



Temperature controller with fuzzy function

**REX-D** SERIES  
(REX-D100, D400, D700, D900)

OPERATION MANUAL

**RKc**® RKC INSTRUMENT INC.

IMDRE01-E4

## INTRODUCTION

Thank you for purchasing the "REX-D series".

This manual describes how to use "REX-D series".

Prior to using the instruments, please carefully read this manual and fully understand the contents.

Keep this manual safely for future reference as required.

## USERS OF THIS MANUAL

This manual is prepared for all personnel who use "REX-D series".

This manual is also written especially for readers who have a fundamental knowledge of electrical engineering, control engineering or communication.

## CAUTIONS

- 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.
- The contents of this manual are copy righted; all rights are reserved by RKC INSTRUMENT INC. It is prohibited to reprint or reproduce the whole or a part of this manual without the prior of RKC INSTRUMENT INC.
- "REX-D series" and this manual are manufactured and prepared under strict quality control before delivery. However, if any problems arise, please contact us directly or your nearest our sales agent.
- RKC assumes no responsibility for any of the following damage which the user or third party may suffer.
  - ① Damage incurred as a result of using this product
  - ② Damage caused by product failure which cannot be predicted by RKC
  - ③ Other indirect damages

## ★For safe operation of “REX-D series”

1. “REX-D series” must be used under the following conditions.

“REX-D series” is a component type and is used after mounting on an instrument panel. It is thus manufactured as a component destined for the final product, so its high-voltage blocks such as the power terminals are uncovered. Therefore, after it is installed on the final product, the final product supplier must take the necessary measures for the user to prevent touching directly the high-voltage blocks.

2. For correct and safe operation of “REX-D series”, always observe the safety precautions described in this manual when performing operations, maintenance and repair work. RKC neither assures responsibility nor provides warranty for problems or accidents occurring if these precautions are not observed.

- For safe operation of “REX-D series”, the following “Signal Words” and “Symbol Marks” are used in this manual.

### 〈Signal Words〉

**WARNING**

: Where there are possible dangers such as electric shock, fire (burns), etc. which could cause loss of life or injury, precautions to avoid such dangers are described.

**CAUTION**

: These describe precautions to be taken if unit damage may result if operating procedures are not strictly followed.

**NOTE**

: Extra notes or precautions are added to operating procedures and explanations.

### 〈Symbol Marks〉



: This mark is used when great care is needed especially for safety.



: This mark is used to add extra notes, precautions or supplementary explanations to table and figures.



## WARNING

### ● **Wiring precautions**

- 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 instrument damage or failure, protect the power line and the input/output lines from high currents by using fuses with appropriate ratings.

### ● **Power supply**

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

### ● **Never use the instrument near inflammable gases.**

- In order to prevent fire, explosion or instrument damage, never use this instrument at a location where inflammable or explosive gases or exist.

### ● **Never touch the inside of the instrument..**

- In order to prevent electric shock or burns, never touch the inside of the instrument. Only RKC service engineers can touch the inside of the instrument to check the circuit or to replace parts. High voltage and high temperature sections inside the instrument are extremely dangerous.

### ● **Never modify the instrument.**

- In order to prevent accident or instrument failure, never modify the instrument.

### ● **Maintenance**

- In order to prevent electric shock, burns or instrument failure, only RKC service engineers may replace parts.
- In order to use this instrument continuously and safely, conduct periodic maintenance. Some parts used in this instrument have a limited service life and may deteriorate over time.

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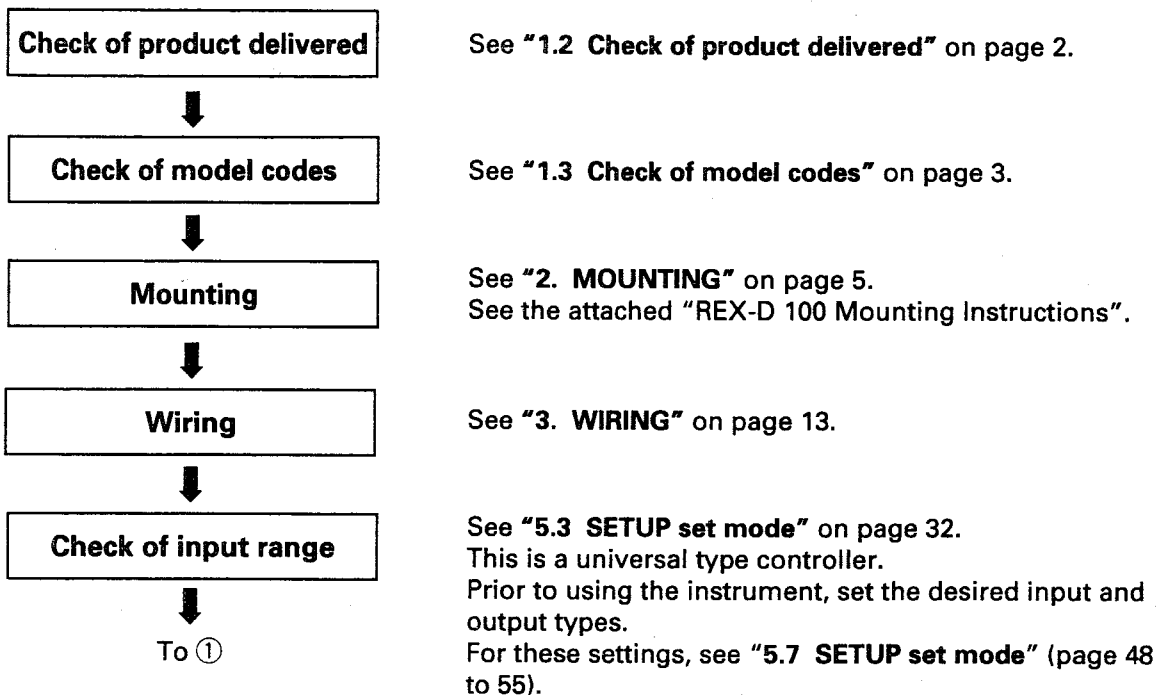
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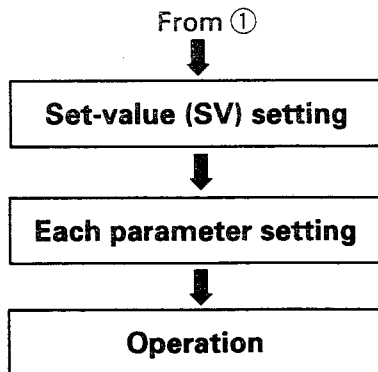
# 1. PREPARATION

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## 1.1 Handling procedure

Conduct necessary work according to the following procedures:





See "5.2 Set-value (SV) changing procedure" on page 31.

See "5.2 Set-value (SV) changing procedure" on page 31.

Initial values prior to shipment are described on and after page 32.

**CAUTION**

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 or downscale of measured-value (PV) display.

Upscale ..... For TC or RTD input

Downscale ..... For TC (To be specified when ordering), voltage or current input.

## 1.2 Check of product delivered

Check that the following items are delivered without damage.

- Mainframe (1 unit)
- Mounting bracket for REX-D100 (2 pieces)
- Mounting bracket (2 pieces) \*For REX-D400, D700 or D900
- REX-D series OPERATION MANUAL (1 copy) [IMDRE01-E□]
- Seal for engineering unit (One sheet)

Option

- External resistor (One piece) [shunt resistor for current input:  $250\Omega \pm 0.02\% \pm 10\text{PPM}$ , 0.25W or more]
- Front cover [NEMA4X] (One piece), rubber packing [NEMA4X] (One piece)

## 1.3 Check of model codes

Check the model code from the following list to determine if the product delivered is as desired.

### ■ Model code

#### REX-D100 model code

**D100**  -   \*   -   -

①      ②      ③              ④      ⑤      ⑥      ⑦      ⑧      ⑨

#### ① Control action

F :PID action with auto-tuning  
W :Heating/cooling PID action with auto-tuning \*1, \*2

#### ② First control output [OUT1]

M :Relay contact  
V :Voltage pulse  
4 :Continuous voltage \*3  
0 to 5V DC  
5 :Continuous voltage \*3  
0 to 10V DC  
6 :Continuous voltage \*3  
1 to 5V DC  
7 :Current 0 to 20mA DC \*3  
8 :Current 4 to 20mA DC \*3

#### ③ Second control output [OUT2]

N :When control action is F  
M :Relay contact  
V :Voltage pulse  
4 :Continuous voltage \*3  
0 to 5V DC  
5 :Continuous voltage \*3  
0 to 10V DC  
6 :Continuous voltage \*3  
1 to 5V DC  
7 :Current 0 to 20mA DC \*3  
8 :Current 4 to 20mA DC \*3

#### ④ Alarm function

N :No alarm function  
D :With alarm function 2-point

#### ⑤ Heater break alarm function

N :No heater break alarm function  
S :Heater break alarm for single-phase heater \*4  
D :Heater break alarm for three-phase heater \*4, \*5

#### ⑥ Contact input \*1, \*5

N :No contact input  
1 :Contact input

#### ⑦ Analog output \*1, \*5

N :No analog output  
4 :Voltage 0 to 5V DC  
5 :Voltage 0 to 10V DC  
6 :Voltage 1 to 5V DC  
7 :Current 0 to 20mA DC  
8 :Current 4 to 20mA DC

#### ⑧ Communication function \*1, \*5

N :No communication function  
5 :RS-485

#### ⑨ Waterproof/dustproof specification (NEMA4X)

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

\*1 If heating/cooling PID action with auto-tuning is selected, contact input, analog output, communication function or heater break alarm for three-phase heater cannot be selected.

\*2 Cooling method (air or water cooling) selection can be set in SETUP mode.

\*3 If continuous voltage/current output is selected, no heater alarm function can be specified.

\*4 As current transformer, either P: CTL-6-P-N or S: CTL-12-S56-10L-N is selected.

\*5 Any one of contact input, analog output, heater break alarm for three-phase heater and communication function is selected.



## ■ Model code

REX-D400 • D700 • D900 model code

**D400 • D700 • D900** -\*--  
 ①      ②      ③ ④      ⑤      ⑥

### ① Control action

F :PID action with auto-tuning  
 W :Heating/cooling PID action with auto-tuning \*1, \*2,\*3

### ② Second control output [OUT2]

N :When control action is F  
 M :Relay contact  
 V :Voltage pulse  
 4 :Continuous voltage \*4  
 0 to 5V DC  
 5 :Continuous voltage \*4  
 0 to 10V DC  
 6 :Continuous voltage \*4  
 1 to 5V DC  
 7 :Current 0 to 20mA DC \*4  
 8 :Current 4 to 20mA DC \*4

### ③ Alarm function

N :No alarm function  
 D :With alarm function 2-point

### ④ Heater break alarm function \*5, \*7

N :No heater break alarm function  
 (With step function)  
 S :Heater break alarm for single-phase heater (With step function)  
 D :Heater break alarm for three-phase heater (No step function) \*6

### ⑤ Analog output \*8, \*9

N :No analog output  
 4 :Voltage 0 to 5V DC  
 5 :Voltage 0 to 10V DC  
 6 :Voltage 1 to 5V DC  
 7 :Current 0 to 20mA DC  
 8 :Current 4 to 20mA DC

### ⑥ Communication function

N :No communication function  
 4 :RS-422A  
 5 :RS-485

- \*1 If the heating/cooling PID action with auto-tuning is selected for REX-D400/D900, neither analog output nor communication function RS-422A can be specified.
- \*2 If the heating/cooling PID action with auto-tuning is selected for REX-D700, neither analog output nor heater break alarm for three-phase heater can be specified.
- \*3 Cooling method (air or water cooling) selection can be set in SETUP mode.
- \*4 If continuous voltage/current output is selected, no heater alarm function can be specified.
- \*5 As current transformer, either P: CTL-6-P-N or S: CTL-12-S56-10L-N is selected.
- \*6 If the heater break alarm for three-phase heater is selected for REX-D400/D900, no contact input (step function) can be specified.  
 For REX-D700, the contact input (step function) is provided.
- \*7 If the heater break alarm function is selected in REX-D700, no communication function RS-422A can be specified.
- \*8 If analog output is selected in REX-D400/D900, no communication function RS-422A can be specified.
- \*9 If analog output is selected in REX-D700, no heater break alarm for three-phase heater can be specified.

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## 2. MOUNTING

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### **WARNING**



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

### **2.1 Cautions for mounting**

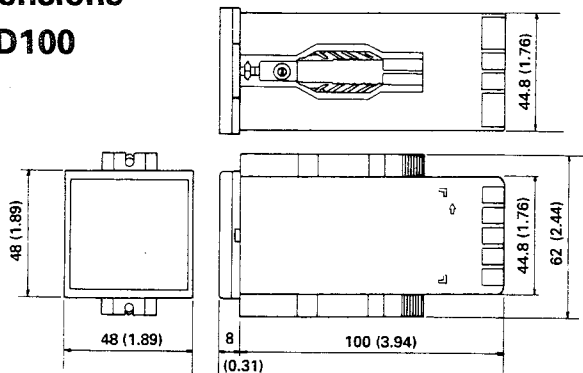
#### **■ Mounting environment**

Avoid the following when selecting the mounting location.

- Ambient temperature of less than 5°C or more than 40°C.
- Ambient humidity of less than 20% or more than 80% 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.

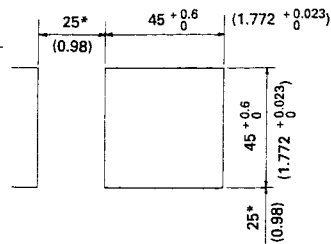
## 2.2 Dimensions

### ■ REX-D100



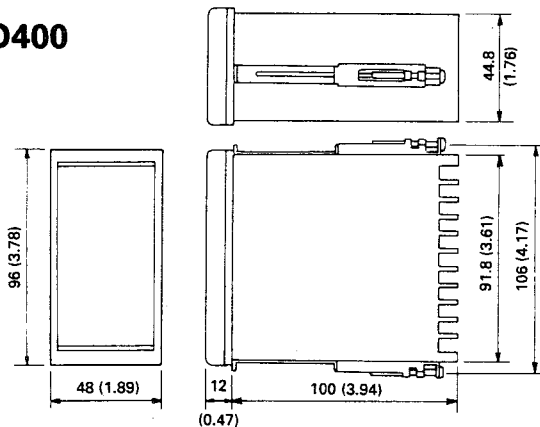
Unit: mm (inch)

#### Panel cutout



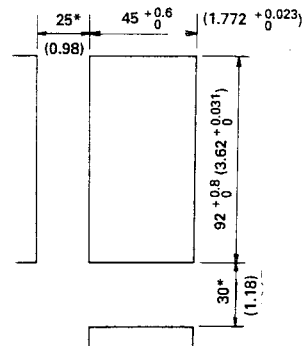
☆ Dimensions in inches are shown for reference.  
\* Minimum

### ■ REX-D400



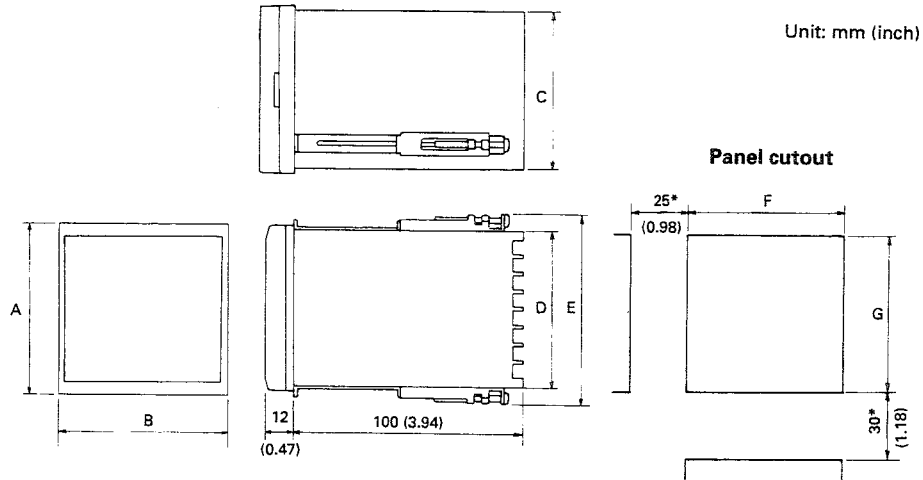
Unit: mm (inch)

#### Panel cutout



☆ Dimensions in inches are shown for reference.  
\* Minimum

# ■ REX-D700, D900



Unit: mm (inch)

Sign Model	A	B	C	D	E	F	G
<b>D700</b>	72 (2.83)	72 (2.83)	67.8 (2.67)	67.8 (2.67)	82 (3.23)	68 <sup>+0.7</sup> <sub>0</sub> (2.677 <sup>+0.027</sup> )	68 <sup>+0.7</sup> <sub>0</sub> (2.677 <sup>+0.027</sup> )
<b>D900</b>	96 (3.78)	96 (3.78)	91.8 (3.61)	91.8 (3.61)	106 (4.17)	92 <sup>+0.8</sup> <sub>0</sub> (3.62 <sup>+0.031</sup> )	92 <sup>+0.8</sup> <sub>0</sub> (3.62 <sup>+0.031</sup> )

## 2.3 Mounting procedures

### ■ Mounting (For REX-D100)

- ① Make rectangular holes corresponding to the number of controllers to be mounted through the panel by referring to the panel cutout dimensions.
- ② Insert the controller into the panel from the panel front.
- ③ Insert the projections at the bottom of the bracket into the slots at the top of the controller [Fig. 1]
- ④ Push the mounting bracket in the arrow direction. [Fig. 2]
- ⑤ Install a mounting bracket also at the bottom of the case in the same way as ③ and ④ above.

