

CONTROLLER

# SA200

DIGITAL TEMPERATURE CONTROLLER



(Actual size)



# SA200



The SA200 is a new high performance temperature controller specifically designed for applications where panel space is critical yet maximum control performance is required!

- ◆ 1/32 DIN size with dual display
- ◆ Close vertical and horizontal mounting
- ◆ Self-tuning and autotuning
- ◆ Loop break alarm and temperature alarms
- ◆ Digital communications with both MODBUS and RKC protocols

## Large, bright LCD displays



1/16 DIN



Actual size

1/32 DIN



Two controllers in the same space as the 1/16 DIN!

Panel cutout will be different from that of 1/16 DIN unit.

## Designed for close vertical or horizontal mounting

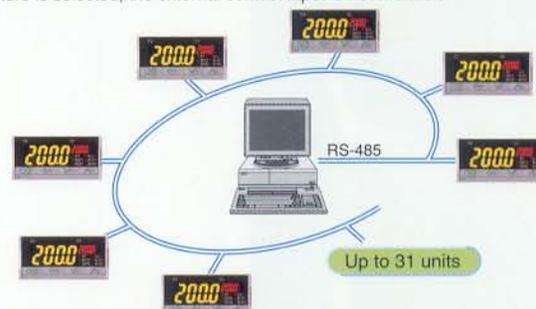
The SA200 allows you to mount several units close together to make effective use of control board or panel space. (Up to 6 units)



## Digital communications MODBUS/ANSI protocol

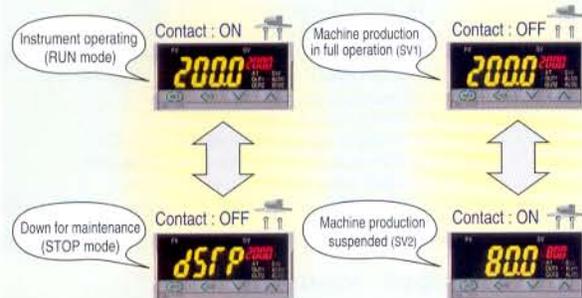
(Optional)

The SA200 offers an optional RS-485 communications interface for networking to computers, PLCs and SCADA software. MODBUS or ANSI protocol can be selected. Up to 32 units, including host computer, can be multi-dropped on one RS-485 communication line. When the communication feature is selected, the external contact input is not available.



## Digital contact input for external switching (Optional)

An optional digital contact input is available for RUN/STOP and SV1/SV2 switching. (RUN/STOP switching can also be completed at the front key panel.) This function can be used with the output from a timer, PLC, etc. When the communication feature is selected, the external contact input is not available.

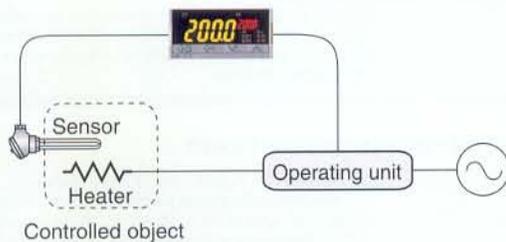


## Control loop break alarm and temperature alarms (Optional)

The control loop break alarm (LBA) monitors and protects an entire temperature control system. The LBA detects heater breaks, thermocouple or RTD failures, short circuits, or the failure of an operating device such as a mechanical or solid state relay.

When the PID computed value reaches 100% and the temperature does not respond in a set time, the loop break alarm is activated. Conversely, when the PID value reaches 0% and the temperature does not respond accordingly, the loop break alarm is turned on.

In addition to the control loop break alarm, deviation (high, low, high-low), process (high, low), set value (high, low) and band alarms can be selected.



