC via the USB port so no power supply is necessary.



USB Communication Converter COM-KG
• Sold separately

Easy Data Management
Communication Tool
PROTEM 2
Data monitoring, setting, storage, copy, transfer, logging, and report creation



Simply download "PROTEM2" from the RKC Instrument website (www.rkcinst.com).

Three Indicators

FZ400

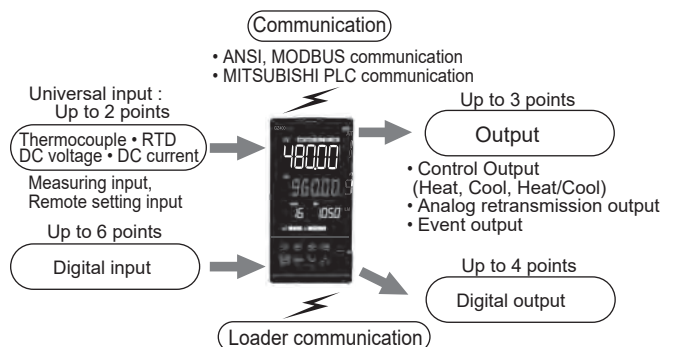


FZ900



- PV
- SV
- MV : Control Output
- TIME : Memory Area Soak Time
- CT : Current Transformer Input
Enables display of load factor of the heater controlling the process and detects potential errors at an early stage.
Selectable Display

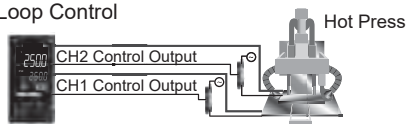
Numerous inputs and outputs



Features

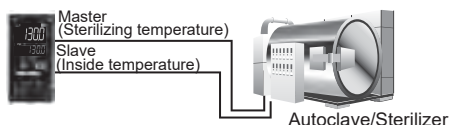
2 Inputs for various applications

2 Loop Control



Cascade Control (Control Loop Combination Function)

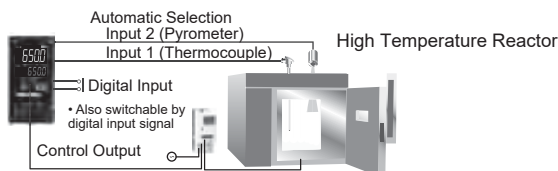
Available with functions related to Cascade control and dedicated Autotuning.



Control with PV select

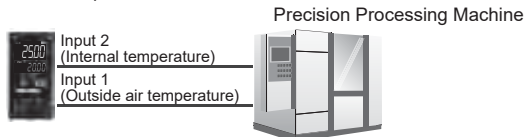
This is a function to switch between Input 1 and Input 2 at a preset temperature.

- This function may be appropriate in such an application where a thermocouple (whose operating temperature range is relatively low) and a radiation pyrometer (which can be used for high temperature applications) are used being switched between them.



Math Control

This is a function of control to maintain constant difference between PV of Input 1 and Input 2.



Display Customization (Parameter Select Function)

Select and display only necessary parameters.

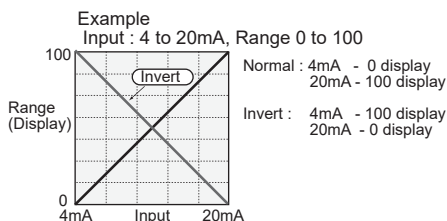
"Set Value • Event 4"



Set value
Event 1
Event 2
Event 3
Event 4
Proportional Band
Integral Time
Derivative Time
Control Response
Proactive intensity
FF Amount

Inverting the Input Function (DC Voltage/Current Input)

The proportional relation between the input current (voltage) and the displayed value can be inverted.

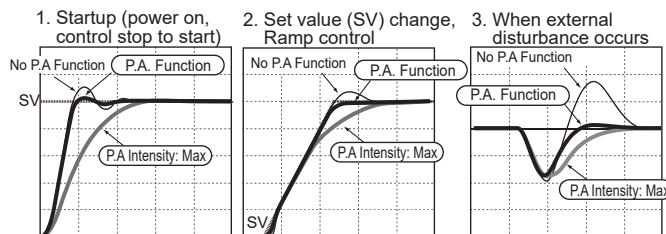


Suppresses fluctuations due to overshoot and external disturbance.

Proactive Function

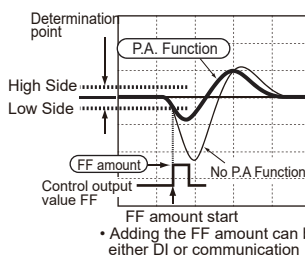
< Suppressing Overshoot >

P.A. : Proactive



Proactive Intensity setting : 0: No function, 1 (Min), 2, 3, 4(Max), Default setting : 2

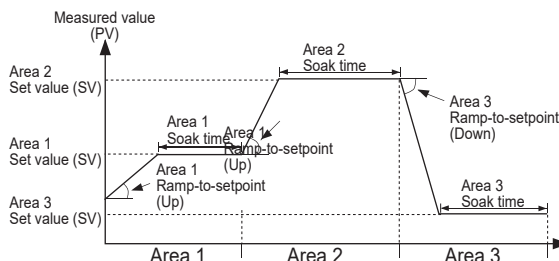
<Bottom suppression function>



When the input fluctuation by external disturbance is detected, the amount of FF (Feed forward) is added to the output value to suppress the Bottom.

Ramp/Soak Program Control

Up to 16-segment ramp/soak control is available by using the Memory Area function (area soak time, link area number, ramp-to-setpoint Up and Down).



Programless connection to PLCs

A PLC special protocol (MAPMAN) function becomes a Master Unit to PLC, and automatically stores temperature data into registers in a PLC.

This enables easy handling of temperature control system to the exiting PLC system is available.

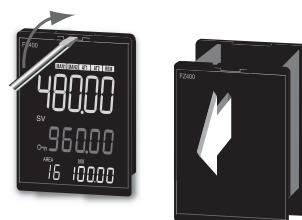


(MITSUBISHI PLC Protocol : QnA compatible, 3C frame (type 4))



Easy maintenance

The internal assembly of the GZ400/900 Series can be removed from the front.





Specifications

Input

Number of inputs

Max. 2 points • Isolated between each channel

Input

Universal input

a) Group 1

Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS), W5Re/W26Re, PR40-20 (ASTM), U, L (DIN)

• Influence of external resistance : Approx. 0.18μV/Ω

• Input break action : Up-scale / Down-scale (Selectable)

RTD : Pt100 (JIS/IEC), JPt100 (JIS)

• Influence of input lead resistance : Approx. 0.006[%/Ω] of reading

• Maximum 100Ω per wire

• Input break action : Up-scale

Low voltage : 0 to 10mV DC, 0 to 100mV DC

• Input break action : Up-scale / Down-scale (Selectable)

b) Group 2

High voltage : 0 to 1V DC, 0 to 5V DC, 1 to 5V DC, 0 to 10V DC,

-5 to +5V DC, -10 to +10V

• Input break action : Value around 0V

c) Group 3

Current : 4 to 20mA DC, 0 to 20mA DC

• Input break action : Value around 0mA

Sampling Time

0.01 sec

Input Digital Filter

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

PV Bias

-span to +span

PV Ratio

0.500 to 1.500

Inverting the Input

If the instrument is a current/voltage input type, the proportional relation between the input current (voltage) and the displayed value can be inverted.

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, U, L

Less than -100°C (-148°F) : ±1.0°C [1.8°F] [Approximate value]

-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, PLII, W5Re/W26Re

Less than 0°C (32°F) : ±2.0°C (3.6°F) [Approximate value]

0 to 1000°C (32 to 1832°F) : ±1.0°C [1.8°F]

More than 1000°C (1832°F) : ±0.1% of Reading

Type : B

Less than 400°C (752°F) : ±70.0°C [±126°F] [Approximate value]

400 to 1000°C (752 to 1832°F) : ±1.4°C [2.5°F]

More than 1000°C (1832°F) : ±0.1% of Reading

Type : PR40-20

Less than 400°C (752°F) : ±20.0°C [±36°F] [Approximate value]

400 to 1000°C (752 to 1832°F) : ±1.0°C [2.5°F]

More than 1000°C (1832°F) : ±0.1% of Reading

Cold junction temperature compensation error

±0.5°C (0.9°F) [at 23°C ±2°C (73.4°F ±3.6°F)]

Within ±1.5°C (±2.7°F)

[Between -10 and +55°C (14 to 131°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 + 1 digit)

• Display accuracy: Is equal to the above accuracy with the value below the minimum resolution rounded up.

• Close horizontal mounting error : ±1.5°C (±2.7°F)

Insulation Resistance

More than 20MΩ (500V DC) between measured terminals and ground

More than 20MΩ (500V DC) between power terminals and ground

Dielectric Strength

1500V AC for one minute between measured 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)

• a), b) is selectable.

Autotuning Method

a) For PID control (Direct action/Reverse action)

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

Startup tuning

The condition to activate Startup Tuning is selectable among a) to g)

a) At power-on, one-time tuning

b) At SV change, one-time tuning

c) At power-on and SV change, one-time tuning

d) At power-on, always on

e) At SV change, always on

f) At power-on and SV change, always on

g) Function off

(Not available for Heat/Cool PID control type)

Proactive Function

Proactive function suppresses overshoot and provides fast and stable control.

Major Setting Range

Set value :

Same as input range.

Proportional band :

0(0.0) to input span (Temperature input)

0.0 to 1000.0% of span (Voltage, Current input)

(ON/OFF control when P = 0)

• Differential gap at ON/OFF control

(High/Low individual setting) :

Temperature input : 0(0.0) to span (°C, °F)

Voltage/Current input : 0.0 to 100.0% of span

Integral time :

0 to 3600 sec, 0.0 to 3600.0 sec or

0.00 to 360.00 sec (PD control when I = 0)

(Heat/Cool individual setting) (selectable)

Derivative time :

0 to 3600 sec, 0.0 to 3600.0 sec or

0.00 to 360.00 sec (PI control when I = 0)

(Heat/Cool individual setting) (selectable)

Cool-side proportional band :

1(0.1) to input span (Temperature input)

0.1 to 1000.0% of span (Voltage, Current input)

Deadband/Overlap :

-span to +span (Temperature input)

-100.0 to +100.0% of span (Voltage, Current input)

Control response :

Slow, Medium, Fast

Ramp-to-setpoint :

0 to span per Time

(Time is selectable between 1 and 3600 sec)

Output limiter :

-5.0 to +105.0% (High/Low individual setting)

Cool-side output limiter :

-5.0 to +105.0% (High/Low individual setting)

Output change rate limiter :

0.0 to 100.0%/sec. (Up/Down individual setting)

Cool-side output change rate limiter :

0.0 to 100.0%/sec. (Up/Down 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%

Output at control stop mode : -5.0 to 100.5% (Heat/Cool individual setting)

Memory area

a) Number of memory area : 16 memory areas

b) Setting item : Set value (SV), Ramp-to-setpoint (Up/Down), Output limiter

High/Low [Heat/Cool], Soak time, Linking area number,

Event set values 1 to 4, Remote/Local select,

Auto/Manual select, MV value, Area trigger select,

Proportional band (Heat/Cool), Integral time (Heat/Cool)

Derivative time (Heat/Cool), Control response parameter,

Manual reset, Overlap/Deadband, Proactive intensity,

FF amount, Control loop break alarm (LBA) time,

LBA deadband

c) Method of area select : Key operations/Communication function/External

contact signal/Area soak time/Event function.

d) Memory area link function

Area soak time : 0 hr 00 min to 99 hr 59 min, 0 min 00 sec to 199min 59 sec

0 min 00 sec to 9 hr 59 min 59 sec (FZ400/900 only)

Linking area number : 0 to 16



Specifications

Output (OUT)

Number of Output

Up to 3 points (OUT1, OUT2, OUT3)

Output Signal

OUT1, 2 : Relay contact output, Voltage pulse output, Current output,
Continuous voltage, Transistor output
OUT3 : Voltage pulse, Current output (Universal output)

Output Items

Control output, HBA output, LBA output, Event output, RUN state output, Output of the communication monitoring result, Manual mode state output, Remote mode state output, AT state output, Output while Set value (SV) is changing, FAIL output, Retransmission output

Output Type

- Relay contact output (1), [OUT1]
 - a) Contact type : 1c contact, 250V AC 3A, 30V DC 1A (Resistive load)
 - b) Electric life : 300,000 operations or more (Rated load)
 - c) Mechanical life : 50,000,000 operations or more (Switching: 180 times/min)
- Relay contact output (2), [OUT2]
 - a) Contact type : 1a contact, 250V AC 3A, 30V DC 1A (Resistive load)
 - b) Electric life : 300,000 operations or more (Rated load)
 - c) Mechanical life : 50,000,000 operations or more (Switching: 180 times/min)
- Voltage pulse output (1), [OUT1, OUT2]
 - 0/12V DC (Load resistance : More than 500Ω)
- Voltage pulse output (2), [OUT3]
 - 0/14V DC (Load resistance : More than 600Ω)
- Current output
 - 4 to 20mA, 0 to 20mA (Load resistance : Less than 500Ω)
- Continuous voltage output
 - 0 to 5V DC, 1 to 5V DC, 0 to 10V DC (Load resistance : More than 1kΩ)
- Transistor output
 - a) Load voltage : Less than 30V DC
 - b) Load current : Less than 100mA

Digital Output

(Optional)

Number of Sub Output

Up to 4 points (DO1 to DO4)
•DO1:Standard, DO2 to DO4 : Optional

Output Items

HBA output, LBA output, Event output, RUN state output, Output of the communication monitoring result, Manual mode state output, Remote mode state output, AT state output, Output while Set value (SV) is changing, FAIL output

Output Type

- Relay contact output
 - a) Contact type : 1a contact, 250V AC 1A, 30V DC 0.5A (Resistive load)
 - b) Electric life : 150,000 operations or more (Rated load)
 - c) Mechanical life : 20,000,000 operations or more (Switching: 300 times/min)

Event (Alarm)

Number of Event Setting

Up to 4 points (Event 1 to 4)

Alarms

Type : Process high, Process low, Process high/low*1, Deviation high, Deviation low, Deviation high/low*1, Band*1, Set value high, Set value low, Set value high/low, MV value high (Heat/Cool), MV value low (Heat/Cool)
*1: Two types of alarm settings are field-selectable.
1. Independent high and low settings.
2. Common high/low setting (Factory setting, unless specified in alarm code when ordering)
• Hold/Re-hold action, Delay timer, Energized/de-energized action, Interlock (latch) function, Alarm lamp ON condition available.

Control loop break alarm (LBA)

LBA time : 0 to 7200 sec (LBA is OFF when 0 is set.)
Dead band : 0 to input span

Heater break alarm (HBA)

- a) Number of alarm : 2 points (1 point per CT input)
- b) Setting range : 0.0 to 100.0A
(0.0: HBA function OFF [Current value monitoring is still available])
• CT does not detect current value when the control output ON time or control output OFF time is less than 250 ms.
- c) Delay times : 0 to 255 times
• Heater break alarm is available for time proportioning output only.

Output logic calculation

OR logic calculation from event 1 to 4, HBA1/2, LBA1/2
Input abnormal 1/2 (High/Low)

Digital Input

(Optional)

Number of Inputs

Up to 6 points (DI 1 to 6)

Input Rating

Non-voltage contact input

Functions

Run/Stop, Auto/Manual (Input 1/Input 2 : Common/Individual)
Remote/Local, PV select, 2-loop control*/Differential temperature control), Interlock release,
Peak/Bottom hold reset (Input 1/Input 2 : Common/Individual),
Autotuning ON/OFF (Input 1/Input 2 : Common/Individual)
Unlock/Lock, Direct/Reverse action, Area select, Area jump

Remote Setpoint Input

(Optional)

Input

- DC voltage (High) : 0 to 1V DC, 0 to 5V DC, 1 to 5V DC, 0 to 10V DC, -5 to +5V DC, -10 to +10V DC
•Input impedance : More than 1MΩ
4 to 20mA DC, 0 to 20mA DC
- DC current : •Input impedance : 50MΩ
- DC voltage (Low) : 0 to 100mV DC, 0 to 10mV DC
•Input impedance : More than 1MΩ
- Universal input
- PV input and remote setpoint input are isolated.

Sampling time

0.05 sec

Accuracy

0.1% of input span

RS Digital Filter

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

RS Bias

-span to +span

RS Ratio

0.001 to 9.999

Analog Retransmission Output (Optional)

Number of Outputs

1 point

Output types

Measured value (PV), Deviation (DEV), Set value (SV), Measured value (PV), Set value (SV), Manipulated value (MV),
Deviation (between PV and SV), Current transformer (CT) input value, Measured value (PV) of differential temperature input
• Selectable

Output Signal

Current output (OUT1, OUT2, OUT3)
4 to 20mA DC, 0 to 20mA DC (Load resistance : Less than 600Ω)
Continuous voltage output (OUT1, OUT2)
0 to 5V DC, 1 to 5V DC, 0 to 10V DC (Load resistance : More than 1kΩ)

Output Scaling

- a) Measured value (PV) : Same as measured range
- b) Deviation : -Input span to +Input span
- c) Set value (SV) : Same as measured range
- d) Manipulated value (MV) : -5.0 to +105.0%
- e) Current transformer (CT) input value: 0.0 to 100.0 %
- f) Measured value (PV) of differential temperature input:
-(Input 1_Input span) to +(Input 1_Input span)

Communications

(Optional)

Number of communications : 1 point

Communication method : RS-485, RS-422A

Communication speed : 2400, 9600, 19200, 38400, 57600, 115200BPS

Protocol : ANSI X3.28(1976) 2.5 A4
MODBUS
PLC communication (MAPMAN)

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 : 31 units



Specifications

Loader communication (Standard)

Protocol : ANSI X3.28 sub-category 2.5 A4
Communication speed : 38400bps
Connection : 1 unit
Method of connection : Exclusive cable (COM-K2)

General Specifications

Waterproof/Dustproof (Optional)

- IP65 (IEC60529)
- Waterproof/Dustproof protection only effective from the front in panel mounted installation.
- When the front loader connector cover is not installed: IP00

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 type
GZ400 : Max. 6.8VA (100V), Rush current : Less than 5.6A
Max. 10.1VA (240V), Rush current : Less than 13.3A
GZ900 : Max. 7.4VA (100V), Rush current : Less than 5.6A
Max. 10.9VA (200V), Rush current : Less than 13.3A
- 24V AC type
GZ400 : Max. 6.9VA (24V), Rush current : Less than 16.3A
GZ900 : Max. 7.4VA (24V), Rush current : Less than 16.3A
- 24V DC type
GZ400 : Max. 175mA (24V), Rush current : Less than 11.5A
GZ900 : Max. 190mA (24V), Rush current : Less than 11.5A

Power Failure Effect

- 100 to 240V AC, 24V AC type
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)
- 24V DC type
A power failure of 5m sec or less will not affect the control action.
If power failure of more than 5m sec occurs, controller will restart with the state of HOT start 1, HOT start 2 or COLD start (selectable)

Self-Diagnostic Function

Adjustment data check, Back-up check, A/D converter check, etc.

Operating Environments : -10 to 55°C [14 to 131°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. 1,000,000,000,000 times.
(Depending on storage and operating conditions.)

Net Weight

GZ400 : Approx. 221g, GZ900 : Approx. 291g

External Dimensions (W x H x D)

GZ400 : 48 x 96 x 65mm, GZ900 : 96 x 96 x 65mm

Compliance with Standards

- UL : UL61010-1
- cUL : CAN/CSA-C22.2 No.61010-1
- CE Mark
LVD: EN61010-1, EMC: EN61326-1, RoHS: EN50581
- RCM : EN55011

Input Range (Universal Input)

a) Group 1

Input	Measured range	Reference
K	-200.0 to +400.0°C, -328.0 to +752.0°F -200.0 to +1372.0°C, -328.0 to +2502.0°F	JIS/IEC
J	-200.0 to +400.0°C, -328.0 to +752.0°F -200.0 to +1200.0°C, -328.0 to +2192.0°F	
T	-200.0 to +400.0°C, -328.0 to +752.0°F	
S	-50.0 to +1768.0°C, -58.0 to +3214.0°F	
R	-50.0 to +1768.0°C, -58.0 to +3214.0°F	
E	-200.0 to +1000.0°C, -328.0 to +1832.0°F	
B	0.0 to 1800.0°C, 0.0 to 3272.0°F	
N	0.0 to 1300.0°C, 0.0 to 2372.0°F	
PLII	0.0 to 1390.0°C, 0.0 to 2534.0°F	NBS
W5Re/W26Re	0 to 2300°C, 0 to 4200°F	ASTM
U	-200.0 to +600.0°C, -328.0 to +1112.0°F	DIN
L	0.0 to 900.0°C, 0.0 to 1652.0°F	
PR40-20	0 to 1800°C, 0 to 3200°F	ASTM
Pt100	-200.0 to +850.0°C, -328.0 to +1562.0°F -100.00 to +850.00°C, -148.00 ~ +999.99°F 0.00 to 50.00°C, 32.00 to 122.00°F	JIS/IEC • 3-wire system
JPt100	-200.0 to +640.0°C, -328.0 to +1184.0°F -100.00 to +640.00°C, -148.00 to +999.99°F 0.00 to 50.00°C, 32.00 to 122.00°F	JIS • 3-wire system
Low Voltage	0 to 10mV DC, 0 to 100mV DC	

b) Group 2

Input	Measured range
High Voltage	0 to 1V DC, 0 to 5V DC, 1 to 5V DC, 0 to 10V DC -5 to +5V DC, -10 to +10V DC

c) Group 3

Input	Measured range
Current	0 to 20mA DC, 4 to 20mA DC

Process/Temperature Controller GZ400/900



Model and Suffix Code

Specifications		Model and Suffix Code											
Model		① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ □ □ □ □ □ □ □ □ □ □ □ □											
① Control Method	GZ400 (48 x 96mm 1/8 DIN Vertical size) GZ900 (96 x 96mm 1/4 DIN size) 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)	F D G A W											
② Input and range	See Input range Code Table												
③ Output 1 (OUT1) (*1)	Not supplied Relay contact output Voltage pulse output (0/12V DC) DC mA, V See Output Code Table Transistor output												
④ Output 2 (OUT2) (*1)	Not supplied Relay contact output Voltage pulse output (0/12V DC) DC mA, V Transistor output												
⑤ Power supply	24V AC/DC 100 to 240V AC												
⑥ Digital output (*1)	Digital output 1 point Digital output 4 points												
⑦ Option 1 (*2)	Not supplied CT input 2 points (CTL-6-P-N) CT input 2 points (CTL-12-S56-10L-N) CT input 2 points (CTL-6-Z)												
⑧ Option 2 (*2)	Not supplied Output 3 (OUT3) Digital input 1 to 6 (DI1 to 6) Communication RS-422A Communication RS-485 Output 3 (OUT3) + Digital input 1 to 6 (DI1 to 6) Output 3 (OUT3) + Communication RS-422A Output 3 (OUT3) + Communication RS-485 Output 3 (OUT3) + Digital input 1 to 4 (DI1 to 4) + Communication RS-422A Output 3 (OUT3) + Digital input 1 to 6 (DI1 to 6) + Communication RS-485												
⑨ Option 3 (*2) (Caution1)	Not supplied Remote setting input Measured input 2												
⑩ Display color	Standard												
⑪ Waterproof/ Dustproof	Not supplied Waterproof/Dustproof protection (IP65)												
⑫ Quick start code	No quick start code (Default setting) Specify quick start code (DO type)												

Caution 1 : When Heat/Cool PID control is selected, Select code "N" or "1" .

*1 :< Default setting of Output 1 (OUT1), Output 2 (OUT2), and Digital output >
Quick start code not specified : Output allocation code "1".

*2 Default setting of Option function >

• CT input

CT1 assignment: Output 1 (OUT1)

CT2 assignment: PID control (without Measured input 2) : Output 1 (OUT1)

PID control (with Measured input 2) : Output 2 (OUT2)

Heat/Cool PID control : Output 2 (OUT2)

• Output 3 (OUT3)

Current output (4 to 20mA), Analog retransmission output (Input 1 measured value)

• Digital input (DI)

Option 2 : Code "B", "E", "J"

DI1 to DI3 : Memory area select (8 points, No set signal)

DI4 : RUN/STOP *

DI5 : AUTO/MAN **

DI6 : Interlock release,

Option 2 : Code "H"

DI1 to DI3 : Memory area select (8 points, No set signal)

DI4 : RUN/STOP *

* When "Remote setting input" is specified at Option 3, this will be configured to "Remote/Local transfer"

** When "Measured input 2" is specified at Option 3, "Auto/Manual transfer" will be assigned to Input 1 and Input 2.

• Communication

When quick start code not specified :

RKC standard communication (ANSI X3.28-1976).

The digit of the communication data depends on the Input range code

• Remote setting input

When quick start code not specified : 0 to 10V DC,

The range will be same as input 1.

• Measured input 2

2-Loop control. Input range and the Control action will be the same as

Measured input 1.

Input range code table (Universal input, Field-programmable)

Thermocouple

Input	Code	Range	Input	Code	Range
K	K : 01	0 to 200°C	T	T : 01	-199.9 to +400.0°C
	K : 02	0 to 400°C		T : 02	-199.9 to +100.0°C
	K : 03	0 to 600°C		T : 03	-100.0 to +200.0°C
	K : 04	0 to 800°C		T : 19	-200.0 to +400.0°C
	K : 06	0 to 1200°C	S	S : 06	-50 to +1768°C
	K : 07	0 to 1372°C		S : 07	-50.0 to +1768.0°C
	K : 08	-199.9 to +300.0°C		R : 01	0 to 1600°C
	K : 09	0.0 to 400.0°C		R : 07	-50 to +1768°C
	K : 10	0.0 to 800.0°C		R : 08	-50.0 to +1768.0°C
	K : 14	0 to 300°C		R : 09	0.0 to 1600.0°C
	K : 41	-200 to +1372°C	E	E : 01	0 to 800°C
	K : 42	-200.0 to +1372.0°C		E : 23	0.0 to 800.0°C
	K : A1	0 to 800°F		B : 03	0 to 1800°C
	K : A2	0 to 1600°F		B : 04	0.0 to 1800.0°C
J	K : A3	0 to 2502°F	N	N : 02	0 to 1300°C
	J : 01	0 to 200°C		N : 05	0.0 to 1300.0°C
	J : 02	0 to 400°C		PLII	A : 01 0 to 1300°C
	J : 03	0 to 600°C			A : 05 0.0 to 1300.0°C
	J : 04	0 to 800°C	W5Re/W26Re	W : 03	0 to 2300°C
	J : 08	0.0 to 400.0°C		F : 02	0 to 1800°C
	J : 29	-200.0 to +1200.0°C		F : A2	0 to 3200°F
	J : A1	0 to 800°F		U : 01	-199.9 to +600.0°C
	J : A3	0 to 2192°F	PR40-20	L : 04	0.0 to 900.0°C
	J : A6	0 to 400°F			

RTD

Input	Code	Range	Input	Code	Range
Pt100	D : 01	-199.9 to +649.0°C	Pt100	D : 27	0.00 to 50.00°C
	D : 04	-100.0 to +100.0°C		D : 34	-100.00 to +100.00°C
	D : 05	-100.0 to +200.0°C		D : 35	-200.0 to +850.0°C
	D : 06	0.0 to 50.0°C		D : 48	-100.00 to +850.00°C
	D : 07	0.0 to 100.0°C		D : A1	-199.9 to +999.9°F
	D : 08	0.0 to 200.0°C	JPt100	D : A9	0.0 to 500.0°F
	D : 09	0.0 to 300.0°C		P : 08	0.0 to 200.0°C
	D : 10	0.0 to 500.0°C		P : 29	-100.00 to +100.00°C
	D : 12	-199.9 to +600.0°C		P : 30	-200.0 to +640.0°C
	D : 21	-200.0 to +200.0°C		P : 36	-100.00 to +640.00°C

DC Current • voltage

Input	Code	Range	Input	Code	Range
0 to 10mV	1 : 01	Scale range and decimal point are programmable	1 to 5V	6 : 01	Scale range and decimal point are programmable
0 to 100mV	2 : 01		0 to 20mA	7 : 01	
0 to 1V	3 : 01		4 to 20mA	8 : 01	
0 to 5V	4 : 01	Factory set value	-10 to 10V	9 : 04	Factory set value
0 to 10V	5 : 01	0.0 to 100.0%	-5 to +5V	9 : 05	0.0 to 100.0%

Output signal code table

4	0 - 5V DC	5	0 - 10V DC	6	1 - 5V DC	7	0 - 20mA DC	8	4 - 20mA DC
---	-----------	---	------------	---	-----------	---	-------------	---	-------------

* Please see page 1-74 for full fahrenheit temperature ranges.

Quick Start Code

- Quick start code 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.

Output allocation code table

Specifications	Initial Setting Code					
	□ □ - □ □ □ □ - □ □					
Output logic selection	See Output Allocation Code Table					
Remote setpoint input signal	None	N				
	0 to 1V DC	3				
	0 to 5V DC	4				
	0 to 10V DC	5				
	1 to 5V DC	6				
	0 to 20mA DC	7				
	4 to 20mA DC	8				
Event 1 type	-5 to +5V DC	9				
	-10 to +10V DC	A				
Event 2 type	None	N				
Event 3 type	See Event Code Table					
Event 4 type	None	N				
Communication	See Event Code Table					
	None	N				
	ANSI/RKC standard protocol	1				
	MODBUS protocol	2				
	PLC communication: MITSUBISHI	3				
	MELSEC series special protocol					

Code	OUT1	OUT2	DO1	DO2	DO3	DO4
1	Input 1 Control output [Heat side]	HBA1 HBA2	Event 1	Event 2	Event 3	Event 4
2	Input 1 Control output [Heat side]	HBA1 HBA2	Event 1	LBA1 LBA2	Event 3	Event 4
3	Input 1 Control output [Heat side]	FAIL	Event 1	HBA1 HBA2	Event 3	LBA1 LBA2
4	Input 1 Control output [Heat side]	HBA1 HBA2	Event 1	FAIL	Event 3	Event 4
5	Input 1 Control output [Heat side]	Event 1	LBA1 LBA2	HBA1 HBA2	Event 3	Event 4
6	Input 1 Control output [Heat side]	HBA1 HBA2	LBA1 LBA2	FAIL	Event 3	Event 4
7	Input 1 Control output [Heat side]	Event 1	LBA1 LBA2	FAIL	Event 3	Event 4
8	Input 1 Control output [Heat side]	Event 2 Event 4	Event 1 Event 3	HBA1 HBA2	LBA1 LBA2	FAIL
Note	When "Output 1 (OUT1)" is specified "N (None)" Allocation is None.	When "Output 2 (OUT2)" is specified "N (None)" Allocation is None.		When "Digital output " is specified "N (None)" Allocation is None.	When "Digital output " is specified "N (None)" Allocation is None.	When "Digital output " is specified "N (None)" Allocation is None.

- If two or more items are allocated to the same output, the resultant output is OR. The output allocation depends on the Control action and the selection of Option 3.

OUT2 allocation

Control Action	Option 3	OUT2 allocation
PID control	None or Remote setting input	Output Allocation Code Table
Heat/Cool PID control or Position proportioning PID control	None or Remote setting input	Input 1 Control output Heat/Cool PID control: Cool-side Position proportioning PID control : Close-side
PID control	Measured input 2	Input 2 Control output

Loop break alarm (LBA) Initial setting code:

- The output allocation has LBA output : 480
- The output allocation has no LBA output: 0

Event Code table

A	Deviation High	R	Deviation Low with Alarm Re-hold
B	Deviation Low	T	Deviation High/Low with Re-Hold
C	Deviation High/Low	V	Set value High
D	Band	W	Set value Low
E	Deviation High with Hold	X	Deviation High/Low (*)
F	Deviation Low with Hold	Y	Deviation High/Low with Alarm Hold (*)
G	Deviation High/Low with Hold	Z	Deviation High/Low with Alarm Re-Hold (*)
H	Process High	1	MV value High
J	Process Low	2	MV value Low
K	Process High with Hold	3	MV value High (Cool side)
L	Process Low with Hold	4	MV value Low (Heat side)
Q	Deviation High with Alarm Re-hold		

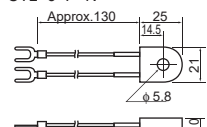
(*) Individual high and low settings

Accessory

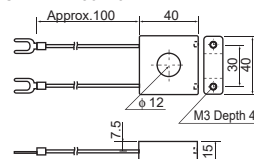
Current transformer for heater break alarm (HBA) (Sold separately)

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

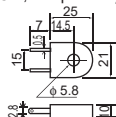
CTL-6-P-N (Unit : mm)



CTL-12-S56-10L-N



CTL-6-P-Z (0 to 10A)
(U.R.D.Co.,LTD product)



Terminal cover (Sold separately)

Type	Model Code
GZ400/900	KFB400-58



GZ900
(GZ900 uses 2 unit)



GZ400

Front cover (Sold separately)

Type	Model Code
GZ900	KRB900-36
GZ400	KRB400-36



GZ900

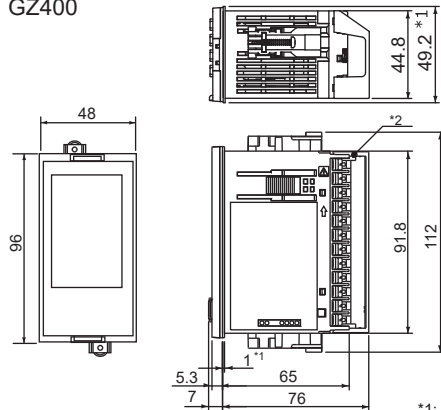


GZ400

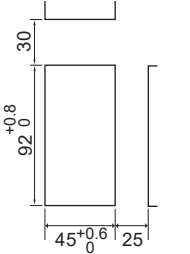
External Dimensions

Unit : mm

GZ400



Panel Cutout



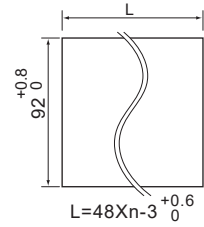
(Panel thickness must be between 1 to 10mm)

*1: Rubber packing for waterproof/dustproof.

*2: Terminal cover.

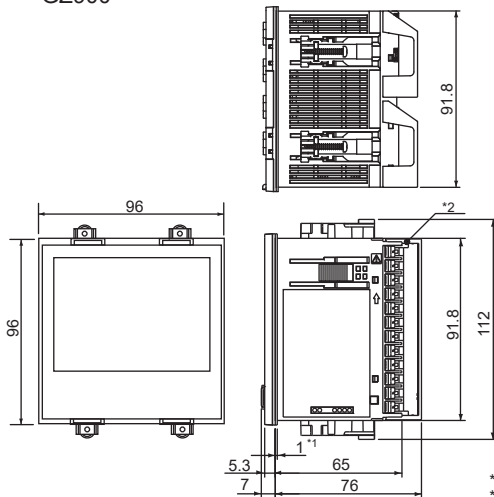
(Close horizontal mounting)

* Up to 6 units

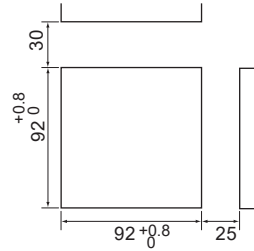


n : Number of controllers
($2 \leq n \leq 6$)

GZ900



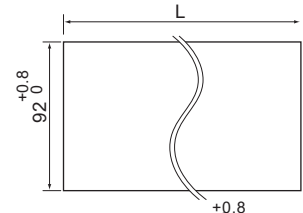
Panel Cutout



(Panel thickness must be between 1 to 10mm)

(Close horizontal mounting)

* Up to 6 units


$$L = 96Xn^{-4} + 0.8$$

n : Number of controllers
($2 \leq n \leq 6$)

- Waterproof/dustproof is not available for close horizontal mounting.

Rear Terminals

GZ400

GZ900

1		25		13	
2		26		14	
3		27		15	
4		28		16	
5		29		17	
6		30		18	
7		31		19	
8		32		20	
9		33		21	
10		34		22	
11		35		23	
12		36		24	

1				13	
2				14	
3				15	
4				16	
5				17	
6				18	
7				19	
8				20	
9				21	
10				22	
11				23	
12				24	

- Use a solderless terminal for screw size M3, width 6mm or less.

(*) Optional

CT : Current transformer for heater break alarm

No	Description	No	Description	No	Description
1		25		13	
2		26		14	
3		27		15	
4		28		16	
5		29		17	
6		30		18	
7		31		19	
8		32		20	
9		33		21	
10		34		22	
11		35		23	
12		36		24	

REX-C100
REX-C400
REX-C410
REX-C700
REX-C900



General Description

The Century Series controllers are designed for precise control performance at the most reasonable cost. Available in five DIN sizes, these instruments are recognized for their solid reliability and ease-of-use. This Series features dual displays, autotuning, PID algorithm, field-selectable °C/°F, reverse or direct action and a full range of temperature alarms.

Features

- ☆ Heat/Cool Control
- ☆ Standard autotuning
- ☆ Heater and loop break alarm
- ☆ Numerous control outputs
- ☆ Field-configurable thermocouples

Heat/Cool Control

The Heat/Cool PID control features heat and cool outputs for use where process-generated heat exists. This allows the input of overlap or deadband settings which contribute to energy savings. (Not available on REX-C100)

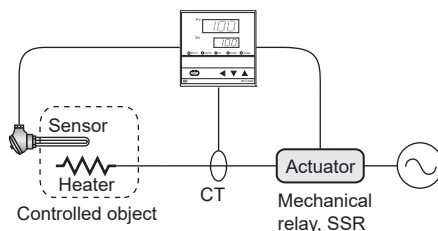
Heater Break Alarm (Optional)

The heater break alarm (HBA) detects a fault in heating or cooling circuit and displays actual amperage on the front panel. If the measured value becomes lower than the preset value, the alarm is activated.

The HBA function requires a current detector for measuring and monitoring the current load.

HBA for three phase is available. Contact RKC for details.

- Current transformer : CTL-6-P-N (0 to 30A),
CTL-12-S56-10L-N (0 to 100A)



Loop Break Alarm (Optional)

The control loop break alarm (LBA) monitors and protects an entire temperature control system. The LBA detects heater breaks, thermocouple or RTD failures, short circuits, or the failure of an operating device such as a mechanical or solid state relay.

When the PID computed value reaches 100% and the temperature does not respond in a set time, the loop break alarm is activated. Conversely, when the PID value reaches 0% and the temperature does not respond accordingly, the loop break alarm is turned on. In this example, the LBA uses reverse action to control heat. For cool control, the LBA action is reversed and becomes direct. LBA deadband is available to suppress the influence of external disturbances.

Standard Features

The Century Series offers full PID Control, autotuning on demand, °C/°F, Reverse or Direct action, PV Bias, anti-reset windup and operator lock-out function. Twelve different field-configurable thermocouple types inputs, RTD, DC milliamp or voltage inputs as well as relay, voltage pulse, 4-20 mA and triac trigger outputs are available.



Specifications

Input

Input (Universal input)

- a) Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS)
W5Re/W26Re (ASTM), U, L (DIN)
 - Influence of external resistance : Approx. 0.35 μ V/ Ω
 - Input break action : Up-scale
- b) 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
- c) DC voltage : 0 to 5V, 1 to 5V (0.0 to 100.0% fixed)
 - Input break action : Down-scale
- d) DC current : 0 to 20mA, 4 to 20mA (0.0 to 100.0% fixed)
 - Input break action : Down-scale

Sampling Time

0.5 sec

Performance

Measuring Accuracy

- a) Thermocouple
 - $\pm$ (0.5% of reading + 1 digit) or $\pm$ 3°C (6°F) whichever is larger
 - R, S inputs: $\pm$ 6°C (12°F) between 0 and 399°C (0 and 799°F)
 - Accuracy is not guaranteed between 0 and 399°C (0 and 799°F) for type B.
- b) RTD
 - $\pm$ (0.5% of reading + 1 digit) or $\pm$ 0.8°C (1.6°F) whichever is larger
- c) DC voltage and DC current
 - $\pm$ (0.5% of span + 1 digit)

Insulation Resistance

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

Dielectric Strength

1000V AC for one minute between measured and ground terminals
1500V AC for one minute between power and ground terminals

Control

Control Method

- a) PID control with autotuning
 - Available for reverse and direct action (Specify when ordering.)
- b) Heat/Cool PID control with autotuning (Not available on REX-C100)
 - Available for air and water cooling type (Specify when ordering.)

Major Setting Range

Setting range : Same as input range.
Heat-side proportional band: 1 to span or 0.1 to span
(ON/OFF action when P=0)
• Differential gap at ON/OFF action is 2°C (°F) as standard
(Factory set value)
Cool-side proportional band: 0 to 1000% of heat-side proportional band
(Heat/Cool ON/OFF action when Pc=0)
Integral time : 0 to 3600sec.(PD action when I=0)
Derivative time : 0 to 3600sec.(PI action when D=0)
Anti-reset windup (ARW) : 1 to 100% of heat-side proportional band
Deadband/overlap : -10 to 10°C (°F) or -10.0 to 10.0°C (°F)
Proportional cycle : 1 to 100 sec.

Control Output

Relay output : Form C contact, 250V AC 3A (resistive load)
(Form A contact : REX-C100)
Voltage pulse output : 0/12V DC
(Load resistance : More than 600 Ω)
Current output : 4 to 20mA DC
(Load resistance : Less than 600 Ω)
Triac trigger output : Zero-cross method for medium capacity
triac drive (less than 100A)
• Not available on Heat/Cool PID type.

Alarms

(Optional)

Temperature Alarm

- a) Number of alarm : 2 points (Maximum)
- b) Alarm action : Deviation High, Low, High/Low, Band
Process High, Low
- c) Alarm differential gap : 2°C (°F) or 2.0°C (°F) as standard.

Heater Break Alarm (For single phase)

- a) Number of inputs : 1point
- b) CT type : CTL-6-P-N(30A), CTL-12-S56-10L-N(100A)
- c) Display range : 0.0 to 100.0A
- d) Accuracy : $\pm$ 5% of input value or 2A
(whichever is larger)

• Output from Alarm 2 terminal.

Control Loop Break Alarm (LBA)

- a) LBA time setting : 0 to 7200 sec.
- b) LBA deadband : 0 to 999 °C[°F] or 100% of span
(OFF when LBA deadband = 0)
- Not available for triac trigger output type.
- Not available for heat/cool type.

Alarm Output

Relay output, Form A contact 250V AC 1A (resistive load)

General Specifications

Supply Voltage

- a) 85 to 264V AC (Including supply voltage variation)
[Rating : 100 to 240V AC] (50/60Hz common)
- b) 21.6 to 26.4V AC(Including supply voltage variation)
[Rating : 24V AC] (50/60Hz common)
- c) 21.6 to 26.4V DC(Ripple rate 10% p-p or less)
[Rating : 24V DC]

Power Consumption

Less than 17VA for standard AC type
Less than 7.5VA for 24V AC type
Less than 200mA for 24V DC type

Power Failure Effect

A power failure of 20msec or less will not affected the control action.
If power failure of more than 20msec occurs, controller will restart.

Operating Environment : 0 to 50°C [32 to 122°F] , 45 to 85% RH

Memory Backup : Backed up by non-volatile memory.

Net Weight

REX-C100 : Approx. 170g
REX-C400 : Approx. 260g
REX-C410 : Approx. 260g
REX-C700 : Approx. 250g
REX-C900 : Approx. 340g

External Dimensions (W x H x D)

REX-C100 : 48 x 48 x 100mm
REX-C400 : 48 x 96 x 100mm
REX-C410 : 96 x 48 x 100mm
REX-C700 : 72 x 72 x 100mm
REX-C900 : 96 x 96 x 100mm

Compliance with Standards (Optional)

- CE Mark
- UL/cUL Recognized



• Triac trigger output type and triac output are not CE Mark or UL/cUL Recognized.

Digital Temperature Controller CENTURY Series

Model and Suffix Code

Digital Controller

Specifications	Model and Suffix Code									
Model	C100 (1/16 DIN size) C400 (1/8 DIN Vertical size) C410 (1/8 DIN Horizontal size) C700 (3/16 DIN size) C900 (1/4 DIN size)									
Control method	PID control with AT (reverse action) PID control with AT (direct action) Heat/Cool PID with AT (Water cooling type) 1 • Not available on REX-C100 Heat/Cool PID with AT (Air cooling type) 1 • Not available on REX-C100					F				
Input type	See Range and Input Code Table					D				
Scale range	See Range and Input Code Table					W				
Control output (OUT1)	Relay contact output Voltage pulse output DC current output : 4 to 20mA 2 Triac trigger output 3					A				
Control output (OUT2)	Control action : F, D Relay contact output Voltage pulse output DC current output : 4 to 20mA									
Alarm 1	No alarm See Alarm Code Table									N
Alarm 2	No alarm See Alarm Code Table									N

Note

1 Triac trigger output and LBA are not available on Heat/Cool type.

2 HBA is not available if current output is specified.

3 Alarm 2 is not available for REX-C100 if triac trigger output is specified.

• For CE Mark and UL/cUL recognized products, add the suffix of "CE" to the end of the model code.

