

Digital indicator with alarm function

AE500

Instruction Manual

IMAE01-E3

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

SYMBOLS

WARNING : This mark indicates precautions that must be taken if there is danger of electric shock, fire, etc., which could result in loss of life or injury.

CAUTION : This mark indicates that if these precautions and operating procedures are not taken, damage to the instrument may result.



: This mark indicates that all precautions should be taken for safe usage.



: This mark indicates important information on installation, handling and operating procedures.



: This mark indicates supplemental information on installation, handling and operating procedures.



: This mark indicates where additional information may be located.



WARNING

- An external protection device must be installed if failure of this instrument could result in damage to the instrument, equipment or injury to personnel.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction can occur and warranty is void under these conditions.

CAUTION

- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take adequate measures.

- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
 - If input/output or signal lines within the building are longer than 30 meters.
 - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock by operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be in accordance with local codes and regulations.
- All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action. The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.
- To prevent instrument damage or failure, protect the power line and the input/output lines from high currents with a protection device such as fuse, circuit breaker, etc.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dispensation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration will occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to instrument display, do not rub with an abrasive material or push front panel with a hard object.
- Do not connect modular connectors to telephone line.

NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for purpose of illustration.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
- No portion of this document may be reprinted, modified, copied, transmitted, digitized, stored, processed or retrieved through any mechanical, electronic, optical or other means without prior written approval from RKC.

1. PRODUCT CHECK

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

AE500 □□□-□ *□□□□ - □□/□/□
 (1) (2) (3) (4)(5)(6)(7) (8)(9)(10)

- (1) Input type: See 8. INPUT RANGE TABLE.
- (2) Range code: See 8. INPUT RANGE TABLE.
- (3) Power supply voltage
 - 3: 24 V AC/DC
 - 4: 100 to 240 V AC
- (4) Alarm 1 [ALM1]
- (5) Alarm 2 [ALM2]
 - N: No alarm
 - H: Process high alarm
 - J: Process low alarm
 - K: Process high alarm with hold action
 - L: Process low alarm with hold action

- (6) Alarm 3 [ALM3] or analog output
 - N: No function
 - H: Process high alarm
 - J: Process low alarm
 - K: Process high alarm with hold action
 - L: Process low alarm with hold action
 - 7: Analog output (0 to 20 mA DC)
 - 8: Analog output (4 to 20 mA DC)
- (7) Alarm 4 [ALM4] or power supply for LED drive
 - N: No alarm
 - H: Process high alarm
 - J: Process low alarm
 - K: Process high alarm with hold action
 - L: Process low alarm with hold action
 - P: Power supply for LED drive

- (8) Communication function
 - N: No communication function
 - 5: RS-485 (2-wire system)
- (9) Waterproof/dustproof construction
 - N: No waterproof/dustproof construction
 - 1: Waterproof/dustproof construction
- (10) Case color
 - N: Off-white
 - A: Off-black

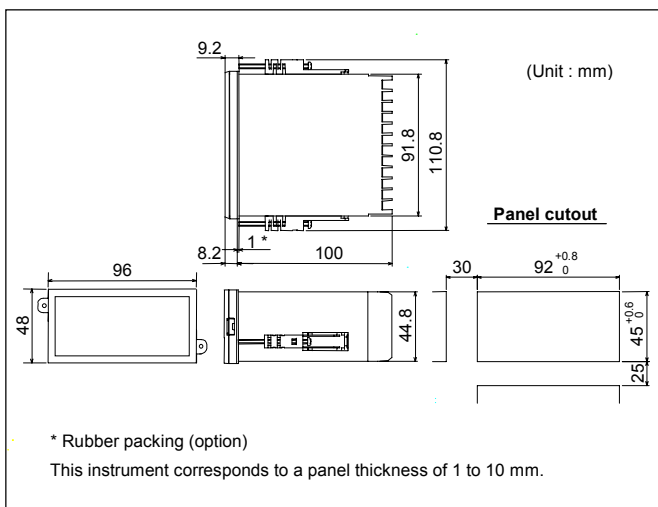
Accessories	
Mounting brackets	2
Mounting screws (with hexagon nuts)	2
Instruction manual (IMAE01-E3) ..	1

2. MOUNTING

2.1 Mounting Cautions

- (1) This instrument is intended to be used under the following environmental conditions. (IEC61010-1)
 [OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]
- (2) Avoid the following when selecting the mounting location.
 - Ambient temperature of less than 0 °C or more than 50 °C .
 - Ambient humidity of less than 45 % or more than 85 % RH.
 - Rapid changes in ambient temperature which may cause condensation.
 - Corrosive or inflammable gases.
 - Direct vibration or shock to the mainframe.
 - Water, oil, chemicals, vapor or steam splashes.
 - Excessive dust, salt or iron particles.
 - Excessive induction noise, static electricity, magnetic fields or noise.
 - Direct air flow from an air conditioner.
 - Exposure to direct sunlight.
 - Excessive heat accumulation.