\* This instrument is provided with a waterproof and dustproof rubber packing. For details of replacing the packing due to deterioration, see "8. REPLACING THE WATERPROOF AND DUSTPROOF RUBBER PACKING". (Page 63)

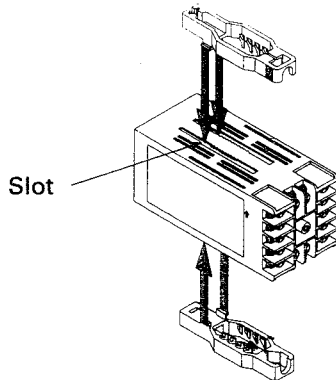


Fig. 1

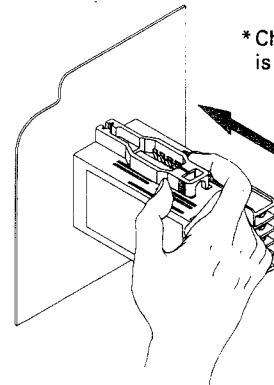


Fig. 2

#### NOTE

The front of this instrument conforms to IP55 with the instrument mounted on a control panel.

## ■ REX-D100 removing procedure

### CAUTION

When removing the mounting bracket, use a screwdriver matching the diameter of the insertion hole. Otherwise, the mounting bracket may be damaged. Use a Phillips screwdriver as much as possible.

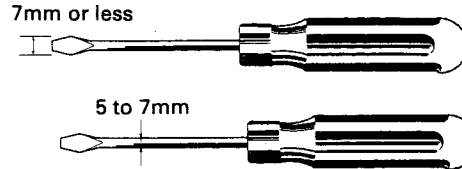
#### When a Phillips screwdriver is used

Use the screwdriver with a diameter of 5 to 7mm.



#### When a minus-headed screwdriver is used

Use a minus-headed screwdriver with a head width of 7mm or less and a diameter of 5 to 7mm. Insert this screwdriver into the insertion hole with the minus head faced in the vertical direction.



- (1) Insert a Phillips screwdriver into the insertion hole at the rear of the mounting bracket.  
If the screwdriver head exceeds the line shown by A, the bracket expands to the left and right to disengage the self-locking hooks on the bracket from those on the case. [Fig. 1]

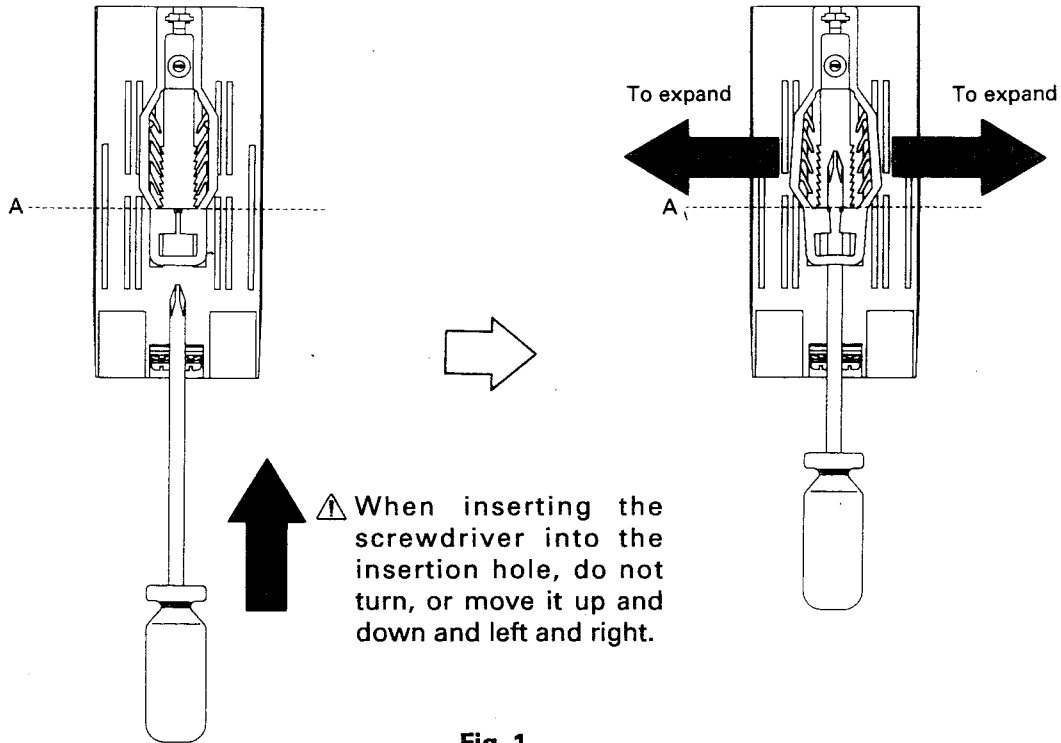


Fig. 1

(2) Pull the bracket toward you ( ① ), then pull it upward ( ② ) with the screwdriver inserted in the insertion hole. [Fig. 2]

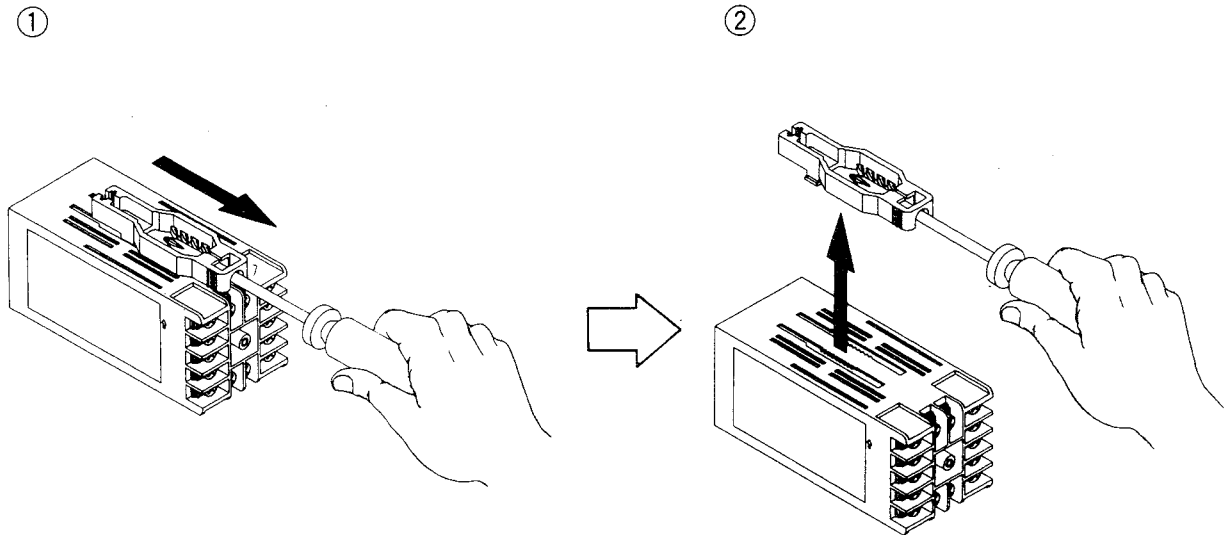


Fig. 2



## ■ Mounting (For REX-D400/D700/D900)

- ① Mount the panel cutout corresponding to the number of units on the panel by referring to panel cutout dimensions.
- ② Insert the instrument into the panel from the front side.
- ③ Engage each mounting bracket with the bracket insertion slots (Fig. 1).
- ④ Then tighten the mounting bracket setscrew from the rear with a Phillips screwdriver (Fig. 2).  
Do not overtighten the bracket setscrew. (Recommended tightening torque: 0.3N·m or less [3kgf·cm or less])
- ⑤ Install a mounting bracket also at the bottom of the case in the same way as ③ and ④ above.

\* This instrument is provided with a waterproof and dustproof rubber packing. For details of replacing the packing due to deterioration, see "8. REPLACING THE WATERPROOF AND DUSTPROOF RUBBER PACKING". (Page 63)

### NOTE

The front of this instrument conforms to IP55 with the instrument mounted on a control panel.

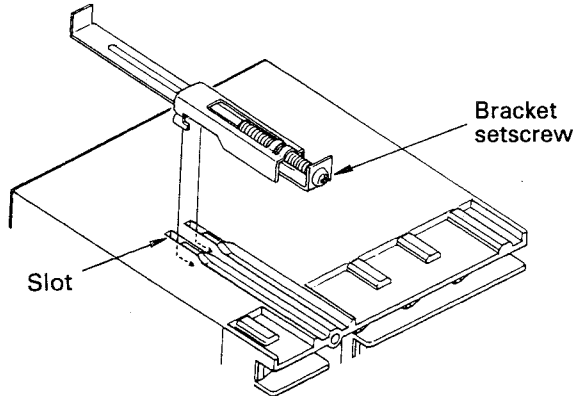


Fig. 1

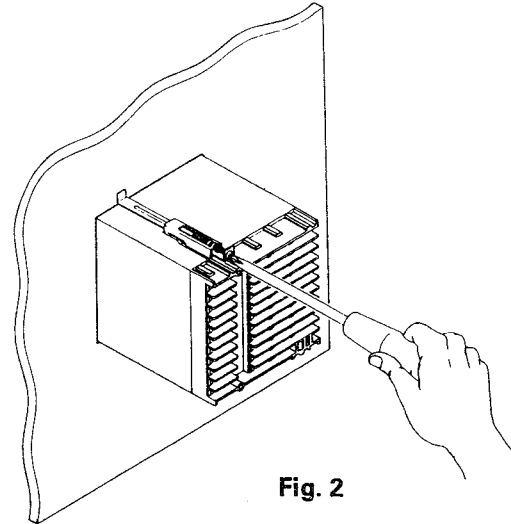


Fig. 2

## 3. WIRING



### WARNING

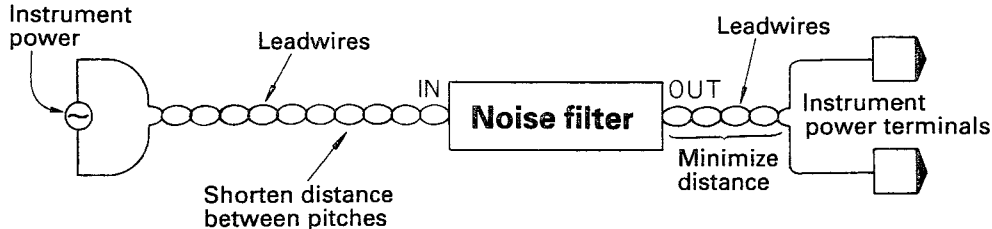


- In order to prevent electric shock or instrument failure, do not turn on the power supply until all of the wiring is completed.
- If failure or error of this instrument could result in a critical accident of the system, install an external protection circuit to prevent such an accident.
- In order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

### 3.1 Cautions for wiring

- (1) For thermocouple input, use the specified compensation wire.
- (2) For RTD input, use leads with low resistance and having no resistance differences between the 3 leads.
- (3) Conduct input signal wiring away from instrument power, electric equipment power and load lines as such as possible to avoid noise induction.
- (4) Conduct instrument power wiring so as not to be influenced by noise from the electric equipment power. If it is assumed that a noise generation source is located near the controller and the controller is influenced by noise, use a noise filter.
  - ① To obtain a satisfactory noise filter effect, select the most suitable type after due consideration of instrument power supply voltage and filter frequency characteristics.
  - ② For instrument power wiring, if it is assumed that noise exerts a bad influence upon the controller, shorten the distance between twisted power supply wire pitches.  
(The shorter the distance between the pitches, the more effective for noise reduction.)

- ③ 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. Otherwise, the longer the distance wiring, the less effective for noise.
- ④ Do not install fuses and/or switches on the filter output signal since this may lessen filter effect.

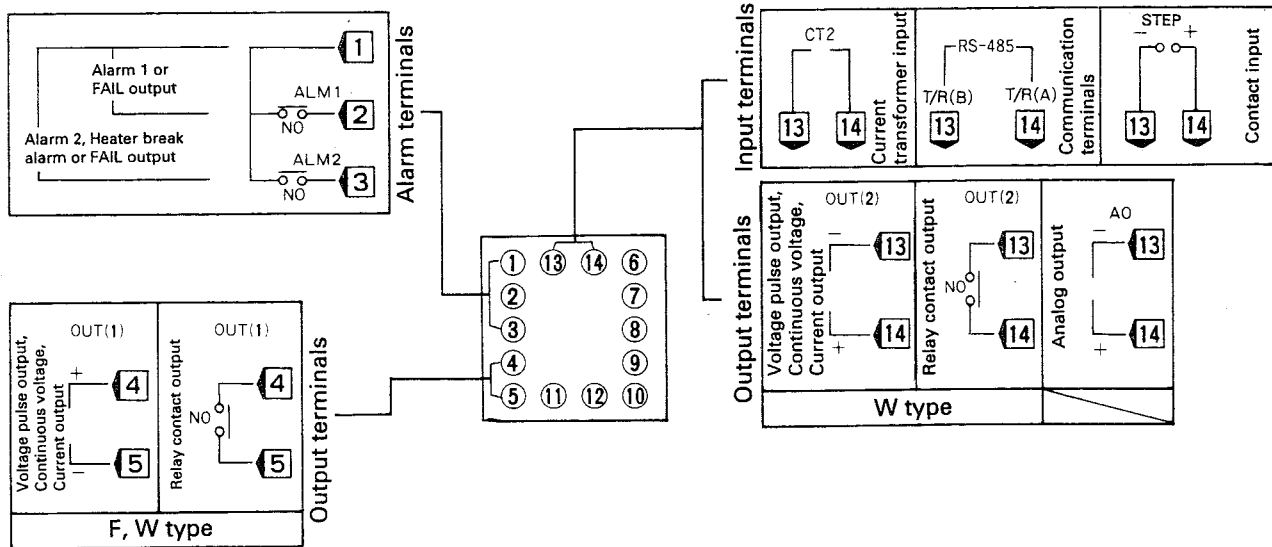


- (5) For wiring, use electric wires conforming to the domestic standard of each country. For power supply wires, use 600V Polyvinyl chloride insulated wires (JIS C3307).
- (6) About 2 sec. are required as the preparation time of contact output during power-ON. Use a delay relay when the output line, is used for an external interlock circuit.
- (7) Display accuracy of current transformer (CT) input value at heater break alarm is within  $\pm 5\%$  of input value or  $\pm 2A$ , whichever is greater.  
Therefore, when a heater break alarm is used, set load current flowing through the current transformer (CT) at a value to be sufficiently large.
- (8) This instrument has no power supply switch nor fuses. Therefore, install them separately close to the instrument, if required.  
[Recommended fuse rating : Rated voltage; 250V Rated current; 1A Type; Time-lag fuse]
- (9) This instrument is intended to be used under the following environmental conditions. (IEC1010)  
[OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]

### 3.2 Rear terminals ⚠

#### ■ REX-D100

Conduct wiring by referring to following diagrams.

