Digital Controller

FB400/FB900 Installation Manual

IMR01W01-E9

Thank you for purchasing this RKC product. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place the manual in a convenient location for easy reference.

This manual describes the handling precautions, mounting, wiring and specifications only. For the basic operations, refer to FB400/FB900 Quick Operation Manual (IMR01W02-E□).

For detailed handling procedures and various function settings, refer to separate **FB400/FB900 Instruction Manual (IMR01W03-E□)** and **FB100/FB400/FB900 Communication Instruction Manual (IMR01W04-E□)**.
The manual can be downloaded from the official RKC website:
https://www.rkcinst.co.jp/english/download-center/

■ Product Check

FB400/FB900 Installation Manual (IMR01W01-E9) 1
FB400/FB900 Quick Operation Manual (IMR01W02-E□) 1
FB400/FB900 Parameter List (IMR01W06-E□) 1
Seal (SAP-306 [for Unit and Direct key type 2) 1
Mounting bracket (with screw) 2 (FB900: 4)
Rubber gasket (FB400: KFB400-36, FB900: KFB900-36) 1

■ Optional (Sold separately)

Terminal cover (KFB400-58) 1

■ Safety Precautions

WARNING

- An external protection device must be installed if failure of this instrument could result in damage to the instrument, equipment or injury to personnel.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and 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 can 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.)
- 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 by operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be in accordance with local codes and regulations.
- To prevent instrument damage or failure, protect the power line and the input/output lines from high currents with a protection device such as fuse, circuit breaker, etc.
- 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 dispensation.
- 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 will occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to instrument display, do not rub with an abrasive material or push front panel with a hard object.
- When high alarm with hold action/re-hold action is used for Event function, alarm does not turn on while hold action is in operation. Take measures to prevent overheating which may occur if the control device fails.

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 purpose of illustration.
- 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.

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

(1) This instrument is intended to be used under the following environmental conditions. **(IEC 61010-1)** [OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]

(2) Use this instrument within the following environment conditions:
- Allowable ambient temperature: –10 to +50 °C
- Allowable ambient humidity: 5 to 95 %RH (Absolute humidity: MAX. W. C 29.3 g/m³ dry air at 101.3 kPa)
- Installation environment conditions: Indoor use, Altitude up to 2000 m

(3) 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.

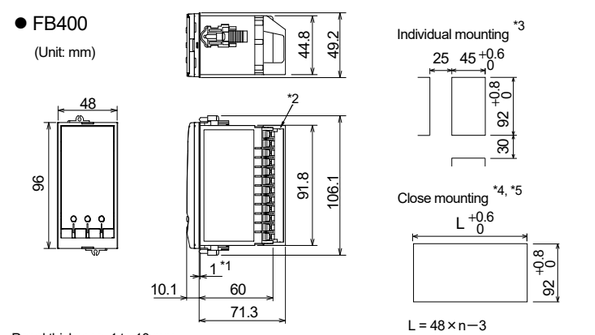
(4) Mount this instrument in the panel considering the following conditions:
- Provide adequate ventilation space so that heat does not build up.
- Do not mount this instrument directly above the equipment that generates large amount of heat (heaters, transformers, semi-conductor functional devices, large-wattage resistors.)
- If the ambient temperature rises above 50 °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.
- Mount this instrument in the horizontal direction for panel. If you did installation except a horizontal direction, this causes malfunction.

(5) If this instrument is permanently connected to equipment, it is important to include a switch or circuit-breaker into the installation. This should be in close proximity to the equipment and within easy reach of the operator. It should be marked as the disconnecting device for the equipment.

1.2 Dimensions

● FB400

(Unit: mm)

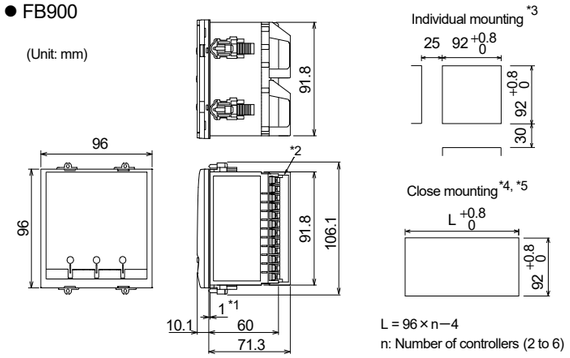


Panel thickness: 1 to 10 mm
(When mounting multiple FB400s close together, the panel strength should be checked to ensure proper support.)