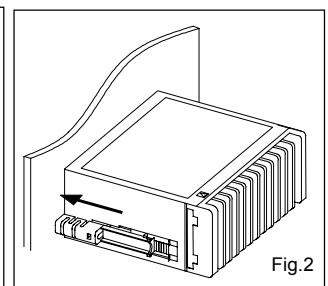
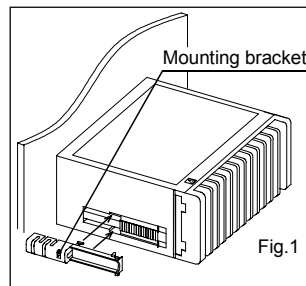
2.2 Dimensions



2.3 Mounting Procedures

1. Make a rectangular holes corresponding to the number of instruments to be mounted through the panel by referring to the panel cutout dimensions.
2. Insert the instrument into the panel from the panel cutout.

3. Insert the mounting bracket into the mounting groove of the instrument. (Fig.1)
4. Push the mounting bracket into the instrument until the instrument is firmly fixed to the panel. (Fig.2)
5. The other mounting bracket should be installed the same way described in 3 and 4.



When mounting the instrument by tightening screw

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

When tightening each screw, tighten it only one turn just after it touches the panel.

Insert the L-shaped hook of the mounting bracket into the groove, then firmly secure it in the groove.

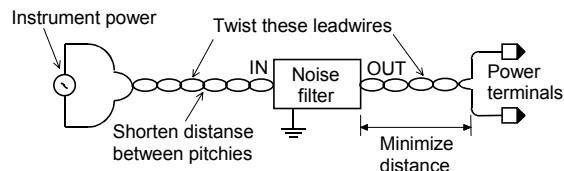
Hexagon nut

If the packing is damaged, please contact RKC sales office or the agent.

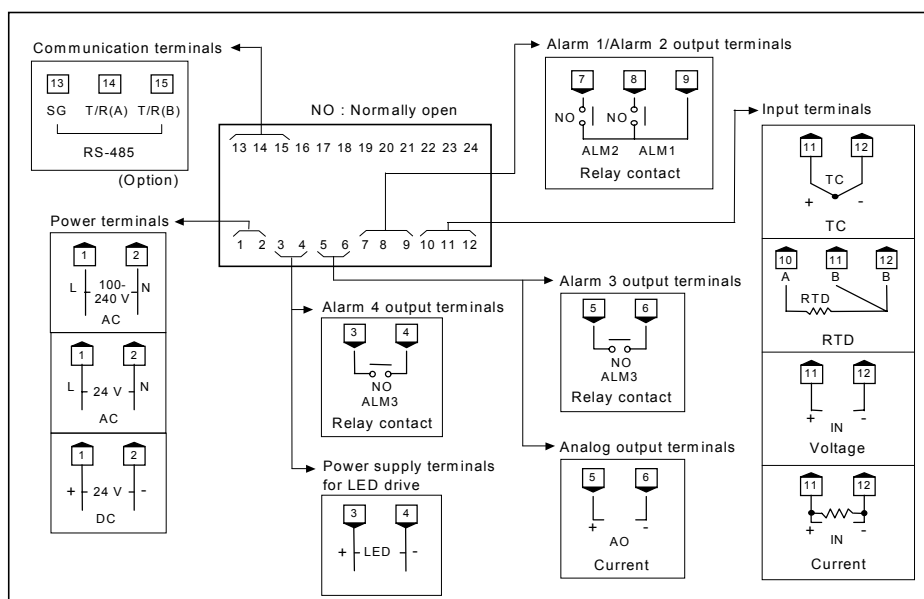
3. WIRING

3.1 Wiring Cautions

- 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 noisereduction.
 - 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 seconds 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.
 - Fuse type: Time-lag fuse
 - Recommended fuse rating: Rated voltage 250 V, Rated current 1 A
- For the current input specification, a resistor of $250\ \Omega$ ($\pm 0.02\% \pm 10$ ppm, 0.25 W or more) must be connected between the input terminals. This resistor must be provided by the customer.
- Do not excessively tighten the terminal screws. In addition, use the solderless terminal appropriate to the screw size. (Screw size: M3×6, recommended tightening torque: $0.4\ \text{N}\cdot\text{m}$ [$4\ \text{kgf}\cdot\text{cm}$])
- To the instrument with power supply of 24 V, please be sure to supply the power from SELV circuit.



