



Temperature Controller

FZ110/FZ400/FZ900 Manual

IMR03A01-E7 All Rights Reserved, Copyright © 2016, RKC INSTRUMENT INC.
Thank you for purchasing this RKC product. In order to achieve maximum performance and ensure proper operation of the instrument, carefully read all the instructions in this manual. Please place the manual in a convenient location for easy reference.
This manual describes installation and wiring of FZ110/400/900 controllers.

For detailed handling procedures and key operations, refer to separate FZ110/FZ400/FZ900 Instruction Manual.
The manual can be downloaded from the official RKC website:
<https://www.rkcinst.co.jp/english/download-center/>

WARNING

- To prevent injury to persons, damage to the instrument and the equipment, a suitable external protection device shall be required.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to the instrument and the equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to the instrument and the equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction may occur and warranty is void under these conditions.

CAUTION

- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy plant.)
- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
 - If input/output or signal lines within the building are longer than 30 meters.
 - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock to operating personnel.

- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- All wiring must be in accordance with local codes and regulations.
- To prevent instrument damage as a result of failure, protect the power line and the input/output lines from high currents with a suitable overcurrent protection device with adequate breaking capacity such as a fuse, circuit breaker, etc.
- A malfunction in this product may occasionally make control operations impossible or prevent alarm outputs, resulting in a possible hazard. Take appropriate measures in the end use to prevent hazards in the event of malfunction.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dissipation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration may occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to the instrument display, do not rub with an abrasive material or push the front panel with a hard object.

NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for explanation purpose.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty, expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
- No portion of this document may be reprinted, modified, copied, transmitted, digitized, stored, processed or retrieved through any mechanical, electronic, optical or other means without prior written approval from RKC.
- Various symbols are used on the equipment, and they have the following meaning.
 - ~: Alternating current
 - ~: Both direct and alternating current
 - ~: Reinforced insulation
 - ~: Safety precaution
- This symbol is used where the instruction manual needs to be consulted for the safety of both the operator and the equipment. Carefully read the cautions in this manual before using the instrument.

1. MOUNTING

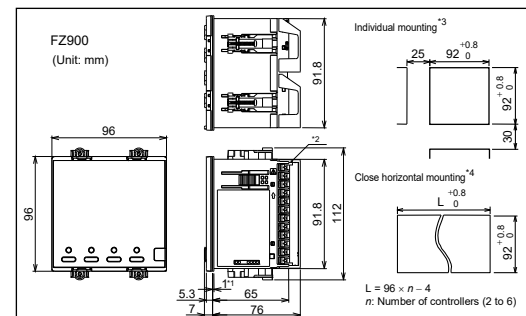
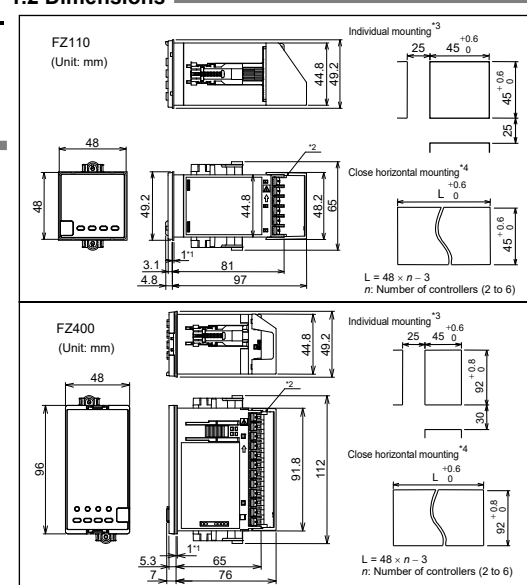
WARNING

To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.

1.1 Mounting Cautions

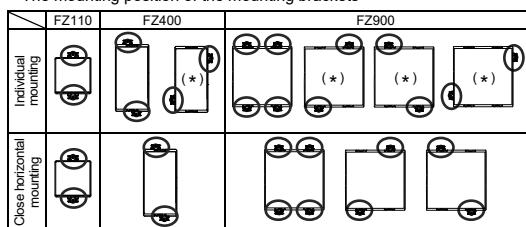
- This instrument is intended to be used under the following environmental conditions. (IEC 61010-1) [OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]
- Use this instrument within the following environment conditions:
 - Allowable ambient temperature: -10 to +55 °C
 - Allowable ambient humidity: 5 to 95 %RH (Absolute humidity: MAX. W. C 29 g/m³ dry air at 101.3 kPa)
- Installation environment conditions: Indoor use
 - Altitude up to 2000 m
 - Short-term temporary overvoltage: 1440 V
 - Long-term temporary overvoltage: 490 V
- Avoid the following conditions when selecting the mounting location:
 - Rapid changes in ambient temperature which may cause condensation.
 - Corrosive or inflammable gases.
 - Direct vibration or shock to the instrument.
 - Water, oil, chemicals, vapor or steam splashes.
 - Excessive dust, salt or iron particles.
 - Excessive induction noise, static electricity, magnetic fields or noise.
 - Direct air flow from an air conditioner.
 - Exposure to direct sunlight.
 - Excessive heat accumulation.
- Mount this instrument in the panel considering the following conditions:
 - Ensure at least 50 mm space on top and bottom of the instrument for maintenance and operating environment.
 - Do not mount this instrument directly above the equipment that generates large amount of heat (heaters, transformers, semi-conductor functional devices, large-wattage resistors).
 - If the ambient temperature rises above 55 °C, cool this instrument with a forced air fan, cooler, etc. Cooled air should not blow directly on this instrument.
 - In order to improve safety and the immunity to withstand noise, mount this instrument as far away as possible from high voltage equipment, power lines, and rotating machinery.
 - High voltage equipment: Do not mount within the same panel.
 - Power lines: Separate at least 200 mm.
 - Rotating machinery: Separate as far as possible.
- For correct functioning mount this instrument in a horizontal position.
- In case this instrument is connected to a supply by means of a permanent connection, a switch or circuit-breaker shall be included in the installation. This shall be in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment.