Range and Input Code Table

Thermocouple (Field-programmable)

Input	Code	Range
K	K 01	0 – 200°C
	K 02	0 – 400°C
	K 03	0 – 600°C
	K 04	0 – 800°C
	K 05	0 – 1000°C
	K 06	0 – 1200°C
	K 07	0 – 1372°C
	K 13	0 – 100°C
	K 14	0 – 300°C
	K 20	0 – 500°C
	K A1	0 – 800°F
	K A2	0 – 1600°F
J	K A3	0 – 2502°F
	K A9	20 – 70°F
	J 01	0 – 200°C
	J 02	0 – 400°C
	J 03	0 – 600°C
	J 04	0 – 800°C
	J 05	0 – 1000°C
	J 06	0 – 1200°C
	J A1	0 – 800°F
	J A2	0 – 1600°F
	J A3	0 – 2192°F
	J A6	0 – 400°F
R	R 01	0 – 1600°C
	R 02	0 – 1769°C
	R 04	0 – 1350°C
	R A1	0 – 3200°F
S	R A2	0 – 3216°F
	S 01	0 – 1600°C
	S 02	0 – 1769°C
	S A1	0 – 3200°F
B	S A2	0 – 3216°F
	B 01	400 – 1800°C
	B 02	0 – 1769°C
	B A1	800 – 3200°F
	B A2	0 – 3308°F

1 Type B input : Accuracy is not guaranteed between 0 and 399°C (0 and 799°F)

Input	Code	Range
E	E 01	0 – 800°C
	E 02	0 – 1769°C
	E A1	0 – 1600°F
N	E A2	0 – 1832°F
	N 01	0 – 1200°C
	N 02	0 – 1300°C
T	N A1	0 – 2300°F
	N A2	0 – 2372°F
	T 01	-199.9 – 400.0°C
	T 02	-199.9 – 100.0°C
	T 03	-100.0 – 200.0°C
	T 04	0.0 – 350.0°C
	T A1	-199.9 – 752.0°F
	T A2	-100.0 – 200.0°F
	T A3	-100.0 – 400.0°F
	T A4	0.0 – 450.0°F
	T A5	0.0 – 752.0°F
W5Re W26Re	W 01	0 – 2000°C
	W 02	0 – 2320°C
	W A1	0 – 4000°F
PL II	A 01	0 – 1300°C
	A 02	0 – 1390°C
	A 03	0 – 1200°C
U	A A1	0 – 2400°F
	A A2	0 – 2534°F
	U 01	-199.9 – 600.0°C
	U 02	-199.9 – 100.0°C
	U 03	0.0 – 400.0°C
	U A1	-199.9 – 999.9°F
	U A2	-100.0 – 200.0°F
	U A3	0.0 – 999.9°F
L	L 01	0 – 400°C
	L 02	0 – 800°C
	L A1	0 – 800°F
	L A2	0 – 1600°F

RTD (Field-programmable)

Input	Code	Range
Pt100	D 01	-199.9 – 649.0°C
	D 02	-199.9 – 200.0°C
	D 03	-100.0 – 50.0°C
	D 04	-100.0 – 100.0°C
	D 05	-100.0 – 200.0°C
	D 06	0.0 – 50.0°C
	D 07	0.0 – 100.0°C
	D 08	0.0 – 200.0°C
	D 09	0.0 – 300.0°C
	D 10	0.0 – 500.0°C
	D A1	-199.9 – 999.9°F
	D A2	-199.9 – 400.0°F
	D A3	-199.9 – 200.0°F
	D A4	-199.9 – 100.0°F
	D A5	-100.0 – 300.0°F
	D A6	0.0 – 100.0°F
	D A7	0.0 – 200.0°F
	D A8	0.0 – 400.0°F
JPT100	D A9	0.0 – 500.0°F
	P 01	-199.9 – 649.0°C
	P 02	-199.9 – 200.0°C
	P 03	-100.0 – 50.0°C
	P 04	-100.0 – 100.0°C
	P 05	-100.0 – 200.0°C
	P 06	0.0 – 50.0°C
	P 07	0.0 – 100.0°C
	P 08	0.0 – 200.0°C
	P 09	0.0 – 300.0°C
	P 10	0.0 – 500.0°C

Voltage and Current

Input	Code	Range
0 – 5V DC	4 01	0.0 – 100.0 (Fixed)
1 – 5V DC	6 01	0.0 – 100.0 (Fixed)
0 – 20mA DC	7 01	0.0 – 100.0 (Fixed)
4 – 20mA DC	8 01	0.0 – 100.0 (Fixed)

• Field programmable among following input group

a) 0 – 5V, 1 – 5V

b) 0 – 20mA, 4 – 20mA

Alarm Code Table

Code	Type
A	Deviation High
B	Deviation Low
C	Deviation High - Low
D	Deviation Band
E	Deviation High with Hold
F	Deviation Low with Hold
G	Deviation High/Low with Hold

Code	Type
H	Process High
J	Process Low
K	Process High with Hold
L	Process Low with Hold
R	Loop break alarm (LBA)
P	Heater break alarm (CTL-6P-N) 30A
S	Heater break alarm (CTL-12-S56-10L-N) 100A

Supply Voltage

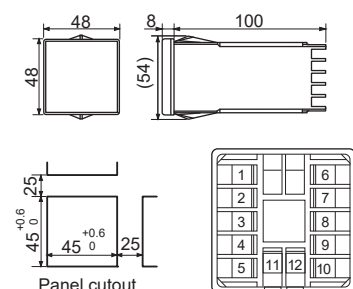
100 – 240V AC	24V AC	24V DC
---------------	--------	--------

Digital Temperature Controller **CENTURY Series**

External Dimensions and Rear Terminals

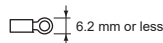
(Unit : mm)

REX-C100



No.	Description
1	Alarm 1
2	Alarm 2
3	T2
4	T1
5	G

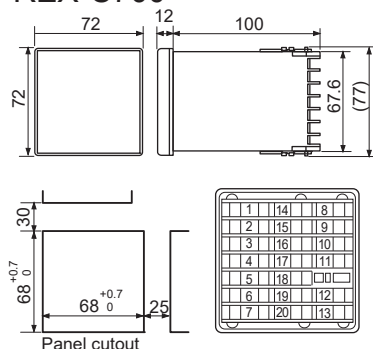
• Use 6.2mm or less solderless terminal.



No.	Description
6	AC 100 to 240V
7	AC 24V
8	DC+ 24V
9	Measured input (1) Thermocouple (2) RTD (3) Voltage/Current
10	

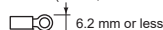
No.	Description
11	CT input for heater break alarm
12	Current transformer input

REX-C700

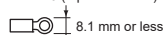


No.	Description
1	Ground
2	AC 100 to 240V
3	AC 24V
4	DC+ 24V
5	Control Output (1) Relay contact output (2) Voltage DC/Current DC (3) Triac trigger output
6	
7	

• Use 6.2mm or less solderless terminal.
No. 1-10 (Power, Alarm and Output terminals)



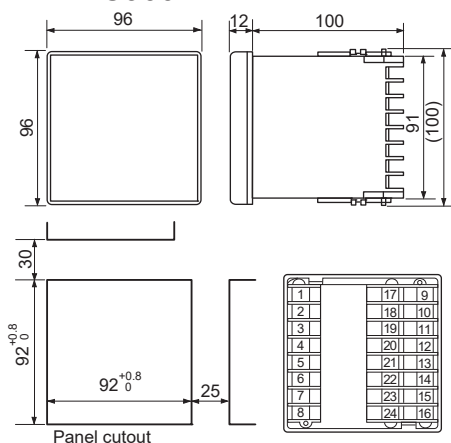
• Use 8.1mm or less solderless terminal.
No. 11-13 (Input terminals)



No.	Description
8	Alarm 1
9	Alarm 2
10	T2
11	T1
12	G
13	

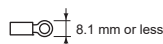
No.	Description
19	CT input for heater break alarm
20	Current transformer input

REX-C900



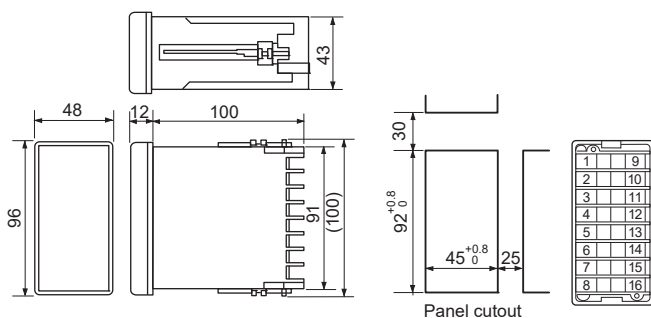
No.	Description
1	Ground
2	AC 100 to 240V
3	AC 24V
4	DC+ 24V
5	Control Output (1) Relay contact output (2) Voltage DC/Current DC (3) Triac trigger output
6	
7	
8	

• Use 8.1mm or less solderless terminal.

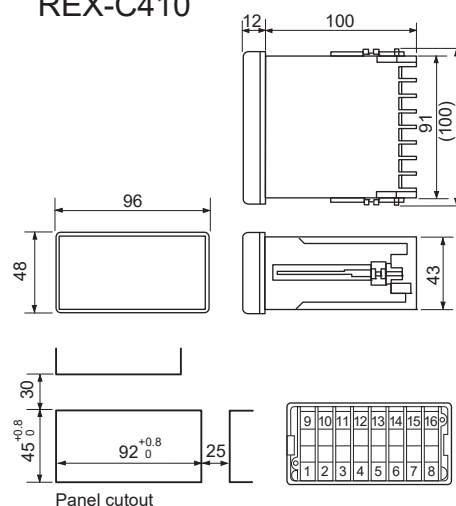


No.	Description
9	Alarm 1
10	Alarm 2
11	T2
12	T1
13	G
14	
15	
16	

REX-C400



REX-C410



SB1



General Description

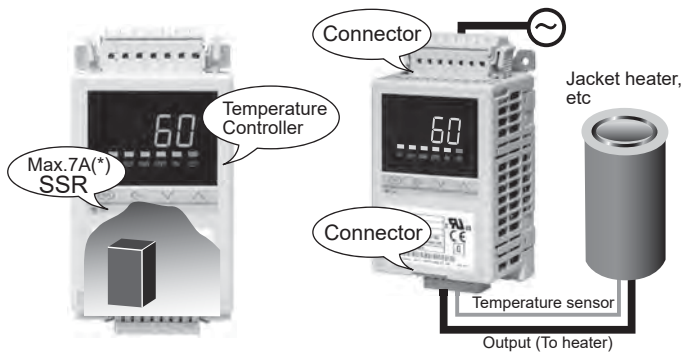
SB1 is a 1 channel temperature controller with Built-in SSR (Solid state relay) designed for flexible heating solutions such as heat trace of pipelines (by controlling Jacket heater etc). Instrument can be wired directly to heaters.

Features

- ☆ Direct Connection to Load (with Built-in SSR)
- ☆ Can be installed in a small space or into a pipe
- ☆ Easy Connection (with a complete connector)
- ☆ Power Saving by SB Link
- ☆ Load Power Shutoff Function and Fuse

Capable of direct connection to the load

Temperature control can be easily assembled and started by connecting a heater line and temperature sensors to the SB1. Wiring is handled with connectors to reduce wiring time.

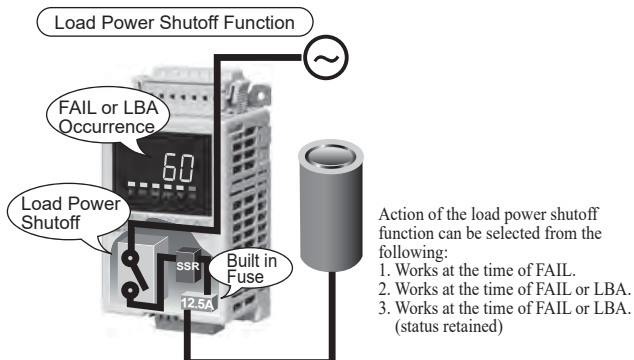


(*) Permissible load capacity may be less than 7A depending on the ambient temperature of the installation location.

Safety design < Load Power Shutoff Function + Fuse >

This function disconnects internal load power with an internal relay.

A fuse is incorporated inside the SB1 to protect the instrument from a load short-circuit.

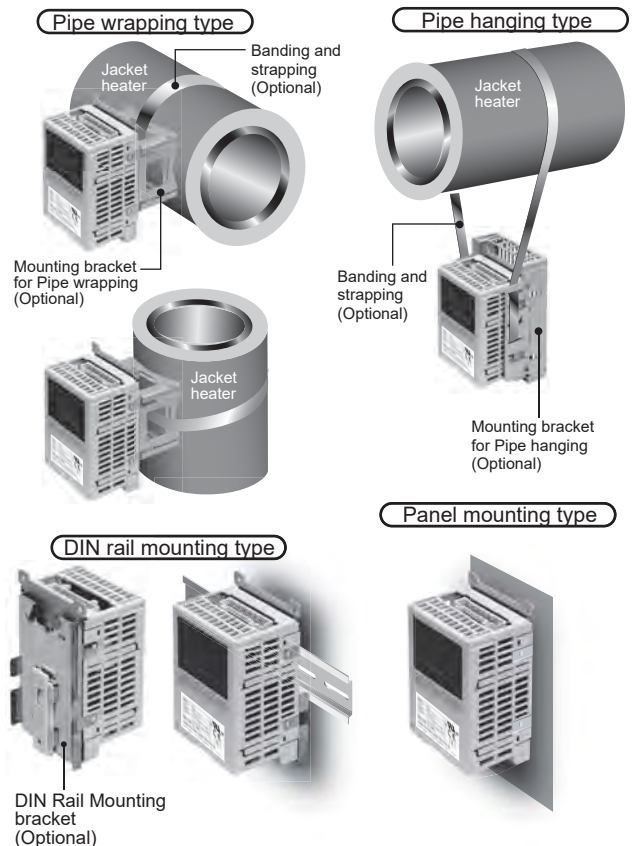


Action of the load power shutoff function can be selected from the following:
 1. Works at the time of FAIL.
 2. Works at the time of FAIL or LBA.
 3. Works at the time of FAIL or LBA.
 (status retained)

* Internal fuse must be replaced by an authorized personnel.

Can be installed in a small space or onto a pipe

The SB1 can be supplied with pipe wrapping type, pipe hanging type, DIN-rail mounting type, or panel mounting type. Proper mounting can be attained according to the pipe configuration.

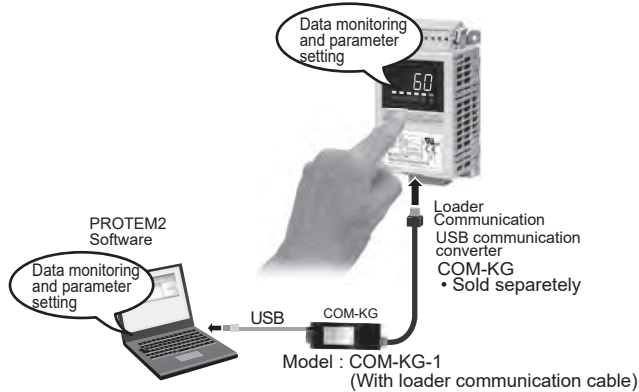


Temperature Controller with Built-in SSR SB1

Features

Setup and Data Monitoring

Data can be viewed on site by using the display and operation keys or controlled remotely via loader communication port.



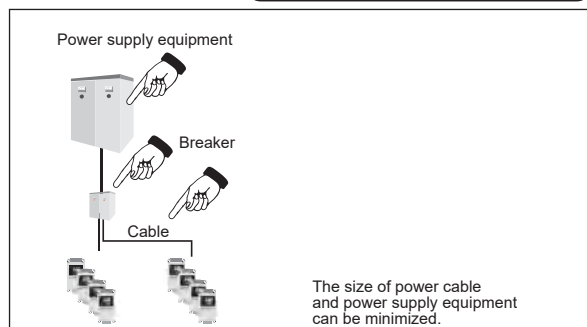
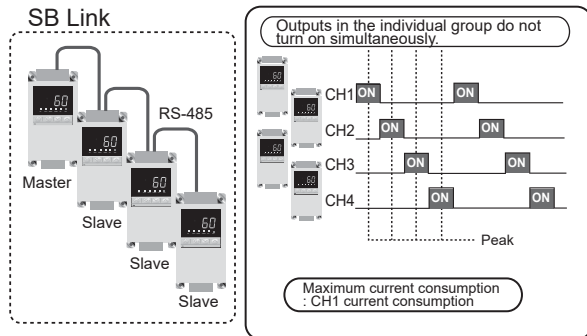
Power saving by SB Link

Peak current suppression (SB Link)

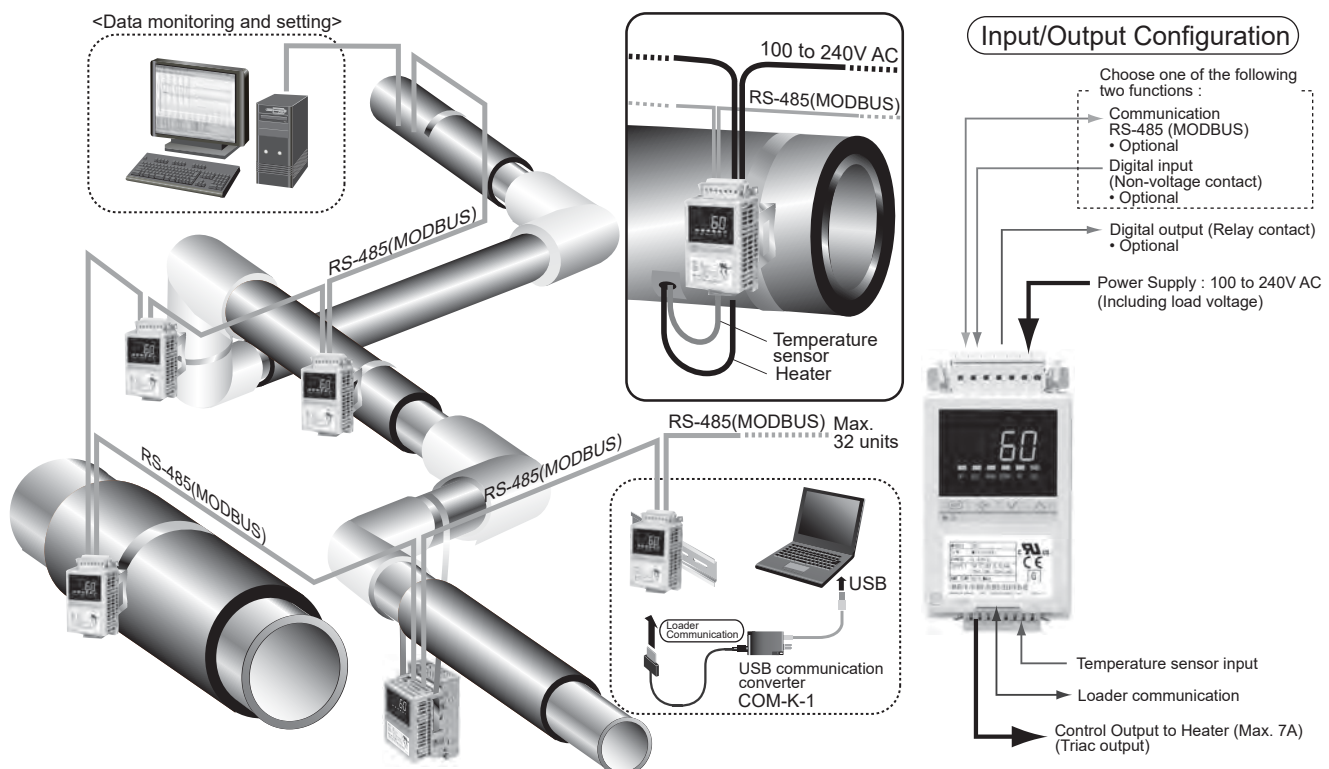
When SB1 controllers are divided into groups (max. 4 pcs per group) with the output limiter, the controllers in the same group will not turn on simultaneously.

Saves energy by limiting the control output around the normal load factor.

* SB Link cannot be used simultaneously with a host communication.



Installation and wiring example





Specifications

Input

Input

- Thermocouple : K, J, (JIS/IEC) : 0 to 800°C, 0 to 999°F
- Influence of external resistance : Approx. 0.25μV/Ω
- Input break action : Up-scale
- RTD : Pt100 (JIS/IEC) : 0 to 400°C, 0 to 800°F
- 1/0.1°C(°F) display can be selectable on only communication data
- Influence of input lead resistance : Approx. 0.02[%/Ω] of reading
- Maximum 100Ω per wire
- Input break action : Up-scale
- Universal input

Sampling Time

0.25 sec

Input Digital Filter

0 to 100 sec (OFF when 0 is set.)

PV Bias

-199 to +999°C(°F)

Performance

Measuring Accuracy

- a) Thermocouple
 - 0°C or more, Less than 500°C (932°F) : $\pm (1.5^\circ\text{C} [2.7^\circ\text{F}] + 1 \text{ digit})$
 - 500°C (932°F) or more : $\pm (0.3\% \text{ of Reading} + 1 \text{ digit})$
- b) RTD
 - 0°C or more, Less than 200°C (392°F) : $\pm (0.6^\circ\text{C} [1.1^\circ\text{F}] + 1 \text{ digit})$
 - More than 200°C (392°F) : $\pm (0.3\% \text{ of Reading} + 1 \text{ digit})$
- Cold-junction temperature compensation error :
 - $\pm 1^\circ\text{C} [1.8^\circ\text{F}]$ (23°C $\pm$ 2°C [73°F $\pm$ 3.6°F])
 - $\pm 2^\circ\text{C} [3.6^\circ\text{F}]$ (-10 to 60°C [14 to 140°F])

Insulation Resistance

- More than 20MΩ (500V DC) between measured terminals and ground (PE terminal)
- More than 20MΩ (500V DC) between power terminals and ground (PE terminal)

Dielectric Strength

- 1000V AC for one minute between measured terminals and ground (PE terminal)
- 1500V AC for one minute between power terminals and ground (PE terminal)

Setting

SV limiter

Scaling low to scaling high (High/Low individual setting)

Ramp-to-setpoint

1 to span per Time
(Time : 1 minute/1 hour (Selectable) Up/Down individual setting)

SV step function

- Number of SV : 2 points (SV1/SV2)
- SV selecting method : Front key, Communication, Digital input (External contact input)

Setting data lock

Lock level : 1 to 10 level (0 : No lock)

Control

Control Method

- PID control (With autotuning)
- P, PI, PD, ON/OFF control selectable
- Direct action/Reverse action is selectable

Startup tuning

- The condition to activate Startup Tuning is selectable among a) to g)
- a) At power-on and stop-to-run, one-time tuning
- b) At SV change, one-time tuning
- c) At power-on, stop-to-run and SV change, one-time tuning
- d) At every power-on and stop-to-run
- e) At every SV change
- f) At every power-on, stop-to-run and SV change
- g) Function off

Fine tuning

- Setting range : -3 to +3 (6 levels, OFF when set to 0.)
- 3 to -1 : Faster response
- 1 to 3 : Slower response
- OFF : Function OFF

Major Setting Range

- Set value : Same as input range.
- Proportional band : 0 to input span (°C,°F)
 - Differential gap at ON/OFF control : 0 to 100 (°C,°F)
- Integral time : 1 to 999sec (P + D action when I = 0)
- Derivative time : 1 to 999sec (P + I action when D = 0)
- Cool-side proportional band : 1 to 1000% of heat side proportional band
- Anti-Reset Windup(ARW) : 1 to 100% of heat side proportional band (Integral action is OFF when ARW = 0)
- Derivative time action select : 0 : PV derivative, 1 : Deviation derivative
- Output limiter : -5.0 to +105.0% (High/Low individual setting)
- Proportional cycle time : 1 to 100 sec
- Manual output : Output limiter low to Output limiter high
 - Auto/Manual transfer action selection
 - With bumpless/Without bumpless

Control output

- Triac output :
 - Output method: AC output (Zero-cross method)
 - Allowable load current: 7 A (Ambient temperature 40°C or less)
 - Set the surface temperature to the following degree if the allowable load current exceeds 3A:
 - Front side: 80°C or less
 - Metal at the back side: 100°C or less
 - Load voltage : 100 to 240 V AC (Same as the power supply voltage)
 - Minimum load current: 50 mA
 - ON voltage : 1.5 V or less (at maximum load current)

Event (Alarm) Output (Optional)

Number of Event

Up to 2 points

Event

- Type :
 - Deviation High, Low, High/Low^{*1}, Band,
 - Process High, Low
 - Set value High, Low
 - Control Loop Break Alarm (LBA)
 - Output of the communication monitoring result,
 - FAIL, RUN status monitor
- ^{*1}: Two types of alarm settings are field-selectable.
 1. Independent high and low settings.
 2. Common high/low setting (Factory setting, unless specified in alarm code when ordering)

Setting range

- Deviation : -199 to + (input span)
- Differential gap : 0 to input span
- Process, Set value : Same as input range
- Differential gap : 0 to input span
- Control loop break alarm (LBA)
 - : LBA time : 0 to 999 sec. (OFF by setting zero)
 - LBA deadband : 0 to input span

Output

- Number of Event : 1 point
- Output method : Relay contact output, Form a contact, 250V AC 1A, 30V DC 0.5A (Resistive load)

Other Functions

- a) Hold/Re-hold action
 - Hold action is activated at power-on and stop-to-run.
 - Re-hold action is activated at power-on, stop-to-run, and the control set value change.
- b) Energized/de-energized action is configurable.
- c) Delay timer : 0 to 600 sec
- d) Interlock (latch) function is configurable.
- e) Load Power Shutoff Function
 - The relay for Load power shutoff opens at the occurrence of instrument abnormality (FAIL) or Control loop break alarm (LBA). (Shut off the internal load power line. [L side of the power])
 - [Selectable action]
 - Relay for Load power shutoff opens at FAIL (Restores when FAIL is resolved.)
 - Relay for Load power shutoff opens at FAIL or LBA (FAIL state or LBA state remains.)
 - Relay for Load power shutoff opens at FAIL or LBA (Returns to the normal state when FAIL state or LBA state recovers.)

Digital Input (Optional)

• Not available with Communication

Number of Sub Output

1 point

Input method

Non-voltage contact output

Function

- SV1/SV2 selection, STOP/RUN, Auto/Manual, Alarm interlock reset, • Selectable

Temperature Controller with Built-in SSR SB1



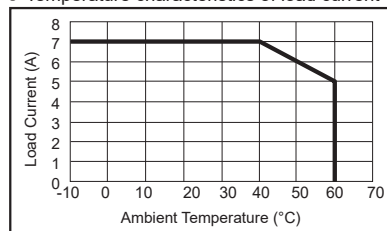
Specifications

Communications (Optional)

• Not available with Digital Input (DI)

Communication method :	RS-485
Communication speed :	2400, 4800, 9600, 19200, BPS
Protocol :	ANSI X3.28(1976) 2.5 A4 MODBUS-RTU
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 :	31 units
Terminating resistor :	External installation is necessary (120Ω 1/2W)
Buffer mode :	Correspond (Mode in which writing to EEPROM is not performed for setting changes)

● Temperature characteristics of load current



CAUTION

Temperature of the Installation position (surface of a jacket heater) : -10 to +100°C.

Inter-controller Communication (Optional) (SB Link)

• Not available with Digital Input (DI)

Function :	Peak current suppression function When a group of controllers (up to 4 units) is connected by SB link, use the Peak current suppression function by setting Output limiter high to prevent all outputs from turning ON at the same time.
Communication method :	RS-485
Communication speed :	19200BPS
Protocol :	MODBUS-RTU
Bit format	
Start bit :	1, Data bit: 8, Parity bit: None, Stop bit: 1
Maximum connection :	4 controllers (Address setting range: 0 to 3 *) * Address No. 0 is for Master controller.

Loader Communication

Communication speed :	9600BPS
Protocol :	ANSI X3.28 sub-category 2.5A4 (RKC standard)
Bit format	
Start bit :	1, Data bit: 8, Parity bit: None, Stop bit: 1
Connection method :	COM-K loader cable (equivalent to W-BV-01-1500)

General Specifications

Power Failure Effect

A power failure of 10m sec or less will not affect the control action.

Memory Backup : Backed up by non-volatile memory

- Data retaining period : Approx. 10 years
- Number of writing : Approx. 1,000,000 times
(Depending on storage and operating conditions.)

Supply Voltage

90 to 264V AC (Including supply voltage variation)
[Rating : 100 to 240V AC] (50/60Hz selectable)

Power Consumption

When a load is disconnected : 4.0 VA max. (at 100 V AC)
6.7 VA max. (at 240 V AC)
When a load is connected [Ambient temperature: 40°C] :
705 VA max. (When connecting a load equivalent to 7A at 100 V AC)
1690 VA max. (When connecting a load equivalent to 7A at 240 V AC)

Rush Current

Less than 13.3A (240V), Less than 5.6A (100V)

Operating Environments : -10 to 60°C [14 to 140°F]

5 to 95% RH (Non condensing)
Absolute humidity : MAX. W.C 29.3g/m³ dry
air at 101.3kPa.

Net Weight

Approx. 130g

Model and Suffix Code

Specifications	Model and Suffix Code		Hardware coding only											Quick start code
	SB1		①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	
① Control Method	PID control with AT (Reverse action)		F											
② Input and range	See Input range Code Table													
③ Control output (OUT)	Triac output					T								
④ Power Supply	100 to 240V AC						4							
⑤ Digital output (DO)	Not supplied Digital output : 1 point							N						
⑥ Communication/ Digital input (DI)	Not supplied													
	Digital input : 1 point													
	RS-485 (ANSI/RKC standard protocol)													
	RS-485 (MODBUS protocol)													
⑦ Mounting method	Without mounting bracket (Panel mounting)													
	With mounting bracket (Sold separately)													
⑧ Quick start code	No quick start code (Default setting)													
	Specify quick start code (Event, Digital output type)													
⑨ Event 1 (Alarm 1) type	No quick start code (Default setting) See Alarm Code Table													No Code
⑩ Event 2 (Alarm 2) type	No quick start code (Default setting) See Alarm Code Table													No Code
⑪ Digital output assignment	No quick start code (Default setting)													No Code
	Event 1													1
	Event 2													2
	Logical OR of Event 1 and Event 2													3
	Logical AND of Event 1 and Event 2 4													4

Input range Code Table

(Universal input)

Thermocouple Input

Input	Code	Range
K	K04	0 to 800°C
	KB1	0 to 999°F
J	J04	0 to 800°C
	JA8	0 to 999°F

RTD Input

Input	Code	Range
Pt100	D17	0 to 400°C
	DB4	0 to 800°F

• 1/0.1°C(°F) display can be selectable on only communication data.

Event Code Table

(Programmable)

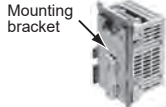
Event Type	Code	Event Type	Code	Event Type	Code
No event	N	Process High with Hold	K	Deviation High/Low with Alarm Hold (Individual high and low settings)	Y
Deviation High	A	Process Low with Hold	L	Deviation High/Low with Alarm Re-Hold (Individual high and low settings)	Z
Deviation Low	B	Deviation High with Alarm Re-hold	Q	Loop break alarm	2
Deviation High/Low (Common high/low setting)	C	Deviation Low with Alarm Re-hold	R	FAIL	3
Band (Common high/low setting)	D	Deviation High/Low with Re-Hold (Common high/low setting)	T	RUN status	4
Deviation High with Hold	E	Band (Individual high and low settings)	U	Output of the communication monitoring result	5
Deviation Low with Hold	F	Set value High	V		
Deviation High/Low with Hold (Common high/low setting)	G	Set value Low	W		
Process High	H	Deviation High/Low (Individual high and low settings)	X		
Process Low	J				

Mounting type Accessories

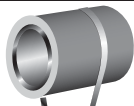
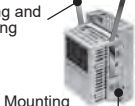
Panel mounting Type

SB1/Accessory	Model Code
SB1	SB1F □□□-T-4 *□□(N)□-□□□
Connector (upper-side)	SB1P-C02 
Connector (lower-side)	SB1P-C01 

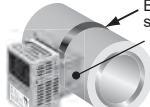
DIN rail mounting Type

SB1/Accessory	Model Code
SB1	SB1F □□□-T-4 *□□(1)□ □□□
DIN rail mounting bracket	SB1P-M03 
Connector (upper-side)	SB1P-C02 
Connector (lower-side)	SB1P-C01 

Pipe hanging Type

SB1/Accessory	Model Code
SB1	SB1F □□□-T-4 *□□(1)□ □□□
Mounting bracket for Pipe hanging	SB1P-M02 
Banding and strapping	SB1P-B02 
Connector (upper-side)	SB1P-C02 
Connector (lower-side)	SB1P-C01 

Pipe wrapping Type

SB1/Accessory	Model Code
SB1	SB1F □□□-T-4 *□□(1)□ □□□
Mounting bracket for Pipe wrapping	SB1P-M01 
Banding and strapping	SB1P-B01 
Connector (upper-side)	SB1P-C02 
Connector (lower-side)	SB1P-C01 

Temperature Controller with Built-in SSR SB1

Accessories (Sold Separately)

● Mounting bracket • Mounting brackets are not necessary when using panel mounting type.

DIN rail mounting Type



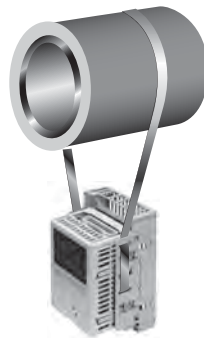
DIN rail mounting bracket
SB1P-M03

Pipe hanging Type



Mounting bracket
for Pipe hanging
SB1P-M02

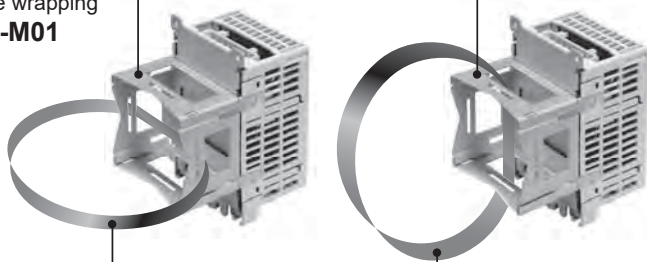
Banding and
strapping
SB1P-B02



< Manufactured by PANDUIT Corporation >
Stainless steel banding and strapping : MBH-TLR
(Heavy type, Width : 7.9 mm, Length : 1000mm)

Pipe wrapping Type

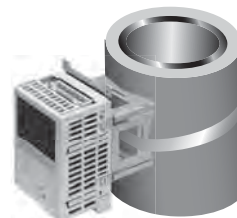
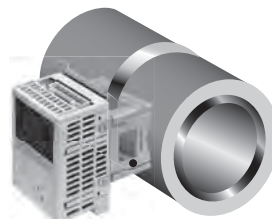
Mounting bracket
for Pipe wrapping
SB1P-M01



Banding and
strapping
SB1P-B01



< Manufactured by PANDUIT Corporation >
Stainless steel banding and strapping : MLT6EH-LP
(Extra heavy Width : 12.7 mm, Length : 594mm)



● Connector and Tool for cable wiring



Power supply/
Event input/output/
Communication
connector
SB1P-C02
• Manufactured by
WAGO Corporation:
721-2107/037-000



Measured input/Control
output connector
SB1P-C01
• Manufactured by
WAGO Corporation:
734-108/037-000

Wiring tool

Tool for SB1P-C02
SB1P-C13

• Manufactured by
WAGO Corporation:
210-720
Partially isolated
shaft Type 2



Tool for SB1P-C01
SB1P-C11

• Manufactured by
WAGO Corporation:
210-719
Partially Isolated
shaft Type 1



or

SB1P-C12

• Manufactured by
WAGO Corporation:
734-230
Push button for
connectors
(Connector operating
lever)



• A small screwdriver can be used for wiring.

● USB communication converter (Loader Communication)



Model Code : USB communication converter (COM-KG)

Specifications	Model and Suffix code	
	COM - KG -	
Loader communication cable	Without loader communication cable	N
	With loader communication cable	1

USB COM-KG (Loader communication)

Cable length : 1m (COM-K2 standard accessory)

Cable length : 1.5m (optional, specify in the model code when ordering)

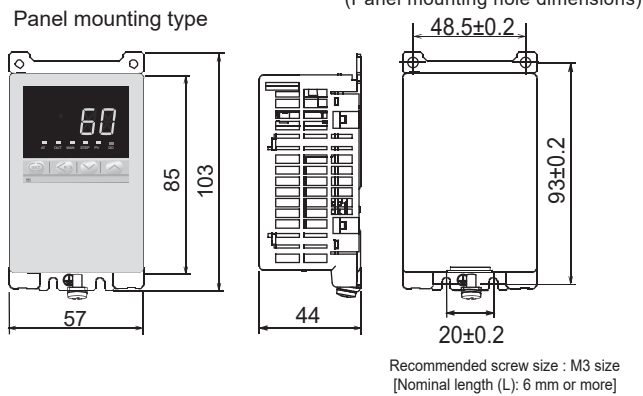
Model Code for cable only
W-BV-01-1500



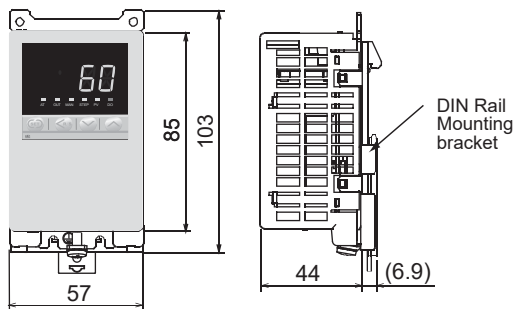
External Dimensions

Unit : mm

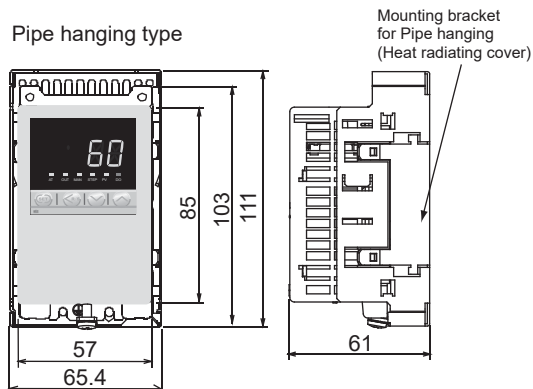
Panel mounting type



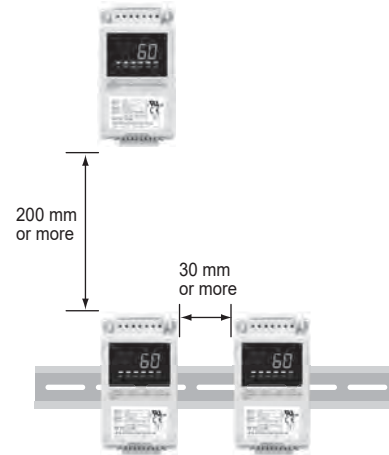
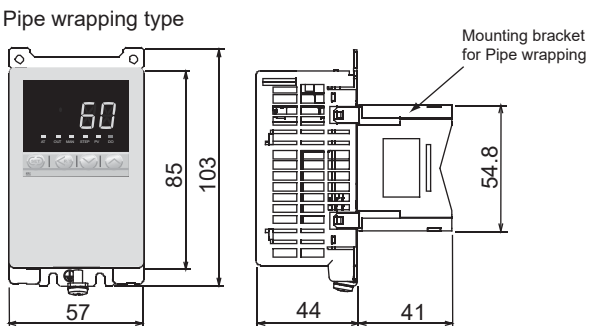
DIN rail mounting type



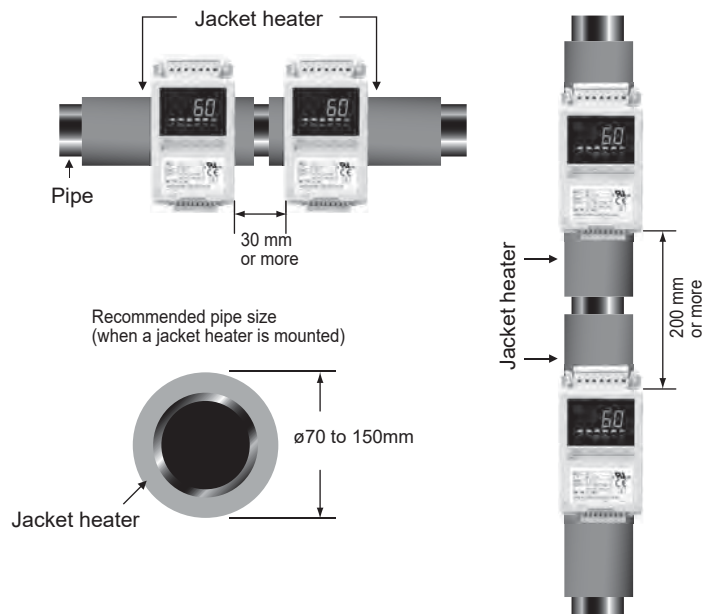
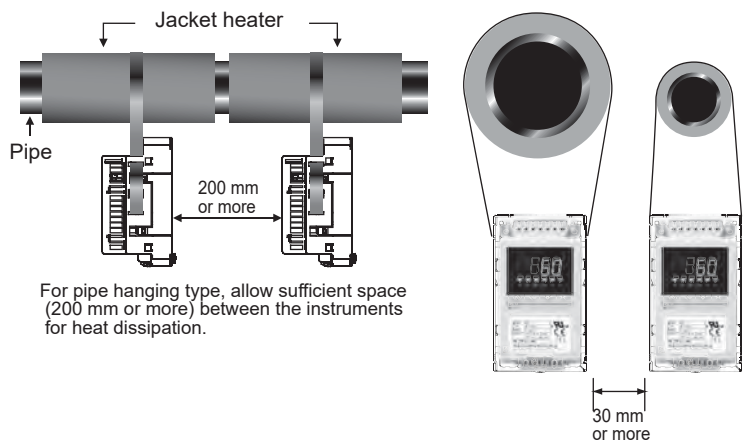
Pipe hanging type



Pipe wrapping type

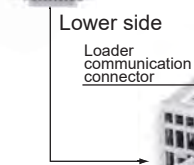
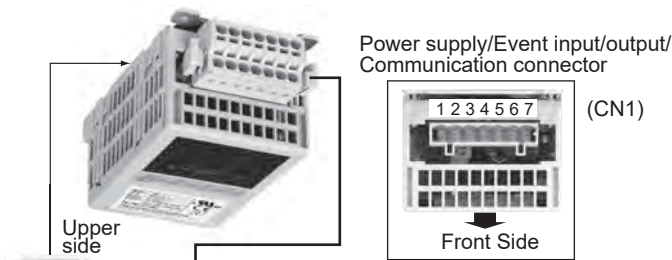


- Space required between SB1
Allow 30 mm or more between the instruments for proper heat dissipation when mounting two or more SB1 controllers in parallel.
When mounting the instruments vertically, allow 200 mm or more to have space for wiring to or from the connectors installed on the top and the bottom of the SB1.



Temperature Controller with Built-in SSR SB1

Connector Configuration



Power supply/Event input/output/Communication connector (CN1)

Upper side

Front Side

Connector (Sold Separately)
Model Code : SB1P-C02

20.8
51.5
29.8

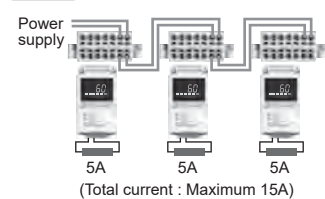
• Manufactured by WAGO Corporation:
721-2107/037-000

Pin No.	1A 1B	2A 2B	3A 3B	4A 4B	5A 5B	6A 6B	7A 7B
Description	SG	T/R(A)	T/R(B)	NO		L	N
	RS-485			Relay contact			(Note)
	Communication (Option)						100 to 240V AC
	DI						
	Non-Voltage contact				Digital output (DO) (Option)		Power supply
	Digital input (DI) (Option)						

• Recommended cable
Compatible cable diameter : 12 AWG (2.5 mm²)
Stripping length: 9 to 10 mm

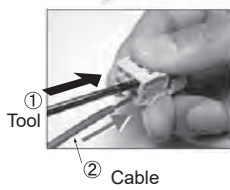
• The pins of the same number at line A and line B of the Plug are connected internally.
• Communication and Digital input (Event input) cannot be selected at the same time.

Caution Maximum allowable current (power supply part) is 15 A.



Wiring tool (Sold Separately)

Model Code : SB1P-C13



- Manufactured by WAGO Corporation: 210-720 Partially isolated shaft Type 2
- A small screwdriver can be used for wiring.

Measured input/Control output connector (CN2)

Front Side

Connector (Sold Separately)
Model Code : SB1P-C01

13.4
39.8
18.6

• Manufactured by WAGO Corporation:
734-108/037-000

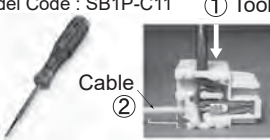
Pin No.	8	7	6	5	4	3	2	1
Description	(Note)	Triac	AC output	L		(1)	B	A
		Heater				(2)	B	A
	Control output (OUT) SSR (Triac)							

• Recommended cable
Compatible cable diameter : 14 AWG (1.5 mm²)
Stripping length: 6 to 7mm

• The pin No. 5 and No.6, the pin No. 7 and No. 8 are connected internally.

Wiring tool (Sold Separately)

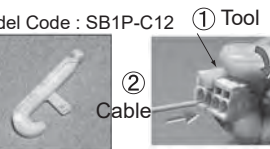
Model Code : SB1P-C11



- Manufactured by WAGO Corporation: 210-719 Partially Isolated shaft Type 1
- A small screwdriver can be used for wiring.

or

Model Code : SB1P-C12



- Manufactured by WAGO Corporation: 734-230 Push button for connectors (Connector operating lever)

PZ400 PZ900



General Description

The PZ400/900 are powerful programmable ramp/soak controllers that can store up to 16 program patterns of 16 segments per pattern with a 0.1% accuracy. These instruments have an easy-to-use front panel designed for both setting functions and data entry. Standard features include at-a-glance program monitoring, multi-level PID, autotuning, Hold, Step, Run and Reset functions and three control modes.

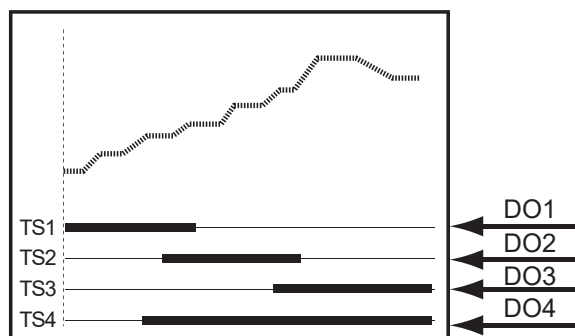
Optional features include alarms, Heat, Cool or Heat/Cool control, external contact input, communication and retransmission output. These instruments are designed for dryers, thermostat chambers, electric furnaces, ovens and textile machinery, or any process requiring time-based temperature control.

Features

- ☆ Easy-to-use front panel
- ☆ 16-segment / 16-pattern program storage
- ☆ Fixed set point control
- ☆ Multi-level PID

Applicable for the mid-scale program control applications

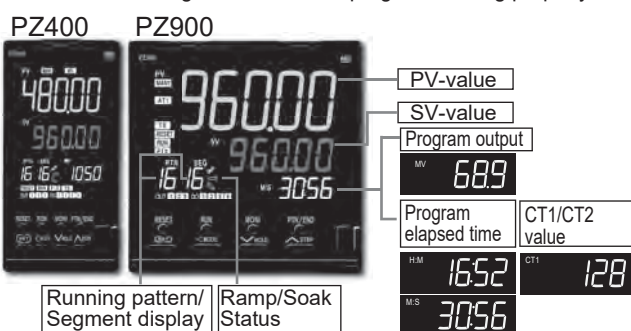
Max. 256 segments.(16 patterns by 16 segments)
Up to four individual time signal outputs per pattern.
The use of logic operation enables handling complicated external sequences up to four points per DO.



At-a-glance view of current status

The large LCD display provides various information about the control status.

It is obvious at first glance to see the program running properly.



5-digit PV/SV display

The high resolution display is suitable for various industrial furnaces, ovens and pottery kilns that need high temperature ranges.

Loader communication and Dedicated software

All models are supplied with a front loader port as standard. Configuration can be set from the computer without removing the controller from the panel.

Saved configuration data can be sent to the controller from your computer on your desk.

Easy Data Management

Communication Tool

PROTEM 2

Data monitoring, setting, storage, copy, transfer, logging, and report creation

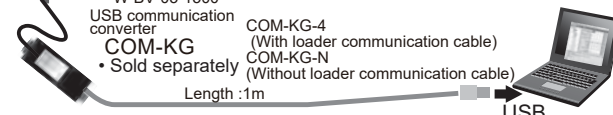


Front loader communication port

The power to COM-KG is supplied from the PC via the USB port so no power supply is necessary.



Loader communication cable
Length : 1.5m
Model code for cable only :
W-BV-05-1500



Simply download "PROTEM2" from the RKC Instrument web site (www.rkcinst.com).

Programless connection to PLCs

A PLC special protocol (MAPMAN) function becomes a Master Unit to PLC, and automatically stores temperature data into registers in a PLC. This enables easy handling of temperature control system to the exiting PLC system is available.



(MITSUBISHI PLC Protocol :
QnA compatible, 3C frame (type 4))

Program less connection

RS-422A/RS-485



Ramp/Soak Temperature/Process Controller PZ400/900



Specifications

Input

Input

Universal input

a) Group 1

Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS), W5Re/W26Re, PR40-20 (ASTM), U, L (DIN)

- Influence of external resistance : Approx. 0.18μV/Ω
 - Input break action : Up-scale / Down-scale (Selectable)
- RTD : Pt100 (JIS/IEC), JPt100 (JIS)
- Influence of input lead resistance : Approx. 0.006[%/Ω] of reading
 - Maximum 100Ω per wire
 - Input break action : Up-scale
- Low voltage : 0 to 10mV DC, 0 to 100mV DC
- Input break action : Up-scale / Down-scale (Selectable)

b) Group 2

High voltage : 0 to 1V DC, 0 to 5V DC, 1 to 5V DC, 0 to 10V DC, -5 to +5V DC, -10 to +10V

- Input break action : Value around 0V

c) Group 3

Current : 4 to 20mA DC, 0 to 20mA DC

- Input break action : Value around 0mA

Sampling Time

0.05 sec

Input Digital Filter

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

PV Bias

-span to +span

PV Ratio

0.500 to 1.500

Inverting the Input

If the instrument is a current/voltage input type, the proportional relation between the input current (voltage) and the displayed value can be inverted.

