



詳細な取り扱いや操作等については、別冊の **SA100 取扱説明書 (IMR01J11-J□)** を参照してください。当社ホームページからダウンロードできます。

ホームページアドレス: <https://www.rkcinst.co.jp/download-center/>





Temperature Controller

SA100

IMR01J09-X1 All Rights Reserved, Copyright © 2024, RKC INSTRUMENT INC.
Thank you for purchasing this RKC product. In order to achieve maximum performance and ensure proper operation of the instrument, carefully read all the instructions in this manual. Please place the manual in a convenient location for easy reference. This manual describes installation, wiring, parts description, and specification of the SA100.

For detailed handling procedures and key operations, refer to separate **SA100 Instruction Manual (IMR01J11-ED)**.
The manual can be downloaded from the official RKC website:
<https://www.rkcinst.co.jp/english/download-center/>



- ### WARNING
- To prevent injury to persons, damage to the instrument and the equipment, a suitable external protection device shall be required.
 - All wiring must be completed before power is turned on to prevent electric shock, fire or damage to the instrument and the equipment.
 - This instrument must be used in accordance with the specifications to prevent fire or damage to the instrument and the 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 may occur and warranty is void under these conditions.

- ### CAUTION
- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy plant.)
 - 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 additional 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.

- 15: Transmission output + ALM1, ALM2
[OUT1: Transmission output OUT2: AND output of ALM1 and ALM2²]
- 16: Transmission output + ALM1, ALM2
[OUT1: Transmission output OUT2: AND output of ALM1 and ALM2¹]
- 17: Transmission output + ALM1
[OUT1: Transmission output OUT2: ALM1²]
- 18: Transmission output + ALM1
[OUT1: Transmission output OUT2: ALM1¹]
- 19: Heat/Cool PID action
[OUT1: Cool-side control output OUT2: Heat-side control output]

- ¹ De-energized ² Energized
- (1) Version symbol
No code: For Japanese domestic market
/Y: For International market

- ### Accessories
- SA100 Installation Manual (IMR01J09-X1).....1
 - SA100 Quick Operation Manual (IMR01J10-ED).....1

- ### Input range code table
- #### TC/RTD inputs

Type	Range	Code	Range	Code
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
	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		
	0 to 1600 °C	R 01	0 to 1769 °C	R 02
	0 to 1350 °C	R 04	0 to 3200 °F	R A1
R	0 to 1600 °C	R 01	0 to 1769 °C	R 02
	0 to 1350 °C	R 04	0 to 3200 °F	R A1
	0 to 3216 °F	R A2		

¹ Accuracy is not guaranteed below 399 °C (751 °F) or less for type R.

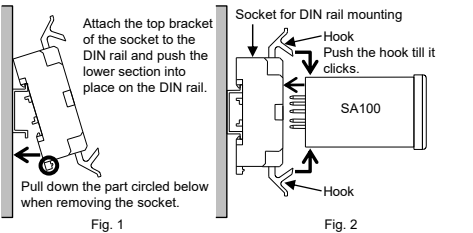


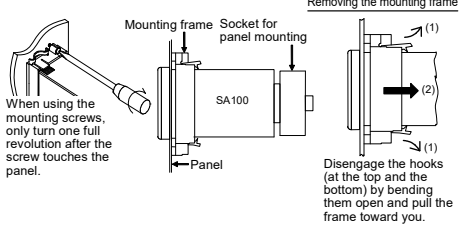
Fig. 1 Fig. 2

The socket must be provided by the customer.

Recommended socket for DIN rail mounting: TP411X (Fuji Electric Co., Ltd.)

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. Fix the instrument to the panel by using the two screws.
6. Mount the socket to the instrument.

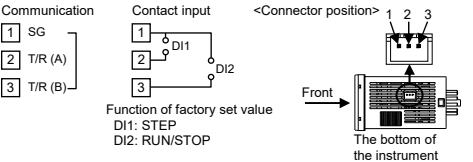


The mounting frame and the socket must be provided by the customer.

Mounting frame type: KCA100-526 (RKC product, Sold separately)

Recommended socket for panel mounting: TP411SBA (Fuji Electric Co., Ltd.)

The Waterproof/Dustproof optional on the front of the instrument conforms to **IP66** (Checked and confirmed its compliance through the internal test at RKC) when mounted on the panel. For effective waterproof/dustproof, the gasket must be securely placed between the instrument and the panel without any gap. If gasket is damaged, please contact RKC sales office or the agent.



Specifications

Input

Thermocouple (TC) input: K, J, R, S, B, E, T, N, PLII, C (W5Re/W26Re), U, L
Input impedance: 1 MΩ or more

RTD input: Pt100, JPt100
Voltage input: 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC
Input impedance: 1 MΩ or more

Current input: 0 to 20 mA DC, 4 to 20 mA DC
Sampling cycle: 0.25 seconds or 0.5 seconds
Input range: See Input range code table

Control method

PID control (ON/OFF, P, PI, or PD actions is available)

Outputs

Output 1 [OUT1]

Relay contact output: 240 V AC 3 A, 30 V DC 1 A (Resistive load)
1c contact
Electrical life: 300,000 times or more
(240 V AC 2 A, 30 V DC 1 A)
200,000 times or more (240 V AC 3 A)

Voltage pulse output: 0/12 V DC
Allowable load resistance: 600 Ω or more
Input/Output terminals are functionally isolation.