L = 48 × n − 3
n: Number of controllers (2 to 6)

● FB900

(Unit: mm)



Panel thickness: 1 to 10 mm
(When mounting multiple FB900s close together, the panel strength should be checked to ensure proper support.)

L = 96 × n − 4
n: Number of controllers (2 to 6)

*1 Gasket
*2 Terminal cover KFB400-58 (optional) [sold separately]
*3 When cutting out each mounting hole through a panel for individual mounting, observe that there is no bur or distortion along the panel cutout surface, or there is no bend on the panel surface. If so, the water resistant characteristics may worsen.
*4 When mounting the instruments in a close mounting, remove the gasket as the water- and dust-proof protection is not supported.
*5 When controllers are closely mounted, ambient temperature must not exceed 50 °C.

1.3 Procedures of Mounting and Removing

■ Mounting procedures

1. Prepare the panel cutout as specified in **1.2 Dimensions**.
2. Insert the instrument through the panel cutout.
3. Insert the mounting bracket into the mounting groove of the instrument. (Fig. 1)
4. Push the mounting bracket forward until the bracket is firmly secured to the panel. (Fig. 2)
5. Only turn one full revolution after the screw touches the panel. (Fig. 3)
6. The other mounting bracket should be installed the same way described in ***3***. to ***5***.

Fig. 1

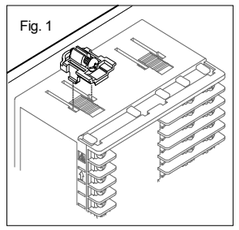


Fig. 2

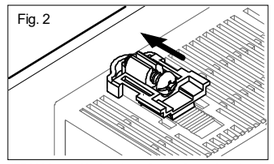
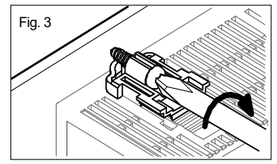


Fig. 3



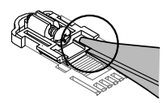
(FB900 is used in the above figures for explanation, but the same mounting procedures also apply to FB400.)

The front of the instrument conforms to **IP66 (NEMA 4X)** when mounted on the panel. Checked and confirmed its compliance through the internal test at RKC, not tested by certification bodies. For effective waterproof/dustproof, the gasket must be securely placed between instrument and panel without any gap. If gasket is damaged, please contact RKC or our distributors.

■ Removing procedures

1. Turn the power OFF.
2. Remove the wiring.
3. Loosen the screw of the mounting bracket. (Fig. 4)
4. Lift the latch of the mounting bracket (①), then pull the mounting bracket (②) to remove it from the case. (Fig. 4)

Use long-nose pliers to remove mounting brackets from the instrument that is installed in a narrow place or installed tightly in a vertical position.



5. The other mounting bracket should be removed in the same way as described in ***3***. and ***4***.
6. Pull out the instrument from the mounting cutout while holding the front panel frame of this instrument. (Fig. 5)

Fig. 4

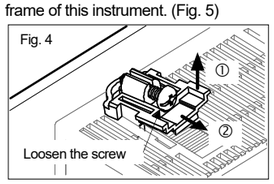
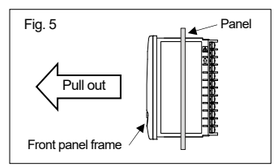


Fig. 5



2. WIRING

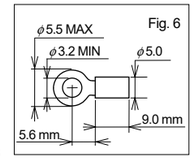
WARNING

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

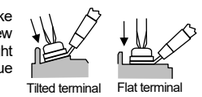
- For thermocouple input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wire with no difference in resistance between the three lead wires.
- To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.
- 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.
- About five seconds are required as preparation time for contact output every time 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, supply power from a SELV circuit.
- A suitable power supply should be considered in the end-use equipment. The power supply must be in compliance with a limited-energy circuit (maximum available current of 8 A).
- This instrument is not furnished with a power supply switch or fuse. Therefore, if a fuse or power supply switch is required, install close to the instrument.
  Recommended fuse rating: Rated voltage 250 V, Rated current 1 A
  Fuse type: Time-lag fuse
- Use the solderless terminal appropriate to the screw size.
  Screw size: M3 × 7 (with 5.8 × 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: Refer to fig. 6
  Specified solderless terminals:
  Manufactured by J.S.T MFG CO., LTD.
  Circular terminal with isolation V1.25–MS3
  (M3 screw, width 5.5 mm, hole diameter 3.2 mm)