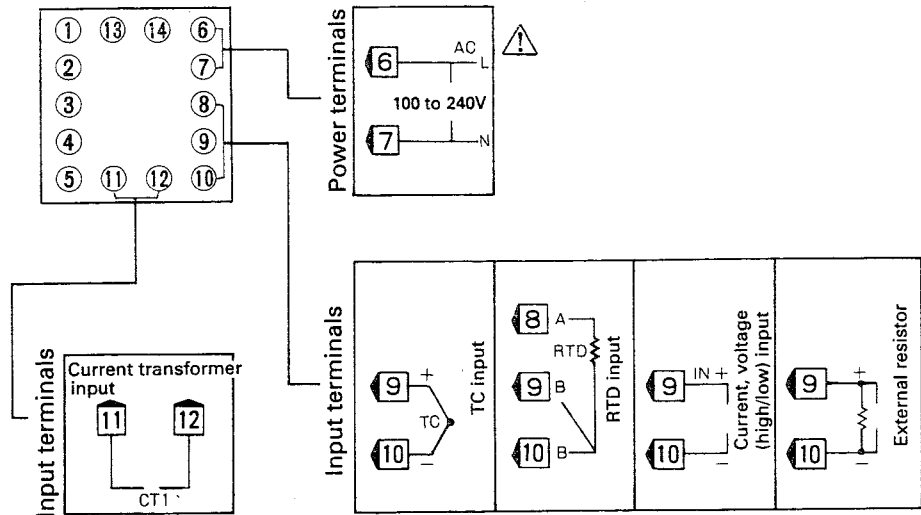


{ F : PID action with auto-tuning }  
 { W : Heating/cooling PID action with auto-tuning }

NO: Normally open

OUT (1):Heating-side (W)

OUT (2):Cooling-side (W)



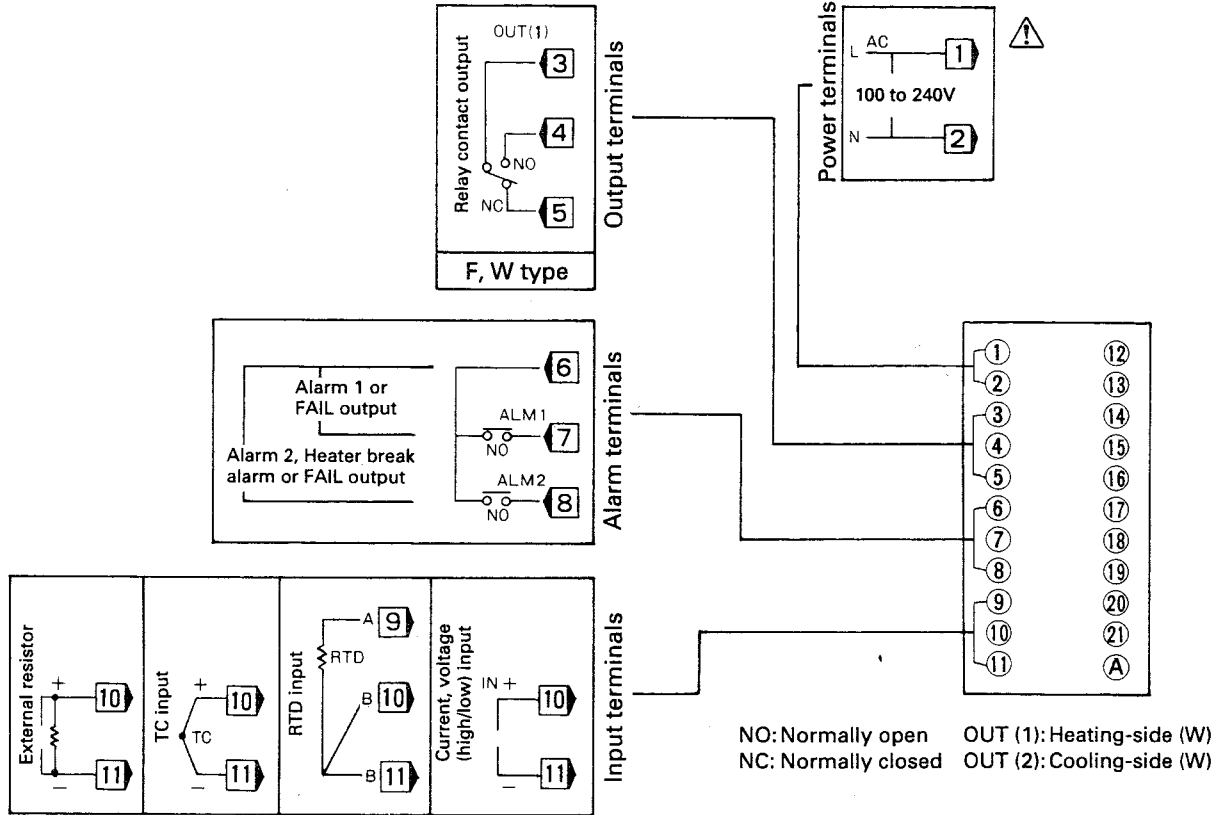
**CAUTIONS**

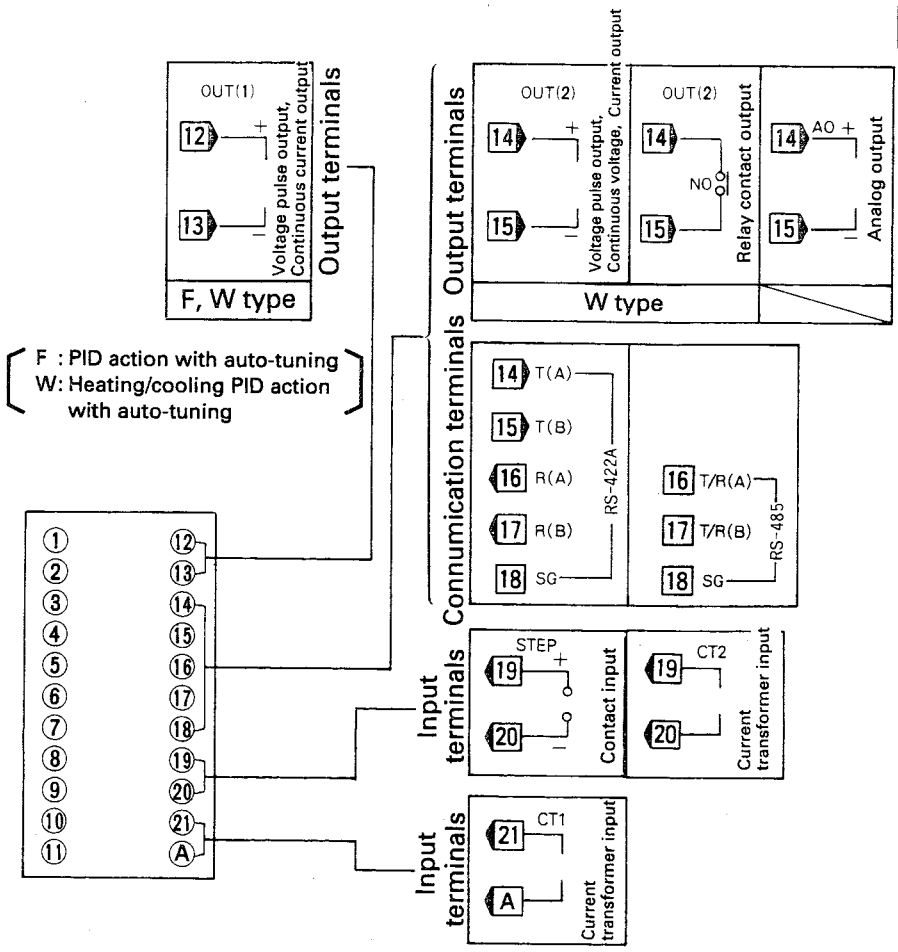
1. Select voltage (low) input or voltage (high) input by the switch in the mainframe.
2. If current input is selected, always mount the attached external resistor.
3. If the heating/cooling PID action with auto-tuning is selected, contact input, analog output, communication function or heater break alarm for three-phase heater cannot be selected.
4. Do not excessively tighten the terminal screws.  
 { Recommended tighten torque: 0.4N•m (4kgf•cm)  
 Maximum allowance tighten torque: 0.7N•m (7kgf•cm) }
5. Use the lug with 6.2mm wider or less.



# ■ REX-D400

Conduct wiring by referring to following diagrams.

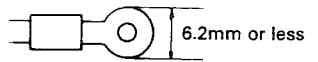




F : PID action with auto-tuning  
 W: Heating/cooling PID action with auto-tuning

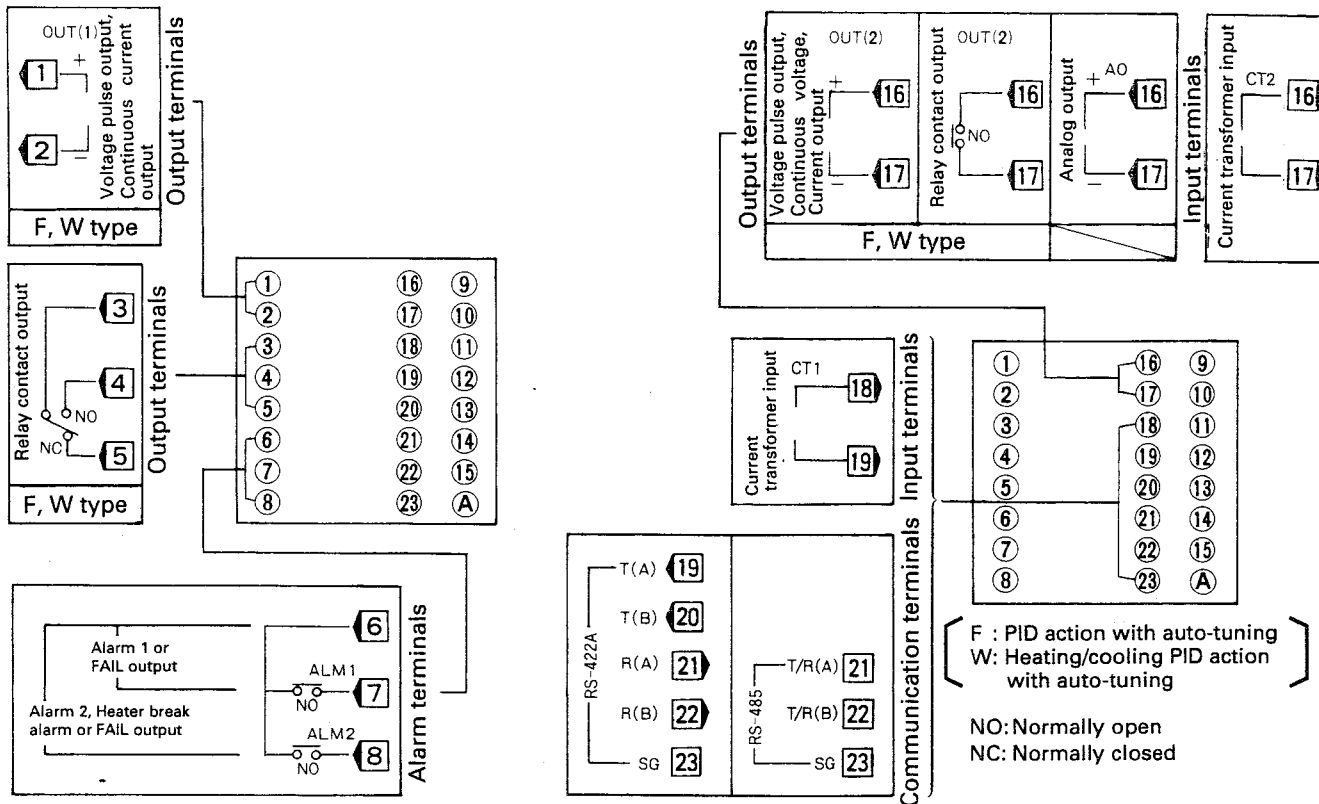
**CAUTIONS**

1. Select voltage (low) input or voltage (high) input by the switch in the mainframe.
2. If current input is selected, always mount the attached external resistor.
3. If the heating/cooling PID action with auto-tuning is selected for REX-D400, neither analog output no communication function RS-422A can be specified.
4. If analog output is selected in REX-D400, no communication function RS-422A can be specified.
5. Do not excessively tighten the terminal screws.  
 Recommended tighten torque:  
 0.4N·m (4kgf·cm)  
 Maximum allowance tighten torque: 1.0N·m (10kgf·cm)
6. Use the lug with 6.2mm wider or less.

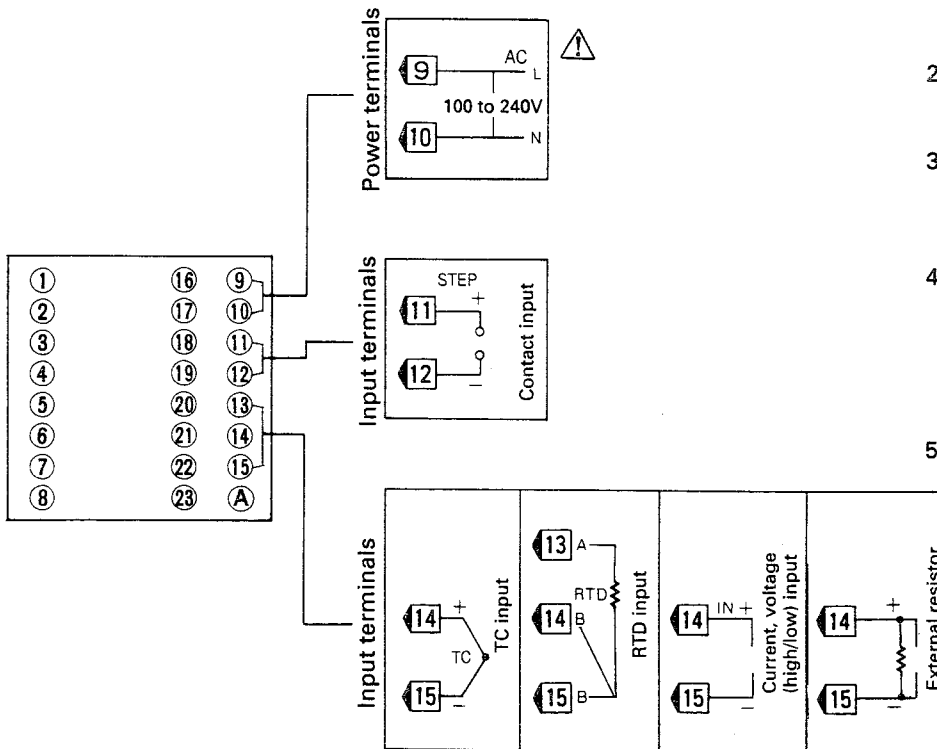


# ■ REX-D700

Conduct wiring by referring to following diagrams.







### CAUTIONS

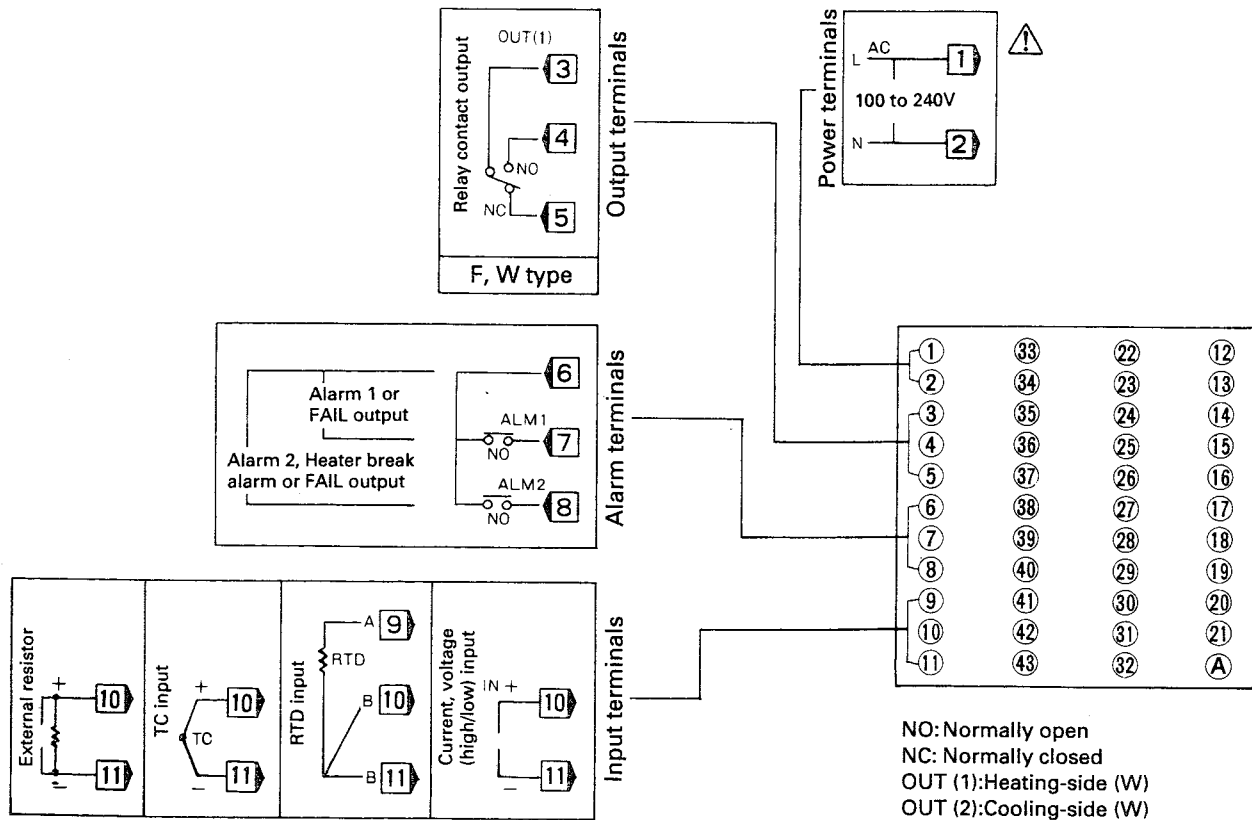
1. Select voltage (low) input or voltage (high) input by the switch in the mainframe.
2. If current input is selected, always mount the attached external resistor.
3. If the heater break alarm function is selected in REX-D700, no communication function RS-422A can be specified.
4. Do not excessively tighten the terminal screws.
 

