CONTROLLER

Temperature Controller

SA100 Series

SA100L

SOCKET MOUNTING TYPE TEMPERATURE LIMIT CONTROLLER

Actual size

RKC INSTRUMENT INC.

SA100L

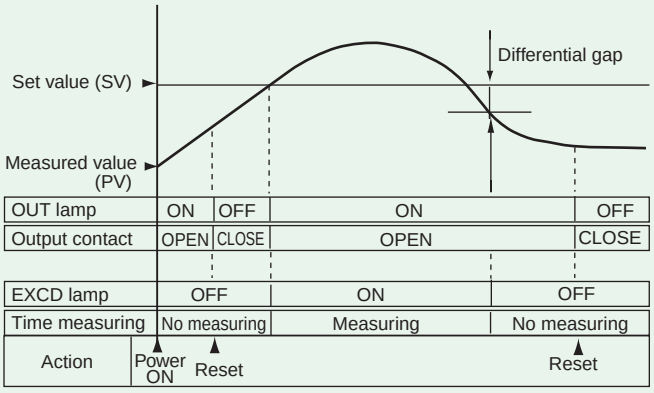
Temperature Limit Controller

Over/Under-Temperature Protection

The SA100L provides over/under-temperature protection by interrupting or removing the power from the process whenever the temperature goes above or below the set value (high limit or low limit). The output can be slected as an alarm or to interrupt power to the heater circuit.
For safety reasons, the output is retained until reset operation is executed even when the measured value goes back to the normal range. Reset operation can be executed by front key operation, communication, or digital input.

The SA100L has various options and functions suitable for wide range of applications that requires two alarms, retransmission output, waterproof and dustproof protection, digital communication, and digital input.
DC current/voltage input type is available as well as thermocouple and RTD input.
The SA100L limit actions can also be configured :
Limit output at power-up : ON/OFF
Alarm output : Energized/de-energize
Limit type : High-limit for over-temperature / Low-limit for under-temperature

The SA100L measures the time while the measured value goes above/below the set value, and it retains the peak value.

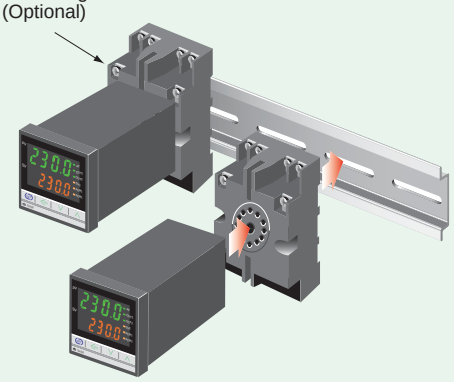


• Output contact is open when power is OFF.(De-energized output)

Simple Mounting on DIN Rail

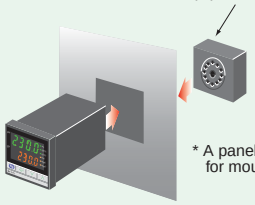
The SA100 is easily mounted on a DIN rail with DIN rail mounting socket. The maintenance is also simple, as the unit can be removed from socket.

DIN rail mounting socket
(Optional)



• The rear terminal socket allows the unit to be mounted on a panel board.

Rear terminal socket
(Optional)



* A panel-mounting frame is necessary (optional) for mounting on panel.

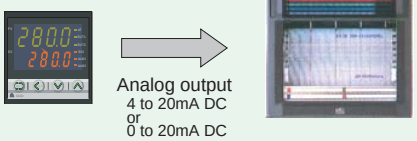
Alarms (Optional)

Two alarm points can be configured for specific applications.

Alarm Type
- Temperature Alarm
  Deviation High, Deviation Low, Deviation High/Low, Band, Process High, Process Low
  (Hold action can be added to deviation and process type)
- Set Value Alarm
  High, Low

Analog Retransmission Output (Optional)

An analog output is available for transmitting the process value to remote instruments such as recorders or data-logging equipment.