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, U, L

Less than -100°C (-148°F) : ±1.0°C [1.8°F] [Approximate value]

-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, PLII, W5Re/W26Re

Less than 0°C (32°F) : ±2.0°C (3.6°F) [Approximate value]

0 to 1000°C (32 to 1832°F) : ±1.0°C [1.8°F]

More than 1000°C (1832°F) : ±(0.1% of Reading + 1 digit)

Type : B

Less than 400°C (752°F) : ±70.0°C [±126°F] [Approximate value]

400 to 1000°C (752 to 1832°F) : ±1.4°C [2.5°F]

More than 1000°C (1832°F) : ±0.1% of Reading

Type : PR40-20

Less than 400°C (752°F) : ±20.0°C [±36°F] [Approximate value]

400 to 1000°C (752 to 1832°F) : ±1.0°C [2.5°F]

More than 1000°C (1832°F) : ±0.1% of Reading

Cold junction temperature compensation error

±0.5°C (0.9°F) [at 23°C ±2°C (73.4°F ±3.6°F)]

Within ±1.5°C (±2.7°F)

[Between -10 and +55°C (14 to 131°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

- Display accuracy: Is equal to the above accuracy with the value below the minimum resolution rounded up

- Close horizontal mounting error : ±1.5°C (±2.7°F)

Insulation Resistance

More than 20MΩ (500V DC) between measured terminals and ground

More than 20MΩ (500V DC) between power terminals and ground

Dielectric Strength

1500V AC for one minute between measured terminals and ground

1500V AC for one minute between power terminals and ground

Program

Number of Storage :

Program pattern : Max. 16 patterns
Segments : Max 16 segments per pattern
• Pattern linkable

Pattern repeat :

1 to 10,000 repeats
• Continuous repeat when set to 10,000.

Segment time :

0 hr 0 min to 199 hr 59 min or 0 min 0 sec to 199 min 59 sec

Other function :

Time signal output (4 points), Pattern end output (Available time setting), Program start selection (Zero start, PV start), Hold, Step, Wait, Pattern copy

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 without feedback resistance.
 - a), b), c) is selectable.

Function

Autotuning, Level-PID autotuning, Startup tuning, Proactive function, Level PID function (8 levels), Control mode selection (Reset, Program control, Fix control, Manual control)

Major Setting Item

Set value, Proportional band, Integral time, Derivative time, Deadband/Overlap, Control response, Ramp-to-setpoint, Output limiter, Cool-side output limiter, Output change rate limiter, Proportional cycle time, Manual reset, Output at control stop mode

Output (OUT)

Relay contact output [OUT1, OUT2]

- a) Contact type : OUT1 : 1c contact, OUT2 : 1a contact
250V AC 3A, 30V DC 1A (Resistive load)
- b) Electric life : 300,000 operations or more (Rated load)
- c) Mechanical life : 50,000,000 operations or more (Switching: 180 times/min)

Relay contact output [DO1 to DO4]

- a) Contact type : 1a contact, 250V AC 1A, 30V DC 0.5A (Resistive load)
- b) Electric life : 150,000 operations or more (Rated load)
- c) Mechanical life : 20,000,000 operations or more (Switching: 180 times/min)

Voltage pulse output [OUT1, OUT2]

0/12V DC (Load resistance : More than 500Ω)

Voltage pulse output [OUT3]

0/14V DC (Load resistance : More than 600Ω)

Current output [OUT1, OUT2, OUT3]

4 to 20mA, 0 to 20mA (Load resistance : Less than 500Ω)

Continuous voltage output [OUT1, OUT2]

0 to 5V DC, 1 to 5V DC, 0 to 10V DC (Load resistance : More than 1kΩ)

Transistor output [OUT1, OUT2]

a) Load voltage : Less than 30V DC

b) Load current : Less than 100mA

OUT1 to OUT3 : Control output, Analog retransmission output, Event, Heater break alarm, Control loop break alarm, RUN status, MAN status, FAIL

DO1 to DO4 : Time signal, Pattern end signal, Event, Heater break alarm,

Control loop break alarm, RUN status, MAN status, FAIL

OUT3 (Optional) : Voltage pulse, Current output (Universal output)

Loader communication (Standard)

Protocol : ANSI X3.28 sub-category 2.5 A4

Communication speed : 38400bps

Connection : 1 unit

Method of connection : Exclusive cable (COM-K2)

Event (Alarm) (Optional)

Number of Event Setting

Up to 4 points (Event 1 to 4)

Alarms

Type : Process high, Process low, Process high/low*1, Deviation high, Deviation low, Deviation high/low*1, Band*1, Set value high, Set value low, Set value high/low, MV value high (Heat/Cool), MV value low (Heat/Cool), FBR input

*1: Two types of alarm settings are field-selectable.

1. Independent high and low settings.

2. Common high/low setting

(Factory setting, unless specified in alarm code when ordering)

- Hold/Re-hold action, Delay timer, Energized/de-energized action, Interlock (latch) function, Alarm lamp ON condition available.

Control loop break alarm (LBA)

LBA time : 0 to 7200 sec (LBA is OFF when 0 is set.)

Dead band : 0 to input span

Heater break alarm (HBA)

- a) Number of alarm : 2 points (1 point per CT input)
- b) CT input range : CTL-6-P-Z : 0.0 to 10.0A (High accuracy type)
CTL-6-P-N : 0.0 to 30.0A
CTL-12-S56-10L-N : 0.0 to 100.0Ab)
- c) Setting range : 0.0 to 100.0A

Digital Input (Optional)

Number of Inputs : Up to 6 points (DI 1 to 6)

Input Rating : Non-voltage contact input

Functions : Run, Reset, Direct/Reverse action, HOLD reset, Step, Autotuning ON/OFF, Setting data Unlock/Lock, Interlock release, Peak/Bottom hold reset

Feedback resistance (FBR) input (Optional)

Resistance value : Standard : 100 to 10kΩ (factory default 135Ω)

Sampling time : 0.5 sec

Ramp/Soak Temperature/Process Controller PZ400/900

Specifications

Communications (Optional)

Communication method : RS-485, RS-422A
Communication speed : 2400, 9600, 19200, 38400, 57600 BPS
Protocol : ANSI X3.28(1976) 2.5 A4
 MODBUS, PLC communication (MAPMAN)
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 : 31 units

General Specifications

Waterproof/Dustproof (Optional)

IP65 (IEC60529)
 • Waterproof/Dustproof protection only effective from the front in panel mounted installation.
 • When the front loader connector cover is not installed: IP00

Supply Voltage

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

Power Consumption

- a) 100 to 240V AC type
 PZ400 : Max. 10.1VA (240V), Rush current : Less than 13.3A
 PZ900 : Max. 10.9VA (200V), Rush current : Less than 13.3A
- b) 24V AC type
 PZ400 : Max. 6.9VA (24V), Rush current : Less than 16.3A
 PZ900 : Max. 7.4VA (24V), Rush current : Less than 16.3A
- c) 24V DC type
 PZ400 : Max. 175mA (24V), Rush current : Less than 11.5A
 PZ900 : Max. 190mA (24V), Rush current : Less than 11.5A

Operating Environments

-10 to 55°C [14 to 131°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. 1,000,000,000,000 times.
 (Depending on storage and operating conditions.)

Net Weight : PZ400 : Approx. 221g, PZ900 : Approx. 291g

External Dimensions (W x H x D)

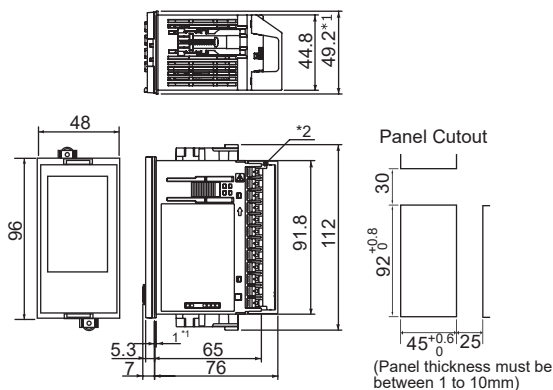
PZ400 : 48 x 96 x 65mm, PZ900 : 96 x 96 x 65mm

Compliance with Standards

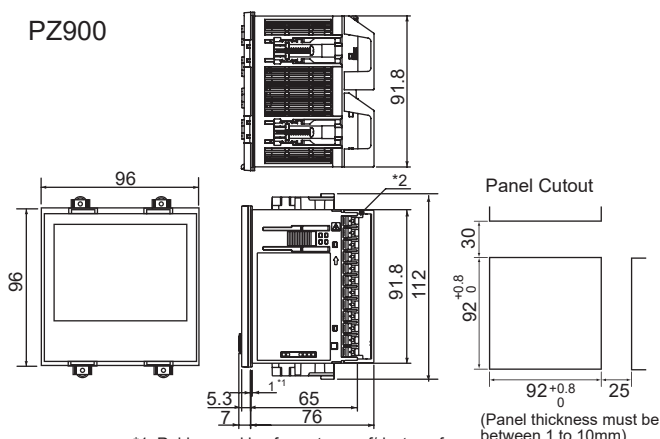
- a) UL : UL61010-1
- b) cUL : CAN/CSA-C22.2 No.61010-1
- c) CE Mark : LVD : EN61010-1, EMC : EN61326-1, RoHS : EN50581
- d) RCM : EN55011

External Dimensions and Rear Terminals

PZ400



PZ900



• PZ400

1	25	13
2	26	14
3	27	15
4	28	16
5	29	17
6	30	18
7	31	19
8	32	20
9	33	21
10	34	22
11	35	23
12	36	24

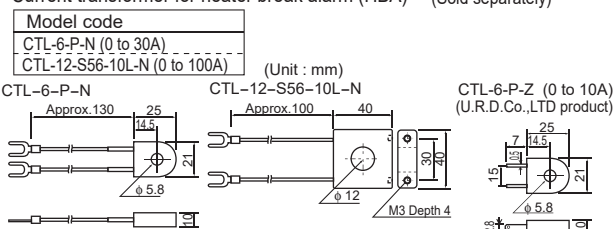
• PZ900

1	25	13
2	26	14
3	27	15
4	28	16
5	29	17
6	30	18
7	31	19
8	32	20
9	33	21
10	34	22
11	35	23
12	36	24

No	Description	No	Description	No	Description
1	AC L 100-240V 24V DC +	25	Output 3 (*) (OUT3) Voltage pulse/Current	13	Digital output 2 (DO 2) (*)
2	24V - N	26		14	Relay contact output
3	NO (1) (2) (3)	27	COM COM	15	Digital output 3 (DO 3) (*)
4	NO (1) (2) (3)	28	DI1 DI1	16	Relay contact output
5	NO (1) (2) (3)	29	DI2 DI2	17	Digital output 4 (DO 4) (*)
6	NO (1) (2) (3)	30	DI3 DI3	18	Relay contact output
7	NO (1) (2) (3)	31	DI4 DI4	19	COM CT1 CT2
8	NO (1) (2) (3)	32	DI5 DI5	20	Open (O) (A) CT1, CT2 input (*)
9	NO (1) (2) (3)	33	DI6 DI6	21	Close (C) (B) Feedback resistance input
10	NO (1) (2) (3)	34	R(A) R(B)	22	
11	NO (1) (2) (3)	35	SG T(A) T(B)	23	
12	NO (1) (2) (3)	36	T(R/A) T(R/B)	24	

Accessory

Current transformer for heater break alarm (HBA) (Sold separately)



Terminal cover (Sold separately)

Type	Model Code
PZ400/900	KFB400-58



Front cover (Sold separately)

Type	Model Code
PZ400	KRB400-36
PZ900	KRB900-36



Ramp/Soak Temperature / Process Controller PZ400/900

Model and Suffix Code

		Model and Suffix Code									
Specifications		PZ400 (PV display: Green, 48 x 96mm 1/8 DIN Vertical size) PZ401 (PV display: White, 48 x 96mm 1/8 DIN Vertical size) PZ900 (PV display: Green, 96 x 96mm 1/4 DIN size) PZ901 (PV display: White, 96 x 96mm 1/4 DIN size)									
① Control Method		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 proportional PID control with AT (Direct action)	F D G A W Z C								
② Input and range		See Input range Code Table									
③ Output 1 (OUT1)		Not supplied Relay contact output Voltage pulse output (0/12V DC) DC mA, V See Output Code Table Transistor output									
④ Output 2 (OUT2)		Not supplied Relay contact output Voltage pulse output (0/12V DC) DC mA, V Transistor output									
⑤ Power supply		24V AC/DC 100 to 240V AC									
⑥ Digital output		Digital output 1 point Digital output 4 points									
⑦ Option 1		Not supplied CT input 2 points (CTL-6-P-N) 0 to 30A CT input 2 points (CTL-12-S56-10L-N) 0 to 100A CT input 2 points (CTL-6-Z) 0 to 10A Feedback resistance input (FBR)									
⑧ Option 2		Not supplied Output 3 (OUT3) Digital input 1 to 6 (DI1 to 6) Communication RS-422A Communication RS-485 Output 3 (OUT3) + Digital input 1 to 6 (DI1 to 6) Output 3 (OUT3) + Communication RS-422A Output 3 (OUT3) + Communication RS-485 Output 3 (OUT3) + Digital input 1 to 6 (DI1 to 6) + Communication RS-422A Output 3 (OUT3) + Digital input 1 to 6 (DI1 to 6) + Communication RS-485									
⑨ Waterproof/Dustproof		Not supplied Waterproof/Dustproof protection (IP65)									
⑩ Quick start code		No quick start code (Default setting) Specify quick start code (DO type)									

< Default setting of Output 1 (OUT1), Output 2 (OUT2) >
 • Output 1 : Control output
 • Output 2 : Heat/Cool PID control : Cooling side output
 Position proportioning PID control : Closing side output
 PID control : Output 2 < Code 4 to 8 > : Analog retransmission output (PV)
 Output 2 < Code M, V, B > : Control output

Output signal code table

4	0 - 5V DC	5	0 - 10V DC	6	1 - 5V DC	7	0 - 20mA DC	8	4 - 20mA DC
---	-----------	---	------------	---	-----------	---	-------------	---	-------------

Quick Start Code

Quick start code		①②③④⑤
		□□□□□
① Digital output 1 function	None See Digital output function code table	N
② Digital output 2 function	None See Digital output function code table	N
③ Digital output 3 function	None See Digital output function code table	N
④ Digital output 4 function	None See Digital output function code table	N
⑤ Communication	When "Communication" is not specified as an option, only "N: None" is selectable as the communication protocol. ANSI/RKC standard protocol MODBUS protocol PLC communication: MITSUBISHI MELSEC series special protocol	N

Digital output function code table

A	Deviation High
B	Deviation Low
C	Deviation High/Low
D	Band
E	Deviation High with Hold
F	Deviation Low with Hold
G	Deviation High/Low with Hold
H	Process High
J	Process Low
K	Process High with Hold
L	Process Low with Hold
P	Heater Break Alarm 1 (HBA1)
Q	Heater Break Alarm 2 (HBA2)
R	Control Loop Break Alarm (LBA)
S	FAIL
V	Set value High
W	Set value Low
1	TS1
2	TS2
3	TS3
4	TS4
5	OR output of TS1 and TS2
6	Pattern End
7	RUN status

TS : Time signal

Measured Range (Universal Inputs)

Input	Measured range
K	-200.0 to +400.0°C, -328.0 to +752.0°F -200.0 to +1372.0°C, -328.0 to +2502.0°F
J	-200.0 to +400.0°C, -328.0 to +752.0°F -200.0 to +1200.0°C, -328.0 to +2192.0°F
T	-200.0 to +400.0°C, -328.0 to +752.0°F
S	-50.0 to +1768.0°C, -58.0 to +3214.0°F
R	-50.0 to +1768.0°C, -58.0 to +3214.0°F
E	-200.0 to +1000.0°C, -328.0 to +1832.0°F
B	0.0 to 1800.0°C, 0.0 to 3272.0°F
N	0.0 to 1300.0°C, 0.0 to 2372.0°F

Input	Measured range
PLII	0.0 to 1390.0°C, 0.0 to 2534.0°F
W5Re/W26Re	0 to 2300°C, 0 to 4200°F
U	-200.0 to +600.0°C, -328.0 to +1112.0°F
L	0.0 to 900.0°C, 0.0 to 1652.0°F
PR40-20	0 to 1800°C, 0 to 3200°F
Pt100	-200.0 to +850.0°C, -328.0 to +1562.0°F -100.00 to +100.00°C, -148.00 to +212.00°F 0.00 to 50.00°C, 32.00 to 122.00°F
JPt100	-200.0 to +640.0°C, -328.0 to +1184.0°F -100.00 to +100.00°C, -148.00 to +212.00°F 0.00 to 50.00°C, 32.00 to 122.00°F

Input range code table

(Universal input, Field-programmable)

Thermocouple		
Input	Range	Code
K	0 to 200°C	K01
	0 to 400°C	K02
	0 to 600°C	K03
	0 to 800°C	K04
	0 to 1200°C	K06
	0 to 1372°C	K07
	-199.9 to +300.0°C	K08
	0.0 to 400.0°C	K09
	0.0 to 800.0°C	K10
	0 to 300°C	K14
	-200 to +1372°C	K41
	-200.0 to +1372.0°C	K42
	0 to 800°F	KA1
	0 to 1600°F	KA2
J	0 to 2502°F	KA3
	0 to 200°C	J01
	0 to 400°C	J02
	0 to 600°C	J03
	0 to 800°C	J04
	0.0 to 400.0°C	J08
	-200.0 to +1200.0°C	J29
	0 to 800°F	JA1
	0 to 2192°F	JA3
	0 to 400°F	JA6
T	-199.9 to +400.0°C	T01
	-199.9 to +100.0°C	T02
	-100.0 to +200.0°C	T03
	-200.0 to +400.0°C	T19
S	-50 to +1768°C	S06
	-50.0 to +1768.0°C	S07
R	0 to 1600°C	R01
	-50 to +1768°C	R07
	-50.0 to +1768.0°C	R08
	0.0 to 1600.0°C	R09
E	0 to 800°C	E01
	0.0 to 800.0°C	E23
B	0 to 1800°C	B03
	0.0 to 1800.0°C	B04
N	0 to 1300°C	N02
	0.0 to 1300.0°C	N05
PLII	0 to 1300°C	A01
	0.0 to 1300.0°C	A05
W5Re/W26Re	0 to 2300°C	W03
PR40-20	0 to 1800°C	F02
	0 to 3200°F	FA2
U	-199.9 to +600.0°C	U01
L	0.0 to 900.0°C	L04

RTD

Input	Range	Code
Pt100	-199.9 to +649.0°C	D01
	-100.0 to +100.0°C	D04
	-100.0 to +200.0°C	D05
	0.0 to 50.0°C	D06
	0.0 to 100.0°C	D07
	0.0 to 200.0°C	D08
	0.0 to 300.0°C	D09
	0.0 to 500.0°C	D10
	-199.9 to +600.0°C	D12
	-200.0 to +200.0°C	D21
	0.00 to 50.00°C	D27
	-100.00 to +100.00°C	D34
	-200.0 to +850.0°C	D35
	-199.9 to +999.9°F	DA1
	0.0 to 500.0°F	DA9
JPt100	0.0 to 200.0°C	P08
	-100.00 to +100.00°C	P29
	-200.0 to +640.0°C	P30

DC Current • voltage

Input	Code	Range
0 to 10mV DC	101	Scale range and decimal point are programmable in the range of -19999 to +99999
0 to 100mV DC	201	
0 to 1V DC	301	
0 to 5V DC	401	
0 to 10V DC	501	
1 to 5V DC	601	Factory set value 0.0 to 100.0%
0 to 20mA DC	701	
4 to 20mA DC	801	
-10 to +10V DC	904	
-5 to +5V DC	905	

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.

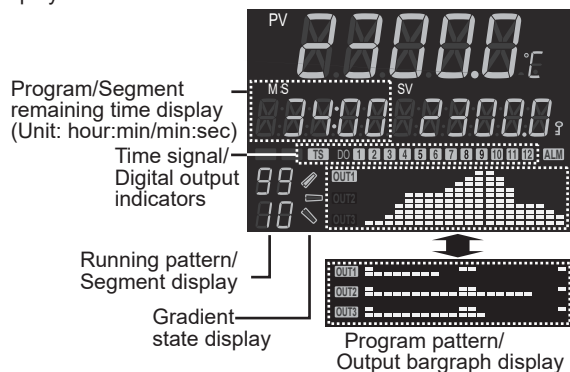
Some of the optional features include analog outputs and digital communications.

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.



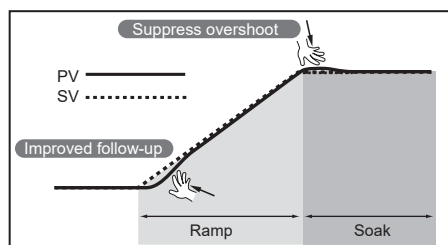
Large Memory

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)

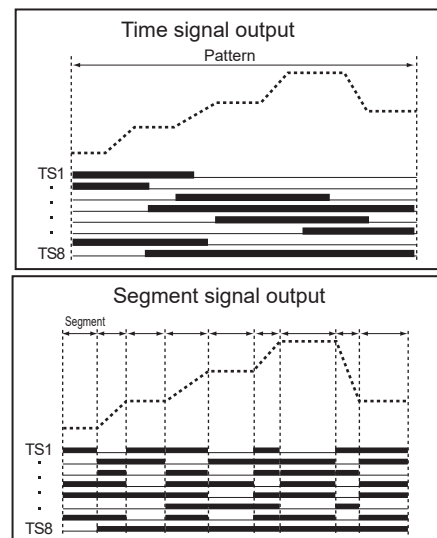
New control algorithm RSS (Ramp Soak Stabilizer)

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

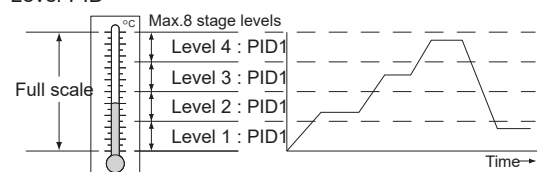
You can select a pattern mode that works within the pattern or a segment mode that works within the segment.
(Please specify one of the two)



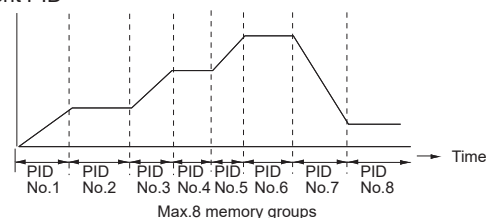
Level-PID or Segment PID

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

<Level-PID>



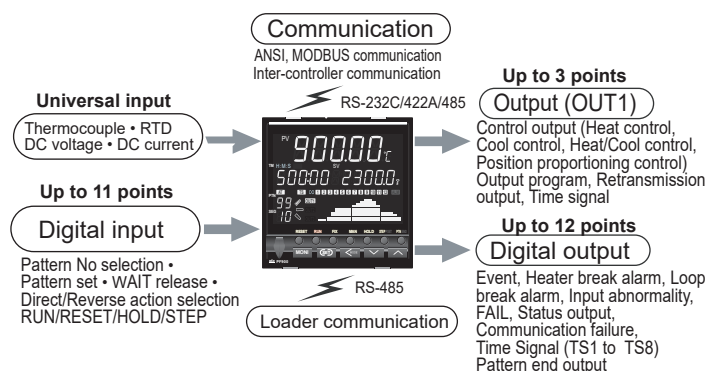
<Segment PID>



Ramp/Soak Process/Temperature Controller PF900

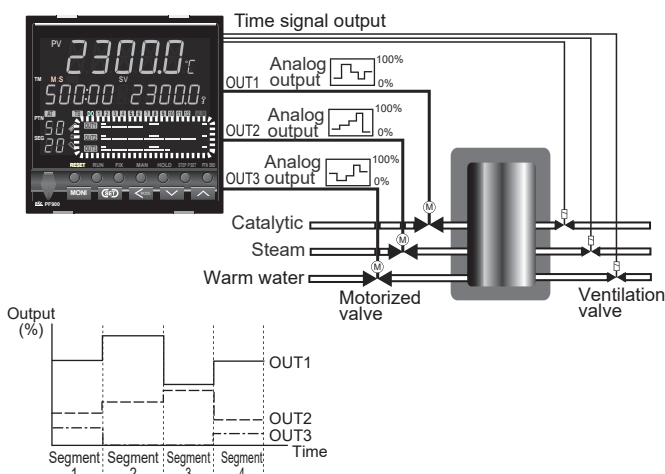
Features

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

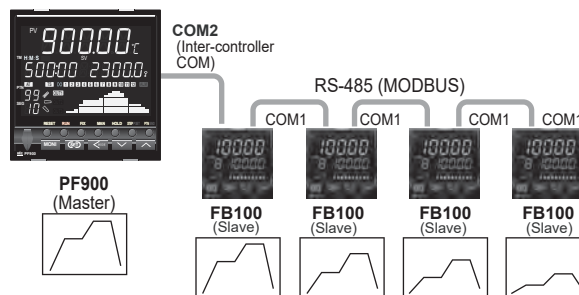
Set values of P, I, D, event, segment wait, time signal, program pattern output can be stored in memory groups and can be called up for a segment to be set.

- 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.

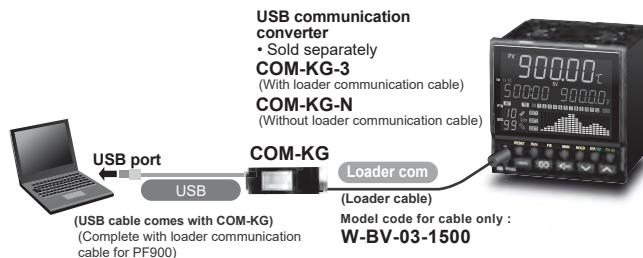


- Memory area needs to be selected on FB series.
- If you use FB400, FB900 or PF900 for a slave device, please select Communication 1. Communication protocol among slave devices is Modbus.
- Models available as a master device
PF900/PF901 : Suffix codes for communication : W, X, or Y
- Models available 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.

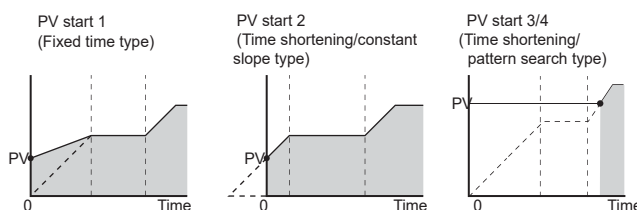


PV Start

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	Provide control output at the time of reset	Control continues with the calculated value of the control.		Control starts with the control output at reset as the manual setpoint.
	Program control mode			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		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)
- Open collector output : Load voltage : Less than 30V DC,
(Sink type) 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 (DO1up 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

- 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 to 100.0A
- e) Heater current display accuracy: $\pm 5\%$ of input value or $\pm 2A$
- 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.

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

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

Additional Function

- Stop/continue selectable during RESET status

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

- 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

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

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 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/m ³ 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
-----------------------------------	----------------

Ramp/Soak Process/Temperature Controller PF900

Model and Suffix Code

Specifications		Model and Suffix Code													
		Hardware coding only				Quick start code 1									
Model		PF900 (PV : Green, SV : Orange, Pattern : White) PF901 (PV : White, SV : White, Pattern : White)		①②③④⑤⑥⑦⑧⑨⑩⑪ -□□□-□*□□□□□□□□□□/Y											
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) Open collector output		M V □ D											
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) Open collector output		N M V □ D											
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 V □ D											
④	Power supply	24V AC/DC 100 to 240V AC			3 4										
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 F									
⑦	Communication <Note 1> Digital input (DI 1 to 6) • DI7 to 11 supplied as standard	Not supplied COM1:RS-232C COM2:Not supplied • Digital input: 6 points, DI 1 to 6 COM1:RS-422A COM2:Not supplied • Digital input: 6 points, DI 1 to 6 COM1:RS-485 COM2:Not supplied • Digital input: 6 points, DI 1 to 6 COM1:RS-232C COM2:RS-485 • Digital input: 6 points, DI 1 to 6 COM1:RS-485 COM2:RS-485 • Digital input: 6 points, DI 1 to 6 COM1:Not supplied COM2:RS-485 • Digital input: 6 points, DI 1 to 6 Digital input: 6 points, DI 1 to 6				N 1 4 5 W X Y D									
⑧	Initial setting	No quick start code (Default setting) Specify quick start code 1 Specify quick start code 1 and 2				N 1 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)										No code F D G A W Z C	
⑩	Quick start code 1	Input and range		No quick start code See Input range Code Table										No code □□□□	
⑪	Quick start code 1	Instrument version		Version symbol											

<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	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	K : C5	-328 to +2502°F		S : 06	-50 to +1768°C
	J : 27	-200.0 to +400.0°C		S : A8	-58.0 to +3214.0°F
	J : 29	-200.0 to +1200.0°C		S : A5	0.0 to 3200.0°F
	J : 16	0.0 to 1200.0°C		S : A7	-58 to +3214°F
	J : 15	-200 to +1200°C	R	R : 05	0.0 to 1700.0°C
	J : C9	-328.0 to +2192.0°F		R : 08	-50.0 to +1768.0°C
	J : B5	0.0 to 2100.0°F		R : 07	-50 to +1768°C
	J : B6	0.0 to 800.0°F		R : A8	-58.0 to +3214.0°F
	J : B9	-328 to +2192°F		R : A5	0.0 to 3200.0°F
E	E : 20	-200.0 to +1000.0°C		R : A7	-58 to +3214°F
	E : 17	-200.0 to +200.0°C	B	B : 04	0.0 to 1800.0°C
	E : 08	0.0 to 1000.0°C		B : 03	0 to 1800°C
	E : 06	-200 to +1000°C		B : A9	0.0 to 3200.0°F
	E : B3	-328.0 to +1832.0°F		B : B3	0.0 to 3272.0°F
	E : A6	0.0 to 1800.0°F		B : B2	0 to 3272°F
	E : B1	-328 to +1832°F		N : 05	0.0 to 1300.0°C
			N	N : 02	0 to 1300°C
				N : A8	0.0 to 2372.0°F
				N : A4	0.0 to 2300.0°F
				N : A7	0 to 2372°F

RTD

Input	Code	Range	Input	Code	Range
Pt100	D : 34	-100.00 to +150.00°C	PLII (NBS)	A : 06	0.0 to 1390.0°C
	D : 35	-200.0 to +850.0°C		A : 05	0.0 to 1300.0°C
	D : 21	-200.0 to +200.0°C		A : 02	0 to 1390°C
	D : 25	-200.0 to +600.0°C		A : A7	0.0 to 2534.0°F
	D : 36	-200 to +850°C		A : A5	0.0 to 2300.0°F
	D : C9	-328.0 to +1562.0°F		A : A2	0 to 2534°F
	D : B8	-300.0 to +1200.0°F	W5Re/W26Re (ASTM)	W : 04	0.0 to 2300.0°C
	D : D2	-328 to +1562°F		W : 06	0.0 to 1200.0°C
JPt100	P : 29	-100.00 to +150.00°C		W : 03	0 to 2300°C
	P : 21	-200.0 to +200.0°C		W : A8	0.0 to 4200.0°F
	P : 26	-200.0 to +600.0°C		W : A6	0.0 to 2200.0°F
	P : 30	-200.0 to +640.0°C		W : A2	0 to 4200°F
	P : 10	0.0 to 500.0°C	L (DIN)	L : 04	0.0 to 900.0°C
	P : 31	-200 to +640°C		L : 05	0 to 900°C
				L : A6	0.0 to 1600.0°F
				L : B1	0.0 to 1652.0°F
				L : A3	0 to 1652°F

DC Current • voltage

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

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
---	-----------	---	---	-----------	---	------------	---	-----------	---	-------------	---	-------------

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

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 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						

• 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	Pattern No. Set
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				Pattern No. Set
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)

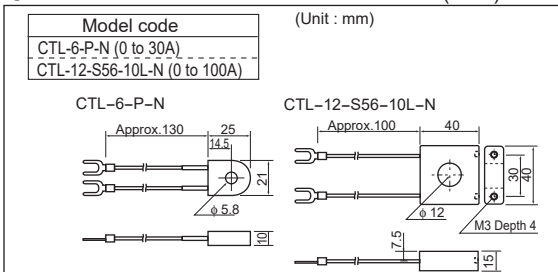
Quick start code 2

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)



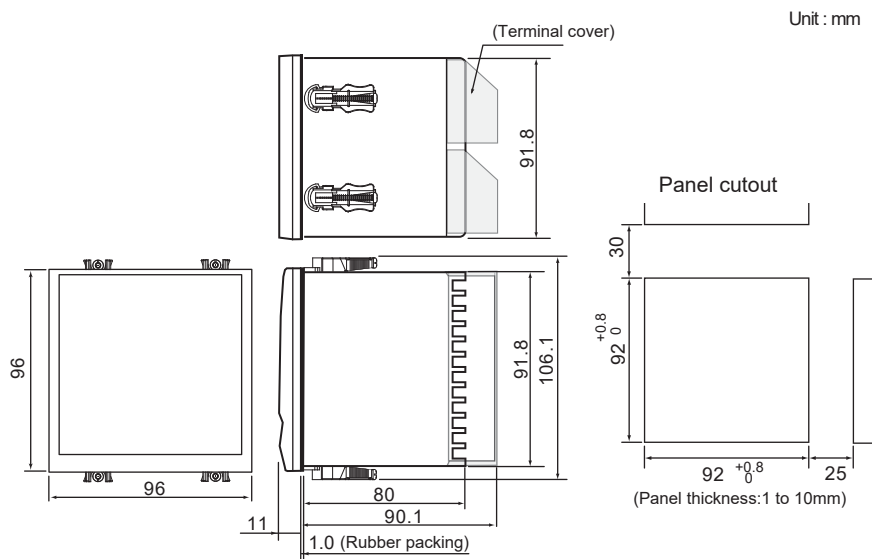
Terminal Cover

(two pieces necessary)
Model code : KFB400-511

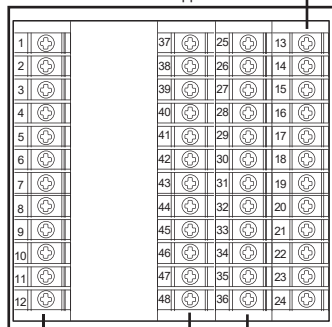


Ramp/Soak Process/Temperature Controller PF900

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		RESET	RESET	(1)	(1)	RESET	RESET	Digital inputs (DI 7 to 11)
15		RUN	RUN	(2)	(2)	RUN	RUN	
16		STEP	STEP	(4)	(4)	STEP	STEP	
17		HOLD	(32) Ptn. No	(8)	(8)	HOLD	HOLD	
18		(32) Ptn.No.	(64) Ptn. No	Ptn. SET	(16)	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 (1) Thermocouple (2) RTD (3) Voltage/Current
23		A						
24		B						

No.	Functions	
1	AC 100 - 240V	Power supply
2	DC 24V	
3	COM	Standard
4	DO4	
5	DO3	
6	COM	Standard
7	DO2	
8	DO1	
9	NO	Output 2 (OUT2)
10	(1) Relay output	
11	(2) Voltage pulse/Voltage/Current	
12	(3) Open collector	Output 1 (OUT1)
13	NO	
14	(1) Relay output	

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

No.	Functions	
25	SG	(Optional)
26	SD	
27	(1) RD	
28	(2)	
29	(3)	
30	COM	(Optional)
31	DI 1	
32	DI 2	
33	DI 3	
34	DI 4	
35	DI 5	Digital inputs (DI 1 to 6)
36	DI 6	

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

SRZ



General Description

The SRZ is a DIN rail mounted module type temperature controller. 4 or 2 loop control can be performed with a single compact module. Module can have 4 CT (Current transformer) inputs. A maximum of 16 temperature control modules can be connected for 64-loop control. Power supply and communication lines are via a connector on the side, no wiring required.

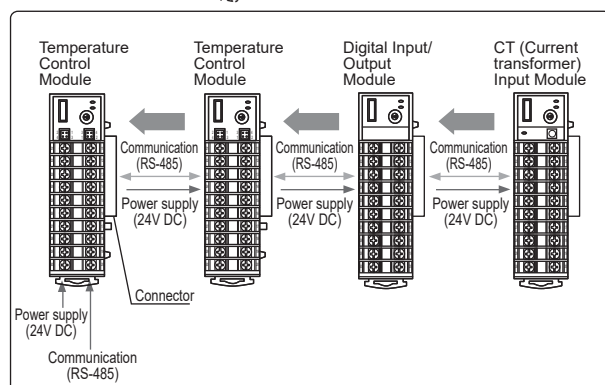
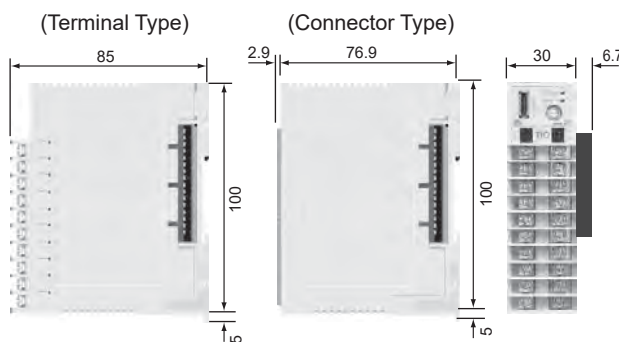
Features

- ☆ 4 loop controller packed in one compact module
- ☆ Multi-zone space-saving and less wiring
- ☆ Heat/Cool action
- ☆ Heater/Loop break alarms
- ☆ DIN rail mounting

Space-Saving and Less Wiring

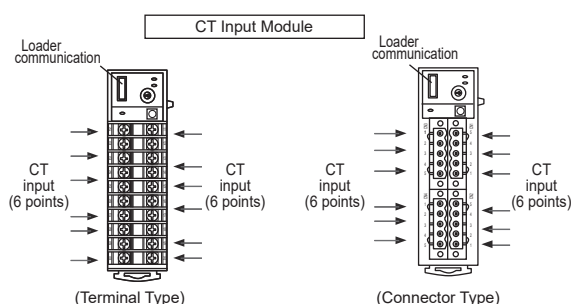
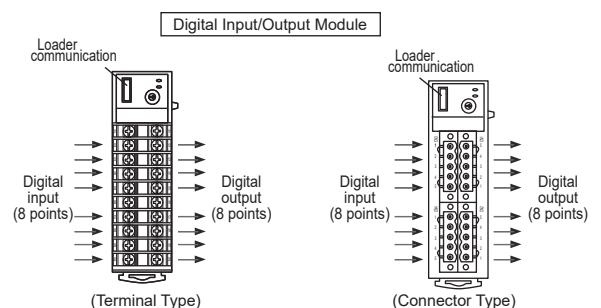
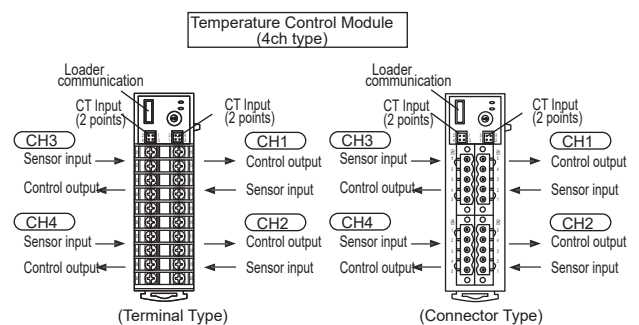
4CH temperature controller packed in one compact module. Separated installation by control zones is possible. Wiring to sensors and output devices is minimized.

Modules can be installed separately inside a control panel or a machine to reduce the physical size of the housing.



Module Configuration

Input/Output Configuration



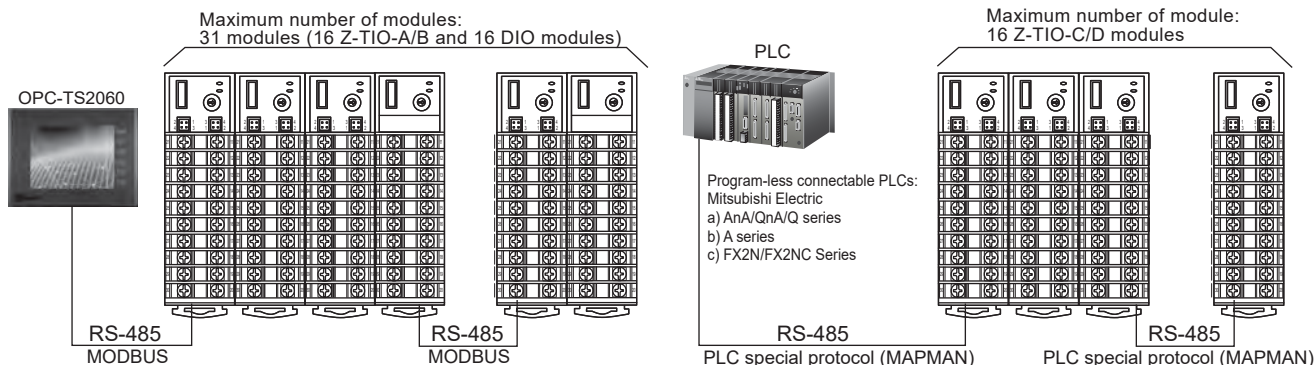
Module type Process/Temperature Controller SRZ

Features

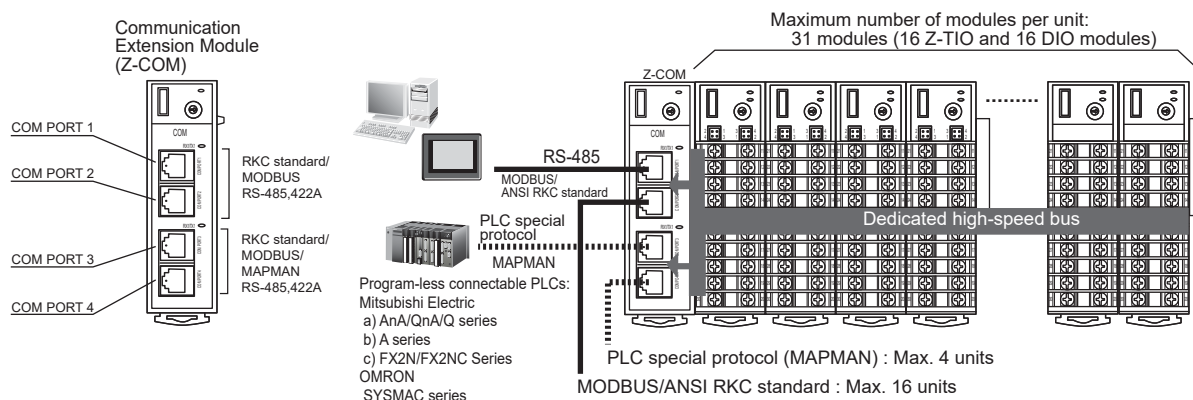
Flexible temperature control system configuration

MODBUS/ANSI RKC standard protocol communication

PLC special protocol

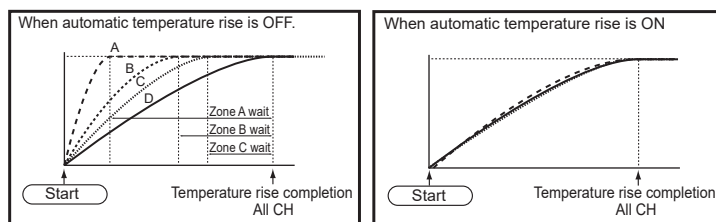


Z-COM module can manage data from connected control modules via high-speed bus connection. MAPMAN program-less connection to PLC is also available.



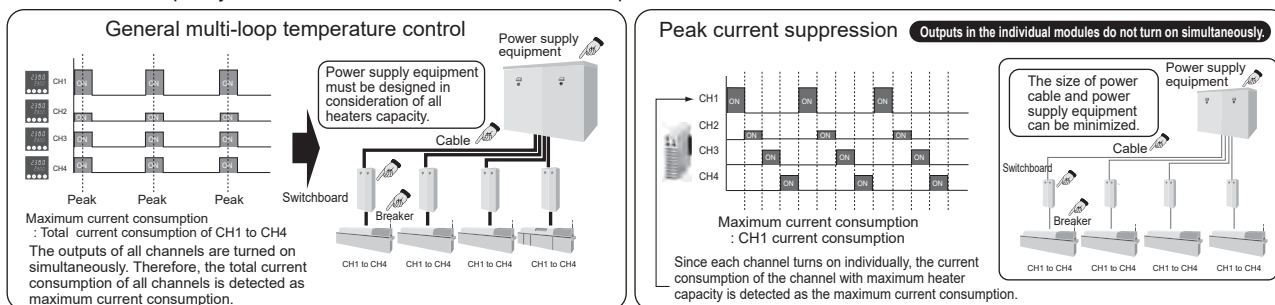
Temperature uniformity at ramp-up (Auto-temperature rise function)

The Auto-temperature rise function controls the rate of temperature rise uniformly across all the channels in a specified group. The SRZ system has the ability to have multiple groups within each system. This uniform controlled temperature rise will suppress local overheating and mechanical distortion in the tools, contributing to higher product quality.



Peak current suppression

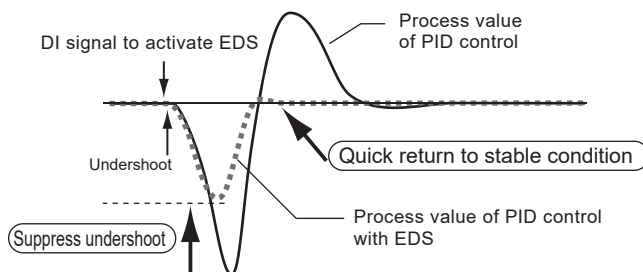
Peak current suppression minimizes the capacity of electrical materials such as power supply equipments, switchboards, power lines, and breakers since this function makes the timing of control output on each channel separate so that the current consumption of the channel with maximum heater capacity is detected as maximum current consumption.



Features

External disturbance suppression with autotuning (EDS)

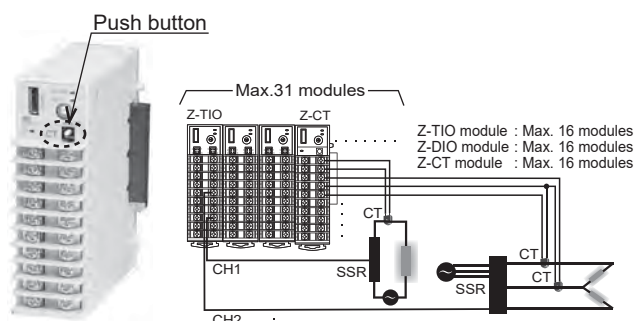
EDS with autotuning calculates optimum settings to suppress control disturbance caused by external factors. The function is activated by a DI signal to adjust control output (feed-forward) to compensate for the disturbance. It is suitable for an application in which external disturbance can be predicted, such as wafer-in/out in semiconductor manufacturing equipment, and during injection in injection molding machine.



Automatic SV setting on heater break alarm and heater over current alarm

Set values of Heater break alarm (HBA) and heater over current alarm are automatically set by pressing a front-mounted push button when a heater is on. This function is also available for three-phase heater break alarm.

