

Temperature Controller

SA100

Instruction Manual

IMR01J01-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 basic insulation between the power supply and the input/output. 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

SA100□□□□-□□-□*□□-□□/□□/□
 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10)

(1) Control action

- F: PID action with autotuning (Reverse action)
- D: PID action with autotuning (Direct action)
- W: Heat/cool PID action with autotuning (Water cooling)
- A: Heat/cool PID action with autotuning (Air cooling)

(2) Input type/Range code

See 10. INPUT RANGE TABLES.

(3) Output 1 (control output, alarm output or transmission output)

- M: Relay contact output V: Voltage pulse output
- 7: Current output (0 to 20 mA DC)
- 8: Current output (4 to 20 mA DC)

(4) Output 2 (control output or alarm output)

- N: No output M: Relay contact output
- V: Voltage pulse output

(5) Power supply voltage

- 3: 24 V AC/DC 4: 100 to 240 V AC

(6) Alarm 1 and (7) Alarm 2

- N: No alarm H: Process high alarm
- A: Deviation high alarm J: Process low alarm
- B: Deviation low alarm K: Process high alarm ¹
- C: Deviation high/low alarm L: Process low alarm ¹
- D: Band alarm R: Control loop break alarm ²
- E: Deviation high alarm ¹ V: SV high alarm
- F: Deviation low alarm ¹ W: SV low alarm
- G: Deviation high/low alarm ¹

(8) Option function

- N: No function
- D: Contact input (RUN/STOP, STEP)
- 5: RS-485 (RKC communication)
- 6: RS-485 (Modbus)

(9) Waterproof/dustproof

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

(10) Output assignment code

- No symbol: Standard output ³
- 03: PID action+ALM1
[OUT1: Control output OUT2: ALM1 output ⁴]
- 04: PID action+ALM1, ALM2
[OUT1: Control output OUT2: AND output of ALM1 and ALM2 ⁵]
- 05: PID action+ALM1, ALM2
[OUT1: Control output OUT2: OR output of ALM1 and ALM2 ⁴]
- 06: PID action+ALM1, ALM2
[OUT1: Control output OUT2: AND output of ALM1 and ALM2 ⁴]
- 07: PID action+ALM1, ALM2 or ALM1 only
[OUT1: Control output OUT2: No output (The alarm state can be checked via communication or by lamp lighting)]
- 08: PID action+ALM1, ALM2
[OUT1: Control output OUT2: ALM1 output ⁵
(ALM2 can be checked via communication or by lamp lighting)]
- 09: ALM1+ALM2
[OUT1: ALM1 output ⁵ OUT2: ALM2 output ⁵]
- 10: ALM1+ALM2
[OUT1: ALM1 output ⁵ OUT2: ALM2 output ⁴]
- 11: ALM1+ALM2
[OUT1: ALM1 output ⁴ OUT2: ALM1 output ⁴]
- 12: Transmission output+PID action
[OUT1: Transmission output OUT2: Control output]
- 13: Transmission output+ALM1, ALM2
[OUT1: Transmission output OUT2: OR output of ALM1 and ALM2 ⁵]
- 14: Transmission output+ALM1, ALM2
[OUT1: Transmission output OUT2: OR output of ALM1 and ALM2 ⁴]
- 15: Transmission output+ALM1, ALM2
[OUT1: Transmission output OUT2: AND output of ALM1 and ALM2 ⁵]

- 16: Transmission output+ALM1, ALM2
[OUT1: Transmission output OUT2: AND output of ALM1 and ALM2 ⁴]
- 17: Transmission output+ALM1
[OUT1: Transmission output OUT2: ALM1 ⁵]
- 18: Transmission output+ALM1
[OUT1: Transmission output OUT2: ALM1 ⁴]
- 19: Heat/cool PID action
[OUT1: Cool-side control output OUT2: Heat-side control output]

¹ With hold action

² LBA can be selected for only ALM1.

³ PID action:

OUT1: Control output, OUT2: No alarm, ALM1(Energized), or OR output of ALM1 and ALM2 (Energized)

Heat/cool PID action:

OUT1: Heat-side control output, OUT2: Cool-side control output

⁴ De-energized

⁵ Energized

2. MOUNTING

2.1 Installation Environment

(1) This instrument is intended to be used under the following environmental conditions. (IEC61010-1)
[OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]

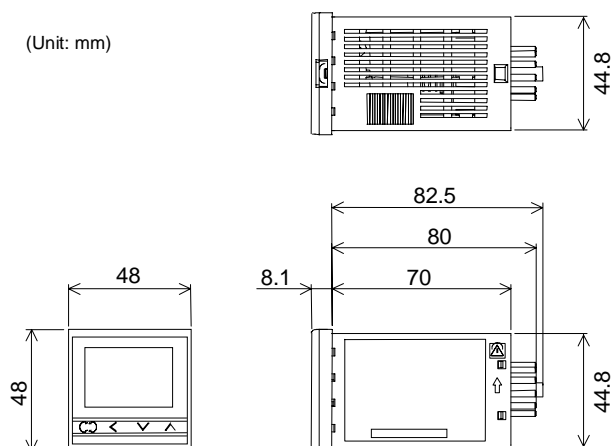
(2) Avoid the following when selecting the mounting location.