SA100L Specifications

Input

Input : a) Thermocouple : K, J, E, T, R, S, B, N (JIS/IEC), U, L (DIN)
PLII (NBS), W5Re/W26Re (ASTM)
Input impedance : Approx.1MΩ
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 Ω resister to the input terminals.
•Refer to the Input and Range Code Table for details.

Sampling time : 0.5 sec.

Influence of external resistance : Approx. 0.2μV/Ω (Thermocouple input)

Influence of lead resistance : Approx. 0.01[%/Ω] of reading (RTD input)
• Maximum 10Ω per wire

Input break action : a) Thermocouple : Up-scale
b) RTD : Up-scale
c) DC voltage/current input : Down-scale
•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 input)

Input digital filter : 0 to 100 sec (OFF when 0 is set.)

PV bias : - span to +span (Within -1999 to 9999)

PV ratio : 0.500 to 1.500

Performance

Measuring accuracy : a) Thermocouple : ±(1% of reading + 1digit) or ±2℃ (4℉)
(Within either range, whichever is larger)
•Accuracy is not guaranteed between 0 and 399℃ (0 and 799℉) for type R, S and B.
•Accuracy is not guaranteed less than -100.0℃ (-148.0℉) for type T and U.
b) RTD : ±(0.3% of reading + 1digit) or ±0.8℃ (1.6℉)
(Within either range, whichever is larger)
c) Voltage, Current Input : ±(0.3% of span + 1digit)

Insulation resistance : More than 20MΩ (500V DC) between measured terminals and ground
More than 20MΩ (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

Action

Limit action : High limit control / Low limit control (Selectable)
• De-energized or energized output can be selected
• The control output contact goes OPEN (it is CLOSED when set to energized) when measured value exceeds the set value, and it is retained until reset operation is executed.
• The state of control output contact when power-up can be configured.
The output contact is OPEN when power-up for standard de-energized type.

Limit action output : Relay contact output, Form C contact, 240VAC, 3A (resistive load)
• Electrical life: 300,000 times or more (rated load)

Other Standard Functions

Hold function : Memorizes the maximum value and the minimum value.
• Hold value can be reset by front key operation, communication, or digital input.
• Hold value is reset when the controller is turned off.

Integrated time measuring :
Counts up the time the measured value exceeds the set value (High limit or Low limit).
• Integrated time can be reset by front key operation, communication, or digital input.
• Integrated time is reset when the controller is turned off.
Display :
Less than 100 min : 0 min 00 sec (0.00) to 99 min 59 sec (99.59)
100 min or more : 100 min 0_ sec (100.0) to 999 min 5_ sec (999.5_)
More than 1000 min : " ---- " display

Outputs

Output : Can be set for control, alarm or retransmission 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 : 240V AC 3A (resistive load), Form C contact
•Electrical life : 300,000 cycles or more (resistive load)
b) Current output : 0 to 20mA DC (Load resistance : less than 400Ω)
4 to 20mA DC (Load resistance : less than 400Ω)
•Measurement terminals and output terminals are not isolated.

Alarms (Optional)

Number of alarms : 2 points

Alarm type : Deviation High, Deviation Low, Deviation High-Low, Deviation Band, Process High, Process Low, Set value High, Set value Low
•Hold action can be added to deviation and process type.

Differential gap : 0 to span (Less than 9999 digit)

Other function : Selection of action for input abnormality
Alarm delay timer function, Interlock function

Contact Input (Optional)

Number of inputs : 2 points

Contact input type : DI1: Limit Output Reset Function
Reset function is executed when the mode is changed from OPEN to CLOSE.
DI2: Interlock Reset Function
Interlock reset function is executed when the mode is changed from OPEN to CLOSE.

Input rating : Non-voltage contact input
a) OPEN : 500kΩ or more
b) CLOSE : 10Ω or les

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.)

Retransmission (Optional)

Retransmission output is allocated to OUT1.

Type : Process value, Set value, Deviation

Output type : Current output : 0 to 20mA DC (Load resistance : less than 400Ω)
4 to 20mA DC (Load resistance : less than 400Ω)
•Measurement terminals and output terminals are not isolated.