3.2 Terminal Configuration



■ Specifications

Power consumption

7 VA max. (at 100 V AC)
 10 VA max. (at 240 V AC)
 5 VA max. (at 24 V AC)
 160 mA max. (at 24 V DC)

Analog output

Number of output points: 1 point
 Output resolution: More than 10 bit
 Output rating: 0 to 20 mA DC
 4 to 20 mA DC
 Load resistor: Less than $600\ \Omega$

Power supply for LED drive

Output voltage: 12 V DC $+1\ \text{V}$
 $-2\ \text{V}$

Weight

Approx. 250g

Power supply voltage

85 to 264 V AC (Including power supply voltage variation)
 21.6 to 26.4 V AC (Including power supply voltage variation)
 21.6 to 26.4 V DC (Including power supply voltage variation)

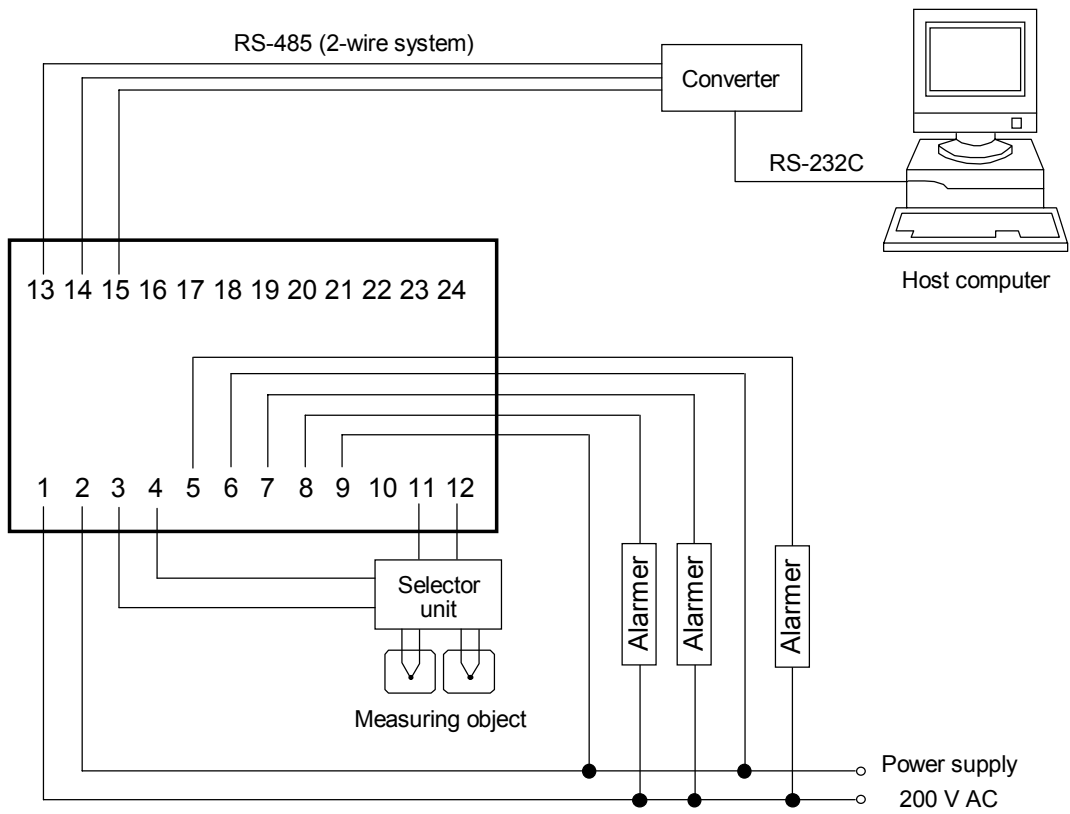
Power supply frequency: 50/60 Hz
 Power supply frequency: 50/60 Hz