- 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

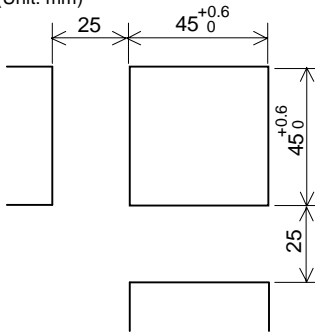
■ External dimension

(Unit: mm)



■ Panel cutout

(Unit: mm)



Installation Conditions:

The display can not be seen from the outside of the visual field range. The visual field range of SA100 is 40° to the upper side, and 30° to the lower side from the center of the display vertically.

2.3 Mounting Procedures

■ DIN rail mounting

1. Mounting the socket to the DIN rail. (Fig. 1)
2. Wiring to the socket. Then, mounting the instrument to the socket.
3. Secure the instrument by locking it with the hooks at the top and bottom of the socket. (Fig. 2)

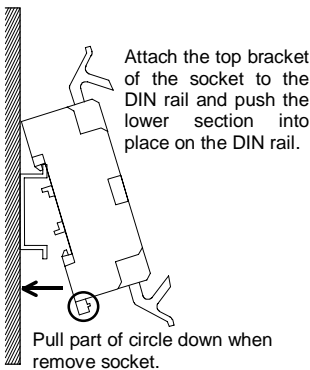


Fig. 1

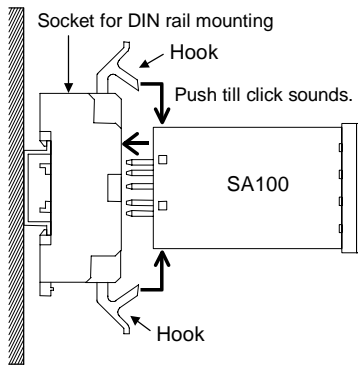


Fig. 2

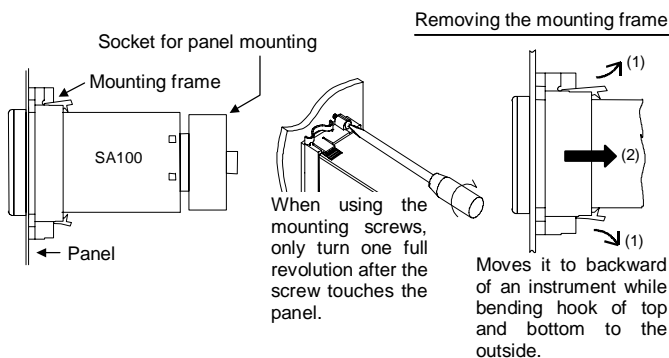


Please prepare socket with a customer.

Recommended socket for DIN rail mounting:
ATC180041 (Matsushita Denko product)

■ Panel mounting

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



Please prepare mounting frame and socket with a customer.

Mounting frame type:
KCA100-59 (RKC product, Sold separately)

Recommended socket for panel mounting:
AT78051 (Matsushita Denko product)

