

CB103 / CB403 / CB903

INSTRUCTION MANUAL

IMCB11-E3

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



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 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 adequate 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.
- 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 of 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.

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.
- 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. PRODUCT CHECK

Check whether the delivered product is as specified by referring to the following model code list.

CB103	□□□□-□ * □□□ - □□/□/□
CB403	
CB903	① ② ③ ④⑤⑥ ⑦⑧⑨

① Control action

- F: PID action with autotuning (Reverse action)
- D: PID action with autotuning (Direct action)

② Input type/Range code: See "8. INPUT RANGE TABLE."

③ Control output [OUT1]

- M: Relay contact T: Triac V: Voltage pulse
- 8: Current (4 to 20 mA DC) G: Trigger (for triac driving)

④ Alarm 1 [ALM1] , ⑤ Alarm 2 [ALM2]

- N: No alarm J: Process low alarm
- A: Deviation high alarm K: Process high alarm*
- B: Deviation low alarm L: Process low alarm*
- C: Deviation high/low alarm P: Heater break alarm (CTL-6) *1
- D: Band alarm S: Heater break alarm(CTL-12)
- *1
- E: Deviation high alarm* R: Control loop break alarm *2
- F: Deviation low alarm* V: SV high alarm
- G: Deviation high/low alarm* W: SV low alarm
- H: Process high alarm (*With hold action)

⑥ Auxiliary output [DO] *3

- N: No auxiliary output
- A to L: Temperature alarm output (See the above alarm code)
- 7: Current (0 to 20 mA DC)
- 8: Current (4 to 20 mA DC)
- Y: RUN/STOP status output

⑦ Contact input

- N: No contact input 2: RUN/STOP
- 1: Step function (SV1/SV2 switching)

⑧ Waterproof/dustproof

- N: No waterproof/dustproof
- 1: Waterproof/dustproof

⑨ Case color

- N: Off-white A: Off-black

*1 Heater break alarm can not be specified in case of ALM1. Also, it isn't possible to specify when control output is current output.

*2 As control loop break alarm, only either the alarm 1 or alarm 2 is selected.

*3 No auxiliary output is provided when control output is trigger output.

<Accessories>

CB103

- Mounting frame: 1 piece
- Mounting screws: 2 pieces
- Instruction Manual [IMCB11-E3]: 1 copy

CB403

- Mounting bracket: 2 pieces
- Mounting screws (with hexagon nuts): 2 pieces
- Instruction Manual [IMCB11-E3]: 1 copy

CB903

- Mounting bracket: 2 pieces*
- Mounting screws (with hexagon nuts): 2 pieces*
- Instruction Manual [IMCB11-E3]: 1 copy

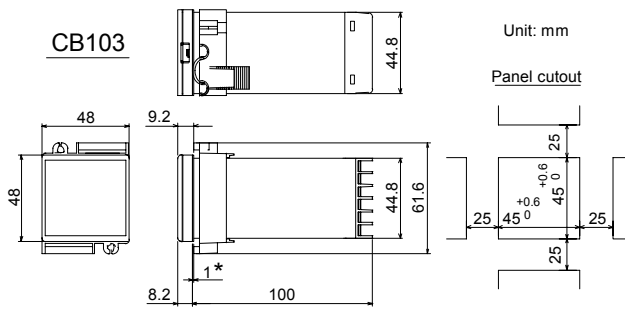
* Waterproof/dustproof option: 4 pieces

2. MOUNTING

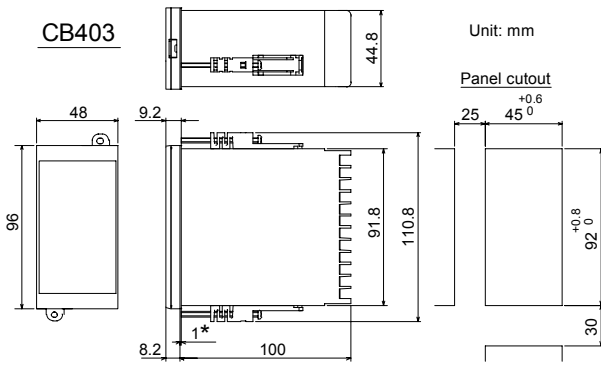
2.1 Mounting Cautions

- (1) This instrument is intended to be used under the following environmental conditions. (IEC61010-1)
 - OVERVOLTAGE CATEGORY II
 - POLLUTION DEGREE 2
- (2) Avoid the following when selecting the mounting location.
 - Ambient temperature of less than 0 °C or more than 50 °C.
 - Ambient humidity of less than 45 % or more than 85 % RH.
 - 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.