1.2 Dimensions



Panel thickness: 1 to 10 mm (When mounting multiple FZ110/400/900 controllers close together, the panel strength should be checked to ensure proper support.)
*1 Gasket (optional)
*2 Terminal cover (optional) [sold separately]
*3 To keep the instrument as waterproof as possible, make sure that the panel surface has no burr or distortion where the hole is to be cut out.
*4 Remove the gasket. When the FZ110/400/900 is mounted closely protection will be compromised and they will not meet IP65 standards.

The mounting position of the mounting brackets



(*) FZ400 with mounting brackets attached on the side and FZ900 mounted with two mounting brackets do not provide water and dustproof protection.

1.3 Procedures of Mounting and Removing

■ Mounting procedures

- Prepare the panel cutout as specified in 1.2 Dimensions.
- Insert the instrument through the panel cutout.
- Insert the mounting bracket into the mounting groove of the instrument. (Fig. 1) Do not push the bracket forcibly forward.
- Tighten up the screw for the mounting bracket with a Phillips screwdriver so that the mounting bracket is firmly secured in place. (Fig. 2) Give the screw another turn when the tip of the screw touches the panel.
- The other mounting bracket(s) should be installed in the same way as described in 3 and 4.

■ Removal procedures

- Turn the power OFF.
- Remove the wiring.
- Loosen the screw of the mounting bracket.
- Hold the rear of the mounting bracket (Fig.3), and lift up one side to remove it from the case. (Fig. 4)
- The other mounting bracket(s) should be removed in the same way as described in 3 and 4.
- Pull out the instrument from the mounting cutout while holding the front panel frame of this instrument.

Use long-nose pliers to remove the mounting brackets from the instrument that is installed in a narrow space or installed closely to each other in a vertical position.

2. WIRING

WARNING

To prevent electric shock or instrument failure, do not turn on the power until all wiring is completed. Make sure that the wiring is correct before applying power to the instrument.

2.1 Wiring Cautions

- For thermocouple input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wire with no difference in resistance between the noise filter output and the instrument power supply terminals to the three lead wires.
- To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.
- Signal connected to Voltage input and Current input shall be low voltage defined as "SELV" circuit per IEC 60950-1.
- If there is electrical noise in the vicinity of the instrument that could affect operation, use a noise filter.
 - Shorten the distance between the twisted power supply wire pitches to achieve the most effective noise reduction.
 - Always install the noise filter on a grounded panel. Minimize the wiring distance between the noise filter output and the instrument power supply terminals to achieve the most effective noise reduction.
 - Do not connect fuses or switches to the noise filter output wiring as this will reduce the effectiveness of the noise filter.
- Allow approximately 5 seconds for contact output when the instrument is turned on. Use a delay relay when the output line is used for an external interlock circuit.
- Power supply wiring must be twisted and have a low voltage drop.
- For an instrument with 24 V power supply input, supply power from a "SELV" circuit defined as IEC 60950-1.
- This instrument is not provided with an overcurrent protection device. For safety, install an overcurrent protection device (such as a fuse) with adequate breaking capacity close to the instrument.
 - Fuse type: Time-lag fuse (Approved fuse according IEC 60127-2 and/or UL 248-14)
 - Fuse rating: Rated voltage 250 V AC
 - Rated current: 0.5 A (for 24 V AC/DC type) 1 A (for 100 to 240 V AC type)
- Use the solderless terminal appropriate to the screw size.
 - Screw size: M3 x 7 (with 5.8 x 5.8 square washer)
 - Recommended tightening torque: 0.4 N·m (4 kgf·cm)
 - Applicable wire: Solid/twisted wire of 0.25 to 1.65 mm²
 - Specified dimension: See Fig. at the right
 - Specified solderless terminal: Manufactured by J.S.T MFG CO., LTD. Circular terminal with isolation V1.25-MS3

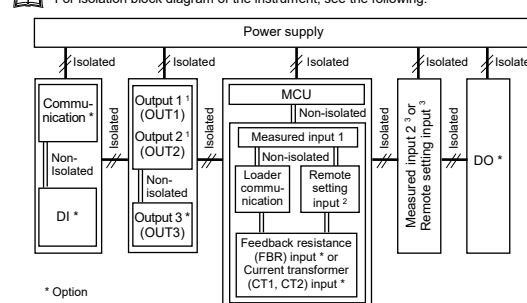
- Make sure that during field wiring parts of conductors cannot come into contact with adjacent conductive parts.

If solderless terminal lugs other than the recommended dimensions are used, terminal screws may not be tightened. In that case, bend each solderless terminal lug before wiring. If the terminal screw is forcibly tightened, it may be damaged.

Up to two solderless terminal lugs can be connected to one terminal screw. The requirements of reinforced insulation can be still complied with in this condition. When actually doing this, place one solderless terminal lug over the other as illustrated right.

When tightening a screw of the instrument, make sure to fit the screwdriver properly into the screw head mounted tilted or flat as shown in the right figure. Tightening the screw with excessive torque may damage the screw thread.