Recommended tighten torque:  
 $0.4\text{N}\cdot\text{m}$  ( $4\text{kgf}\cdot\text{cm}$ )  
 Maximum allowance tighten torque: $1.0\text{N}\cdot\text{m}$  ( $10\text{kgf}\cdot\text{cm}$ )
5. Use the lug with 6.2mm wider or less.

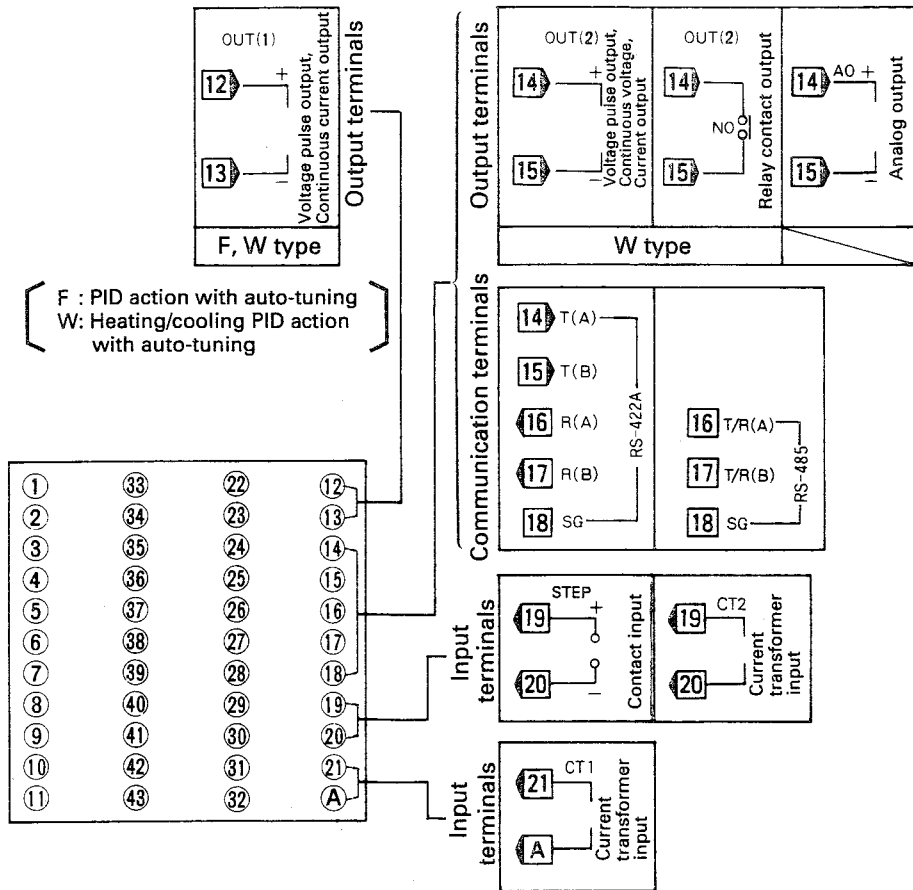


# ■ REX-D900

Conduct wiring by referring to following diagrams.



## CAUTIONS



1. Select voltage (low) input or voltage (high) input by the switch in the mainframe.
2. If current input is selected, always mount the attached external resistor.
3. If the heating/cooling PID action with auto-tuning is selected for REX-D900, neither analog output no communication function RS-422A can be specified.
4. If analog output is selected in REX-D900, no communication function RS-422A can be specified.
5. Do not excessively tighten the terminal screws.

Recommended tighten torque:  
 0.4N·m (4kgf·cm)  
 Maximum allowance tighten torque: 1.0N·m (10kgf·cm)

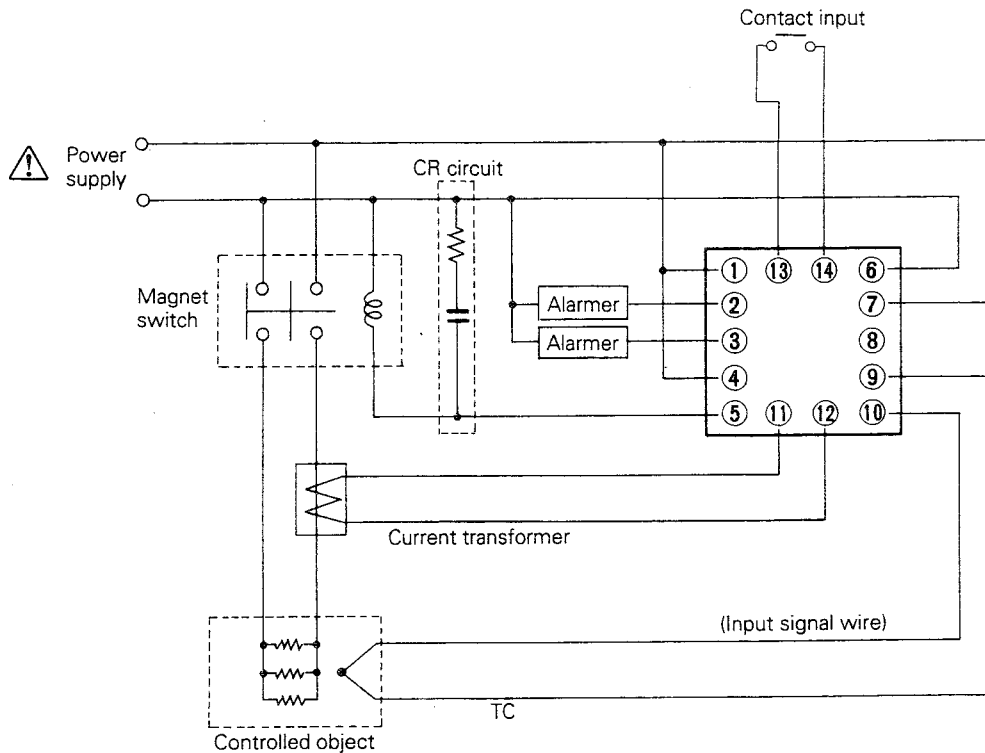
6. Use the lug with 6.2mm wider or less.



### 3.3 Wiring example

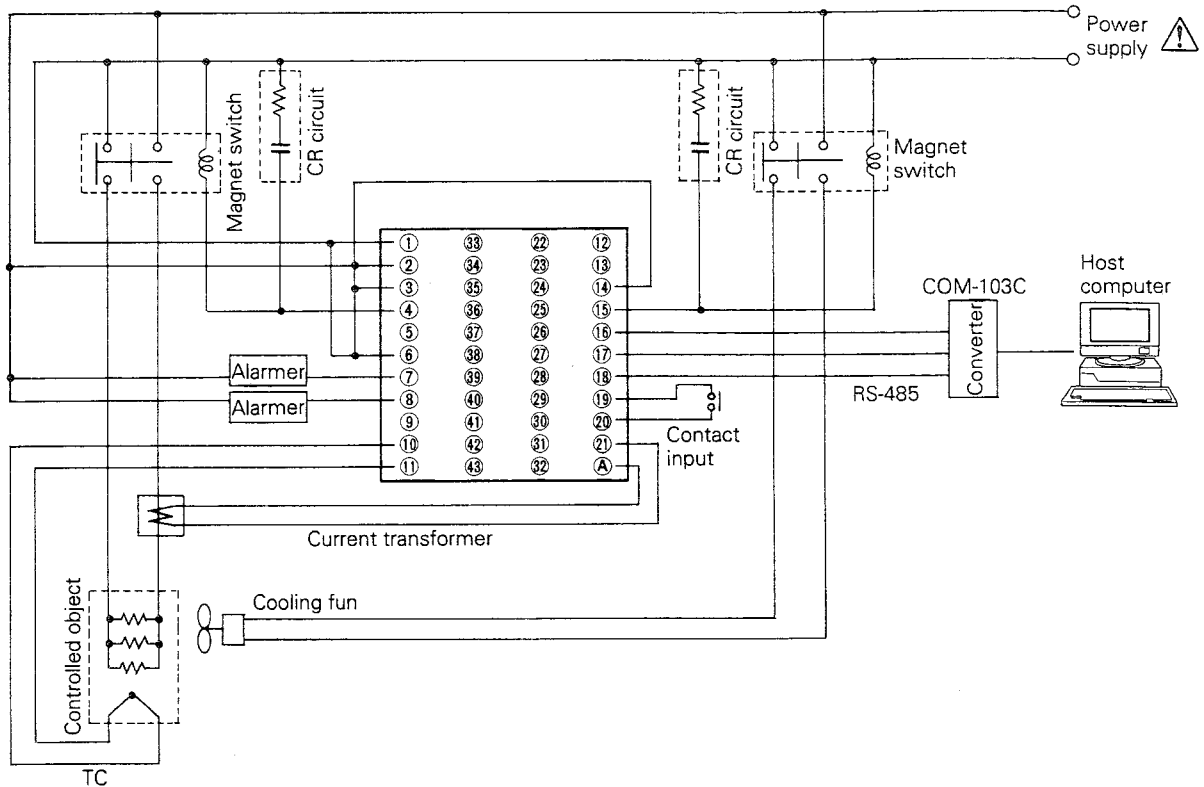
#### ■ PID action with auto-tuning

REX - D 100 F - M N \* D S - 1 N - N N



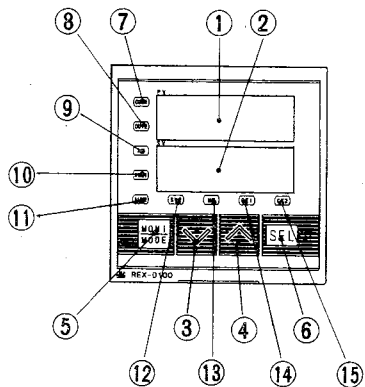
# ■ Heating/cooling PID action with auto-tuning

REX - D 900 W - M \* D S - N - 5

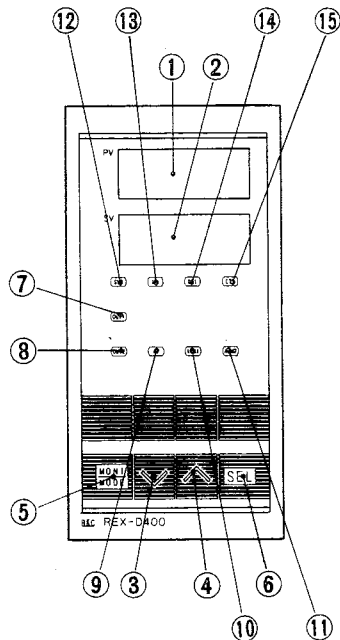


# 4. NAME OF PARTS

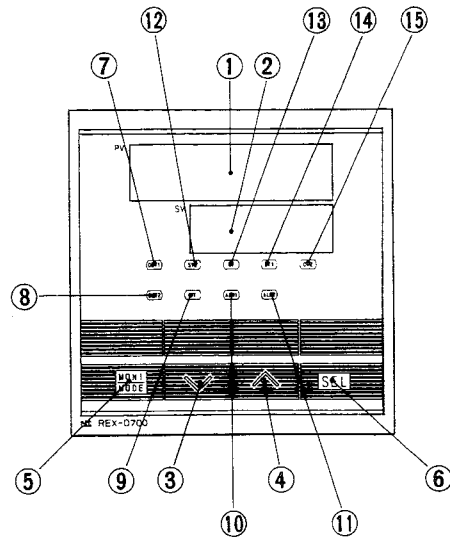
## ■ REX-D100



## ■ REX-D400



## ■ REX-D700,D900



\* The arrangement of lamps and keys on REX-D700 is the same as that on REX-D900.

Name	Details
① Measured-value (PV) display unit	<ul style="list-style-type: none"> <li>• Displays measured-value (PV).</li> <li>• Displays various characters depending on the instrument status.</li> </ul>
② Set-value (SV) display unit	<ul style="list-style-type: none"> <li>• Displays set-value (SV).</li> <li>• Displays input value, output value and various characters depending on the instrument status.</li> </ul>
③ Set-value decrement key	<ul style="list-style-type: none"> <li>• Used when the numeric value needs to be decreased for set-value change.</li> <li>• Used for selecting operation mode in each mode. ( <input type="checkbox"/> )</li> </ul>
④ Set-value increment key	<ul style="list-style-type: none"> <li>• Used when the numeric value needs to be increased for set-value change.</li> <li>• Used for selecting operation mode in each mode. ( <input type="checkbox"/> )</li> </ul>
⑤ MONI/MODE key	<ul style="list-style-type: none"> <li>• Used when each mode is set or each mode display is changed. ( <input type="checkbox"/> MONI/MODE )</li> </ul>
⑥ SEL key	<ul style="list-style-type: none"> <li>• Used when each mode is set or each mode display is changed. ( <input type="checkbox"/> SEL )</li> </ul>
⑦ Output lamp 1 [Green]	<ul style="list-style-type: none"> <li>• Lights when control output is turned ON.</li> </ul>
⑧ Output lamp 2 [Green]	<ul style="list-style-type: none"> <li>• Lights when cooling side output is turned ON.</li> </ul>
⑨ Auto-tuning (AT) lamp [Green]	<ul style="list-style-type: none"> <li>• Flashes during auto-tuning execution.</li> </ul>
⑩ ALM 1 lamp [Red]	<ul style="list-style-type: none"> <li>• Lights with the first alarm turned ON. This lamp lights also when a control loop break alarm (LBA) occurs.</li> </ul>
⑪ ALM 2 lamp [Red]	<ul style="list-style-type: none"> <li>• Lights with the second alarm turned ON. This lamp lights also when a heater break alarm (HBA) occurs.</li> </ul>
⑫ SV2 lamp [Green]	<ul style="list-style-type: none"> <li>• Lights when the set-value (SV) display unit shows SV2.</li> </ul>
⑬ MV lamp [Green]	<ul style="list-style-type: none"> <li>• Lights during manual control. The set-value (SV) display unit shows the manual output value. The manual output value is changed by the <input type="checkbox"/> or <input type="checkbox"/> key.</li> </ul>
⑭ CT1 lamp [Green]	<ul style="list-style-type: none"> <li>• Lights when the set-value (SV) display unit shows CT1.</li> </ul>
⑮ CT2 lamp [Green]	<ul style="list-style-type: none"> <li>• Lights when the set-value (SV) display unit shows CT2.</li> </ul>

---

## 5. OPERATION

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### 5.1 Calling procedure in each mode

Broadly, the following six statuses are available for this instrument.

- PV/SV display/set mode: Mode used to confirm and set the measured-value (PV) or set-value (SV).
- Operator mode : Mode used to change operation mode or to confirm the current value.
- Operator set mode : Mode used to set alarms and set-value.
- Engineer mode : Mode used to execute/stop the auto-tuning function and to lock the setting.
- Engineer set mode : Mode used to set and confirm various parameters.
- SETUP set mode : Mode used to select input/output and the operation mode function, etc. \*

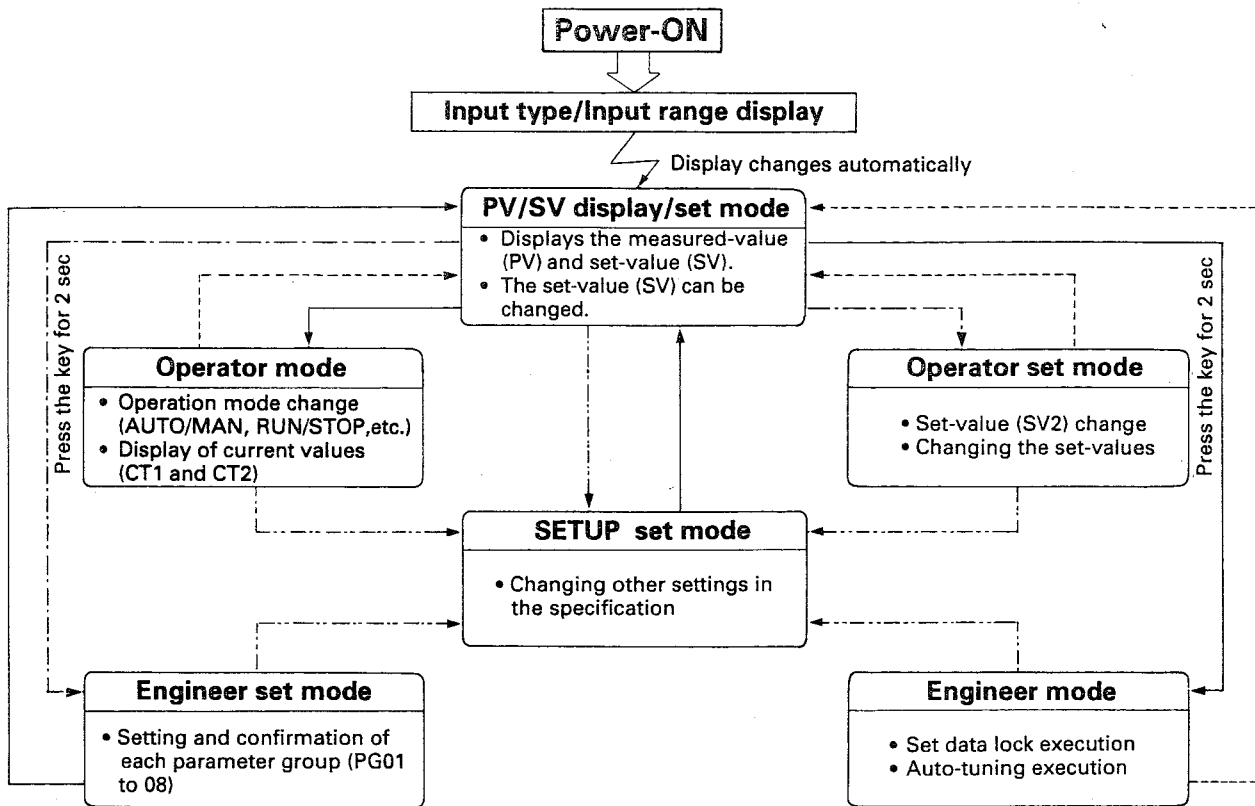
\* The SETUP set mode accesses parameters which are not usually changed.