Rating: 100 to 240 V AC
 Rating: 24 V AC
 Rating: 24 V DC

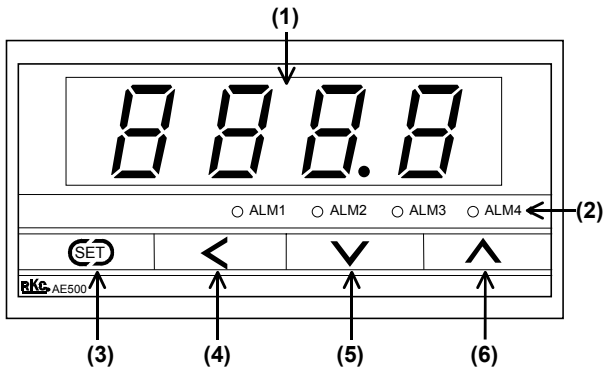
Alarm output rated

Alarm 1/alarm 2: Relay contact output 250 V AC, 1A (Resistive load) 1a contact
 Alarm 3/alarm 4: Relay contact output 250 V AC, 3A (Resistive load) 1a contact

3.3 Wiring Example



4. NAME OF PARTS



(1) Measured value (PV) display unit

Displays measured value (PV).
Displays various characters depending on the instrument.

(2) Alarm output indication lamps (ALM1 to ALM4) [Red]

ALM1: Lights when alarm 1 output is turned on.
ALM2: Lights when alarm 2 output is turned on.
ALM3: Lights when alarm 3 output is turned on.
ALM4: Lights when alarm 4 output is turned on.

(3) SET key

Used for parameter registration/calling up.

(4) Shift key

Used to shift the digit when the setting is changed.
Used when the character display in each mode is changed to the set value display.

(5) DOWN key

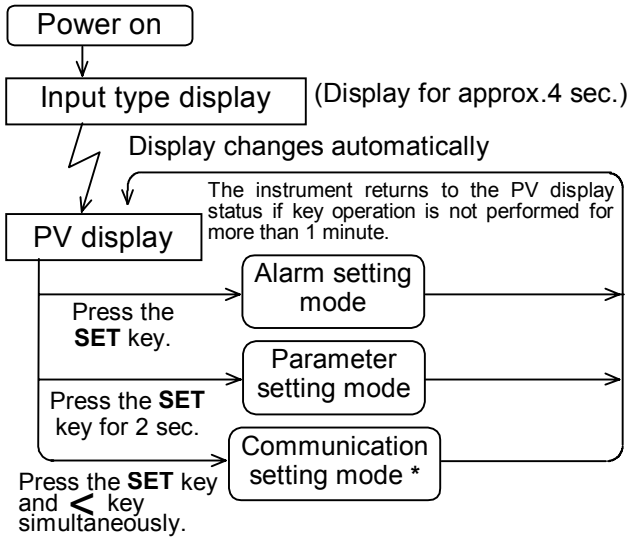
Used to decrease numerals.

(6) UP key

Used to increase numerals.

5. SETTING

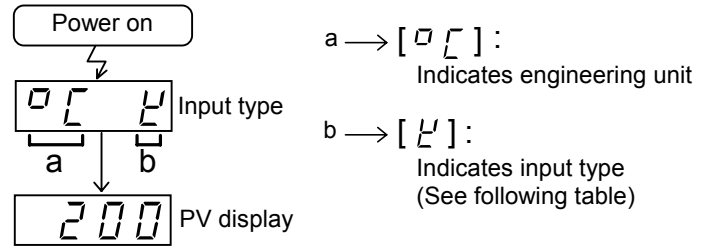
5.1 Calling-up Procedure of Each Mode



* Displayed when the instrument has the communication function.

Input type display

This instrument immediately confirms input type following power on.
 [Example] For a instrument with the K thermocouple input type and range from 0 to 1372 °C.



Display	E	J	R	S	B	E	T	N	PL	W5Re/	W26Re
Input type	TC										
	K	J	R	S	B	E	T	N	PL	W5Re/	W26Re

