



Digital Controller

# Installation Manual

## CB103/CB403/CB903

IMCB38-E1

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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 the mounting, wiring and specifications only.

For detailed handling procedures, various function settings and parameters, refer to separate **CB103/CB403/CB903 INSTRUCTION MANUAL (IMCB35-ED)**.

The manual can be downloaded from the official RKC website:  
[http://www.rkcinst.com/english/manual\\_load.htm](http://www.rkcinst.com/english/manual_load.htm).

### Product check

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Mounting frame [CB103] (KCA100-526) .....	1
Mounting brackets [CB403/CB903] (KCA400-532)* .....	2
* For CB903 waterproof/dustproof (optional): 4 pieces	

### Safety precautions

#### 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.
- All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action. The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.
- 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. SPECIFICATIONS

### Input

Input type:	
Thermocouple:	K, J, R, S, B, E, T, N, PLII, W5Re/W26Re, U, L
	Input impedance: Approx. 1 MΩ
RTD:	Pt100, JPt100
Voltage:	0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC (Z-1010)
Current:	0 to 20 mA DC, 4 to 20 mA DC
Sampling cycle:	0.5 seconds
Input range:	Refer to Input range table

### Control method

PID control (ON/OFF, P, PI, or PD actions is available)

### Control output

Relay contact output:	250 V AC, 3 A (Resistive load)
	Electrical life: 300,000 times or more (Rated load)
Voltage pulse output:	0/12 V DC (Load resistance 600 Ω or more)
Current output:	4 to 20 mA DC (Load resistance 600 Ω or less)
Trigger output for triac driving:	
	Zero cross method for medium capacity triac driving (100 A or less)
	Load voltage used: 100 V AC line, 200 V AC line
	Load used: Resistive load
	Output method: AC output (Zero-cross method)
Triac output:	Allowable load current: 0.5 A (Ambient temperature: 40 °C or less)
	Load voltage: 75 to 250 V AC
	Minimum load current: 20 mA
	ON voltage: 1.6 V or less (at maximum load current)

### Alarm output

Relay contact output:	250 V AC, 1 A (Resistive load)
	Electrical life: 50,000 times or more (Rated load)

### Auxiliary output

Relay contact output:	250 V AC, 3 A (Resistive load)
Current output:	0 to 20 mA DC or 4 to 20 mA DC (Load resistance 600 Ω or less)

### Contact input

Dry contact input:	At open 500 kΩ or more
	At close 10 Ω or less

### Performance

Display accuracy (at the ambient temperature 23 °C ±2 °C):	
Thermocouple:	± (0.3 % of display value + 1 digit) or ± 2 °C [4 °F] Whichever is greater
R, S and B input:	0 to 399 °C [0 to 799 °F] Accuracy is not guaranteed.
T and U input:	-199.9 to -100.0 °C [-199.9 to -158.0 °F] Accuracy is not guaranteed.
RTD:	± (0.3 % of display value + 1 digit) or ± 0.8 °C [1.6 °F] Whichever is greater
Voltage/Current:	± (0.3 % of Input span + 1 digit)

### Memory backup

Backed up by Nonvolatile Memory	
Number of write times:	Approx. 1,000,000 times
Data storage period:	Approx. 10 years

### Power

Power supply voltage:	85 to 264 V AC [Including power supply voltage variation], 50/60 Hz
	(Rating: 100 to 240 V AC)
	21.6 to 26.4 V AC [Including power supply voltage variation], 50/60 Hz
	(Rating: 24 V AC)
	21.6 to 26.4 V DC [Including power supply voltage variation]
	(Rating: 24 V DC)
Power consumption	7 VA max. (at 100 V AC) 10 VA max. (at 240 V AC)
	5 VA max. (at 24 V AC) 160 mA max. (at 24 V DC)

### Weight

CB103: Approx. 170 g	CB403: Approx. 250 g	CB903: Approx. 340 g
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## 2. MOUNTING

#### WARNING

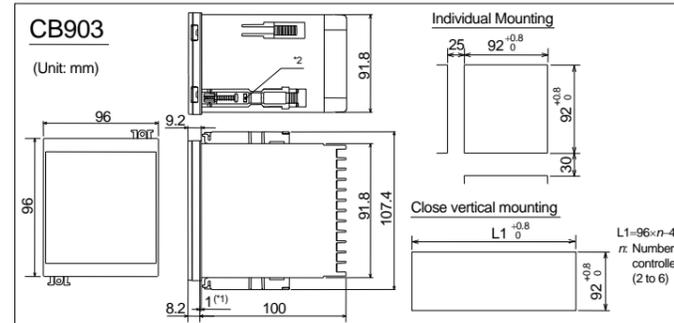
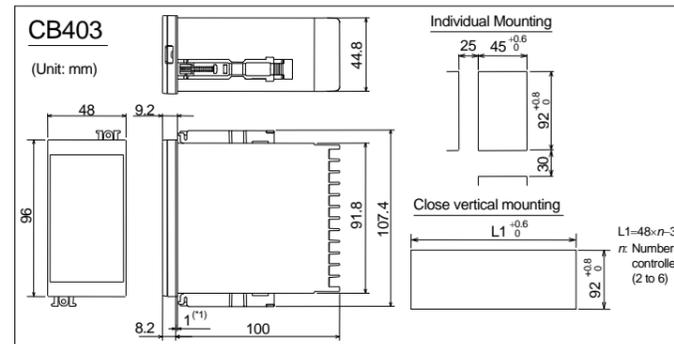
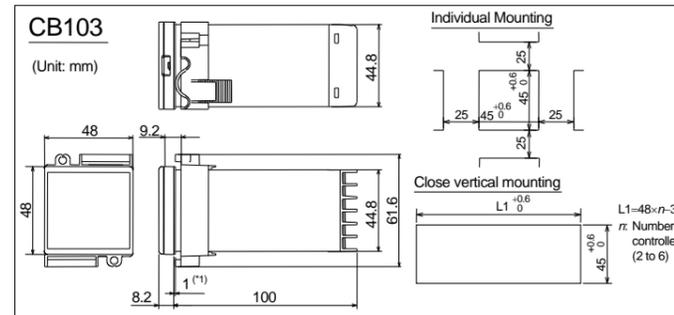
To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.