Current output: 0 to 20 mA DC or 4 to 20 mA DC
Allowable load resistance: 400 Ω or less
Input/Output terminals are functionally isolation.

- 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 to operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- 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 as a result of failure, protect the power line and the input/output lines from high currents with a suitable overcurrent protection device with adequate breaking capacity such as a fuse, circuit breaker, etc.
- A malfunction in this product may occasionally make control operations impossible or prevent alarm outputs, resulting in a possible hazard. Take appropriate measures in the end use to prevent hazards in the event of malfunction.
- 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 dissipation.
- 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 may occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to the instrument display, do not rub with an abrasive material or push the front panel with a hard object.

- ### NOTICE
- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
 - The figures, diagrams and numeric values used in this manual are only for explanation purpose.
 - RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
 - RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
 - 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.

Type	Range	Code	Range	Code
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	0 to 3308 °F ¹	B A2
E	0 to 800 °C	E 01	0 to 1000 °C	E 02
	0 to 1600 °F	E A1	0 to 1832 °F	E A2
N	0 to 1200 °C	N 01	0 to 1300 °C	N 02
	0.0 to 800.0 °C	N 06	0 to 2300 °F	N A1
	0.0 to 2372 °F	N A2	0.0 to 999.9 °F	N A5
T	-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 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		
C (W5Re/ W26Re)	0 to 2000 °C	W 01	0 to 2320 °C	W 02
	0 to 4000 °F	W A1		
PLII	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
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 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	-100.0 to +100.0 °F	D A4
	-100.0 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
	0 to 450 °C	P 05	0.0 to 50.0 °C	P 06
	-100.0 to +200.0 °C	P 07	0.0 to 200.0 °C	P 08
	0.0 to 100.0 °C	P 09	0.0 to 500.0 °C	P 10
	0.0 to 300.0 °C	P 09	0.0 to 500.0 °C	P 10

¹ Accuracy is not guaranteed below 399 °C (751 °F) or less for types S, and B.
² Accuracy is not guaranteed below -100.0 °C (-148.0 °F) or less for type T and U.

Type	Range	Code	Type	Range	Code
0 to 5 V DC	0.0 to 100.0 %	4 01	0 to 20 mA DC	0.0 to 100.0 %	7 01
0 to 10 V DC	0.0 to 100.0 %	5 01	4 to 20 mA DC	0.0 to 100.0 %	8 01
1 to 5 V DC	0.0 to 100.0 %	6 01			

3. WIRING

WARNING

To prevent electric shock or instrument failure, do not turn on the power until all wiring is completed. Make sure that the wiring is correct before applying power to the instrument.

3.1 Wiring Cautions

- For thermocouple input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wire with no difference in resistance between the three lead wires.
- To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.
- Signal connected to Voltage input and Current input shall be low voltage defined as "SELV" circuit per IEC 60950-1.
- 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.

- Preparation time for contact output
Allow approximately 5 seconds for contact output when 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.
- This instrument is not provided with an overcurrent protection device. For safety install an overcurrent protection device (such as a fuse) with adequate breaking capacity close to the instrument.
 - Fuse type: Time-lag fuse (Approved fuse according IEC 60127-2 and/or UL 248-14)
 - Recommended fuse rating: Rated current 0.4 A
- For the current input specification, a resistor of 250 Ω ± 0.02 % (Temperature characteristics: ± 10 ppm/°C, Rated power: 0.25 W or more) must be connected between the input terminals. This resistor must be provided by the customer.
- For an instrument with 24 V power supply input, supply power from a "SELV" circuit defined as IEC 60950-1.
- A suitable power supply should be considered in the end-use equipment. The power supply must be in compliance with a limited-energy circuit (maximum available current of 8 A).

Output 2 [OUT2]
Relay contact output: 240 V AC 3 A, 30 V DC 1 A (Resistive load) 1c contact
Electrical life: 300,000 times or more (240 V AC 2 A, 30 V DC 1 A)
200,000 times or more (240 V AC 3 A)

Voltage pulse output: 0/12 V DC
Allowable load resistance: 600 Ω or more
Input/Output terminals are functionally isolation.