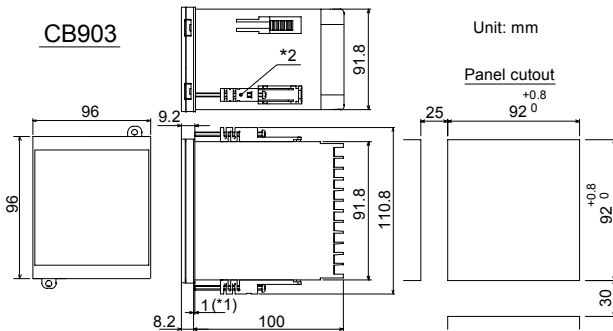
2.2 Dimensions



CB103 Unit: mm
 Panel cutout
 Weight: 170 g
 *Rubber (option)
 For mounting of the instrument, panel thickness must be between 1 to 10 mm.



CB403 Unit: mm
 Panel cutout
 Weight: 250 g
 *Rubber (option)
 For mounting of the instrument, panel thickness must be between 1 to 10 mm.



CB903 Unit: mm
 Panel cutout
 Weight: 340 g
 *1 Rubber (option)
 *2 Up to 4 mounting brackets can be used.
 For mounting of the instrument, panel thickness must be between 1 to 10 mm.

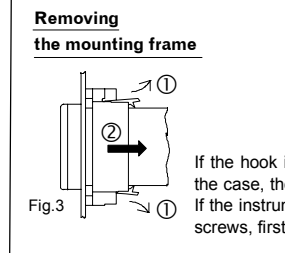
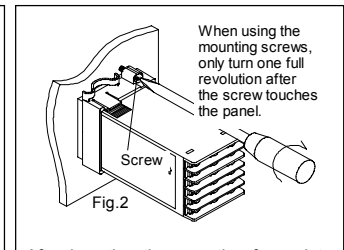
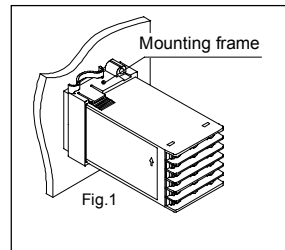
2.3 Mounting Procedures

NOTE

- The waterproof/dustproof option on the front of the instrument conforms to IP65 (CB103: IP66) 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, contact your nearest RKC agent or sales office.

■ CB103

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

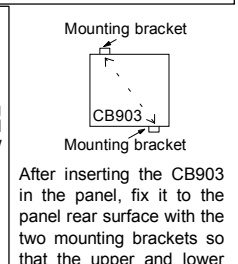
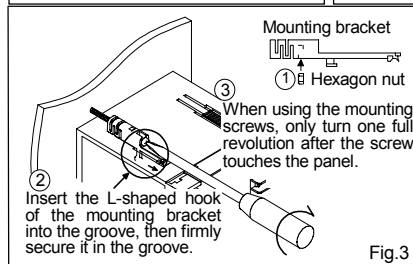
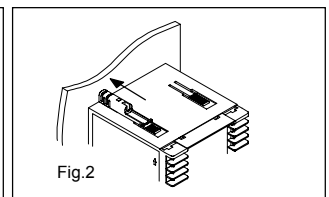
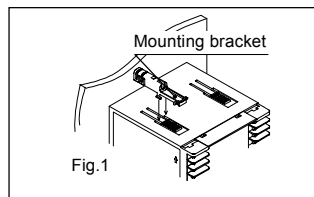


After inserting the mounting frame into the instrument according to the above procedures (Fig.2), fix the instrument to the panel by using the two screws. When tightening each screw, tighten it only one turn just after it touches the panel. Use the attached screws.

If the hook in the mounting frame is disengaged from the case, the mounting frame can be removed (Fig.3). If the instrument is fixed to the panel by tightening the screws, first loosen the screw.

■ CB403/CB903

- (1) Prepare the panel cutout as specified in 2.2 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)

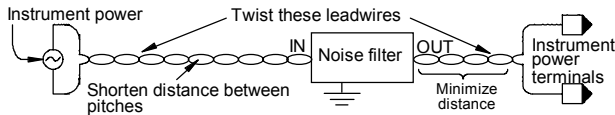


Insert a hexagon nut in the mounting bracket according to the above procedure (Fig. 3) to mount the bracket, then fix the instrument with the screw. Use the hexagon nuts and screws attached.

3. WIRING

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.
- 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.
- Power supply wiring must be twisted and have a low voltage drop.

- About four 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.
- This instrument is not furnished with a power supply switch or fuses. Therefore, if a fuse or power supply switch is required, install close to the instrument.
 - Fuse type: Time-lag fuse
 - Recommended fuse rating: Rated voltage 250 V
Rated current 1 A
- For the current input specification, a resistor of 250 Ω (±0.02 % ±10 ppm, 0.25 W or more) must be connected between the input terminals. This resistor must be provided by the customer.
- Do not excessively tighten the terminal screws. In addition, use the solderless terminal appropriate to the screw size.
 - Screw size: M3x6
 - Recommended tightening torque: 0.4 N·m [4 kgf·cm]
- For an instrument with 24 V power supply, supply power from a SELV circuit.