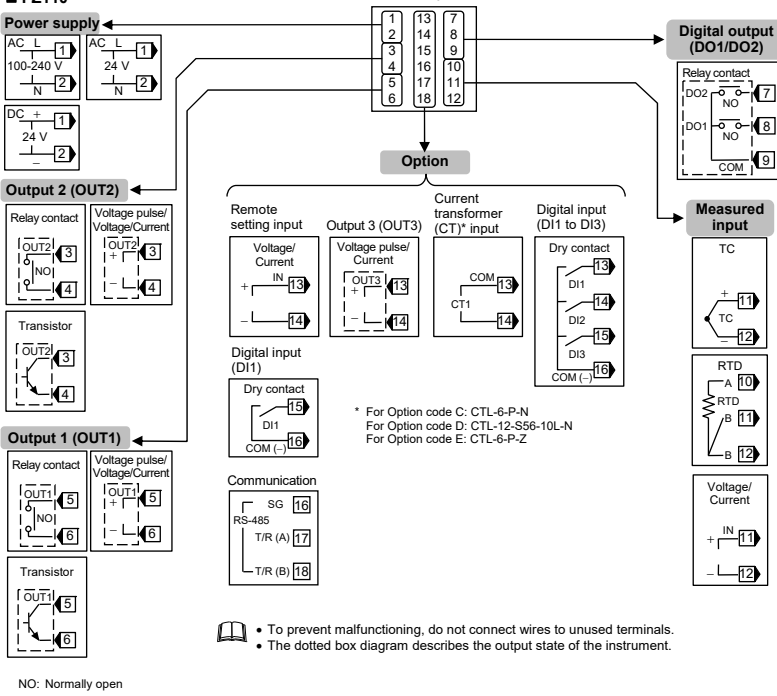
For isolation block diagram of the instrument, see the following:



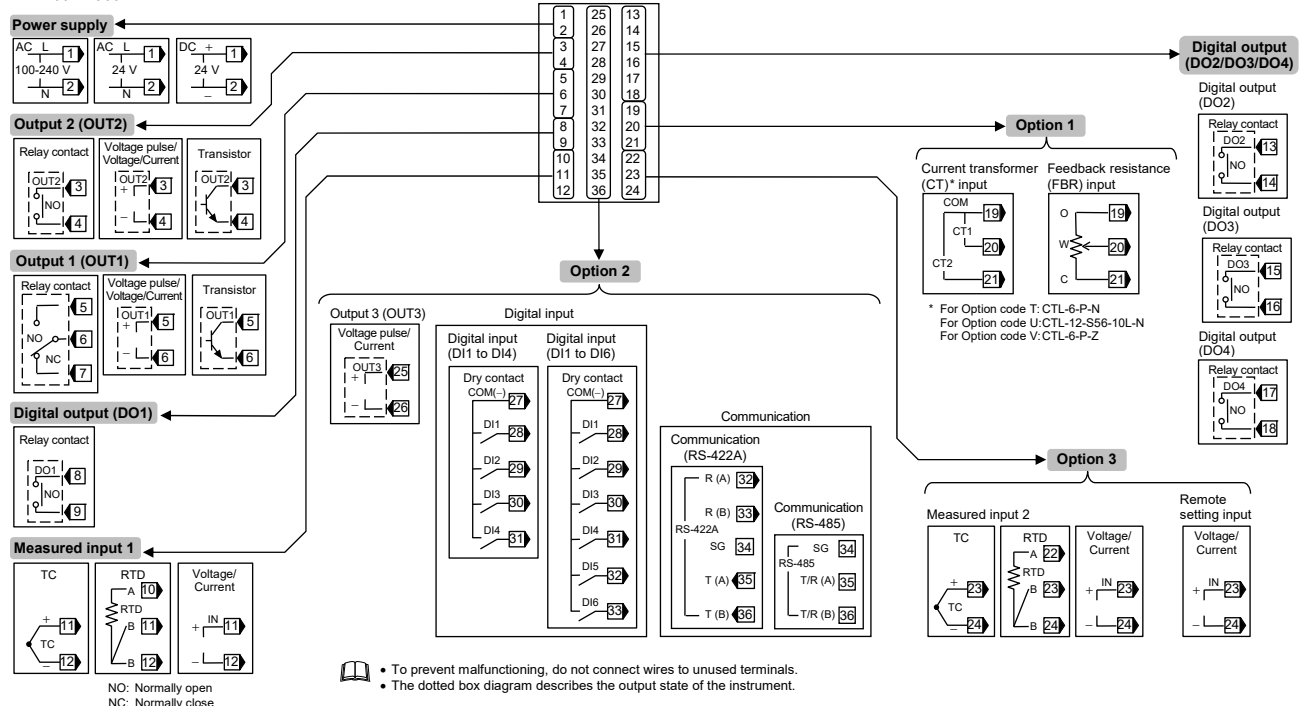
* Option
1 Outputs are isolated if either OUT1 or OUT2 is "relay contact output." If both outputs are not "relay contact output," outputs are not isolated.
2 For FZ110 (optional)
3 For FZ400/900 (optional)