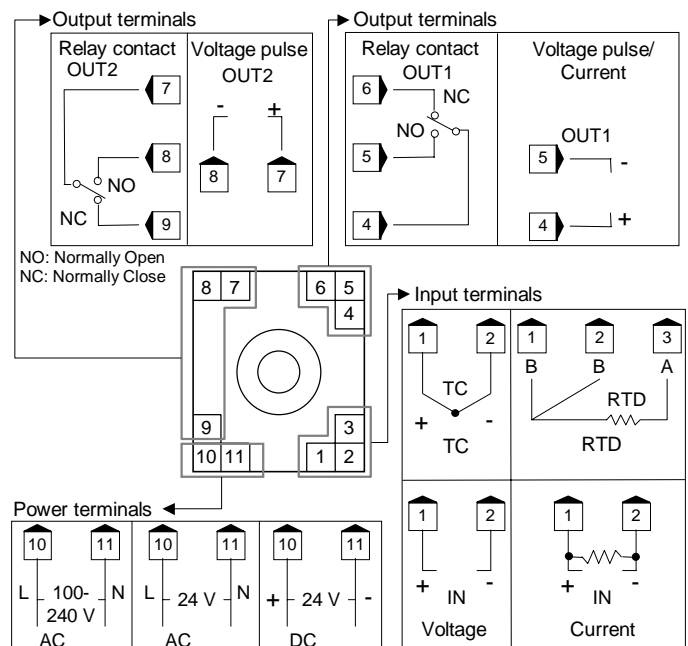
3. WIRING

CAUTION

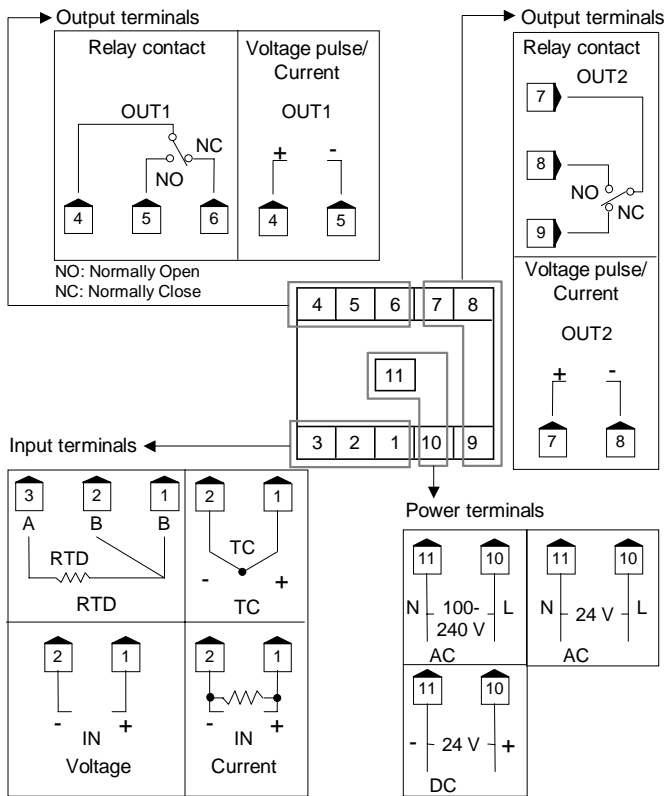
- For thermocouple input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wire with no difference in resistance between the three lead wires.
- To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.
- If there is electrical noise in the vicinity of the instrument that could affect operation, use a noise filter.
 - Shorten the distance between the twisted power supply wire pitches to achieve the most effective noise reduction.
 - Always install the noise filter on a grounded panel. Minimize the wiring distance between the noise filter output and the instrument power supply terminals to achieve the most effective noise reduction.
 - Do not connect fuses or switches to the noise filter output wiring as this will reduce the effectiveness of the noise filter.
- About four seconds are required as preparation time for contact output every time the instrument is turned on. Use a delay relay when the output line is used for an external interlock circuit.
- Power supply wiring must be twisted and have a low voltage drop.
- For an instrument with 24 V power supply, supply power from a SELV circuit.
- This instrument is not furnished with a power supply switch or fuse. Therefore, if a fuse or power supply switch is required, install close to the instrument.
[Recommended fuse rating: Rated voltage 250 V, Rated current 1 A Fuse type: Time-lag fuse]
- For the current input specification, a resistor of 250 Ω (±0.02 % ±10 ppm, 0.25 W or more) must be connected between the input terminals. This resistor must be provided by the customer.
- The input and output terminals for the voltage pulse output/current output are not isolated. Always use an isolating type SSR and operating unit. If the grounded type sensor is used, do not ground output wiring. Do not connect any output wires to the terminals with any other output wires.

3.1 Terminal Configuration

■ Socket for DIN rail mounting (ATC180041)



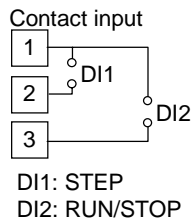
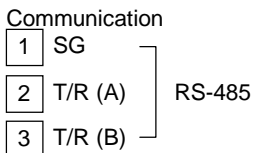
■ Socket for panel mounting (AT78051)



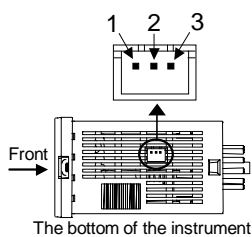
■ Option

Communication function and contact input are optional. Connect connector to bottom of instrument. A connector and connector cable for connecting the input block is necessary to be prepared by the customer.

Housing: XHP-3 (J.S.T. Mfg. Co., Ltd. product)
Recommended cable size: AWG30 to 22



<Connector position>



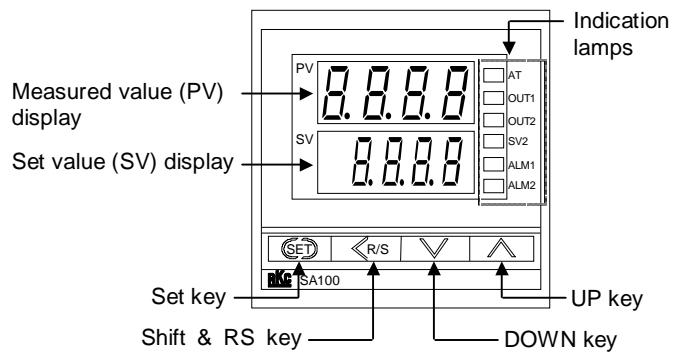
Power supply voltage:

85 to 264 V AC (Power supply voltage range), 50/60 Hz
Rating: 100 to 240 V AC
21.6 to 26.4 V AC (Power supply voltage range), 50/60 Hz
Rating: 24 V AC
21.6 to 26.4 V DC (Power supply voltage range)
Rating: 24 V DC

Power consumption:

4 VA max. (at 100 V AC) 7 VA max. (at 240 V AC)
4 VA max. (at 24 V AC) 100 mA max. (at 24 V DC)

4. PARTS DESCRIPTION



Measured value (PV) display [Green]

Displays PV or various parameter symbols.