Contact input (optional)
Dry contact input: At open 500 kΩ or more
At close 10 Ω or less

Performance
Reference operating conditions (at the ambient temperature 23 °C ± 2 °C):
Thermocouple (TC): ± (1 % of display value + 1 digit) or ± 2 °C [4 °F] (whichever is larger)
R, S and B input: Accuracy is not guaranteed below 399 °C (751 °F) or less.
T and U input: Accuracy is not guaranteed below -100.0 °C (-148.0 °F) or less.
RTD: ± (0.3 % of display value + 1 digit) or ± 0.8 °C [1.6 °F] (whichever is larger)
Voltage/Current: ± (0.3 % of span + 1 digit)

Memory backup
Backed up by Nonvolatile Memory
Number of write times: Approx. 100,000 times
Data storage period: Approx. 10 years

Power
Power supply voltage: 85 to 264 V AC [Including power supply voltage variation],
(Rating: 100 to 240 V AC), 50/60 Hz
21.6 to 26.4 V AC [Including power supply voltage variation],
(Rating: 24 V AC), 50/60 Hz
21.6 to 26.4 V DC [Including power supply voltage variation],
(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)

Weight
Approx. 110 g

- Various symbols are used on the equipment, and they have the following meaning.
 - ~: Alternating current
 - ~: Both direct and alternating current
 - ⚡: Reinforced insulation
 - ⚠: Safety precaution
- This symbol is used where the instruction manual needs to be consulted for the safety of both the operator and the equipment. Carefully read the cautions in this manual before using the instrument.

1. MODEL CODE

SA100	□ □ □ □	-	□ □	*	□ □	-	□ □	/	□ □	/	Y
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)

- (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)¹
A: Heat/Cool PID action with autotuning (Air cooling)¹
- (2) Input type/Range code: See "■ Input range code table."
- (3) Output 1 [OUT1] (Control output, Alarm output or Transmission output)
M: Relay contact output 7: Current output (0 to 20 mA DC)
V: Voltage pulse output 8: Current output (4 to 20 mA DC)
- (4) Output 2 [OUT2] (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 [ALM1] and (7) Alarm 2 [ALM2]
N: No alarm
A: Deviation high alarm
B: Deviation low alarm
C: Deviation high/low alarm
D: Band alarm
E: Deviation high alarm with hold action
F: Deviation low alarm with hold action
G: Deviation high/low alarm with hold action
H: Process high alarm
J: Process low alarm
K: Process high alarm with hold action
L: Process low alarm with hold action
R: Control loop break alarm (LBA)²
V: SV high alarm
W: SV low alarm
- (8) Optional function
N: No function 6: RS-485 (Modbus)
5: RS-485 (RKC communication) D: Contact input

¹ No self-tuning function is provided in the W or A control action type.
² LBA can be selected for only ALM1.

2. MOUNTING

WARNING

To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.

2.1 Mounting Cautions

- (1) This instrument is intended to be used under the following environmental conditions. (IEC 61010-1) (OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2)
- (2) Use this instrument within the following environmental conditions:
 - Allowable ambient temperature: 0 to 50 °C
 - Allowable ambient humidity: 45 to 85 %RH (Absolute humidity: MAX. W. C 29.3 g/m³ dry air at 101.3 kPa)
- Installation environment conditions:
Indoor use
Altitude up to 2000 m
- (3) Avoid the following conditions when selecting the mounting location:
 - Rapid changes in ambient temperature which may cause condensation.
 - Corrosive or inflammable gases.
 - Direct vibration or shock to the instrument.
 - 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.
- (4) Mount this instrument in the panel considering the following conditions:
 - Provide adequate ventilation space so that heat does not build up.
 - Do not mount this instrument directly above the equipment that generates large amount of heat (heaters, transformers, semi-conductor functional devices, large-wattage resistors).
 - If the ambient temperature around this instrument exceeds 50 °C, use a cooling fan, a cooling unit or something similar to decrease the ambient temperature around this instrument below 50 °C. Make sure cooled air should not blow directly on this instrument.
 - In order to improve safety and the immunity to withstand noise, mount this instrument as far away as possible from high voltage equipment, power lines, and rotating machinery.
 - High voltage equipment: Do not mount within the same panel.
 - Power lines: Separate at least 200 mm.
 - Rotating machinery: Separate as far as possible.
- (5) In case this instrument is connected to a supply by means of a permanent connection, a switch or circuit-breaker shall be included in the installation. This shall be in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment.

- (9) Waterproof/Dustproof
N: No Waterproof/Dustproof 1: Waterproof/Dustproof
- (10) Output assignment code
No symbol: Standard output
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
- 03: PID action + ALM1
[OUT1: Control output OUT2: ALM1 output¹]
- 04: PID action + ALM1, ALM2
[OUT1: Control output OUT2: AND output of ALM1 and ALM2²]
- 05: PID action + ALM1, ALM2
[OUT1: Control output OUT2: OR output of ALM1 and ALM2¹]
- 06: PID action + ALM1, ALM2
[OUT1: Control output OUT2: AND output of ALM1 and ALM2¹]
- 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 output² (ALM2 can be checked via communication or by lamp lighting)]
- 09: ALM1 + ALM2
[OUT1: ALM1 output² OUT2: ALM2 output²]
- 10: ALM1 + ALM2
[OUT1: ALM1 output² OUT2: ALM2 output¹]
- 11: ALM1 + ALM2
[OUT1: ALM1 output¹ OUT2: ALM2 output¹]
- 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 ALM2²]
- 14: Transmission output + ALM1, ALM2
[OUT1: Transmission output OUT2: OR output of ALM1 and ALM2¹]

¹ De-energized ² Energized

2.2 Dimensions