3.2 Terminal Configuration

<p>CB103</p> <table border="1"> <tr><td>1</td><td>13</td><td>7</td></tr> <tr><td>2</td><td>14</td><td>8</td></tr> <tr><td>3</td><td>15</td><td>9</td></tr> <tr><td>4</td><td>16</td><td>10</td></tr> <tr><td>5</td><td>17</td><td>11</td></tr> <tr><td>6</td><td>18</td><td>12</td></tr> </table> <p>CB403</p> <table border="1"> <tr><td>1</td><td>13</td></tr> <tr><td>2</td><td>14</td></tr> <tr><td>3</td><td>15</td></tr> <tr><td>4</td><td>16</td></tr> <tr><td>5</td><td>17</td></tr> <tr><td>6</td><td>18</td></tr> <tr><td>7</td><td>19</td></tr> <tr><td>8</td><td>20</td></tr> <tr><td>9</td><td>21</td></tr> <tr><td>10</td><td>22</td></tr> <tr><td>11</td><td>23</td></tr> <tr><td>12</td><td>24</td></tr> </table> <p>CB903</p> <table border="1"> <tr><td>1</td><td>13</td></tr> <tr><td>2</td><td>14</td></tr> <tr><td>3</td><td>15</td></tr> <tr><td>4</td><td>16</td></tr> <tr><td>5</td><td>17</td></tr> <tr><td>6</td><td>18</td></tr> <tr><td>7</td><td>19</td></tr> <tr><td>8</td><td>20</td></tr> <tr><td>9</td><td>21</td></tr> <tr><td>10</td><td>22</td></tr> <tr><td>11</td><td>23</td></tr> <tr><td>12</td><td>24</td></tr> </table> <p>NO: Normally open NC: Normally closed</p>	1	13	7	2	14	8	3	15	9	4	16	10	5	17	11	6	18	12	1	13	2	14	3	15	4	16	5	17	6	18	7	19	8	20	9	21	10	22	11	23	12	24	1	13	2	14	3	15	4	16	5	17	6	18	7	19	8	20	9	21	10	22	11	23	12	24	<p>Power terminals</p> <p>Auxiliary output terminals (Option) *1</p> <p>Relay contact: DO (3), NO (4)</p> <p>Current: AO (3) 0 to 20mA DC or 4 to 20mA DC</p> <p>*1 No auxiliary output is provided when control output is trigger output.</p> <p>Alarm output (ALM3) RUN/STOP state output</p> <p>Control output terminals</p> <p>Trigger: T2 (4), T1 (5), G (6)</p> <p>Triac: OUT1 (5), SSR (6)</p> <p>Voltage pulse Current: OUT1 (5), (6)</p> <p>Relay contact: OUT1 (5), NO (6)</p> <p>Alarm output terminals (Option)</p> <p>Alarm 2: NO (7), ALM2 (8)</p> <p>Alarm 1: NO (8), ALM1 (9)</p>	<p>Input terminals</p> <p>RTD: 10 (A), 11 (B), 12 (B)</p> <p>Thermocouple: 11 (+), 12 (-)</p> <p>Current: 11 (+) 0 to 20mA DC or 4 to 20mA DC, 12 (-)</p> <p>Voltage: 11 (+) 0 to 5V DC or 1 to 5V DC, 12 (-)</p> <p>Contact input terminals (Option)</p> <p>DI: 13 (-), 15 (+)</p> <p>Current transformer input terminals (Option)</p> <table border="1"> <tr> <td> <p>CB103</p> <p>17 (CT1), 18 (CT1)</p> </td> <td> <p>CB403/CB903</p> <p>23 (CT1), 24 (CT1)</p> </td> </tr> </table>	<p>CB103</p> <p>17 (CT1), 18 (CT1)</p>	<p>CB403/CB903</p> <p>23 (CT1), 24 (CT1)</p>
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Power supply voltage:

- 90 to 264 V AC (Power supply voltage range)
50/60 Hz, Rating: 100 to 240 V AC
21.6 to 26.4 V AC
(Power supply voltage range)
- 50/60 Hz, Rating: 24 V AC
21.6 to 26.4 V DC
(Power supply voltage range)
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)
- 3.84 W max. [160 mA max.] (at 24 V DC)

Control output:

- Relay contact output rated:
250 V AC, 3 A (Resistive load), 1a contact
- Voltage pulse output rated:
0/12 V DC (Load resistance 600 Ω or more)
- Current output rated:
4 to 20 mA DC (Load resistance 600 Ω or less)
- Trigger output (for triac driving) rated:
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
- Triac output rated:
0.5 A (Ambient temperature 40 °C or less)

Alarm output (option):