#### Key operational cautions

- The instrument automatically returns to PV/SV display/set mode if the front key is not pressed for more than 1 min. when the instrument is any of the following modes.
  - Operator set mode
  - Engineer set mode
  - Engineer mode
  - SETUP set mode
- If the instrument returns to PV/SV display/set mode during setting operation, the value now being set is not captured.





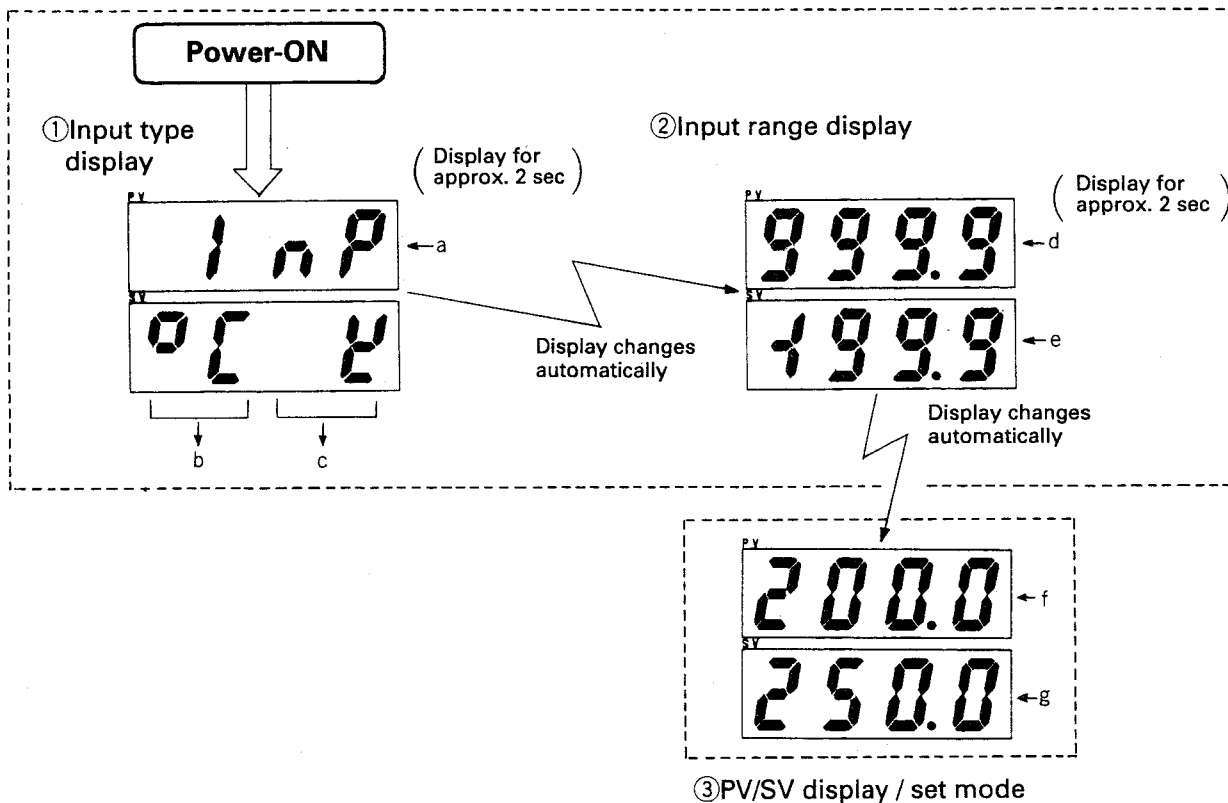
Press the key for 2 sec

Press the key for 2 sec

- Press the **MONI MODE** key.
- - - - -→ Press the **SEL** key.
- · - · - → Press the **MONI MODE** and **SEL** keys simultaneously.
- - - - -→ Press the **MONI MODE** or **SEL** key.

## ■ Input type/input range display

This instrument immediately confirms input type and range following power-ON.



① **Input type display**

(Display for approx. 2 sec)

a : Input display character (InP)

b : Unit

Display	Unit
□C	°C
□F	°F
None	%

② **Input range display**

(Display for approx. 2 sec)

d : High input range limit value

e : Low input range limit value

c : Input type

Display	H	J	L	E	N	T	U	R	S	B	W5Re/ W26Re	P	JP	PT	V
Input type	TC											RTD		Voltage input	
	K	J	L	E	N	T	U	R	S	B	W5Re/ W26Re	P	JP		PT

③ **PV/SV display/set mode**

The measured-value (PV) display unit shows the measured-value (PV), and the set-value (SV) display unit shows the set-value (SV). In addition, the set-value (SV) can be changed. Usually set the instrument to this mode except when changing the parameter set-value.

f : Measured-value (PV) display unit

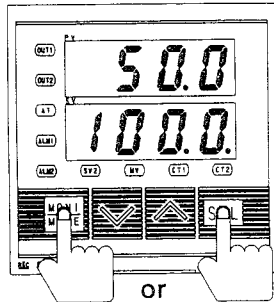
g : Set-value (SV) display unit

## 5.2 Set-value (SV) changing procedure

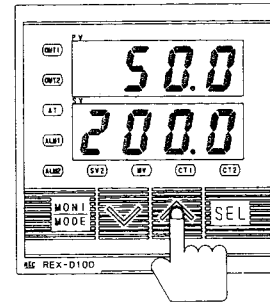
This instrument employs the up/down method for setting each constant. The set-value can be changed by pressing the  $\Delta$  and  $\nabla$  keys on the front panel.

[Example] Change the set-value (SV) to 200.0°C.

① Set the instrument to the PV/SV display/set mode.



② Numeric value change



If the instrument is set to another mode, press the **MONI MODE** or **SEL** key to set the instrument to the PV/SV display/set mode.

Keep pressing the  $\Delta$  key to increase the numeric value on the set-value (SV) display unit until it reaches "200.0". Pressing the  $\Delta$  key increases the numeric value and pressing the  $\nabla$  key decreases the numeric value.

### NOTE

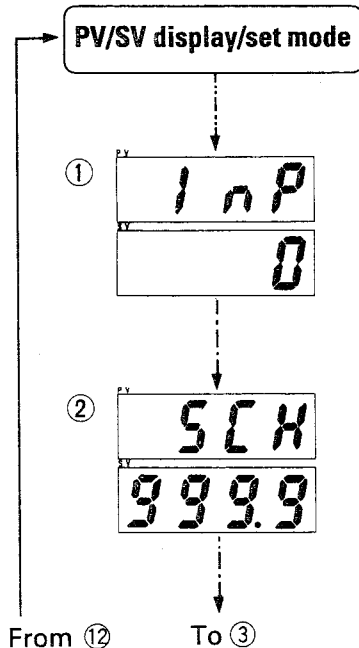
●Holding down the  $\Delta$  or  $\nabla$  key increases the speed at which the numeric value changes.

## 5.3 SETUP set mode

SETUP set mode is used to enter the input type, the range of each function and to enable or disable functions. The display sequence in SETUP set mode is shown below.

Display in SETUP set mode can be changed by pressing the **[SEL]** key.

### (1) Display sequence



- > : Press the **[MONI MODE]** and **[SEL]** keys simultaneously
- > : Press the **[SEL]** key
- > : Press the **[MONI MODE]** key



**Always set the input type.**

#### Input type selection

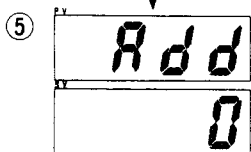
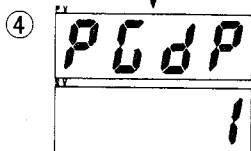
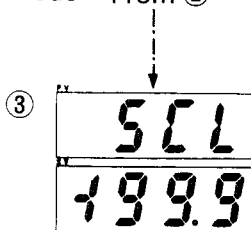
The measured-value (PV) input type can be changed.  
 Setting range : See the input range table on page 60.  
 Initial value : 0

#### Scaling high-limit setting

Sets the high limit of the scaling setting range.  
 Setting range : Scaling low-limit to 9999  
 Initial value : 999.9

To PV/SV

display/set mode From ②



From ⑫

To ⑥

### Scaling low-limit setting

Sets the low limit of the scaling setting range.

Setting range : -1999 to scaling high-limit

Initial value : -199.9

### Decimal-point position selection

[Displayed for voltage/current input]

Sets the decimal-point position on the voltage/current input scale.

Setting range : 0 (No digit below decimal-point)

1 (1 digit below decimal-point)

2 (2 digits below decimal-point)

3 (3 digits below decimal-point)

Initial value : 1

### Device address setting

[Displayed when the controller has the communication function]

Sets the communication device address of this controller.

Setting range : 0 to 99

Initial value : 0

To PV/SV  
display/set mode

From ⑤

⑥

MAN
0

#### Selection of manual mode (MAN) function

Selects whether to enable or disable manual control.

Setting range: 0 (Not provided) 1 (Provided)

Initial value : 0

⑦

STOP
0

#### Selection of operation STOP function

Selects whether to enable or disable the operation STOP function.

Setting range: 0 (Not provided) 1 (Provided)

Initial value : 0

⑧

CT5
0

#### CT type selection

[Displayed only when the controller has the heater break alarm function]

Selects the CT type used for the heater break alarm.

Setting range: 0 (CTL-6-P-N) 1 (CTL-12-S56-10L-N)

Initial value : 0

From ⑫

To ⑨

To PV/SV  
display/set mode

From ⑧

⑨

c5
0

⑩

RTK5
10

⑪

ROBE
0

From ⑫

To ⑫

### Selection of air cooling or water cooling

[Displayed only for heating/cooling PID action with auto-tuning.]

Selects the cooling method on the cooling side for heating/cooling PID action with auto-tuning.

Setting range: 0 (Air cooling)      1 (Water cooling)

Initial value : 0

### Auto-tuning (AT) differential gap setting

Sets the differential gap during auto-tuning.

Setting range: 0 to 3600 sec

Initial value : 10

### Action selection at input abnormality \*1

Selects the action to be performed when an error occurs.

Setting range: 0..Not provided

1..Output OFF [Output limit (high limit)]\*2

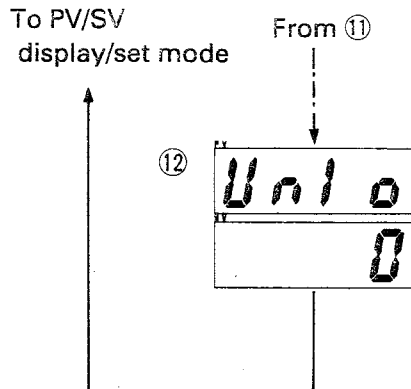
2..Output ON [Output limit (low limit)]\*2

Initial value : 0

\*1 Not displayed for heating/cooling PID action with auto-tuning.

\*2 [Output limit (low-limit)] and [Output limit (high-limit)] are for continuous output.





### Universal output selection

#### [Displayed for universal output]

Selects the universal output type.

Setting range: 0 (Relay contact output)


1 (Voltage pulse output)

2 (Continuous current output)

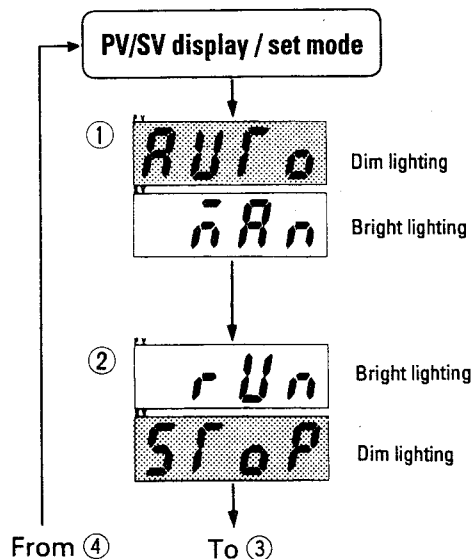
Initial value : 0


\*Excluding the second control output of REX-D100 or REX-D400/D700/D900.

## 5.4 Operator mode

Operator mode is used to change each operation mode or to monitor and confirm the current value. The display sequence in operator mode is shown below. Press the  key to change the display in operator mode.

### (1) Display sequence



→ : Press the  key

#### AUTO/MAN transfer

[Displayed only when there is AUTO/MAN transfer.]

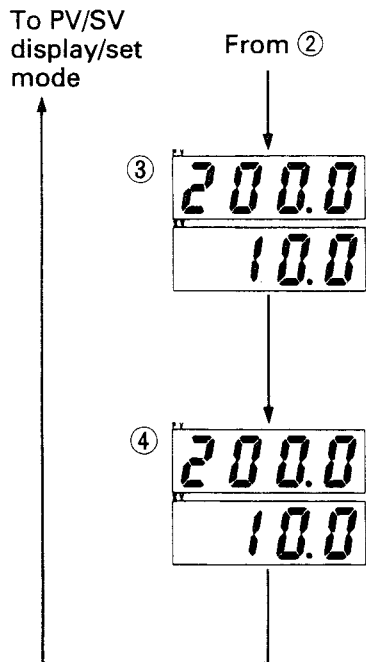
Automatic or manual control is selected.  
(In the Figure on the left, manual (MAN) mode is selected.)

#### RUN/STOP transfer \*1

[Displayed only when there is RUN/STOP transfer.]

RUN or STOP is selected.  
(In the Figure on the left, RUN mode is selected)

\*1 If the instrument is stopped by "RUN/STOP" transfer when an alarm is output due to instrument failure, both alarm output and control output are turned off. (The same status as at power-OFF)



**Displayed of the current transformer input value (CT1) \*1**

[Displayed only when the instrument has the heater break alarm for single-phase heater or heater break alarm for three-phase heater]

Displays the value input to the current transformer used when the instrument has the heater break alarm function on the set-value (SV) display unit.

Display range : 0.0 to 100.0A

**Displayed of the current transformer input value (CT2) \*2**

[Displayed only when the instrument has the heater break alarm for three-phase heater]

Displays the value input to the current transformer used when the instrument has the heater break alarm for three-phase on the set-value (SV) display unit.

Display range : 0.0 to 100.0A

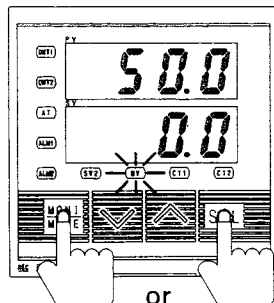
\*1 The CT1 lamp lights when the current transformer input value (CT1) is displayed.

\*2 The CT2 lamp lights when the current transformer input value (CT2) is displayed.

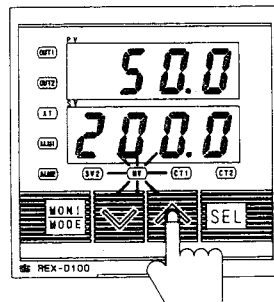
## (2) Procedure for setting the manipulated output value (MV) in MAN mode.

Manipulated output (MV) in MAN mode is manually set in PV/SV display/set mode.

### [Display examples]



or



### ① Set the instrument to the PV/SV display/set mode

If the instrument is set to another mode, press the **MONI MODE** or **SEL** key to set the instrument to the PV/SV display/set mode.

\* At this time, the MV lamp lights.

The manipulated output value (MV) is displayed on the set-value (SV) display unit.

### ② Numeric value change

Pressing the **▲** key increases the manipulated output value (MV) on the set-value (SV) display unit, and pressing the **▼** key decreases the value.

\* Keeping pressing the **▲** or **▼** key makes numeric value change faster.