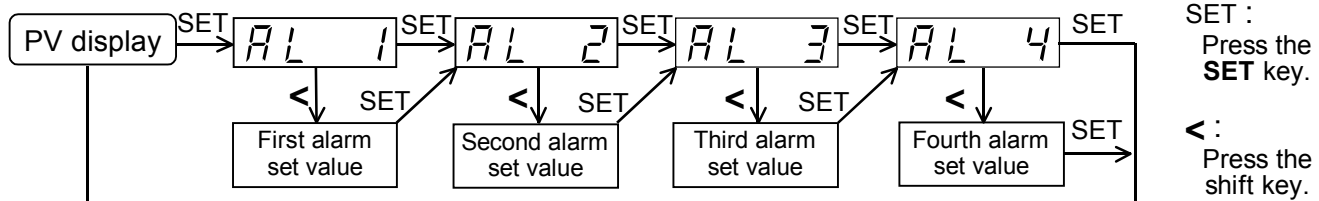
Display	U	L	J	P	P	T	H
Input type	TC		RTD		Voltage (Current)		
	U	L	JPt 100	Pt 100			

5.2 Details of Each Mode

Alarm setting mode

This is the mode used to set the alarm (alarm 1 to alarm 4). The following parameter symbols are displayed one by one every time the SET key is pressed.

For details see the 5.3 Parameter Setting Procedure.



SET :
Press the SET key.

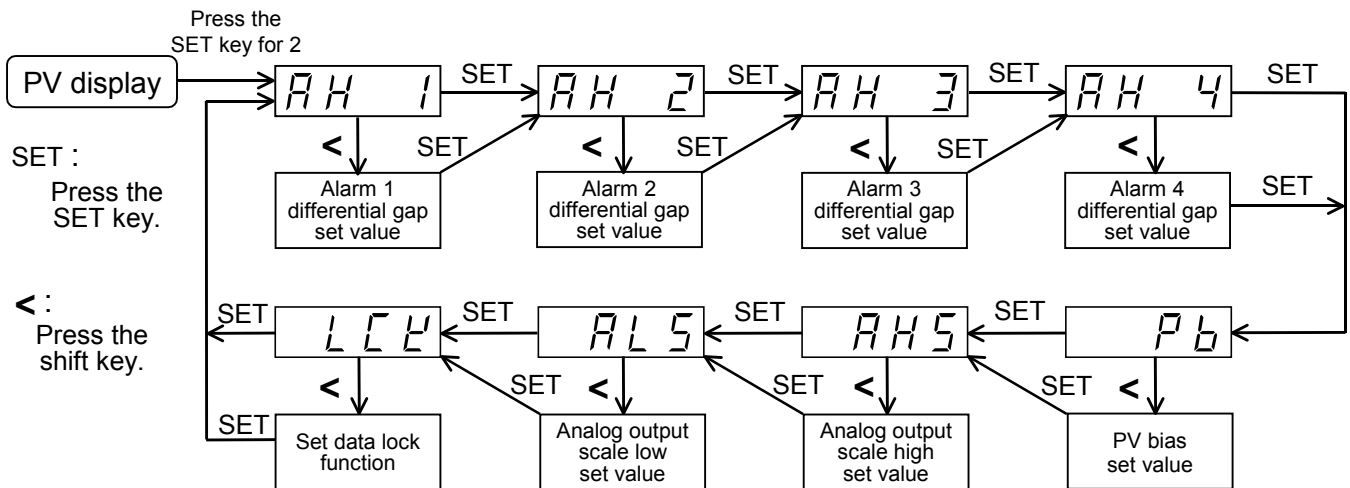
< :
Press the shift key.

Symbol	Name	Setting (display) range	Description	Factory set value
AL 1 AL1	Alarm 1 setting	Temperature input: -1999 to +9999 °C [°F] or -199.9 to +999.9 °C [°F]	Set the alarm 1 set value.	Temperature input: 0 or 0.0 Voltage/current input: 0.0
AL 2 AL2	Alarm 2 setting	Voltage/current input: Same as input range	Set the alarm 2 set value.	
AL 3 AL3	Alarm 3 setting		Set the alarm 3 set value. Not displayed when there is analog output.	
AL 4 AL4	Alarm 4 setting		Set the alarm 4 set value. Not displayed when there is power supply for LED drive.	

Parameter setting mode

This is the mode used to set the various parameters such as alarm differential gap, PV bias etc. The following parameter symbols are displayed one by one every time the **SET** key is pressed. (Press the SET key for 2 sec when enter parameter setting mode from PV display.)

For details see the **5.3 Parameter Setting Procedure**.




