

# REX-C100 SERIES INSTRUCTION MANUAL

IMNZC17-E3

Before operating this instrument, please carefully read this manual and fully understand its contents. And always keep it around you to make it available easily anytime.

## WARNING

- If failure or error of this instrument could result in a critical accident of the system, install an external protection circuit to prevent such an accident.
- Do not turn on the power supply until all of the wiring is completed. Otherwise electric shock, fire or malfunction may result.
- Use this instrument within the scope of its specifications. Otherwise fire or malfunction may result.
- Do not use this instrument in the places subject to flammable or explosive gas.
- Do not touch high-voltage blocks such as power supply terminals, etc. Otherwise electric shock may result.
- Never disassemble, repair or modify the instrument. This may cause electric shock, fire or malfunction.

## CAUTION

- This is a Class A instrument. In a domestic environment this instrument may cause radio interference, in which case the user is required to take adequate measures.
- This instrument is protected from electric shock by reinforced insulation. So please arrange reinforced insulation to the wire for input signal against the wires for instrument power supply, source of power and loads as far as possible.
- This instrument is manufactured on the assumption that it is used in the condition of being mounted on the instrumentation panel. Therefore, take the necessary measures on the equipment side mounted with this instrument so that the operator or other personnel are not accessible to high-voltage blocks in this instrument such as power supply terminals, etc.
- Always observe precautions described in this manual. Otherwise serious injury or accident may result.
- Conduct all of the wiring in accordance with the local codes and regulations.
- Install a protection device such as a fuse, etc. in the power supply, input or output line, if necessary.
- Do not allow metal fragments or lead wire scraps to fall inside this instrument. This may cause electric shock, fire or malfunction.
- Firmly tighten each terminal screw at the specified torque. Otherwise electric shock or fire may result.
- Do not place any obstacle around this instrument in order not to impede radiation of heat. And do not close ventilation holes.
- Do not connect wires to unused terminals.
- Before cleaning the instrument, always turn off the power supply.
- Remove stains from this instrument using a soft, dry cloth. Do not use a volatile solvent such as thinner in order to avoid deformation or discoloration.
- Do not rub nor strike the display unit of this instrument with a hard object.

## Notice

- This manual is subject to change without prior notice.
- Examples of figures, diagrams and numeric values used in this manual are for a better understanding of the text, but not for assuring the resultant operation.
- This manual may not be reproduced or copied in whole or in part without RKC's prior consent.
- RKC assumes no responsibility for any of the following damage which the user or third party may suffer.
  - Damage incurred as a result of using this product
  - Damage caused by product failure which cannot be predicted by RKC
  - Other indirect damage
- In order to use this instrument continuously and safely, periodic maintenance is required. Some of components and parts used in this instrument have a limited service life, or deteriorate over time.

## 1. PRODUCT CHECK

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

### Model code

C 1 0 0 □ □ □ - □ \* □ □  
 ① ② ③ ④ ⑤ ⑥

- |   |   |  |
|---|---|--|
| ① Control action<br>F : PID action [Reverse action]<br>D : PID action [Direct action] | ⑤ First alarm [ALM1]<br>N : No first alarm<br>A : Deviation high alarm *2<br>B : Deviation low alarm *2<br>C : Deviation high/low alarm *2<br>D : Band alarm<br>E : Deviation high alarm *3<br>F : Deviation low alarm *3<br>G : Deviation high/low alarm *3<br>H : Process high alarm *2<br>J : Process low alarm *2<br>K : Process high alarm *3<br>L : Process low alarm *3<br>R : Control loop break alarm *4 | ⑥ Second alarm [ALM2]<br>N : No second alarm<br>A : Deviation high alarm *2<br>B : Deviation low alarm *2<br>C : Deviation high/low alarm *2<br>D : Band alarm<br>E : Deviation high alarm *3<br>F : Deviation low alarm *3<br>G : Deviation high/low alarm *3<br>H : Process high alarm *2<br>J : Process low alarm *2<br>K : Process high alarm *3<br>L : Process low alarm *3<br>P : Heater break alarm (CTL-6)<br>S : Heater break alarm (CTL-12)<br>R : Control loop break alarm *4 |
|---|---|--|

- \*1 When control output is trigger output for triac driving, only the first alarm is available.
- \*2 Without hold action.
- \*3 With hold action.
- \*4 As control loop break alarm, only either the first alarm or second alarm is selected.
- Confirm that power supply voltage is also the same as that specified when ordering.