Output resolution : More than 10bits

Waterproof/Dustproof (Optional)

Waterproof/Dustproof protection : IP66
•Waterproof/Dustproof protection only effective from the front panel mounted installation.

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.

Memory backup : Backed up by non-volatile memory.
Number of writing : Approx. 100,000 times
Data retaining period : Approx. 10 years

Ambient temperature : 0 to 50℃ (32 to 122℉)

Ambient humidity : 45 to 85% RH

Weight : Approx. 120g

External dimensions : 48 (W) X 48 (H) X 70 (D)mm (1/16 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 (UL61010-1) File No. E172270
- cUL recognized (CAN/CSA-C22.2 No. 61010-1) File No. E172270
- FM approved (FM3545)

SA100L Model and Suffix Code

Specifications		Model and Suffix Code
Size	48 x 48 mm (1/16 DIN) size, socket mounting type controller	SA100 L □ □ □ - □ □ - □ * □ □ - □ □ / □ □ / Y
Type	Temperature Limit Controller	L
Input and Range	See Input and Range Code Table	□ □ □
OUT 1 (Limit control, alarm or retransmission output)	Relay contact output DC current output : 0 to 20mA DC current output : 4 to 20mA	M 7 8
OUT 2 (Limit control or alarm output)	No output Relay contact output	N M
Power supply voltage	24V AC/DC 100 to 240V AC	3 4
Alarm 1	No alarm See Alarm Code Table	N □
Alarm 2	No alarm See Alarm Code Table	N □
Communication Contact input	Not supplied Digital communications : RS-485 (RKC standard) Digital communications : RS-485 (MODBUS) External contact input	N 5 6 D
Waterproof/Dustproof	Not supplied Waterproof/Dustproof	N 1
Output allocation code	Standard output [1] See Output Allocation Code Table	No code □ □
Instrument version	Version symbol	Y

1 Standard output :
a) OUT 1 = Relay contact output (Code : M) : Limit control output (De-energized)
OUT 2 = No output
b) OUT 1 = Relay contact output (Code : M) : Limit control output (De-energized)
OUT 2 = Relay contact output (Code : M) : Alarm 1 or OR logic output of Alarm 1 and Alarm 2.
c) OUT 1 = DC current output (Code : 7 or 8) : Retransmission output.
OUT 2 = Relay contact output (Code : M) : Limit control output (De-energized)

Input and Range Code Table

Thermocouple

Input	Code	Range
K (JIS/IEC)	K 01	0 to 200℃
	K 02	0 to 400℃
	K 03	0 to 600℃
	K 04	0 to 800℃
	K 05	0 to 1000℃
	K 06	0 to 1200℃
	K 07	0 to 1372℃
	K 13	0 to 100℃
	K 14	0 to 300℃
	K 20	0 to 500℃
	K 17	0 to 450℃
	K 08	-199.9 to 300.0℃
	K 09	0.0 to 400.0℃
	K 10	0.0 to 800.0℃
	K 29	0.0 to 200.0℃
	K 37	0.0 to 600.0℃
	K 38	-199.9 to 800.0℃
	K A1	0 to 800℉
	K A2	0 to 1600℉
	K A3	0 to 2502℉
	K A9	20 to 70℉
	K A4	0.0 to 800.0℉
	K B2	-199.9 to 999.9℉
J (JIS/IEC)	J 01	0 to 200℃
	J 02	0 to 400℃
	J 03	0 to 600℃
	J 04	0 to 800℃
	J 05	0 to 1000℃
	J 06	0 to 1200℃
	J 10	0 to 450℃
	J 07	-199.9 to 300.0℃
	J 08	0.0 to 400.0℃
	J 09	0.0 to 800.0℃
	J 22	0.0 to 200.0℃
	J 23	0.0 to 600.0℃
	J 30	-199.9 to 600.0℃
	J A1	0 to 800℉
	J A2	0 to 1600℉
	J A3	0 to 2192℉
	J A6	0 to 400℉
	J B6	0.0 to 800.0℉
	J A9	-199.9 to 999.9℉
R [1] (JIS/IEC)	R 01	0 to 1600℃
	R 02	0 to 1769℃
	R 04	0 to 1350℃
	R A1	0 to 3200℉
	R A2	0 to 3216℉