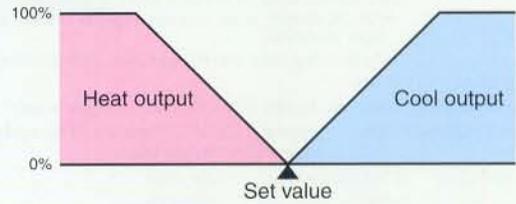
## Waterproof and dustproof protection (Optional)

The waterproof and dustproof feature protects the panel-mounted instrument in severe environments or wash-down conditions and conforms to IP66 (NEMA 4) standards. (Released soon)



## Heat/cool control (Optional)

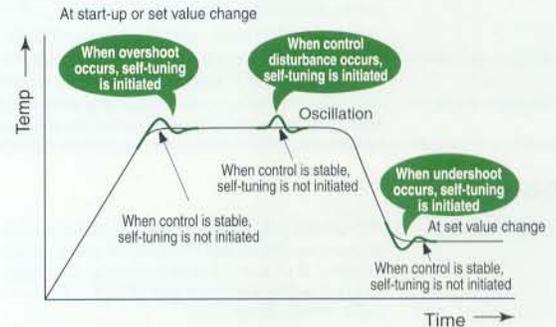
The heat/cool PID controller has heat and cool outputs for use where process-generated heat exists. The controller allows the input of overlap or deadband settings which can contribute to energy savings.



## RKC self-tuning Advanced algorithm for optimum control

RKC self-tuning offers the most advanced algorithm for precise temperature control. Self-tuning is initiated at start-up and when process parameters or conditions change. At these times, new PID parameters are calculated for the best control performance. With the unique RKC self-tuning, the controller evaluates whether PID parameters should be maintained or replaced, selecting the best setting for the controlled process. If it is determined that the existing PID parameters can achieve the best control for the process, the present PID parameters will be retained and the new PID parameters will be canceled. Self-tuning can be turned on/off in parameter setting mode. Self-tuning is not available with heat/cool control.

In addition to self-tuning, the controller also has autotuning (AT) so that either function can be selected for optimum process control.



## Easy maintenance

The internal assembly of the SA200 can be removed from the front of a control board. It is easy to inspect, maintain or replace the instrument because it does not require access from the back of the panel.



# SA200 Specifications

## Inputs

Input :	a) Thermocouple : K, J, E, T, R, S, B, N (JIS/IEC), U, L (DIN) PLI (NBS), W5Re/W26Re (ASTM) Input impedance : Approx. 1M $\Omega$
	b) RTD : Pt100 (JIS/IEC), JPt100 (JIS)
	c) DC voltage input : 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
	d) DC current input : 0 to 20mA DC, 4 to 20mA DC • For DC current input, connect a 250 $\Omega$ resistor to the input terminals. • Refer to the Input and Range Code Table for details.
Sampling time :	0.5 sec.
Influence of external resistance :	Approx. 0.2 $\mu$ V/ $\Omega$ (Thermocouple input)
Influence of lead resistance :	Approx. 0.01[%/ $\Omega$ ] of reading (RTD input) • Maximum 10 $\Omega$ per wire
Input break action :	a) Thermocouple : Up-scale b) RTD : Up-scale c) DC voltage/current input : Down-scale • Both heat/cool control outputs are OFF for heat/cool PID action. • Reading is around zero for 0 to 5V DC input, 0 to 10V DC input and 0 to 20mA DC input.
Input short action :	Down-scale (RTD)
PV bias :	- span to +span (Within -1999 to 9999)

## Display

Display method :	LCD display
	a) PV : Green
	b) SV : Orange
	c) AT, OUT1/2 : Green
	d) SV2, ALM1/2 : Orange

## Performance

Measuring accuracy :	a) Thermocouple : $\pm$ (0.3% of reading + 1 digit) or $\pm$ 2 $^{\circ}$ C (4 $^{\circ}$ F) (Within either range, whichever is larger) • Accuracy is not guaranteed between 0 and 399 $^{\circ}$ C (0 and 799 $^{\circ}$ F) for type R, S and B. • Accuracy is not guaranteed less than -100.0 $^{\circ}$ C (-158.0 $^{\circ}$ F) for type T and U. b) RTD : $\pm$ (0.3% of reading + 1 digit) or $\pm$ 0.8 $^{\circ}$ C (1.6 $^{\circ}$ F) (Within either range, whichever is larger) c) Voltage, Current Input : $\pm$ (0.3% of span + 1 digit)
Insulation resistance :	More than 20M $\Omega$ (500V DC) between measured terminals and ground More than 20M $\Omega$ (500V DC) between power terminals and ground
Dielectric voltage :	1000V AC for one minute between measured terminals and ground 1500V AC for one minute between power terminals and ground

