



Temperature Controller

SA200/SA201

IMR01D12-X1 All Rights Reserved, Copyright © 2022, 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 SA200/SA201.

For detailed handling procedures and key operations, refer to separate **SA200/SA201 Instruction Manual (IMR01D14-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
- (12) Version symbol
No code: For Japanese domestic market
/Y: For International market

- ### Accessories
- Mounting brackets..... 2
 - Mounting screws..... 2
 - SA200/SA201 Installation Manual (IMR01D12-X1)..... 1
 - SA200/SA201 Quick Operation Manual (IMR01D13-ED)..... 1

Input range table

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 600 °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 3216 °F	R A2		

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

- 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.

TC/RTD input				
Type	Range	Code	Range	Code
S	0 to 1600 °C ¹ 0 to 3200 °F ¹	S 01 S A1	0 to 1769 °C ¹ 0 to 3216 °F ¹	S 02 S A2
	B 400 to 1800 °C 800 to 3200 °F	B 01 B A1	0 to 1820 °C ¹ 0 to 3308 °F ¹	B 02 B A2
E	0 to 800 °C 0 to 1600 °F	E 01 E A1	0 to 1000 °C 0 to 1832 °F	E 02 E A2
	N 0 to 1200 °C 0.0 to 800.0 °C	N 01 N 06	0 to 1300 °C 0.0 to 2300 °F	N 02 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 -100.0 to +200.0 °C	T 01 T 03	-199.9 to +100.0 °C ² 0 to 350.0 °C	T 02 T 04
	-199.9 to +752.0 °F ² -100.0 to +400.0 °F	T A1 T A3	-100.0 to +200.0 °F 0 to 450.0 °F	T A2 T A4
	0.0 to 752.0 °F	T A5		
	W5Re/ W26Re	W 01 W A1	0 to 2320 °C 0 to 4000 °F	W 02 W 02
PLII	0 to 1300 °C 0 to 1200 °C	A 01 A 03	0 to 1390 °C 0 to 2400 °F	A 02 A A1
	0 to 2534 °F	A A2		
U	-199.9 to +600.0 °C ² 0.0 to 400.0 °C	U 01 U 03	-199.9 to +100.0 °C ² 0 to 999.9 °F	U 02 U A1
	-100.0 to +200.0 °F	U A2	0.0 to 999.9 °F	U A3
L	0 to 400 °C 0 to 800 °F	L 01 L A1	0 to 600 °C 0 to 1600 °F	L 02 L A2
Pt100	-199.9 to +649.0 °C -100.0 to +50.0 °C	D 01 D 03	-199.9 to +200.0 °C -100.0 to +100.0 °C	D 02 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	-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		
	-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
JPt100	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

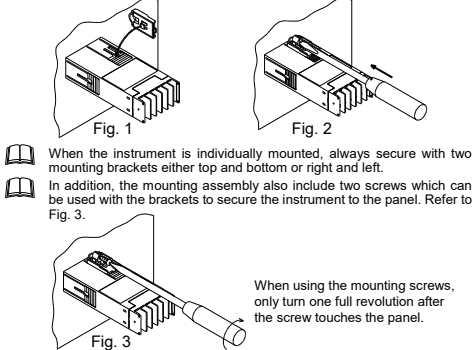
¹ Accuracy is not guaranteed below 399 °C (751 °F) or less for types S, and B.

² Accuracy is not guaranteed below -100.0 °C (-148.0 °F) or less for type T and U.

Voltage/Current inputs				
Type	Range	Code	Type	Range
0 to 5 V DC	0.0 to 100.0 %	4 01	0 to 20 mA DC	0.0 to 100.0 %
0 to 10 V DC	0.0 to 100.0 %	5 01	4 to 20 mA DC	0.0 to 100.0 %
1 to 5 V DC	0.0 to 100.0 %	6 01		

2.3 Mounting Procedures

1. Prepare the panel cutout as specified in **2.2 Dimensions**.
2. Insert the instrument through the panel cutout.
3. Insert the mounting bracket into the mounting groove of the instrument. (Fig.1)
4. Push the mounting bracket forward with a blade screwdriver until the bracket is firmly secured to the panel. (Fig. 2)
5. The other mounting bracket should be installed the same way as described in 3. and 4.



Close Mounting

- Secure the mounting brackets in the positions as shown in Fig.4 and Fig.5.
- If the SA200/201 have waterproof/dustproof options, protection will be compromised and not meet IP66 by close mounting.
 - Two SA200/201 cannot be inserted into a panel cutout of 48 × 48 mm.

Specifications

- ### Input
- Thermocouple (TC) input: K, J, R, S, B, E, T, N, PLII, 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: Refer to Input range table

- ### Control method
- PID control (ON/OFF, P, PI, or PD actions is available)

- ### Outputs
- #### Output 1 [OUT1]
- Relay contact output: 240 V AC 2 A, 30 V DC 2 A (Resistive load)
1a contact
Electrical life: 100,000 times or more (Rated load)
- 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.