2.2 Terminal Configuration

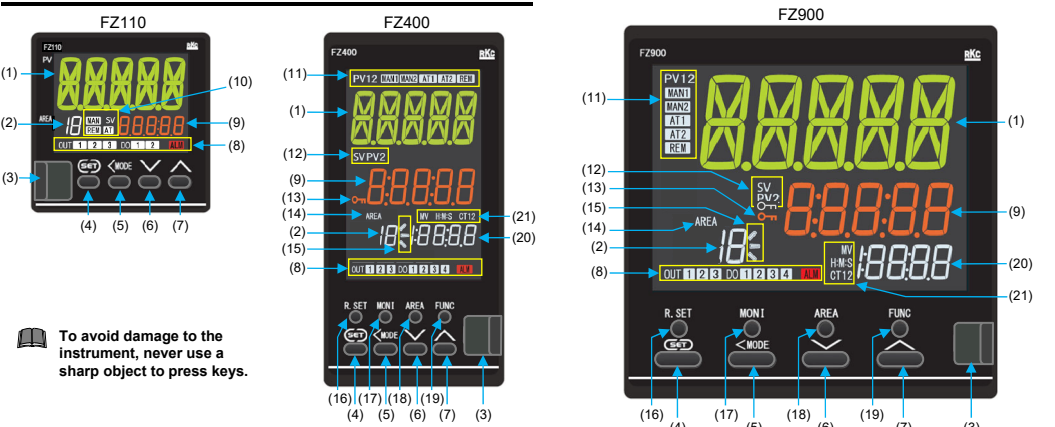
■ FZ110



■ FZ400/FZ900



3. PARTS DESCRIPTION



(1) Measured value (PV) display [Green (Standard) or White]	Displays Measured value (PV) or various parameter symbols.
(2) Memory area display [White]	Displays the memory area No. (1 to 16)
(3) Loader communication connector	Setting and monitoring on a computer (PC) is possible if the controller is connected with our cable to a PC via our USB communication converter COM-K2 (sold separately)*. Our communication software* must be installed on the PC. * For the COM-K2 *, refer to the official RKC website. * Only available as a download from the official RKC website.

(4) SET key	Used for calling up parameters and set value registration.
(5) Shift key	Shifts digits when settings are changed. Used to switch the modes.
(6) Down key	Decreases numerals.
(7) Up key	Increases numerals.
(8) OUT1 to 3 lamp [White]	Lights when Outputs 1 to 3 (OUT1 to 3) ¹ are turned on.
DO1 to 4 lamp [White]	Lights when Digital outputs 1 to 4 (DO1 to 4) ¹ are turned on. (FZ110: DO1 and DO2)

(8) ALM lamp [Red]	Lights when any of the following occurs. • Event 1 to 4 • Heater break alarm (HBA) 1 or 2 • Control loop break alarm (LBA) 1 or 2 • Input error of input 1 or 2
(9) Set value (SV) display [Orange]	Displays Set value (SV) or various parameter set values.
(10) Only for FZ110	
Manual (MAN) mode lamp [White]	Lights in Manual (MAN) mode. When lit, the SV display unit shows a Manual manipulated output value.
Remote (REM) mode lamp [White]	Lights in Remote (REM) mode. When lit, the SV display unit shows a remote setting input value.
SV display lamp [White]	Lights when the SV display unit shows a Set value (SV).
AT lamp [White]	Flashes when Autotuning (AT) is activated. (After AT is completed: AT lamp will go out) Lights when Startup tuning (ST) execution. (After ST is completed: AT lamp will go out)

¹ Outputs, such as control output, retransmission output, event output, are assigned to Outputs 1 to 3 (OUT1 to 3) and Digital outputs 1 to 4 (DO1 to 4).
(Control output can be assigned to OUT1 to 3 only.)
Outputs are assigned in Engineering mode. For detailed, refer to separate FZ110/FZ400/FZ900 Instruction Manual [Part 2] (IMR03A05-ED).

The below items are for FZ400/900 only.

(11) PV1/2 display lamp [White]	PV1 Lights when the Input 1. Measured value (PV) is displayed on the PV display unit. PV2 Lights when the Input 2. Measured value (PV) is displayed on the PV display unit.
Manual (MAN1) mode lamp [White]	Lights when Input 1 is in Manual (MAN) mode. When lit, the SV display unit shows an Input 1. Manual manipulated output value.
Manual (MAN2) mode lamp [White]	Lights when Input 2 is in Manual (MAN) mode. When lit, the SV display unit shows an Input 2. Manual manipulated output value.
AT1 lamp [White]	Flashes when Autotuning (AT) is activated on Input 1. (After AT is completed: AT lamp will go out) Lights when Startup tuning (ST) is activated on Input 1. (After ST is completed: AT lamp will go out)

(11) AT2 lamp [White]	Flashes when Autotuning (AT) is activated on Input 2. (After AT is completed: AT lamp will go out) Lights when Startup tuning (ST) is activated on Input 2. (After ST is completed: AT lamp will go out)
Remote (REM) mode lamp [White]	Lights in Remote (REM) mode. When lit, the SV display unit shows a remote setting input value.
(12) SV display lamp [White]	Lights when the SV display unit shows a Set value (SV).
PV2 display lamp [White]	PV2 Lights when the Input 2. Measured value (PV) is displayed on the SV display unit.
(13) Set lock display [White]	Lights when the settings are locked or when "Parameter select direct registration" is on.
(14) AREA display lamp [White]	Lights when Memory area is displayed.
(15) Displays the ramp status [White]	SV ramp status is displayed; (rise, soak, fall)
(16) R.SET key	The parameters can be scrolled backwards.
(17) MONI key	Used to switch screens. When the MONI key is pressed while any screen other than Monitor & SV setting mode is displayed, the screen returns the PV/SV Monitor.
(18) AREA key	When the AREA key is pressed, the screen is switched to the Memory area transfer screen.
(19) FUNC key ²	The selected function can be assigned to this key for a direct access to it.
(20) Manipulated output value (MV) display [White]	Displays one of the following ² : Manipulated output value (MV), Memory area soak time, or Current transformer (CT) input value.
(21) MV display lamp [White]	Lights when Manipulated output value (MV) is displayed on the MV display.
H.M.S display lamp [White]	Lights when time (hour:minute:second) is displayed on the MV display.
CT1/2 display lamp [White]	CT1 lights when the Current transformer 1 (CT1) input value is displayed on the MV display. CT2 lights when the Current transformer 2 (CT2) input value is displayed on the MV display.

² Functions are configured in the Engineering mode. For detailed, refer to separate FZ110/FZ400/FZ900 Instruction Manual [Part 2] (IMR03A05-ED).