Set value (SV) display [Orange]

Displays SV or STEP set value (SV1, SV2).
Displays various parameter set values.

Indication lamps:

Autotuning (AT) lamp [Green]

Flashes during autotuning execution.

Output lamps (OUT1, OUT2) [Green]

OUT1: Lights when output1 is turned on.
OUT2: Lights when output2 is turned on.

STEP set value (SV2) lamp [Orange]

Lights when the SV2 of STEP function is selected.

Alarm lamps (ALM1, ALM2) [Orange]

ALM1: Lights when alarm1 is turned on.
ALM2: Lights when alarm2 is turned on.

Set key

Used for parameter calling up and set value registration.

Shift & R/S key

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

DOWN key

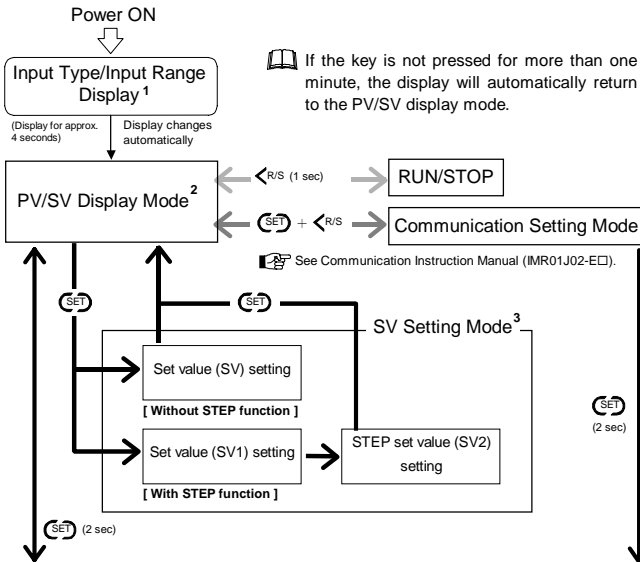
Decrease numerals.

UP key

Increase numerals.

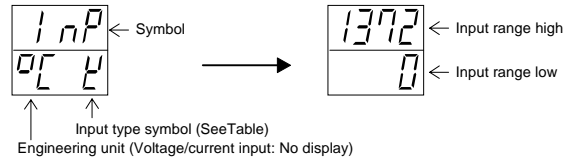
To avoid damage to the instrument, never use a sharp object to press keys.

5. SETTING



1 Input type/Input Range Display

Input type: Thermocouple K Input range: 0 to 1372 °C



Input Type Symbol Table

SYMBOL	K	J	R	S	B	E	T	N	PL	W5Re/W26Re	U	L	JPt 100	Pt 100	V
INPUT TYPE	Thermocouple (TC)										RTD		Voltage (Current)		

2 PV/SV Display Mode

The controller will display the measured value (PV) and the set value (SV).

- If the STEP function is provided, the SV display will show the set value (SV1) or STEP set value (SV2) depending on whether the contact input is opened or closed.
- The controller can be switched to RUN or STOP mode.

3 SV Setting Mode

The blinking digit on the SV display indicates which digit can be set.

- Setting range: Within input range
- Factory set value: Temperature input 0 (0.0) °C [°F], Voltage/current inputs 0.0 %
- If the STEP function is provided, the following parameter symbols are displayed on the PV.