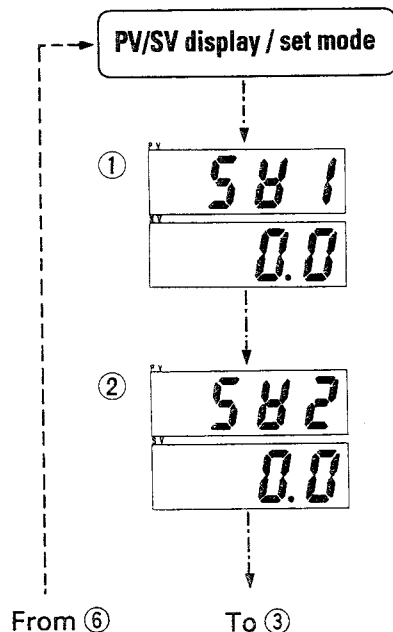
## 5.5 Operator set mode

Operator set mode is used to change the set-value (SV) which is the control target and the alarm set values.

The display sequence in the operator set mode is shown below.

The display within operator set mode is changed by pressing the **[SEL]** key, while the numeric value of each setting is changed by pressing the **[▲]** and **[▼]** keys.

### (1) Display sequence



-----> : Press the **[SEL]** key.

-----> : Press the **[MONI MODE]** or **[SEL]** key.

#### Set-value (SV1) \*1

The set-value (SV1) in operation STOP mode can be changed.

Setting range : Scaling low-limit to scaling high-limit  
(-1999 to 9999)

Initial value : 0 (0.0)

#### Step set-value (SV2) \*2

Step set-value (SV2) can be changed.

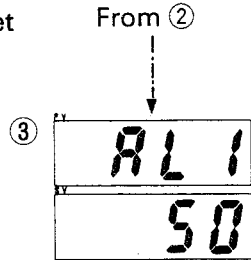
Setting range : Scaling low-limit to scaling high-limit  
(-1999 to 9999)

Initial value : 0 (0.0)

\*1 Display in stop mode or manual mode, or when the contacts are closed at contact input.

\*2 Display in stop mode or manual mode, or when the contacts are opened at contact input.

To PV/SV  
display/set  
mode



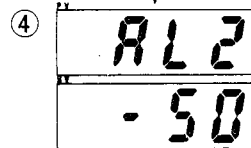
### First alarm set-value (AL1)

[Displayed only if alarm function is provided]

First alarm set-value can be changed.

Setting range: See \*A

Initial value : 50 (50.0)



### Second alarm set-value (AL2)

[Displayed only if alarm function is provided]

Second alarm set-value can be changed.

Setting range: See \*A

Initial value : -50 (-50.0)

From ⑥

To ⑤

### \*A Deviation alarm

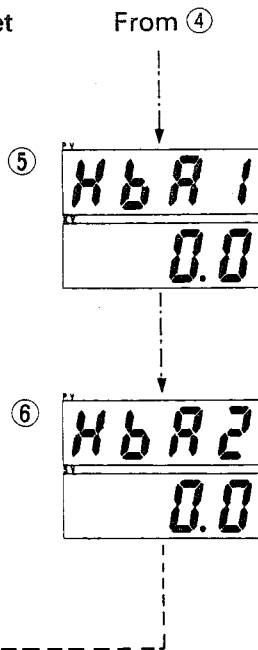
- High alarm, low alarm : -span to +span
- High and low alarm : -span to +span (Absolute value setting)

**Band alarm** : -span to +span (Absolute value setting)

### Process alarm

- High/low SV alarm : Same as the input range
- High/low PV alarm : Same as the input range

To PV/SV  
display/set  
mode



#### Heater break alarm value (HBA1) \*A

[Displayed only when the instrument has a heater break alarm]

The heater break alarm value (HBA1) can be changed.

Setting range : 0.0 to 100.0A (0.0: HBA1 OFF)

Initial value : 0.0

#### Heater break alarm value (HBA2) \*A

[Displayed only when the instrument has a heater break alarm for three-phase heater]

The heater break alarm value (HBA2) can be changed.

Setting range : 0.0 to 100.0A (0.0: HBA2 OFF)

Initial value : 0.0

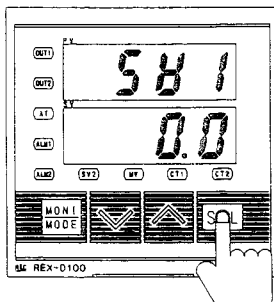
- \*A ●Set heater break alarm set-value to a value about 85% current transformer input value (CT). However, when power supply variations are large, set the alarm to a slightly smaller value. In addition, when two or more heaters are connected in parallel, set the alarm to a slightly larger value so that it is activated even with only one heater is broken (However, within the value of CT).
- When the heater break alarm set-value is set to "0.0" or the current transformer is not connected, the heater break alarm is turned OFF.

## (2) Changing the set-value (SV1) in operation STOP mode

Usually, the set-value (SV) display unit shows the set-value (SV1) in PV/SV display/set mode and thus the setting can be changed. However, when operation STOP is set, the set-value (SV) display unit shows "STOP" in PV/SV display/set mode and thus the setting cannot be changed. To change the set-value (SV1) in operation STOP mode, set the instrument to operator set mode. The procedure for changing set-value (SV1) is shown below.

### [Example] Change the set-value (SV) to 200.0°C

#### ① Set the instrument to operator set mode

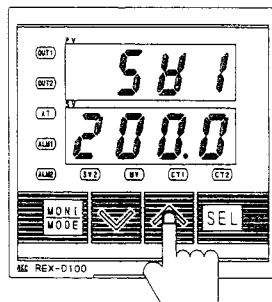


Press the **[SEL]** key in PV/SV display/set mode to set the instrument to operator set mode.

First, "Set-value (SV1)" is displayed.

The measured-value (PV) display unit shows "SV1" and the set-value (SV) display unit shows the number.

#### ② Numeric value change

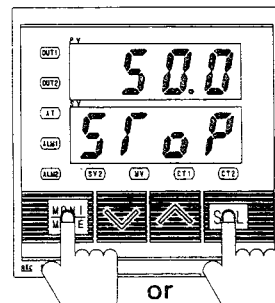


Keep pressing the **[▲]** key to increase the numeric value on the set-value (SV) display unit until it reaches "200.0".

Pressing the **[▲]** key increases the numeric value and pressing the **[▼]** key decreases the numeric value.

\*Keep pressing the **[▲]** or **[▼]** key to increase the speed with which the numeric value changes.

#### ③ Setting end



After the setting is completed, press the **[MONI MODE]** or **[SEL]** key to set the instrument to the desired mode.

(The above figure shows that the instrument is in PV/SV display/set mode)

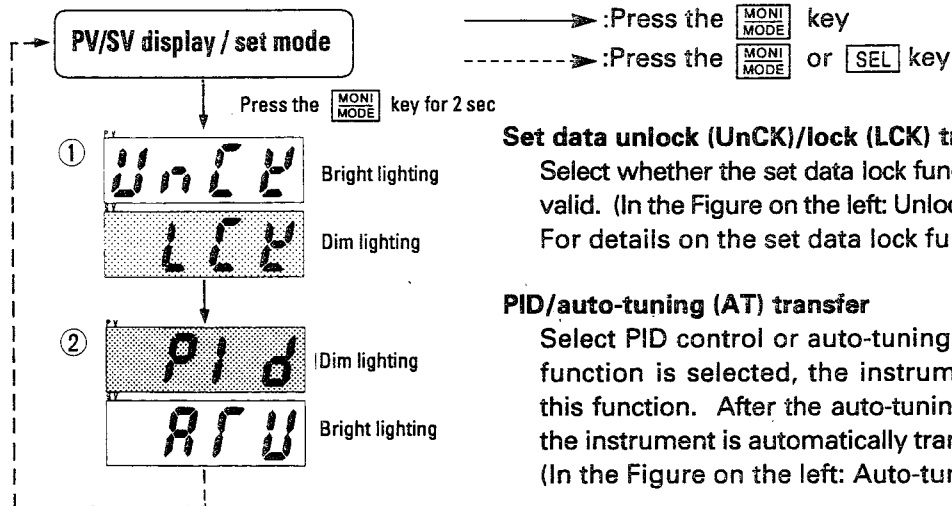


## 5.6 Engineer mode

Engineer mode is used to lock the set data and to switch PID/auto-tuning (AT). The display sequence in engineer mode is shown below.

The display within engineer mode can be changed by pressing the **MONI MODE** key.

### (1) Display sequence



#### Set data unlock (UnCK)/lock (LCK) transfer

Select whether the set data lock function is invalid (unlock) or valid. (In the Figure on the left: Unlock is selected.)

For details on the set data lock function, see page 45.

#### PID/auto-tuning (AT) transfer

Select PID control or auto-tuning (AT). If the auto-tuning function is selected, the instrument immediately starts this function. After the auto-tuning function is completed, the instrument is automatically transferred to PID control. (In the Figure on the left: Auto-tuning (AT) is selected.)

\* If the auto-tuning function is activated, the auto-tuning lamp flashes.

#### NOTE

After changing the engineer mode setting, the setting becomes valid when the **MONI MODE** key is pressed.

## (2) Set data lock function

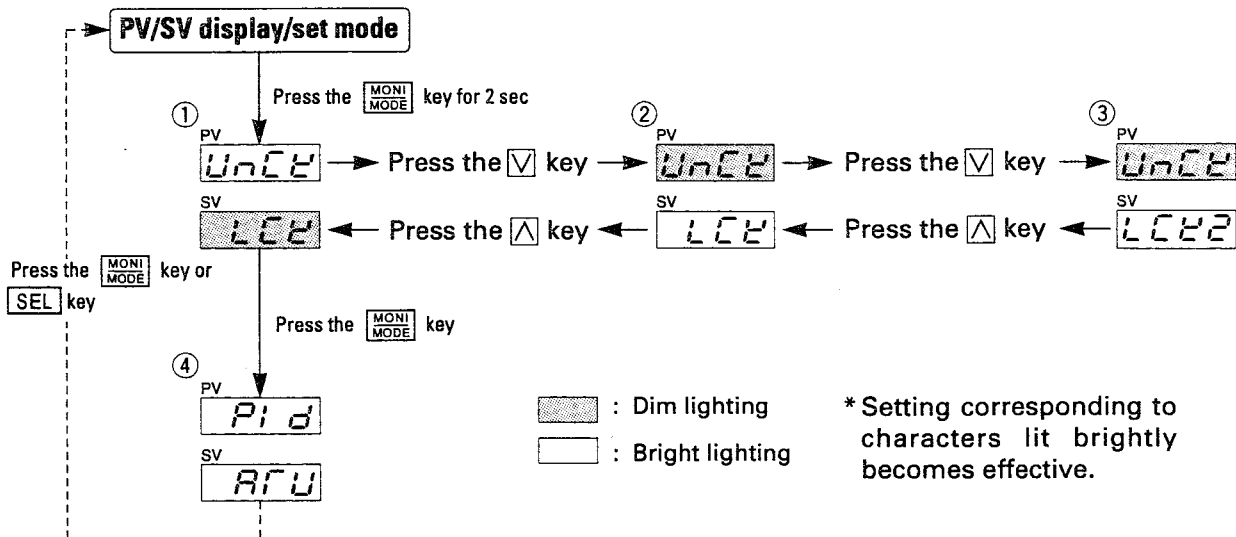
The set data lock function is used not to change the setting by front key operations. The following 2 levels are available for the set data lock functions. Select the desired set data lock level by pressing the  or  key after displaying the set data unlock (UNLOCK)/lock (LOCK) selection screen.

### ■ Set data lock list

X : Setting can be changed. — : Setting cannot be changed.

Mode	Level, Symbol	Set data lock (Level 1)	Set data lock (Level 2)
		LOCK	LOCK2
PV/SV display/set mode		—	X
Operator mode		X	X
Engineer mode		X	X
Operator set mode		—	—
Engineer set mode		—	—
SETUP set mode		—	—

## ■ Display sequence



### NOTES

- In the same way as the normal changing procedure, set the instrument to PV/SV display/set mode when changing the set-value (SV) in the set data lock (LEVEL 2) state.
- Only the set-value (SV) displayed in PV/SV display/set mode can be changed with the set data lock function (level 2) activated. Therefore, if the instrument is provided with the step function (contact input), select the set-value (SV1) or the step set-value (SV2).

{ Contact open : Set-value (SV1) can be changed.  
} Contact close : Step set-value (SV2) can be changed.

### (3) Requirements for auto-tuning (AT)

Auto-tuning (AT) is the function of automatically measuring, computing and setting the optimum PID constants. The requirements for auto-tuning (AT) start and suspension are described in the following. Auto-tuning (AT) is started/stopped by "PID/auto-tuning (AT) transfer" in the engineer mode (See page 44).

#### ① Requirements for auto-tuning (AT) start

Start auto-tuning (AT) when all the following conditions are satisfied:

- In the operator mode
  - AUTO/MAN transfer → Auto mode
  - Operation execution RUN/STOP transfer → execution (RUN)
- Input value should not be abnormal.

#### ② Requirements for auto-tuning (AT) suspension

- If the AT cycle does not reach 1.5 cycles about 9 hours after auto-tuning (AT) start, an auto-tuning (AT) error occurs and this function is stopped automatically.
- When set-value (SV) is changed
- When PV bias is changed
- When high or low output limiter value is changed
- When the input type is changed
- When the direct/reverse action is changed
- When input value becomes abnormal
- When power failure occurs

#### NOTES

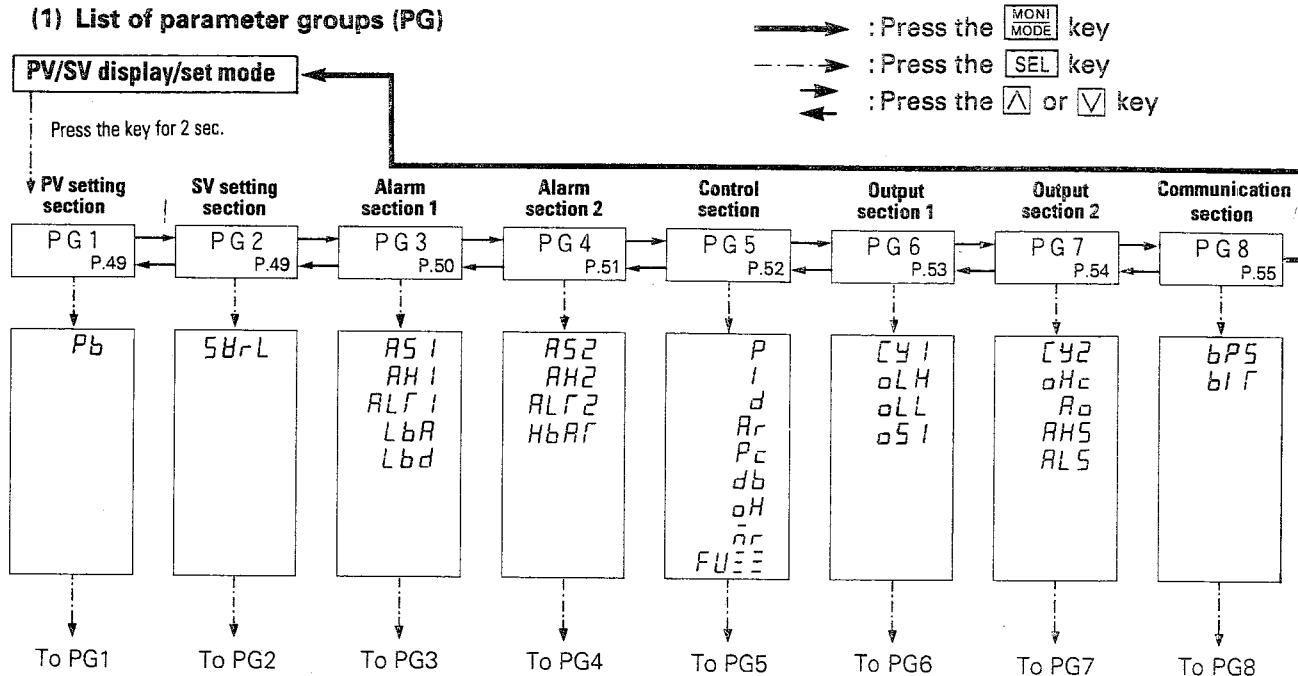
1. If the auto-tuning (AT) suspension condition is established, the auto-tuning (AT) function is immediately suspended to be changed to PID control.  
The PID constants at this time are the same as before starting auto-tuning (AT). In addition, even if the auto-tuning (AT) function is completed, it is automatically transferred to PID control.
2. Even if the auto-tuning function is activated while manipulated output is limited by the output limiter (See 5.7 Engineer set mode [P. 48]), no optimum PID constants may be obtained.

## 5.7 Engineer set mode

Engineer set mode is used to set the control action, input/output, alarms, operation selection of additional functions and the presence or absence of the functions. The parameter group (PG) list in engineer set mode is shown below.