Fig. 6



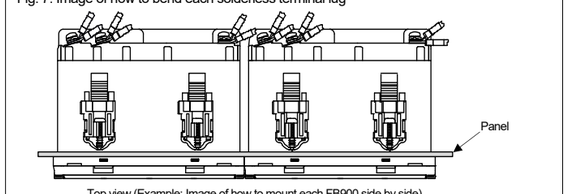
- Make sure that the any wiring such as solderless terminal is not in contact with the adjoining terminals.

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.



- Up to two solderless terminal lugs can be connected to one terminal screw, then refer to figure 7.

Fig. 7: Image of how to bend each solderless terminal lug

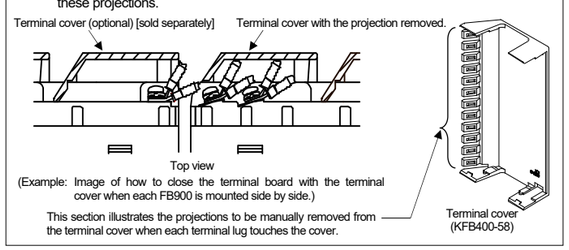


Top view (Example: Image of how to mount each FB900 side by side)

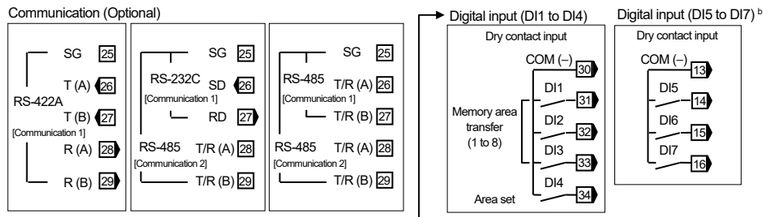
If solderless terminal lugs other than those in not specified dimensions are used, terminal screws may not be tightened. In such a case, bend each solderless terminal lug in advance and then conduct wiring. If the terminal screw is forcibly tightened, it may be damaged.

- Caution for the terminal cover usage:
  If each solderless terminal lug touches the terminal cover, remove each projection from the terminal cover by manually bending it in front and in rear until broken. (Fig. 8)

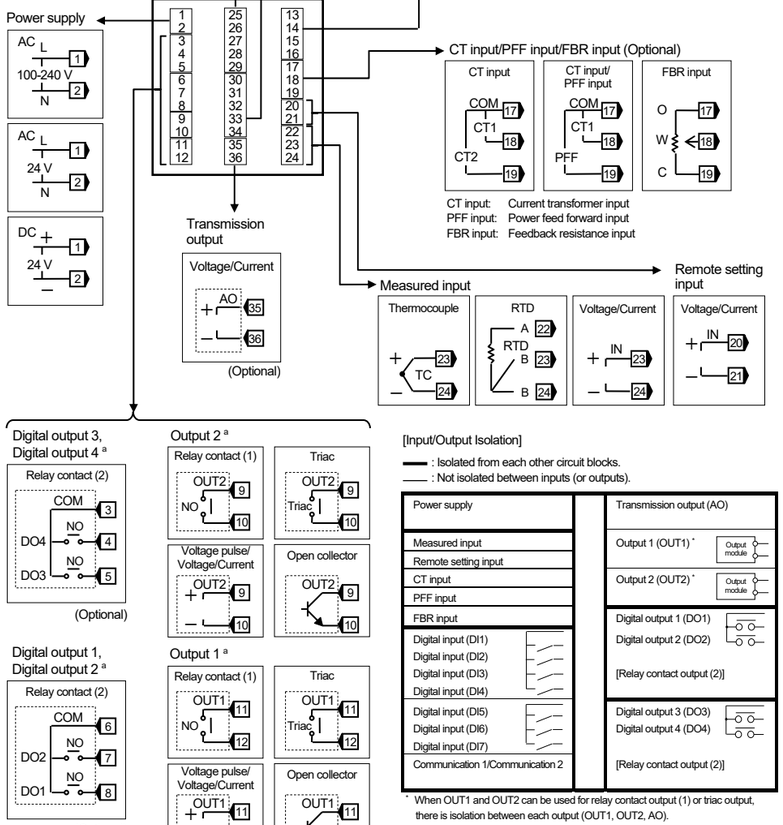
Fig. 8: Image of how to close the terminal board with the terminal cover and to remove these projections.