4. SPECIFICATIONS

■ Measured input

Number of input:	1 point + 1 point (optional)* (Isolated between each input) * Option: FZ400/900 only		
TC input:	K, J, T, S, R, E, B, N (JIS C1602-1995), PLII (NBS), W5Re/W26Re (ASTM-E988-96 [Reapproved 2002]), U, L (DIN43710-1985), PR40-20 (ASTM-E1751-00)		
RTD input:	Pt100 (JIS C1604-1997), JPt100 (JIS C1604-1997, Pt100 of JIS C1604-1981)		
Low voltage input:	0 to 10 mV DC, 0 to 100 mV DC		
High voltage input:	0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, -5 to +5 V DC, -10 to +10 V DC		
Current input:	0 to 20 mA DC, 4 to 20 mA DC		
Input accuracy:	Input type	Input range	Accuracy
K, J, T, E, U, L	*1	Less than -100 °C	±1.0 °C (Approximate value)
		-100 °C or more, Less than +500 °C	±0.5 °C
S, R, N, PLII, W5Re/W26Re	*2	+500 °C or more	±0.1 % of Reading
		Less than 0 °C	±2.0 °C
B	*2	Less than 1000 °C	±1.0 °C
		0 °C or more, Less than 1000 °C	±0.1 % of Reading
PR40-20	*2	1000 °C or more	±0.1 % of Reading
		Less than 400 °C	±20 °C (Approximate value)
Pt100, JPt100	*2	400 °C or more, Less than 1000 °C	±10 °C
		1000 °C or more	±0.1 % of Reading
Voltage/Current	*2	Less than 200 °C	±0.2 °C
		200 °C or more	±0.1 % of Reading
		0.00 to 50.00 °C	±0.10 °C
			±0.1 % of span
The display accuracy is the above accuracy rounded up at the minimum resolution.			
*1: Accuracy is not guaranteed for less than -100 °C			
*2: Accuracy is not guaranteed for less than 400 °C for TC input type S, R, W5Re/W26Re B and PR40-20.			
Sampling cycle:	0.05 seconds When Input 2 is configured for 2-loop control or cascade control: 0.1 seconds		

Influence of signal source resistance (TC input):	Approx. 0.18 μV/1Ω (Converted depending on TC types)
Influence of input lead (RTD input):	Approx. 0.006 %/Ω of span (100 Ω or less per wire) If the resistance is 100 Ω or more, the measuring range may be limited.
Input impedance (Voltage/Current input):	1 MΩ or more (Low/High voltage), Approx. 50 Ω (Current)
Measured current (RTD input):	Approx. 1 mA
Action at input break:	TC input and Low voltage input: Upscale or DOWNSCALE (selectable) RTD input: Upscale High voltage input and Current input: DOWNSCALE (Indicates value near 0)
Action at input short circuit:	DOWNSCALE (RTD input: except 0.00 to 50.00 °C range) Upscale (RTD input: 0.00 to 50.00 °C) -Input span to -Input span
PV bias:	-Input span to -Input span
PV ratio:	0.500 to 1.500
PV digital filter (First order lag digital filter):	0.0 to 100.0 seconds (0.0: Filter OFF)
Square root extraction function (Voltage/Current input):	Calculation method: Measured value = √(Input value) × PV ratio + PV bias PV low input cut-off: 0.00 to 25.00 % of input span
Allowable input range:	-1.0 to +3.0 V (TC/RTD/Low voltage), -12 to +12 V (High voltage), -20.0 to +30.0 mA (Current)
■ Remote setting input	
Number of input:	1 point (FZ400/900: Isolated from PV, FZ110: Non-isolated from PV)
TC input (Select from the list below when Measured input 2 is selected for FZ400/900):	K, J, T, S, R, E, B, N (JIS C1602-1995), PLII (NBS), W5Re/W26Re (ASTM-E988-96 [Reapproved 2002]), U, L (DIN43710-1985), PR40-20 (ASTM-E1751-00)
RTD input (Select from the list below when Measured input 2 is selected for FZ400/900):	Pt100 (JIS C1604-1997), JPt100 (JIS C1604-1997, Pt100 of JIS C1604-1981)
Low voltage input (Only FZ400/900):	0 to 10 mV DC, 0 to 100 mV DC
High voltage input:	0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, -5 to +5 V DC, -10 to +10 V DC
Current input:	0 to 20 mA DC, 4 to 20 mA DC
Input range:	Programmable range
Sampling cycle:	0.05 seconds
Input impedance:	1 MΩ or more (Low/High voltage), Approx. 50 Ω (Current)

Action at input break:	TC input and Low voltage input: Upscale or DOWNSCALE (selectable) RTD input: Upscale High voltage input and Current input: DOWNSCALE (Indicates value near 0)
RS bias:	-Input span to -Input span
RS ratio:	0.001 to 9.999
RS digital filter (First order lag digital filter):	0.0 to 100.0 seconds (0.0: Filter OFF)
Allowable input range:	-1.0 to +3.0 V (TC/RTD/Low voltage), -12 to +12 V (High voltage), -20.0 to +30.0 mA (Current)
■ Current transformer (CT) input	
Number of input:	FZ400/900: 2 points, FZ110: 1 point
Input range:	0.0 to 0.1 Arms
Measurable current range:	0.0 to 100.0 A (CTL-6-P-Z) 0.0 to 30.0 A (CTL-6-P-N) 0.0 to 100.0 A (CTL-12-S56-10L-N)
Sampling cycle:	0.5 seconds
Voltage of through current:	300 V or less
■ Feedback resistance (FBR) input (only FZ400/900)	
Number of input:	1 point (Non-isolated from PV)
Permissible resistance range:	100 Ω to 10 kΩ (Standard: 135 Ω)
Input range:	0.0 to 100.0 % (for adjustment span of open and close) The value is displayed on the Manipulated output value monitor (FBR input at disconnection: 0.0 %)
Sampling cycle:	0.5 seconds
Action at FBR break:	To be selected from OPEN, CLOSE, OFF, and Continue control.
■ Digital input (DI)	
Number of input:	FZ400/900: MAX. 6 points, FZ110: MAX. 3 points
Input method:	Dry contact input OFF (Open state): 50 kΩ or more ON (Close state): 1 kΩ or less Contact current: 3.3 mA DC or less Voltage at open: Approx. 5 V DC
Capture judgment time:	Within 200 ms
■ Output	
Relay contact output [FZ110: OUT1 and OUT2]:	-Remote setting input
Contact type:	a contact
Contact rating (Resistive load):	250 V AC 3 A, 30 V DC 1 A
Electrical life:	100,000 times or more (Rated load)