Set value (SV1): 581 STEP set value (SV2): 582

Parameter Setting Mode

LbA	Control loop break alarm (LBA) Setting range: 0.0 to 200.0 minutes (0.0: OFF) Factory set value: 8.0	(A)	t	Cool-side proportioning cycle time Setting range: 1 to 100 seconds Factory set value: Relay contact output: 20 Voltage pulse output: 2																	
LbD	LBA deadband (LBD) Setting range: 0 to span Factory set value: Temperature input: 0 (0.0) Voltage/current inputs: 0.0	(SET)	Pb	PV bias Setting range: -span to +span Factory set value: Temperature input: 0 (0.0) Voltage/current inputs: 0.0																	
AL1	Alarm 1 (ALM1) Setting range: Process alarm, SV alarm: Same as input range. Deviation alarm: -span to +span Factory set value: Temperature input: 50 (50.0) Voltage/current inputs: 5.0	(SET)	df	Digital filter Setting range: 0 to 100 seconds (0: OFF) Factory set value: 0																	
AL2	Alarm 2 (ALM2) Setting range: Process alarm, SV alarm: Same as input range. Deviation alarm: -span to +span Factory set value: Temperature input: 50 (50.0) Voltage/current inputs: 5.0	(SET)	AO	Analog output specification Item:																	
ATU	Autotuning (AT) Setting range: on: AT start or execution off: AT end or cancel Factory set value: off	(SET)	<table border="1"> <thead> <tr> <th>Symbol</th> <th>Contents of output</th> </tr> </thead> <tbody> <tr> <td>PV</td> <td>Measured value (PV) *</td> </tr> <tr> <td>SV</td> <td>Set value (SV)</td> </tr> <tr> <td>DEV</td> <td>Deviation (DEV)</td> </tr> <tr> <td>MV</td> <td>Manipulated output value (MV)</td> </tr> </tbody> </table>	Symbol	Contents of output	PV	Measured value (PV) *	SV	Set value (SV)	DEV	Deviation (DEV)	MV	Manipulated output value (MV)								
Symbol	Contents of output																				
PV	Measured value (PV) *																				
SV	Set value (SV)																				
DEV	Deviation (DEV)																				
MV	Manipulated output value (MV)																				
STU	Self-tuning (ST) Setting range: on: Self-tuning ON off: Self-tuning OFF Factory set value: off	(SET)	AHS	Analog output scale high Setting range: Measured value (PV) : Same as input range Set value (SV) : Same as input range Deviation (DEV) : -span to +span Manipulated output value (MV) : 0.0 to 100.0 % Factory set value: Temperature input: Input range (high limit) Voltage/current inputs: 100.0																	
P	Heat-side proportional band (P) Setting range: 0 to span (0 or 0.0: ON/OFF action) Factory set value: Temperature input: 30 (30.0) Voltage/current inputs: 3.0	(SET)	ALS	Analog output scale low Setting range: Measured value (PV) : Same as input range Set value (SV) : Same as input range Deviation (DEV) : -span to +span Manipulated output value (MV) : 0.0 to 100.0 % Factory set value: Temperature input: Input range (low limit) Voltage/current inputs: 0.0																	
I	Integral time (I) Setting range: 0 to 3600 seconds (0: PD action) Factory set value: 240	(SET)	LLC	Set data lock Setting range: 0 (Unlock) 1 (Lock) Factory set value: 0000 See Lock Level Table																	
d	Derivative time (D) Setting range: 0 to 3600 seconds (0: PI action) Factory set value: 60	(SET)	<table border="1"> <thead> <tr> <th>Setting</th> <th>Lock level</th> </tr> </thead> <tbody> <tr> <td>0000</td> <td>SV and all parameter can be set.</td> </tr> <tr> <td>0001</td> <td>Only SV and alarms can be set.</td> </tr> <tr> <td>0010</td> <td>Only setting items other than alarms can be set.</td> </tr> <tr> <td>0100</td> <td>Only setting items other than SV can be set.</td> </tr> <tr> <td>0011</td> <td>Only SV can be set.</td> </tr> <tr> <td>0101</td> <td>Only alarms can be set.</td> </tr> <tr> <td>0110</td> <td>Only setting items other than SV and alarms can be set.</td> </tr> <tr> <td>0111</td> <td>SV and all parameter cannot be set.</td> </tr> </tbody> </table>	Setting	Lock level	0000	SV and all parameter can be set.	0001	Only SV and alarms can be set.	0010	Only setting items other than alarms can be set.	0100	Only setting items other than SV can be set.	0011	Only SV can be set.	0101	Only alarms can be set.	0110	Only setting items other than SV and alarms can be set.	0111	SV and all parameter cannot be set.
Setting	Lock level																				
0000	SV and all parameter can be set.																				
0001	Only SV and alarms can be set.																				
0010	Only setting items other than alarms can be set.																				
0100	Only setting items other than SV can be set.																				
0011	Only SV can be set.																				
0101	Only alarms can be set.																				
0110	Only setting items other than SV and alarms can be set.																				
0111	SV and all parameter cannot be set.																				
Ar	Anti-reset windup (ARW) Setting range: 0 to 100 % of heat-side proportional band (0: Integral action OFF) Factory set value: 100 %	(SET)																			
t	Heat-side proportioning cycle time Setting range: 1 to 100 seconds Factory set value: Relay contact output: 20 Voltage pulse output: 2	(SET)																			
Pc	Cool-side proportional band Setting range: 1 to 1000 % of heat-side proportional band Factory set value: 100	(SET)																			
db	Overlap/Deadband Setting range: -span to +span Factory set value: Temperature input: 0 (0.0) Voltage/current inputs: 0.0	(SET)																			

(A) Return to first parameter setting item

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

The setting range is from -1999 to +9999 regardless of the position of the decimal point.

Basic operation procedure (Following is an example of SV to 200 °C)



Press the **SET** key to enter the SV setting mode.