2.2 Terminal Configuration (All the terminal configuration of FB400 and FB900 is the same.)



[b] Digital input (DI5 to DI7) can be changed by the Digital input (DI) assignment in the Engineering Mode.



[a] Output assignment

Output 1 (OUT1) and Output 2 (OUT2):
Control output or Digital output can be allocated to OUT1 and OUT2.
For Heat/Cool PID control, OUT1 corresponds to the heat-side output and OUT2 corresponds to the cool-side output.
For Position proportioning PID control, OUT1 corresponds to the open-side output and OUT2 corresponds to the close-side output.

Digital output 1 (DO1) to Digital output 4 (DO4):
Output of the Event function can be allocated to DO1 to DO4.

The following two methods of the output assignments are available:
Specify when ordering (Initial setting code)
Setting by Output assignment (Engineering Mode)

Table 1: Output type

	OUT1 OUT2	DO1 to DO4	AO
Relay contact output (1)	○		
Relay contact output (2)		○	
Voltage pulse output	○		
Current output	○		○
Voltage output 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC	○		○
Voltage output 0 to 1 V DC			○
Triac output	○		
Open collector output	○		

(O: Indicates that an output specification is supported.)

[Input/Output Isolation]

▬▬ : Isolated from each other circuit blocks.
—— : Not isolated between inputs (or outputs).

* When OUT1 and OUT2 can be used for relay contact output (1) or triac output, there is isolation between each output (OUT1, OUT2, AO).

Table 2: Input type and Measured range

Input type	Measured range	Input type	Measured range
K	–200.0 to +400.0 °C	W5Re/W26Re	0 to 2300 °C
	–200.0 to +800.0 °C		0 to 4200 °F
	–200 to +1372 °C	U	0.0 to 600.0 °C
	–328.0 to +400.0 °F		32.0 to 1112.0 °F
	–250.0 to +800.0 °F	L	0.0 to 900.0 °C
	–328 to +2502 °F		32.0 to 1652.0 °F
J	0.0 to 400.0 °C	Pt100	–100.00 to +100.00 °C
	–200.0 to +400.0 °C		–200.0 to +850.0 °C
	–200.0 to +800.0 °C		–199.99 to +199.99 °F
	–200 to +1200 °C		–328.0 to +1562.0 °F
	–200.0 to +700.0 °F	JPt100	–100.00 to +100.00 °C
	–328.0 to +1200.0 °F		–200.0 to +640.0 °C
	–328 to +2192 °F		–199.99 to +199.99 °F
T	–200.0 to +400.0 °C		–328.0 to +1184.0 °F
	–328.0 to +752.0 °F	±1 V	Programmable range (–19999 to +19999)
S, R	–50 to +1768 °C	0 to 5 V	
	–58 to +3214 °F	1 to 5 V	
E	–200.0 to +700.0 °C	0 to 10 V	
	–200 to +1000 °C	0 to 1 V	
	–328.0 to +1292.0 °F	0 to 100 mV	
	–328 to +1832 °F	0 to 10 mV	
B	0 to 1800 °C	±100 mV	
	0 to 3272 °F	±10 mV	
N	0 to 1300 °C	0 to 20 mA	
	0 to 2372 °F	4 to 20 mA	
PLII	0 to 1390 °C		
	0 to 2534 °F		

3. SPECIFICATIONS

Measured input

Number of input: 1 point
Input type and range: Refer to table 2.
Sampling cycle: 100 ms±0.3 %
(50 ms±5 % or 250 ms±0.3 % is selectable)
Influence of external resistance:
Approx. 0.2 μV/Ω
(Converted depending on TC types)
Influence of input lead: Approx. 0.01 %/Ω of PV (RTD input)
10 Ω or less per wire
Input impedance: TC input: 1 MΩ or more
Voltage (low) input: 1 MΩ or more
Voltage (high) input: Approx. 1 MΩ
Current input: Approx. 50 Ω
Sensor current: Approx. 250 μA (RTD input)
Action at input beak:
TC input, Voltage (low) input: Upscale or Downscale
RTD input: Upscale
Voltage (high) input, Current input:
Downscale (Indicates the value 0 V or 0 mA)
Action at input short circuit: Downscale (RTD input)
Input correction:
PV bias: –Input span to +Input span
PV ratio: 0.500 to 1.500
First order lag digital filter: 0.0 to 100.0 seconds (0.0: OFF)
Low level cutoff: 0.00 to 25.00 % of input span
Cold-junction temperature compensation error (TC input):
Within ±1.0 °C
Within ±1.5 °C (range of –10 to +50 °C)