## Control

Control method :	a) PID control (with autotuning and self-tuning function) • Available for reverse and direct action. (Specify when ordering.) • ON/OFF, P, PI and PD control are also selectable. ON/OFF action differential gap : 2 $^{\circ}$ C (2 $^{\circ}$ F) (Temperature input) 0.2% (Voltage, current input) b) Heat/cool PID control (with autotuning function) Air cooling and water cooling type are available.
Setting range :	a) Set value (SV) : Same as input range. b) Heat side proportional band (P) : 1 to span or 0.1 to span (ON/OFF action when P=0) c) Cool side proportional band (Pc) : 1 to 1000% of heat side proportional band (P) d) Integral time (I) : 1 to 3600 sec. (PD action when I=0) e) Derivative time (D) : 1 to 3600 sec. (PI action when D=0) f) Anti-reset windup (ARW) : 1 to 100% of heat side proportional band (P) (Integral action is OFF when ARW=0) g) Heat side proportional cycle : 1 to 100 sec. (No cycle setting for current output) h) Cool side proportional cycle : 1 to 100 sec. (No cycle setting for current output) i) Deadband/Overlap : - span to +span (Within -1999 to 9999)

## Outputs

Output :	Can be set for control or alarm functions. • Alarm output can be set for energized/de-energized action. • Alarm output can be set for AND/OR logic calculation.
Number of outputs :	2 points
Output type :	a) Relay contact output : 250V AC 2A (resistive load), Form A contact • Electrical life : 300,000 cycles or more (resistive load) b) Voltage pulse output : 0/12V DC (Load resistance : more than 600 $\Omega$ ) • Measurement terminals and output terminals are not isolated.

## Alarms (Optional)

Number of alarms :	2 points
Alarm type :	a) Deviation High alarm b) Deviation Low alarm c) Deviation High-Low alarm d) Deviation Band alarm e) Process High alarm f) Process Low alarm g) Set value High alarm h) Set value Low alarm i) Loop break alarm (LBA) • Hold action can be added to deviation and process type. • When input is abnormal, the alarm output is ON.
Setting range :	a) Deviation alarm : -span to +span (Within -1999 to 9999) b) Process alarm : Same as set value (SV). c) Set value alarm : Same as set value (SV). d) Loop break alarm : 0.0 to 200.0 min.
LBA deadband :	2 $^{\circ}$ C (2 $^{\circ}$ F) (Temperature input), 0.2% (Voltage, current input)

## Contact input (Optional)

Number of inputs :	2 points
Contact input type :	a) RUN/STOP switching (OPEN : STOP, CLOSE : RUN) b) STEP function (OPEN : SV1, CLOSE : SV2)
Input rating :	Non-voltage contact input a) OPEN : 500k $\Omega$ or more b) CLOSE : 10 $\Omega$ or less

## Communications (Optional)

Communication method :	Based on RS-485 (two-wire) Half-duplex multi-drop connection
Protocol :	a) ANSI X3.28(1976) 2.5 A4 b) MODBUS
Synchronous method :	Asynchronous
Communication speed :	2400, 4800, 9600, 19200 BPS (Selectable)
Bit configuration :	a) Start bit : 1 b) Data bit : 7 or 8 • For MODBUS 8 bit only c) Parity bit : Without, Odd or Even d) Stop bit : 1 or 2
Maximum connection :	31 (Address can be set from 0 to 99.)

## Dustproof and waterproof (Optional)

Dustproof and waterproof protection :	IP66 • Dustproof and waterproof protection are effective only from the front direction when installed on a panel. • Dustproof and waterproof are not effective when controllers are closely mounted.
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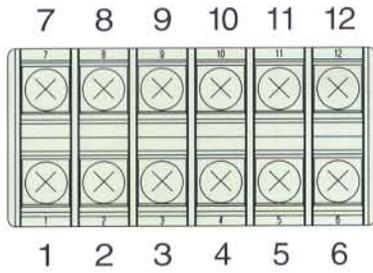
## General specifications