- Relay contact output rated:
250 V AC, 1 A (Resistive load), 1a contact

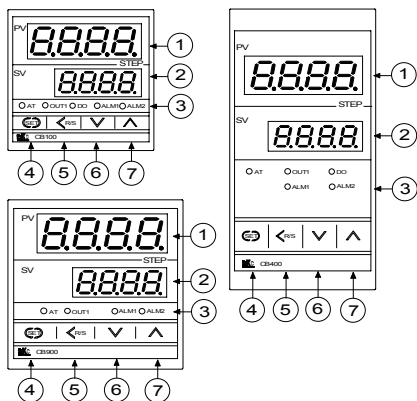
Auxiliary output (option):

- Relay contact output rated:
250 V AC, 3 A (Resistive load), 1a contact
- Current output rated:
0 to 20 mA DC or 4 to 20 mA DC
(Load resistance 600 Ω or less)

Contact input (option):

- Dry contact input rated
At open 500 kΩ or more

4. NAME OF PARTS



① Measured value (PV) display [Green]

- Displays PV or various parameter symbols.
- The decimal point at the least significant digit lights in the step state (while the contact input closed).

② Set value (SV) display [Orange]

Displays SV, STEP set value (SV2), or various parameter set values (or CT input value).

③ Indication lamps

Alarm output lamps (ALM1,ALM2) [Red]

ALM1: Lights when alarm 1 output is turned on.

ALM2: Lights when alarm 2 output is turned on.

Control output lamp (OUT1) [Green]

OUT1: Lights when control output is turned on. **

** Lamp indication becomes as follows for current output.

For an output of less than 0 %: Extinguished

For an output of more than 100 %: Lit

For an output of more than 0 % but less than 100 %: Dimly lit.

Auxiliary output lamp (DO) [Green]

DO: Lights when first auxiliary output (alarm 3 [ALM3], RUN/STOP state output) is turned on. When the analog output is selected as an auxiliary output, the DO lamp does not light.

Autotuning (AT) lamp [Green]

Flashes during autotuning execution.

④ SET (Set key)

Used for parameter calling up and set value registration.

⑤ <R/S (Shift & R/S key)

- Shift digits when settings are changed.
- Select the RUN/STOP function.

⑥ ∇ (DOWN key)

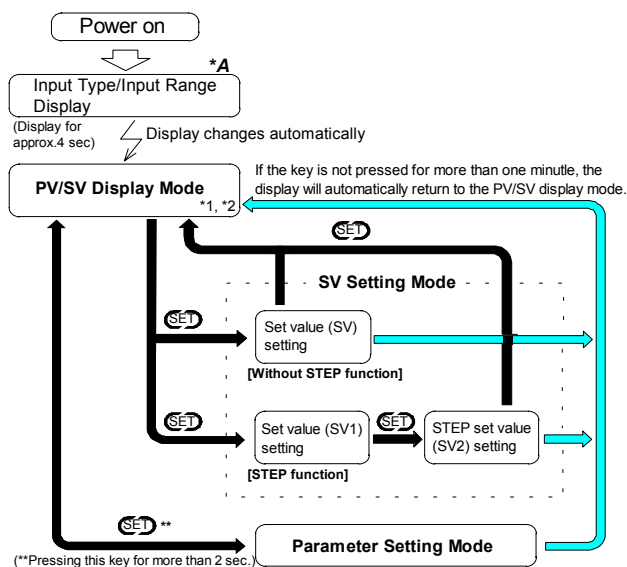
Decrease numerals.

⑦ ▲ (UP key)

Increase numerals.

5. SETTING

5.1 Calling Up Procedure of Each Mode



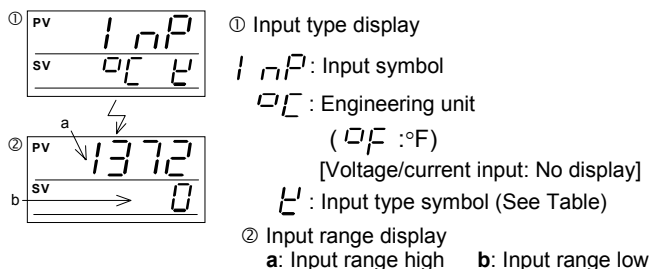
*1 The RUN/STOP function can be selected. The RUN/STOP function can be selected every time the <R/S key is pressed for one second.

*2 If the step function is provided, the SV display shows the SV selected by the contact input.

*A: Input Type/Input Range Display

This instrument immediately confirms input type and range following power on.

Example: For a controller with the K thermocouple input type and range from 0 to 1372 °C.



Input Type Symbol Table

Symbol	Thermocouple (TC)										RTD		Voltage (Current)				
Input type	K	J	R	S	B	E	T	N	PL/II	W5Re/W26Re	U	L		JPt100	Pt100		
	P	V	r	S	b	E	r	n	P	∩	U	L	J	P	P	r	∩

5.2 Detail of Each Mode

■ PV/SV display mode

The controller will display the measured value (PV) and the set value (SV). If the STEP function is provided, the SV display will show the set value (SV1) or STEP set value (SV2) depending on whether the contact input is opened or closed.



