

## ● Measured Input (Universal Inputs)

### 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 +100.00°C, -148.00 to +212.00°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 +100.00°C, -148.00 to +212.00°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

#### Number of inputs

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

Influence of external resistance : Approx. 0.18μV/Ω (Thermocouple input)

Influence of lead resistance : Approx. 0.006% of Span/Ω (RTD input)  
 • Maximum 100Ω per wire

#### Input impedance (Voltage/Current Input)

Low voltage : 1MΩ, or more, High voltage : 1MΩ or more  
 Current : Approx. 50Ω,

#### Input Break Action

Thermocouple input : Up-scale/Down-scale (Selectable)  
 RTD input : Up-scale  
 Low voltage input : Up-scale/Down-scale (Selectable)  
 Current input : Value around 0mA  
 High voltage input : Value around 0V

Input short action (RTD Input) : Down-scale (Except 0.00 to 50.00°C)  
 Up-scale (0.00 to 50.00°C)

#### Measured input correction

a) PV bias : -span to +span  
 b) PV ratio : 0.500 to 1.500  
 c) PV digital filter : 0.1 to 100.0 sec. (OFF when 0 is set.)

## ● Current Transformer (CT) Input <Optional>

#### Number of inputs

FZ400/FZ900 : 2 points  
 FZ110 : 1 point

#### CT Type

CTL-6-P-Z, CTL-6-P-N, CTL-12-S56-10L-N

#### 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 100.0A

Sampling Time : 0.5 sec

## ● Digital Input (DI) <Optional>

#### Number of inputs

FZ400/FZ900 : Max. 6 points (DI1 to DI6)  
 FZ110 : Max. 3 points (DI1 to DI3)

Input method : Non-voltage contact input

OFF (Open state): 50 kΩ or more

ON (Close state): 1 kΩ or less

Capture judgment time: Within 200 ms

Function : Run/Stop, Auto/Mabual (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

## ● Performance

Sampling Time : 0.05 sec

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

### ● Measuring display accuracy table

Input Type	Range	Accuracy
K, J, T, E, U, L	Lower than -100°C (-148°F)	± (1.0°C [1.8°F] + 1 digit) [Approximate value]
	-100 to 500°C (-148 to 932°F)	± (0.5°C [0.9°F] + 1 digit)
	500°C (932°F) or higher	± (0.1% of Reading + 1 digit)
N, R, S, PLII <sup>*2</sup> W5Re/W26Re	Lower than 0°C (32°F)	± (2.0°C [3.6°F] + 1 digit) [Approximate value]
	0 to 1000°C (32 to 1832°F)	± (1.0°C [1.8°F] + 1 digit)
	1000°C (1832°F) or higher	± (0.1% of Reading + 1 digit)
B	Lower than 400°C (752°F)	± (70°C [126°F] + 1 digit) [Approximate value]
	400 to 1000°C (752 to 1832°F)	± (1.4°C [2.52°F] + 1 digit)
	1000°C (1832°F) or higher	± (0.1% of Reading + 1 digit)
PR40-20	Lower than 400°C (752°F)	± (20°C [36°F] + 1 digit) [Approximate value]
	400 to 1000°C (752 to 1832°F)	± (10°C [18°F] + 1 digit)
	1000°C (1832°F) or higher	± (0.1% of Reading + 1 digit)
Pt100, JPt100	Lower than 200°C (392°F)	± (0.2°C [0.36°F] + 1 digit)
	200°C (392°F) or higher	± (0.1% of Reading + 1 digit)
	0.00 to 50.00°C (90.00°F)	± (0.10°C [0.18°F] + 1 digit)
Voltage/Current	-span to +span	± (0.1% of span + 1 digit)

#### • Display accuracy:

Is equal to the above accuracy with the value below the minimum resolution rounded up.

\*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, PR20-40 and W5Re/W26Re.

### ● Resolution

a) Thermocouple : 1/200000 (PR40-20, B : 1/100000)

b) RTD : -200 to +850°C : 1/200000,  
 -100.00 to +100.00°C/0.00 to 50.00 : 1/60000

c) Voltage/Current : 0 to 10mV : 1/120000, Except 0 to 10mV : 1/200000

## ● Control

Control method : Control Brilliant II PID control

Control action : PID control, Heat/Cool type PID control,  
 Position proportioning control without feedback resistance  
 • P, PI, PD, ON/OFF control selectable  
 • Direct action/Reverse action is selectable

Other control function :

Manual control, Cascade control, 2 inputs control (Differential temperature control, Control with PV select, Input circuit error alarm), Proactive intensity, Level PID, Startup tuning

Additional function :

Inverting the Input, Temperature compensation calculation, Parameter select

Proportional band :

TC/RTD input : 0(0.0) to span (°C, °F)  
 Voltage/Current input : 0.0 to 1000.0% of span  
 (ON/OFF control when P = 0)  
 • Differential gap at ON/OFF control (High/Low individual setting) :  
 TC/RTD input : 0(0.0) to span (°C, °F)  
 Voltage/Current input : 0.0 to 100.0% of span

Cool side proportional band :

TC/RTD input : 0(0.0) to span (°C, °F)  
 Voltage/Current input : 0.0 to 1000.0% of span  
 • Heat-side and Cool-side are both ON/OFF control when P = 0.  
 • Only cooling side ON/OFF control is not available.