Mechanical life:	20 million times or more (Switching: 300 times/min)
Proportional cycle time:	0.1 to 100.0 seconds (When configured for control output)
Relay contact output [FZ400/900: OUT1]:	Contact type: a contact
Contact rating (Resistive load):	250 V AC 3 A, 30 V DC 1 A
Electrical life:	300,000 times or more (Rated load)
Mechanical life:	50 million times or more (Switching: 180 times/min)
Proportional cycle time:	0.1 to 100.0 seconds (When configured for control output)
Relay contact output [FZ400/900: OUT2]:	Contact type: a contact
Contact rating (Resistive load):	250 V AC 3 A, 30 V DC 1 A
Electrical life:	300,000 times or more (Rated load)
Mechanical life:	50 million times or more (Switching: 180 times/min)
Proportional cycle time:	0.1 to 100.0 seconds (When configured for control output)
Relay contact output [FZ110: DO1 to DO2, FZ400/900: DO1 to DO4]:	Contact type: a contact
Contact rating (Resistive load):	250 V AC 1 A, 30 V DC 0.5 A
Electrical life:	150,000 times or more (Rated load)
Mechanical life:	20 million times or more (Switching: 300 times/min)
Voltage pulse output [OUT1 and OUT2]:	Output voltage: 0/12 V DC (Rated) ON voltage: 10 to 13 V OFF voltage: 0.5 V or less
Allowable load resistance:	500 Ω or more
Proportional cycle time:	0.1 to 100.0 seconds (When configured for control output)
Voltage pulse output [OUT3]:	Output voltage: 0/14 V DC (Rated) ON voltage: 12 to 17 V OFF voltage: 0.5 V or less
Allowable load resistance:	600 Ω or more
Proportional cycle time:	0.1 to 100.0 seconds (When configured for control output)
Current output [OUT1, OUT2 and OUT3]:	Output current: 4 to 20 mA DC, 0 to 20 mA DC
Output range:	3.2 to 20.8 mA DC, 0 to 21 mA DC
Allowable load resistance:	500 Ω or less
Continuous voltage output [OUT1 and OUT2]:	Output voltage: 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC
Output range:	0 to 5.25 V DC, 0.8 to 5.2 V DC, 0 to 10.5 V DC
Allowable load resistance:	1 kΩ or more

Transistor output [OUT1 and OUT2]:	
Allowable load current:	100 mA
Load voltage:	30 V DC or less
Voltage drop at ON:	2 V or less (at allowable load current)
Leakage current at OFF:	0.1 mA or less
Proportional cycle time:	0.1 to 100.0 seconds (When configured for control output)

■ Communication

Interface:	Based on RS-485, EIA standard Based on RS-422A, EIA standard (only FZ400/900)
Protocol:	RKC communication (ANSI X3.28-1976 subcategories 2.5 and A4) Modbus-RTU PLC communication (MAPMAN)

■ General specifications

Power supply voltage:	• 85 to 264 V AC [Including power supply voltage variation] (Rated: 100 to 240 V AC) Frequency variation: 50/60 Hz (−10 % to +5 %) • 20.4 to 26.4 V AC [Including power supply voltage variation] (Rated: 24 V AC) Frequency variation: 50/60 Hz (−10 % to +5 %) • 20.4 to 26.4 V DC [Including power supply voltage variation] (Rated: 24 V DC)
Power consumption:	• 100 to 240 V AC FZ110: 5.3 VA max. (at 100 V AC), 8.3 VA max. (at 240 V AC) FZ400: 6.8 VA max. (at 100 V AC), 10.1 VA max. (at 240 V AC) FZ900: 7.4 VA max. (at 100 V AC), 10.9 VA max. (at 240 V AC) • 24 V AC FZ110: 5.3 VA max. (at 24 V AC) FZ400: 6.9 VA max. (at 24 V AC) FZ900: 7.4 VA max. (at 24 V AC) • 24 V DC FZ110: 129 mA max. (at 24 V DC) FZ400: 175 mA max. (at 24 V DC) FZ900: 190 mA max. (at 24 V DC)
Rush current:	• 100 to 240 V AC FZ110: 5.6 A or less (at 100 V AC), 13.3 A or less (at 240 V AC) FZ400: 5.6 A or less (at 100 V AC), 13.3 A or less (at 240 V AC) FZ900: 5.6 A or less (at 100 V AC), 13.3 A or less (at 240 V AC) • 24 V AC FZ110: 16.3 A or less (at 24 V AC) FZ400: 16.3 A or less (at 24 V AC) FZ900: 16.3 A or less (at 24 V AC)