### 2.1 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: 0 to 50 °C
    - Allowable ambient humidity: 5 to 95 %RH (Absolute humidity: MAX. W. C 29.3 g/m<sup>3</sup> dry air at 101.3 kPa)
  - Installation environment conditions: Indoor use, Altitude up to 2000 m
- 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 mainframe.
  - 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:
    - 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.
    - 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.

### 2.2 Dimensions



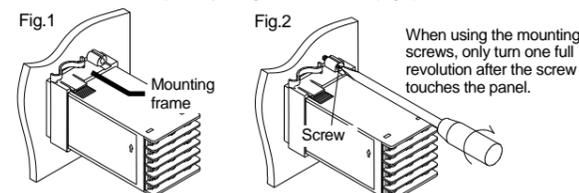
- \*1 Gasket (optional)
- \*2 Up to four mounting brackets can be used.
- For mounting of the instrument, panel thickness must be between 1 to 10 mm. (When mounting multiple instruments close together, the panel strength should be checked to ensure proper support.)
- Waterproof and Dustproof are not effective when instruments are closely spaced.

### 2.3 Mounting Procedures

#### CB103

##### <Mounting Procedures>

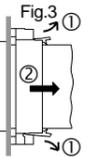
- Prepare the panel cutout as specified in **2.2 Dimensions**.
- Insert the instrument through the panel cutout.
- Insert the mounting frame into the mounting from the rear of the instrument.
- Push the mounting frame forward until the frame is firmly secured to the panel. (Fig.1)
- Fix the instrument to the panel by using the two screws. (Fig.2)



- The optional waterproof/dustproof on the front of the instrument conforms to IP66 (Checked and confirmed its compliance through the internal test at RKC) when mounted on the panel. For effective waterproof/dustproof, the gasket must be securely placed between instrument and panel without any gap. If the gasket is damaged, please contact RKC sales office or the agent.

##### <Removal Procedures>

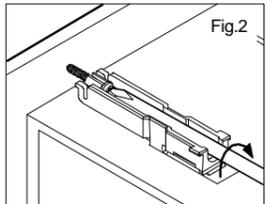
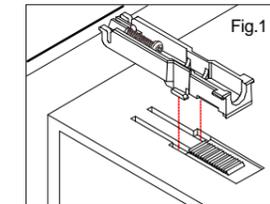
- Turn the power OFF.
- Remove the wiring.
- Loosen the screw of the mounting frame.
- Remove the mounting frame from the case. (Fig.3)



#### CB403/903

##### <Mounting Procedures>

- Prepare the panel cutout as specified in **2.2 Dimensions**.
- Insert the instrument through the panel cutout.
- Insert the mounting bracket into the mounting groove of the instrument. Do not push the mounting bracket forward. (Fig. 1)
- Secure the bracket to the instrument by tightening the screw. Take care to refrain from moving the bracket forward.
- Only turn about one full revolution after the screw touches the panel. (Fig. 2)
- If the screw has been rotated too tight, the screw may turn idle. In such a case, loosen the screw once and tighten it again until the instrument is firmly fixed.
- The other mounting bracket should be installed in the same way as described in **3** to **5**.

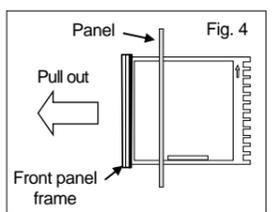
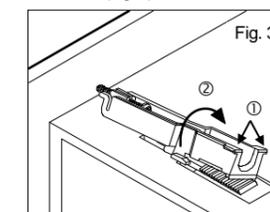


- When the instrument is mounted, always secure with two mounting brackets so that upper and lower mounting brackets are positioned diagonally.

- The optional waterproof/dustproof (CB903: mounting bracket 4 pieces) on the front of the instrument conforms to IP65 (Checked and confirmed its compliance through the internal test at RKC) when mounted on the panel. For effective waterproof/dustproof, the gasket must be securely placed between instrument and panel without any gap. If gasket is damaged, please contact RKC sales office or the agent.

##### <Removal Procedures>

- Turn the power OFF.
- Remove the wiring.
- Loosen the screw of the mounting bracket.
- Hold the mounting bracket by the edge (①) and tilt it (②) to remove from the case. (Fig. 3)
- The other mounting bracket 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. (Fig. 4)



## 3. 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.

### 3.1 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.
- For the current input specification, an external resistor (250 Ω ±0.02 %, 0.25 W or more, ±10 ppm/°C) must be connected between the input terminals. For external resistor (shunt resistor), use the KD100-55: sold separately (RKC product). If this resistor is installed, close horizontal mounting is not possible.
- 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.