Display within engineer set mode can be changed by pressing the  $\Delta$ ,  $\nabla$  or  $\boxed{\text{SEL}}$  key.

### (1) List of parameter groups (PG)



#### NOTE

Note that certain items are not displayed depending on the specifications.

## (2) Description of parameter groups (PG)

### [Parameter group(PG1)] PV setting section

Symbol	Name	Setting range	Description	Initial value prior to shipment
<i>PG 1</i>	Parameter group 1		The first characters of parameter group (PG1). They are also displayed first when the instrument is set to engineer set mode.	
PG1				
<i>Pb</i>	PV bias	Temperature input -1999 (-199.9) to 9999 (999.9)°C [°F] Voltage input -1999 to 9999 (The decimal-point position is the same as that of PV.)	Sensor correction is made by adding bias value to measured-value (PV).	0 (0.0)
Pb				

### [Parameter group (PG2)] SV setting section

Symbol	Name	Setting range	Description	Initial value prior to shipment
<i>PG 2</i>	Parameter group 2		The first characters of parameter group (PG2).	
PG2				
<i>SVrL</i>	SV change rate limit	Temperature input 0 (0.0) to input span or 9999 (999.9)°C [°F]/min Voltage input 0.0 to 100.0%/min of span	Setting amount of set-value (SV) change per one minute when the set-value (SV) is change.	0 (0.0)
SVrL				

[Parameter group (PG3)] Alarm section 1

Symbol	Name	Setting range	Description	Initial value prior to shipment
<i>PG 3</i>	Parameter group 3		The first characters of parameter group (PG3).	
PG3				
*1 <i>AS 1</i>	First alarm action selection	See *A	Selects first alarm action.	5
AS1				
*1 <i>AH 1</i>	First alarm differential gap	Temperature input 0 (0.0) to 100(100.0)°C [°F] Voltage input 0.0 to 10.0% of span	Sets first alarm differential gap.	Temperature input 2 (2.0) Voltage input 0.2
AH1				
*1 <i>ALT 1</i>	First alarm timer setting	0 to 600 sec	Sets time until alarm is turned ON after measured-value (PV) enters first alarm area.	0
ALT1				
*2 <i>LbA</i>	Control loop break alarm (LbA)	0 to 7200 sec (0: LbA OFF)	Set control loop break alarm set-value (SV). Control loop break alarm turns OFF with this alarm set to "0".	0
LbA				
*2 <i>Lbd</i>	LbA dead band (LBD)	Temperature input 0 to 9999°C [°F] (0: LBD OFF) Voltage input 0 to 100% of span	Set the area of not outputting LbA. No LbA dead band functions with "0" set.	0
Lbd				

\*1 Displayed only when the alarm function is provided.

\*2 Not displayed in heating/cooling PID action with the auto-tuning function.

\*A 0:Alarm OFF

1:High-limit SV alarm

2:Low-limit SV alarm

3:High-limit PV alarm

4:Low-limit PV alarm

5:Deviation high alarm

6:Deviation low alarm

7:Deviation high/low alarm  
(Absolute-value setting)

8:Band alarm

(Absolute-value setting)

9:High-limit PV alarm (With hold action)

10:Low-limit PV alarm (With hold action)

11:Deviation high alarm (With hold action)

12:Deviation low alarm (With hold action)

13:Deviation high/low alarm (With hold action)

(Absolute-value setting)

14:FAIL alarm

[Parameter group [PG4]] Alarm section 2

Symbol	Name	Setting range	Description	Initial value prior to shipment
<i>PG 4</i>	Parameter group 4		The first characters of parameter group (PG4).	
PG4				
*1 <i>AS2</i>	Second alarm action selection	See *A	Selects second alarm action.	6
AS2				
*1 <i>AH2</i>	Second alarm differential gap	Temperature input 0 (0.0) to 100 (100.0)°C [°F] Voltage input 0.0 to 10.0% of span	Sets second alarm differential gap.	Temperature input 2 (2.0) Voltage input 0.2
AH2				
*1 <i>ALT2</i>	Second alarm timer setting	0 to 600 sec	Sets timer until alarm is turned ON after measured-value (PV) enters second alarm area.	0
ALT2				
*2 <i>HbAT</i>	HBA delay timer	0 to 600 sec	Set to the time until a heater break alarm is turned ON after a heater break occurs.	3
HbAT				

\*1 Displayed only when the alarm function is provided.

\*2 Displayed only when the heater break (HBA) function is provided.

\*A 0:Alarm OFF

1:High-limit SV alarm

2:Low-limit SV alarm

3:High-limit PV alarm

4:Low-limit PV alarm

5:Deviation high alarm

6:Deviation low alarm

7:Deviation high/low alarm

(Absolute-value setting)

8:Band alarm

(Absolute-value setting)

9:High-limit PV alarm (With hold action)

10:Low-limit PV alarm (With hold action)

11:Deviation high alarm (With hold action)

12:Deviation low alarm (With hold action)

13:Deviation high/low alarm (With hold action)

(Absolute-value setting)

14:FAIL alarm



[Parameter group (PG5)] Control section

	Symbol	Name	Setting range	Description	Initial value prior to shipment
	<i>PG 5</i>	Parameter group 5		The first characters of parameter group (PG5).	
	PG5				
*1	<i>P</i>	Proportional band	Temperature input 0 (0.0) to input span to 9999 (999.9)°C [°F] Voltage input 0.0 to 100.0% of span	Set when PI or PID control is performed. For heating/cooling PID action: Proportional band setting on the heating-side.	Temperature input 30 (30.0) Voltage input 3.0
	P				
*2	<i>I</i>	Integral time	OFF, 1 to 3600 sec	Eliminates offset occurring in proportional control.	240
	I				
*2	<i>d</i>	Derivative time	OFF, 1 to 3600 sec	Prevents ripples by predicting output change, thereby improving control stability.	60
	d				
	<i>Ar</i>	Anti-reset wind-up (ARW)	1 to 100% of proportional band	Prevents overshoot and/or undershoot caused by integral action effect.	100
	Ar				
*3	<i>Pc</i>	Cooling-side proportional band	1 to 3000% of proportional band	Sets cooling-side proportional band when heating/cooling PID action is performed.	100
	Pc				
*3	<i>db</i>	Deadband/overlap	Temperature input -10 (-10.0) to 10 (10.0) °C [°F] Voltage input -10.0 to 10.0% of span	Sets control deadband between heating-side and cooling-side proportional bands. Minus (-) setting results in overlap.	0 (0.0)
*4	db				
	<i>oH</i>	ON/OFF action differential gap	Temperature input 0 (0.0) to 50 (50.0)°C [°F] Voltage input 0.0 to 10.0% of span	Set the differential gap during ON/OFF action.	Temperature input 2 (2.0) Voltage input 0.2
	oH				
	<i>Mr</i>	Manual reset	-50.0 to 50.0% (Heating/cooling -100.0 to 100.0%)	Corrects the manipulated variable (MV) to eliminate the offset occurring in proportional control.	0.0
	Mr				

<i>FUZZ</i>	Fuzzy	ON/OFF	Selects fuzzy function ON/OFF.	ON
FUZZ				

\*1 When set to 0 (0.0), the controller is in ON/OFF action.

\*2 The setting can be changed even in ON/OFF action, but is not activated.

\*3 Activated only during heating/cooling PID action with the auto-tuning function.

The setting can be changed even in ON/OFF action, but is not activated.

\*4 If the overlap setting exceeds the proportional band on the heating or cooling side, the controller sets the overlap value to the proportional band on the heating or cooling side, whichever is smaller. If manual output is specified, the overlap value can be changed, but the data becomes invalid.

### [Parameter group (PG6)] Output section 1

Symbol	Name	Setting range	Description	Initial value prior to shipment
<i>PG 6</i>	Parameter group 6		The first characters of parameter group (PG6).	
PG6				
*1 <i>CY1</i>	Proportioning cycle	1 to 100 sec	Sets control output cycle. For heating/cooling PID: Heating-side proportioning cycle	20
CY1				
<i>oLH</i>	Output limit (high limit)	Output limit (low limit) to 105.0% (Heating/cooling 0.0 to 105.0%)	High limit of manipulated output value (MV). For heating/cooling PID action: Output limit (high limit) on the heating-side output.	105.0
oLH				
*2 <i>oLL</i>	Output limit (low limit)	-5.0% to output limit (high limit)	The high limit of manipulated output value (MV) on the cooling side for the heating/cooling PID action with auto-tuning.	-5.0
oLL				
*2 <i>oS1</i>	Direct/reverse action selection	0: Direct action 1: Reverse action	Selects direct or reverse control action.	1
oS1				

\*1 Not displayed in ON/OFF action and for continuous voltage or current output.

A heater break alarm may malfunction at a low load factor (short ON time) depending on the input timing of a measured signal to the CT. (The alarm occurs even if no heater breaks.) In this case, set the proportioning cycle to more than 5 sec.

\*2 Not displayed in heating/cooling PID action with the auto-tuning function.

[Parameter group (PG7)] Output section 2

Symbol	Name	Setting range	Description	Initial value prior to shipment
<i>PG 7</i>	Parameter group 7		The first characters of parameter group (PG7).	
PG7				
*1 <i>CY2</i>	Cooling-side proportioning cycle	1 to 100 sec	Sets cooling-side output cycle for heating/cooling PID action.	20
CY2				
*2 <i>oHc</i>	Output limit (high limit)	0.0 to 105.0% (cooling-side output)	The high limit of manipulated output value (MV) on the heating/cooling PID action.	105.0
oHc				
*3 <i>Ao</i>	Analog output specification selection	0 : Measured-value (PV) 1 : Deviation 2 : Set-value (SV) 3 : Control output (Heating-side) 4 : Heater current value (CT1)	Selects analog output type.	0
Ao				
*3 <i>AHS</i>	High limit analog output range	Specification selection 0, 2 : Scaling low-limit to scaling high-limit 1 : -span (-1999) to span (9999) 3 : 0.0 to 100.0% 4 : 0.0 to 100.0A	Sets high limit of analog output range.	
AHS				
*3 <i>ALS</i>	Low limit analog output range	Specification selection 0, 2 : Scaling low-limit to scaling high-limit 1 : -span (-1999) to span (9999) 3 : 0.0 to 100.0% 4 : 0.0 to 100.0A	Sets low limit of analog output range.	
ALS				

\*1 Displayed if the control output is relay contact output or voltage pulse output.

A heater break alarm may malfunction at a low load factor (short ON time) depending on the input timing of a measured signal to the CT. (The alarm occurs even if no heater breaks.) In this case, set the proportioning cycle to more than 5 sec.

\*2 Displayed only during heating/cooling PID action with the auto-tuning function.

\*3 Displayed only for analog output. [Option]

**[Parameter group (PG8) Communication section**

Symbol	Name	Setting range	Description	Initial value prior to shipment
<i>PG 8</i>	Parameter group 8		The first characters of parameter group (PG8).	
PG8				
* <i>bPS</i>	Communication speed	0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps	Selects communication speed.	3
bPS				
* <i>biT</i>	Communication data bit configuration	See *A.	Selects data bit configuration during communication.	0
biT				

\* Not displayed when there is no communication function.

\*A

Setting	Parity bit	Data bit [bit]	Stop bit [bit]
0	None	8	1
1	None	8	2
2	Even	7	1
3	Even	7	2
4	Odd	7	1
5	Odd	7	2

## 5.8 Basic operation during setting change

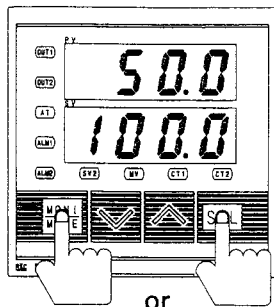
### (1) Basic operation procedure

- ① Set the instrument to the PV/SV display/set mode.
- ② Set to the mode whose setting needs to be changed.
- ③ Display the parameter whose setting needs to be changed.
- ④ Press the  $\Delta$  or  $\nabla$  key to change the numeric value.
- ⑤ Save the numeric value by pressing the **MONI MODE** or **SEL** key.

### (2) Setting change examples

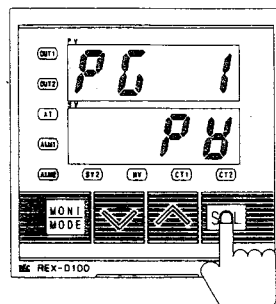
**[Example]** When the proportional band (P) of the parameter group (PG5) is set to 100.0.

- ① Set the instrument to the PV/SV display/set mode
- ② Call up engineer set mode
- ③ Set the parameter group (PG5).

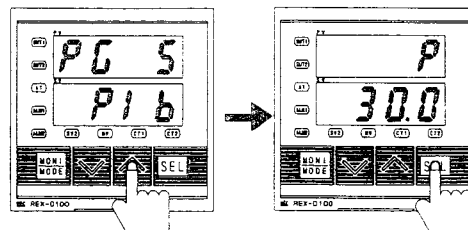


or

If the instrument is set to another mode, press the **MONI MODE** or **SEL** key to set the instrument to the PV/SV display/set mode.

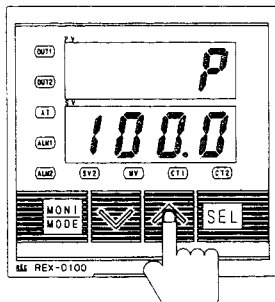


Press the **SEL** key for 2 sec. with the controller set to PV/SV display/set mode to call up engineer set mode. First, "Parameter group (PG1)" is displayed.



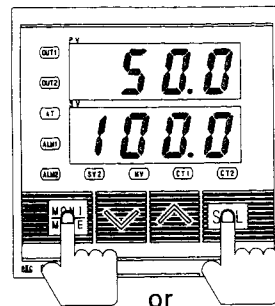
Press the  $\Delta$  key to call up the parameter group (PG5). Next, press the **SEL** key to display the proportional band (P). The measured-value (PV) display unit shows "P" and the set-value (SV) display unit shows the numeric value.

#### ④ Numeric value change



Keep pressing the  $\uparrow$  key to increase the numeric value on the set-value (SV) display unit until it reaches "100.0". Pressing the  $\boxed{\text{SEL}}$  key then makes the setting effective.

#### ⑤ Setting end



After the setting is completed, press the  $\boxed{\text{MONI MODE}}$  or  $\boxed{\text{SEL}}$  key to set the instrument to the desired mode. (The above figure shows that the instrument is in PV/SV display/set mode)

**NOTE** When validating the set items

For set-value (SV) or manipulated output value (MV) → If the  $\uparrow$  or  $\checkmark$  key is released after the setting is finished, data thus set becomes valid.



In operator or engineer mode → Validated by pressing the  $\boxed{\text{MONI MODE}}$  key after setting completion.

Changing the set-value (SV1) in operation STOP mode  
Operator set mode, Engineer set mode or  
SETUP set mode

} → Validated by pressing the  $\boxed{\text{SEL}}$  key after setting completion.

## 6. DISPLAY AT ABNORMALITY ⚠

### ● For input abnormality

Display	Details	Action (output)	Measures
<p>Measured-value (PV)</p> <p>Flashing</p>	<p>Input abnormality</p> <p>Measured-value (PV) rose above the high input range limit or fell below the low input range limit.</p>	<ul style="list-style-type: none"> <li>Action at input abnormality</li> </ul> <p>If overscale or downscale occurs in the controller, the controller takes the action for input abnormality set as a result of action selection mode for input abnormality.</p>	<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>⚠ WARNING</b></p> <p><b>In order to prevent electric shock, prior to replacing the sensor, always turn OFF the power.</b></p> </div> <p>Check input type, range, sensor and sensor connection.</p>
<p></p> <p>Flashing</p>	<p>Overscale</p> <p>Measured-value (PV) is beyond the effective input range.</p>		
<p></p> <p>Flashing</p>	<p>Underscale</p> <p>Measured-value (PV) is below the effective input range.</p>		

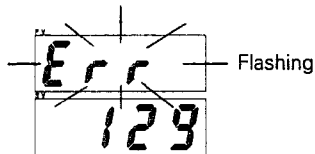
● **Self-diagnostic function**

If an error is detected by the self-diagnostic function, the PV display unit flashes "Err", and the SV display unit shows the error code.

If two or more errors occur simultaneously, the total summation of these error codes is displayed.

Error code	Details	Action (output)	Measures
1	Adjusted data destroyed	Outputs are all turned OFF	Turn OFF the power once. If an error occurs after the power is turned ON again, contact your nearest RKC sales office or agent from which you bought the controller.
2 or 4	RAM error		
128	Input error		

**[Example] If the adjusted data is destroyed and an input error occurs simultaneously**



The PV display unit flashes "Err" and the SV display unit shows the number 129 : 1 (adjusted data destroyed) plus 128 (input error).