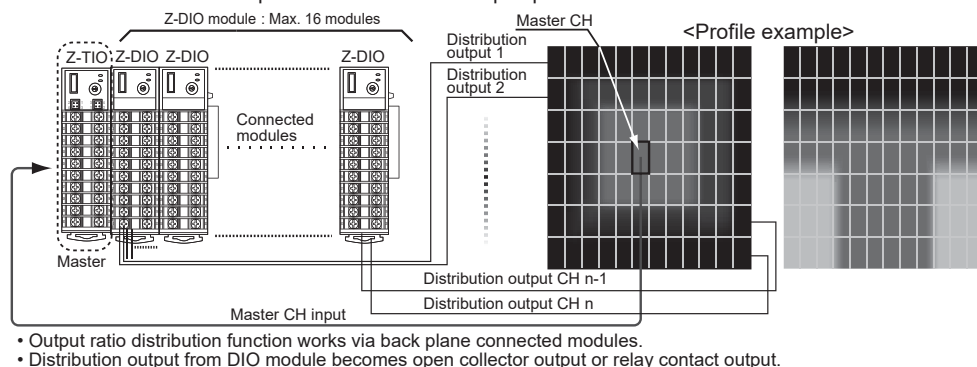
- HBA function of Z-CT module is designed only for time proportional control (On/Off output). Phase control (continuous output) is not available.
- The CT input monitor value indicates the effective value when the heater break alarm function is enabled and output is 100% (heater ON) or 0% (heater OFF.)



Multi-loop profile control (Output ratio distribution function)

This function enables one master loop to distribute its output value to multiple outputs of Z-DIO modules. Bias and ratio can be set for each output independently.

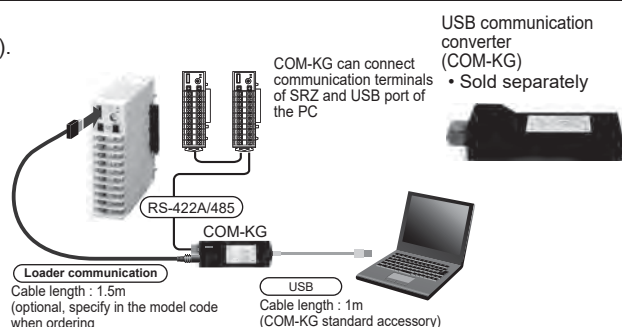
A maximum of 187 distribution outputs from one control loop is possible when Z-DIOs and Z-TIOs are used for output ratio distribution.



Communication with a PC via USB port (Loader communication)

The SRZ module has a standard loader port on the front panel to connect to a PC USB port via COM-K2 (USB communication converter). Using Win-UCI software on the PC, parameter settings can be easily saved on the PC in CSV format, and the same parameter settings are easily copied to other SRZ modules.

- The Loader port is only for parameter setup



Model Code : USB communication converter (COM-KG)

Specifications	Model and Suffix code	
	COM-KG-	
Loader communication cable	Without loader communication cable	N
	With loader communication cable	1

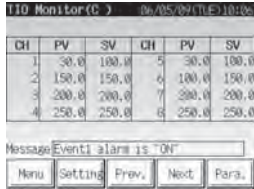
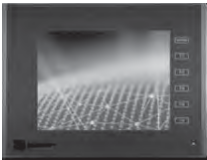
Module type Digital Temperature Controller SRZ



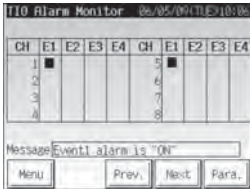
Display unit

Operation Panel : OPC-TS2060

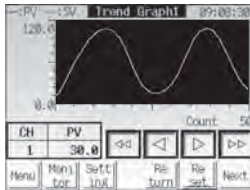
5.7 inches TFT color LCD operation panel



<PV/SV monitor>

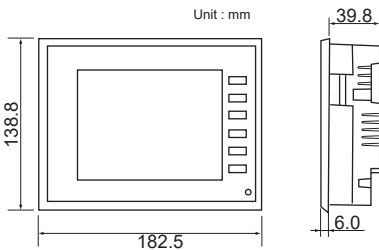


<Alarm monitor>



<Trend Graph>

External Dimension

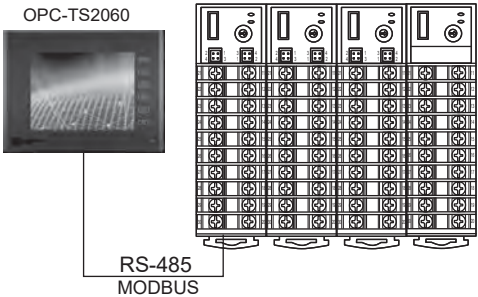


Specifications

Display : TFT color LCD
Power supply voltage : 24V DC
Power consumption : Less than 13W
Ambient temperature : 0 to 50°C

Ambient humidity : Less than 85% RH
Waterproof/Dustproof : IP65
Weight : 580g
Compliance : UL, cUL, CE marking

Maximum number of modules:
31 modules (16 Z-TIO-A/B and 16 DIO modules)



Model Code

Specifications	No	Model Code	①	②	③
Display method	①	TFT color LCD	1	/	/
Available controller	②	Z-TIO/DIO (MODBUS protocol)	5	J	E
Language	③	Japanese			
		English			

Accessories (Sold separately)

Specifications	Model
Cable : Between OPC-TS2060 and Z-TIO (Length 3m)	V6-MLT



Specifications

Temperature control module (Z-TIO)

Input

Number of inputs

- 4 points (Z-TIO-A), 2 points (Z-TIO-B)
- Isolated between each channel.

Input

- Universal input
 - Temperature, Current, Low voltage input group
 - Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS), W5Re/W26Re (ASTM)
 - Influence of external resistance : Approx. 0.125μV/Ω
 - Input break action : Up-scale / Down-scale (Selectable)
 - RTD : Pt100 (JIS/IEC), JPt100 (JIS)
 - Influence of input lead resistance : Approx. 0.02[%/Ω] of reading
 - Maximum 10Ω per wire
 - Input break action : Up-scale
 - Low voltage : 0 to 1V DC, 0 to 100mV DC, 0 to 10mV DC,
 - Input break action : Up-scale / Down-scale (Selectable)
 - Current : 4 to 20mA DC, 0 to 20mA DC
 - Input break action : Uncertain (indicates a value around 0mA)
- High voltage input group
 - High voltage : 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
 - Input break action : Uncertain (indicates a value around 0V)

Sampling Time

0.25 sec

Input Digital Filter

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

PV Bias

-span to +span

PV Ratio

0.500 to 1.500

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
 - Less than -100°C (-148°F) : ±2.0°C (±3.6°F)
 - 100 to 500°C (-148 to 932°F) : ±1.0°C (±1.8°F)
 - More than 500°C (932°F) : ±(0.2% of Reading + 1 digit)
 - Type : N, S, R, W5Re/W26Re
 - Less than 1000°C (1832°F) : ±2.0°C (±3.6°F)
 - More than 1000°C (1832°F) : ±(0.2% of Reading + 1 digit)
 - Type : B
 - Less than 400°C (752°F) : ±70.0°C (±126°F)
 - 400 to 1000°C (752 to 1832°F) : ±2.0°C (±3.6°F)
 - More than 1000°C (1832°F) : ±(0.2% of Reading + 1 digit)
- Cold junction temperature compensation error when close horizontal mounting
 - Terminal type : ±1.0°C (1.8°F) [at 23±2°C (73±3.6°F)]
 - Less than -100°C (-148°F) input : ±2.0°C (±3.6°F)
 - Connector type : ±2.0°C (3.6°F) [at 23±2°C (73±3.6°F)]
 - Less than -100°C (-148°F) input : ±4.0°C (±7.2°F)
- b) RTD
 - Less than 200°C (392°F) : ±0.4°C (±0.8°F)
 - More than 200°C (392°F) : ±(0.2% of Reading + 1 digit)
- c) DC voltage and DC current
 - ±(0.2% of span)

Insulation Resistance

More than 20MΩ (500V DC) between measured terminals and ground
 More than 20MΩ (500V DC) between power terminals and ground
 More than 20MΩ (500V DC) between measured terminals and power terminals

Dielectric Strength

750V AC for one minute between measured terminals and ground
 750V AC for one minute between power terminals and ground
 750V AC for one minute between measured terminals and power terminals

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 without feedback resistance.
- *a), b), c) is selectable.

Autotuning Method

- a) For PID control (Direct action/Reverse action)
- 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
- e) For Position proportioning control without feedback resistance

Startup tuning

The condition to activate Startup Tuning is selectable among a) to g)

- a) At power-on, one-time tuning
 - b) At SV change, one-time tuning
 - c) At power-on and SV change, one-time tuning
 - d) At power-on, always on
 - e) At SV change, always on
 - f) At power-on and SV change, always on
 - g) Function off
- (Not available for Position proportioning control without feedback resistance)

Major Setting Range

- Set value : Same as input range.
- Proportional band : 0 to input span (°C, °F) (Temperature input)
 0.0 to 1000.0% of span (Voltage, Current input)
 (ON/OFF control when P = 0)
- Integral time : 0 to 3600sec. or 0.0 to 1999.9sec.
 (selectable)
- Derivative time : 0 to 3600sec. or 0.0 to 1999.9sec.
 (selectable)
- Cool-side proportional band : 1(0.1,0.01) to input span (°C, °F)(Temperature input)
 0.1 to 1000.0% of span (Voltage, Current input)
- Cool-side integral time : 0 to 3600sec. or 0.0 to 1999.9sec.
 (selectable)
- Cool-side derivative time : 0 to 3600sec. or 0.0 to 1999.9sec.
 (selectable)
- Deadband/Overlap : -span to +span (Temperature input)
 -100.0 to +100.0% of span (Voltage, Current input)
- Control response : Slow, Medium, Fast
- Ramp-to-setpoint : 0 to span per Time
 (Time is selectable between 1 and 3600 sec)
 (Up/Down individual setting)
- Output limiter : -5.0 to +105.0% (High/Low individual setting)
- Cool-side output limiter : -5.0 to +105.0% (High/Low individual setting)
- Output change rate limiter : 0.0 to 100.0%/sec. (Up/Down individual setting)
- Cool-side output change rate limiter : 0.0 to 100.0%/sec. (Up/Down 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%
- Manual output : Output limiter low to output limiter high
- Output at control stop mode : -5.0 to 100.5% (Heat/Cool individual setting)

Motor Valve Control (position proportioning control type only)

- Motor time : 5 to 1000 sec. (full open to full close)
- Integral output limiter : OFF, 100.0 to 200.0% of motor time
- Neutral zone : 0.1 to 10.0%
- Differential gap : 0.1 to 5.0%
- Valve action at a stop mode : a) CLOSE : OFF, OPEN : OFF
 b) CLOSE : ON, OPEN : OFF
 c) CLOSE : OFF, OPEN : ON
 * a), b), c) is selectable.

Memory area

- Number of memory area : 8 memory areas
- Setting item : Set value (SV), Proportional band, Integral time, Derivative time, Cool-side proportional band, Cool-side integral time, Cool-side derivative time, Deadband/Overlap, Control response, Manual reset, Ramp-to-setpoint (Up/Down), Event set vale, LBA time, LBA deadband, Soak time : 0 min 0.00 sec to 199 min 59 sec or 0 hr 00 min to 9 hr 59 min (selectable)
- Linking area number : OFF, 1 to 8

Output Type

- Relay output : Form A contact, 250V AC 3A (resistive load)
- Voltage pulse output : 0/12V DC
 (Load resistance : More than 600Ω)
 • Power supply and output are not isolated.
- Current output : 4 to 20mA DC, 0 to 20mA DC
 (Load resistance : Less than 600Ω)
 • Power supply and output are not isolated.
- Continuous voltage output : 0 to 1V DC, 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
 (Load resistance : More than 1kΩ)
 • Power supply and output are not isolated.
- Open collector output : Load voltage : Less than 30V DC,
 (Sink type) Maximum load current : Less than 100mA
 ON voltage : Less than 2V DC (at 100mA)



Specifications

Temperature control module (Z-TIO)

Event (Alarm)

Number of Event Setting
Up to 4 points (Event 1 to 4)

Alarm Type

Process high, Process low, Deviation high, Deviation low, Deviation high/low, Band, Set value high, Set value low, MV value high, MV value low, Cool side MV value high, Cool side MV value low, FBR value high, FBR value low, LBA (Control loop break alarm), Deviation high between channel, Deviation low between channel, Deviation high/low between channel, Deviation band between channel, Temperature rise completion

- LBA is assignable to event 4.
- Temperature rise completion is assignable to event 3.

Setting range

Deviation, Deviation between channel, Temperature rise completion
: - (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, FBR valued : -5.0 to +105.0%

Control loop break alarm (LBA)
: LBA time : 0 to 7200 sec. (OFF by setting zero)
LBA deadband : 0 to input span

Other Functions

- Hold/Re-hold action (Valid for deviation/band/process alarm only)
 - Hold action is activated at Power-up and STOP to RUN.
 - Re-hold action is activated at Power-up, STOP to RUN, and the control set value change.
- Event action is configurable in case of input abnormality.
- Energized/de-energized action is configurable.
- Delay timer : 0 to 1800 sec
- Interlock (latch) function is configurable.

Heater Break Alarm (Optional)

Number of CT Input : 4 points (4ch type), 2 points (2ch type)
CT Input type : CTL-6-P-N (30A), CTL-12-S56-10L-N(100A)
• Selectable

Accuracy : $\pm 5\%$ of input value or $\pm 2A$ (whichever is larger)

Display range : 0.0 to 100.0A

Communications

Communication method : RS-485
Communication speed : 4800, 9600, 19200, 38400 BPS
Protocol :
a) ANSI X3.28(1976) 2.5 B1 (RKC standard)
b) MODBUS- RTU
c) PLC special protocol (Mapman): Z-TIO-C/D Module
Correspond to MITSUBISHI MELSEC PLC series
1. A compatible, 1C Frame (type 4)
AnA/AnU common command (QR/QW)
(AnA, QnA series, Q series)
QnA compatible, 3C Frame (type 4) command (0401/1401)
(QnA/Q series) • Z Resistor only
2. A compatible, 1C Frame (type 4)
ACPU common command (WR/WW)
(A series, FX2N, FX2NC series)

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 • For MODBUS 1 bit

Maximum connection : Z-TIO-A/B : 32 modules, Z-TIO-C/D : 16 modules

Other Functions

Remote set input
Temperature ratio setting
Cascade control mode

Output ratio distribution function

Function which distributes the control output value of the master channel to the Z-DIO/TIO module output.

EDS function

Function which suppresses overshoot and undershoot.

Auto-temperature-rise with learning function

Function which achieves temperature uniformity at ramp-up in the same control group while learning function calculates optimum parameter settings for this function.
Up to 16 groups can be configured within modules which are connected each other by connectors on the base.

Peak current suppression function

When the output type is time proportional output, the peak current suppression function changes the start timing of the proportional cycle so that the outputs of the channels do not turn ON simultaneously.

- The peak current suppression function is performed in one modules.

Master-slave Mode

With this function, when a mode of Mode-master channel is changed, the mode of all slave channels (preset) will be also automatically changed. Modes can be selected among various mode function such as memory area (recipe).

Digital input/output module (Z-DIO)

Digital Input

Number of inputs

- 8 points
- Isolated input (4 points/common)

Input method

Voltage contact input
Open : Less than 5.0V, Close : More than 17.5V
Contact current : Less than 3.0mA
Allowable input voltage : Less than 26.4V DC

Function

Interlock reset, RUN/STOP, Remote/Local, Auto/Manual, Memory area selection, External disturbance suppression

Function allocation

See digital input allocation table

Digital Output

Number of inputs

- 8 points
- 4 points/common

Output signal

- Relay contact output, Form a contact
250V AC 1A, 30V DC 1A (Resistive load)
- Open collector output (Sink type)
Allowable load current : Less than 100mA
Load voltage : Less than 30V
Minimum load : 0.5mA
ON voltage : Less than 2.0V (at maximum load current)
Leakage current at OFF : Less than 0.1mA

Function

Event 1 output (CH1 to CH4), Event 2 output (CH1 to CH4)
Event 3 output (CH1 to CH4), Event 4 output (CH1 to CH4)
HBA output, Burn-out status output, Temperature rise completion output, Manual output

Function allocation

See output allocation table

Communications

Communication method : RS-485
Communication speed : 4800, 9600, 19200, 38400 BPS
Protocol : ANSI X3.28(1976) 2.5 B1
MODBUS

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 • For MODBUS 1 bit

Maximum connection : 16 units

CT (Current transformer) input module (Z-CT)

Input

Number of CT Input : 12 points
CT Input type and range : CTL-6-P-Z 0.0 to 10.0A
CTL-6-P-N 0.0 to 30.0A
CTL-12-S56-10L-N 0.0 to 100.0A
• Selectable
3 sec

Sampling cycle

Accuracy :
CTL-6-P-Z : $\pm 0.3A$
CTL-6-P-N : $\pm 5\%$ of input value or $\pm 2A$ (whichever is larger)
CTL-12-S56-10L-N : $\pm 5\%$ of input value or $\pm 2A$ (whichever is larger)

Event (Alarm)

Alarm type : Heater break alarm (HBA) and Heater over current alarm

- Interlock (latch) function is configurable.
- Alarm delay time : 0 to 255 times

Setting method

- Via communication or push-button switch
- Automatic alarm setting function is available.

CT allocation

Module address setting and channel setting

Communications

Communication method : RS-485
Communication speed : 4800, 9600, 19200, 38400 BPS
Protocol : ANSI X3.28(1976) 2.5 B1
MODBUS

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 • For MODBUS 1 bit

Maximum connection : 16 units

Specifications

Communication Extension module (Z-COM)

Communications

Communication method : RS-485/RS-422A
Communication speed : 4800, 9600, 19200, 38400 BPS
Protocol : a) ANSI X3.28(1976) 2.5 B1 (RKC standard)
 b) MODBUS- RTU
 c) PLC special protocol (Mapman)
 Correspond to PLC
 MITSUBISHI MELSEC series
 AnA/AnU common command (QR/QW)
 (AnA, QnA series, Q series)
 OMRON SYSMAC series
 C mode command (WD/RD/WE/RE)
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 • For MODBUS 1 bit

Communication allocation
 Communication 1 (COM PORT 1 to 2)
 RKC standard or MODBUS protocol
 Communication 2 (COM PORT 3 to 4)
 RKC standard, MODBUS protocol or PLC special protocol (Mapman)

Maximum connection
 RKC standard/MODBUS protocol : 16 units
 PLC special protocol : 4 units

Maximum connection function module
 Same function module : 16 modules/unit
 Total function module : 31 modules/unit

Z-TIO/Z-DIO/Z-CT/Z-COM Common specifications

General Specifications

Supply Voltage
 21.6 to 26.4V DC (Ripple rate 10% p-p or less) [Rating:24VDC]

Power Consumption
 a) Z-TIO : Less than 140mA, Surge current : Less than 10A
 b) Z-DIO : Less than 70mA, Surge current : Less than 10A
 c) Z-CT : Less than 70mA, Surge current : Less than 10A
 d) Z-COM : Less than 30mA, Surge current : Less than 10A

Power Failure Effect
 A power failure of 4m 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 or COLD start (Only Z-TIO)

Memory Backup : Backed up by non-volatile memory (FRAM)
 • Data retaining period : Approx. 10 years
 • Number of writing : Approx. 1,000,000,000,000 times.
 (Depending on storage and operating conditions.)

Operating Environments : -10 to 50°C [14 to 122°F]
 5 to 95% RH.
 Absolute humidity : MAX. W.C 29.3g/m³ dry air at 101.3kPa.

Net Weight
 Z-TIO Terminal type : Approx 130g (2ch type), Approx 160g (4ch type)
 Z-TIO Connector type : Approx 120g (2ch type), Approx 140g (4ch type)
 Z-DIO Terminal type : Approx 150g (DI/DO 8ch type),
 Approx 120g (DI 8ch type),
 Approx 140g (DO 8ch type)
 Z-DIO Connector type : Approx 130g (DI/DO 8ch type),
 Approx 100g (DI 8ch type),
 Approx 120g (DO 8ch type)
 Z-CT Terminal type : Approx 160g
 Z-CT Connector type : Approx 140g
 Z-COM : Approx 110g

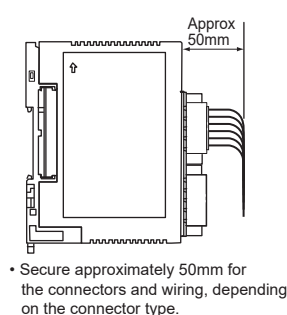
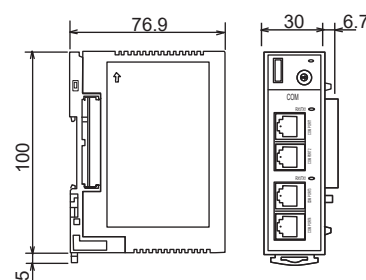
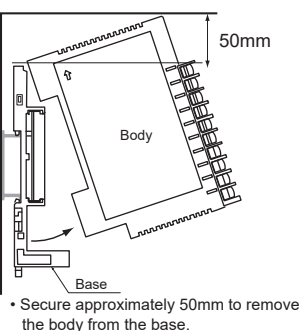
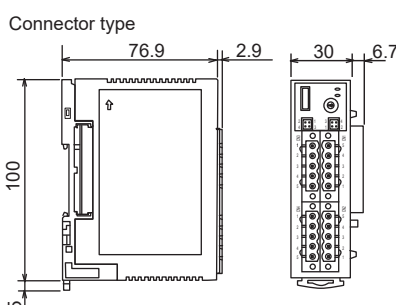
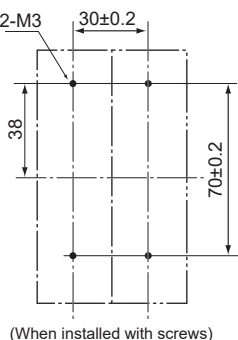
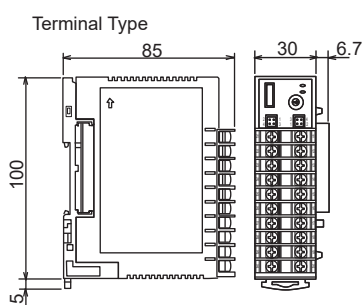
External Dimensions
 See external dimensions

External Dimensions and Rear Terminals

Unit:mm

Temperature Control Module (Z-TIO)
 Digital Input Output Module (Z-DIO)
 CT Input Module (Z-CT)i

Communication Extension Module (Z-COM)



Module type Process/Temperature Controller SRZ



Model and Suffix Code

- 4ch type Temperature Control Module (Z-TIO-A/C) • If used as a heat and cool module or position proportional controller then it is only 2 channels.

Specifications		Model and Suffix Code										Hardware coding only	Quick start code 1	PID control	Heat/Cool PID control	Position proportional PID control without FBR
Model		Z-TIO-A (Standard type) Z-TIO-C (PLC special protocol : MAPMAN)										1-234567-89: / Y				
Wiring method	①	Terminal type Connector type	T	C												
Output 1	②	See Output Code Table												CH1 output	CH1 Heat output	CH1 Open output
Output 2	③	See Output Code Table												CH2 output	CH1 Cool output	CH1 Close output
Output 3	④	See Output Code Table												CH3 output	CH2 Heat output	CH2 Open output
Output 4	⑤	See Output Code Table												CH4 output	CH2 Cool output	CH2 Close output
CT input	⑥	Not supplied CT input : 4 points								N A						
Initial setting	⑦	No quick start code (Default setting) Specify quick start code 1 Specify quick start code 1 and 2 (See page 11)								N 1 2						
Quick start code 1	Control Method	⑧	No quick start code 4CH PID control with AT (Reverse action) 4CH PID control with AT (Direct action) 2CH Heat/Cool PID control with AT 2CH Heat/Cool PID control with AT for extruder (Air cooling type) 2CH Heat/Cool PID control with AT for extruder (Water cooling type) 2CH Position proportional PID control without FBR										No code F D G A W Z			
	Input and range	⑨	No quick start code See Input range Code Table										No code □□□			
Instrument version	⑩	Version symbol												Y		

- 2ch type Temperature Control Module (Z-TIO-B/D) • If used as a heat and cool module or position proportional controller then it is only 1 channel.

Specifications		Model and Suffix Code										Hardware coding only	Quick start code 1	PID control	Heat/Cool PID control	Position proportional PID control without FBR	
Model		Z-TIO-B (Standard type) Z-TIO-D (PLC special protocol : MAPMAN)										1-2	3/4				5
Wiring method	①	Terminal type	T														
		Connector type	C														
Output 1	②	See Output Code Table													CH1 output	CH1 Heat output	
Output 2	③	See Output Code Table													CH2 output	CH1 Cool output	
CT input	④	Not supplied CT input : 2 points														CH1 Open output	
Option	⑤	Not supplied														CH1 Close output	
Initial setting	⑥	No quick start code (Default setting) Specify quick start code 1 Specify quick start code 1 and 2 (See page 11)															
Quick start code 1	Control Method	⑦	No quick start code											No code			
			2CH PID control with AT (Reverse action)											F			
			2CH PID control with AT (Direct action)											D			
			1CH Heat/Cool PID control with AT											G			
			1CH Heat/Cool PID control with AT for extruder (Air cooling type)											A			
			1CH Heat/Cool PID control with AT for extruder (Water cooling type)											W			
Input and range	⑧	No quick start code											No code				
		See Input range Code Table											□□□				
Instrument version	⑨	Version symbol														Y	

Input range code table

Thermocouple

Input	Code	Range	Input	Code	Range
K	K : 35	-200.0 to +400.0°C	J	J : B6	0.0 to 800.0°F
	K : 40	-200.0 to +800.0°C		J : B9	-328 to +2192°F
	K : 09	0.0 to 400.0°C		J : A1	0 to 800°F
	K : 10	0.0 to 800.0°C		J : A2	0 to 1600°F
	K : 42	-200.0 to +1372.0°C	T	T : 19	-200.0 to +400.0°C
	K : 02	0 to 400°C		T : C5	-328 to +752°C
	K : 04	0 to 800°C		T : C6	0.0 to +752.0°F
	K : 41	-200 to +1372°C		T : C6	0.0 to +752.0°F
	K : C7	-328 to +2501°F	S	S : 06	-50 to +1768°C
	K : A4	0.0 to 800.0°F		S : A7	-58 to +3214°F
	K : A1	0 to 800°F	R	R : 07	-50 to +1768°C
	K : A2	0 to 1600°F		R : A7	-58 to +3214°F
J	J : 27	-200.0 to +400.0°C	E	E : 20	-200.0 to +1000.0°C
	J : 32	-200.0 to +800.0°C		E : B2	0.0 to +800.0°F
	J : 08	0.0 to 400.0°C	B	B : B1	-328 to +1832°F
	J : 09	0.0 to 800.0°C		B : B1	32 to 3272°F
	J : 29	-200.0 to +1200.0°C	N	N : 02	0 to 1300°C
	J : 02	0 to 400°C		N : A6	32 to 2372°F
	J : 04	0 to 800°C			
	J : 15	-200 to +1200°C			

RTD

Input	Code	Range
Pt100	D : 35	-200.0 to +850.0°C
	D : 21	-200.0 to +200.0°C
	D : C6	-328.0 to +752.0°F
	D : D2	-328 to +1562°F
JPt100	P : 30	-200.0 to +640.0°C
	P : C6	-328.0 to +752.0°F
	P : D2	-328 to +1184°F

DC Current • voltage

Input	Code	Range	Input	Code	Range
0 to 10mV	1 : 01	0.0 to 100.0%	0 to 10V	5 : 01	0.0 to 100.0%
0 to 100mV	2 : 01		1 to 5V	6 : 01	
0 to 1V	3 : 01		0 to 20mA	7 : 01	
0 to 5V	4 : 01		4 to 20mA	8 : 01	

Output signal code table

M	Relay contact output	V	Voltage pulse output (0/12V DC)	D	Open collector output		
3	0 - 1V DC	4	0 - 5V DC	5	0 - 10V DC	6	1 - 5V DC
						7	0 - 20mA DC
						8	4 - 20mA DC

Model and Suffix Code

Temperature Control Module (Z-TIO) 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					
	①	②	③	④	⑤	⑥
Event 1 type	① See Event Type Code Table	☐	☐	☐	☐	☐
Event 2 type	② See Event Type Code Table	☐	☐	☐	☐	☐
Event 3 type	③ See Event Type Code Table	☐	☐	☐	☐	☐
Event 4 type	④ See Event Type Code Table	☐	☐	☐	☐	☐
CT type	No CT input				N	
	CTL-6-P-N				P	
	CTL-12-S56-10L-N				S	
Communication Protocol	ANSI/RKC standard protocol					1
	MODBUS protocol					2
	PLC special protocol (MAPMAN) (Mitsubishi MELSEC A/Q series)					3
	PLC special protocol (MAPMAN) (Mitsubishi MELSEC FX series)					5

Event Type Code Table

Event Type	Code	Event Type	Code
No event	N	Deviation High with Alarm Re-Hold	Q
Deviation High	A	Deviation Low with Alarm Re-Hold	R
Deviation Low	B	Deviation High/Low with Alarm Re-Hold	T
Deviation High/Low	C	Set value High	V
Band	D	Set value Low	W
Deviation High with Alarm Hold	E	MV value High	1
Deviation Low with Alarm Hold	F	MV value Low	2
Deviation High/Low with Alarm Hold	G	Cool side MV value High	3
Process High	H	Cool side MV value Low	4
Process Low	J	LBA (Loop break alarm)	1 5
Process High with Alarm Hold	K	Temperature rise completion	2 6
Process Low with Alarm Hold	L		

¹ LBA is available with event 4 only.
² Temperature rise completion is available with event 3 only.

● Digital Input/Output Module (Z-DIO-A)

Specifications		Model and Suffix Code		Hardware coding	Quick start code											
				Z-DIO-A								1	2	3/4	5	6
Wiring method		①	Terminal type Connector type	T C												
Number of digital input (DI)		②	Not supplied DI 8 points		N A											
Digital output (DO) signal		③	Not supplied Relay contact output, 8 points Open Collector output, 8 points			N M D										
Quick start code		④	No quick start code (Default setting) Specify quick start code			N 1										
Quick start code	Digital input (DI) allocation	⑤	No quick start code No digital input See DI allocation table			No symbol N ☐										
	Digital output (DO) allocation (DO1 to DO4)	⑥	No quick start code No digital output See DO1 to 4 allocation table			No symbol N ☐										
	Digital output (DO) allocation (DO5 to DO8)	⑦	No quick start code No digital output See DO5 to 8 allocation table			No symbol N ☐										
	Communication protocol	⑧	No quick start code ANSI/RKC standard protocol MODBUS protocol			No symbol										

DO1 to 4 Allocation Table

Code	Digital output			
	DO 1	DO 2	DO 3	DO 4
00	No allocation			
01	DO1 manual output	DO2 manual output	DO3 manual output	DO4 manual output
02	Event 1 (All CH)	Event 2 (All CH)	Event 3 (All CH)	Event 4 (All CH)
03	Event 1 (CH1)	Event 2 (CH1)	Event 3 (CH1)	Event 4 (CH1)
04	Event 1 (CH2)	Event 2 (CH2)	Event 3 (CH2)	Event 4 (CH2)
05	Event 1 (CH3)	Event 2 (CH3)	Event 3 (CH3)	Event 4 (CH3)
06	Event 1 (CH4)	Event 2 (CH4)	Event 3 (CH4)	Event 4 (CH4)
07	Event 1 (CH1)	Event 1 (CH2)	Event 1 (CH3)	Event 1 (CH4)
08	Event 2 (CH1)	Event 2 (CH2)	Event 2 (CH3)	Event 2 (CH4)
09	Event 3 (CH1)	Event 3 (CH2)	Event 3 (CH3)	Event 3 (CH4)
10	Event 4 (CH1)	Event 4 (CH2)	Event 4 (CH3)	Event 4 (CH4)
11	TIO HBA (CH1)	TIO HBA (CH2)	TIO HBA (CH3)	TIO HBA (CH4)
12	Burnout (CH1)	Burnout (CH2)	Burnout (CH3)	Burnout (CH4)
13	Temperature rise	HBA (Comprehensive output)	Burnout (All CH)	DO4 manual output

DO5 to 8 Allocation Table

Code	Digital output			
	DO 5	DO 6	DO 7	DO 8
00	No allocation			
01	DO5 manual output	DO6 manual output	DO7 manual output	DO8 manual output
02	Event 1 (All CH)	Event 2 (All CH)	Event 3 (All CH)	Event 4 (All CH)
03	Event 1 (CH1)	Event 2 (CH1)	Event 3 (CH1)	Event 4 (CH1)
04	Event 1 (CH2)	Event 2 (CH2)	Event 3 (CH2)	Event 4 (CH2)
05	Event 1 (CH3)	Event 2 (CH3)	Event 3 (CH3)	Event 4 (CH3)
06	Event 1 (CH4)	Event 2 (CH4)	Event 3 (CH4)	Event 4 (CH4)
07	Event 1 (CH1)	Event 1 (CH2)	Event 1 (CH3)	Event 1 (CH4)
08	Event 2 (CH1)	Event 2 (CH2)	Event 2 (CH3)	Event 2 (CH4)
09	Event 3 (CH1)	Event 3 (CH2)	Event 3 (CH3)	Event 3 (CH4)
10	Event 4 (CH1)	Event 4 (CH2)	Event 4 (CH3)	Event 4 (CH4)
11	TIO HBA (CH1)	TIO HBA (CH2)	TIO HBA (CH3)	TIO HBA (CH4)
12	Burnout (CH1)	Burnout (CH2)	Burnout (CH3)	Burnout (CH4)
13	Temperature rise	HBA (Comprehensive output)	Burnout (All CH)	DO8 manual output

DI Allocation Table

Code	Digital input							
	DI 1	DI 2	DI 3	DI 4	DI 5	DI 6	DI 7	DI 8
00	No allocation							
01	Memory area selection (1 to 8)			Area set	Operation mode 1	Operation mode 2	Alarm interlock reset	AUTO/MANUAL
02	Memory area selection (1 to 8)			Area set	Operation mode 1	Operation mode 2	Alarm interlock reset	LOCAL/REMOTE
03	Memory area selection (1 to 8)			Area set	Operation mode 1	Operation mode 2	Alarm interlock reset	Feed-forward start
04	Memory area selection (1 to 8)			Area set	Operation mode 1	Operation mode 2	Alarm interlock reset	Soak stop
05	Memory area selection (1 to 8)			Area set	Operation mode 1	Operation mode 2	Alarm interlock reset	STOP/RUN
06	Memory area selection (1 to 8)			Area set	Operation mode 1	Operation mode 2	AUTO/MANUAL	LOCAL/REMOTE
07	Memory area selection (1 to 8)			Area set	Operation mode 1	Operation mode 2	AUTO/MANUAL	Feed-forward start
08	Memory area selection (1 to 8)			Area set	Operation mode 1	Operation mode 2	AUTO/MANUAL	Soak stop
09	Memory area selection (1 to 8)			Area set	Operation mode 1	Operation mode 2	AUTO/MANUAL	STOP/RUN
10	Memory area selection (1 to 8)			Area set	Operation mode 1	Operation mode 2	LOCAL/REMOTE	Feed-forward start
11	Memory area selection (1 to 8)			Area set	Operation mode 1	Operation mode 2	LOCAL/REMOTE	Soak stop
12	Memory area selection (1 to 8)			Area set	Operation mode 1	Operation mode 2	LOCAL/REMOTE	STOP/RUN
13	Memory area selection (1 to 8)			Area set	Operation mode 1	Operation mode 2	EDS start	Soak stop
14	Memory area selection (1 to 8)			Area set	Operation mode 1	Operation mode 2	EDS start	STOP/RUN
15	Memory area selection (1 to 8)			Area set	Operation mode 1	Operation mode 2	Soak stop	STOP/RUN
16	Memory area selection (1 to 8)			Area set	Alarm interlock reset	AUTO/MANUAL	LOCAL/REMOTE	Feed-forward start
17	Memory area selection (1 to 8)			Area set	Alarm interlock reset	AUTO/MANUAL	LOCAL/REMOTE	Soak stop
18	Memory area selection (1 to 8)			Area set	Alarm interlock reset	AUTO/MANUAL	LOCAL/REMOTE	STOP/RUN
19	Memory area selection (1 to 8)			Area set	Alarm interlock reset	AUTO/MANUAL	EDS start	Soak stop
20	Memory area selection (1 to 8)			Area set	Alarm interlock reset	AUTO/MANUAL	EDS start	STOP/RUN
21	Memory area selection (1 to 8)			Area set	Alarm interlock reset	AUTO/MANUAL	Soak stop	STOP/RUN
22	Memory area selection (1 to 8)			Area set	AUTO/MANUAL	LOCAL/REMOTE	EDS start	Soak stop
23	Memory area selection (1 to 8)			Area set	AUTO/MANUAL	LOCAL/REMOTE	EDS start	STOP/RUN
24	Memory area selection (1 to 8)			Area set	AUTO/MANUAL	LOCAL/REMOTE	Soak stop	STOP/RUN
25	Memory area selection (1 to 8)			Area set	LOCAL/REMOTE	Feed-forward start	Soak stop	STOP/RUN
26	Memory area selection (2 points)	Area set	Alarm interlock reset	STOP/RUN	AUTO/MANUAL	LOCAL/REMOTE	Operation mode 1	Operation mode 2
27	Memory area selection (1 to 8)			Area set	Operation mode 1	Operation mode 2	EDS start 1	EDS start 2
28	Memory area selection (2 points)	Area set	Alarm interlock reset	Area set	AUTO/MANUAL	LOCAL/REMOTE	EDS start 1	EDS start 2
29	EDS start 1	EDS start 2	Alarm interlock reset	Area set	AUTO/MANUAL	LOCAL/REMOTE	Operation mode 1	Operation mode 2

- Area setting is set to disabled at the factory.
- EDS function : External disturbance suppression function

Operation mode 1 : Only monitoring. (Control stop, Event function OFF)
 Operation mode 2 : Monitoring and Event function (Control stop)

Module type Temperature/Process Controller SRZ

Model and Suffix Code

● CT (Current transformer) Input Module (Z-CT)

Specifications	Model and Suffix Code	Hardware coding only	Quick start code
Model	Z-CT-A	① / ②-③ ④	
Wiring method	① Terminal type Connector type	T C	
Quick start code	② No quick start code (Default setting) Specify quick start code	N 1	
Quick start code	CT type	③ No quick start code CTL-6-P-N (0 to 30A) CTL-12-S56-10L-N (0 to 100A) CTL-6-P-Z (0 to 10A)	No code P S Z
	Communication protocol	④ No quick start code ANSI/RKC standard protocol MODBUS protocol	No code 1 2

● Communication Module (Z-COM-A)

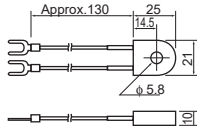
Specifications	Model and Suffix Code	Hardware coding only	Quick start code
Model	Z-COM-A	① ②/③ ④ ⑤ ⑥	
COM PORT 1,2 communication	① RS-422A RS-485	4 5	
COM PORT 3,4 communication	② RS-422A RS-485	4 5	
Quick start code	③ No quick start code (Default setting) Specify quick start code	N 1	
Quick start code	COM PORT 1,2 communication protocol	④ No quick start code ANSI/RKC standard protocol MODBUS protocol	No code 1 2
	COM PORT 3,4 communication protocol	⑤ No quick start code ANSI/RKC standard protocol MODBUS protocol PLC special protocol (Mitsubishi MELSEC A/Q series) PLC special protocol (OMRON SYMAC series) PLC special protocol (Mitsubishi MELSEC FX series)	No code 1 2 3 4 5
	Maximum channel data (For PLC special communication)	⑥ No quick start code 16-channels specification 32-channels specification 48-channels specification 64-channels specification	No code A B C D

● Accessories

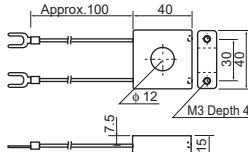
Current transformer for heater break alarm (HBA)

* Separately
(Unit : mm)

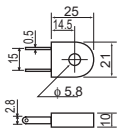
Model : CTL-6-P-N (0 to 30A)



Model : CTL-12-S56-10L-N (0 to 100A)



Model : CTL-6-P-Z (0 to 10A)
[Available for Z-CT module only]



1 (U.R.D.Co.,LTD product)

Plug-in connector (For connector type module)

* Separately



Model : SRZP-03
(2 piece)

(Push-in spring connection type)
Equivalent part :
FKC 2.5/ 5-STF-5,08 AU
PHOENIX CONTACT



Model : SRZP-02
(2 piece)

(Side screw type)
Equivalent part :
MSTB 2.5/5-STF-5,08AU
PHOENIX CONTACT



Model : SRZP-01
(2 piece)

(Front screw type)
Equivalent part :
FRONT-MSTB 2.5/5-STF-5,08AU
PHOENIX CONTACT

Front terminal cover

* Separately

Model :
KSRZ-510A



Termination resistor connector

* Separately

Model : W-BW-01
(For RS-485)

Model : W-BW-02
(For RS-422A)



Standard accessory

Power supply terminal cover

Model : KSRZ-518A

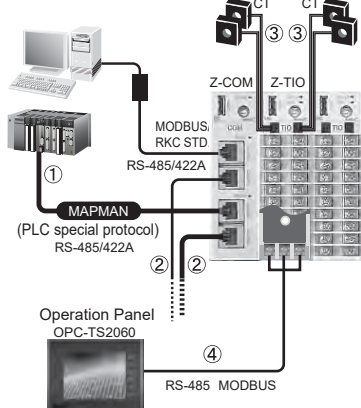


Connector cover

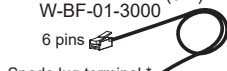
Model : KSRZ-517A



Communication cables

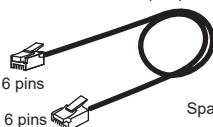


① Model : W-BF-01-3000 (3m)



* Other types of cables such as cable with 9-pin D-SUB connector are also available. Please contact RKC.

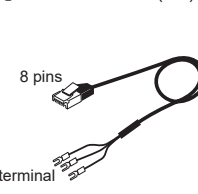
② Model :
W-BF-02-500 (0.5m)
W-BF-02-1000 (1m)
W-BF-02-3000 (3m)



③ Model :
W-BW-03-1000 (1m)
W-BW-03-2000 (2m)
W-BW-03-3000 (3m)



④ Model : V6-MLT (3m)



End plates

* Separately

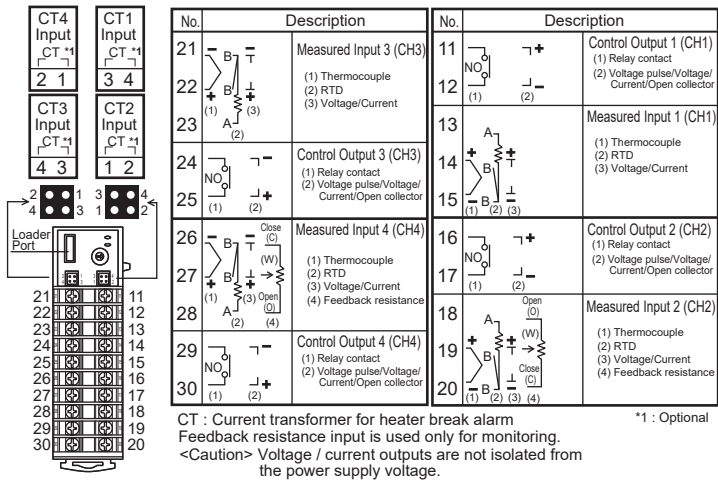
Model : DEP-01
(2 piece)

To firmly fix the modules, use end plates on both sides of the mounted modules on the DIN rail.

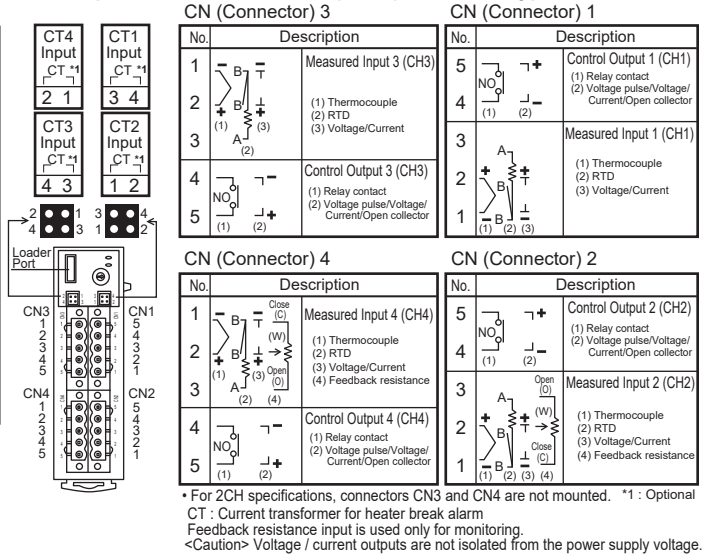


Terminal/ Connector Configuration

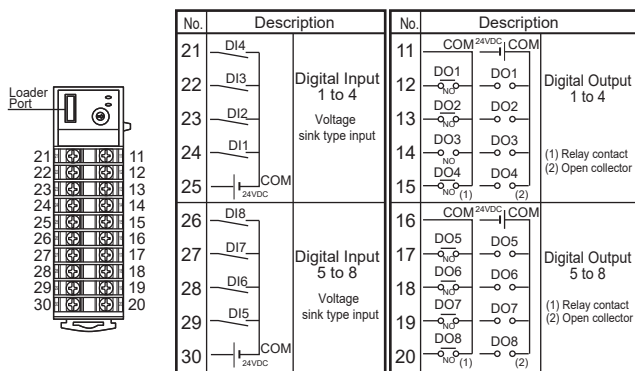
● Temperature Control Module (Z-TIO) Terminal type



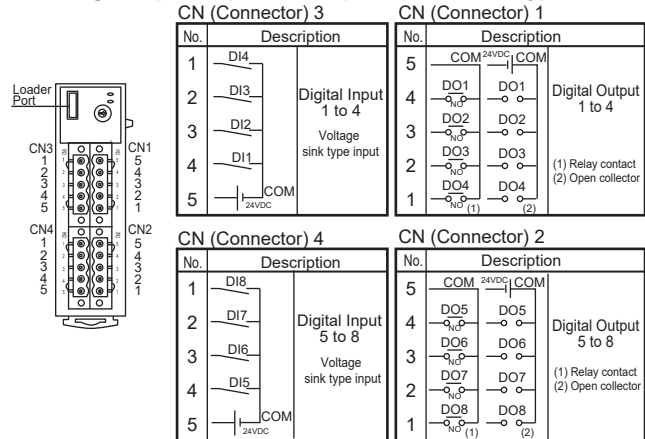
● Temperature Control Module (Z-TIO) Connector type



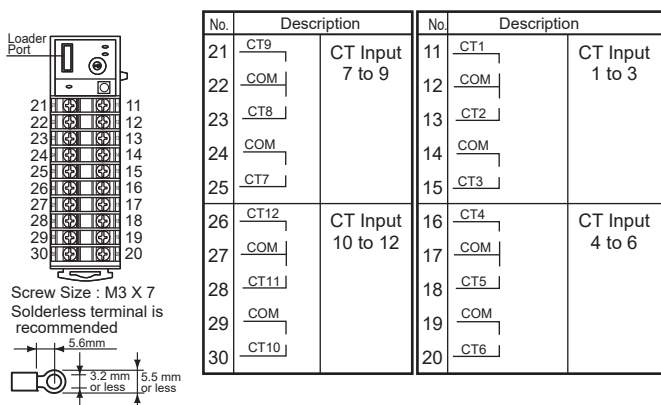
● Digital Input/Output Module (Z-DIO) Terminal type



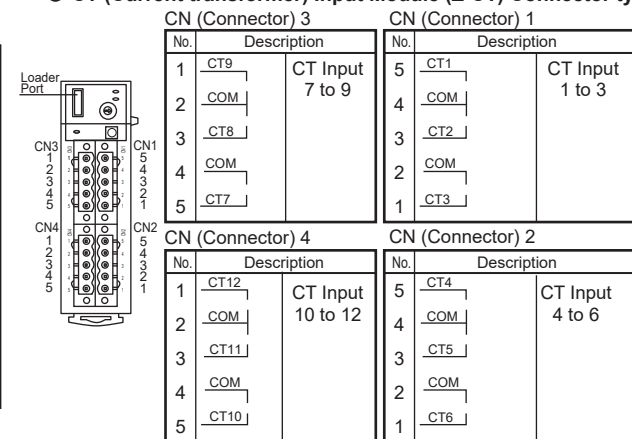
● Digital Input/Output Module (Z-DIO) Connector type



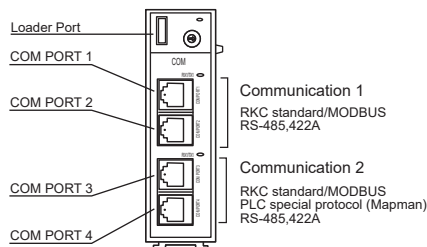
● CT (Current transformer) Input Module (Z-CT) Terminal type



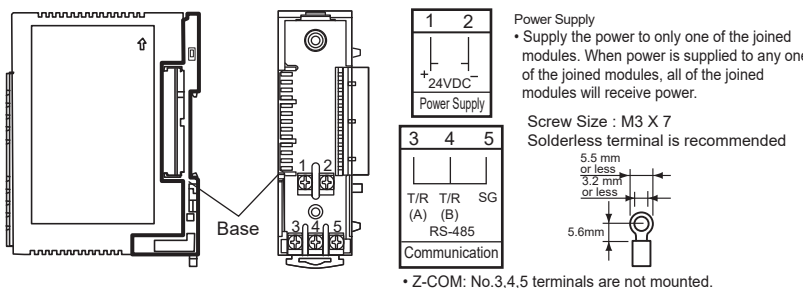
● CT (Current transformer) Input Module (Z-CT) Connector type



● Communication Extension Module (Z-COM)



● Z-TIO/DIO/CT/COM



Communication Converter Model Code

The SRZ can be connected to various Open Networks via a gateway.