This decimal point indicates that the instrument is in the step state. It also lights in the step state while parameter setting mode are being displayed.

Display in step state

The controller can be switched to RUN or STOP mode. (See 6. OPERATIONS)

■ SV setting mode

This is the mode used to set the set value (SV). The brightly lit digit on the SV display can be set.

Setting range: Within input range
 Factory set value: 0 °C [°F] or 0.0 °C [°F]

If the STEP function is provided, the following parameter symbols are displayed on the PV display.

Set value (SV1): 58.1 STEP set value (SV2): 58.2

■ Parameter setting mode

This is the mode used to set the various parameters such as alarms, PID constants, etc. The following parameter symbols are displayed one by one every time the SET key is pressed. For the details, see Parameter table (page 5).

Parameter table

#1: Factory set value

Symbol	Name	Setting range	Description	#1
<i>CT1</i>	Current transformer input 1 (CT1)	0.0 to 100.0 A [Only display]	Display input value from the current transformer. [Displayed only when the instrument has the heater break alarm]	_____
<i>AL1</i>	Alarm 1 (ALM1)	For temperature input: Deviation alarm, Process alarm, SV alarm: -1999 to +9999 °C[°F] or -199.9 to +999.9 °C[°F]	Set the alarm 1, alarm 2 and alarm 3 set value.	Temperature input: 50(50.0)
<i>AL2</i>	Alarm 2 (ALM2)	For voltage/current inputs: Deviation alarm: -span to +span (Within 9999)	Alarm differential gap: Temperature input: 2 or 2.0 °C[°F] Voltage/current inputs: 0.2 % of span	Voltage/ current inputs: 5.0
<i>AL3</i>	Alarm 3 (ALM3)	Process alarm, SV alarm: Same as input range	SV alarm can not be specified in case of ALM3. ALM3 is auxiliary output.	
<i>HBA1</i>	Heater break alarm 1 (HBA)	0.0 to 100.0 A See *1.	Alarm value is set by referring to input value from the current transformer (CT). Used only for single-phase.	0.0
<i>LBA</i>	Control loop break alarm(LBA)	0.1 to 200.0 min. (0.0 can not be set.) See *2.	Set control loop break alarm set value.	8.0
<i>Lbd</i>	LBA deadband (LBD)	Temperature input: 0 to 9999 °C[°F] Voltage/current inputs: 0 to 100 % of span	Set the area of not outputting LBA. No LBA deadband functions with 0 set. Differential gap: Temperature input: 0.8 °C[°F] Voltage/current inputs:0.8 % of span	0
<i>ATU</i>	Autotuning (AT)	0: AT end or cancel 1: AT start or execution	Turns the autotuning ON/OFF.	0
<i>STU</i>	Self-tuning (ST)	0: Self-tuning OFF 1: Self-tuning ON	Turns the self-tuning ON/OFF.	0
<i>P</i>	Proportional band (P)	Temperature input: 1(0.1) to span or 9999(999.9) °C[°F] Voltage/current inputs: 0.1 to 100.0 % of span	Set when PI, PD or PID control is performed. ON/OFF action control when set to 0(0.0). ON/OFF action differential gap: Temperature input: 2 or 2.0°C[°F] Voltage/current inputs: 0.2 % of span	Temperature input: 30(30.0) Voltage/ current inputs: 3.0
<i>I</i>	Integral time (I)	1 to 3600 sec (PD control when set to 0 sec.)	Set the time of integral action which eliminates the offset occurring in proportional control.	240
<i>d</i>	Derivative time (D)	1 to 3600 sec (PI control when set to 0 sec.)	Set the time of derivative action which prevents ripples by predicting output changes and thus improves control stability.	60
<i>AR</i>	Anti-reset windup (ARW)	1 to 100 % of proportional band. (0 %: Integral action OFF)	Overshooting and undershooting are restricted by the integral effect.	100
<i>T</i>	Proportioning cycle (T)	1 to 100 sec (0 can not be set.) (Not displayed if the control output is current output.)	Set control output cycle.	See *3.
<i>Pb</i>	PV bias (Pb)	Temperature input: -1999 to +9999 °C[°F] or -199.9 to +999.9 °C [°F] Voltage/current inputs: -span to +span	Sensor correction is made by adding bias value to measured value (PV).	0 or 0.0
<i>AO</i>	Analog output (Ao) selection	0: Measured value (PV) 1: Set value (SV) 2: Deviation value (DEV) 3: Manipulated output value (MV)	Select the analog output type. Analog output is auxiliary output.	0

(Continued on the next page.)