## 7. INPUT RANGE TABLE

Group		Input type		Input select
Temperature input	TC	K (K)	-199.9 to 999.9 °C	0
			-200 to 1372 °C	1
		J (J)	-199.9 to 999.9 °C	2
			-200 to 1200 °C	3
		T (T)	-199.9 to 400.0 °C	4
		R (R)	0 to 1769 °C	5
		S (S)	0 to 1769 °C	6
		B (b) *	0 to 1820 °C	7
		E (E)	-200 to 1000 °C	8
		N (n)	0 to 1300 °C	9
		PLII (P)	0 to 1390 °C	10
		W5Re/W26Re (W)	0 to 2320 °C	11
		U (U)	0 to 600 °C	12
L (L)	0 to 900 °C	13		

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

Group		Input type		Input select
Temperature input	TC	K (K)	-199.9 to 999.9 °F	14
			-330 to 2500 °F	15
		J (J)	-199.9 to 999.9 °F	16
			-330 to 2192 °F	17
		T (T)	-199.9 to 752.0 °F	18
		R (R)	0 to 3216 °F	19
		S (S)	0 to 3216 °F	20
		B (B) *	0 to 3308 °F	21
		E (E)	-330 to 1832 °F	22
		N (N)	0 to 2372 °F	23
		PLII (P)	0 to 2534 °F	24
		W5Re/W26Re (W)	0 to 4208 °F	25
		U (U)	0 to 1100 °F	26
		L (L)	0 to 1600 °F	27
		RTD	JPt100Ω	-199.9 to 510.0 °C
Pt100Ω	-199.9 to 660.0 °C		29	
JPt100Ω	-199.9 to 950.0 °F		30	
Pt100Ω	-199.9 to 999.9 °F		31	

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

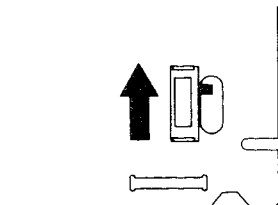
Group		Input type		Input select
Voltage input	Voltage input (Low)	mV, V ( $\mu$ )	0 to 10 mV DC	32
			0 to 100 mV DC	33
			0 to 1 V DC	34
	*1 Voltage input (High)	V ( $\mu$ )	0 to 5 V DC	35
			1 to 5 V DC	36
			0 to 10 V DC	37
*2 Current input	mA ( $\mu$ )	0 to 20 mA DC	/	
		4 to 20 mA DC		

\*1 If voltage (high) input is used, the internal switch needs to be switched.

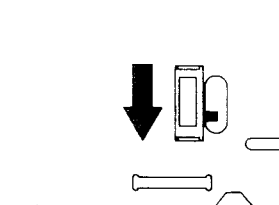
\*2 If a current input of 0 to 20mA is used, select a voltage (high) input of 0 to 5V, and if a current input of 4 to 20mA is used, select a voltage (high) input of 1 to 5V. In either case, connect an external resistor (250 $\Omega$ ±0.02%±10PPM, 0.25W or more).

### ● Switch selection

Always turn OFF the power, then pull out the internal chassis. 



For voltage (low) input



For voltage (high) input

### CAUTIONS

- No data is backed up when the power supply is turned off during setting change.
- If the setting is changed during auto-tuning, the auto-tuning function is suspended.

## 8. REPLACING THE WATERPROOF AND DUSTPROOF RUBBER PACKING



### WARNING



- In order to prevent electric shock, always turn off the power supply before replacing the rubber packing.
- In order to prevent electric shock, and instrument failure, always turn off the power supply before pulling out the internal chassis.
- In order to prevent injury or instrument failure, do not touch the internal printed circuit board.

If the waterproof and dustproof rubber packing deteriorates, contact your nearest RKC sales office or agent from which you bought the controller.

Type	Parts code	Remarks
REX-D100	KD100-35	For the board
REX-D100	KD100-310	For the case
REX-D400	KF400N-32	For the board
REX-D400	KD400-35	For the case
REX-D700	KF700N-32	For the board
REX-D700	KD700-34	For the case
REX-D900	KD900N-32	For the board
REX-D900	KD900-35	For the case

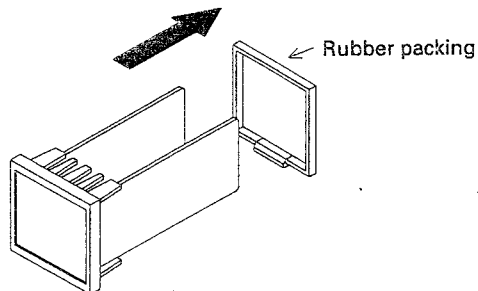
## ● Replacement of dustproof and waterproof rubber packing

### CAUTION

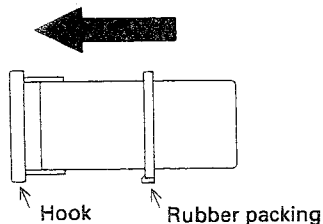
Prior to replacing the rubber packing, first confirm that no water remains, then turn on the power supply. If the water remains, shorting may result.

#### [For the board]

- ① Pull the internal assembly out of the case, then remove the old rubber packing.



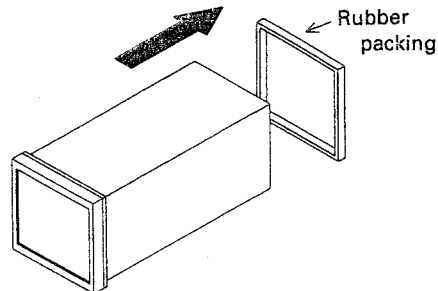
- ② Replace the old rubber packing with a new one, then put the internal chassis in the case.



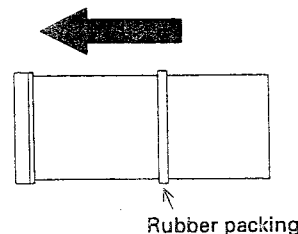
\* Firmly push the rubber packing in the board until it also contacts the hook.

#### [For the case]

- ① Remove the mounting bracket and disconnect all of the lead wires from the rear terminal board of this instrument, then remove the instrument from the control panel. Next, remove the deteriorated rubber packing from this instrument.



- ② Firmly push the new rubber packing into the instrument, then re-mount the instrument in the panel.



## 9. EXTERNAL RESISTOR $\triangle$ (shunt resistor for current input)

OPTION

### 9.1 Prior to connecting external resistor (shunt resistor for current input)

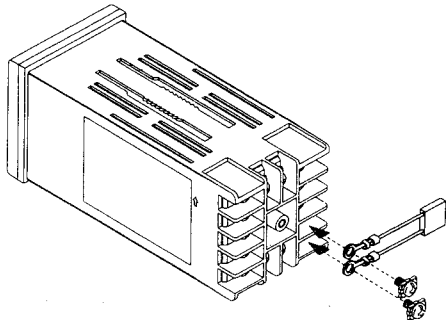
If the current input specification is selected, it becomes necessary to change voltage input and also to connect an external resistor (shunt resistor for current input [250 $\Omega$  $\pm$ 0.02% $\pm$ 10PPM, 0.25W or more] ). If a current input of 0 to 20mA is used, select a voltage (high) input of 0 to 5V, or if a current input of 4 to 20mA is used, select a voltage (high) input of 1 to 5V. In either case, connect an external resistor (shunt resistor for current input [250 $\Omega$  $\pm$ 0.02% $\pm$ 10PPM, 0.25W or more] ) between the input terminals at the rear of the controller case. The setting procedure for current input is described in the following.

### 9.2 Setting procedure

[Example of changing the setting] When changing to a current input of 0 to 20mA

- (1) In order to prevent electric shock, always turn off the power supply.  $\triangle$

Next, connect the external resistor between the No. 9 and No. 10 input terminals at the rear of the case (for REX-D100). However for REX-D400/D900, connect the external resistor between the No. 10 and No. 11 input terminals, or for REX-D700, between the No. 14 and No. 15 input terminals.



#### REX-D100

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

#### REX-D400, D700, D900

[ Recommended tighten torque: 0.4N·m (4kgf·cm)  
Maximum allowance tighten torque: 1.0N·m (10kgf·cm) ]

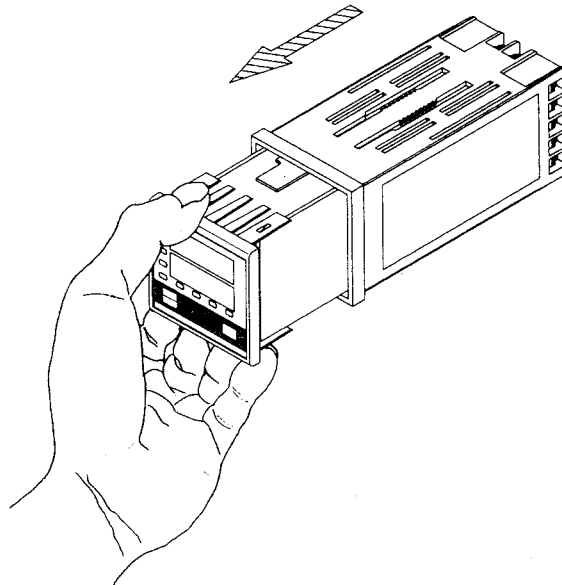


## WARNING



- In order to prevent electric shock and instrument failure, always turn off the power supply before pulling out the internal chassis.
- In order to prevent injury or instrument failure, do not touch the internal printed circuit board.

- (2) Remove the internal assembly from the case by pressing the latch located at the bottom of the front panel and pulling it forward.



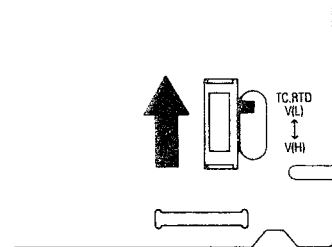


## WARNING

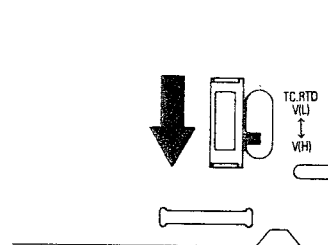


● In order to prevent electric shock and instrument failure, always turn off the power supply before pulling out the internal chassis.

- (3) Change voltage (low) input to voltage (high) input by the internal switch.  
For REX-D100/D700, the internal switch is located on the left printed wiring board when viewed from the front, or for REX-D400/D900, on the right printed wiring board when viewed from the front.



**Voltage (low) input**

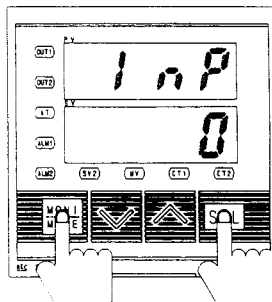


**Voltage (high) input**

- (4) Put the internal chassis into the case, then turn ON the power. As a result, the input type and range are displayed. (See "Input type/input range display" on page 29.)

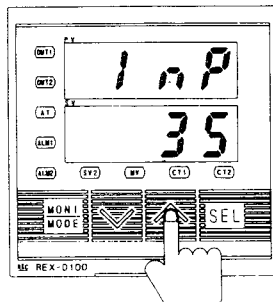


- (5) Next, simultaneously press the **MONI MODE** and **SEL** keys to call up SETUP set mode. First, "Input type selection ( ; nP )" is displayed.

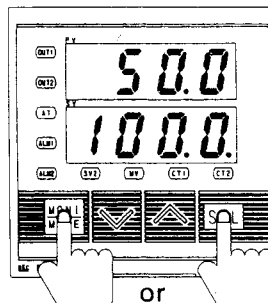


Press the keys to simultaneously.

- (6) Keep pressing the **▲** keys to increase the numeric value on the set-value (SV) display unit.  
Press the **▲** key to set the input to a voltage (high) input of 0 to 5V (input selection: 35).  
For input selection, see P. 60.  
After the numeric value is set, this setting becomes valid if **SEL** key is pressed.



- (7) After the setting is completed, press the **MONI MODE** or **SEL** key to set the instrument to the desired mode.  
(Figure on the under: PV/SV display/set mode)



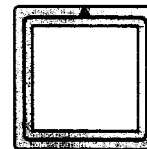
**\* Follow the same steps for setting REX-D400/D700/D900.**

## 10. FRONT COVER (NEMA4X)

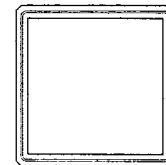
OPTION

### 10.1 Check of product delivered

Check that the front cover and rubber packing both conforming to NEMA4X shown in the figure at the right are ready at hand.



Front cover  
(NEMA4X)

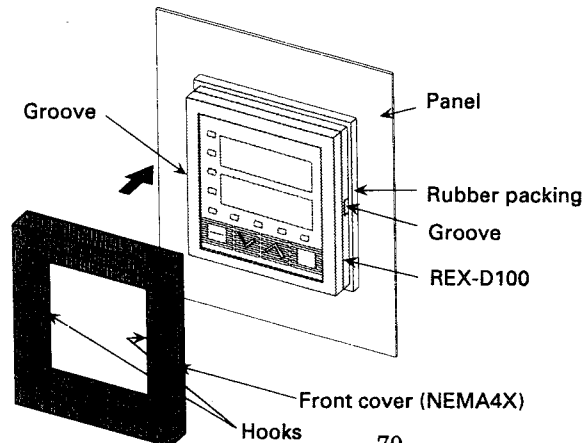


Rubber packing  
(NEMA4X)

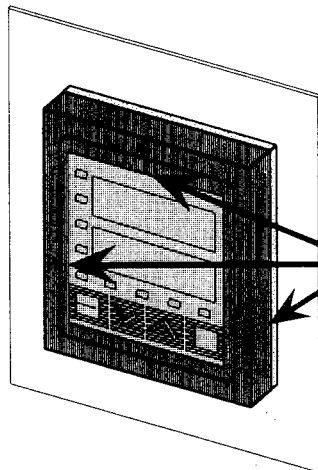
### 10.2 Mounting

- (1) Check that the REX-D100 is firmly fixed to the panel.
- (2) Push the hooks inside the front cover into the grooves in the case until a click sound is produced.

At this time, firmly fix the front cover to the instrument front so that no gaps exist between the front cover and rubber packing, and between the front cover and instrument front.



- With the front cover (NEMA4X) attached to the instrument front

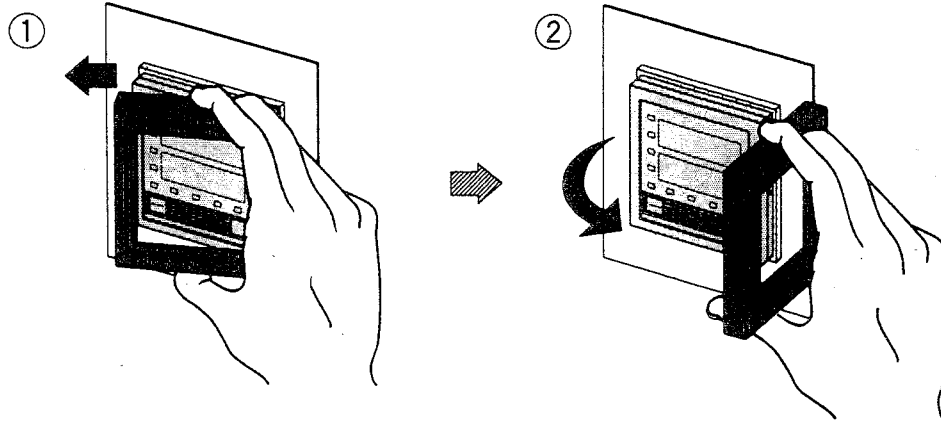


Check that no gaps exist between the front cover and rubber packing, and between the front cover and instrument front.

### 10.3 Dismounting

Push the front cover to the left while pushing it from the top and bottom to disengage the hook at the left from the groove ( ① ). The front cover can also be pushed to the right first under this condition to disengage the hook at the right from the groove.

Next, disengage the other hook from the relevant groove to remove the front cover ( ② ).



### 10.4 Maintenance

If the rubber packing or the rubber packing at the rear of the front cover conforming to NEMA4X deteriorates, place orders of new rubber packings with your nearest RKC sales office or agent from which you bought these rubber packings.

Name	Parts code
Front cover (NEMA4X)	KD100-316
Rubber packing (NEMA4X)	KD100-315

## OUTPUT RATED TABLE

Control output	Relay contact	250V AC, 3A (Load resistance)
	Voltage pulse	0–12V DC (D100), 0–15V DC (D400, D700, D900)
	Continuous voltage <sup>*1</sup>	0 to 5V DC, 0 to 10V DC, 1 to 5V DC
	Current <sup>*1</sup>	0 to 20mA DC, 4 to 20mA DC
Alarm output <sup>*2</sup>	Relay contact	250V AC, 0.5A (Load resistance)
Analog output	Voltage	0 to 5V DC, 0 to 10V DC, 1 to 5V DC
	Current	0 to 20mA DC, 4 to 20mA DC

\*1 There is no continuous voltage output setting for the first control output (OUT1) of the REX-D400/D700/D900.

\*2 Including heater break alarm, control loop break alarm and FAIL alarm.

MEMO

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