Ethernet communication converter
(Ethernet/IP, MODBUS/TCP, EtherCAT)



COM-ME

Z-TIO,Z-DIO

DeviceNet
communication
converter



COM-JH

Ethernet (Modbus/TCP)
communication
converter



COM-JL

CC-Link
communication
converter



COM-JC

RS-485

MODBUS



SRX



General Description

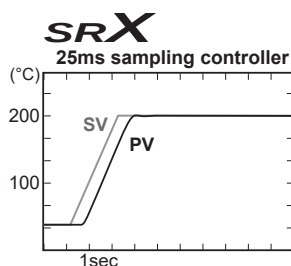
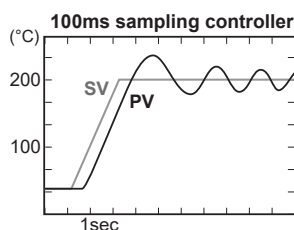
The SRX is a module type digital controller with a super high speed sampling of control updating cycle time of 25ms (0.025 sec). Dual loop control can be performed with a single compact module. A maximum of 31 modules can be connected for 62-loop control. Communication and power supply for extension modules are snapped together via mating connectors. Distributed installation via RS-485 is possible to allow formation of a multi-zone distributed control system in a compact size.

Features

- ☆ High-speed feedback control
- ☆ Multi-zone space-saving
- ☆ 256 Ramp/Soak program function

High-speed Feedback Control

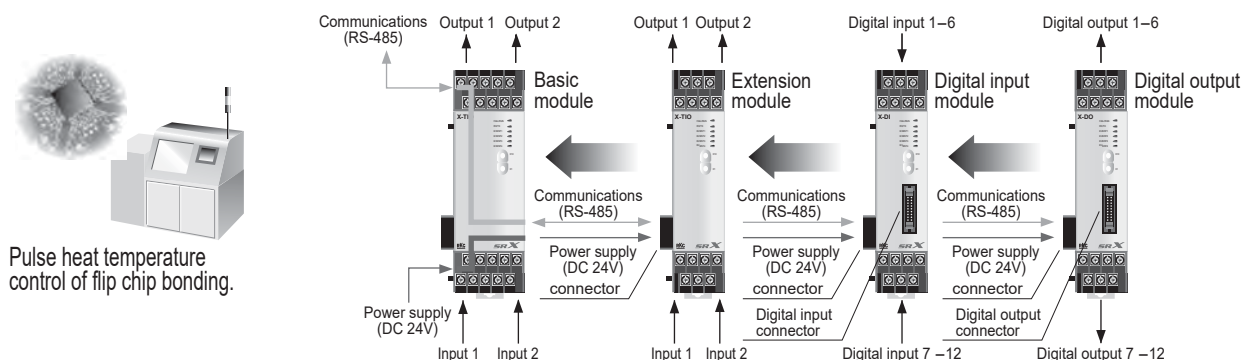
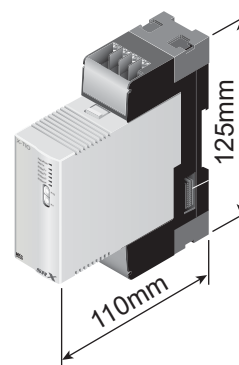
The SRX sampling of the control updating cycle time is a rapid 25ms (0.025sec.) Supplied with high resolution input and parameters settable in 1/100 sec. for process applications with fast response. Applications in RTP (Rapid Thermal Process), RTA (Rapid Thermal Anneal) and pulse heat temperature control of flip chip bonders in semiconductor manufacturing can be controlled by the SRX. The high speed sampling function also makes it suitable for additional application requirements such as pressure and flow rate.



Multi-Zone Space-Saving

Dual loop control can be performed with a single compact module. Side connectivity for power supply and communications eliminates the need for wiring and offers close mounting. Distributed installation via RS-485 is possible to form a multi-zone distributed control system in a compact size.

The digital input module is used to accomplish operation mode changes. Digital output module outputs operating state or various event conditions.



Pulse heat temperature control of flip chip bonding.

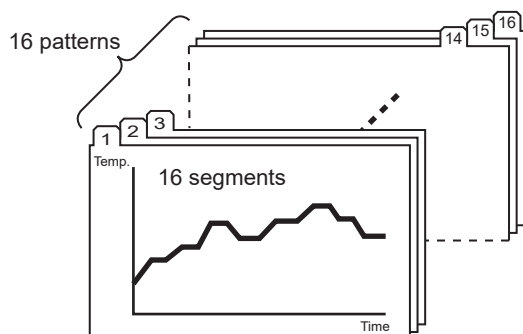
Extension modules can be added to a basic module.



Features

Ramp/Soak Program Function

Ramp/Soak program control of 16 segments by 16 patterns is supplied as standard. Control can be selected from a standard fixed-setpoint control or ramp/soak program control.



Digital Input Module

The DI-A module has 12 input points on the terminal block. The DI-B module has 16 additional inputs on the front face connector as well as 12 inputs on the terminal block.

The DI module is used to facilitate operation mode changes (temperature control module, program pattern selection, start/stop of autotuning)

< Operation modes change >

RESET
RUN
FIX
MANUAL
HOLD
STEP

< Program pattern selection >

< Start / Stop of autotuning >



DI-A



DI-B

Digital Output Module

The DO-A module has 12 outputs from the terminal block. The DO-B module has 16 additional outputs from the front face connector as well as 12 outputs from the terminal block.

< Function of DO module >

Burn-out state
Event 1 output state
Event 2 output state
Heater break alarm state
Loop break alarm state
Program end state
Pattern end state
Program wait state
Time signal 1 to 16 output state
DI module CH1 to 28 input state



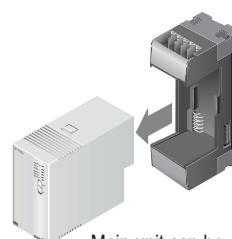
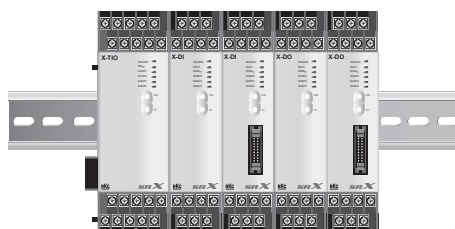
DO-A



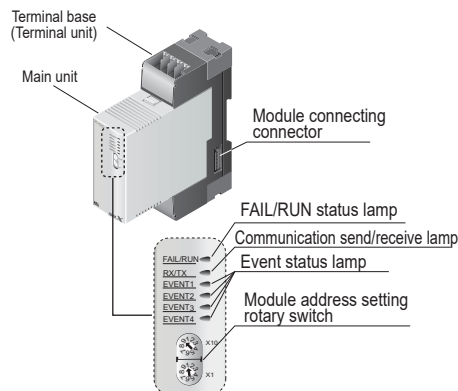
DO-B

Easy DIN Rail Mounting

The SRX controller utilizes DIN rail mounting for flexible installation. Control systems can be customized and expanded to meet specific application requirements simply by attaching additional modules on the rail.



Main unit can be easily removed from a terminal base unit.



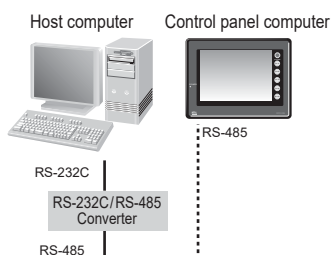
Compliance with Standards

- CE Mark
- UL/cUL Recognized
- RCM Mark



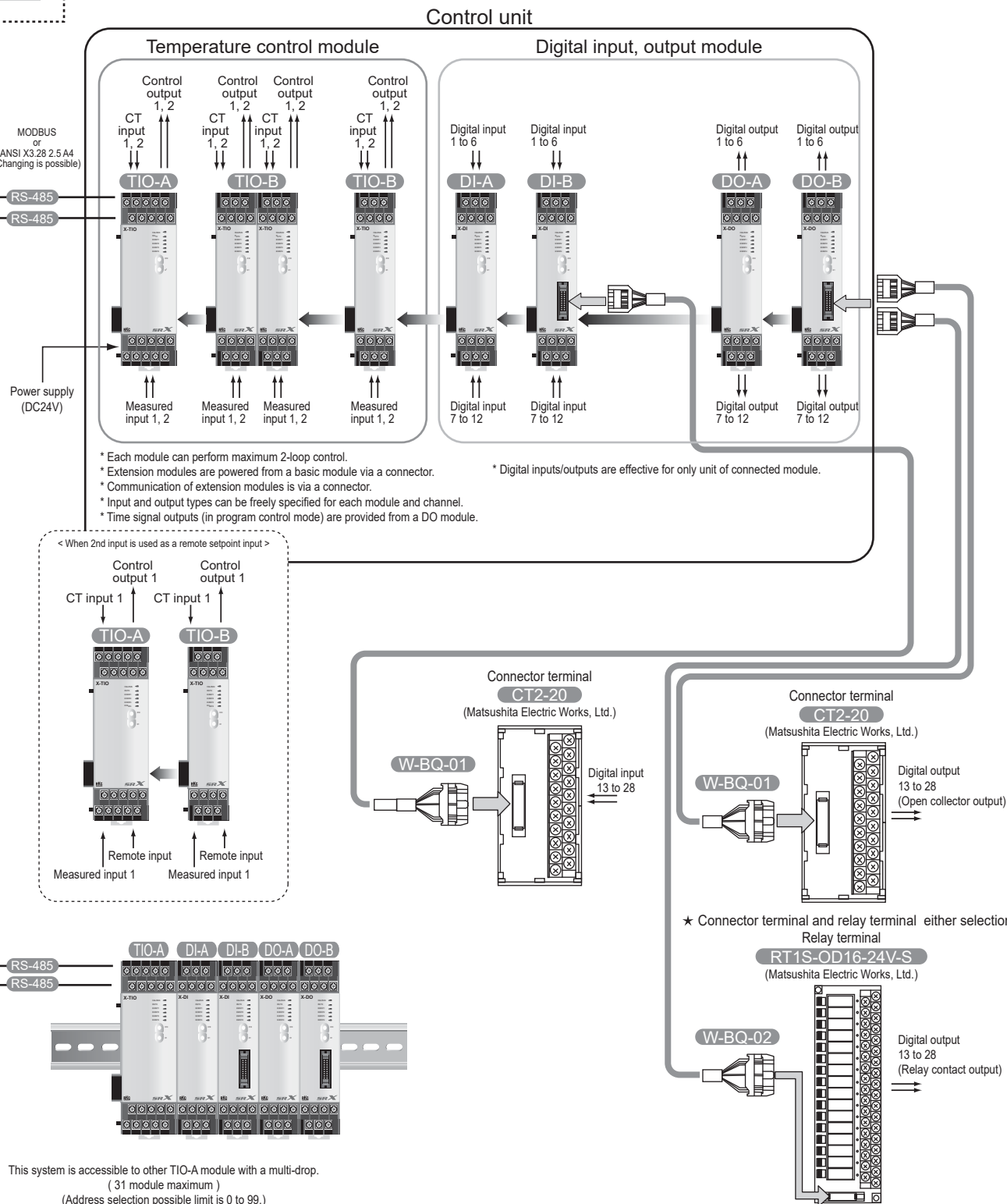


System Configuration



★ Serial port (RS-485 or RS-232C) is required.

★ When using with Windows 95/98/NT/2000/XP,
An RS232C/RS-485 converter with automatic send/receive switching function is required.
Recommended products : CD485, CD485V (Data Link Co. Ltd)
Alternative products (485 OI 9TB, etc) may be available from B and B-Electronics through
<http://www.bb-elec.com>





Specifications

Temperature control module (TIO-A/B)

Input

Number of Inputs

- 2 points
- 2nd input can be used as a remote input.

Input

- Thermocouple, DC low voltage group
Thermocouple : K, J, E, T, R, S, B, N (JIS/IEC)
PLII (NBS), W5Re/W26Re(ASTM)
• Input impedance : Approx. 1M Ω
• Influence of external resistance : Approx. 0.25 μ V/ Ω
• Input break action : Up-scale
DC low voltage : 0 to 1V DC, 0 to 100mV DC, 0 to 10mV DC
• Input break action : Up-scale (0 to 100mV, 0 to 10mV)
Value around 0V (0 to 1V)
- RTD group
Pt100 (JIS/IEC), JPt100 (JIS)
• Influence of lead resistance : Approx. 0.01[%/ Ω] of reading
• Maximum 10 Ω per wire
• Input break action : Up-scale
• Input short action : Down-scale
- DC high voltage, DC current group
DC high voltage : 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
• Input break action : Value around 0V
DC current : 0 to 20mA DC, 4 to 20mA DC
• Input break action : Value around 0V

Sampling Time

0.025 sec.

PV Bias

- span to +span (Within -1999 to 9999)

Digital Filter

0.01 to 10.00 sec. (OFF when 0 is set.)

Performance

Measuring Accuracy

- Thermocouple
Type : K, J, T, E, PLII
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 + 1 digit
Type : N, S, R, W5Re/W26Re
-50 to 1000°C (-58 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 + 1 digit
Type : B
Less than 400°C (752°F) : $\pm 0.70^\circ\text{C}$ ($\pm 126^\circ\text{F}$)
400 to 1000°C (752 to 1832°F) : 1.0°C (1.8°F)
More than 1000°C (1832°F) : $\pm 0.1\%$ of Reading + 1 digit
Cold junction temperature compensation error
 $\pm 1.0^\circ\text{C}$ (1.8°F) [at $23^\circ\text{C} \pm 2^\circ\text{C}$ ($73.4^\circ\text{F} \pm 3.6^\circ\text{F}$)]
Within $\pm 1.5^\circ\text{C}$ ($\pm 2.7^\circ\text{F}$) [Between 0 and 50°C (14 to 122°F)]
- 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 + 1 digit
- DC voltage and DC current
 $\pm 0.1\%$ of span + 1 digit

Insulation Resistance

More than 20M Ω (500V DC) between each isolation block

Dielectric Strength

More than 600V AC for one minute between each isolation block

Control

Control Method

- Brilliant PID control (with autotuning)
- Direct action/Reverse action (selectable)

Major Setting Range

- Set value : Same as input range.
- Proportional band : 0 to span or 0.1 to span (Temperature)
0.0 to 1000.0% of input span (Voltage, Current)
(ON/OFF action when P=0)
- Integral time : 0.01 to 360.00 sec. or 0.1 to 3600.0 sec.
- Derivative time : 0.00 to 360.00 sec. or 0.0 to 3600.0 sec.
- Control response : Slow, Medium, Fast
- Output limiter : -5.0 to +105.0% (High/Low individual setting)
- Output change rate limiter : 0.0 to 100.0% / sec.
- Proportional cycle time : 0.2 to 50.0 sec.
- Level PID : 8 sets of PID parameters can be assigned to set values at different points.

Control Output

- Relay output : Form A contact, 250V AC 3A (resistive load)
- Voltage pulse output : 0/12V DC
(Load resistance : More than 600 Ω)
- Current output : 0 to 20mA, 4 to 20mA DC
(Load resistance : Less than 600 Ω)
- Continuous voltage output : 0 to 5V, 0 to 10V, 1 to 5V DC
(Load resistance : More than 1k Ω)

Alarms

Event (Alarm) Output

- Number of alarm : Up to 2 points/channel
- Type : Deviation High, Low, High/Low, Band,
Process High, Low
• Hold action is available except for Band Alarm.
- Setting range : Deviation alarm : -span to +span
Deviation High/Low, Band : 0 to span
Process alarm : Same as input range
- Differential gap : 0 to 10°C ($^\circ\text{F}$) or 0.0 to 10.0°C ($^\circ\text{F}$)
(Temperature input)
0 to 100 digits (Voltage, Current input)
- Output : Communication data output

Loop break alarm (LBA)

- Number of alarm : 2 points (1 point/channel)
- LBA time setting : 0 to 7200 sec. (LBA is OFF when 0 is set)
- LBA deadband : 0 to input span
- Output : Communication data output

Heater Break Alarm (HBA) : (Optional)

- Number of alarm : 2 points
- CT type : CTL-6-P-N (30A), CTL-12-S56-10L-N (100A)
(Specify when ordering)
- Display range : 0.0 to 100.0A
- Accuracy : $\pm 5\%$ of input value or $\pm 2\text{A}$ (whichever is larger)
- Output : Communication data output

Program

Storage Program Pattern : Max. 16 patterns (16 segments per pattern)

Storage Segments : Max. 256 segments (16 patterns x 16 segments)

Program Setting : Level setting (Setting per channel)
Segment time (Setting per channel)

Setting Range : Level : Same as input range
Segment time : 0.00 to 300.00 sec. / 0.0 to 3000.0 sec. / 0 to 30000 sec. / 0 to 30000 min (selectable)

Program Repeat : 1 to 1000 times
(Continuous when 1000 times is set)

Time Accuracy : $\pm 0.01\%$ of reading + 1digit

Start Mode : Zero start, Fixed time type PV start, Time shorting/Constant slope type PV start (selectable)

Functions : HOLD, STEP, WAIT

Control Mode : Reset, Program, Fixed, Manual

Time Signal : 16 points per 1 pattern
• Contact outputs of time signals are provided from a DO module. (available soon)

Digital input module (DI-A/B)

Digital Input

Number of Inputs

DI-A module :	12 points (6 points/common) Terminal block
DI-B module :	12 points (6 points/common) Terminal block
	16 points (4 points/common) Connector

Input Rating

Non-voltage contact input (OPEN : 500kΩ or more, CLOSE : 10Ω or less)	
Contact current :	Less than 10mA
Open voltage :	Approx. 24V DC

Input Type

The function of each channel is programmable.

- Program control mode
RESET, RUN, FIX, MAN, HOLD, STEP
- Program start pattern selection
- Auto-tuning START / STOP

Isolation type

Photo-coupler isolation

Setting method

Setting by digital communication.

Digital output module (DO-A/B)

Digital Output

Number of Outputs

DO-A module :	12 points (6 points/common) Terminal block
DO-B module :	12 points (6 points/common) Terminal block
	16 points (4 points/common) Connector

Output Rating

Transistor output (sink type)	
Rated load :	24V DC
Maximum load current :	50mA (1 point)
ON voltage :	Maximum 2V DC

Output Type

The function of each channel is programmable.

Burn-out state, Event 1 state, Event 2 state, Heater break out state, Loop break out (LBA) state, Pattern end state, Wait state, Time signal CH1 to 16 output state, DI module CH1 to 28 input state

Isolation type

Photo-coupler isolation

Setting method

Setting by digital communication.

Common specification

Communications

- Communication method : Based on RS-485 (2-wire)
- Communication speed : 2400, 9600, 19200, 38400 BPS
- Protocol :
ANSI X3.28(1976) 2.5 A4
MODBUS
- Bit format
Start bit : 1
Data bit : 7 or 8 •For MODBUS 8 bit only
Parity bit : Without, Odd or Even
Stop bit : 1
- Communication code : ASCII(JIS) 7-bit code
- Maximum connection : 31 (Address can be set from 0 to 99.)

External Dimensions

See external dimensions.

Operating Environment

Free from corrosive or flammable gas, and dust.

Other Conditions

Free from external noise, vibration, shock and exposure to direct sunlight.

Compliance with Standards

- CE Mark
- UL/cUL Recognized
- RCM Mark



General Specifications

Supply Voltage

21.6 to 26.4V DC (Ripple rate 10% p-p or less) [Rating : 24V DC]

Power Consumption

TIO-A module :	Less than 120mA
TIO-B module :	Less than 120mA
DI-A module :	Less than 115mA
DI-B module :	Less than 160mA
DO-A module :	Less than 70mA
DO-B module :	Less than 90mA

Power Failure Effect

A power failure of 20 msec or less will not affect the control action.
If power failure of more than 20 msec occurs, controller will restart.
HOT or COLD start is selectable. (Only TIO module)

Operating Environments : -10 to 50°C [14 to 122°F]
5 to 95% RH (Non-condensing)
Absolute humidity : 29g/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. 10,000,000,000 times (TIO module)
Approx. 1,000,000 times (DI/DO module)

- Depending on storage and operating conditions.

Net Weight

TIO-A module :	Approx. 220g
TIO-B module :	Approx. 190g
DI-A module :	Approx. 152g
DI-B module :	Approx. 158g
DO-A module :	Approx. 152g
DO-B module :	Approx. 158g

Module type High-speed Digital Controller SRX

Model and Suffix Code

Temperature Control Module

Specifications	Model and Suffix Code									
Model	X-TIO	—	□	—	□	—	□	□	*	□
Type ¹	Basic module	A								
	Extension module	B								
Measured input 1 (CH1)	See Range and Input Code Table									
Measured input 2 (CH2) ²	See Range and Input Code Table									
Control output 1 (CH1)	Relay output Voltage pulses DC voltage : 0 to 5V DC voltage : 0 to 10V DC voltage : 1 to 5V DC current : 0 to 20mA DC current : 4 to 20mA							M V 4 5 6 7 8		
Control output 2 (CH2)	Relay output Voltage pulses DC voltage : 0 to 5V DC voltage : 0 to 10V DC voltage : 1 to 5V DC current : 0 to 20mA DC current : 4 to 20mA							M V 4 5 6 7 8		
Current Transformer ³ Input 1 (CH1)	Not supplied CTL-6-P-N CTL-12-S56-10L-N								N P S	
Current Transformer ³ Input 2 (CH2)	Not supplied CTL-6-P-N CTL-12-S56-10L-N									N P S

¹ Extension module cannot be used alone.

² The second PV input can be also used as a remote setpoint input (voltage / current input only).

³ When a heater break alarm (HBA) is used, please specify relay output or voltage pulse output for the relevant channel output.

Range and Input Table

Thermocouple and Low voltage group (Field-programmable)

Input	Code	Range	Resolution
K	K	-200 — 1372°C	1°C, 0.1°C, 1°F, 0.1°F (Selectable)
		-328 — 2501°F	
J	J	-200 — 1200°C	
		-328 — 2192°F	
T	T	-200 — 400°C	
		-328 — 752°F	
E	E	-200 — 1000°C	
		-328 — 1832°F	
PLII	A	0 — 1390°C	
		32 — 2534°F	
N	N	0 — 1300°C	
		32 — 2372°F	
S	S	-50 — 1768°C	
		-58 — 3000°F	
R	R	-50 — 1768°C	
		-58 — 3000°F	
W5Re/W26Re	W	0 — 2300°C	
		32 — 3000°F	
B	B	0 — 1800°C	
		32 — 3000°F	
0 — 10mV DC	1	-20000 — 20000	1, 0.1, 0.01, 0.001, 0.0001 (Programmable)
0 — 100mV DC	2	(Programmable	
0 — 1V DC	3	within 20,000 span)	

RTD group (Field-programmable)

Input	Code	Range	Resolution
Pt100	D	-200 — 850°C -328 — 1562°F	1°C, 0.1°C, 1°F, 0.1°F (Selectable)
JPt100	P	-200 — 600°C -328 — 1112°F	

High voltage and Current group (Field-programmable)

0 — 5V DC	4	-20000 — 20000 (Programmable within 20,000 span)	1, 0.1, 0.01, 0.001, 0.0001 (Programmable)
0 — 10V DC	5		
1 — 5V DC	6		
0 — 20mADC	7		
4 — 20mADC	8		

Digital Input Module

Specifications	Model and Suffix Code	
Model	X-DI	— □
Type	12 points input (Terminal)	A
	28 points input (Terminal and Connector)	B

X-DI-B ↔ Connector Terminal Cable

Type	Model and Suffix Code
Cable for connector terminal connection (Length:3m)	W-BQ-01-3000
Cable for connector terminal connection (Length:2m)	W-BQ-01-2000
Cable for connector terminal connection (Length:1m)	W-BQ-01-1000

Digital Output Module

Specifications	Model and Suffix Code	
Model	X-DO	— □
Type	12 points input (Terminal)	A
	28 points input (Terminal and Connector)	B

X-DO-B ↔ Connector Terminal Cable (Length : 3m)

Type	Model and Suffix Code
Cable for connector terminal connection (Length:3m)	W-BQ-01-3000
Cable for connector terminal connection (Length:2m)	W-BQ-01-2000
Cable for connector terminal connection (Length:1m)	W-BQ-01-1000
Cable for relay terminal connection (Length:3m)	W-BQ-02-3000
Cable for relay terminal connection (Length:2m)	W-BQ-02-2000
Cable for relay terminal connection (Length:1m)	W-BQ-02-1000

Connector Terminal

Model and Suffix Code
RS7DS-20V2
(Yoshida Electric Industry CO.,LTD.)

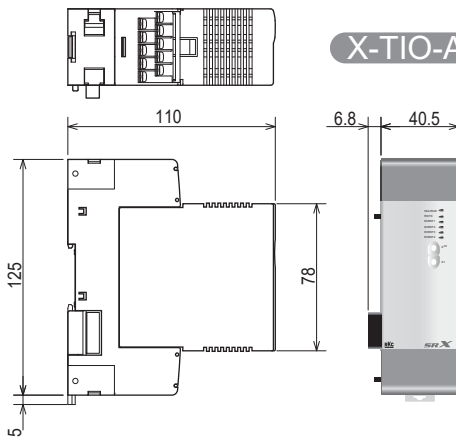
Relay Terminal

Type	Model and Suffix Code
Y-shaped solderless terminal type	PCRY-1H20-16-FD
Round shaped/Y-shaped solderless terminal type	PCRYR-1H20-16-FD

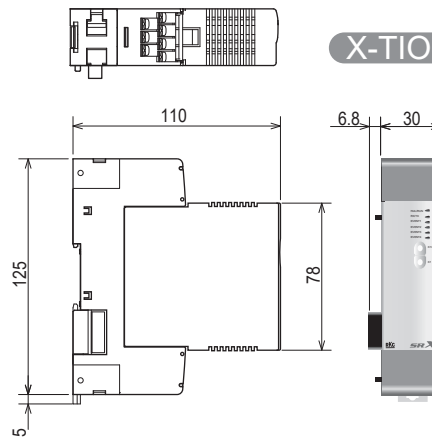
(TOYOGIKEN CO.,LTD.)

External Dimensions and Terminals

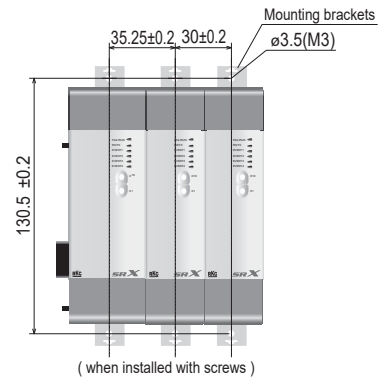
Basic Control Module



Extension Control Module



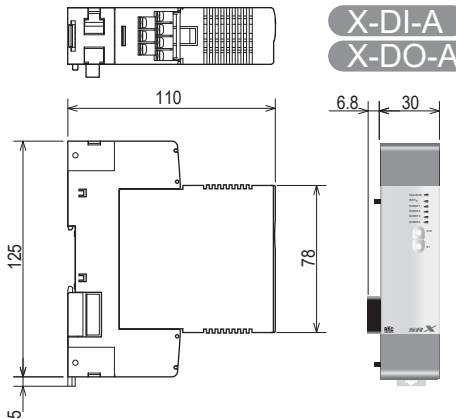
Unit : mm



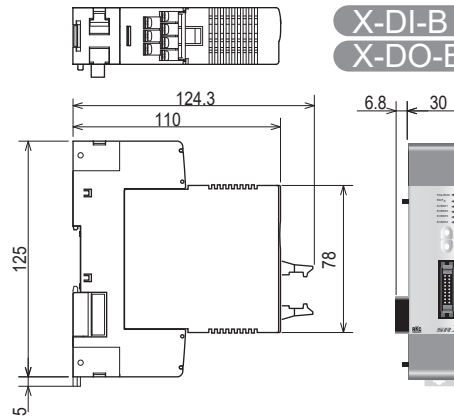
* Mounting brackets

Each module is supplied with one mounting brackets as a joint. Additional mounting brackets must be ordered separately.

Digital Input/Output Module

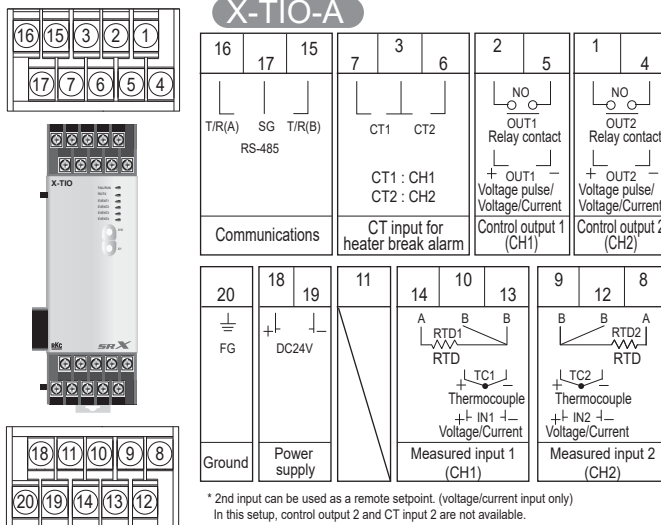


Digital Input/Output Module



Basic Control Module

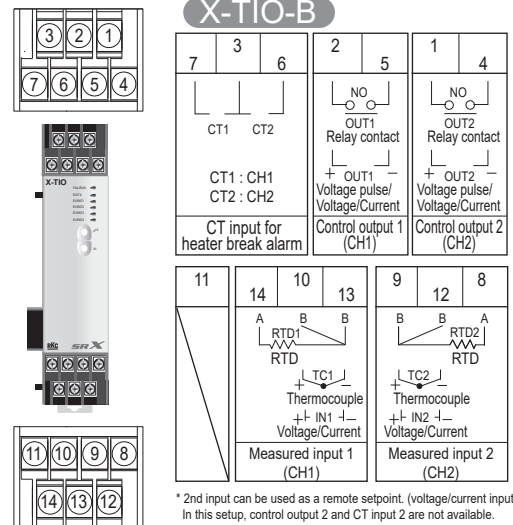
X-TIO-A



* 2nd input can be used as a remote setpoint. (voltage/current input only)
In this setup, control output 2 and CT input 2 are not available.

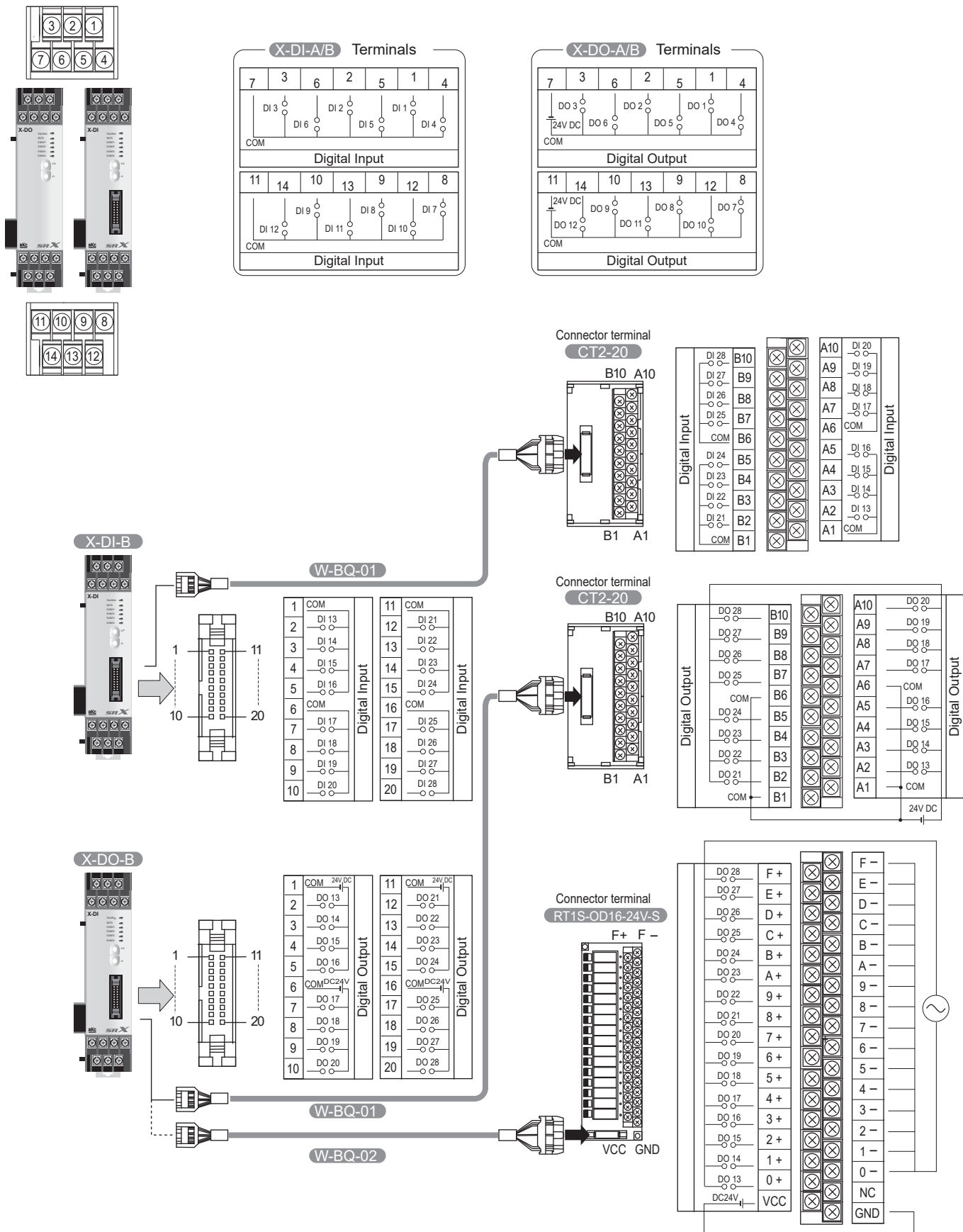
Extension Control Module

X-TIO-B



* 2nd input can be used as a remote setpoint. (voltage/current input only)
In this setup, control output 2 and CT input 2 are not available.

Module type High-speed Digital Controller SRX



FAREX SR Mini HG System



General Description

The SR Mini HG System is an advanced high performance multi-zone PID temperature control system. This space-saving system is designed to be mounted inside an instrument panel and replace multiple temperature controllers. Not only does the SR Mini HG simplify panel configuration with its compact size and provide smooth connectivity with PLCs, computers and process controls, it is dedicated to integrating temperature control into the process.

The single SR Mini unit consists of a power supply/CPU module and up to ten I/O modules per DIN rail. With two control zones per module, twenty zones per unit, up to sixteen units can be connected so that the system can expand up to a maximum of 320 control zones. The SR Mini HG SYSTEM offers over 25 different types of control modules with which to configure your system. Modules such as temperature, Heat/Cool, voltage/current input, cascade, valve motor, analog and digital inputs and outputs and conveyor belt speed.

Features

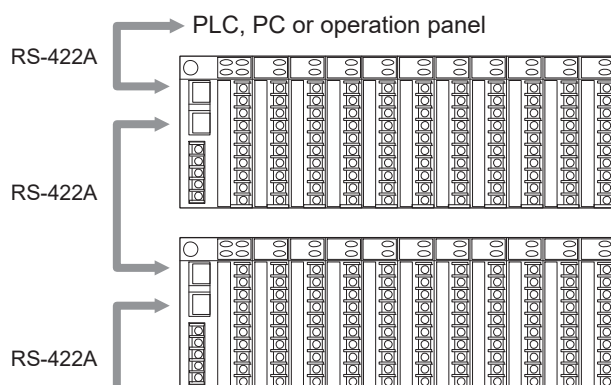
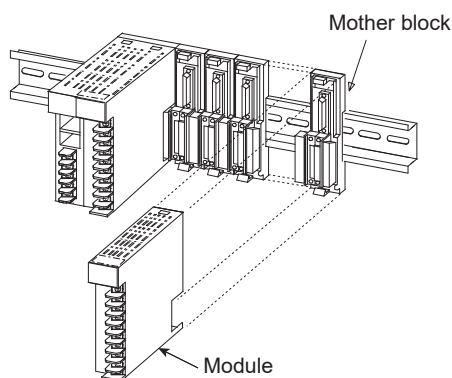
- ☆ Integrates process control with PLCs
- ☆ Control/monitor from one location
- ☆ Maximum of 320 control loops
- ☆ DIN rail mounting
- ☆ MODBUS/ ANSI protocols
- ☆ CC-link or direct communication
- ☆ PLC direct communication (MAPMAN)

Expandability

A single SR Mini unit consists of a power supply/CPU module and up to ten I/O modules per DIN rail. With two control zones per module, (Heat/Cool zones use a double wide module), twenty zones per unit, up to sixteen units can be combined so that the system can be expanded up to a maximum of 320 control zones. This system can be connected to an operation panel or PC as one system. With this configuration flexibility, each system can be designed for specific control and installation requirements.

Flexible Installation

The SR Mini HG System utilizes DIN rail mounting for flexible installation. Your system can be customized and expanded to meet your specific application requirements by simply attaching additional modules on the rail.



Up to 16 units (Max. 320 loops) are available when connected to a RKC touch screen operation panel, PLC or a host computer.

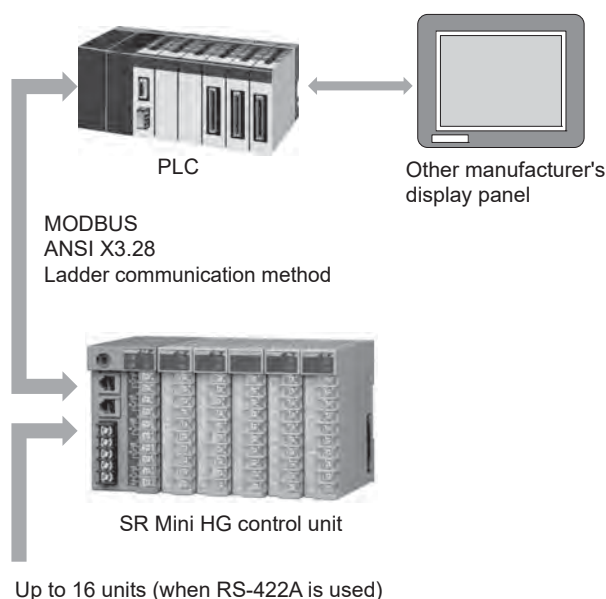
Up to 4 units (Max 80 loops) are available when using MAPMAN, a direct PLC communication.

Modular Type Controller FAREX SR Mini HG System

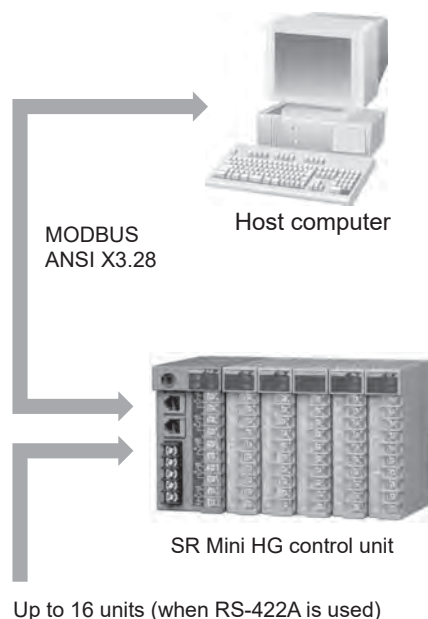
Simplified Connectivity

The SR Mini HG System offers various connectivity options to communicate to a host PC or PLC, such as serial communication, Open Network communication, and PLC direct communication "MAPMAN" function. For serial communication, Modbus or ANSI X3.28 protocol is available. For Open Network communication, CC-Link module are available. Direct communication to PLCs is provided by the MAPMAN function. Without programming, MAPMAN function automatically writes process data into the PLC registers, sends new settings to the controller and updates parameters continuously and automatically through simple flag operations on the PLC side.

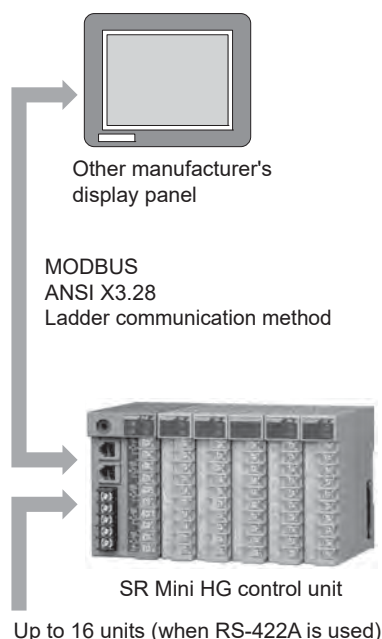
SR Mini HG System Connected to PLC



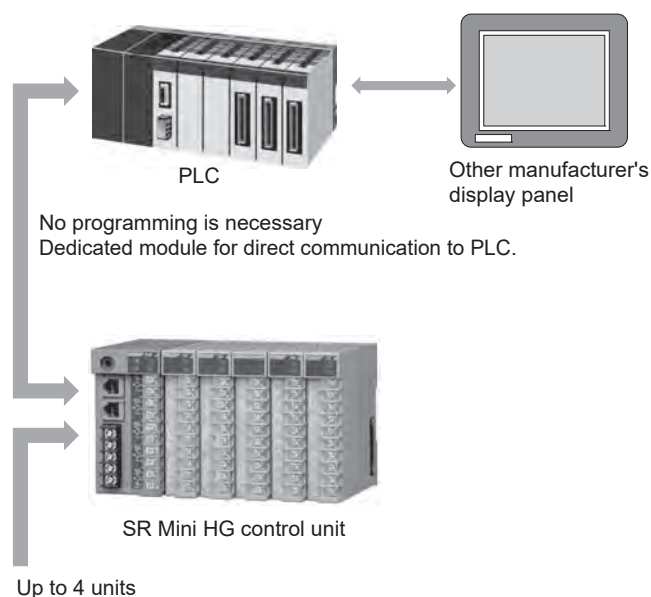
SR Mini HG System Connected to PC



SR Mini HG System Connected to RKC Touch Screen Operation Panel



SR Mini HG System Connected to PLC (PLC direct communication: "MAPMAN")



Modules

Power Supply / CPU Module

The CPU module (PCP module) supplies power to each connected modules, manages data, and interfaces with a host PC, PLC or an operation panel. One PCP module is necessary for each control unit.

(H-PCP-A, B) Single-communication port

Modbus, or ANSI protocol is available. For CC-Link, CC-Link module is available as function module.

(H-PCP-J) Dual-communication port

In addition to all communication function available for H-PCP-A/B, MAPMAN function is built into the H-PCP-J which automatically writes data into specified register areas of a PLC, and temperature controller's data is read and written only by PLC flag operations.

Control Module

Temperature Control Module

(H-TIO-A,B,C,D)

These are standard temperature control modules with one or two channels. The input type is thermocouple or RTD. One channel type can have options such as alarm output.

High Accuracy Temperature Control Module

(H-TIO-E,F,G)

These are high accuracy temperature control modules with one or two channels. The sampling time is 0.1 second, and the accuracy is 0.1% of the full scale. The input type is thermocouple or RTD.

Control Module with DC Voltage/Current Input

(H-TIO-H,J)

These are high accuracy control modules with one or two channels. The input type is DC voltage/current input.

Other Control Module

Conveyor Speed Control Module

(H-SIO-A)

This module controls conveyor belt speed.

Current Transformer Input Module

(H-CT-A)

This module is used with a current transformer (CT) to detect heater break or any loop failure.

Analog Input / Output Module

Analog Input Module

(H-AI-A,B)

These modules have two or four inputs with independent high and low alarms as standard.

Analog Output Module

(H-AO-B)

These modules have two or four outputs which are useful for retransmission to recorders, etc.

Temperature Input Module

(H-TI-C)

These modules have four channels that can be used for temperature input monitoring. The input type is thermocouple or RTD. Two-channel high accuracy type is also available.

Digital Input / Output Module

Digital Input Module

(H-DI-A)

This module is for multi-memory area change, and mode transfer.

Digital Event Input Module

(H-DI-B)

This module allows you to program logics and output from the digital output module. Logic results also can be handled on communication.

Digital Output Module

(H-DO-A,B)

These modules can be used for independent alarm output per channel, or various control status output.

Digital Event Output Module

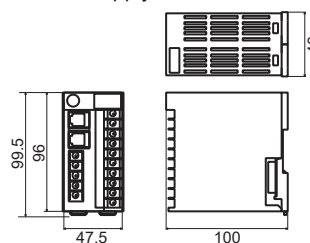
(H-DO-C)

This module allows you to add independent alarms. You can have more than two alarms if you use this module.