Symbol	Name	Setting (display) range	Description	Factory set value
AH 1	Alarm 1 differential gap setting	Temperature input: 0 to 100 °C [°F] or 0.0 to 100.0 °C [°F]	Set the alarm 1 differential gap.	Temperature input: 2 or 2.0 Voltage/current Input: 0.2
AH1				
AH 2			Set the alarm 2 differential gap.	
AH2				
AH 3	Alarm 3 differential gap setting	Voltage/current input: 0.0 to 10.0 %	Set the alarm 3 differential gap. Not displayed when there is analog output	
AH3				
AH 4	Alarm 4 differential gap setting.		Set the alarm 4 differential gap. Not displayed when there is power supply for LED drive.	
AH4				
Pb	PV bias	Temperature input: -1999 to +9999 °C [°F] or -199.9 to +999.9 °C [°F] Voltage/current input: -span to +span However, within -1999 to +9999	Sensor correction is made by adding bias value to measured value (PV).	Temperature input: 0 or 0.0 Voltage/current Input: 0.0
Pb				
AHS	Analog output scale high	ALS to SLH (Setting limiter [high limit])	Sets high limit of the analog output range. Not displayed when there is no analog output.	SLH
AHS				
ALS	Analog output scale low	SLL (Setting limiter [low limit]) to AHS	Sets low limit of the analog output range. Not displayed when there is no analog output.	SLL
ALS				
LCK	Set data lock function	0: Can be changed 1: Can not be changed	Selects the set data can be changed or can not be changed.	0
LCK				


Communication setting mode

This is the mode to conduct settings relating to the communication function. It is displayed for the instrument with the communication function.

For details the protocol, identifiers and communication setting mode, see the separate **Communication Instruction Manual (IMAE02-E□)**.

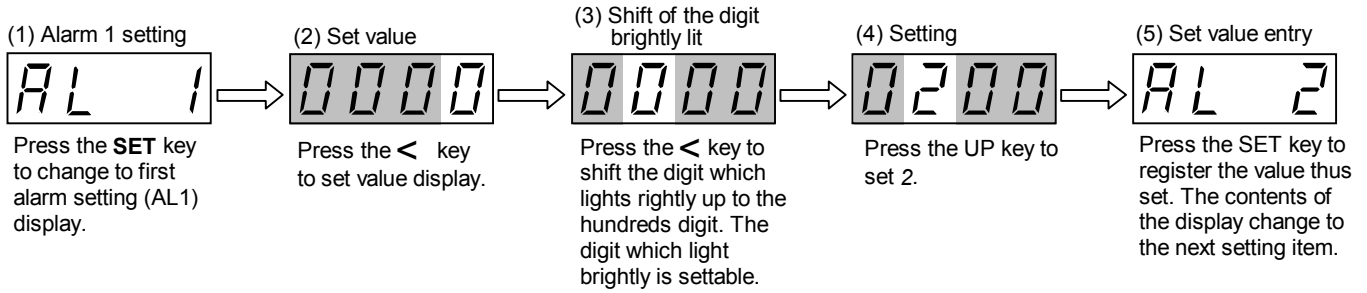
5.3 Parameter Setting Procedure

 Even if the displayed value is changed, it is not registered. To register it, press the SET key.

 If the key operated for more than 1 minute, the present mode return to the PV display.


■ Setting alarm

Example: Following is an example of first alarm to 200 °C.




6. OPERATIONS

6.1 Operating Cautions

 Connect the input signal wiring, and then turn ON the power. If the input signal wiring opens, the instrument judges the input is disconnected.

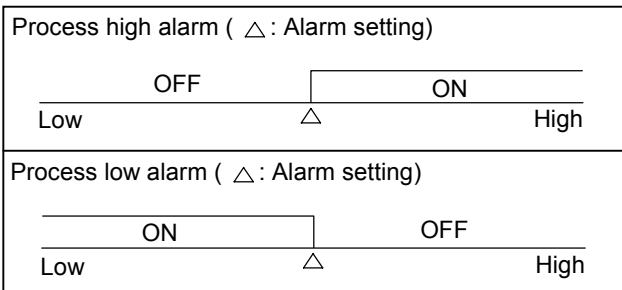
- TC input: Up-scale or downscale (To be specified when ordering)
- RTD input: Up-scale (Downscale when the input is shorted)
- Voltage (current) input: Downscale (For 0 to 5 V DC or 0 to 20 mA DC, indefinite.)

 No influence is exerted upon the instrument for power failure of 20 ms or less. For power failure of more than 20 ms, the instrument performs the same operation as that at the time of power on after power recovery.