Symbol	Name	Setting range	Description	#1
AHS	Analog output scale high (AHS)	PV,SV: ALS to Setting limiter high (SLH) DEV: ALS to +span (within 9999) MV: ALS to 100.0	Set the analog output scale high.	Input range (high limit)
ALS	Analog output scale low (ALS)	PV,SV: Setting limiter low (SLL) to AHS DEV: -span (within -9999) to AHS MV: 0.0 to AHS	Set the analog output scale low.	Input range (low limit)
LCK	Set data lock function (LCK)	See *4.	Performs set data change enable/disable.	0000

NOTE Some parameter symbols may not be displayed depending on the specification.

*1 Precautions for heater break alarm (HBA) setting

- Displayed only for when HBA is selected as alarm 2.
- HBA is not available on a current output.
- Set HBA set value to a value about 85 % of current transformer input value (CT). However, when power supply variations are large, set the HBA to a slightly smaller value. In addition, when two or more heaters are connected in parallel, set the HBA to a slightly larger value so that it is activated even with only one heater is broken (However, within the value of CT).
- When the HBA set value is set to "0.0" or the current transformer is not connected, the HBA is turned on.

*2 Precautions for control loop break alarm (LBA) setting

- Displayed only for when LBA is selected as alarm 1 or alarm 2.
- When AT function is turned on, the LBA function can not activated.
- The LBA function is activated when control output reaches 0 % or 100 %. The time required for the LBA output to turn on includes both the time from the initial occurrence of loop failure and the LBA setting time. We recommend that the set value of LBA be twice the value of the integral time (I).
- If LBA setting time does not match the controlled object requirements, the LBA setting time should be lengthened. If setting time is not correct, the LBA will malfunction by turning on or off at inappropriate times or not turning on at all.

*3 Relay contact output: 20 sec, Voltage pulse output/Trigger output for triac driving/Triac output: 2 sec

*4 Details of set data lock level selection

Setting	Details of lock level	Setting	Details of lock level
0000	SV and parameter can be set.	0011	Only SV can be set.
0001	Only SV and alarms (ALM1, ALM2, ALM3) can be set.	0101	Only alarms (ALM1, ALM2, ALM3) can be set.
0010	Only setting items other than alarms (ALM1, ALM2, ALM3) can be set.	0110	Only setting items other than SV and alarms (ALM1, ALM2, ALM3) can be set.
0100	Only setting items other than SV can be set.	0111	SV and parameter cannot be set.

- Each locked setting item can only be monitored.
- Each alarm setting item [HBA, LBA, LBD] can be locked when any of "0001", "0011", "0101" and "0111" is set.

5.3 Parameter Setting Procedure

Key operational cautions

- When the set value is changed, it is not automatically stored. To store it, press the **SET** key.
- When the set data is locked, the digits on the SV display are brightly lit and the set value cannot be changed.

■ Setting set value (SV)

(1) Set to the SV setting mode

PV	30
SV	0000

Press the **SET** key to enter the SV setting mode. The digit which light brightly is settable.

Example: Following is an example of set value (SV) to 200 °C [No step function]

(2) Shift of the digit brightly lit

PV	30
SV	0000

Press the **<R/S** key to shift the digit which lights brightly up to the hundreds digit.

(3) Numeric value change

PV	30
SV	0200

Press the **UP** key to set 2. Pressing the **UP** key increase numerals, and pressing the **DOWN** key decrease numerals.

(4) Set value entry

PV	30
SV	200

After finishing the setting, press the **SET** key. All of the set value digits light brightly and as a result the instrument returns to the PV/SV display mode.

■ Setting parameters other than set value (SV)

The setting procedures are the same as those of example (2) to (4) in the above "■Setting set value (SV)." Pressing the **SET** key after the setting end shifts to the next parameter. When no parameter setting is required, return the instrument to the PV/SV display mode. For the details of parameter setting mode selection, see "5.1 Calling up procedure of each mode."

6. OPERATIONS

CAUTIONS

- All mounting and wiring must be completed before the power is turned on.
 - Upscale*1: TC input, RTD input (Downscale when the input is shorted.)
 - Downscale*1: TC input (To be specified when ordering), Voltage input (Current input)*2
- *1 Alarm output ON *2 For 0 to 5 V DC or 0 to 20 mA DC, both control and alarm outputs are indefinite.
- A power failure of 20 ms or less will not affect the control action. When a power failure of more than 20 ms occurs, the instrument assumes that the power has been turned off. When power returns, the controller will retain the conditions that existed prior to shut down. The alarm hold action is activated when the power is turned on or the SV is changed, including an SV change made with the STEP function.

6.1 Operation Procedures

- Prior to starting operation, check that the mounting and wiring have been finished, and that the SV and various parameters have been set.
- A power supply switch is not furnished with this instrument. It is ready to operate as soon as the power is turned on. [Factory set value: RUN (operation start)]

NOTE

This instrument holds the conditions that exist just before the power is turned on. For example, if the power is turned off in STOP mode, the instrument starts in STOP mode when the power is turned on again.

■ RUN/STOP selection

RUN/STOP can be selected by both key operation (P. 4) and contact input (Option). In addition, at STOP the key operation and contact states are displayed on the PV display.