Remote setting (RS) input

Number of input: 1 point (Not isolated from measured input)
Input type:
Voltage (low) input: 0 to 10 mV DC, 0 to 100 mV DC, 0 to 1 V DC
Voltage (high) input: 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC
Current input: 0 to 20 mA DC, 4 to 20 mA DC
Sampling cycle: Twice of the measured input sampling cycle
Input impedance:
Voltage (low) input: 1 MΩ or more
Voltage (high) input: Approx. 1 MΩ
Current input: Approx. 50 Ω
Action at input beak: Downscale (Indicates the value 0 V or 0 mA)
Input correction:
RS bias: –Input span to +Input span
RS ratio: 0.001 to 9.999
RS digital filter (first order lag): 0.0 to 100.0 seconds (0.0: OFF)
Allowable input voltage: Voltage (low) input: Within ±3.5 V
Voltage (high) input: Within ±12 V

Current transformer (CT) input [Optional]

Number of inputs: 2 points
(when PFF input is selected: 1 point)
CT type: CTL-6-P-N or CTL-12-S56-10L-N
(Sold separately)
Input range: CTL-6-P-N: 0.0 to 30.0 A
CTL -12-S56-10L-N: 0.0 to 100.0 A
Automatic power frequency detection:
Power frequency can be set automatically by auto detection. The frequency may not be set automatically with a CT value of 0.5 A or less.
Sampling cycle: Twice of the measured input sampling cycle

Feedback resistance (FBR) input [Optional]

Number of input: 1 point
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)
Sampling cycle: Twice of the measured input sampling cycle
Action at FBR break: Upscale

Power feed forward (PFF) input [Optional]

Number of input: 1 point (Use the special transformer)
Allowable voltage range:
Input of instrument: 0 to 20 V AC
Load power supply voltage:
0 to 168 V AC: 100 to 120 V AC type transformer (PFT-01)
0 to 336 V AC: 200 to 240 V AC type transformer (PFT-02 or PFT-02A)
Automatic power frequency detection:
Power frequency can be set automatically by auto detection.
Sampling cycle: Twice of the measured input sampling cycle

Digital input (DI)

Number of inputs: 7 points (DI1 to DI4 [optional], DI5 to DI7)
Input method: Dry contact input
Open state: 500 kΩ or more
Close state: 10 Ω or less
Contact current: 5 mA or less
Voltage at open: Approx. 5 V DC
Capture judgment time: 200 ms

Output

Number of outputs: 7 points (OUT1, OUT2, DO1 to DO4, AO)
Output type: Refer to table 1.

- Relay contact output (1)
  Contact type: 1a 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)
- Relay contact output (2)
  Contact type: 1a contact
  Contact rating (Resistive load):
  250 V AC 1 A/ 30 V DC 1 A
  Electrical life: 300,000 times or more (Rated load)
  Mechanical life: 20 million times or more
  (Switching: 300 times/min)
- Voltage pulse output
  Output voltage: 0/12 V DC (Rating)
  ON voltage: 11 to 13 V
  OFF voltage: 0.2 V or less
  Allowable load resistance: 600 Ω or more
- Current output
  Output current (Rating): 4 to 20 mA DC, 0 to 20 mA DC
  Output range: 1 to 21 mA DC, 0 to 21 mA DC
  Allowable load resistance: 600 Ω or less
  Output impedance: 1 MΩ or more
- Voltage output
  Output voltage (Rating): 0 to 10 V DC, 0 to 5 V DC, 1 to 5 V DC
  0 to 1 V DC (AO only)
  Output range: –0.5 to +10.5 V DC, –0.25 to +5.25 V DC, 0.8 to 5.2 V DC, –0.05 to +1.05 V DC
  Allowable load resistance: 1 kΩ or more
  Output impedance: 0.1 Ω or less
- Triac output
  Output method: AC output (Zero-cross method)
  Allowable load current: 0.5 A (Ambient temperature 40 °C or less)
  Ambient temperature 50 °C: 0.3 A
  Load voltage: 75 to 250 V AC
  Minimum load current: 30 mA
  ON voltage: 1.6 V or less (at maximum load current)
- Open collector output
  Output method: Sink type
  Allowable load current: 100 mA
  Load voltage: 30 V DC or less
  Minimum load current: 0.5 mA
  ON voltage: 2 V or less (at maximum load current)
  Leakage current at OFF: 0.1 mA or less