### Accessories

- Mounting brackets... 2 pcs.
- Instruction manual (IMNZC17-E3)... 1 copy

## 2. MOUNTING

## WARNING

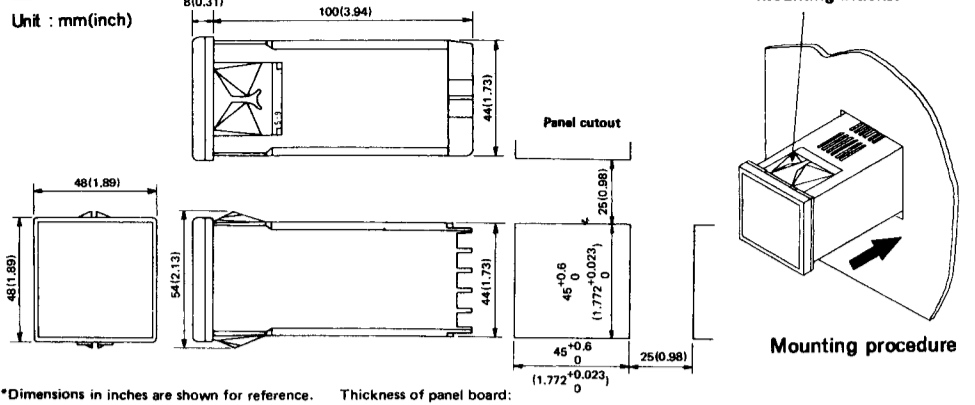
- In order to prevent electric shock or instrument failure, do not turn on the power supply until all of the wiring is completed.

### Cautions for mounting

Avoid the following when selecting the mounting location.

- Ambient temperature of less than 0 °C (32 °F) or more than 50 °C (122 °F).
- 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.
- Should be used indoors where the system is not exposed to direct sunlight.
- Heat to be accumulated radiation heat.

### Dimensions



### Mounting procedures

- When the controllers are mounted on panel with 1 to 5mm in thickness = Since the mounting brackets are already installed on the controller, insert the controller into the panel front without removal of the brackets.
- When the controllers are mounted on panel with 5 to 9mm in thickness = Remove the mounting brackets from the controller with a slotted screwdriver. Engage each mounting bracket with holes marked with "5-9" on the housing and then insert the controller into the panel from the panel front.

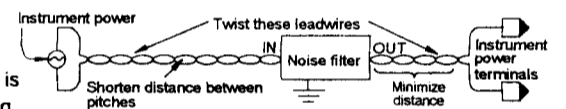
## 3. MOUNTING

## WARNING

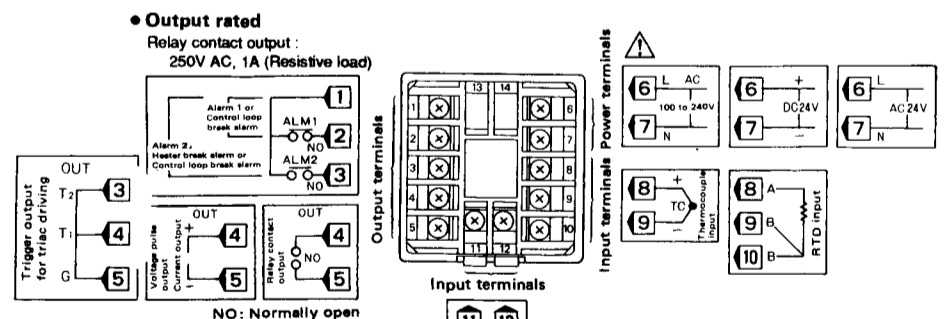
- In order to prevent electric shock or instrument failure, do not turn on the power supply until all of the wiring is completed.
- If failure or error of this instrument could result in a critical accident of the system, install an external protection circuit to prevent such an accident.
- In order to prevent electric shock or instrument failure, protect power line and the input/output lines from high currents by using fuses with appropriate ratings.