RUN/STOP selection

		Transfer by contact input	
		RUN (Contact close)	STOP (Contact open)
Transfer by key operation	RUN	RUN	STOP
	STOP	STOP	STOP
		-	dSTOP
		STOP	STOP
		STOP	STOP

Only when the contact is closed, RUN/STOP can be selected by key operation.

NOTE

- When there is no contact input *STOP* is displayed on the display unit at STOP.
- Operation when changed to operation, stop (STOP):
Output: Control output OFF, Alarm output OFF
Autotuning: AT canceled (The PID constants are not updated.)

■ RUN/STOP display (Z-1018 specification)

When operation is changed to the STOP mode by RUN/STOP selection, a parameter symbol to indicate the STOP mode is displayed on the SV display. Pressing the SET key with the STOP mode displayed can also check and change the set value (SV).

6.2 STEP Function (option)

The controller has two set value (SV). This STEP function selects these two set values (SV) by contact input (terminal No.13, 15).
Contact open: set value (SV1)
Contact closed: STEP set value (SV2)

6.3 Auxiliary Output Function (option)

One auxiliary output can be selected from among ALM3, analog output, and RUN/STOP mode output (RUN: contact closed, STOP: contact open).

6.4 Set Data Lock (LCK) Function

The set data lock function permits locking of critical parameters and prevents unauthorized personnel from changing parameters.

6.5 Autotuning (AT) Function

The AT function automatically measures, computes and sets the optimum PID and LBA constants.

■ Requirements for AT start

Start AT when all the following conditions are satisfied:

- Prior to starting the AT function, end all the parameter settings other than PID and LBA.
- Confirm the LCK function has not been engaged.

■ Requirements for AT cancellation

The AT function is canceled if any of the following conditions is exist:

- When the SV is changed.
(Including SV change by the STEP function)
- When the PV bias value is changed.
- When the RUN/STOP is changed to the STOP mode.
- When the PV becomes abnormal when burnout.
- When the power is turned off.
- When a power failure longer than 20 ms occurs.
- When the AT function does not end in nine hours after autotuning started.

NOTE

- If the AT is canceled, the controller immediately changes to PID control. The PID and LBA constants will be the same as before AT was activated.
- When AT is completed, the controller immediately changes to PID control. If the control system does not allow the AT cycling process, do not use AT and set each PID constant to meet the needs of the application.

6.6 Self-tuning (ST) Function

The ST function is used to automatically calculate and set adaptive PID constants anytime the power is turned on, the SV is changed or the controller detects unstable control conditions.

CAUTION


- The ST function should be turned off when the controlled system is affected by rippling that occurs due to periodic external disturbances.
- The power to the controlled system must be turned on before the power to the instrument is turned on or SV is changed. This is required when ST function is on.
- To activate the ST function, the following parameters must not be set to zero: P≠0, I≠0, D≠0, ARW≠0.
- When the AT function is activated, the ST function can not be turned on.
- When the ST function is activated, the PID and ARW settings cannot be changed, only monitored.

7. ERROR DISPLAYS

■ Error display

E r r	RAM failure (Incorrect set data write, etc.)	Please contact your nearest RKC sales office or agent.
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■ Over-scale and Underscale

Measured value (PV) is flashing	PV is outside of input range.	 <div style="border: 1px solid black; padding: 5px; display: inline-block;">WARNING</div> To prevent electric shock, always turn off the power before replacing the sensor. Check the sensor or input lead
□ □ □ □ flashing	Overscale - PV is above the high input display range limit.	
U U U U flashing	Underscale - PV is below the low input display range limit.	