Communication [Optional]

Interface: Based on RS-232C, RS-485, or RS-422A, EIA standard
Multi-drop connection of RS-485 and RS-422A is available.
Protocol:

- RKC communication (ANSI X3.28-1976 subcategories 2.5 and A4)
- Modbus-RTU

Termination resistor: Externally connected
(Example: 120 Ω 1/2W)

General specifications

Power supply voltage:

- 100 to 240 V AC type:
  90 to 264 V AC [Including power supply voltage variation], 50/60 Hz
  (Rating 100 to 240 V AC)
  Frequency variation: 50 Hz±10 %, 60 Hz±10 %
- 24 V AC type:
  21.6 to 26.4 V AC [Including power supply voltage variation], 50/60 Hz
  (Rating 24 V AC)
  Frequency variation: 50 Hz±10 %, 60 Hz±10 %
- 24 V DC type:
  21.6 to 26.4 V DC [Including power supply voltage variation]
  (Rating 24 V DC)

Power consumption (at maximum load):

- 100 to 240 V AC type:
  FB400: 7.8 VA max. (at 100 V AC), 11.9 VA max. (at 240 V AC)
  FB900: 8.7 VA max. (at 100 V AC), 13.0 VA max. (at 240 V AC)
- 24 V AC type:
  FB400: 8.2 VA max. (at 24 V AC) FB900: 9.3 VA max. (at 24 V AC)
- 24 V DC type:
  FB400: 250 mA max. (at 24 V DC) FB900: 300 mA max. (at 24 V DC)
- Rush current: 12 A or less

Allowable ambient temperature: –10 to +50 °C
Allowable ambient humidity: 5 to 95 %RH
(Absolute humidity: MAX.W.C 29.3 g/m^3 dry air at 101.3 kPa)
Insulation resistance:
Between measuring terminal and grounding:
20 MΩ or more at 500 V DC
Between power supply terminal and grounding:
20 MΩ or more at 500 V DC
Between power supply and measuring terminals:
20 MΩ or more at 500 V DC
When grounding is not provided: Between panels
Withstand voltage:

Time: 1 min.	①	②	③	④	⑤
① Grounding terminal					
② Power terminal	1500 V AC				
③ Measured input terminal	1500 V AC	2300 V AC			
④ Output terminal (Relay contact, Triac)	1500 V AC	2300 V AC	2300 V AC		
⑤ Output terminal (Voltage, Current)	1500 V AC	2300 V AC	1500 V AC		
⑥ Communication, digital input (DI) terminals	1500 V AC	2300 V AC	510 V AC	2300 V AC	1000 V AC

Transportation and Storage environment conditions:

- Shock: Height 800 mm or less
- Temperature: –25 to +55 °C (at storage),
  –40 to +70 °C (at transport)
- Humidity: 5 to 100 %RH (Non condensing)

Installation environment conditions:
Indoor use
Altitude up to 2000 m
Weight: FB400: Approx. 230 g
FB900: Approx. 290 g

Standard

Safety standards: UL: UL 61010-1
cUL: CAN/CSA-C22.2 No.61010-1
CE marking:

- LVD: EN61010-1
  OVERVOLTAGE CATEGORYII,
  POLLUTION DEGREE 2,
  Class II (Reinforced insulation)
- EMC: EN61326-1

RCM: EN55011
Panel sealing: NEMA 4X (NEMA250), IP66 (IEC60529)
[Front panel]

4. MODEL CODE

■ Suffix code

FB400 -□□ - □ ∗ □□□□/□□ -□ □□□/Y
FB900 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

▬ : Indicates a specification code to be optional specified. If this section is blank, this means that no code is described on the nameplate.