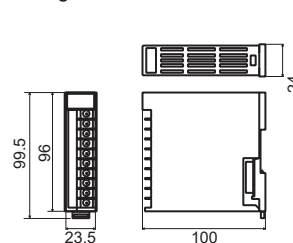
External Dimensions

Unit : mm

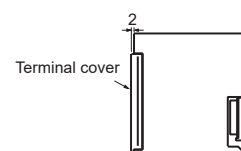
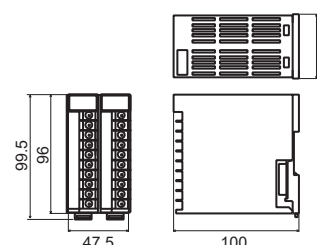
• Power supply / CPU module



• Single width module



• Double width module Heat/Cool control module



Modular Type Controller FAREX SR Mini HG System



Device Configuration

Module		Specifications
Power/CPU Module	H-PCP-A	100 to 120V AC, 50/60Hz FAIL output, Digital output : 4 points, Communication function
		200 to 240V AC, 50/60Hz FAIL output, Digital output : 4 points, Communication function
		24V DC FAIL output, Digital output : 4 points, Communication function
	H-PCP-B	100 to 120V AC, 50/60Hz FAIL output, Digital output : 2 points, Digital input : 3 points, Communication function
		200 to 240V AC, 50/60Hz FAIL output, Digital output : 2 points, Digital input : 3 points, Communication function
		24V DC FAIL output, Digital output : 2 points, Digital input : 3 points, Communication function
	H-PCP-J	100 to 120V AC, 50/60Hz FAIL output, Digital output : 8 points, ANSI/ MODBUS/ MAPMAN command protocol Communication function (Selectable)
		200 to 240V AC, 50/60Hz FAIL output, Digital output : 8 points, Communication function
		24V DC FAIL output, Digital output : 8 points, Communication function
Temperature Control Module	H-TIO-A	Thermocouple, RTD input : 1 zone, Brilliant PID or ON/OFF control, CT input : 1 point, Alarm output : 1 point
	H-TIO-B	Thermocouple, RTD input : 2 zones, Brilliant PID or ON/OFF control
Temperature Control Module (Heat/Cool type)	H-TIO-C	Thermocouple, RTD input : 1 zone, Brilliant PID control, CT input : 1 point
	H-TIO-D	Thermocouple, RTD input : 2 zones, Brilliant PID control, CT input : 2 points
High Accuracy Temperature Control Module	H-TIO-E	Thermocouple, RTD input : 1 zone, Brilliant PID or ON/OFF control, Alarm output : 1 point
	H-TIO-F	RTD input : 2 zones, Brilliant PID or ON/OFF control
High Accuracy Temperature Control Module (Heat/Cool type)	H-TIO-G	Thermocouple, RTD input : 1 zone, Brilliant PID control
	H-TIO-H	DC voltage, DC current input : 1 zone, Brilliant PID or ON/OFF control, Alarm output : 1 point
Control with Voltage/Current Input Module	H-TIO-J	DC voltage, DC current input : 2 zones, Brilliant PID or ON/OFF control
Conveyor Speed Control Module	H-SIO-A	DC voltage pulse input : 1 zone, Brilliant PID control, Digital input : 2 points
Temperature Input Module	H-TI-C	Thermocouple, RTD input : 4 zones, Alarm function : 2 points/zone
CT Input Module	H-CT-A	CT input : 6 points (RKC's proprietary CT)
Digital Output Module	H-DO-A	Alarm output, Relay contact output : 8 points (Common every 4 points)
	H-DO-B	Alarm output, Open collector output : 8 points
	H-DO-C	Alarm output, Relay contact output : 4 points (All points are Common)
Analog Input Module	H-AI-A	Analog input (Not insulated between channels) : 4 points 0 to 10mV, 0 to 100mV, 0 to 1V, 0 to 5V, 0 to 10V, 1 to 5V, -1 to 1V, -5 to 5V, -10 to 10V, 0 to 20mA, 4 to 20mA DC Alarm function : 2 points / channel
	H-AI-B	Analog input (Insulated between channels) : 2 points 0 to 10mV, 0 to 100mV, 0 to 1V, 0 to 5V, 0 to 10V, 1 to 5V, -1 to 1V, -5 to 5V, -10 to 10V, 0 to 20mA, 4 to 20mA DC Alarm function : 2 points / channel
Analog Output Module	H-AO-B	Analog output (Insulated between channels) : 2 points 0 to 1V, 0 to 5V, 0 to 10V, 1 to 5V, 0 to 20mA, 4 to 20mA DC
Digital Input Module	H-DI-A	24V DC input : 8 points (Common every 4 points)
	H-DI-B	Event input, 24V DC input : 8 points (Common every 4 points)
Communication Converter	H-LNK-A	CC-Link gateway for SR Mini HG (1control unit : 16ch max, Total : 256ch max*) *1 control unit occupies 4 stations. The maximum of 64 stations can be used.

H-TIO Input range code table

Thermocouple

Input	Code	Range
K	K : 02	0 to 400°C
	K : 04	0 to 800°C
	K : 11	0 to 1300°C
	K : 09	0.0 to 400.0°C
	K : 10	0.0 to 800.0°C
	K : 23	0.0 to 1300.0°C
	K : A1	0 to 800°F
	K : A4	0.0 to 800.0°F
	K : A5	0 to 2400°F
	K : B4	0.0 to 2400.0°F
	K : 32	-200.0 to +300.0°C
	J : 02	0 to 400°C
J	J : 04	0 to 800°C
	J : 06	0 to 1200°C
	J : 08	0.0 to 400.0°C
	J : 09	0.0 to 800.0°C
	J : 16	0.0 to 1200.0°C
	J : 26	-200.0 to +300.0°C
	J : A2	0 to 1600°F
	J : A4	0.0 to 700.0°F
	J : A5	0 to 2100°F
	J : B2	0.0 to 1600.0°F
	S : 03	0 to +1700°C
	S : 04	0.0 to +1700.0°C
S	S : A3	0 to +3000°F

Input	Code	Range
T	T : 06	0.0 to 400.0°C
	T : 08	0 to 400°C
	T : 09	0 to 200°C
	T : 10	-200 to +200°C
	T : 12	0.0 to 200.0°C
	T : 13	-200.0 to +200.0°C
	T : A7	0.0 to +700.0°F
	T : A9	0 to +700°F
	T : B1	-300 to +400°F
	T : B3	-300.0 to +400.0°F
	R : 03	0 to +1700°C
	R : 05	0.0 to +1700.0°C
R	R : A3	0 to +3000°F
	E : 02	0 to 1000°C
	E : 03	0.0 to 700.0°C
	E : 04	0 to 400°C
	E : 07	0.0 to 400.0°C
	E : 08	0.0 to 1000.0°C
	E : A3	0 to 1800°F
	E : A8	0.0 to 1800.0°F
	B : 03	0 to 1800°C
	B : 04	0.0 to 1800.0°C
	B : A5	0 to 3000°F
	N : 02	0 to 1300°C
N	N : 05	0.0 to 1300.0°C
	N : A1	0 to 2300°F
	N : A4	0.0 to 2300.0°F

Input	Code	Range
PLII (NBS)	A : 03	0 to 1200°C
	A : 04	0.0 to 1200.0°C
	A : A3	0 to 2300°F
	A : A5	0.0 to 2300.0°F
	W : 03	0 to 2300°C
	W : 04	0.0 to 2300.0°C
W5Re/W26Re (ASTM)	W : A3	0 to 3000°F

1 : The range can be specified only H-TIO-E/G module.

DC Current • Voltage H-TIO-H/J

Input	Code	Range
0 to 10mV	1 : 01	0.0 to 100.0%
-10 to +10mV	G : 01	
0 to 100mV	2 : 01	
-100 to +100mV	U : 01	
0 to 1V	3 : 01	
-1 to +1V	W : 01	
0 to 5V	4 : 01	
1 to 5V	6 : 01	
-5 to +5V	D : 01	
0 to +10V	5 : 01	
-10 to +10V	V : 01	
0 to 20mA	7 : 01	
4 to 20mA	8 : 01	

4 : Scale range is programmable.

RTD

Input	Code	Range
Pt100	D : 16	0.0 to 400.0°C
	D : 17	0 to 400°C
	D : 18	-200 to +200°C
	D : 21	-200.0 to +200.0°C
	D : 22	-50.00 to +150.00°C
	D : B5	-300 to +1200°F
	D : B4	0 to 800°F
	D : B7	0.0 to +800.0°F
	D : B8	-300.0 to +1200.0°F
	P : 16	0.0 to 400.0°C
	P : 17	0 to 400°C
	P : 18	-200 to +200°C
JPt100	P : 21	-200.0 to +200.0°C
	P : 22	-50.00 to +150.00°C
	P : B4	-300 to +900°F
	P : B3	0 to 800°F
	P : B7	0.0 to +800.0°F
	P : B8	-300.0 to +900.0°F

2 : The range with the resolution of 1/100 can be specified only by H-TIO-E module.

3 : The range can be specified only by H-TIO-F module (high accuracy type).

FAREX SR Mini HG SYSTEM H-PCP-J Module

FAREX SR Mini HG SYSTEM H-PCP-J Module



Mapman Function enables PLCs and RKC temperature controllers to act as one.



Digital Controller

General Description

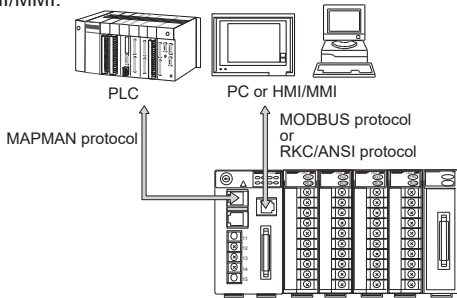
A temperature controller (FAREX SR Mini HG) becomes a Master Unit to PLC, and automatically stores temperature data into registers in a PLC. This enables easy handling of temperature control system to the exiting PLC system is available..

Features

- ☆ Control/monitor from one location
- ☆ Maximum of 80 control loops
- ☆ DIN rail mounting
- ☆ MODBUS/ANSI protocols

Simultaneous Use of Two Protocols

Communication ports (COM. PORT3) has been added. MODBUS protocol or RKC/ANSI protocol can be assigned. During MAPMAN command protocol communication, maintenance and increase of display devices are now available using a PLC or a HMI/MMI.



Selectable a Type of PLC and Protocol

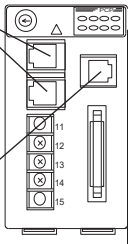
You can select a type of PLC (SLC500/MELSEC/SYMAC/JW) to connect and a protocol (MAPMAN/RKC/MODBUS) to use with a DIP switch.

<COM.PORT1 and COM.PORT2>

- (Selectable options)
- MAPMAN protocol
 - Allen-Bradley SLC500 command
 - Mithubishi MELSEC command
 - Omron SYMAC command
 - Sharp JW command
- MODBUS protocol
- RKC/ANSI protocol

<COM.PORT3>

- (Selectable options)
- MODBUS protocol
- RKC/ANSI protocol



Increased Communication Speed

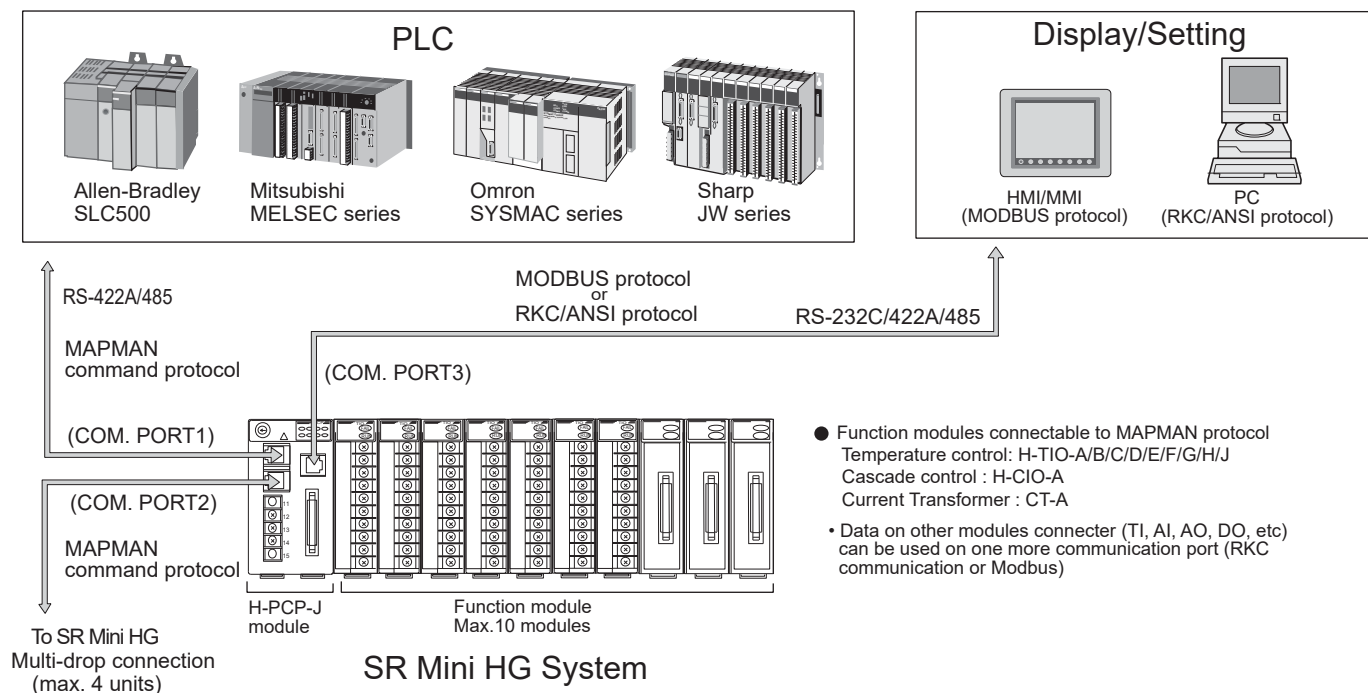
Communication speed at all ports has been increased to 38.4K from 19.2Kbps.

Comparison of Programming

Connection Method	Ladder communication	Field network	Programless (MAPMAN protocol)
Connection example			
PLC/Temp. controllers Comm. software	Required	Paretically necessary (When instrument is started)	Not required
PLC/Temp.controllers Temp. control S/W	Required	Required	Not required (R/W possible by flag handling)

FAREX SR Mini HG SYSTEM H-PCP-J Module

Typical Configuration



Specifications

Basic Functions

Data supervision

Operating and system data

Control unit diagnosis

Function modules configuration check

Self-diagnostic

Check item : ROM/RAM check, Watchdog timer, Power supply monitoring
• If error occurs in self-diagnosis, the hardware will automatically return the module outputs to the OFF position.

Memory backup

RAM is backed up by a lithium battery.
Data retaining period : Approx. 10 years
(depends on storage and operating conditions.)

Power Supply

Supply Voltage

- 90 to 132V AC (Including supply voltage variation)
[Rating : 100 to 120V AC] (50/60Hz common use)
- 180 to 264V AC (Including supply voltage variation)
[Rating : 200 to 240V AC] (50/60Hz common use)
- 21.6 to 26.4V DC (Ripple rate 10% p-p or less)
[Rating : 24V DC]

Power Consumption

- 100 to 120V AC type : Less than 40VA
- 200 to 240V AC type : Less than 50VA
- 24V DC type : Less than 21W, 1A

Output voltage/current

5V DC, 1.7A max.
12V DC, 1.0A max.

Over current protection

Fold-back limiting method : 5V

Digital Output

Number of output

8 points

Output type

Temperature alarm (Alarm 1, Alarm 2), Heater break alarm, Burnout Temperature input (TI) alarm, Analog input (AI) alarm, Control loop break alarm (LBAA), Temperature rise completion, FAIL, PLC communication status, Unused, (Selectable)

Output method

Open collector output, Sink type
8 points/common, DC12/24V
Max. load current : 0.1A/points, 0.8A/common

Communications

Communication Method

RS-422A (4-wire), RS-485 (2-wire), RS-232C (3-wire, Only COM.PORT3)
(Specify when ordering)

Communication Protocol

- ANSI X3.28 subcategory 2.5B1
- MODBUS
- PLC special protocol

Communication Speed : 9600, 19200, 38400 BPS

Synchronous method : Start/stop synchronous type

Bit Format

Start bit : 1
Data bit : 7 or 8
Parity bit : Without, Odd or Even
Stop bit : 1 or 2

General Specifications

Insulation Resistance

More than 20MΩ (500V DC) between power terminals and ground
More than 20MΩ (500V DC) between output terminals and ground

Dielectric Strength

1500V AC for one minute between power terminals and ground
1500V AC for one minute between output terminals and ground

Operating Environments : 0 to 50°C [32 to 122°F] , 45 to 85%

Net Weight : Approx. 300g

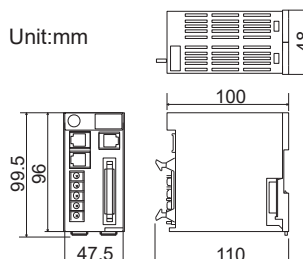
Compliance with Standards

- CE Mark
- UL/cUL Recognized



External Dimensions

Unit:mm

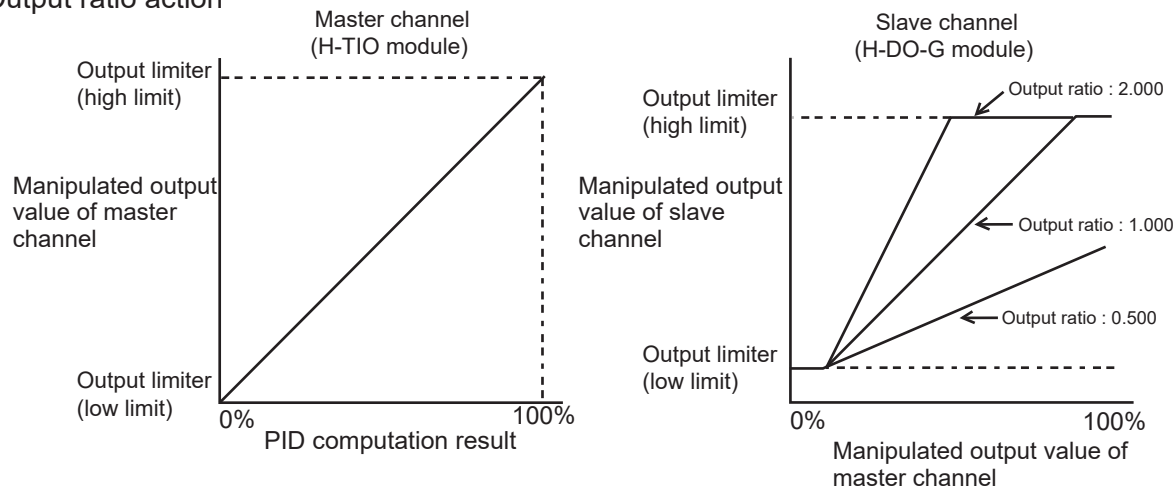


Digital Output Module with Output Ratio (H-DO-G-D)

Output ratio function multiplies value (gradient) set with output ratio in manipulated output value of master channel (Temperature control module H-TIO-[]), and it is function to output the consequence as manipulated output value from slave channel (Digital output module H-DO-G).

Other than H-PCP-J module, H-TIO-[] module and H-DO-G module are requirement to do output ratio function.

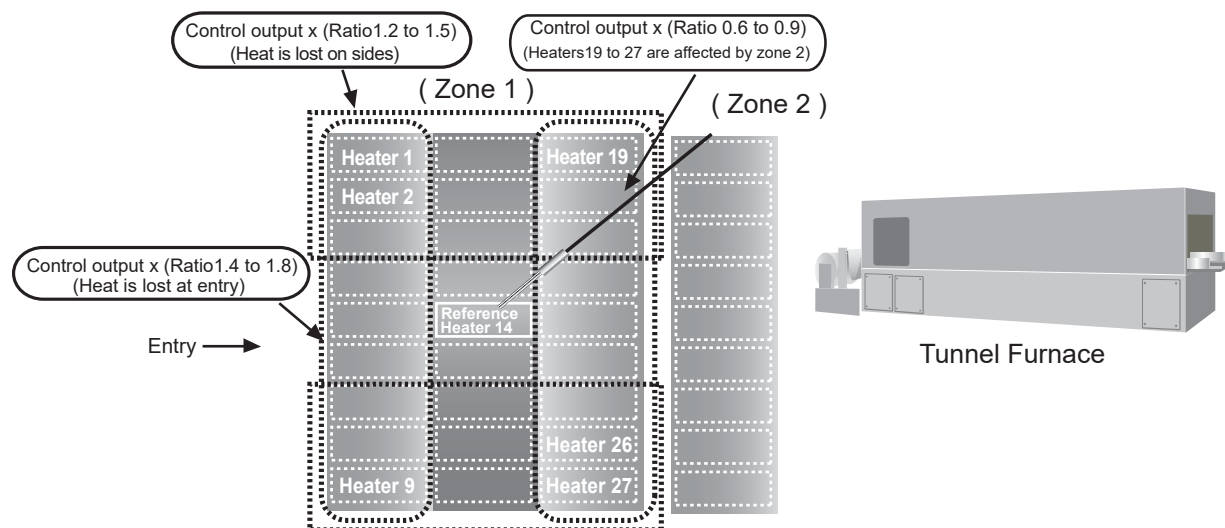
● Output ratio action



● Application

To obtain uniform temperature with a single sensor, temperature distribution of heaters is analyzed and the control output at a reference point is multiplied by ratio which is then sent to each heater for temperature control.

This type of output ratio distribution was formerly available with a thyristor unit, but now it can be achieved with an SSR and a magnetic contactor, and a compact and low cost multi-zone temperature control system can be built up.



● Output Specifications

Number of output

16 points

Output method

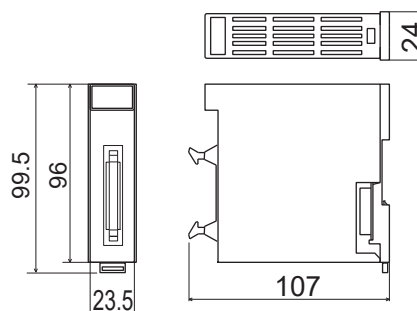
Open collector output, Sink type, 12 to 24V DC
Max. load current : 50mA, 1common, 400mA

Output type

Control output of master channel (TIO module)
Output limiter
Output ratio
Control output cycle : 1 to 100sec

● External Dimensions

Unit:mm

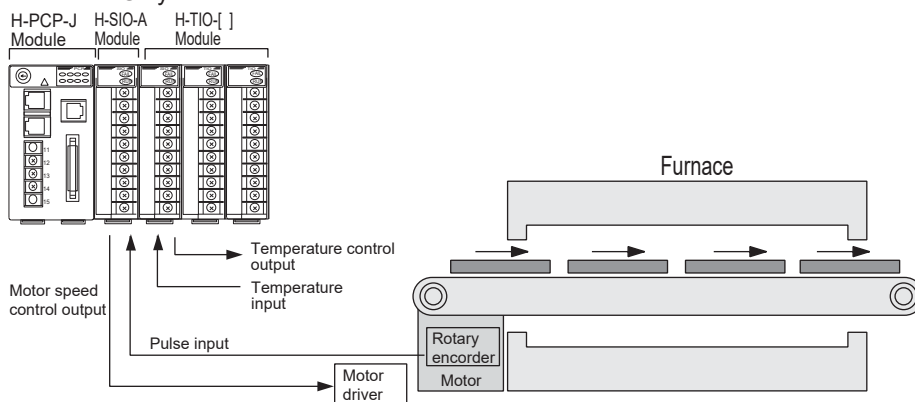


FAREX SR Mini HG SYSTEM H-PCP-J Module

Speed Control Module (H-SIO-A)

Speed control function inputs pulse from rotary encoder, and motor speed is controlled.
Other than H-PCP-J module, H-SIO-A module are requirement to do speed control functions.

SR Mini HG system



Specifications

Input

Number of input : 1 point

Input type

- Voltage pulse input
High level voltage : 7 to 15V DC
Low level voltage : 0 to 2V DC
Rise/fall time : Less than 5μsec
- Dry contact

Power supply for sensor

12V DC $\pm 10\%$, Less than 70mA

Input response frequency : 2Hz to 50kHz

Measuring method

Periodic computation method and Pulse count method (Selectable)

Divide ratio : 1 to 1000 (Effective only for periodic computation method)

Gate time : 0.1 to 4.0sec (Effective only for pulse count method)

Digital Filter

First order lag digital filter : 0.1 to 100.0 sec (No filter when 0.0 is set)

Action at input break : Indicates display scale low value

Display scale range

-1999 to +10000

However, scaling is possible within a span of 10000 maximum.

Decimal point position can be varied down to 3 digit.

Control

Control Method

Open loop control

Close loop control (Brilliant PID control with autotuning)

- Available PI control (Selectable)

Setting Range

Set value : Same as display scale range
Proportional band : 0.1 to 1000.0% of span (Zero is not setttable)
Integral time : 1 to 3600 sec. (Zero is not setttable)
Derivative time : 0 to 3600 sec. (PI action when D=0)
Control response : Slow, Medium, Fast

Control Output

Voltage output : 0 to 1V DC, 0 to 5V DC, 0 to 10V DC
1 to 5V DC
(Load resistance : More than 1kΩ)
Current output : 0 to 20mA DC, 4 to 20mA DC
(Load resistance : Less than 500Ω)

Output Scale Range

-9999 to 10000 (However, scaling is possible within a span of 10000 maximum. Decimal point position is common with display scale.

Alarms

Number of alarms : 2 points

Type

Process High, Process Low, Deviation High, Deviation Low, Deviation High/Low, Band, Set value High, Set value Low

Alarm hold cancel time : 1 to 255 sec

Number of alarm output : 1 point

Alarm output type

Relay output, Form A contact 250V AC, 24V DC 2A (resistive load)

Contact Input

Number of Inputs : 2 points

Type :

- Control ON/OFF : OPEN : Open loop control,
CLOSE : Close loop control
- RUN/STOP : OPEN : STOP
CLOSE : RUN

Input Rating :

Non-voltage contact input, Photocoupler isolation (Pulse input type is not isolated)

- OPEN : 500kΩ or more
- CLOSE : 10Ω or less
- Allowable contact resistance : 100Ω or less

General Specifications

Self-Diagnostic Function

RAM check, adjustment data check and watchdog timer

Operation at error : FAIL Lamp lights, Control output is OFF.

Operating Environments : 0 to 50°C [32 to 122°F] , 45 to 85%

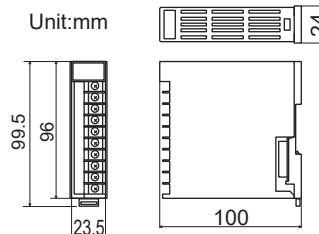
Net Weight : Approx. 300g

Compliance with Standards

- CE Mark
- UL/cUL Recognized



External Dimensions



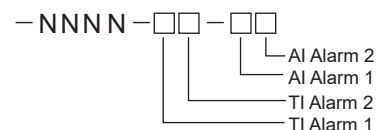
FAREX SR Mini HG SYSTEM H-PCP-J Module

Model and Suffix Code

Power supply/CPU module within MAPMAN Function (H-PCP-J)

Specifications	Model and Suffix Code									
Model	H-PCP — J — □ □ □ □ — D * □ □									
Type	Within MAPMAN Function J									
Power supply	100 to 120V AC				1					
	200 to 240V AC				2					
	24V DC				3					
COM.PORT 1,2 Communication	RS-422A				4					
	RS-485				5					
COM.PORT 3 Communication	RS-232C				1					
	RS-422A				4					
	RS-485				5					
Digital output	Open collector output								D	
Alarm 1	See Alarm Code Table									□
Alarm 2	See Alarm Code Table									□

Initial Code Table



TI, AI Alarm Code Table

N : No alarm
H : Process High
J : Process Low
K : Process High (with alarm hold)
L : Process Low (with alarm hold)

* An analog input module (H-AI) and a temperature input module (H-TI) can be connected to a H-PCP-J module, but MapMan protocol does not support these module.

Digital Controller

Alarm Code Table

A	Deviation High	B	Deviation Low	C	Deviation High/Low	D	Deviation band
E	Deviation High (with alarm hold)	F	Deviation Low (with alarm hold)	G	Deviation High/Low (with alarm hold)	H	Process High
J	Process Low	K	Process High (with alarm hold)	L	Process Low (with alarm hold)	Q	Deviation High (with alarm Re-hold)
R	Deviation Low (with alarm re-hold)	T	Deviation High/Low (with alarm re-hold)	N	No alarm		

DO module within output ratio

Model H-DO-G-D

Safety Standards:

When specifying models with CE Mark, CSA Certification and UL recognition add "/CE" to the model code.

Speed control module

Specifications	Model and Suffix Code									
Model	H-SIO — A — F □ □ — □ □									
Type	1 channel type A									
Control method	PID control with AT				F					
Input (Pulse input)	Dry contact input (Power supply for sensor, 12V DC)				Z01					
	Voltage input (Power supply for sensor, 12V DC)				Z02					
Control output	0 to 1V DC				3					
	0 to 5V DC				4					
	0 to 10V DC				5					
	1 to 5V DC				6					
	0 to 20mA DC				7					
	4 to 20mA DC				8					
Alarm output	No alarm output								N	
	Alarm 1 output								1	
	Alarm 2 output								2	

MA900



General Description

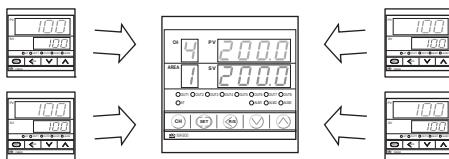
The MA900 controls up to 4 channels in a compact 1/4 DIN size. The MA900 increases zone density and makes smaller numbers of loops affordable, yet still holds many of the advantages that a single loop controller might offer. This unit will aid designers of control equipment by saving labor costs, installation costs, electric panel sizes, and operation costs.

Features

- ☆ 4 channels control
- ☆ Multi-memory area
- ☆ Digital communications
- ☆ Heat/Cool action
- ☆ Digital contact input
- ☆ Multiple alarm functions
- ☆ Close horizontal mounting
- ☆ IP65 Waterproof/dustproof protection

4 channels Control

4 channels of temperature controls are packed into 96 x 96 x 100mm case. The MA900 can reduce your panel cutouts and make your panel board smaller.



Multi-Memory Area

Up to 8 kinds of combinations of temperature set value, PID constant, alarm set value, etc. for each channel can be registered as "Memory area" (recipe).

The change of settings caused by the change of a process and product can be simply realized only by switching the "Area". The switching of the area by optional external contact input is also available.

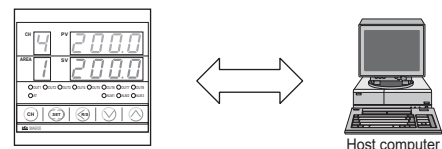
The available parameters for multi memory area :

SV, Alarm set values, PID constants, Anti-reset windup, Overlap/dead band, Setting change rate limiter, Channel used/unused



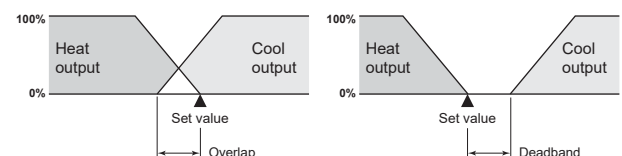
Digital Communications (Optional)

An optional communications interface, RS-232C, RS-422A or RS-485 is available for networking to computers, PLCs and SCADA software. MODBUS or ANSI (RKC standard) protocol can be selected. Up to 31 units can be interfaced on one RS-422A or RS-485 communication line.



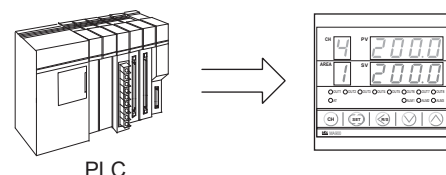
Heat/Cool Control (Optional)

The Heat/Cool PID control features heat and cool outputs for use where process-generated heat exists. This allows the input of overlap or deadband settings which contribute to energy savings.



Digital Contact Input (Optional)

An optional digital contact input is available for RUN/STOP and memory area switching. (RUN/STOP switching can also be completed at the front key panel.)



Multi-Loop Digital Temperature Controller MA900

Features

Multiple of Alarm Functions

The MA900 provides a wide selection of alarm types to configure up to three alarms.

Alarm 1 (Standard) :

Temperature alarms, Loop break alarm, FAIL

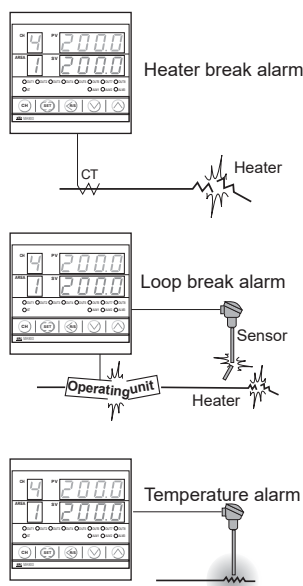
Alarm 2 (Optional) :

Temperature alarms, Heater break alarm, FAIL

Alarm 3 (Optional) :

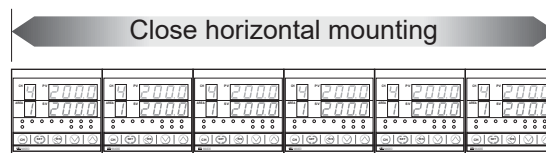
Temperature alarms, FAIL

Alarm output is common to all channels. But alarm 3 is available for optional independent output for each channel.



Close Horizontal Mounting (Optional)

The MA900 has been designed with a unique mounting bracket that allows close horizontal mounting of multiple instruments to save valuable panel space.



Waterproof/Dustproof (Optional)

For operation in severe environments or when washdown is required, the IP65 rating is available for waterproof/dustproof protection.



Specifications

Input

Number of Inputs

4 points

Input

- a) Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS)
W5Re/W26Re (ASTM), U, L (DIN)
 - Influence of external resistance : Approx. $0.2\mu\text{V}/\Omega$
 - Input break action : Up-scale
- b) RTD : Pt100 (JIS/IEC), JPt100 (JIS)
 - Influence of input lead resistance : Approx. $0.01\%[\%/\Omega]$ of reading
 - Maximum 10Ω per wire
 - Input break action : Up-scale
 - Input is not isolated.
- c) DC voltage : 0 to 5V, 1 to 5V, 0 to 10V
 - Input break action : Down-scale
 - Input is not isolated.

Sampling Time

0.5 sec

Input Filter

First order lag digital filter
Time constant 1 to 100 sec. (OFF when 0 is set)

PV Bias

- span to +span (Within -1999 to 9999)

Performance

Measuring Accuracy

- a) Thermocouple
 - $\pm(0.3\%$ of reading + 1 digit) or $\pm 2^\circ\text{C}$ (4°F) whichever is larger
 - Accuracy is not guaranteed between 0 and 399°C (0 and 799°F) for type R, S and B.
 - Accuracy is not guaranteed less than -100.0°C (-158.0°F) for type K, J, T and U.
- b) RTD
 - $\pm(0.3\%$ of reading + 1 digit) or $\pm 0.8^\circ\text{C}$ (1.6°F) whichever is larger
- c) DC voltage
 - $\pm(0.3\%$ of span + 1 digit)

Insulation Resistance

More than $20\text{M}\Omega$ (500V DC) between measured terminals and ground
More than $20\text{M}\Omega$ (500V DC) between power terminals and ground

Dielectric Strength

1000V AC for one minute between measured terminals and ground
1500V AC for one minute between power terminals and ground

Control

Control Method

- a) PID control (with autotuning function)
 - Available for reverse and direct action. (Specify when ordering.)
- b) Heat/Cool PID control (with autotuning function)
 - Air and water cooling types are available. (Specify when ordering.)

Major Setting Range

- Set value : Same as input range.
- Heat side proportional band : 1 to span (ON/OFF action when P=0)
 - Differential gap at ON/OFF action is 2°C (°F) or 0.2%.
- Cool side proportional band : 1 to 1000% of heat side proportional band
- Integral time : 1 to 3600sec. (P + D action when I=0)
- Derivative time : 1 to 3600sec. (P + I action when D=0)
- Anti-Reset Windup (ARW) : 1 to 100% of heat side proportional band
 - (Integral action is OFF when ARW=0)
- Deadband/Overlap : -span to +span (Within -1999 to 9999)
 - Minus setting : Over lap
- Proportional cycle time : 1 to 100 sec.

Operation Mode

Available for switching each channel to be normal (control), alarm monitoring (control output OFF, alarm action enabled) and unused.

Control Output

- Relay output : Form A contact, 250V AC 3A (resistive load)
- Voltage pulse output : 0/12V DC
 - (Load resistance : More than 600Ω)
- Current output : 4 to 20mA DC or 0 to 20mA DC
 - (Load resistance : Less than 600Ω)
- Open collector output : Load voltage : Less than 30V DC,
 - (Sink type) Maximum load current : Less than 100mA
 - Minimum load current : 0.5mA
- Between output terminals are not isolated.

Alarm (Up to 3 points) (Optional)

- Alarm 1 output (Standard), Alarm 2, 3 (Optional)
- Independent output for each channel of Alarm 3 is optionally available (OUT 5 to 8), but not available for Heat/Cool control type.

Temperature Alarm

- a) Type : Deviation High, Low, High/Low, Band, Process High, Low
 - Set value High, Low, Fail
- b) Differential gap : 2°C (°F) or 2.0°C (°F) (Temperature input)
 - 0.2% (Voltage, current input)

Control Loop Break Alarm (LBA)

- a) LBA time setting : 0.1 to 200.0 min.
- b) LBA deadband : 0 to 9999 °C [°F] or 100% of span
 - (OFF by setting zero)
- Output from Alarm 1 terminal.

Heater Break Alarm (For single phase)

- a) CT type : CTL-6-P-N (30A), CTL-12-S56-10L-N (100A)
- b) Display range : 0.0 to 100.0A
- c) Accuracy : ± 5% of input value or ± 2A (whichever is larger)
 - Output from Alarm 2 terminal.

Alarm Output

- a) Alarm Output 1 to 3
 - Relay output, Form A contact 250V AC 1A (resistive load)
- b) OUT 5 to 8
 - Relay output, Form A contact 250V AC 3A (resistive load)

Contact Input (Optional)

Number of Inputs : 5 points

Contact Input Type

- a) RUN/STOP switching (OPEN : STOP, CLOSE : RUN)
- b) Memory area selection :
 - Area selection : 3 points (BCD input 0 to 7)
 - Data set : 1 point

Input Rating

Non-voltage contact input (OPEN : 500kΩ or more, CLOSE : 10Ω or less)

Communications (Optional)

- a) Communication method : RS-232C (3-wire), RS-422A (4-wire)
 - RS-485 (2-wire)
- b) Communication speed : 2400, 4800, 9600, 19200 BPS
- c) Bit format
 - Start bit : 1
 - Data bit : 7 or 8 • For MODBUS 8 bit only
 - Parity bit : Even, odd or without parity
 - Stop bit : 1 or 2
- d) Communication code : ASCII(JIS) 7-bit code
- e) Maximum connection : RS-232C : 1 unit
 - RS-422A, RS-485 : 31 units
 - (Address can be set from 0 to 99.)

Waterproof/Dustproof (Optional)

IP65

• Waterproof/dustproof protection only effective from the front in panel mounted installations.

General Specifications

Supply Voltage

- a) 90 to 264V AC (Including supply voltage variation)
 - [Rating : 100 to 240V AC] (50/60Hz common)
- b) 21.6 to 26.4V AC (Including supply voltage variation)
 - [Rating : 24V AC] (50/60Hz common)
- c) 21.6 to 26.4V DC (Ripple rate 10% p-p or less) [Rating : 24V DC]

Power Consumption

Less than 14VA for standard AC type at 100V
 Less than 20VA for standard AC type at 240V
 Less than 11VA for 24V AC type
 Less than 330mA for 24V DC type

Power Failure Effect

Not affected by power failure shorter than 30msec, otherwise reset to the initial state.

Operating Environments

0 to 50°C [32 to 122°F], 45 to 85% RH

Memory Backup

Backed up by non-volatile memory.
 Number of writing : Approx. 100,000 times
 Data retaining period : Approx. 10 years

Net Weight

Approx. 560g

External Dimensions (W x H x D)

96 x 96 x 100mm

Compliance with Standards

- CE Mark
- UL/cUL Recognized
- C-Tick Mark



Multi-Loop Digital Temperature Controller MA900

Model and Suffix Code

Specifications	Model and Suffix Code																																																																																																																																																																																																																																																																																																																																																																																																				
Model	MA900-4				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

¹ Alarm output is common to all channels.

² Heater break output is not available if either control is current output.

³ As for control output of 5 to 8, when code A or W is selected they are used as cool-side control output, and when F or D is selected, they are used as channel output for alarm 3.

Range and Input Code Table

Thermocouple (Field-programmable)

Input	Code	Range
K ¹	K : 01	0 – 200°C
	K : 02	0 – 400°C
	K : 03	0 – 600°C
	K : 04	0 – 800°C
	K : 05	0 – 1000°C
	K : 06	0 – 1200°C
	K : 07	0 – 1372°C
	K : 08	-199.9 – 300.0°C
	K : 09	0.0 – 400.0°C
	K : 10	0.0 – 800.0°C
	K : 13	0 – 100°C
	K : 14	0 – 300°C
	K : 17	0 – 450°C
	K : 20	0 – 500°C
	K : 29	0.0 – 200.0°C
	K : 37	0.0 – 600.0°C
	K : 38	-199.9 – 800.0°C
	K : A1	0 – 800°F
	K : A2	0 – 1600°F
	K : A3	0 – 2502°F
J ¹	K : A4	0.0 – 800.0°F
	K : A9	20 – 70°F
	K : B2	-199.9 – 999.9°F
	J : 01	0 – 200°C
	J : 02	0 – 400°C
	J : 03	0 – 600°C
	J : 04	0 – 800°C
	J : 05	0 – 1000°C
	J : 06	0 – 1200°C
	J : 07	-199.9 – 300.0°C
J ¹	J : 08	0.0 – 400.0°C
	J : 09	0.0 – 800.0°C
	J : 10	0 – 450°C

¹ Type K, J, T and U input : Accuracy is not guaranteed less than -100.0°C (-158.0°F)

² Type R, S and B input : Accuracy is not guaranteed between 0 to 399°C (0 to 799°F)

³ DC voltage input can be used for the input of 0 to 20mA (in case of 0 to 5V) and 4 to 20mA (1 to 5V) by attaching 250Ω shunt resistor (sold separately) to input terminal. (The model of shunt resistor : KD100-55)

RTD (Field-programmable)

Input	Code	Range
Pt100	D : 01	-199.9 – 649.0°C
	D : 02	-199.9 – 200.0°C
	D : 03	-100.0 – 200.0°C
	D : 04	-100.0 – 100.0°C
	D : 05	-100.0 – 200.0°C
	D : 06	0.0 – 50.0°C
	D : 07	0.0 – 100.0°C
	D : 08	0.0 – 200.0°C
	D : 09	0.0 – 300.0°C
	D : 10	0.0 – 500.0°C
	D : A1	-199.9 – 999.9°F
	D : A2	-199.9 – 400.0°F
	D : A3	-199.9 – 200.0°F
	D : A4	-199.9 – 100.0°F
	D : A5	-100.0 – 300.0°F
	D : A6	0.0 – 100.0°F
	D : A7	0.0 – 200.0°F
	D : A8	0.0 – 400.0°F
	D : A9	0.0 – 500.0°F
JPt100	P : 01	-199.9 – 649.0°C
	P : 02	-199.9 – 200.0°C
	P : 03	-100.0 – 50.0°C
	P : 04	-100.0 – 100.0°C
	P : 05	-100.0 – 200.0°C
	P : 06	0.0 – 50.0°C
	P : 07	0.0 – 100.0°C
	P : 08	0.0 – 200.0°C
	P : 09	0.0 – 300.0°C
	P : 10	0.0 – 500.0°C

Voltage DC ³ (Field-programmable)

Input	Code	Range
0 – 5V	4 : 01	0.0 – 100.0 (Default)
0 – 10V	5 : 01	0.0 – 100.0 (Default)
1 – 5V	6 : 01	0.0 – 100.0 (Default)

Alarm 1 Code Table

Code	Type
A	Deviation High
B	Deviation Low
C	Deviation High/Low
D	Band Alarm
E	Deviation High with Alarm Hold

Code	Type
F	Deviation Low with Alarm Hold
G	Deviation High/Low with Alarm Hold
H	Process High
J	Process Low
K	Process High with Alarm Hold

Code	Type
L	Process Low with Alarm Hold
M	FAIL
R ¹	Loop break alarm (LBA)
V	Set value High
W	Set value Low

¹ Loop break alarm is not available for Heat/Cool PID control type.

Alarm 2 and 3 Code Table

Code	Type
A	Deviation High
B	Deviation Low
C	Deviation High/Low
D	Band Alarm
E	Deviation High with Alarm Hold

Code	Type
F	Deviation Low with Alarm Hold
G	Deviation High/Low with Alarm Hold
H	Process High
J	Process Low
K	Process High with Alarm Hold

Code	Type
L	Process Low with Alarm Hold
M	FAIL
V	Set value High
W	Set value Low

Accessories

Current transformer for heater break alarm

CTL-6-P-N (0 – 30A)

CTL-12-S56-10L-N (0 – 100A)

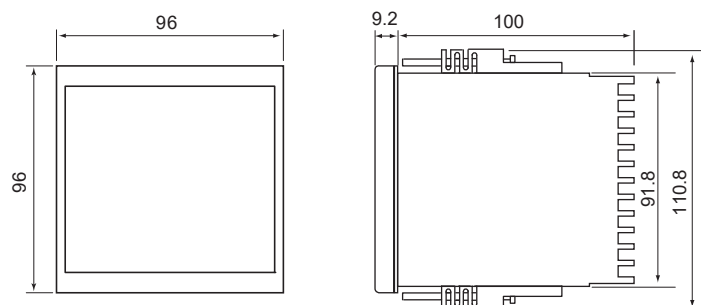
Shunt resistor for DC current input

KD100-55

Multi-Loop Digital Temperature Controller MA900

External Dimensions and Rear Terminals

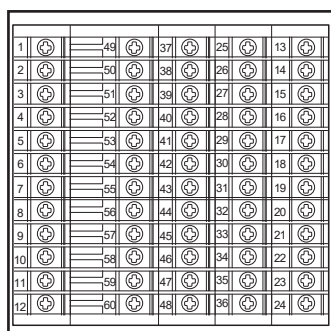
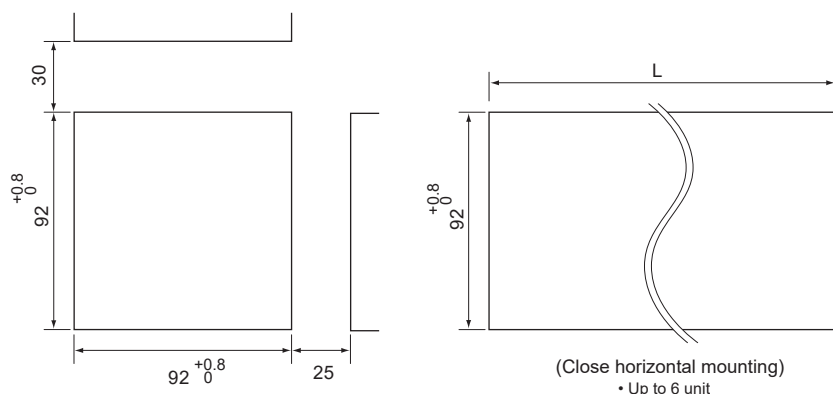
Unit : mm



For mounting of the controllers, panel thickness must be between 1 to 10mm.
When mounting multiple controllers close together, the panel strength should be checked to ensure proper support..

• Dustproof and waterproof are not effective when controllers are closely mounted.

Panel Cutouts



• Use the solder less terminal appropriate to the screw size.