Power failure:	• 24 V DC FZ110: 11.5 A or less (at 24 V DC) FZ400: 11.5 A or less (at 24 V DC) FZ900: 11.5 A or less (at 24 V DC) A power failure of 20 ms or less will not affect the control action (100 to 240 V AC, 24 V AC) A power failure of 5 ms or less will not affect the control action (24 V DC)
Memory backup:	Backed up by non-volatile memory Number of writing: Approx. One trillion (10 ¹²) times (FRAM) Data storage period: Approx. 10 years
Weight:	FZ110: Approx. 122 g FZ400: Approx. 221 g FZ900: Approx. 291 g

5. MODEL CODE

5.1 FZ110

■ Suffix code

FZ110	□	□	□	□	-□	□	□	*	□	□	□	□	□	/□
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)				

(1) Control method	(7) Option 1
F: PID control with AT (Reverse action)	N: None
D: PID control with AT (Direct action)	A: Digital input (1 point)
G: Heat/Cool PID control with AT	-Remote setting input
A: Heat/Cool PID control with AT (for Extruder [air cooling])	B: Digital input (1 point)
W: Heat/Cool PID control with AT (for Extruder [water cooling])	+Output 3 (OUT3)
Z: Position proportioning PID control (Reverse action)	C: Digital input (1 point)
C: Position proportioning PID control (Direct action)	+CT input (CTL-12-S56-10L-N)
	E: Digital input (1 point)
	+CT input (CTL-6-P-Z)
	F: Digital input (3 points)
(2) Measured input and Range	(8) Option 2
□□□: See Range Code Table	N: None
(3) Output 1 (OUT1),	A: Communication (RS-485)
(4) Output 2 (OUT2)	(9) Display color
N: None	N: Green (Standard)
M: Relay contact output	W: White
V: Voltage pulse output (0/12 V DC)	(10) Waterproof/Dustproof (optional)
4: Voltage output (0 to 5 V DC)	N: None
5: Voltage output (0 to 10 V DC)	1: Waterproof/Dustproof
6: Voltage output (1 to 5 V DC)	(11) Quick start code
7: Current output (0 to 20 mA DC)	N: Quick start code not specified
8: Current output (4 to 20 mA DC)	1: Specify quick start code
B: Transistor output	
(5) Power supply voltage	
3: 24 V AC/DC	
4: 100 to 240 V AC	
(6) Digital output (DO)	
N: None	
1: Digital output [1 point] (DO1)	
2: Digital output [2 points] (DO1, DO2)	

■ Quick start code (Initial setting code)

□ □ - □ □ □ □ - □ □
(1) (2) (3) (4) (5) (6) (7)

(1) Output assignment (OUT1, OUT2, DO1, DO2)	
1 to 8: See Output Assignment Code Table	
(2) Remote setting input type	
N: None	7: Current input (0 to 20 mA DC)
3: Voltage input (0 to 1 V DC)	8: Current input (4 to 20 mA DC)
4: Voltage input (0 to 5 V DC)	9: Voltage input (−5 to +5 V DC)
5: Voltage input (0 to 10 V DC)	A: Voltage input (−10 to +10 V DC)
6: Voltage input (1 to 5 V DC)	
(3) Event 1 type, (4) Event 2 type, (5) Event 3 type, (6) Event 4 type	
N: None	U: Band
A: Deviation high	(High/low individual setting)
B: Deviation low	V: SV high
C: Deviation high/low	W: SV low
D: Band	X: Deviation high/low
E: Deviation high with hold action	(High/low individual setting)
F: Deviation low with hold action	Y: Deviation high/low with hold action
G: Deviation high/low with hold action	(High/low individual setting)
H: Process high	Z: Deviation high/low with re-hold action
J: Process low	(High/low individual setting)
K: Process high with hold action	1: MV high
L: Process low with hold action	2: MV low
Q: Deviation high with re-hold action	3: MV high (Cool-side)
R: Deviation low with re-hold action	4: MV low (Cool-side)
T: Deviation high/low with re-hold action	
(7) Communication protocol	
N: None	
1: RKC communication (ANSI X3.28-1976)	
2: Modbus	
3: PLC communication: MITSUBISHI MELSEC series special protocol (QnA-compatible 3C frame format 4)	

5.2 FZ400/FZ900

■ Suffix code

FZ400	□	□	□	□	-□	□	□	*	□	□	□	□	□	/□
FZ900	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		

(1) Control method	(7) Option 1
F: PID control with AT (Reverse action)	N: None
D: PID control with AT (Direct action)	T: CT input (2 points) [CTL-6-P-N]
G: Heat/Cool PID control with AT	U: CT input (2 points)
A: Heat/Cool PID control with AT (for Extruder [air cooling])	[CTL-12-S56-10L-N]
W: Heat/Cool PID control with AT (for Extruder [water cooling])	V: CT input (2 points) [CTL-6-P-Z]
Z: Position proportioning PID control (Reverse action)	W: Feedback resistance (FBR) input
C: Position proportioning PID control (Direct action)	(8) Option 2
	N: None
	A: Output 3 (OUT3)
	B: Digital input (6 points)
	C: Communication (RS-422A)
	D: Communication (RS-485)
	E: Output 3 (OUT3)
	+ Digital input (6 points)
	F: Output 3 (OUT3)
	+ Communication (RS-422A)
	G: Output 3 (OUT3)
	+ Communication (RS-485)
	H: Output 3 (OUT3)
	+ Digital input (4 points)
	+ Communication (RS-422A)
	J: Output 3 (OUT3)
	+ Digital input (6 points)
	+ Communication (RS-485)
(5) Power supply voltage	(9) Option 3
3: 24 V AC/DC	N: None
4: 100 to 240 V AC	1: Remote setting input
	2: Measured input 2
(6) Digital output (DO)	(10) Display color
1: Digital output [1 point] (DO1)	N: Green (Standard)
4: Digital output [4 points] (DO1 to DO4)	W: White
	(11) Waterproof/Dustproof (optional)
	N: None
	1: Waterproof/Dustproof

(12) Quick start code

N: Quick start code not specified

1: Specify quick start code

For details of the Digital input assignment, refer to a separate **FZ110/FZ400/FZ900 Instruction Manual [Part 1] (IMR03A04-ED)**.