6.2 Description of Each Functions

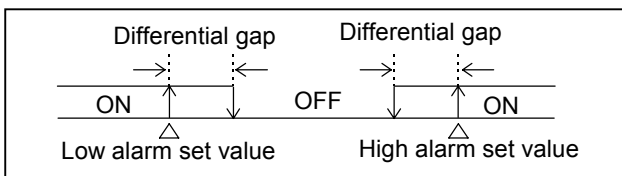
■ Alarm (ALM) function

Each alarm action is as follows.



■ Alarm differential gap

If measured value (PV) is close to the alarm set value, the alarm relay contact may repeatedly turn ON and OFF due to input fluctuations. If the differential gap is set, repeated turning ON and OFF of the relay contact can be prevented.

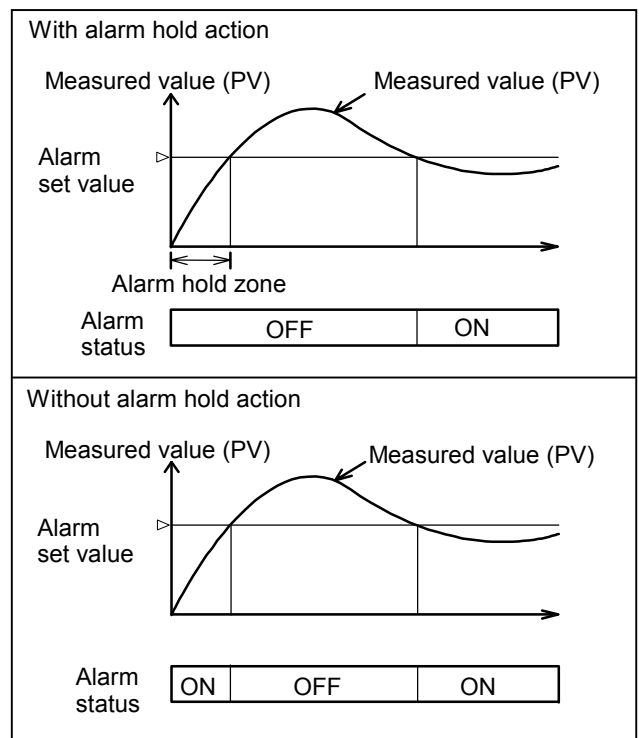


■ Set data lock (LCK) function

The set data lock function is used to prevent misoperation by not setting any parameter. The parameter thus locked cannot be set or changed, but can only be monitored.

■ Alarm hold action

In the alarm hold action, the alarm function is kept invalid even if the measured value (PV) is in the alarm range when the power is on. The alarm function is held until the measured value (PV) goes out of the alarm state once.



7. DISPLAY AT ERROR OCCURRENCE

■ Error display

	RAM failure (Incorrect set data write, etc.)	Please contact RKC sales office or the agent.
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■ Overscale and Underscale