Screw size : M3 X 6

No.	Description
1	AC L DC + 100 to 240V 24V
2	24V N - - - -
3	NO
4	NC
5	NO (1) (2) (3)
6	NO (1) (2) (3)
7	NO (1) (2) (3)
8	NO (1) (2) (3)
9	NO (1) (2) (3)
10	NO (1) (2) (3)
11	NO (1) (2) (3)
12	NO (1) (2) (3)

No.	Description
49	NO Alarm 2 output
50	NC
51	NO Alarm 3 output
52	NC
53	NO (1) (2) (3)
54	NO (1) (2) (3)
55	NO (1) (2) (3)
56	NO (1) (2) (3)
57	NO (1) (2) (3)
58	NO (1) (2) (3)
59	NO (1) (2) (3)
60	NO (1) (2) (3)

No.	Description
37	DI Contact input (RUN/STOP)
38	DI
39	COM
40	DI 1
41	DI 2
42	DI 4
43	DI SET
44	SG SG SG
45	T(A) T(R/A) SD
46	T(B) T(R/B) RD
47	R(A)
48	T(R/B)

No.	Description
25	COM CT1
26	CT2
27	CT3
28	COM CT4
29	CT4
30	
31	
32	
33	
34	
35	
36	

No.	Description
13	A CH1 Measured input
14	B (1) Thermocouple
15	(1) (2) (3) RTD
16	A CH2 Measured input
17	B (1) Thermocouple
18	(1) (2) (3) RTD
19	A CH3 Measured input
20	B (1) Thermocouple
21	(1) (2) (3) RTD
22	A CH4 Measured input
23	B (1) Thermocouple
24	(1) (2) (3) RTD

About output 5 to 8

- It becomes Cool side output for CH1 to CH4 in Heat/Cool control specification.
- It can be used as independent channel output for Alarm 3 in PID control specification. (Specify when ordering)

MA901



General Description

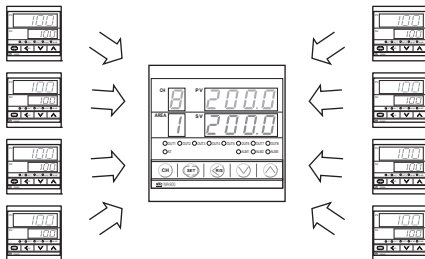
The MA901 controls up to 8 channels in a compact 1/4 DIN size. The MA901 increases zone density and makes smaller numbers of loops affordable, yet still holds many of the advantages that a single loop controller might offer. This unit will aid designers of control equipment by saving labor costs, installation costs, electric panel sizes, and operation costs.

Features

- ☆ 8 channels control
- ☆ Multi-memory area
- ☆ Digital communications
- ☆ Digital contact input
- ☆ Multiple alarm functions
- ☆ Close horizontal mounting
- ☆ IP65 Waterproof/Dustproof protection

8 channels Control

8 channels of temperature controls are packed into 96 x 96 x 100mm case. The MA901 can reduce your panel cutouts and make your panel board smaller.



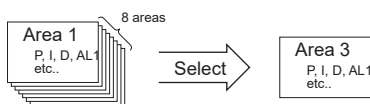
Multi-Memory Area

Up to 8 kinds of combinations of temperature set value, PID constant, alarm set value, etc. for each channel can be registered as "memory area" (recipe).

The change of settings caused by the change of a process and product can be simply realized only by switching the "area". The switching of the area by optional external contact input is also available.

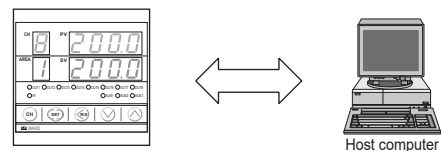
The available parameters for multi memory area :

SV, Alarm set values, PID constants, Anti-reset windup, Overlap/dead band, Setting change rate limiter, Channel used/unused



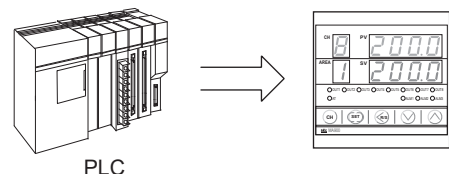
Digital Communications (Optional)

An optional communications interface, RS-232C or RS-422A, RS-485 is available for networking to computers, PLCs and SCADA software. MODBUS or ANSI (RKC standard) protocol can be selected. Up to 31 units can be interfaced on one RS-422A or RS-485 communication line.



Digital Contact Input (Optional)

An optional digital contact input is available for RUN/STOP and memory area switching. (RUN/STOP switching can also be completed at the front key panel.)



Multiple Alarm Functions

The MA901 provides a wide selection of alarm types to configure up to three alarms.

Alarm 1 (Standard) :

Temperature alarms, Loop break alarm, FAIL

Alarm 2 (Optional) :

Temperature alarms, Heater break alarm, FAIL

Alarm 3 (Optional) :

Temperature alarms, FAIL

• Alarm output is common to all channels.

Multi-Loop Digital Temperature Controller MA901



Specifications

Input

Number of Inputs
8 points

Input

- a) Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS)
W5Re/W26Re (ASTM), U, L (DIN)
- Influence of external resistance : Approx. 0.2μV/Ω
 - Input break action : Up-scale
- b) RTD : Pt100 (JIS/IEC), JPt100 (JIS)
- Influence of input lead resistance : Approx. 0.01[%/Ω] of reading
 - Maximum 10Ω per wire
 - Input break action : Up-scale
 - Input is not isolated.
- c) DC voltage : 0 to 5V, 1 to 5V, 0 to 10V
- Input break action : Down-scale
 - Input is not isolated.

Sampling Time
1 sec

Input Filter

First order lag digital filter
Time constant 1 to 100 sec. (OFF when 0 is set)

PV Bias

- span to +span (Within -1999 to 9999)

Performance

Measuring Accuracy

- a) Thermocouple
±(0.3% of reading + 1 digit) or ±2°C (4°F) whichever is larger
- Accuracy is not guaranteed between 0 and 399°C (0 and 799°F) for type R, S and B.
 - Accuracy is not guaranteed less than -100.0°C (-158.0°F) for type K, J, T and U.
- b) RTD
±(0.3% of reading + 1 digit) or ±0.8°C (1.6°F) whichever is larger
- c) DC voltage
±(0.3% of span + 1 digit)

Insulation Resistance

More than 20MΩ (500V DC) between measured terminals and ground
More than 20MΩ (500V DC) between power terminals and ground

Dielectric Strength

1000V AC for one minute between measured terminals and ground
1500V AC for one minute between power terminals and ground

Control

Control Method

PID control (with autotuning function)
•Available for reverse and direct action. (Specify when ordering.)

Major Setting Range

Set value : Same as input range.
Proportional band : 1 to span (ON/OFF action when P=0)
•Differential gap at ON/OFF action is 2°C (°F) or 0.2%.
Integral time : 1 to 3600sec.(P + D action when I=0)
Derivative time : 1 to 3600sec.(P + I action when D=0)
Anti-Reset Windup(ARW) : 1 to 100% of heat side proportional band
(Integral action is OFF when ARW=0)
Proportional cycle time : 1 to 100 sec.

Operation Mode

Available for switching each channel to be normal (control), alarm monitoring (control output OFF, alarm action enabled) and unused.

Control Output

Relay output : Form A contact, 250V AC 3A (resistive load)
Voltage pulse output : 0/12V DC
(Load resistance : More than 600Ω)
Current output : 4 to 20mA DC or 0 to 20mA DC
(Load resistance : Less than 600Ω)
Open collector output : Load voltage : Less than 30V DC,
(Sink type) Maximum load current : Less than 100mA
Minimum load current : 0.5mA
•Between output terminals are not isolated.

Alarm (Up to 3 points)

(Optional)

- Alarm 1 output (Standard), Alarm 2, 3 (Optional)

Temperature Alarm

- a) Type : Deviation High, Low, High/Low, Band,
Process High, Low
Set value High, Low, Fail
b) Differential gap : 2°C (°F) or 2.0°C (°F) (Temperature input)
0.2% (Voltage, current input)

Control Loop Break Alarm (LBA)

- a) LBA time setting : 0.1 to 200.0 min.
b) LBA deadband : 0 to 9999 °C [°F] or 100% of span
(OFF by setting zero)
•Output from Alarm 1 terminal.

Heater Break Alarm (For single phase)

- a) CT type : CTL-6-P-N (30A), CTL-12-S56-10L-N (100A)
b) Display range : 0.0 to 100.0A
c) Accuracy : ± 5% of input value or ± 2A (whichever is larger)
•Output from Alarm 2 terminal.

Alarm Output

- a) Alarm Output 1 to 3
Relay output, Form A contact 250V AC 1A (resistive load)

Contact Input

(Optional)

Number of Inputs : 5 points

Contact Input Type

- a) RUN/STOP switching (OPEN : STOP, CLOSE : RUN)
b) Memory area selection :
Area selection : 3 points (BCD input 0 to 7)
Data set : 1 point

Input Rating

Non-voltage contact input (OPEN : 500kΩ or more, CLOSE : 10Ω or less)

Communications

(Optional)

- a) Communication method : RS-232C (3-wire), RS-422A (4-wire)
RS-485 (2-wire)
b) Communication speed : 2400, 4800, 9600, 19200 BPS
c) Bit format
Start bit : 1
Data bit : 7 or 8 •For MODBUS 8 bit only
Parity bit : Even, odd or without parity
Stop bit : 1 or 2
d) Communication code : ASCII(JIS) 7-bit code
e) Maximum connection : RS-232C : 1 unit
RS-422A, RS-485 : 31 units
(Address can be set from 0 to 99.)

Waterproof/Dustproof

(Optional)

IP65

- Waterproof/dustproof protection only effective from the front in panel mounted installations.

General Specifications

Supply Voltage

- a) 90 to 264V AC (Including supply voltage variation)
[Rating : 100 to 240V AC] (50/60Hz common)
- b) 21.6 to 26.4V AC(Including supply voltage variation)
[Rating : 24V AC] (50/60Hz common)
- c) 21.6 to 26.4V DC(Ripple rate 10% p-p or less) [Rating : 24V DC]

Power Consumption

- Less than 14VA for standard AC type at 100V
- Less than 20VA for standard AC type at 240V
- Less than 11VA for 24V AC type
- Less than 330mA for 24V DC type

Power Failure Effect

- Not affected by power failure shorter than 30msec, otherwise reset to the initial state.

Operating Environments

- 0 to 50°C [32 to 122°F] , 45 to 85% RH

Memory Backup

- Backed up by non-volatile memory.
- Number of writing : Approx. 100,000 times
- Data retaining period : Approx. 10 years

Net Weight

- Approx. 560g

External Dimensions (W x H x D)

- 96 x 96 x 100mm

Compliance with Standards

- CE Mark
- UL/cUL Recognized
- C-Tick Mark



Multi-Loop Digital Temperature Controller MA901

Model and Suffix Code

Specifications	Model and Suffix Code																	
Model	MA901-8 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐																	
Control method	PID control with AT (reverse action) ☐ F PID control with AT (direct action) ☐ D																	
Input type	See Range and Input Code Table ☐																	
Range	See Range and Input Code Table ☐																	
Control output (CH 1 to 4)	Relay output Voltage pulse DC current : 0 to 20mA DC current : 4 to 20mA Open collector output ☐ M V 7 8 D																	
Control output (CH 5 to 8)	Relay output Voltage pulse DC current : 0 to 20mA DC current : 4 to 20mA Open collector output ☐ M V 7 8 D																	
Power supply voltage	24V AC/DC 100 to 240V AC ☐ 3 4																	
Alarm 1 ¹	See Alarm 1 Code Table (Standard) ☐																	
Alarm 2 ^{1, 2, 3}	No alarm Heater break alarm (CTL-6-P-N) Heater break alarm (CTL-12-S56-10L-N) See Alarm 2 and 3 Code Table ☐ N P S																	
Alarm 3 ¹	No alarm See Alarm 2 and 3 Code Table ☐ N																	
Contact input	Not supplied Contact input (RUN/STOP, Area select • Data set) ☐ N D																	
Digital communications ²	Not supplied RS-232C (3-wire system : RKC standard) RS-422A (4-wire system : RKC standard) RS-485 (2-wire system : RKC standard) RS-485 (2-wire system : MODBUS) RS-422A (4-wire system : MODBUS) RS-232C (3-wire system : MODBUS) ☐ N 1 4 5 6 7 8																	
Waterproof/Dustproof	Not supplied Waterproof/Dustproof protection ☐ N 1																	
Instrument version	Version symbol ☐ Y																	

¹ Alarm output is common to all channels.

² Heater break alarm and communication/contact input cannot be specified on the same hardware.

³ Heater break output is not available if either control output is current output.

Range and Input Code Table

Thermocouple

Input	Code	Range	Input	Code	Range	Input	Code	Range
K ¹	K : 01	0 – 200°C	J ¹	J : 22	0.0 – 200.0°C	T ¹	T : 01	-199.9 – 400.0°C
	K : 02	0 – 400°C		J : 23	0.0 – 600.0°C		T : 02	-199.9 – 100.0°C
	K : 03	0 – 600°C		J : 30	-199.9 – 600.0°C		T : 03	-100.0 – 200.0°C
	K : 04	0 – 800°C		J : A1	0 – 800°F		T : 04	0.0 – 350.0°C
	K : 05	0 – 1000°C		J : A2	0 – 1600°F		T : A1	-199.9 – 752.0°F
	K : 06	0 – 1200°C		J : A3	0 – 2192°F		T : A2	-100.0 – 200.0°F
	K : 07	0 – 1372°C	R ²	J : A6	0 – 400°F		T : A3	-100.0 – 400.0°F
	K : 08	-199.9 – 300.0°C		J : A9	-199.9 – 999.9°F		T : A4	0.0 – 450.0°F
	K : 09	0.0 – 400.0°C		J : B6	0.0 – 800.0°F		T : A5	0.0 – 752.0°F
	K : 10	0.0 – 800.0°C		R : 01	0 – 1600°C	W5Re W26Re	W : 01	0 – 2000°C
	K : 13	0 – 100°C		R : 02	0 – 1769°C		W : 02	0 – 2320°C
	K : 14	0 – 300°C		R : 04	0 – 1350°C		W : A1	0 – 4000°F
	K : 17	0 – 450°C	S ²	R : A1	0 – 3200°F	PL II	A : 01	0 – 1300°C
	K : 20	0 – 500°C		R : A2	0 – 3216°F		A : 02	0 – 1390°C
	K : 29	0.0 – 200.0°C		S : 01	0 – 1600°C		A : 03	0 – 1200°C
	K : 37	0.0 – 600.0°C		S : 02	0 – 1769°C		A : A1	0 – 2400°F
	K : 38	-199.9 – 800.0°C		S : A1	0 – 3200°F		A : A2	0 – 2534°F
	K : A1	0 – 800°F	B ²	S : A2	0 – 3216°F	U ¹	U : 01	-199.9 – 600.0°C
J ¹	K : A2	0 – 1600°F		B : 01	400 – 1800°C		U : 02	-199.9 – 100.0°C
	K : A3	0 – 2502°F		B : 02	0 – 1820°C		U : 03	0.0 – 400.0°C
	K : A4	0.0 – 800.0°F		B : A1	800 – 3200°F		U : A1	-199.9 – 999.9°F
	K : A9	20 – 70°F	E	B : A2	0 – 3308°F	L	U : A2	-100.0 – 200.0°F
	K : B2	-199.9 – 999.9°F		E : 01	0 – 800°C		U : A3	0.0 – 999.9°F
	J : 01	0 – 200°C		E : 02	0 – 1000°C		L : 01	0 – 400°C
	J : 02	0 – 400°C	N	E : A1	0 – 1600°F		L : 02	0 – 800°C
	J : 03	0 – 600°C		E : A2	0 – 1832°F		L : A1	0 – 800°F
	J : 04	0 – 800°C		N : 01	0 – 1200°C		L : A2	0 – 1600°F
	J : 05	0 – 1000°C		N : 02	0 – 1300°C			
	J : 06	0 – 1200°C		N : 06	0.0 – 800.0°C			
	J : 07	-199.9 – 300.0°C		N : A1	0 – 2300°F			
	J : 08	0.0 – 400.0°C		N : A2	0 – 2372°F			
	J : 09	0.0 – 800.0°C		N : A5	0.0 – 999.9°F			
	J : 10	0 – 450°C						

¹ Type K, J, T and U input : Accuracy is not guaranteed less than -100.0°C (-158.0°F)

² Type R, S and B input : Accuracy is not guaranteed between 0 to 399°C (0 to 799°F)

³ DC voltage input can be used for the input of 0 to 20mA (in case of 0 to 5V) and 4 to 20mA (1 to 5V) by attaching 250Ω shunt resistor (sold separately) to input terminal. (The model of shunt resistor : KD100-55)

RTD

Input	Code	Range
Pt100	D : 01	-199.9 – 649.0°C
	D : 02	-199.9 – 200.0°C
	D : 03	-100.0 – 50.0°C
	D : 04	-100.0 – 100.0°C
	D : 05	-100.0 – 200.0°C
	D : 06	0.0 – 50.0°C
	D : 07	0.0 – 100.0°C
	D : 08	0.0 – 200.0°C
	D : 09	0.0 – 300.0°C
	D : 10	0.0 – 500.0°C
JPt100	D : A1	-199.9 – 999.9°F
	D : A2	-199.9 – 400.0°F
	D : A3	-199.9 – 200.0°F
	D : A4	-199.9 – 100.0°F
	D : A5	-100.0 – 300.0°F
	D : A6	0.0 – 100.0°F
	D : A7	0.0 – 200.0°F
	D : A8	0.0 – 400.0°F
	D : A9	0.0 – 500.0°F
	P : 01	-199.9 – 649.0°C
	P : 02	-199.9 – 200.0°C
	P : 03	-100.0 – 50.0°C
	P : 04	-100.0 – 100.0°C
	P : 05	-100.0 – 200.0°C
	P : 06	0.0 – 50.0°C
	P : 07	0.0 – 100.0°C
	P : 08	0.0 – 200.0°C
	P : 09	0.0 – 300.0°C
	P : 10	0.0 – 500.0°C

Voltage DC ³

Input	Code	Range
0–5V	4 : 01	0.0 – 100.0
0–10V	5 : 01	0.0 – 100.0
1–5V	6 : 01	0.0 – 100.0

Alarm 1 Code Table

Code	Type
A	Deviation High
B	Deviation Low
C	Deviation High/Low
D	Band Alarm
E	Deviation High with Alarm Hold

Code	Type
F	Deviation Low with Alarm Hold
G	Deviation High/Low with Alarm Hold
H	Process High
J	Process Low
K	Process High with Alarm Hold

Code	Type
L	Process Low with Alarm Hold
M	FAIL
R ¹	Loop break alarm (LBA)
V	Set value High
W	Set value Low

¹ Loop break alarm is not available for Heat/Cool PID control type.

Alarm 2 and 3 Code Table

Code	Type
A	Deviation High
B	Deviation Low
C	Deviation High/Low
D	Band Alarm
E	Deviation High with Alarm Hold

Code	Type
F	Deviation Low with Alarm Hold
G	Deviation High/Low with Alarm Hold
H	Process High
J	Process Low
K	Process High with Alarm Hold

Code	Type
L	Process Low with Alarm Hold
M	FAIL
V	Set value High
W	Set value Low

Accessories

Current transformer for heater break alarm

CTL-6-P-N (0 – 30A)

CTL-12-S56-10L-N (0 – 100A)

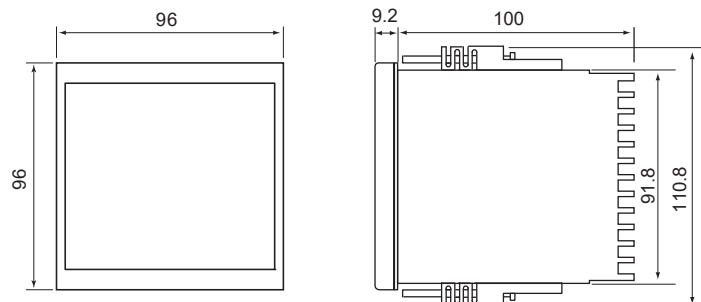
Shunt resistor for DC current input

KD100-55

Multi-Loop Digital Temperature Controller MA901

External Dimensions and Rear Terminals

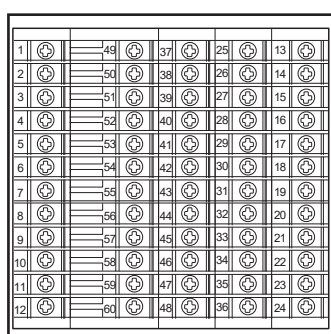
Unit : mm



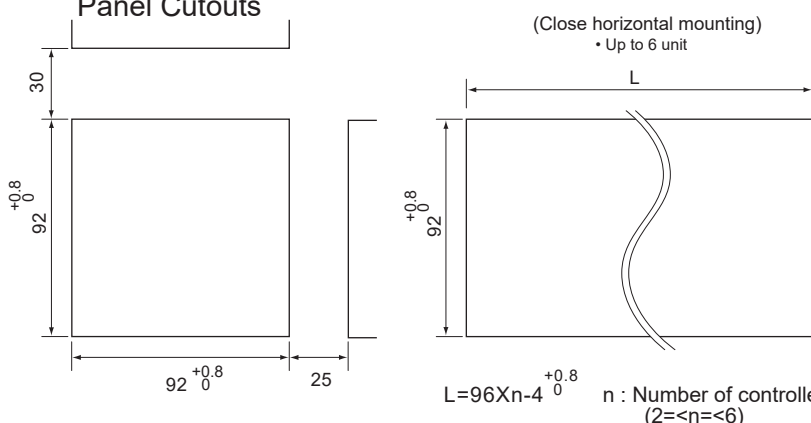
For mounting of the controllers, panel thickness must be between 1 to 10mm.
When mounting multiple controllers close together, the panel strength should be checked to ensure proper support..

• Dustproof and waterproof are not effective when controllers are closely mounted.

Panel Cutouts



• Use the solder less terminal appropriate to the screw size.
Screw size : M3 X 6



$L = 96Xn - 4$ (tolerance +0.8/0) n : Number of controllers (2 ≤ n ≤ 6)

No.	Description
1	AC L DC +
2	100 to 240V 24V -
3	NO
4	NO
5	Output 1 (1) Relay contact (2) Voltage pulse/Current (3) Open collector output
6	Output 2 (1) Relay contact (2) Voltage pulse/Current (3) Open collector output
7	Output 3 (1) Relay contact (2) Voltage pulse/Current (3) Open collector output
8	Output 4 (1) Relay contact (2) Voltage pulse/Current (3) Open collector output
9	Output 5 (1) Relay contact (2) Voltage pulse/Current (3) Open collector output
10	Output 6 (1) Relay contact (2) Voltage pulse/Current (3) Open collector output
11	Output 7 (1) Relay contact (2) Voltage pulse/Current (3) Open collector output
12	Output 8 (1) Relay contact (2) Voltage pulse/Current (3) Open collector output

No.	Description
49	Alarm 2 output
50	NO
51	Alarm 3 output
52	NO
53	Output 5 (1) Relay contact (2) Voltage pulse/Current (3) Open collector output
54	Output 6 (1) Relay contact (2) Voltage pulse/Current (3) Open collector output
55	Output 7 (1) Relay contact (2) Voltage pulse/Current (3) Open collector output
56	Output 8 (1) Relay contact (2) Voltage pulse/Current (3) Open collector output
57	Output 9 (1) Relay contact (2) Voltage pulse/Current (3) Open collector output
58	Output 10 (1) Relay contact (2) Voltage pulse/Current (3) Open collector output
59	Output 11 (1) Relay contact (2) Voltage pulse/Current (3) Open collector output
60	Output 12 (1) Relay contact (2) Voltage pulse/Current (3) Open collector output

<Heater break alarm type>

No.	Description
37	COM
38	CT1
39	CT2
40	COM
41	CT3
42	CT4
43	COM
44	CT5
45	CT6
46	COM
47	CT7
48	CT8

No.	Description
25	CH5 Measured input (1) Thermocouple (2) RTD (3) Voltage
26	CH6 Measured input (1) Thermocouple (2) RTD (3) Voltage
27	CH7 Measured input (1) Thermocouple (2) RTD (3) Voltage
28	CH8 Measured input (1) Thermocouple (2) RTD (3) Voltage
29	CH9 Measured input (1) Thermocouple (2) RTD (3) Voltage
30	CH10 Measured input (1) Thermocouple (2) RTD (3) Voltage
31	CH11 Measured input (1) Thermocouple (2) RTD (3) Voltage
32	CH12 Measured input (1) Thermocouple (2) RTD (3) Voltage
33	CH13 Measured input (1) Thermocouple (2) RTD (3) Voltage
34	CH14 Measured input (1) Thermocouple (2) RTD (3) Voltage
35	CH15 Measured input (1) Thermocouple (2) RTD (3) Voltage
36	CH16 Measured input (1) Thermocouple (2) RTD (3) Voltage

No.	Description
13	CH1 Measured input (1) Thermocouple (2) RTD (3) Voltage
14	CH2 Measured input (1) Thermocouple (2) RTD (3) Voltage
15	CH3 Measured input (1) Thermocouple (2) RTD (3) Voltage
16	CH4 Measured input (1) Thermocouple (2) RTD (3) Voltage
17	CH5 Measured input (1) Thermocouple (2) RTD (3) Voltage
18	CH6 Measured input (1) Thermocouple (2) RTD (3) Voltage
19	CH7 Measured input (1) Thermocouple (2) RTD (3) Voltage
20	CH8 Measured input (1) Thermocouple (2) RTD (3) Voltage
21	CH9 Measured input (1) Thermocouple (2) RTD (3) Voltage
22	CH10 Measured input (1) Thermocouple (2) RTD (3) Voltage
23	CH11 Measured input (1) Thermocouple (2) RTD (3) Voltage
24	CH12 Measured input (1) Thermocouple (2) RTD (3) Voltage

<Contact input • Communications type>

No.	Description
37	DI
38	DI
39	COM
40	DI 1
41	DI 2
42	DI 4
43	DI SET
44	SG SG SG
45	T(A) T(R/A) SD
46	T(B) T(R/B) RD
47	R(A)
48	T(R/B)

Heater break alarm and communication/contact input cannot be specified on the same hardware.



CB100L



Digital Controller

General Description

The CB100L is a family of FM approved high limit or low limit controllers. They have a wide range of options including a variety of inputs, two additional alarms, analog retransmission of variables, waterproof/dustproof, digital inputs, and digital communications. This series is CE marked, UL/cUL, and FM approved.

Features

- ☆ Over/Under temperature protection
- ☆ Digital communications
- ☆ Peak temperature measurement
- ☆ Over temperature timer
- ☆ CE marked, UL/cUL and FM approved

Over/Under Temperature Protection

The CB100L provide you the over/under temperature protection for your equipment or products in process. When the temperature goes above or below the set value (high limit or low limit), the CB100L will interrupt or remove the power from the process. This output can be used for alarm or interrupting power to the heater circuit.

For safety reason, the output will be retained until reset operation is executed even when the measured value goes back to the normal range. Reset operation can be executed by front key operation, communication, or digital input.

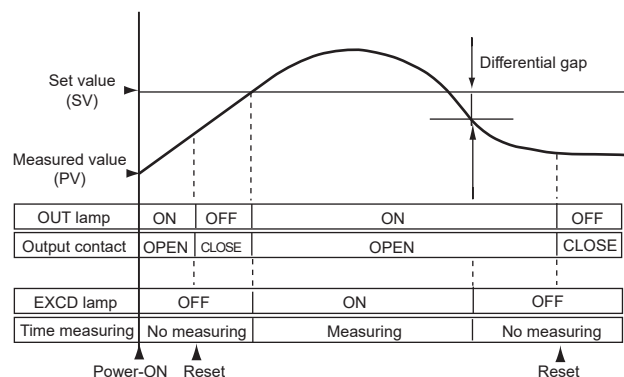
The CB100L limit actions can also be configured :

Limit output at power-up : ON/OFF

Alarm output : Energized/de-energized

Limit type : High-limit for over-temperature / Low-limit for under-temperature

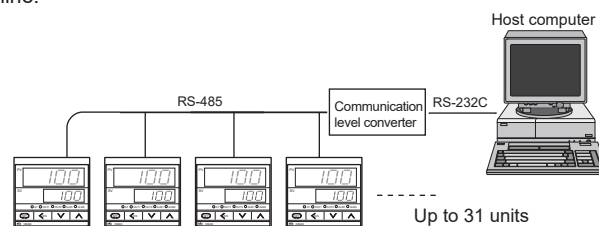
The CB100L measures the time while the measured value goes above/below the set value, and it retains the peak value.



• Output contact is open when power is OFF.(De-energized output)

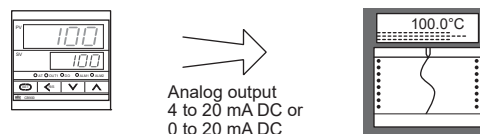
Digital Communications (Optional)

CB100L offer RS-485 communications with ANSI protocol. Up to 31 units can be connected to one RS-485 communication line.



Analog Output (Optional)

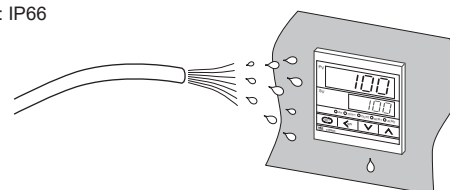
Analog output is available for measured value retransmission. For the set value retransmission, please ask RKC for details.



Waterproof/Dustproof (Optional)

For operation in severe environments or when washdown is required, the IP66(65) rating is available for waterproof/dustproof protection.

CB100L: IP66



Close Horizontal Mounting

The CB100L allow you to mount horizontally up to 6 units close together to make effective use of control board or panel space.



Specifications

Input

Input

- a) Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS)
W5Re/W26Re (ASTM), U, L (DIN)
 - Influence of external resistance : Approx. 0.2μV/Ω
 - Input break action : Up-scale
- b) RTD : Pt100 (JIS/IEC), JPt100 (JIS)
 - Influence of input lead resistance : Approx. 0.01[%/Ω] of reading
 - Maximum 10Ω per wire
 - Input break action : Up-scale
- c) DC voltage : 0 to 5V, 1 to 5V, 0 to 10V (0.0 to 100.0% Default value)
 - Input break action : Down-scale
- d) DC current : 0 to 20mA, 4 to 20mA (0.0 to 100.0% Default value)
 - For DC current input, connect a 250 Ω resistor to the input terminals.
 - Input break action : Down-scale

Sampling Time

0.5 sec

PV Bias

Temperature input : -1999(-199.9) to 9999(999.9)°C[°F]
DC voltage, DC current : - span to +span

Performance

Measuring Accuracy

- a) Thermocouple
 - ±(0.3% of reading + 1 digit) or ±2°C (4°F) whichever is larger
 - Accuracy is not guaranteed between 0 and 399°C (0 and 799°F) for type R, S and B.
 - Accuracy is not guaranteed between -199.9 and -100.0°C (-199.9 and -158.0°F) for type T and U.
- b) RTD
 - ±(0.3% of reading + 1 digit) or ±0.8°C (1.6°F) whichever is larger
- c) DC voltage and DC current
 - ±(0.3% of span + 1 digit)

Insulation Resistance

More than 20MΩ (500V DC) between measured terminals and ground
More than 20MΩ (500V DC) between power terminals and ground

Dielectric Strength

1000V AC for one minute between measured terminals and ground
1500V AC for one minute between power terminals and ground

Action

Limit Action

- High limit control
 - De-energized or energized output can be selected
 - Low limit control is available.
 - The control output contact goes OPEN (CLOSED when set to energized) when measured value exceeds the set value, and it is retained until reset operation is executed. The reset can be made by front key operation, communication, or digital input.
 - The state of control output contact when power-up can be configured. The output contact is OPEN when power-up for standard de-energized type.

Limit Action Output

Relay contact output, Form A contact, 250V AC, 3A (resistive load)

Other Standard Functions

Peak Hold

- Memorizes the maximum value during the measured value exceeds the set value (when high limit control).
 - Peak hold value can be reset by front key operation, communication, or digital input.
 - Peak hold value is reset when the controller is turned off.
 - "----" is displayed before the measured value exceeds the set value for the first time.

Integrated Time Measuring

- Counts up the time during the measured value exceeds the set value (when high limit control).
 - Integrated time can be reset by front key operation, communication, or digital input.
 - Integrated time is reset when the controller is turned off.

Optional Functions

Temperature Alarms

- a) Number of points : 2 points
- b) Type : Deviation High, Deviation Low, Deviation High/Low, Band, Process High, Process Low (Hold action is available)
- c) Differential gap : 2°C or 2.0°C (temperature input)
0.2% of span (DC voltage/current input)
- d) Output : Relay contact output, Form A contact, 250VAC, 1A (resistive load)

Communications

- a) Communication method : RS-485 (2-wire)
- b) Communication speed : 1200, 2400, 4800, 9600, 19200 BPS
- c) Bit format
 - Start bit : 1
 - Data bit : 7 or 8
 - Parity bit : Even, odd or without parity
 - Stop bit : 1 or 2
- d) Communication code : ASCII(JIS) 7-bit code
- e) Maximum connection : 31 (Address can be set from 0 to 99.)

Contact Input

- a) Number of points : 1 point
- b) Input method : Non-voltage contact input
 - Resistance at OPEN : 500KΩ or more
 - Resistance at CLOSE : 10Ω or less
- c) Function : Reset function is executed when the mode is changed from OPEN to CLOSE.

Analog Output

- a) Number of points : 1 point
- b) Output signal : 4 to 20mA DC, 0 to 20mA DC
- c) Allowable load resistance : 600Ω or less
- d) Output type : Measured value
- e) Accuracy : ±0.3% of span
- f) Resolution : More than 10 bits

Waterproof/Dustproof

- IP66
- Waterproof/dustproof protection only effective from the front in panel mounted installations.
- Waterproof/dustproof protection is not available for close horizontal mounting installations.

General specifications

Supply Voltage

- a) 85 to 264V AC (Including supply voltage variation)
[Rating : 100 to 240V AC] (50/60Hz common)
- b) 21.6 to 26.4V AC (Including supply voltage variation)
[Rating : 24V AC] (50/60Hz common)
- c) 21.6 to 26.4V DC (Ripple rate 10% p-p or less) [Rating : 24V DC]

Power Consumption

- Less than 10VA for standard AC type
- Less than 5VA for 24V AC type
- Less than 160mA for 24V DC type

Power Failure Effect

- Not affected by power failure shorter than 20msec, otherwise reset to the initial state.

Operating Environments : 0 to 50°C [32 to 122°F] , 45 to 85% RH

Memory Backup : Backed up by non-volatile memory.

Net Weight

Approx. 170g

External Dimensions (W x H x D)

48 x 48 x 100mm

Compliance with Standards

- CE Mark
- UL/cUL Recognized
- FM Approved



Model and Suffix Code

Specifications	Model and Suffix Code														
Size	CB100 (1/16 DIN size) ☐ ☐ ☐ - M * ☐ ☐ - ☐ - ☐ ☐ / ☐														
Type	Temperature Limit controller ☐ L ☐														
Input type	See Range and Input Code Table ☐														
Range	See Range and Input Code Table ☐														
Output	Relay output ☐ M ☐														
Alarm 1	No alarm ☐ See Alarm Code Table ☐ N ☐														
Alarm 2	No alarm ☐ See Alarm Code Table ☐ N ☐														
Analog output	Not supplied ☐ 0 to 20mA DC ☐ 4 to 20mA DC ☐ N 7 8														
Digital communications ¹ Contact input ¹	Not supplied ☐ Digital communications : RS-485 (2-wire system) ☐ Contact input ☐ N 5 D														
Waterproof/Dustproof	Not supplied ☐ Waterproof/Dustproof protection ☐ • Body color is only available in black. ☐ N 1														
Body color	Black ☐ White ☐ A N														

¹ Either communications or contact input can be selected.

Range and Input Code Table

Thermocouple (Field-programmable)

Input	Code	Range
K	K 01	0 – 200°C
	K 02	0 – 400°C
	K 03	0 – 600°C
	K 04	0 – 800°C
	K 05	0 – 1000°C
	K 06	0 – 1200°C
	K 07	0 – 1372°C
	K 13	0 – 100°C
	K 14	0 – 300°C
	K 17	0 – 450°C
	K 20	0 – 500°C
	K A1	0 – 800°F
	K A2	0 – 1600°F
	K A3	0 – 2502°F
	K A9	20 – 70°F
J	J 01	0 – 200°C
	J 02	0 – 400°C
	J 03	0 – 600°C
	J 04	0 – 800°C
	J 05	0 – 1000°C
	J 06	0 – 1200°C
	J A1	0 – 800°F
	J A2	0 – 1600°F
	J A3	0 – 2192°F
	J A6	0 – 400°F
R ¹	R 01	0 – 1600°C
	R 02	0 – 1769°C
	R 04	0 – 1350°C
	R A1	0 – 3200°F
	R A2	0 – 3216°F
S ¹	S 01	0 – 1600°C
	S 02	0 – 1769°C
	S A1	0 – 3200°F
	S A2	0 – 3216°F
B ¹	B 01	400 – 1800°C
	B 02	0 – 1820°C
	B A1	800 – 3200°F
	B A2	0 – 3308°F

¹ Type R, S and B input : Accuracy is not guaranteed between 0 and 399°C (0 and 799°F)

² Type T and U input : Accuracy is not guaranteed between -199.9 and -100.0°C (-199.9 and -158.0°F)

³ DC current input : A 250 Ω resistor is externally connected to input terminals.

Input	Code	Range
E	E 01	0 – 800°C
	E 02	0 – 1000°C
	E A1	0 – 1600°F
	E A2	0 – 1832°F
N	N 01	0 – 1200°C
	N 02	0 – 1300°C
	N A1	0 – 2300°F
	N A2	0 – 2372°F
T ²	T 01	-199.9 – 400.0°C
	T 02	-199.9 – 100.0°C
	T 03	-100.0 – 200.0°C
	T 04	0.0 – 350.0°C
	T A1	-199.9 – 752.0°F
	T A2	-100.0 – 200.0°F
	T A3	-100.0 – 400.0°F
	T A4	0.0 – 450.0°F
	T A5	0.0 – 752.0°F
	T A6	0.0 – 100.0°F
W5Re /W26Re	W 01	0 – 2320°C
	W A1	0 – 4000°F
PL II	A 01	0 – 1300°C
	A 02	0 – 1390°C
	A 03	0 – 1200°C
	A A1	0 – 2400°F
	A A2	0 – 2534°F
U ²	U 01	-199.9 – 600.0°C
	U 02	-199.9 – 100.0°C
	U 03	0.0 – 400.0°C
	U A1	-199.9 – 999.9°F
	U A2	-100.0 – 200.0°F
	U A3	0.0 – 999.9°F
L	L 01	0 – 400°C
	L 02	0 – 800°C
	L A1	0 – 800°F
	L A2	0 – 1600°F

RTD (Field-programmable)

Input	Code	Range
Pt100	D 01	-199.9 – 649.0°C
	D 02	-199.9 – 200.0°C
	D 03	-100.0 – 50.0°C
	D 04	-100.0 – 100.0°C
	D 05	-100.0 – 100.0°C
	D 06	0.0 – 50.0°C
	D 07	0.0 – 100.0°C
	D 08	0.0 – 200.0°C
	D 09	0.0 – 300.0°C
	D 10	0.0 – 500.0°C
	D A1	-199.9 – 999.9°F
	D A2	-199.9 – 400.0°F
	D A3	-199.9 – 200.0°F
	D A4	-199.9 – 100.0°F
	D A5	-100.0 – 300.0°F
	D A6	0.0 – 100.0°F
JPt100	P 01	-199.9 – 649.0°C
	P 02	-199.9 – 200.0°C
	P 03	-100.0 – 50.0°C
	P 04	-100.0 – 100.0°C
	P 05	-100.0 – 200.0°C
	P 06	0.0 – 50.0°C
	P 07	0.0 – 100.0°C
	P 08	0.0 – 200.0°C
	P 09	0.0 – 300.0°C
	P 10	0.0 – 500.0°C

Voltage and Current ³ (Field-programmable)

Input	Code	Range
0 – 5V DC	4 01	0.0 – 100.0 (Default)
0 – 10V DC	5 01	0.0 – 100.0 (Default)
1 – 5V DC	6 01	0.0 – 100.0 (Default)
0 – 20mA DC	7 01	0.0 – 100.0 (Default)
4 – 20mA DC	8 01	0.0 – 100.0 (Default)

Alarm Code Table

Code	Type
A	Deviation High
B	Deviation Low
C	Deviation High/Low
D	Band Alarm
E	Deviation High with Hold
F	Deviation Low with Hold
G	Deviation High/Low with Hold

Code	Type
H	Process High
J	Process Low
K	Process High with Hold
L	Process Low with Hold

Supply Voltage

100 - 240V AC	24V AC	24V DC
---------------	--------	--------

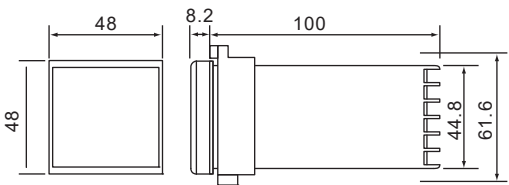
Accessories

Shunt resistor for DC current input
KD100-55

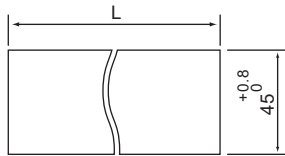
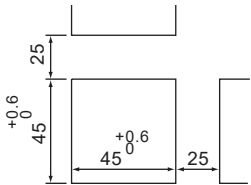
Terminal cover
KCA100-517 (CB100L) KCA900-58 (CB900L)

External Dimensions and Rear Terminals

Unit : mm



Panel cutouts



$$L = (48 \times n - 3) \begin{matrix} +0.6 \\ 0 \end{matrix}$$

n : Number of controllers (2= n = ≤ 6)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----

No.	Description
1	AC 100 to 240V AC 24V DC 24V Power supply
2	
3	AO Analog output
4	
5	Limit output
6	Relay contact output

No.	Description
7	Alarm 2 Alarm output
8	Alarm 1 Relay contact output
9	
10	Measured input (1) Thermocouple (2) RTD (3) Voltage/Current
11	
12	

No.	Description
13	SG
14	T/R(A) Communications
15	T/R(B) Contact input
16	
17	
18	



SA200L



Digital Controller

General Description

The SA200L is a FM approved high limit or low limit controllers. The SA200L is a high performance 32nd DIN controller that has been specifically designed for applications where panel space is critical. Though small in size, this controller has exceptional features such as dual display of process and set value, mounting flexibility, alarms and MODBUS communications. SA200L is CE marked, UL/cUL, UKCA and FM approved.

Features

- ☆ Over/Under temperature protection
- ☆ 1/32 DIN size with dual display
- ☆ Peak temperature measurement
- ☆ Over temperature timer
- ☆ CE marked, UL/cUL, UKCA and FM approved

Over/Under Temperature Protection

The SA200L provide you the over/under temperature protection for your equipment or products in process. When the temperature goes above or below the set value (high limit or low limit), the SA200L will interrupt or remove the power from the process. This output can be used for alarm or interrupting power to the heater circuit.

For safety reason, the output will be retained until reset operation is executed even when the measured value goes back to the normal range. Reset operation can be executed by front key operation, communication, or digital input.

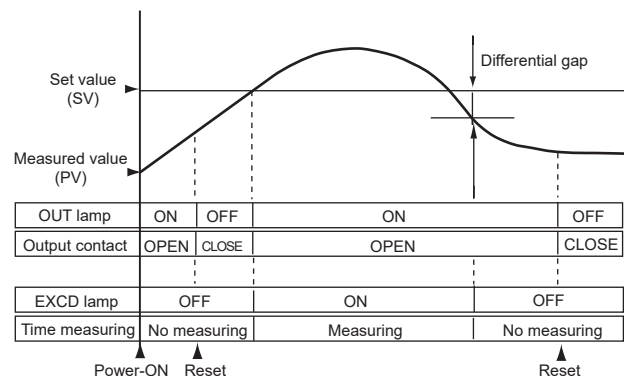
The SA200L limit actions can also be configured :

Limit output at power-up : ON/OFF

Alarm output : Energized/de-energized

Limit type : High-limit for over-temperature / Low-limit for under-temperature

The SA200L measures the time while the measured value goes above/below the set value, and it retains the peak value.



• Output contact is open when power is OFF.(De-energized output)

Easy Maintenance

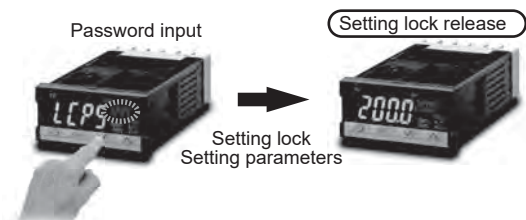
The internal assembly of the SA200L can be removed from the front of a control board.

It is easy to inspect, maintain or replace the instrument because it does not require access from the back of the panel.



Setting lock with password

The setting lock function is equipped for safety reasons, which hides the setting parameters when locked and displays the setting parameters when a password is entered.



Analog Retransmission Output (Optional)

The output 1 can be configured as an analog retransmission output.

With this function, the measured value can be retransmitted as an analog current signal (4-20mA / 0-20mA).



Digital Communications (Optional)

The SA200L offers an optional RS-485 communications interface for networking to computers. MODBUS or ANSI protocol can be selected.

Up to 31 units, can be multi-dropped on one RS-485 communication line.





Specifications

Input

Input

- a) Thermocouple : K, J, E, T, R, S, B, N, C (W5Re/W26Re) (JIS/IEC) PLII (NBS) U, L (DIN)
 - Input impedance : Approx. 1MΩ
 - Influence of external resistance : Approx. 0.2μV/Ω
 - Input break action : Up-scale
- b) RTD : Pt100(JIS/IEC), JPt100(JIS)
 - Influence of lead resistance : Approx. 0.01[%/Ω] of span
 - Maximum 10Ω per wire
 - Input break action : Up-scale
 - Input short action : Down-scale
- c) DC voltage : 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
- d) DC current : 0 to 20mA DC, 4 to 20mA DC
 - For DC current input, connect a 250 Ω resistor to the input terminals.
 - Input break action : Down-scale
 - Reading is around zero for 0 to 5V DC input, 0 to 10V DC input and 0 to 20mA DC input.

Sampling Time

0.5 sec. 0.25sec (Selectable)

Input Digital Filter

1 to 100 sec (OFF when 0 is set.)

PV Bias

- span to +span (Within -1999 to 9999)

PV Ratio

0.500 to 1.500

Performance

Measuring Accuracy

- a) Thermocouple
 - ±(0.3% of reading + 1 digit) or ±2°C (4°F) whichever is larger
 - Accuracy is not guaranteed less than 399°C (0 and 799°F) for type R, S and B.
 - Accuracy is not guaranteed less than -100.0°C (-158.0°F) for type T and U.
- b) RTD
 - ±(0.3% of reading + 1 digit) or ±0.8°C (1.6°F) whichever is larger
- c) DC voltage and DC current
 - ±(0.3% of span + 1 digit)

Insulation Resistance

More than 20MΩ (500V DC) between measured terminals and ground
More than 20MΩ (500V DC) between power terminals and ground

Dielectric Strength

1500V AC for one minute between measured terminals and ground
1500V AC for one minute between power terminals and ground

Action

Limit Action

- High limit control
 - De-energized or energized output can be selected
 - Low limit control is available.
 - The control output contact goes OPEN (CLOSED when set to energized) when measured value exceeds the set value, and it is retained until reset operation is executed. The reset can be made by front key operation, communication, or digital input.
 - The state of control output contact when power-up can be configured. The output contact is OPEN when power-up for standard de-energized type.

Other Standard Functions

Hold Function

- Memorizes the maximum value and the minimum value.
 - Hold value can be reset by front key operation, communication, or digital input.
 - Hold value is reset when the controller is turned off.