Input	Code	Range
S [1] (JIS/IEC)	S 01	0 to 1600℃
	S 02	0 to 1769℃
	S A1	0 to 3200℉
	S A2	0 to 3216℉
B [1] (JIS/IEC)	B 01	400 to 1800℃
	B 02	0 to 1820℃
	B A1	800 to 3200℉
	B A2	0 to 3308℉
E (JIS/IEC)	E 01	0 to 800℃
	E 02	0 to 1000℃
	E A1	0 to 1600℉
	E A2	0 to 1832℉
N (JIS/IEC)	N 01	0 to 1200℃
	N 02	0 to 1300℃
	N 06	0.0 to 800.0℃
	N A1	0 to 2300℉
	N A2	0 to 2372℉
	N A5	0.0 to 999.9℉
T [2] (JIS/IEC)	T 01	-199.9 to 400.0℃
	T 02	-199.9 to 100.0℃
	T 03	-100.0 to 200.0℃
	T 04	0.0 to 350.0℃
	T A1	-199.9 to 752.0℉
	T A2	-100.0 to 200.0℉
	T A3	-100.0 to 400.0℉
	T A4	0.0 to 450.0℉
	T A5	0.0 to 752.0℉
W5Re/W26Re (ASTM)	W 01	0 to 2000℃
	W 02	0 to 2320℃
	W A1	0 to 4000℉
PLII (NBS)	A 01	0 to 1300℃
	A 02	0 to 1390℃
	A 03	0 to 1200℃
	A A1	0 to 2400℉
	A A2	0 to 2534℉
U [2] (DIN)	U 01	-199.9 to 600.0℃
	U 02	-199.9 to 100.0℃
	U 03	0.0 to 400.0℃
	U A1	-199.9 to 999.9℉
	U A2	-100.0 to 200.0℉
	U A3	0.0 to 999.9℉
L (DIN)	L 01	0 to 400℃
	L 02	0 to 800℃
	L A1	0 to 800℉
	L A2	0 to 1600℉

RTD

Input	Code	Range
Pt100 (JIS/IEC)	D 01	-199.9 to 649.0℃
	D 02	-199.9 to 200.0℃
	D 03	-100.0 to 50.0℃
	D 04	-100.0 to 100.0℃
	D 05	-100.0 to 200.0℃
	D 06	0.0 to 50.0℃
	D 07	0.0 to 100.0℃
	D 08	0.0 to 200.0℃
	D 09	0.0 to 300.0℃
	D 10	0.0 to 500.0℃
	D A1	-199.9 to 999.9℉
	D A2	-199.9 to 400.0℉
	D A3	-199.9 to 200.0℉
	D A4	-100.0 to 100.0℉
	D A5	-100.0 to 300.0℉
	D A6	0.0 to 100.0℉
	D A7	0.0 to 200.0℉
	D A8	0.0 to 400.0℉
	D A9	0.0 to 500.0℉
JPt100 (JIS)	P 01	-199.9 to 649.0℃
	P 02	-199.9 to 200.0℃
	P 03	-100.0 to 50.0℃
	P 04	-100.0 to 100.0℃
	P 05	-100.0 to 200.0℃
	P 06	0.0 to 50.0℃
	P 07	0.0 to 100.0℃
	P 08	0.0 to 200.0℃
	P 09	0.0 to 300.0℃
	P 10	0.0 to 500.0℃

Voltage/Current DC

Input	Code	Range
0 to 5V	4 01	0.0 to 100.0%
0 to 10V	5 01	0.0 to 100.0%
1 to 5V	6 01	0.0 to 100.0%
0 to 20mA [3]	7 01	0.0 to 100.0%
4 to 20mA [3]	8 01	0.0 to 100.0%

1 Accuracy is not guaranteed between 0 and 399℃ (0 and 799℉) for type R, S and B.
2 Accuracy is not guaranteed less than -100.0℃ (-158.0℉) for type T and U.
3 For DC current input, connect a 250 Ω resister to the input terminals.