(1) Output 1 (OUT1), (2) Output 2 (OUT2)

N: None (OUT2 only)
M: Relay contact output
V: Voltage pulse output
4: Voltage output (0 to 5 V DC)
5: Voltage output (0 to 10 V DC)
6: Voltage output (1 to 5 V DC)
7: Current output (0 to 20 mA DC)
8: Current output (4 to 20 mA DC)
T: Triac output
D: Open collector output

(3) Power supply voltage

3: 24 V AC/DC
4: 100 to 240 V AC

(4) Digital output (DO1 to 4)

N: None
4: DO1 + DO2 + DO3 + DO4

(5) CT input/Power feed forward input/ Feedback resistance input

N: None
T: CT input (2 points)
1: Power feed forward input
(one 100 to 120 V AC type transformer included)
2: Power feed forward input
(one 200 to 240 V AC type transformer included)
3: CT input (1 point) + Power feed forward input (one 100 to 120 V AC type transformer included)
4: CT input (1 point) + Power feed forward input (one 200 to 240 V AC type transformer included)
F: Feedback resistance input

(6) Transmission output (AO)

N: None
3: Voltage output (0 to 1 V DC)*
4: Voltage output (0 to 5 V DC)*
5: Voltage output (0 to 10 V DC)*
6: Voltage output (1 to 5 V DC)*
7: Current output (0 to 20 mA DC)*
8: Current output (4 to 20 mA DC)*

* If any one of the Transmission outputs is specified (other than the code "N"), the Digital inputs (from DI1 to DI4) are automatically added.

(7) Communication function/Digital input (DI1 to DI4)

N: None
1: Communication 1 (RS-232C) + No communication 2 [1]
4: Communication 1 (RS-422A) + No communication 2 [1]
5: Communication 1 (RS-485) + No communication 2 [1]
W: Communication 1 (RS-232C) + Communication 2 (RS-485) [1, 2]
X: Communication 1 (RS-485) + Communication 2 (RS-485) [1, 2]
Y: No communication 1 + Communication 2 (RS-485) [1, 2]
D: Digital input (DI1 to DI4) [Memory area transformer]

[1] If any one of the Communication functions is also specified (other than the code "N"), the Digital inputs (from DI1 to DI4) are automatically added.
[2] Factory set value of Communication 2 protocol: Intercontroller communication

(8) Case color

N: White
A: Black

(9) Quick start code

N: No quick start code (Configured to factory set value) *
1: Specify quick start code 1
2: Specify quick start code 1 and 2
* Factory set value: Refer to the Parameter list (IMR01W06-E□).

(10) Control Method [Quick start code 1]

No code: Quick start code 1 is not specified
F: PID control with AT (Reverse action)
D: PID control with AT (Direct action)
G: Heat/Cool PID control with AT
A: Heat/Cool PID control with AT (for Extruder [air cooling])
W: Heat/Cool PID control with AT (for Extruder [water cooling])
Z: Position proportioning PID control without FBR (Reverse action)
C: Position proportioning PID control without FBR (Direct action)

(11) Measured input and Range [Quick start code 1]

No code: Quick start code 1 is not specified
□□□: Refer to Range code table.

(12) Instrument specification

Y: Version symbol

■ Quick start code 2 (Initial setting code)

□ □ - □ □ □ □ - □ □
(1) (2) (3) (4) (5) (6) (7) (8)

(1) Output assignments (OUT1, OUT2, and DO1 to DO4)

1 to 7: Refer to Output assignments table.

(2) Remote setting input

1: Voltage input (0 to 10 mV DC)
2: Voltage input (0 to 100 mV DC)
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)

(3) Event function 1 (EV1), (4) Event function 2 (EV2), (5) Event function 3 (EV3), (6) Event function 4 (EV4)

N: None
A: Deviation high
B: Deviation low
C: Deviation high/low
D: Band
E: Deviation high [1]
F: Deviation low [1]
G: Deviation high/low [1]
H: Process high
J: Process low
K: Process high [1]
L: Process low [1]
Q: Deviation high [2]
R: Deviation low [2]
T: Deviation high/low [2]
V: SV high
W: SV low
1: MV high
2: MV low
3: Cooling MV high
4: Cooling MV low
5: Control loop break alarm (LBA) [3]

[1] With Hold action
[2] With Re-hold action
[3] Can be selected only for Event 4 (EV4).