### Cautions for wiring

- For thermocouple input, use the specified compensation wire.
- For RTD input, use leads with low resistance and having no resistance differences among the 3 leads.
- Conduct input signal wiring away from instrument power, electric equipment power and load lines to avoid noise induction.
- Conduct instrument power wiring so as not to be influenced by noise from the electric equipment power. If the instrument may be affected by external noise, a noise filter should be used.
  - Shorten the distance between twisted power supply wire pitches. The shorter the distance between the pitches, the more effective for noise reduction.
  - Install the noise filter on the panel which is always grounded and minimize the wiring distance between the noise filter output side and the instrument power terminals.
  - Do not install fuses and/or switches on the filter output signal since this may lessen filter effect.
- For power supply wires, use twisted wires with low voltage drop.
- About 5 to 6 sec are required as the preparation time for contact output after power on. Use a delay relay when the output line is used for an external interlock circuit.
- This instrument has no power supply switch nor fuses. Therefore, install the fuse close to the instrument and the switch, if required.
  - Recommended fuse rating : Rated voltage ; 250 V Rated current ; 1 A • Fuse type ; Time-lag fuse
- To the instrument with power supply of 24 V, please be sure to supply the power from SELV circuit.
- This instrument is intended to be used under the following environmental conditions. (IEC1010)
  - \*OVERVOLTAGE CATEGORY II \*POLLUTION DEGREE 2



### Terminal configuration



### Output rated

- Relay contact output : 250V AC, 1A (Resistive load)
- Voltage pulse output : 0 / 12V DC (Load resistance 600 Ω or more)
- Current output : 4 to 20mA DC (Load resistance 600 Ω or less)
- Trigger output (for triac driving) : Zero-cross method for medium capacity triac driving (100A or less)
- Load voltage : 100V AC system, 200V AC system
- Load : Resistive load

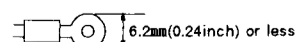
### Power supply & Power consumption

Power supply	Power consumption
100 to 240 V AC	9 VA max. (at 240 V AC), 6 VA max. (at 100 V AC)
24 V AC	6 VA max. (at 24 V AC)
24 V DC	145 mA max. (at 24 V DC)

### Heater break alarm function CT input specifications

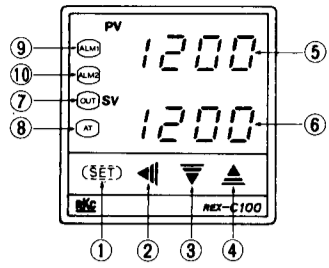
- Measured current: 0 to 30 A (CTL-6-P-N), 0 to 100 A (CTL-12-S56-10L-N)
- Input rating : Maximum current rating : 120 mA, Input impedance : 2.5 Ω

- \*1. Terminals which are not used according to the controller type are all removed.
- \*2. When control output is trigger output for triac driving, the number of alarm output points becomes 1.
- \*3. Crimp-style terminal lug: Therefore, use the lug suitable for a screw of M3.



Recommended tighten torque : 0.4N·m (4kgf·cm)  
 Maximum allowance tighten torque : 0.7N·m (7kgf·cm)

#### 4. NAME OF PARTS

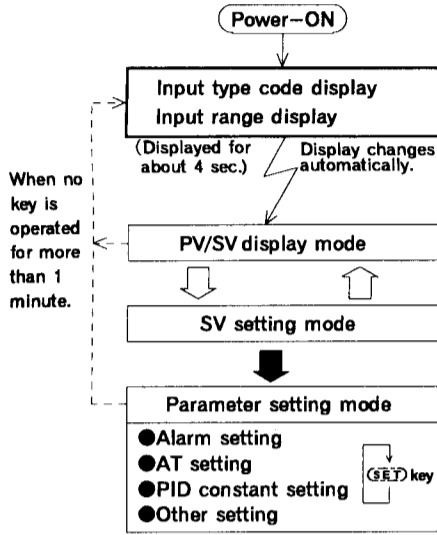


- ① Set (SET) key
- ② Setting digit shift key
- ③ Set-value decrement key
- ④ Set-value increment key
- ⑤ Measured-value (PV) display unit (Green)
- ⑥ Set-value (SV) display unit (Orange)
- ⑦ Control output (OUT) lamp (Green)
- ⑧ Auto-tuning (AT) lamp (Green)
- ⑨ First alarm (ALM1) lamp (Red)
- ⑩ Second alarm (ALM2) lamp (Red)