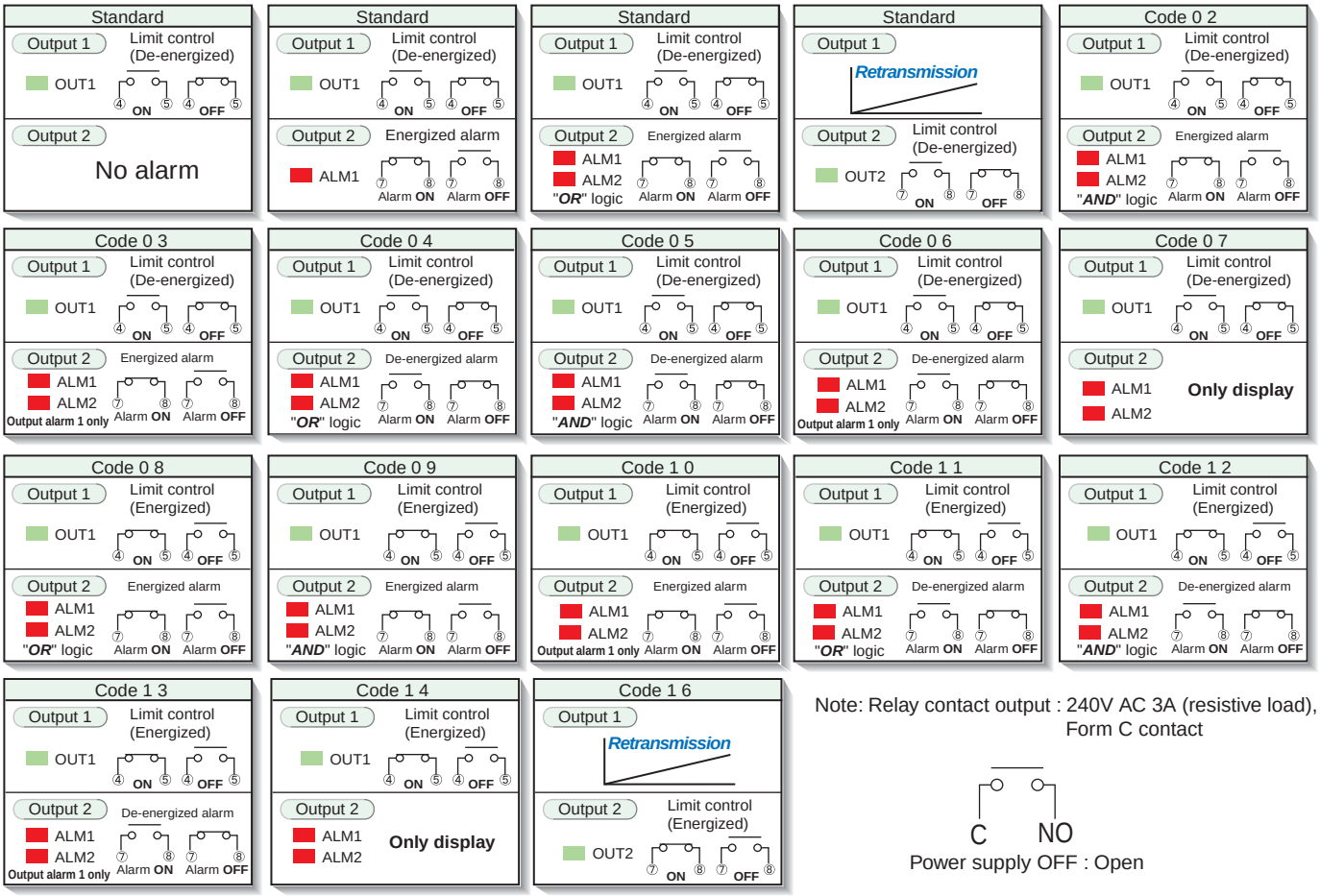
SA100L Alarm Code Table

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	V	Set value High
W	Set value Low						

Output Allocation Code Table

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

[1] The alarm monitor can only be confirmed by front LCD display or serial communication.