The blinking digit indicates which digit can be set.



Press the **←** key to shift digit to the third digit from the right and **▲** key to change the numeral to 2.



Pressing the **SET** key stores the value settings and the display will automatically return to the PV/SV display mode.

When the set value is changed, it is not automatically stored. To store it, press the **SET** key.

When the set data is locked, the digits on the SV display are brightly lit and the set value cannot be changed.

6. OPERATION

6.1 Operating Precautions

All mounting and wiring must be completed before the power is turned on.

Connect the input signal wiring and turn the power on. If the input signal wiring is not complete prior to turning the power on, the instrument determines that burnout has occurred.

The settings for the SV and all parameters should be appropriate for the controlled object.

A power supply switch is not furnished with this instrument. It is ready to operate as soon as the power is turned on. [Factory set value: RUN (operation start)]

A power failure of 20 ms or less will not affect the control action. When a power failure of more than 20 ms occurs, the instrument assumes that the power has been turned off. When power returns, the controller will retain the conditions that existed prior to shut down.

The alarm hold action is activated when the power is turned on or the SV is changed, including an SV change made with the STEP function.

6.2 RUN/STOP

RUN/STOP can be selected by key operation or by open or closed contact input (option).

■ Conditions when changed to STOP mode

Control, Alarm : Control OFF, Alarm OFF
Output : OUT1 output OFF (OPEN),
OUT2 output OFF (OPEN)

Autotuning (AT): AT canceled
(The PID constants are not updated)

■ Display when changed to STOP mode

RUN/STOP mode with Key operation	RUN/STOP Mode with Contact input ¹	
	RUN Mode (Contact closed)	STOP Mode (Contact open)
RUN	RUN	STOP (dSP) ²
STOP	STOP (eSP) ²	STOP (fSP) ²

¹ Contact input: Connector pin No.1, 3

² Characters in parentheses are those shown on the PV display:

dSP : Only contact input is in the STOP mode

eSP : Only key operation is in the STOP mode

fSP : Both key operation and contact input are in the STOP mode

7. FUNCTIONS

7.1 STEP (option)

The instrument has two set values (SV). This STEP function selects these two set values (SV) by contact input (Connector pin No.1, 2).

Contact open: Set value (SV1)
Contact closed: STEP set value (SV2)

7.2 Set Data Lock (LCK)

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

7.3 Autotuning (AT)

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

■ Requirements for AT start

Start AT when all the following conditions are satisfied:

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

■ Requirements for AT cancellation

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

- When the SV (SV1, SV2) is changed.
- When the PV becomes abnormal when burnout occurs.
- When the power is turned off.
- When a power failure longer than 20 ms occurs.
- When the PV bias value is changed.
- When the AT does not end in nine hours after autotuning started.
- When the RUN/STOP is changed to the STOP mode.

If the AT is canceled, the controller immediately changes to PID control. The PID and LBA constants will be the same as before AT was activated.

When AT is completed, the controller immediately changes to PID control. If the control system does not allow the AT cycling process, do not use AT and set each PID constant to meet the needs of the application.

7.4 Self-tuning (ST)

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

The ST function should be turned off when the controlled system is affected by rippling that occurs due to periodic external disturbances.

The power to the controlled system must be turned on before the power to the instrument is turned on or SV is changed. This is required when ST function is on.

To activate the ST function, the following parameters must not be set to zero: $P \neq 0$, $I \neq 0$, $D \neq 0$, $ARW \neq 0$.


When the heat/cool PID action is selected, the ST function can not be activated.


When the AT function is activated, the ST function can not be turned on.

When the ST function is activated, the PID and ARW settings cannot be changed, only monitored.

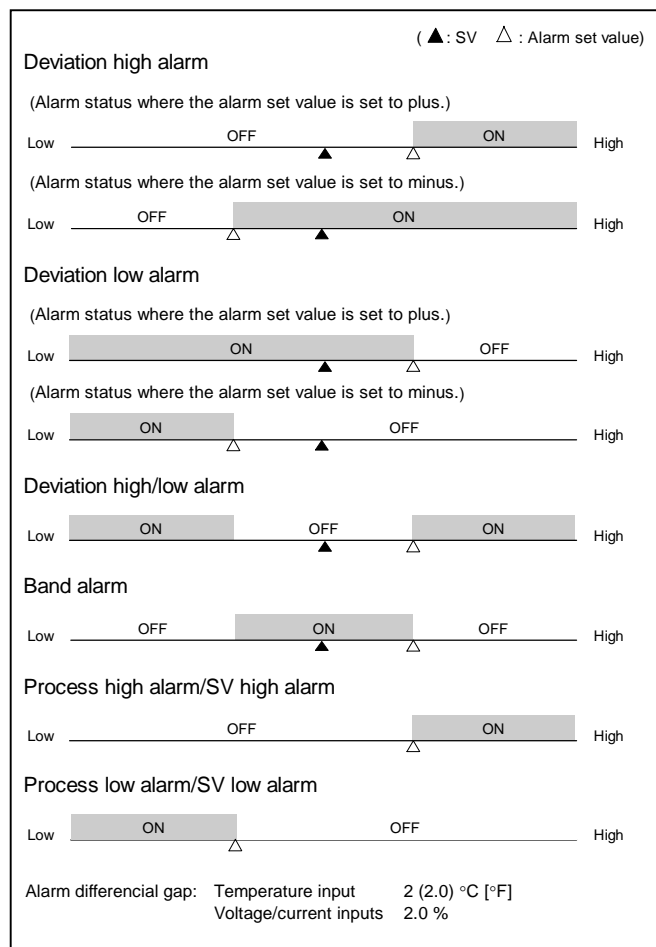
7.5 Control Loop Break Alarm (LBA)