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

8. INPUT RANGE TABLE

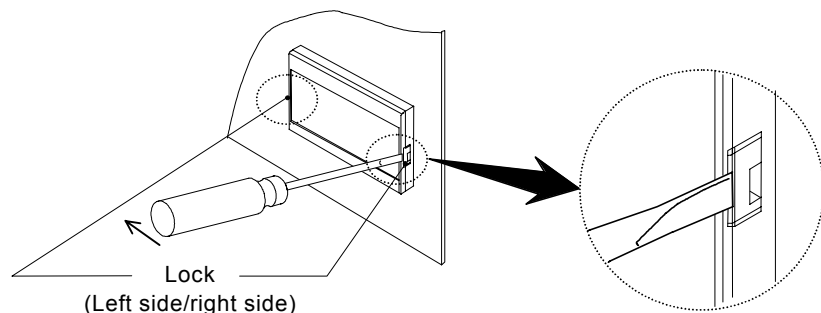
Input type	Model code	Input type	Model code	Input type	Model code	Input type	Model code	Input type	Model code						
K	0 to 200 °C	K' 01	J	0 to 800 °F	J' A1	N	0 to 1200 °C	N' 01	U	-199.9 to +100.0 °C ²	U' 02	Pt100	-100.0 to +100.0 °F	D' A4	
	0 to 400 °C	K' 02		0 to 1600 °F	J' A2		0 to 1300 °C	N' 02		0.0 to 400.0 °C	U' 03		0.0 to 400.0 °F	D' A5	
	0 to 600 °C	K' 03		0 to 2192 °F	J' A3		0 to 2300 °F	N' A1		-199.9 to +999.9 °F ²	U' A1		0.0 to 100.0 °F	D' A6	
	0 to 800 °C	K' 04		0 to 400 °F	J' A6		0 to 2372 °F	N' A2		-100.0 to +200.0 °F	U' A2		0.0 to 200.0 °F	D' A7	
	0 to 1000 °C	K' 05		0 to 300 °F	J' A7		0 to 1769 °C	R' 01		0.0 to 999.9 °F	U' A3		0.0 to 400.0 °F	D' A8	
	0 to 1200 °C	K' 06		0 to 1600 °C	R' 02		0 to 1769 °C	R' 02		0 to 400 °C	L' 01		0.0 to 500.0 °F	D' A9	
	0 to 1372 °C	K' 07		0 to 1769 °C	R' 01		0 to 1769 °C	R' 02		0 to 800 °C	L' 02		-199.9 to +649.0 °C	P' 01	
	0 to 100 °C	K' 13		0 to 1350 °C	R' 04		0 to 350.0 °C	T' 04		0 to 800 °F	L' A1		-199.9 to +200.0 °C	P' 02	
	0 to 300 °C	K' 14		0 to 3200 °F	R' A1		0.0 to 200.0 °C	T' 03		0 to 1600 °F	L' A2		-100.0 to +50.0 °C	P' 03	
	0 to 450 °C	K' 17		0 to 3216 °F	R' A2		-199.9 to +752.0 °F ²	T' A1		0 to 200.0 °C	D' 01		-100.0 to +100.0 °C	P' 04	
	0 to 500 °C	K' 20		0 to 1600 °C	S' 01		-100.0 to +200.0 °F	T' A2		-199.9 to +200.0 °C	D' 02		-100.0 to +200.0 °C	P' 05	
	0 to 800 °F	K' A1		0 to 1769 °C	S' 02		0.0 to 450.0 °F	T' A3		-100.0 to +50.0 °C	D' 03		0.0 to 50.0 °C	P' 06	
	0 to 1600 °F	K' A2		0 to 3200 °F	S' A1		0.0 to 752.0 °F	T' A5		-100.0 to +100.0 °C	D' 04		0.0 to 100.0 °C	P' 07	
	0 to 2502 °F	K' A3		0 to 3216 °F	S' A2		0 to 2000 °C	W' 01		-100.0 to +200.0 °C	D' 05		0.0 to 200.0 °C	P' 08	
20 to 70 °F	K' A9	400 to 1800 °C	B' 01	0 to 2320 °C	W' 02	0.0 to 50.0 °C	D' 06	0.0 to 300.0 °C	P' 09						
J	0 to 200 °C	J' 01	B	0 to 1820 °C	B' 02	Pt100	0.0 to 100.0 °C	D' 07	0 to 5 V DC	0.0	4' 01				
	0 to 400 °C	J' 02		800 to 3200 °F	B' A1		0 to 1300 °C	A' 01		0.0 to 200.0 °C	D' 08	0 to 10 V DC ³	0.0	5' 01	
	0 to 600 °C	J' 03		0 to 3308 °F	B' A2		0 to 1390 °C	A' 02		0.0 to 300.0 °C	D' 09	1 to 5 V DC	to	6' 01	
	0 to 800 °C	J' 04		0 to 800 °C	E' 01		0 to 1200 °C	A' 03		0.0 to 500.0 °C	D' 10	to	to	7' 01	
	0 to 1000 °C	J' 05		0 to 1000 °C	E' 02		0 to 2400 °F	A' A1		-199.9 to +999.9 °F	D' A1	0 to 20 mA DC	100.0	7' 01	
	0 to 1200 °C	J' 06		0 to 1600 °F	E' A1		0 to 2534 °F	A' A2		-199.9 to +400.0 °F	D' A2	4 to 20 mA DC	to	8' 01	
	0 to 450 °C	J' 10		0 to 1832 °F	E' A2		-199.9 to +600.0 °C ²	U' 01		-199.9 to +200.0 °F	D' A3				
							W5Re/								
							W26Re								
							FL II								

¹ 0 to 399 °C/0 to 799 °F : Accuracy is not guaranteed. ² -199.9 to -100.0 °C/-199.9 to -158.0 °F : Accuracy is not guaranteed. ³ Z-1010 specification

9. HOW TO PULL OUT THE INTERNAL ASSEMBLY

⚠ WARNING

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



Unlock using such an screwdriver.
Gently press outside on handle.

● Recommended tool: Blade screwdriver

● Recommended blade width: 6 mm



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



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

The first edition: AUG. 1999

The third edition: AUG. 2001