■ Quick start code (Initial setting code)

□ □ - □ □ □ □ - □ □

(1) (2) (3) (4) (5) (6) (7)

(1) Output assignment (OUT1, OUT2, DO1 to DO4)

1 to 8: See Output Assignment Code Table

(2) Remote setting input type

N: None

3: Voltage input (0 to 1 V DC)

4: Voltage input (0 to 5 V DC)

5: Voltage input (0 to 10 V DC)

6: Voltage input (1 to 5 V DC)

7: Current input (0 to 20 mA DC)

8: Current input (4 to 20 mA DC)

9: Voltage input (−5 to +5 V DC)

A: Voltage input (−10 to +10 V DC)

(3) Event 1 type, (4) Event 2 type, (5) Event 3 type, (6) Event 4 type

N: None

A: Deviation high

B: Deviation low

C: Deviation high/low

D: Band

E: Deviation high with hold action

F: Deviation low with hold action

G: Deviation high/low with hold action

H: Process high

J: Process low

K: Process high with hold action

L: Process low with hold action

Q: Deviation high with re-hold action

R: Deviation low with re-hold action

T: Deviation high/low with re-hold action

U: Band

(High/low individual setting)

V: SV high

W: SV low

X: Deviation high/low

(High/low individual setting)

Y: Deviation high/low with hold action

(High/low individual setting)

Z: Deviation high/low with re-hold action

(High/low individual setting)

1: MV high

2: MV low

3: MV high (Cool-side)

4: MV low (Cool-side)

(7) Communication protocol

N: None

1: RKC communication (ANSI X3.28-1976)

2: Modbus

3: PLC communication: MITSUBISHI MELSEC series special protocol

(QnA-compatible 3C frame format 4)

Range Code Table					
● TC input					
Type	Code	Range	See Note		
K	K01	0 to 200 °C	4		
	K02	0 to 400 °C	4		
	K03	0 to 800 °C	4		
	K04	0 to 800 °C	4		
	K06	0 to 1200 °C	4		
	K07	0 to 1372 °C	4		
	K08	-199.9 to +300.0 °C	4		
	K09	0.0 to 400.0 °C	4		
	K10	0.0 to 800.0 °C	4		
	K14	0 to 300 °C	4		
	K41	-200 to +1372 °C	4		
	K42	-200.0 to +1372.0 °C	5		
J	KA1	0 to 800 °F	4		
	KA2	0 to 1600 °F	4		
	KA3	0 to 2502 °F	4		
	JO1	0 to 200 °C	4		
	JO2	0 to 400 °C	4		
	JO3	0 to 800 °C	4		
	JO4	0 to 800 °C	4		
	JO8	0.0 to 400.0 °C	4		
	J29	-200.0 to +1200.0 °C	5		
	JA1	0 to 800 °F	4		
	JA3	0 to 2192 °F	4		
	JA6	0 to 400 °F	4		
T	TO1	-199.9 to +400.0 °C	4		
	TO2	-199.9 to +100.0 °C	4		
	TO3	-100.0 to +200.0 °C	4		
	T19	-200.0 to +400.0 °C	5		
	R01	0 to 1600 °C	4		
R	R07	-50 to +1768 °C	4		
	R08	-50.0 to +1768.0 °C	5		
	R09	0.0 to 1600.0 °C	5		
	S06	-50 to +1768 °C	4		
	S07	-50.0 to +1768.0 °C	5		
S	B03	0 to 1800 °C	4		
	B04	0.0 to 1800.0	5		
E	E01	0 to 800 °C	4		
	E23	0 to 800.0 °C	4		
N	N02	0 to 1300 °C	4		
	N05	0 to 1300.0 °C	5		
W5R/W26Re	WO3	0 to 2300 °C	4		
	PLI1	0 to 1300 °C	4		
● RTD input					
Type	Code	Range	See Note		
PT100	D01	-199.9 to +649.0 °C	4		
	D04	-100.0 to +130.0 °C	4		
	D05	-100.0 to +200.0 °C	4		
	D06	0.0 to 50.0 °C	4		
	D07	0.0 to 100.0 °C	4		
	D21	0.0 to 200.0 °C	4		
JPT100	D09	0.0 to 300.0 °C	4		
	D10	0.0 to 500.0 °C	4		
	D12	-199.9 to +600.0 °C	4		
	D21	-200.0 to +200.0 °C	5		
	D27	0.0 to 50.0 °C	4		
	D34	-100.0 to +100.0 °C	4		
	D35	-200.0 to +850.0 °C	5		
	D48	-100.0 to +850.0 °C	5		
	DA1	-199.9 to +999.9 °F	4		
	DA9	0.0 to 500.0 °F	4		
P31	P08	-100.0 to +100.0 °C	4		
	P29	-100.0 to +100.0 °C	5		
	P30	-200.0 to +640.0 °C	5		
	P36	-100.0 to +640.0 °C	5		
	● Voltage/Current input				
	Type	Code	Range	See Note	
0 to 10 mV DC	201	0 to 10 mV DC	1		
	201	0 to 100 mV DC	1		
	301	-0.0 to 100.0 mV	5		
	401	0 to 10 V DC	5		
	501	0 to 10 V DC	5		
Programmable range	501	-19999 to +99999	5		
	601	0 to 1 mV DC	6		
	701	0 to 2 mV DC	6		
	801	0 to 5 mV DC	6		
	904	-10 to +10 V DC	6		
Factory set value: 0.0 to 100.0	905	-5 to +5 V DC	6		