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)

Derivative time : 0 to 3600 sec, 0.0 to 3600.0 sec or 0.00 to 360.00 sec

(PI control when D = 0) (Heat/Cool individual setting)

Control response : Slow, Medium, Fast

Proportional cycle time : 0.1 to 100.0 sec (Heat/Cool individual setting)

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) , (OFF when 0 is set.)

Output at Control Stop mode :

-5.0 to +105.0% (Heat/Cool individual setting)

Overlap/Deadband :

TC/RTD input : -span to +span (°C, °F)  
 Voltage/Current input : -100.0 to +100.0% of input span

Undershoot suppression factor : 0.0 to 1.0

Overlap/Deadband reference point :

0.0 to 1.0  
 (0.0: Proportional band on heat-side, 1.0: Proportional band on cool-side,  
 0.5: Midpoint)

Control motor time (Position proportioning control) : 5 to 1000 sec

Control motor integral output limiter (Position proportioning control) : 0.0 to 200.0%

Output at control stop mode (Position proportioning control) :

a) Close : Output off, Open : Output off  
 b) Close : Output on, Open : Output off  
 c) Close : Output off, Open : Output on

Action at saturated output (Position proportioning control) :

Invalid : The close-side output remains ON when the valve position is fully closed  
 The open-side output remains ON when the valve position is fully opened  
 Valid : The close-side output remains ON when the valve position is fully closed  
 The open-side output remains ON when the valve position is fully opened

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)

## ● Output

- Output signal : OUT1, 2 : Relay contact output, Voltage pulse output, Current output, Continuous voltage, Transistor output  
OUT3 : Voltage pulse, Current output (Universal output)  
DO1, DO2 (FZ110) : Relay contact output  
DO1 to DO4 (FZ400/900) : Relay contact output
- Output function : Control output (Heat/Cool), Event output, LBA (Control loop break alarm output), HBA (Heater break alarm output), RUN status monitor, Output of communication monitoring result  
Manual status output, Remote status output, AT status output, SV change status output, FAIL output, Retransmission output
- Number of event/alarm : Up to 4 points
- Output specification
- 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)
- Relay contact output (4), [DO1, DO2 of FZ110, DO1 to DO4 of FZ400/900]
- 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)
- 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

## ● Analog Retransmission Output (AO)

- Output type : 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

## ● Event, Alarm function

- 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)

## ● Multi-Memory Area (recipe)

- Number of memory area : 16 areas (recipes)
- Stored parameters : 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
- Method of area select : Key operations/Communication function/External contact signal/Area soak time/Event function.
- Memory area link function
- a) 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)
  - b) Linking area number : 0 to 16

## ● Host communication (Optional)

- Communication method : RS-485, RS-422A (FZ400/900 only)  
Protocol : a) ANSI X3.28 sub-category 2.5A4 (RKC standard)  
b) MODBUS-RTU  
c) PLC communication (MAPMAN)
- Bit format : Data bit 7 or 8 (MODBUS-RTU : 8 bit fix)  
Parity bit 1(odd or even) or none  
Stop bit 1 or 2
- Communication speed : 2400bps, 4800bps, 9600bps, 19200bps, 38400bps  
57600bps
- Maximum connection : 31 units

## ● Loader communication

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

## ● General Specifications

- Supply voltage
- a) 85 to 264V AC (50/60Hz, Selectable), Rating : 100 to 240V AC
  - b) 20.4 to 26.4V AC (50/60Hz, Selectable), Rating : 24V AC
  - c) 20.4 to 26.4V DC Rating : 24V DC
- Power consumption/Rush current
- a) 100 to 240V AC type
- FZ110 : Max. 5.3VA (100V), Rush current : Less than 5.6A  
Max. 8.3 VA (240V), Rush current : Less than 13.3A
  - FZ400 : Max. 6.8VA (100V), Rush current : Less than 5.6A  
Max. 10.1VZ (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
- b) 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
- c) 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
- 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 voltage  
1500V AC for one minute between measured terminals and ground  
1500V AC for one minute between power terminals and ground  
3000V AC for one minute between measured terminals and power terminals
- Power failure
- a) 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)
- b) 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)
- 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.)
- 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
- Ambient temperature : -10 to +55°C (14 to 131°F)  
Ambient humidity : 5 to 95% RH (Non condensing)  
(MAX.W.C 29g/m<sup>3</sup> dry air at 101.3kPa)

## Weight

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

## 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