#### 5. OPERATION

##### Calling-up procedure of each mode

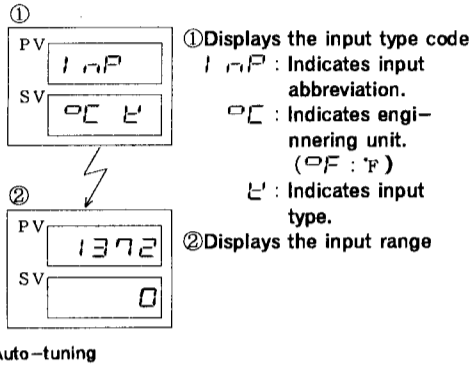
- ⬇ : Press the (SET) key.
- ⬆ : Press the (SET) key for more than 5 sec.



##### Input type code/input range display

This controller, with the power turned ON, displays automatically the input type code on the measured-value (PV) display unit and the input range, on the set-value (SV) display unit, respectively.

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



##### Parameter type

The following parameter symbols are displayed one by one every time the (SET) key is pressed. However, some parameter symbols may not be displayed depending on the specification.

Symbol	Name	Setting range	Description	Initial value prior to shipment
CT	Current transformer input	Setting is not possible. Set heater break alarm value by referring to this value.	Display input value from the current transformer.	
AL1	First alarm	Deviation alarm-Process alarm: -199.9 to +999.9°C [°F] or -199.9 to +999.9°C [°F]	Set alarm set-value of first alarm.	50 or 50.0
AL2	Second alarm	Differential gap: 2 or 2.0°C [°F]	Set alarm set-value of second alarm.	
HbA	Heater break alarm	0.0 to 100.0A	Alarm value is set by referring to input value from the current transformer (CT).	0.0
LbA	Control loop break alarm	0.1 to 200.0 min.	Set control loop break alarm set-value. Cannot be set to "0.0".	8.0
Lbd	LBA deadband	0 to 9999°C [°F] Differential gap: 0.8°C [°F]	Set the area of not outputting LBA. No LBA deadband functions with "0" set.	0
ATU	Auto-tuning	0000: Auto-tuning end or stop 0001: Auto-tuning start	Turns the auto-tuning ON/OFF.	0000
P	(Heating side) Proportional band	1 to span or 0.1 to span	Set heating-side proportional band. ON/OFF action with P set to "0" or "0.0"	30 or 30.0
I	Integral time	1 to 3600 sec.	Eliminates offset occurring control is performed. I action turns OFF with I set to "0"	240
d	Derivative time	1 to 3600 sec.	Prevents ripples by predicting output change thereby improving control stability. D action turns OFF with D set to "0"	60
Ar	Anti-reset windup	1 to 100% of proportional band (heating side).	Prevents overshoot and/or undershoot caused by integral action. I action turns OFF with this action set to "0"	100
T	(Heating side) Proportional cycle	1 to 100 sec.	Set control output cycle.	Relay contact output: 20 Voltage pulse, trigger output: 2
LCK	Set data lock	0100: No set data locked (All parameters changeable) 0101: Set data locked (All parameters not changeable) 0110: Only the set-value (SV) is changeable with the set data locked	Performs set data change enable/disable.	0100

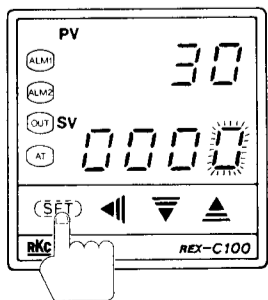
\*The second alarm (or first alarm), heater break alarm, control loop break alarm parameter symbols are not simultaneously displayed.  
\*Heater break alarm is not available on a current output.