Integrated Time Measuring

- Counts up the time during the measured value exceeds the set value (High limit or Low limit).
 - Integrated time can be reset by front key operation, communication, or digital input.
 - Integrated time is reset when the controller is turned off.

Display :

Less than 100 min : 0 min 00 sec (0.00) to 99 min 59 sec (99.59)
100 min or more : 100 min 00 sec (100.0) to 999 min 59 sec (999.59)
More than 1000 min : "----" display

Output

Output

- Can be set for limit control, alarm or retransmission function.
 - Output can be set for energized/de-energized action.
 - Output can be set for AND/OR logic calculation.
- Number of outputs : 2 points

Output Type

- a) Relay contact output (OUT1, OUT2) : 240V AC 2A, 30V DC 2A (Resistive load) Form A contact
- b) Current output (OUT1) :
 - 0 to 20mA DC (Load resistance : less than 400Ω)
 - 4 to 20mA DC (Load resistance : less than 400Ω)

Optional Functions

Temperature Alarms

- a) Number of points : 2 points
- b) Type :
 - Deviation High, Deviation Low, Deviation High/Low, Band, Process High, Process Low
 - Set value high, Set value low (Hold action is available)
- c) Differential gap : 0 to span
- d) Other function :
 - Selection of action for input abnormality.
 - Alarm timer function, Interlock function.

Communications

- a) Communication method : RS-485 (2-wire)
- c) Protocol : ANSI X3.28 (1976) 2.5 A4, MODBUS
- b) Communication speed : 2400, 4800, 9600, 19200, 38400, 57600 BPS
- c) 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
- d) Maximum connection : 31 (Address can be set from 1 to 99.)

Contact Input

- a) Number of points : 2 point
- b) Input method : Non-voltage contact input
 - Resistance at OPEN : 500KΩ or more
 - Resistance at CLOSE : 10Ω or less
- c) Function :
 - DI1: Limit Output Reset Function
 - DI2: Alarm Interlock Reset Function

Retransmission

- Retransmission output is allocated to OUT1.
- a) Type : Process value, Set value, Deviation

Waterproof/Dustproof

- IP66
- Dustproof and waterproof protection are effective only from the front direction when installed on a panel.

General specifications

Supply Voltage

- a) 85 to 264V AC (Including supply voltage variation) [Rating : 100 to 240V AC] (50/60Hz common)
- b) 21.6 to 26.4V AC (Including supply voltage variation) [Rating : 24V AC] (50/60Hz common)
- c) 21.6 to 26.4V DC (Ripple rate 10% p-p or less) [Rating : 24V DC]

Power Consumption

- Less than 7VA for standard AC type
- Less than 4VA for 24V AC type
- Less than 100mA for 24V DC type

Power Failure Effect

- Not affected by power failure shorter than 20msec, otherwise reset to the initial state.

Operating Environments : -10 to 55°C [14 to 131°F] , 5 to 95% RH

Memory Backup : Backed up by non-volatile memory.

- Number of writing : Approx. 100,000 times
- Data retaining period : Approx. 10 years

Net Weight

Approx. 110g

External Dimensions (W x H x D)

48 x 24 x 100mm

Compliance with Standards

- FM : FM3545
- UL : UL 61010-1
- cUL : CAN/CSA-C22.2 No.61010-1
- CE Mark
- LVD : EN61010-1, EMC: EN61326-1, RoHS: EN IEC 63000
- UKCA Mark
- Electrical Safety: EN61010-1, EMC: EN61326-1, RoHS: EN IEC 63000
- RCM: EN55011





Model and Suffix Code

Specifications	Model and Suffix Code														
Model	SA200 (48 x 24 mm, 1/32 DIN size)														
Controller Type	Temperature Limit Controller														
Input and Range	See Range and Input Code Table														
OUT 1 (Control, alarm or retransmission output)	1	Relay contact output DC current output : 0 to 20mA DC current output : 4 to 20mA					M	7	8						
OUT 2 (Control or alarm output)	1	No output Relay contact output					N	M							
Power supply voltage		24V AC/DC 100 to 240V AC								3	4				
Alarm 1		No alarm See Alarm Code Table								N					
Alarm 2		No alarm See Alarm Code Table										N			
Communication Contact input		Not supplied Digital communications : RS-485 (RKC standard) Digital communications : RS-485 (MODBUS) External contact input										N	5	6	D
Waterproof/Dustproof		Not supplied Waterproof/Dustproof protection										N	1		
Body color		Black												A	
Output allocation code	2	Standard output See Output Allocation Code Table													No code

1 Either output 1 or output 2 must be relay

2 Standard output :

- a) OUT 1 = Relay contact output (Code : M) : Limit control output (De-energized)
OUT 2 = No output
- b) OUT 1 = Relay contact output (Code : M) : Limit control output (De-energized)
OUT 2 = Relay contact output (Code : M) : Alarm 1 or OR logic output of Alarm 1 and Alarm 2.
- c) OUT 1 = DC current output (Code : 7 or 8) : Retransmission output.
OUT 2 = Relay contact output (Code : M) : Limit control output (De-energized)

Range and Input Code Table

Thermocouple input (Field-programmable)

Input	Code	Range
K (JIS/IEC)	K : 01	0 to 200°C
	K : 02	0 to 400°C
	K : 03	0 to 600°C
	K : 04	0 to 800°C
	K : 05	0 to 1000°C
	K : 06	0 to 1200°C
	K : 07	0 to 1372°C
	K : 13	0 to 100°C
	K : 14	0 to 300°C
	K : 20	0 to 500°C
	K : 17	0 to 450°C
	K : 08	-199.9 to 300.0°C
	K : 09	0.0 to 400.0°C
	K : 10	0.0 to 800.0°C
	K : 29	0.0 to 200.0°C
	K : 37	0.0 to 600.0°C
	K : 38	-199.9 to 800.0°C
	K : A1	0 to 800°F
	K : A2	0 to 1600°F
	K : A3	0 to 2502°F
J (JIS/IEC)	J : 01	0 to 200°C
	J : 02	0 to 400°C
	J : 03	0 to 600°C
	J : 04	0 to 800°C
	J : 05	0 to 1000°C
	J : 06	0 to 1200°C
	J : 10	0 to 450°C
	J : 07	-199.9 to 300.0°C
	J : 08	0.0 to 400.0°C
	J : 09	0.0 to 800.0°C
	J : 22	0.0 to 200.0°C
	J : 23	0.0 to 600.0°C
	J : 30	-199.9 to 600.0°C
	J : A1	0 to 800°F
	J : A2	0 to 1600°F
	J : A3	0 to 2192°F
R (JIS/IEC)	R : 01	0 to 1600°C
	R : 02	0 to 1769°C
	R : 04	0 to 1350°C
	R : A1	0 to 3200°F
	R : A2	0 to 3216°F

Input	Code	Range
S (JIS/IEC)	S : 01	0 to 1600°C
	S : 02	0 to 1769°C
	S : A1	0 to 3200°F
	S : A2	0 to 3216°F
B (JIS/IEC)	B : 01	400 to 1800°C
	B : 02	0 to 1820°C
	B : A1	800 to 3200°F
	B : A2	0 to 3308°F
E (JIS/IEC)	E : 01	0 to 800°C
	E : 02	0 to 1000°C
	E : A1	0 to 1600°F
	E : A2	0 to 1832°F
N (JIS/IEC)	N : 01	0 to 1200°C
	N : 02	0 to 1300°C
	N : 06	0.0 to 800.0°C
	N : A1	0 to 2300°F
	N : A2	0 to 2372°F
	N : A5	0.0 to 999.9°F
T (JIS/IEC)	T : 01	-199.9 to 400.0°C
	T : 02	-199.9 to 100.0°C
	T : 03	-100.0 to 200.0°C
	T : 04	0.0 to 350.0°C
	T : A1	-199.9 to 752.0°F
	T : A2	-100.0 to 200.0°F
	T : A3	-100.0 to 400.0°F
	T : A4	0.0 to 450.0°F
C (W5Re/W26Re) (JIS/IEC)	W : 01	0 to 2000°C
	W : 02	0 to 2320°C
	W : A1	0 to 4000°F
	W : A2	0 to 2534°F
PLII (NBS)	A : 01	0 to 1300°C
	A : 02	0 to 1390°C
	A : 03	0 to 1200°C
	A : A1	0 to 2400°F
U (DIN)	U : 01	-199.9 to 600.0°C
	U : 02	-199.9 to 100.0°C
	U : 03	0.0 to 400.0°C
	U : A1	-199.9 to 999.9°F
L (DIN)	L : 01	0 to 400°C
	L : 02	0 to 800°C
	L : A1	0 to 800°F
	L : A2	0 to 1600°F

1 Type R, S and B input : Accuracy is not guaranteed between 0 and 399°C (0 and 799°F).

2 Type T and U input : Accuracy is not guaranteed less than -100.0°C (-158.0°F).

3 DC current input : A 250 Ω resistor is externally connected at the input terminals.

RTD input (Field-programmable)

Input	Code	Range
Pt100 (JIS/IEC)	D : 01	-199.9 to 649.0°C
	D : 02	-199.9 to 200.0°C
	D : 03	-100.0 to 50.0°C
	D : 04	-100.0 to 100.0°C
	D : 05	-100.0 to 200.0°C
	D : 06	0.0 to 300.0°C
	D : 07	0.0 to 100.0°C
	D : 08	0.0 to 200.0°C
	D : 09	0.0 to 300.0°C
	D : 10	0.0 to 500.0°C
	D : A1	-199.9 to 999.9°F
	D : A2	-199.9 to 400.0°F
	D : A3	-199.9 to 200.0°F
	D : A4	-100.0 to 100.0°F
	D : A5	-100.0 to 300.0°F
	D : A6	0.0 to 100.0°F
JPt100 (JIS)	P : 01	-199.9 to 649.0°C
	P : 02	-199.9 to 200.0°C
	P : 03	-100.0 to 50.0°C
	P : 04	-100.0 to 100.0°C
	P : 05	-100.0 to 200.0°C
	P : 06	0.0 to 300.0°C
	P : 07	0.0 to 100.0°C
	P : 08	0.0 to 200.0°C
	P : 09	0.0 to 300.0°C
	P : 10	0.0 to 500.0°C

Voltage/Current DC input ³(Field-programmable)

Input	Code	Range
0 to 5V	4 : 01	0.0 to 100.0%
0 to 10V	5 : 01	0.0 to 100.0%
1 to 5V	6 : 01	0.0 to 100.0%
0 to 20mA	7 : 01	0.0 to 100.0%
4 to 20mA	8 : 01	0.0 to 100.0%

Temperature Limit Controller SA200L

Model and Suffix Code

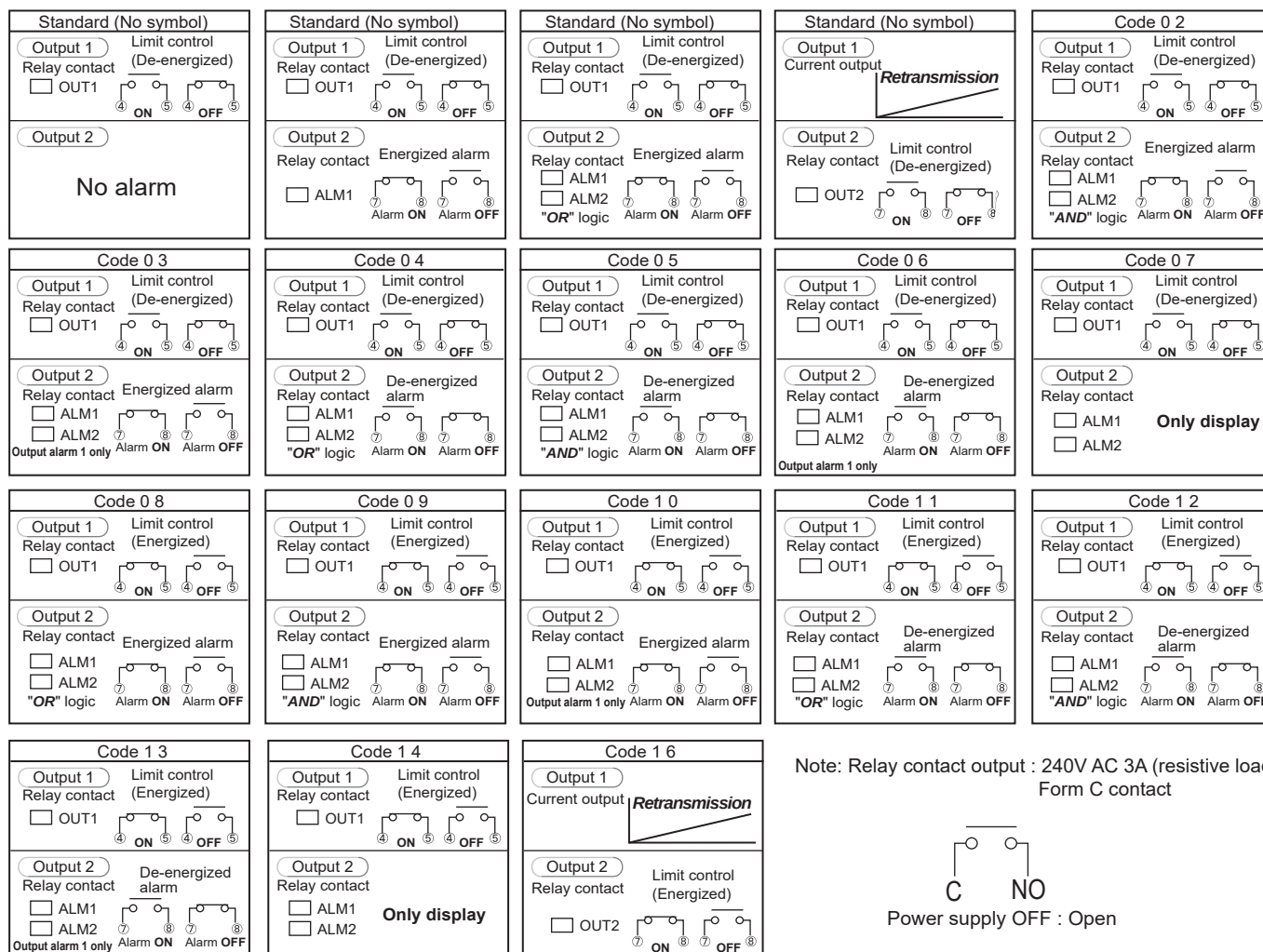
Alarm Code Table

A	Deviation High	B	Deviation Low	C	Deviation High/Low	D	Deviation Band
E	Deviation High with Hold	F	Deviation Low with Hold	G	Deviation High/Low with Hold	H	Process High
J	Process Low	K	Process High with Hold	L	Process Low with Hold	V	Set value High
W	Set value Low						

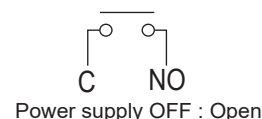
Output Allocation Code Table

Code	Specifications		
	Control methods	Output 1	Output 2
0 2	Limit control + Alarm 1, 2	Limit Control output (De-energized)	AND logic output of Alarm 1 and Alarm 2 (Energized)
0 3	Limit control + Alarm 1, 2	Limit Control output (De-energized)	Alarm 1 output (Energized)
0 4	Limit control + Alarm 1, 2 or only Alarm 1	Limit Control output (De-energized)	OR logic output of Alarm 1 and Alarm 2 (De-energized)
0 5	Limit control + Alarm 1, 2	Limit Control output (De-energized)	AND logic output of Alarm 1 and Alarm 2 (De-energized)
0 6	Limit control + Alarm 1, 2	Limit Control output (De-energized)	Alarm 1 output (De-energized)
0 7	Limit control + Alarm 1, 2 or only Alarm 1 ¹	Limit Control output (De-energized)	No output
0 8	Limit control + Alarm 1, 2 or only Alarm 1	Limit Control output (Energized)	OR logic output of Alarm 1 and Alarm 2 (Energized)
0 9	Limit control + Alarm 1, 2	Limit Control output (Energized)	AND logic output of Alarm 1 and Alarm 2 (Energized)
1 0	Limit control + Alarm 1, 2	Limit Control output (Energized)	Alarm 1 output (Energized)
1 1	Limit control + Alarm 1, 2 or only Alarm 1	Limit Control output (Energized)	OR logic output of Alarm 1 and Alarm 2 (De-energized)
1 2	Limit control + Alarm 1, 2	Limit Control output (Energized)	AND logic output of Alarm 1 and Alarm 2 (De-energized)
1 3	Limit control + Alarm 1, 2	Limit Control output (Energized)	Alarm 1 output (De-energized)
1 4	Limit control + Alarm 1, 2 or only Alarm 1 ¹	Limit Control output (Energized)	No output
1 6	Retransmission + Limit control	Retransmission output	Limit Control output (Energized)

¹ The alarm monitor can only be confirmed by front LCD display or serial communication.



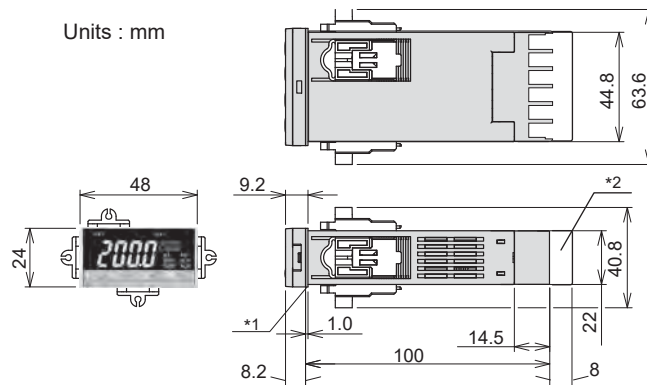
Note: Relay contact output : 240V AC 3A (resistive load), Form C contact



Accessories

Name	Model code
Shunt resistor for DC current input	KD100-55

External Dimensions and Rear Terminals



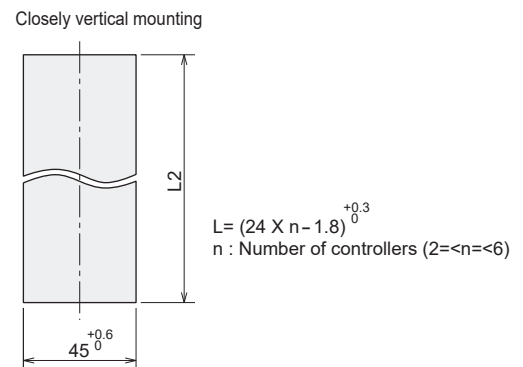
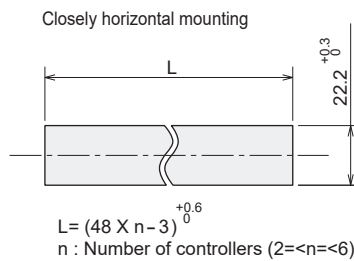
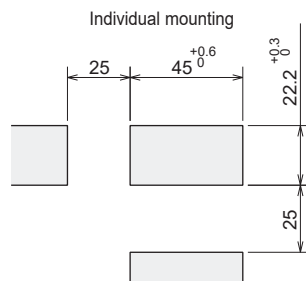
*1 For Waterproof/Dustproof models, a rubber gasket is added.

*2 Terminal cover is optional.

For mounting of the SA200L, panel thickness must be between 1-10 mm. When mounting multiple SA200Ls close together, the panel strength should be checked to ensure proper support.

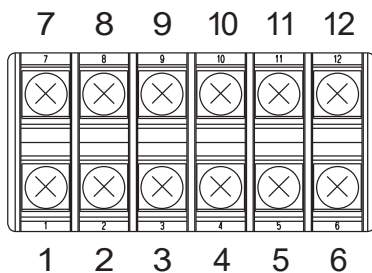
Two mounting brackets will be furnished for installation of the instrument at either the top and bottom or sides.

Close vertically and horizontally mounted instruments cannot be combined in one installation.



Warning

If the SA200s have waterproof/dustproof option, protection may be compromised by close mounting. Close vertical mounting is not available when a shunt resistor for current input is used.



No.	1	2	3	4	5	6
Contents	 100 to 240V AC		 Current			
	 24V AC/DC		 Relay contact		 Relay contact	
	Power supply		Output 1		Output 2	

No.	7	8	9	10	11	12
Contents	 ① Thermocouple ② RTD ③ Voltage / Current *			 SG T/R(A) T/R(B) RS-485 DI1 DI2		
	Measured input			Communications / Contact inputs		

Note :

- For terminal connection, use lug that is 5.8 mm wide or less.

*A 250Ω resistor is externally connected at the input terminals.

SA100L



General Description

The SA100L is a FM approved high limit or low limit controllers. The SA100L is a socket mounting type temperature controller and is available for mounting inside the panel or by easily mounting on DIN rail. The SA100L has features such as analog retransmission output and digital communications for networking.

SA100L is CE marked, UL/cUL, UKCA and FM approved.

Features

- ☆ Over/Under temperature protection
- ☆ Digital communications
- ☆ Peak temperature measurement
- ☆ Over temperature timer
- ☆ CE marked, UL/cUL, UKCA and FM approved

Over/Under Temperature Protection

The SA100L provide you the over/under temperature protection for your equipment or products in process. When the temperature goes above or below the set value (high limit or low limit), the SA100L will interrupt or remove the power from the process. This output can be used for alarm or interrupting power to the heater circuit.

For safety reason, the output will be retained until reset operation is executed even when the measured value goes back to the normal range. Reset operation can be executed by front key operation, communication, or digital input.

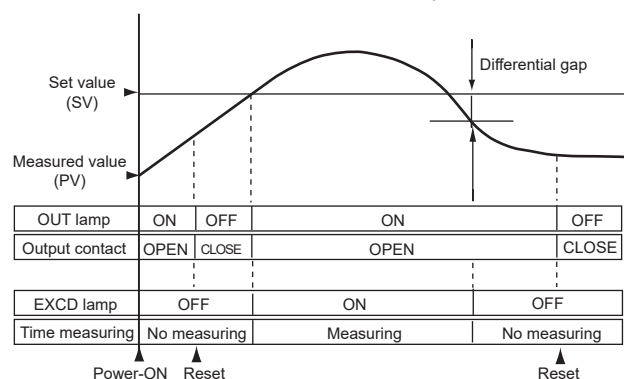
The SA100L limit actions can also be configured :

Limit output at power-up : ON/OFF

Alarm output : Energized/de-energized

Limit type : High-limit for over-temperature / Low-limit for under-temperature

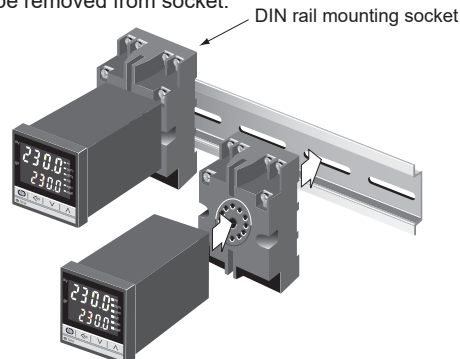
The SA100L measures the time while the measured value goes above/below the set value, and it retains the peak value.



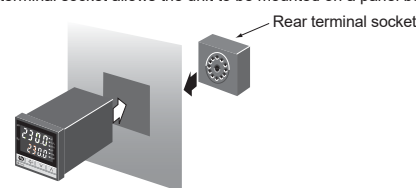
• Output contact is open when power is OFF.(De-energized output)

Simple Mounting on DIN Rail

The SA100L can be simply mounted on a DIN rail with DIN rail mounting socket. The maintenance is also simple, as the unit can be removed from socket.



• The rear terminal socket allows the unit to be mounted on a panel board.

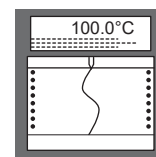


Analog Retransmission Output (Optional)

An analog output is available so that the process value can be retransmitted an analog signal to a remote instrument such as a recorder or data-logging equipment.



Analog output
4 to 20 mA DC or
0 to 20 mA DC



Digital Communications (Optional)

The SA100L offers an optional RS-485 communications interface for networking to computers, PLCs and SCADA software. MODBUS or ANSI protocol can be selected. Up to 32 units, including host computer, can be multi-dropped on one RS-485 communication line. When the communication feature is selected, the external contact input is not available.

Temperature Limit Controller SA100L



Specifications

Input

Input

- a) Thermocouple : K, J, R, S, B, E, T, N (JIS/IEC), PLII (NBS) C(W5Re/W26Re) (JIS/ASTM), U, L (DIN)
 - Influence of external resistance : Approx. 0.2 μ V/ Ω
 - Input break action : Up-scale
- b) 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
- c) DC voltage : 0 to 5V, 1 to 5V, 0 to 10V (0.0 to 100.0% Default value)
 - DC voltage input can be used for the input of 0 to 20mA (in case of 0 to 5V) and 4 to 20mA (1 to 5V) by attaching 250 Ω shunt resistor (sold separately) to input terminal.
 - Refer to the Input and Range Code Table for details.
 - Input break action : Down-scale

Sampling Time

0.5 sec. 0.25sec (Selectable)

Input digital filter

0 to 100 sec (OFF when 0 is set.)

PV Bias

- span to +span

PV Ratio

0.500 to 1.500

Performance

Measuring Accuracy

- a) Thermocouple
 - ± 1 (1% of reading + 1 digit) or $\pm 2^{\circ}\text{C}$ (4°F) whichever is larger
 - Accuracy is not guaranteed between 0 and 399 $^{\circ}\text{C}$ (0 and 799 $^{\circ}\text{F}$) for type R, S and B.
 - Accuracy is not guaranteed less than -100.0 $^{\circ}\text{C}$ (-158.0 $^{\circ}\text{F}$) for type T and U.
- b) RTD
 - ± 0.3 (0.3% of reading + 1 digit) or $\pm 0.8^{\circ}\text{C}$ (1.6°F) whichever is larger
- c) DC voltage and DC current
 - ± 0.3 (0.3% of span + 1 digit)

Insulation Resistance

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

Dielectric Strength

1000V AC for one minute between measured terminals and ground
1500V AC for one minute between power terminals and ground

Action

Limit Action

- High limit control
 - De-energized or energized output can be selected
 - Low limit control is available.
 - The control output contact goes OPEN (CLOSED when set to energized) when measured value exceeds the set value, and it is retained until reset operation is executed. The reset can be made by front key operation, communication, or digital input.
 - The state of control output contact when power-up can be configured. The output contact is OPEN when power-up for standard de-energized type.

Other Standard Functions

Hold Function

- Memorizes the maximum value and the minimum value.
 - Hold value can be reset by front key operation, communication, or digital input.
 - Hold value is reset when the controller is turned off.

Integrated Time Measuring

Counts up the time during the measured value exceeds the set value (High limit or Low limit).

- Integrated time can be reset by front key operation, communication, or digital input.
- Integrated time is reset when the controller is turned off.

Display :

Less than 100 min : 0 min 00 sec (0.00) to 99 min 59 sec (99.59)
100 min or more : 100 min 00 sec (100.0) to 999 min 59 sec (999.59)
More than 1000 min : " ---- " display

Output

Output

- Can be set for limit control, alarm or retransmission function.
- Output can be set for energized/de-energized action.
- Output can be set for AND/OR logic calculation.
- Number of outputs : 2 points

Output Type

- a) Relay contact output (OUT1, OUT2) : 240V AC 3A, 30V DC 1A (Resistive load) Form C contact
 - Electrical life: 300,000 times or more (AC 240 V 2 A DC 30 V 1 A)
 - 200,000 times or more (AC 240 V 3 A)
- b) Current output (OUT1) :
 - 0 to 20mA DC (Load resistance : less than 400 Ω)
 - 4 to 20mA DC (Load resistance : less than 400 Ω)

Optional Functions

Temperature Alarms

- a) Number of points : 2 points
- b) Type :
 - Deviation High, Deviation Low, Deviation High/Low, Band, Process High, Process Low
 - Set value high, Set value low
 - (Hold action is available)
- c) Differential gap : 0 to span
- d) Other function :
 - Selection of action for input abnormality.
 - Alarm timer function, Interlock function.

Communications

- a) Communication method : RS-485 (2-wire)
- c) Protocol : ANSI X3.28 (1976) 2.5 A4, MODBUS
- b) Communication speed : 2400, 4800, 9600, 19200, 38400, 57600 BPS
- c) 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
- d) Maximum connection : 31 (Address can be set from 1 to 99.)

Contact Input

- a) Number of points : 2 point
- b) Input method : Non-voltage contact input
 - Resistance at OPEN : 500K Ω or more
 - Resistance at CLOSE : 10 Ω or less
- c) Function :
 - DI1: Limit Output Reset Function
 - DI2: Interlock Reset Function

Retransmission

- Retransmission output is allocated to OUT1.
- a) Type : Process value, Set value, Deviation, Manipulated value

Waterproof/Dustproof

- IP66
- Waterproof/dustproof protection only effective from the front in panel mounted installations.
- Waterproof/dustproof protection is not available when controllers are closely mounted.

General specifications

Supply Voltage

- a) 85 to 264V AC (Including supply voltage variation)
 - [Rating : 100 to 240V AC] (50/60Hz common)
- b) 21.6 to 26.4V AC (Including supply voltage variation)
 - [Rating : 24V AC] (50/60Hz common)
- c) 21.6 to 26.4V DC (Ripple rate 10% p-p or less) [Rating : 24V DC]

Power Consumption

- Less than 7VA for standard AC type
- Less than 4VA for 24V AC type
- Less than 100mA for 24V DC type

Power Failure Effect

- Not affected by power failure shorter than 20msec, otherwise reset to the initial state.

Operating Environments : 0 to 50 $^{\circ}\text{C}$ [32 to 122 $^{\circ}\text{F}$] , 45 to 85% RH

- Memory Backup** : Backed up by non-volatile memory.
- Number of writing : Approx. 100,000 times
- Data retaining period : Approx. 10 years

Net Weight

Approx. 110g

Compliance with Standards

- FM : FM3545
- UL : UL 61010-1
- cUL : CAN/CSA-C22.2 No.61010-1
- CE Mark
 - LVD: EN61010-1, EMC: EN61326-1, RoHS: EN IEC 63000
- UKCA Mark
 - Electrical Safety: EN61010-1, EMC: EN61326-1, RoHS: EN IEC 63000
- RCM: EN55011





Model and Suffix Code

Specifications	Model and Suffix Code															
Model	SA100 (48 x 48 mm, 1/16 DIN size, socket mounting type)															
Controller Type	Temperature Limit Controller	L														Y
Input and Range	See Range and Input Code Table															
OUT 1 (Control, alarm or retransmission output)	1	Relay contact output				DC current output : 0 to 20mA				DC current output : 4 to 20mA				M		
OUT 2 (Control or alarm output)	1	No output				Relay contact output				N			M			
Power supply voltage		24V AC/DC				100 to 240V AC				3			4			
Alarm 1		No alarm				See Alarm Code Table				N						
Alarm 2		No alarm				See Alarm Code Table				N						
Communication Contact input		Not supplied				Digital communications : RS-485 (RKC standard)				Digital communications : RS-485 (MODBUS)				N		
		External contact input												5		
														6		
														D		
Waterproof/Dustproof		Not supplied				Waterproof/Dustproof protection				N			1			
Output allocation code	2	Standard output				See Output Allocation Code Table							No code			
Instrument version		Version symbol														Y

1 Either output 1 or output 2 must be relay

2 Standard output :

- a) OUT 1 = Relay contact output (Code : M) : Limit control output (De-energized)
 OUT 2 = No output
 b) OUT 1 = Relay contact output (Code : M) : Limit control output (De-energized)
 OUT 2 = Relay contact output (Code : M) : Alarm 1 or OR logic output of Alarm 1 and Alarm 2.
 c) OUT 1 = DC current output (Code : 7 or 8) : Retransmission output.
 OUT 2 = Relay contact output (Code : M) : Limit control output (De-energized)

Range and Input Code Table

Thermocouple input (Field-programmable)

Input	Code	Range
K (JIS/IEC)	K : 01	0 to 200°C
	K : 02	0 to 400°C
	K : 03	0 to 600°C
	K : 04	0 to 800°C
	K : 05	0 to 1000°C
	K : 06	0 to 1200°C
	K : 07	0 to 1372°C
	K : 13	0 to 100°C
	K : 14	0 to 300°C
	K : 20	0 to 500°C
	K : 17	0 to 450°C
	K : 08	-199.9 to 300.0°C
	K : 09	0.0 to 400.0°C
	K : 10	0.0 to 800.0°C
	K : 29	0.0 to 200.0°C
	K : 37	0.0 to 600.0°C
	K : 38	-199.9 to 800.0°C
	K : A1	0 to 800°F
	K : A2	0 to 1600°F
	K : A3	0 to 2502°F
J (JIS/IEC)	J : 01	0 to 200°C
	J : 02	0 to 400°C
	J : 03	0 to 600°C
	J : 04	0 to 800°C
	J : 05	0 to 1000°C
	J : 06	0 to 1200°C
	J : 10	0 to 450°C
	J : 07	-199.9 to 300.0°C
	J : 08	0.0 to 400.0°C
	J : 09	0.0 to 800.0°C
	J : 22	0.0 to 200.0°C
	J : 23	0.0 to 600.0°C
	J : 30	-199.9 to 600.0°C
	J : A1	0 to 800°F
	J : A2	0 to 1600°F
	J : A3	0 to 2192°F
R (JIS/IEC)	R : 01	0 to 1600°C
	R : 02	0 to 1769°C
	R : 04	0 to 1350°C
	R : A1	0 to 3200°F
	R : A2	0 to 3216°F

Input	Code	Range
S (JIS/IEC)	S : 01	0 to 1600°C
	S : 02	0 to 1769°C
	S : A1	0 to 3200°F
	S : A2	0 to 3216°F
B (JIS/IEC)	B : 01	400 to 1800°C
	B : 02	0 to 1820°C
	B : A1	800 to 3200°F
	B : A2	0 to 3308°F
E (JIS/IEC)	E : 01	0 to 800°C
	E : 02	0 to 1000°C
	E : A1	0 to 1600°F
	E : A2	0 to 1832°F
N (JIS/IEC)	N : 01	0 to 1200°C
	N : 02	0 to 1300°C
	N : 06	0.0 to 800.0°C
	N : A1	0 to 2300°F
	N : A2	0 to 2372°F
	N : A5	0.0 to 999.9°F
T (JIS/IEC)	T : 01	-199.9 to 400.0°C
	T : 02	-199.9 to 100.0°C
	T : 03	-100.0 to 200.0°C
	T : 04	0.0 to 350.0°C
	T : A1	-199.9 to 752.0°F
	T : A2	-100.0 to 200.0°F
C (W5Re/W26Re) (JIS/IEC)	C : 01	0 to 2000°C
	C : 02	0 to 2320°C
	C : A1	0 to 4000°F
	C : A2	0 to 1300°C
PLII (NBS)	PLII : 01	0 to 1300°C
	PLII : 02	0 to 1390°C
	PLII : A1	0 to 2400°F
	PLII : A2	0 to 2534°F
U (DIN)	U : 01	-199.9 to 600.0°C
	U : 02	-199.9 to 100.0°C
	U : 03	0.0 to 400.0°C
	U : A1	-199.9 to 999.9°F
	U : A2	-100.0 to 200.0°F
	U : A3	0.0 to 999.9°F
L (DIN)	L : 01	0 to 400°C
	L : 02	0 to 800°C
	L : A1	0 to 800°F
	L : A2	0 to 1600°F

1 Type R, S and B input : Accuracy is not guaranteed between 0 and 399°C (0 and 799°F).

2 Type T and U input : Accuracy is not guaranteed less than -100.0°C (-158.0°F).

3 DC current input : A 250 Ω resistor is externally connected at the input terminals.

RTD input (Field-programmable)

Input	Code	Range
Pt100 (JIS/IEC)	D : 01	-199.9 to 649.0°C
	D : 02	-199.9 to 200.0°C
	D : 03	-100.0 to 50.0°C
	D : 04	-100.0 to 100.0°C
	D : 05	-100.0 to 200.0°C
	D : 06	0.0 to 50.0°C
	D : 07	0.0 to 100.0°C
	D : 08	0.0 to 200.0°C
	D : 09	0.0 to 300.0°C
	D : 10	0.0 to 500.0°C
JPt100 (JIS)	D : A1	-199.9 to 999.9°F
	D : A2	-199.9 to 400.0°F
	D : A3	-199.9 to 200.0°F
	D : A4	-100.0 to 100.0°F
	D : A5	-100.0 to 300.0°F
	D : A6	0.0 to 100.0°F
	D : A7	0.0 to 200.0°F
	D : A8	0.0 to 400.0°F
	D : A9	0.0 to 500.0°F
	P : 01	-199.9 to 649.0°C
	P : 02	-199.9 to 200.0°C
	P : 03	-100.0 to 50.0°C
	P : 04	-100.0 to 100.0°C
	P : 05	-100.0 to 200.0°C
	P : 06	0.0 to 50.0°C
	P : 07	0.0 to 100.0°C
	P : 08	0.0 to 200.0°C
	P : 09	0.0 to 300.0°C
	P : 10	0.0 to 500.0°C

Voltage/Current DC input ³(Field-programmable)

Input	Code	Range
0 to 5V	4 : 01	0.0 to 100.0%
0 to 10V	5 : 01	0.0 to 100.0%
1 to 5V	6 : 01	0.0 to 100.0%
0 to 20mA	7 : 01	0.0 to 100.0%
4 to 20mA	8 : 01	0.0 to 100.0%

Temperature Limit Controller SA100L

Model and Suffix Code

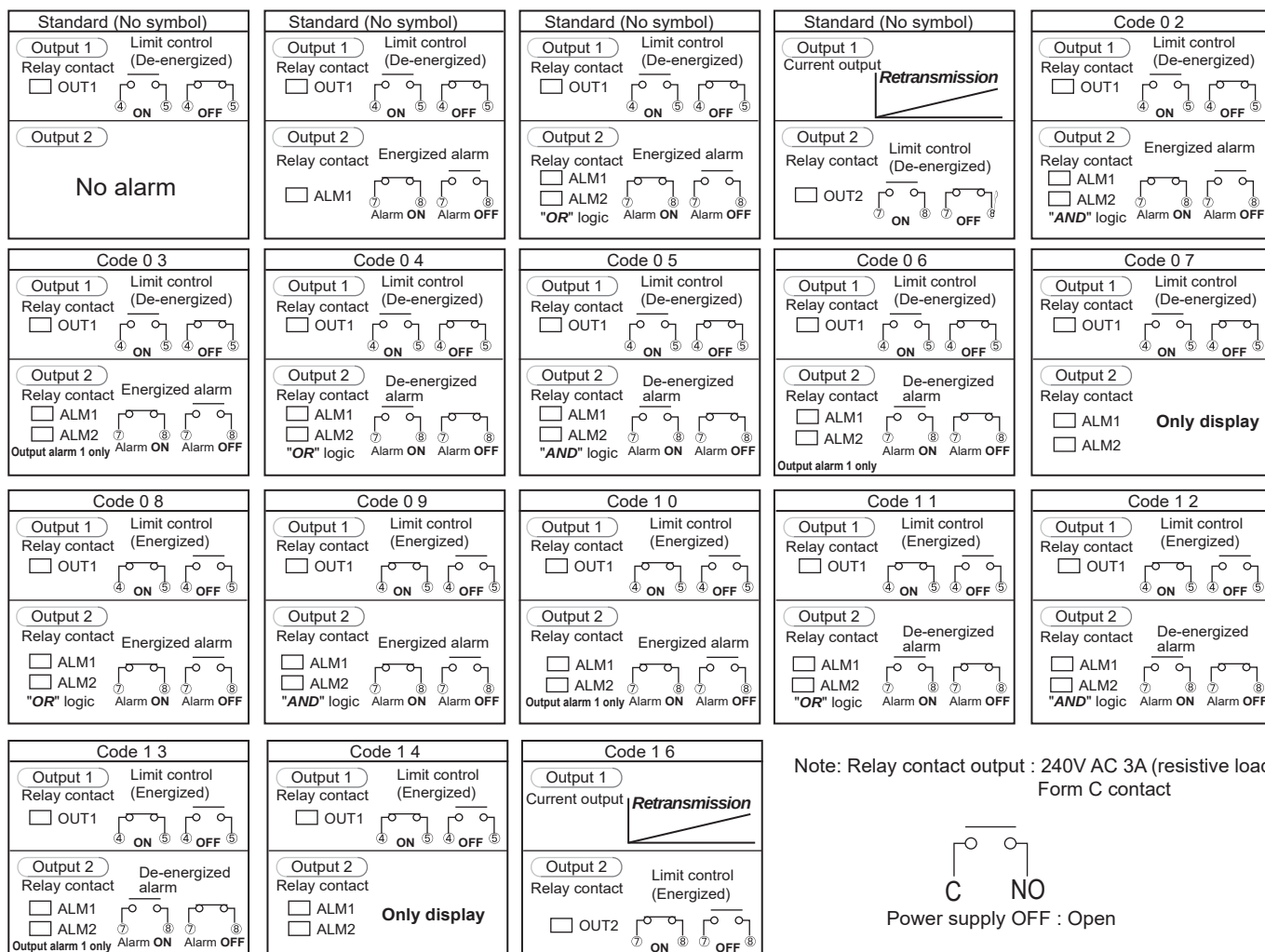
Alarm Code Table

A	Deviation High	B	Deviation Low	C	Deviation High/Low	D	Deviation Band
E	Deviation High with Hold	F	Deviation Low with Hold	G	Deviation High/Low with Hold	H	Process High
J	Process Low	K	Process High with Hold	L	Process Low with Hold	V	Set value High
W	Set value Low						

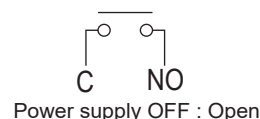
Output Allocation Code Table

Code	Specifications		
	Control methods	Output 1	Output 2
0 2	Limit control + Alarm 1, 2	Limit Control output (De-energized)	AND logic output of Alarm 1 and Alarm 2 (Energized)
0 3	Limit control + Alarm 1, 2	Limit Control output (De-energized)	Alarm 1 output (Energized)
0 4	Limit control + Alarm 1, 2 or only Alarm 1	Limit Control output (De-energized)	OR logic output of Alarm 1 and Alarm 2 (De-energized)
0 5	Limit control + Alarm 1, 2	Limit Control output (De-energized)	AND logic output of Alarm 1 and Alarm 2 (De-energized)
0 6	Limit control + Alarm 1, 2	Limit Control output (De-energized)	Alarm 1 output (De-energized)
0 7	Limit control + Alarm 1, 2 or only Alarm 1	Limit Control output (De-energized)	No output
0 8	Limit control + Alarm 1, 2 or only Alarm 1	Limit Control output (Energized)	OR logic output of Alarm 1 and Alarm 2 (Energized)
0 9	Limit control + Alarm 1, 2	Limit Control output (Energized)	AND logic output of Alarm 1 and Alarm 2 (Energized)
1 0	Limit control + Alarm 1, 2	Limit Control output (Energized)	Alarm 1 output (Energized)
1 1	Limit control + Alarm 1, 2 or only Alarm 1	Limit Control output (Energized)	OR logic output of Alarm 1 and Alarm 2 (De-energized)
1 2	Limit control + Alarm 1, 2	Limit Control output (Energized)	AND logic output of Alarm 1 and Alarm 2 (De-energized)
1 3	Limit control + Alarm 1, 2	Limit Control output (Energized)	Alarm 1 output (De-energized)
1 4	Limit control + Alarm 1, 2 or only Alarm 1	Limit Control output (Energized)	No output
1 6	Retransmission + Limit control	Retransmission output	Limit Control output (Energized)

¹ The alarm monitor can only be confirmed by front LCD display or serial communication.



Note: Relay contact output : 240V AC 3A (resistive load), Form C contact



Accessories

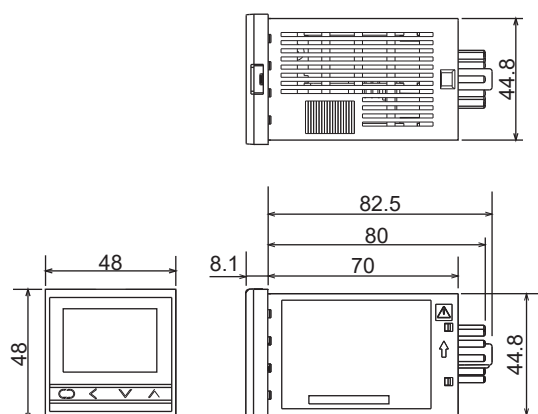
Name	Model code
Shunt resistor for DC current input	KD100-55
A panel-mounting frame	KCA100-526
Socket (FUJI ELECTRIC product)	
Name	Model code
DIN rail mounting socket	TP411X
Rear terminal socket	TP411SBA

Communication cable with connector

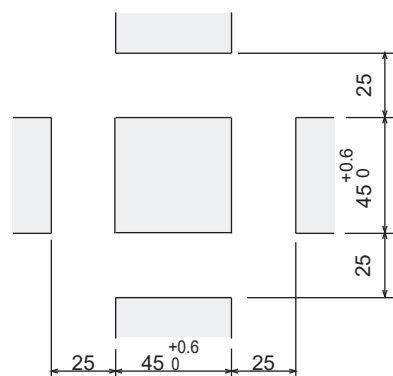
Name	Model code
With terminating resistor and no connector on open end. (Length : 1m)	W-BO-01-1000
Without terminating resistor and no connector on open end. (Length : 1m)	W-BO-02-1000
Contact input cable with connector	
Name	Model code
No connector on open end. (Length : 1m)	W-BO-03-1000

External Dimensions and Rear Layout

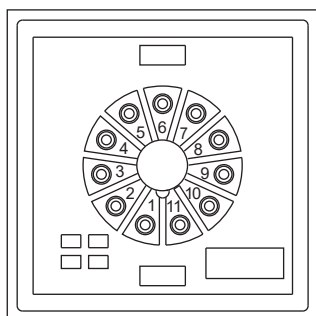
Units : mm



Panel Cutout



- Panel thickness must be between 1-10mm.
- Mounting frame is optional.



PIN	1	2	3	4	5	6	7	8	9	10	11
Contents											
	① Thermocouple ② RTD ③ Voltage			① Relay contact ② Current			Relay contact			100 to 240V AC 24V AC/DC	
	Measured input			Output 1			Output 2			Power supply	

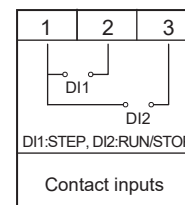
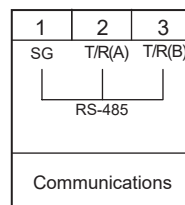
Communication function and contact input are optional.

Connect connector to bottom of instrument.

A connector and connector cable for connecting the input block is necessary to be prepared by the customer.

Housing: XHP-3 (J.S.T. Mfg. Co., Ltd. product)

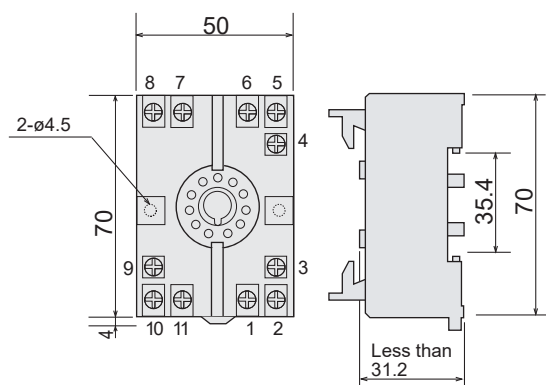
Recommended cable size: AWG30 to 22



• Socket (Optional) External Dimensions

DIN rail mounting socket type

Model : TP411X (FUJI ELECTRIC product)



Rear terminal socket type

Model : TP411SBA (FUJI ELECTRIC product)