8. INPUT RANGE TABLE

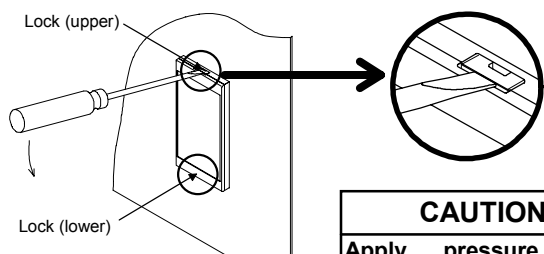
Input type	Model code	Input type	Model code	Input type	Model code	Input type	Model code	Input type	Model code					
K	0 to 200 °C	K 01	J	0 to 800 °F	J A1	N	0 to 1200 °C	N 01	U *2	-199.9 to +100.0 °C	U 02	Pt100	-100.0 to +100.0 °F	D A4
	0 to 400 °C	K 02		0 to 1600 °F	J A2		0 to 1300 °C	N 02		0.0 to 400.0 °C	U 03		-100.0 to +300.0 °F	D A5
	0 to 600 °C	K 03		0 to 2192 °F	J A3		0 to 2300 °F	N A1		-199.9 to +999.9 °F	U A1		0.0 to 100.0 °F	D A6
	0 to 800 °C	K 04		0 to 400 °F	J A6		0 to 2372 °F	N A2		-100.0 to +200.0 °F	U A2		0.0 to 200.0 °F	D A7
	0 to 1000 °C	K 05		0 to 300 °F	J A7	*2 -199.9 to +400.0 °C	T 01	0.0 to 999.9 °F		U A3	0.0 to 400.0 °F		D A8	
	0 to 1200 °C	K 06		*1 0 to 1600 °C	R 01	*2 -199.9 to +100.0 °C	T 02	0 to 400 °C		L 01	0.0 to 500.0 °F		D A9	
	0 to 1372 °C	K 07	*1 0 to 1769 °C	R 02	-100.0 to +200.0 °C	T 03	0 to 800 °C	L 02	-199.9 to +649.0 °C	P 01				
	0 to 100 °C	K 13	*1 0 to 1350 °C	R 04	0.0 to 350.0 °C	T 04	0 to 800 °F	L A1	-199.9 to +200.0 °C	P 02				
	0 to 300 °C	K 14	*1 0 to 3200 °F	R A1	-199.9 to +752.0 °F	T A1	0 to 1600 °F	L A2	-100.0 to +50.0 °C	P 03				
	0 to 450 °C	K 17	*1 0 to 3216 °F	R A2	-100.0 to +200.0 °F	T A2	-199.9 to +649.0 °C	D 01	-100.0 to +100.0 °C	P 04				
	0 to 500 °C	K 20	*1 0 to 1600 °C	S 01	-100.0 to +400.0 °F	T A3	-199.9 to +200.0 °C	D 02	-100.0 to +200.0 °C	P 05				
	0 to 800 °F	K A1	*1 0 to 1769 °C	S 02	0.0 to 450.0 °F	T A4	-100.0 to +50.0 °C	D 03	0.0 to 50.0 °C	P 06				
	0 to 1600 °F	K A2	*1 0 to 3200 °F	S A1	0.0 to 752.0 °F	T A5	-100.0 to +100.0 °C	D 04	0.0 to 100.0 °C	P 07				
	0 to 2502 °F	K A3	*1 0 to 3216 °F	S A2	0 to 2000 °C	W 01	-100.0 to +200.0 °C	D 05	0.0 to 200.0 °C	P 08				
20 to 70 °F	K A9	400 to 1800 °C	B 01	0 to 2320 °C	W 02	0.0 to 50.0 °C	D 06	0.0 to 300.0 °C	P 09					
J	0 to 200 °C	J 01	B	*1 0 to 1820 °C	B 02	Pt100	0.0 to 100.0 °C	D 07	0 to 5 V DC	4 01				
	0 to 400 °C	J 02		800 to 3200 °F	B A1		0.0 to 200.0 °C	D 08	1 to 5 V DC	0.0 to 100.0	6 01			
	0 to 600 °C	J 03	E	0 to 800 °C	E 01		0 to 1300 °C	A 01	0.0 to 300.0 °C	D 09	0 to 20 mA DC	7 01		
	0 to 800 °C	J 04		0 to 1000 °C	E 02		0 to 1390 °C	A 02	0.0 to 500.0 °C	D 10	4 to 20 mA DC	8 01		
	0 to 1000 °C	J 05		0 to 800 °C	E 01		0 to 1200 °C	A 03	-199.9 to +999.9 °F	D A1				
	0 to 1200 °C	J 06		0 to 1600 °F	E A1		0 to 2400 °F	A A1	-199.9 to +400.0 °F	D A2				
0 to 450 °C	J 10	0 to 1832 °F	E A2	0 to 2534 °F	A A2	-199.9 to +200.0 °F	D A3							
				U *2 -199.9 to +600.0 °C	U 01									

*1 0 to 399 °C / 0 to 799 °F : Accuracy is not guaranteed. *2 -199.9 to -100.0 °C / -199.9 to -158.0 °F : Accuracy is not guaranteed.

9. REMOVING THE INTERNAL ASSEMBLY

! WARNING

- To prevent electric shock or instrument failure, only qualified personnel should be allowed to remove the internal assembly.
- To prevent electric shock or instrument failure, the power must be turned off before removing internal assembly.
- To prevent injury or instrument failure, do not touch the printed wiring boards when removing the internal assembly.



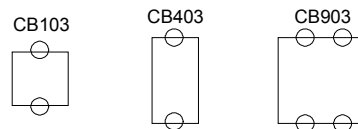
Unlock using such an screwdriver. Gently press down on handle for the upper lock and lift up for the lower lock.

CAUTION

Apply pressure very carefully when removing internal assembly to avoid damage to the

NOTE

- Unlocking points (marked with "O") depend on the model as



- Recommended tool: Blade screwdriver (Recommended blade width: 6mm or less)



To conform to IEC61010-1 requirements for protection from electric shock, the internal assembly of this instrument can only be removed with an appropriate tool.