Supply voltage :	a) AC type : 85 to 264V AC (50/60Hz common) [Including supply voltage variation] (Rating 100 to 240V AC) b) 24V AC type : 21.6 to 26.4V AC (50/60Hz common) [Including supply voltage variation] (Rating 24V AC) c) 24V DC type : 21.6 to 26.4V DC [Including supply voltage variation] (Rating 24V DC)
Power consumption :	a) AC type : Maximum 4VA at 100V AC Maximum 7VA at 240V AC b) 24V AC type : Maximum 4VA c) 24V DC type : Maximum 100mA
Power failure :	A power failure of 20 ms or less will not affect the control action. If power failure of more than 20 ms occurs, controller will restart.
Memory backup :	Backed up by non-volatile memory. Data retaining period : Approx. 10 years
Ambient temperature :	0 to 50 $^{\circ}$ C (32 to 122 $^{\circ}$ F)
Ambient humidity :	45 to 85% RH
Weight :	Approx. 110g
External dimensions :	48(W) X 24(H) X 100(D)mm (1/32 DIN)
Operating environment :	Free from corrosive and flammable gas and dust.
Other conditions :	Free from external noise, vibration, shock and exposure to direct sunlight.

## Compliance with standards

• CE marked	
• UL recognized	
• CSA certified	
• C-Tick marked	
•  Class II Reinforced insulation	

# SA200 Rear Terminal Layout and Configuration



No.	1	2	3	4	5	6
Contents	100 to 240V AC	N	Voltage pulse	Voltage pulse	Voltage pulse	Voltage pulse
	24V AC/DC		Relay contact	Relay contact	Relay contact	Relay contact
	Power supply		Output 1		Output 2	

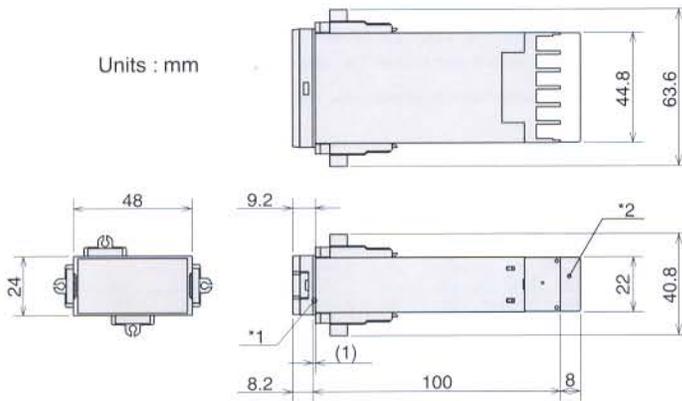
No.	7	8	9	10	11	12
Contents						
	① Thermocouple ② RTD ③ Voltage / Current *			Measured input		
	Measured input			Communications / Contact inputs		

**Note :**

- Terminal assembly for unspecified functions will not be furnished.
- For terminal connection, use lug that is 5.8 mm wide or less.

\*A 250Ω resistor is externally connected at the input terminals.

## External Dimensions



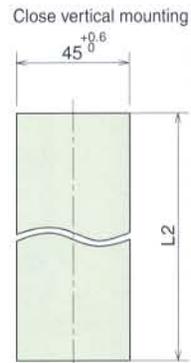
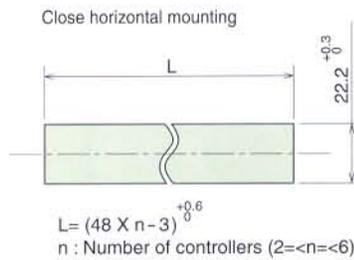
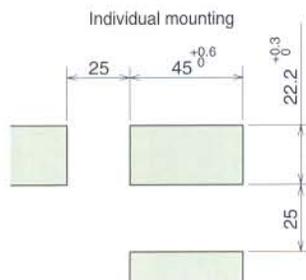
- \*1 For waterproof and dustproof models, a rubber packing is added.
- \*2 Terminal cover is optional.

For mounting of the SA200, panel thickness must be between 1-10 mm. When mounting multiple SA200s close together, the panel strength should be checked to ensure proper support.

Two mounting brackets will be furnished for installation of the instrument at either the top and bottom or sides.

Close vertically and horizontally mounted instruments cannot be combined in one installation.