The LBA function is activated when control output reaches 0 % or 100%. The time required for the LBA output to turn on includes both the time from the initial occurrence of loop failure and the LBA setting time. We recommend that the set value of LBA be twice the value of the integral time (I).

 When AT function is turned on, the LBA function can not be activated.

 If LBA setting time does not match the controlled object requirements, the LBA setting time should be lengthened. If setting time is not correct, the LBA will malfunction by turning on or off at inappropriate times or not turning on at all.

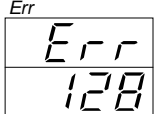
7.6 Alarms (ALM)



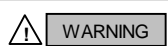

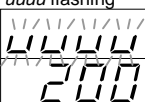
 The alarm outputs are assigned to OUT1/OUT2.

8. ERROR DISPLAYS

■ Error display

Display	Description	Solution
	The error codes are shown in the SV display. When two or more errors occur simultaneously, the error code numbers are totaled and displayed as one number.	Turn off the power once. If an error occurs after the power is turned on again, please contact RKC sales office or the agent.

■ Overscale and Underscale

Display	Description	Solution
Measured value (PV) is flashing	PV is outside of input range.	 WARNING To prevent electric shock, always turn off the power before replacing the sensor.
oooo flashing 	Overscale - PV is above the high input display range limit.	
uuuu flashing 	Underscale - PV is below the low input display range limit.	Check the sensor or input lead.

9. SPECIFICATIONS

■ Input

TC: K, J, R, S, B, E, T, N, PLII, W5Re/W26Re, U, L
 RTD: JPt100, Pt100
 Voltage: 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC
 Current: 0 to 20 mA DC, 4 to 20 mA DC

■ Display accuracy

TC: ±(1 % of displayed value +1 digit) or ±2 °C
 RTD: ±(0.3 % of displayed value +1 digit) or ±0.8 °C
 Voltage/current: ±(0.3 % of span +1 digit)

■ Control action

PID control: Direct action/reverse action, Heat/cool control
 (Water cooling, Air cooling), ON/OFF, P, PI, PD
 Selectable
 With Autotuning (AT) and Self-tuning (ST) functions

■ Output (OUT1, OUT2)

Relay contact: 240 V AC, 3A (Resistive load) 1c contact,
 Electric life 300,000 times or more (Rated load)
 Voltage pulse: Input/output terminals are not isolated
 0/12 V DC (load resistance 600 Ω or more)
 Current: 0 to 20 mA DC, 4 to 20 mA DC
 (Load resistance: 400 Ω or less,
 Resolution: 10 bits or more)

■ Communication function (Option)

Interface: Based on RS-485, EIA standard
 Protocol: • RKC communication
 • Modbus

■ Contact input (Option)

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

■ Others

Dimension: 48 (W) × 48 (H) × 70 (D) mm
 Weight: Approx. 120 g

10. INPUT RANGE TABLES

Input Range Table 1

Input type	Input range	Code		
		Input	Range	
Thermo-couple	K	0 to 200 °C	K	01
		0 to 400 °C	K	02
		0 to 600 °C	K	03
		0 to 800 °C	K	04
		0 to 1000 °C	K	05
		0 to 1200 °C	K	06
		0 to 1372 °C	K	07
		-199.9 to +300.0 °C	K	08
		0.0 to 400.0 °C	K	09
		0.0 to 800.0 °C	K	10

Continued on the next page.