Note: Relay contact output : 240V AC 3A (resistive load), Form C contact

Power supply OFF : Open

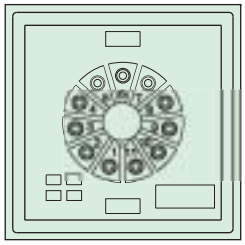
Accessory

Socket (Matsushita Denko product)

Name	Model code
DIN rail mounting sockets	ATC180041
Rear terminal socket	AT78051

Name	Model code
Mounting frame	KCA100-59
Shunt resistor for DC current input	KD100-55

SA100L Rear Layout and Configuration



PIN	1	2	3	4	5	6	7	8	9	10	11
Contents	① ② ③			NO C NC ① ②			NO C NC ①			L N 100 to 240V AC + − 24V AC/DC	
	① Thermocouple ② RTD ③ Voltage / Current *			① Relay contact ② DC Current			Relay contact				
	Measured input			Output 1			Output 2			Power supply	

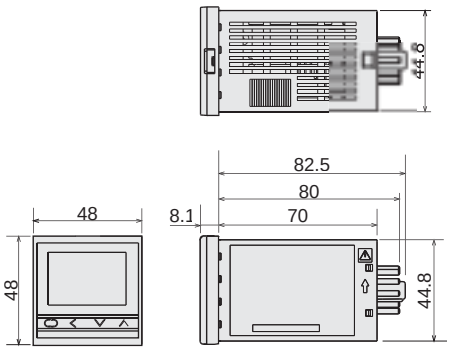
*A 250Ω resistor is externally connected at the input terminals.

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
Optional cable with connector is available soon.
1. With terminating resistor and no connector on open end. (Length : 1m)
Model : W-BO-01-1000
2. Without terminating resistor and no connector on open end. (Length :1m)
(Can be used for contact input.) Model : W-BO-02-1000

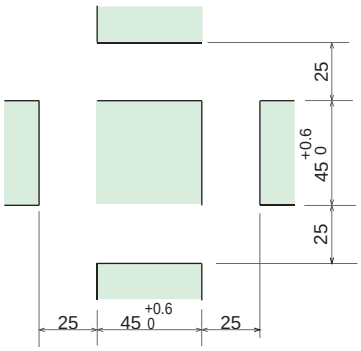
1	2	3
SG	T/R(A)	T/R(B)
	RS-485	
Communications		

1	2	3
	DI1	DI2
DI1 : Limit output reset DI2 : Interlock reset		
Contact inputs		

External Dimensions



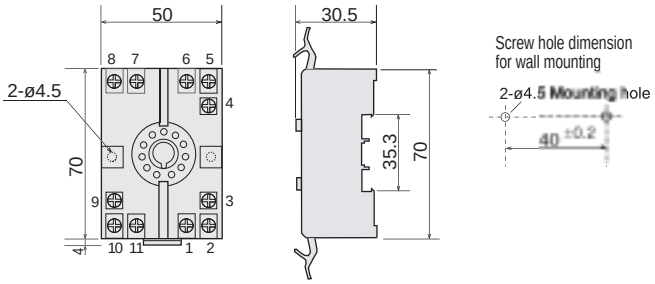
Panel Cutout



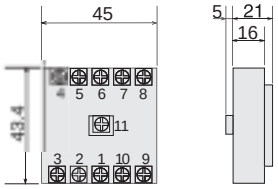
- Panel thickness must be between 1-10mm.
- Mounting frame is optional.

Socket (Optional) External Dimensions

DIN rail mounting socket type
Model : ATC180041 (Matsushita Denko product)



Rear terminal socket type
Model : AT78051 (Matsushita Denko product)



Safety Warning	Caution for imitated products
•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.	As products imitating our product now appear on the market, be careful that you don't purchase these imitated products. We will not warrant such products nor bear the responsibility for any damage and/or accident caused by their use.

RKC INSTRUMENT

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