## Panel Cutouts



**Warning**

If the SA200s have waterproof/dustproof options, protection may be compromised by close mounting. Close vertical mounting is not available when a shunt resistor for current input is used. When multiple instruments are vertically closely mounted, connecting two or more solderless terminal lugs to one terminal is not possible.



# SA200 Alarm Code Table

A	Deviation High	B	Deviation Low	C	Deviation High - Low	D	Deviation Band
E	Deviation High with hold	F	Deviation Low with hold	G	Deviation High - Low with hold	H	Process High
J	Process Low	K	Process High with hold	L	Process Low with hold	R	Loop break alarm *1
V	Set value High	W	Set value Low				

\*1: Loop break alarm is not available with heat/cool PID control type.

# Output Allocation Code Table

Code	Specifications		
	Control methods	Output 1	Output 2
0 3	PID control + Alarm 1	Control output	Alarm 1 output (De-energized)
0 4	PID control + Alarm 1, 2	Control output	AND logic output of Alarm 1 and Alarm 2 (Energized)
0 5	PID control + Alarm 1, 2	Control output	OR logic output of Alarm 1 and Alarm 2 (De-energized)
0 6	PID control + Alarm 1, 2	Control output	AND logic output of Alarm 1 and Alarm 2 (De-energized)
0 7	PID control + Alarm 1, 2 or only Alarm 1 *1	Control output	No output
0 8	PID control + Alarm 1, 2 *1	Control output	Only Alarm 1 output (Energized)
0 9	Alarm 1 + Alarm 2 *2	Alarm 1 output (Energized)	Alarm 2 output (Energized)
1 0	Alarm 1 + Alarm 2 *2	Alarm 1 output (Energized)	Alarm 2 output (De-energized)
1 1	Alarm 1 + Alarm 2 *2	Alarm 1 output (De-energized)	Alarm 2 output (De-energized)

\*1: The alarm monitor can only be confirmed by front LCD display or serial communication.  
 \*2: Specify control action F to use both outputs as alarms.

The diagrams illustrate the output allocation for each code:

- Standard:** Output 1 is PID control. Output 2 is 'No alarm'.
- Code 0 3:** Output 1 is PID control. Output 2 is De-energized alarm (ALM1).
- Code 0 4:** Output 1 is PID control. Output 2 is Energized alarm (ALM1, ALM2) with AND logic.
- Code 0 5:** Output 1 is PID control. Output 2 is De-energized alarm (ALM1, ALM2) with OR logic.
- Code 0 6:** Output 1 is PID control. Output 2 is De-energized alarm (ALM1, ALM2) with AND logic.
- Code 0 7:** Output 1 is PID control. Output 2 is 'Only display' (ALM1).
- Code 0 8:** Output 1 is PID control. Output 2 is Energized alarm (ALM1, ALM2) with 'Output alarm1 only'.
- Code 0 9:** Output 1 is Energized alarm (ALM1). Output 2 is Energized alarm (ALM2).
- Code 1 0:** Output 1 is Energized alarm (ALM1). Output 2 is De-energized alarm (ALM2).
- Code 1 1:** Output 1 is De-energized alarm (ALM1). Output 2 is De-energized alarm (ALM2).

Note: Relay contact output : 250V AC 2A (resistive load), Form A contact



# Accessory

Name	Model code
Shunt resistor for DC current input	KD100-55
Terminal cover	KSA200-56

\*Modbus is a registered trademark of Schneider Electric



• Before operating this product, read the instruction manual carefully to avoid incorrect operation.  
• This product is intended for use with industrial machines, test and measuring equipment. It is not designed for use with medical equipment.  
• If it is possible that an accident may occur as a result of the failure of the product or some other abnormality, an appropriate independent protection device must be installed.  
• When installing this product, avoid the following:  
• Direct exposure to sunlight.

• An ambient temperature lower than 0°C or higher than 50°C  
• Areas subject to high humidity. Ambient humidity should not be lower than 45% or higher than 85%RH  
• Direct contact with water.  
• Corrosive environments.  
• Hazardous areas containing explosive or flammable gases.  
• Vibration or shock.  
• Areas subject to electrical noise caused by inductive interference, static electricity or magnetic fields.



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