##### Parameter setting procedure

###### Setting set-value (SV)

Following is an example of setting the set-value (SV) to 200°C.

- Press the (SET) key to enter the SV setting mode. The digit which light brightly is settable.
- Press the ◀ key to shift the digit which lights brightly up to the hundreds digit.
- Press the ▲ key to "2". Pressing the ▲ key increments numerals, and pressing the ▼ key decrements numerals.
- After finishing the setting, press the (SET) key. All of the set-value digits light brightly and as a result the controller returns to the PV/SV display mode.



###### Set-value increase or decrease

Example : When a temperature 199°C is changed 200°C.

Press the ◀ key to shift the digit brightly lit to the least significant digit. Press the ▲ key to change "9" to "0", thereby obtaining 200°C. The same applies to set-value decrease.

###### Minus (-) value setting

Example : For changing 200 to -100.

Press the ◀ key to shift the digit brightly lit to the hundreds digit. Press the ▼ key to decrement figures in order of 1 → 0 → -1.

###### Setting parameters other than set-value

- Press the (SET) key for more than 5 sec. to set controller to the parameter setting mode.
- Press the (SET) key by the required number of times until the parameter symbol to be set is displayed.
- 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 is finished in the parameters.
- When no parameter setting is required, return the controller to the PV/SV display mode.

###### Key operation cautions

- For this controller, the value whose setting was changed is not registered. It is registered for the first time it is shifted to the next parameter by pressing the (SET) key.
- When the controller is not set to the SV setting mode (the SV does not light brightly or dimly even with the (SET) key pressed) or each value does not light brightly or dimly even with the controller moved to the parameter setting mode, set data lock is activated. In this case, change the "LCK" parameter set-value to "0100".
- This controller returns to the PV/SV display mode status if key operation is not performed for more than 1 minute.

##### Set data locking procedures

This controller is provided with a set data locking function which disables each set-value change by the front key and also the auto-tuning function. Use this function for malfunction prevention at the end of each setting.

- Press the (SET) key by the required number of times to show "LCK" on the measured-value (PV) display unit.
- Press the ◀, ▲ and ▼ keys to set the number in the table at right. Thus the set data lock state can be selected.

0100	No set data locked. (All parameters changeable)
0101	Set data locked. (All parameters not changeable)
0110	Only the set-value (SV) is changeable with the set data locked

###### NOTES

- Do not change the upper 2 digits "01" of the set-value, as it may cause malfunction.
- Checking each set-value is possible during data lock.

##### Cautions for operation

- If any problems arise due to hunting exists in the control system, do not use the auto-tuning function. In this case, set each value to match the controlled object.
- Connect the input signal wiring, and then turn ON the power. If the input signal wiring opens, the controller judges that input is disconnected to cause the upscale of measured-value display. (For thermocouple input, downscale is also available as option.)
- No influence is exerted upon the controller for power failure of 20ms or less. For power failure of 20ms or more, the controller performs the same operation as that at the time of power-ON after power recovery (This applies only when alarm action is turned OFF).
- When the set-value (SV) is changed during progress in the auto-tuning function, suspend the auto-tuning to perform PID control using the values before auto-tuning start.
- When the auto-tuning function is suspended halfway, no values of PID and control loop break alarm are changed. (The value before auto-tuning function start is maintained.)

#### 6. DISPLAY AT ERROR OCCURRENCE

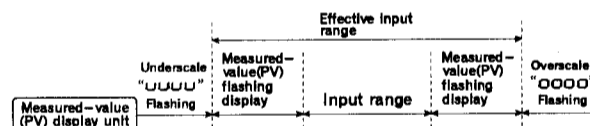
##### Error display

Err	RAM failure (Incorrect set-data write, etc.)	Please contact us or your nearest RKC agent.
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##### Overscale, Underscale

0000 (Flashing)	Overscale (Measured-value exceeds the high input display range limit.)	<b>WARNING</b> In order to prevent electric shock, prior to replacing the sensor, always turn OFF the power. Sensor or input lead check.
UUUU (Flashing)	Underscale (Measured-value below the low input display range limit.)	