Input type	Input range	Code	
		Input	Range
Thermo-couple	K	0 to 100 °C	K 13
		0 to 300 °C	K 14
		0 to 450 °C	K 17
		0 to 500 °C	K 20
		0.0 to 200.0 °C	K 29
		0.0 to 600.0 °C	K 37
		-199.9 to +800.0 °C	K 38
		0 to 800 °F	K A1
		0 to 1600 °F	K A2
		0 to 2502 °F	K A3
		0.0 to 800.0 °F	K A4
		20 to 70 °F	K A9
		-199.9 to +999.9 °F	K B2
	J	0 to 200 °C	J 01
		0 to 400 °C	J 02
		0 to 600 °C	J 03
		0 to 800 °C	J 04
		0 to 1000 °C	J 05
		0 to 1200 °C	J 06
		-199.9 to +300.0 °C	J 07
		0.0 to 400.0 °C	J 08
		0.0 to 800.0 °C	J 09
		0 to 450 °C	J 10
		0.0 to 200.0 °C	J 22
		0.0 to 600.0 °C	J 23
		-199.9 to +600.0 °C	J 30
		0 to 800 °F	J A1
		0 to 1600 °F	J A2
		0 to 2192 °F	J A3
		0 to 400 °F	J A6
		-199.9 to +999.9 °F	J A9
		0.0 to 800.0 °F	J B6
		R	0 to 1600 °C ¹
	0 to 1769 °C ¹		R 02
	0 to 1350 °C ¹		R 04
	0 to 3200 °F ¹		R A1
	0 to 3216 °F ¹		R A2
	S	0 to 1600 °C ¹	S 01
		0 to 1769 °C ¹	S 02
		0 to 3200 °F ¹	S A1
		0 to 3216 °F ¹	S A2
	B	400 to 1800 °C	B 01
		0 to 1820 °C ¹	B 02
		800 to 3200 °F	B A1
	E	0 to 3308 °F	B A2
0 to 800 °C		E 01	
0 to 1000 °C		E 02	
N	0 to 1600 °F	E A1	
	0 to 1832 °F	E A2	
	0 to 1200 °C	N 01	
	0 to 1300 °C	N 02	
	0.0 to 800.0 °C	N 06	
T	0 to 2300 °F	N A1	
	0 to 2372 °F	N A2	
	0.0 to 999.9 °F	N A5	
	-199.9 to +400.0 °C ²	T 01	
	-199.9 to +100.0 °C ²	T 02	
	-100.0 to +200.0 °C	T 03	
	0.0 to 350.0 °C	T 04	
	-199.9 to +752.0 °F ²	T A1	
	-100.0 to +200.0 °F	T A2	
	-100.0 to +400.0 °F	T A3	
0.0 to 450.0 °F	T A4		
0.0 to 752.0 °F	T A5		

Input type	Input range	Code	
		Input	Range
Thermo-couple	W5Re/ W26Re	0 to 2000 °C	W 01
		0 to 2320 °C	W 02
		0 to 4000 °F	W A1
	PL II	0 to 1300 °C	A 01
		0 to 1390 °C	A 02
		0 to 1200 °C	A 03
		0 to 2400 °F	A A1
		0 to 2534 °F	A A2
	U	-199.9 to +600.0 °C ²	U 01
		-199.9 to +100.0 °C ²	U 02
		0.0 to 400.0 °C	U 03
		-199.9 to +999.9 °F ²	U A1
		-100.0 to +200.0 °F	U A2
		0.0 to 999.9 °F	U A3
	L	0 to 400 °C	L 01
0 to 800 °C		L 02	
0 to 800 °F		L A1	
0 to 1600 °F		L A2	
RTD	Pt100	-199.9 to +649.0 °C	D 01
		-199.9 to +200.0 °C	D 02
		-100.0 to +50.0 °C	D 03
		-100.0 to +100.0 °C	D 04
		-100.0 to +200.0 °C	D 05
		0.0 to 50.0 °C	D 06
		0.0 to 100.0 °C	D 07
		0.0 to 200.0 °C	D 08
		0.0 to 300.0 °C	D 09
		0.0 to 500.0 °C	D 10
		-199.9 to +999.9 °F	D A1
		-199.9 to +400.0 °F	D A2
		-199.9 to +200.0 °F	D A3
		-199.9 to +100.0 °F	D A4
		-199.9 to +300.0 °F	D A5
		0.0 to 100.0 °F	D A6
		0.0 to 200.0 °F	D A7
		0.0 to 400.0 °F	D A8
	0.0 to 500.0 °F	D A9	
	JPt100	-199.9 to +649.0 °C	P 01
		-199.9 to +200.0 °C	P 02
		-100.0 to +50.0 °C	P 03
		-100.0 to +100.0 °C	P 04
		-100.0 to +200.0 °C	P 05
		0.0 to 50.0 °C	P 06
		0.0 to 100.0 °C	P 07
		0.0 to 200.0 °C	P 08
		0.0 to 300.0 °C	P 09
		0.0 to 500.0 °C	P 10

¹ Accuracy is not guaranteed between 0 to 399 °C (0 to 751 °F).

² Accuracy is not guaranteed between -199.9 to -100.0 °C (-199.9 to -148.0 °F).

Input Range Table 2

Input type	Input range	Code		
		Input	Range	
Voltage	0 to 5 V DC	0.0 to 100.0 %	4	01
	0 to 10 V DC		5	01
	1 to 5 V DC		6	01
Current	0 to 20 mA DC		7	01
	4 to 20 mA DC		8	01

The first edition: MAR. 2001

The third edition: AUG. 2002 [IMQ00]