- #### Output 2 [OUT2]
- Relay contact output: 240 V AC 2 A, 30 V DC 2 A (Resistive load)
1a contact
Electrical life: 100,000 times or more (Rated load)
- 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): ± (0.3 % 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.
± (0.3 % of display value + 1 digit) or ±0.8 °C [1.6 °F] (whichever is larger)
- RTD: ± (0.3 % of span + 1 digit)
- 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

Communication function (optional)

- Interface: Based on RS-485, EIA standard
Connection method: 2-wire system, half-duplex multi-drop connection
Synchronous method: Start/Stop synchronous type
Protocol: RKC communication (ANSI X3.28-1976 subcategories 2.5 and A4)
Modbus-RTU

- Communication speed: 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps
Maximum connections: 31 instruments (32 instruments maximum including a host computer)

Transmission output

- Output type: Measured value (PV), Set value (SV), Deviation value, Manipulated output value (MV)

- 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

SA200	□	□	□	□	-	□	□	-	□	□	-	□	□	/	□	□	/	Y
SA201	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)						

- (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: Refer to "■ Input range 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
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
- (8) Optional function
N: No function
5: RS-485 (RKC communication)
6: RS-485 (Modbus)
D: Contact input
- (9) Waterproof/Dustproof
N: No Waterproof/Dustproof 1: Waterproof/Dustproof

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.

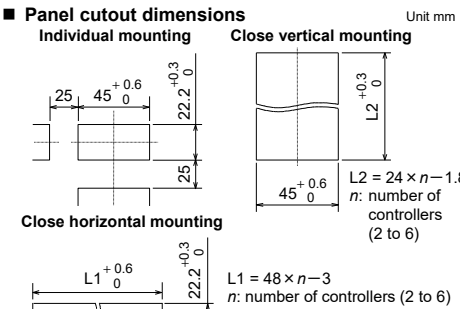
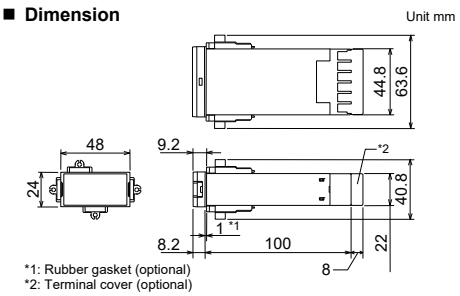
2.1 Mounting Cautions

- (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: -10 to +55 °C
 - Allowable ambient humidity: 5 to 95 %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 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.
- (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 rises above 55 °C, cool this instrument with a forced air fan, cooler, etc. 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.

- (10) Case color
N: White A: Black
- (11) 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

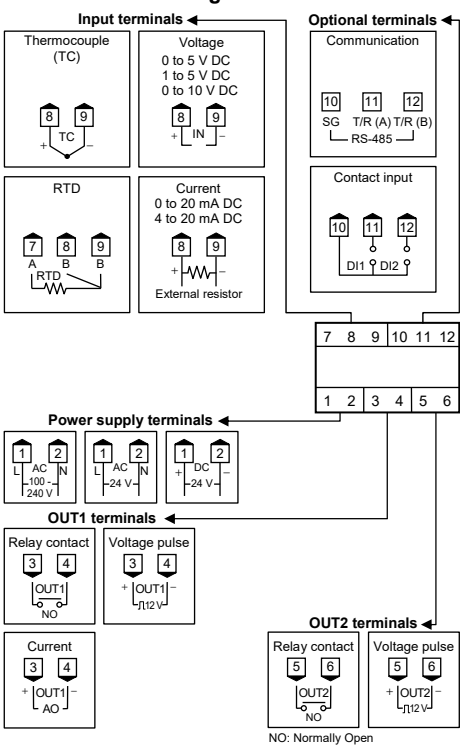
2.2 Dimensions



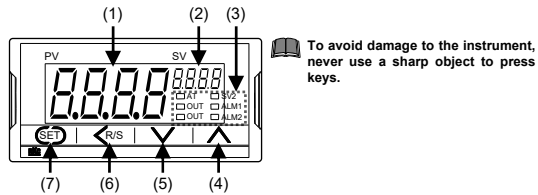
For mounting of the SA200/201, panel thickness must be between 1 to 10 mm. When mounting multiple SA200/201 close together, the panel strength should be checked to ensure proper support.

Installation Conditions:
The display cannot be seen from the outside of the visual field range. The visual field range of SA200/201 is 40 degrees to the upper side, and 30 degrees to the lower side from the center of the display vertically.

3.3 Connector Configurations



4. PARTS DESCRIPTION



(1) Measured value (PV) display [SA200: Green] [SA201: Red]	Displays PV or various parameter symbols.
(2) Set value (SV) display [SA200: Orange] [SA201: Red]	Displays SV or STEP set value (SV1, SV2). Displays various parameter set values.
(3) Indication lamps	Autotuning (AT) lamp [SA200: Green SA201: Red] Flashes during Autotuning activated. (After Autotuning is completed: AT lamp will become OFF) Output lamps (OUT1, OUT2) [SA200: Green SA201: Red] OUT1: Lights when Output 1 is turned on. OUT2: Lights when Output 2 is turned on. STEP set value (SV2) lamp [SA200: Orange SA201: Red] Lights when the SV2 of STEP function is selected. Alarm lamps (ALM1, ALM2) [SA200: Orange SA201: Red] ALM1: Lights when Alarm 1 is turned on. ALM2: Lights when Alarm 2 is turned on.
(4) UP key	Increases numerals.
(5) DOWN key	Decreases numerals.
(6) Shift & R/S key	Shifts digits when settings are changed. Selects the RUN/STOP function.
(7) Set key	Used for calling up parameters and set value registration.