Each status at input abnormality is shown in the following :



##### Input range table

Input type Character	Range	Code	Input type Character	Range	Code	Input type Character	Range	Code	
TC	0 to 200°C	01	TC	0 to 800°C	01	RTD	-199.9 to +649.0°C	01	
	0 to 400°C	02		E	0 to 1000°C		02	-199.9 to +200.0°C	02
	0 to 600°C	03			E		0 to 1600°F	A1	-100.0 to + 50.0°C
	0 to 800°C	04		E			0 to 1832°F	A2	-100.0 to +100.0°C
	0 to 1000°C	05			N		0 to 1200°C	01	-100.0 to +200.0°C
	0 to 1200°C	06		N			0 to 1300°C	02	0.0 to 50.0°C
	0 to 1372°C	07			N		0 to 1000°C	N,04	0.0 to 100.0°C
	0 to 100°C	13		T			0 to 2300°F	A1	0.0 to 200.0°C
	0 to 300°C	14			T		0 to 2372°F	A2	0.0 to 300.0°C
	0 to 450°C	17		T			-199.9 to +400.0°C	01	0.0 to 500.0°C
	0 to 500°C	20			T		-199.9 to +100.0°C	02	-199.9 to +999.9°F
	0 to 800°F	A1		T			-100.0 to +200.0°C	03	-199.9 to +400.0°F
	0 to 1600°F	A2			T		0.0 to 350.0°C	04	-199.9 to +200.0°F
	0 to 2502°F	A3		T			-199.9 to +752.0°F	T, A1	-100.0 to +100.0°F
20 to 70°F	A9	T	-100.0 to +200.0°F		A2	-100.0 to +300.0°F	A5		
0 to 200°C	01		F	-100.0 to +400.0°F	A3	0.0 to 100.0°F	A6		
0 to 400°C	02	F		0.0 to 450.0°F	A4	0.0 to 200.0°F	A7		
0 to 600°C	03		F	0.0 to 752.0°F	A5	0.0 to 400.0°F	A8		
0 to 800°C	04	F				0.0 to 500.0°F	A9		
0 to 1000°C	05		J	0 to 2000°C	01	JPt100	-199.9 to +649.0°C	01	
0 to 1200°C	06	J		0 to 2320°C	W,02		-199.9 to +200.0°C	02	
0 to 450°C	10		J	0 to 4000°F	A1		-100.0 to + 50.0°C	03	
0 to 800°F	A1	J		0 to 1300°C	01		-100.0 to +100.0°C	04	
0 to 1600°F	A2		J	0 to 1390°C	02		-100.0 to +200.0°C	05	
0 to 2192°F	A3	J		0 to 1200°C	A,03		0.0 to 50.0°C	06	
0 to 400°F	A6		J	0 to 2400°F	A1		0.0 to 100.0°C	07	
0 to 300°F	A7	J		0 to 2534°F	A2		0.0 to 200.0°C	08	
0 to 1600°C	01		R	-199.9 to +600.0°C	01		0.0 to 300.0°C	09	
0 to 1769°C	02	R		-199.9 to +100.0°C	02		0.0 to 500.0°C	10	
0 to 1350°C	03		R	0.0 to 400.0°C	03				
0 to 3200°F	A1	R		-199.9 to +999.9°F	U, A1				
0 to 3216°F	A2		R	-100.0 to +200.0°F	A2				
0 to 1600°C	01	S		0.0 to 999.9°F	A3				
0 to 1769°C	02		S						
0 to 3200°F	A1	S		0 to 400°C	01				
0 to 3216°F	A2		S	0 to 800°C	L,02				
400 to 1800°C	01	B		0 to 800°F	L, A1				
0 to 1820°C	02		B	0 to 1600°F	A2				
800 to 3200°F	A1								
0 to 3308°F	A2								

\*Accuracy in the range of 0 to 400°C (0 to 800°F): Not guaranteed.

**RKC. RKC INSTRUMENT INC.**

IMNZ17-E 3

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