(7) CT type

N: CT1 (None), CT2 (None)
P: CT1 (CTL-6-P-N), CT2 (None)
S: CT1 (CTL-12-S56-10L-N), CT2 (None)
T: CT1 (CTL-6-P-N), CT2 (CTL-6-P-N)
U: CT1 (CTL-12-S56-10L-N), CT2 (CTL-12-S56-10L-N)

(8) Communication 1 protocol

N: None
1: RKC communication (ANSI X3.28-1976)
2: Modbus

● Range code table

[Thermocouple (TC) input, RTD input]

Type	Code	Measured range	Code	Measured range
K	K35	–200.0 to +400.0 °C	KC4	–328.0 to +400.0 °F
	K40	–200.0 to +800.0 °C	KC6	–250.0 to +800.0 °F
	K41	–200 to +1372 °C	KC5	–328 to +2502 °F
	K09	0.0 to 400.0 °C	KA4	0.0 to 800.0 °F
	K10	0.0 to 800.0 °C	KA1	0 to 800 °F
	K14	0 to 300 °C	KA2	0 to 1600 °F
	K02	0 to 400 °C		
	K04	0 to 800 °C		
J	J27	–200.0 to +400.0 °C	JC6	–328.0 to +1200.0 °F
	J32	–200.0 to +800.0 °C	JC7	–200.0 to +700.0 °F
	J15	–200 to +1200 °C	JB9	–328 to +2192 °F
	J08	0.0 to 400.0 °C	JB6	0.0 to 800.0 °F
	J09	0.0 to 800.0 °C	JA1	0 to 800 °F
	J02	0 to 400 °C	JA2	0 to 1600 °F
	J04	0 to 800 °C		
T	T19	–200.0 to +400.0 °C	TC2	–328.0 to +752.0 °F
E	E21	–200.0 to +700.0 °C	EA9	–328.0 to +1292.0 °F
	E06	–200 to +1000 °C	EB1	–328 to +1832 °F
S	S06	–50 to +1768 °C	SA7	–58 to +3214 °F
R	R07	–50 to +1768 °C	RA7	–58 to +3214 °F
B	B03	0 to 1800 °C	BB2	0 to 3272 °F
N	N02	0 to 1300 °C	NA7	0 to 2372 °F
PLII	A02	0 to 1390 °C	AA2	0 to 2534 °F
W5Re/W26Re	W03	0 to 2300 °C	WA2	0 to 4200 °F
U	U04	0.0 to 600.0 °C	UB2	32.0 to 1112.0 °F
L	L04	0.0 to 900.0 °C	LA9	32.0 to 1652.0 °F
Pt100	D21	–200.0 to +200.0 °C	DD1	–200.0 to +200.0 °F
	D34	–100.00 to +100.00 °C	DC8	–199.99 to +199.99 °F
	D35	–200.0 to +850.0 °C	DC9	–328.0 to +1562.0 °F
JPt100	P29	–100.00 to +100.00 °C	PC8	–199.99 to +199.99 °F
	P30	–200.0 to +640.0 °C	PC9	–328.0 to +1184.0 °F
			PD1	–200.0 to +200.0 °F

[Voltage input, Current input]

Type	Code	Measured range
0 to 10 mV DC	101	Programmable range –19999 to +19999 (Factory set value: 0.0 to 100.0 %)
0 to 100 mV DC	201	
0 to 1 V DC	301	
0 to 5 V DC	401	
0 to 10 V DC	501	
1 to 5 V DC	601	
0 to 20 mA DC	701	
4 to 20 mA DC	801	
–100 to +100 mV DC	901	
–1 to +1 V DC	902	
–10 to +10 mV DC	903	

● Output assignments table

Code	OUT1	OUT2	DO1	DO2	DO3	DO4
1	MV1	MV2	EV1	EV2	EV3	EV4
2	MV1	MV2	EV1	EV2	EV3	HBA1 HBA2
3	MV1	MV2	EV1	EV2	HBA1 HBA2	FAIL
4	MV1	MV2	EV1	HBA1 HBA2	EV3	EV4
5	MV1	HBA1 HBA2	EV1	EV2	EV3	EV4
6	MV1	HBA1 HBA2	EV1	EV2	EV3	FAIL
7	MV1	FAIL	EV1	EV2	EV3	EV4

MV1: Control output 1, MV2: Control output 2, HBA1: Heater break alarm 1, HBA2: Heater break alarm 2, FAIL: Fail output (De-energized only), EV1 to EV4: Event output 1 to Event output 4

– When used as Heat/Cool PID control or Position proportioning PID control, select any code of 1 to 4.
– An output logic becomes *OR* output when two or more output functions are assigned to one output.

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