

SA100 SOCKET MOUNTING TYPE DIGITAL TEMPERATURE CONTROLLER

SA100

SOCKET MOUNTING TYPE
DIGITAL TEMPERATURE
CONTROLLER



Actual size



RKC® RKC INSTRUMENT INC.

SA100



Simple Mounting on DIN Rail

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

DIN rail mounting socket
(Optional)



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



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

Corresponding to Various Applications

Two points of output can be used as control, alarm or analog retransmission. The SA100 corresponds to various applications such as temperature controller and overheat protection unit etc.

- As a temperature controller

1. Temperature alarm controller



OUT1 → Control output
OUT2 → Alarm output

2. Temperature retransmitting controller



OUT1 → Retransmission output
OUT2 → Control output

3. Heat/Cool temperature controller



OUT1 → Heating output
OUT2 → Cooling output

- As a overheat protection or alarm unit

1. Overheat protection unit



OUT1 → Control output
* Setting to ON/OFF action by specifying direct action.

2. Overheat protection with transmitting function



OUT1 → Retransmission output
OUT2 → Control output
* Setting to ON/OFF action by specifying direct action.

3. Alarm unit



OUT1 → Alarm output
OUT2 → Alarm output

- The change of display for PV/SV can be configurable. For the details of it, contact our sales office.



PV (measured value)
display only



SV (set value)
display only

The SV is displayed on PV display.
Parameters are displayed on SV display.

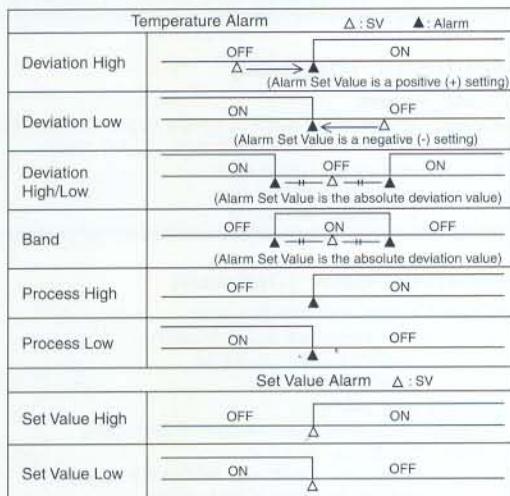
Alarms

(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
- Loop Break Alarm



Analog Retransmission Output

(Optional)

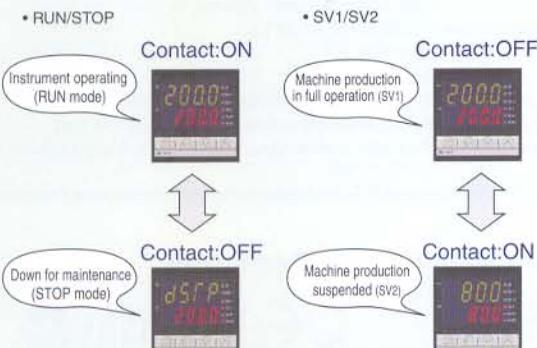
An analog output is available so that the process value can be retransmitted as an analog signal to a remote instrument such as a recorder or data-logging equipment.



Digital contact input for external switching

(Optional)

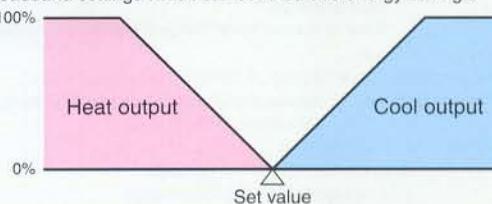
An optional digital contact input is available for RUN/STOP and SV1/SV2 switching. (RUN/STOP switching can also be completed at the front key panel.) This function can be used with the output from a timer, PLC, etc. When the communication feature is selected, the external contact input is not available.



Heat/Cool control

(Optional)

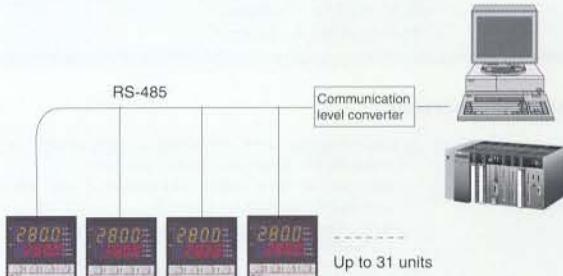
The Heat/Cool PID controller has heat and cool outputs for use where process-generated heat exists. The controller allows the input of overlap or deadband settings which can contribute to energy savings.



Digital communications MODBUS/ANSI protocol

(Optional)

The SA100 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.



Two types of PID constants tuning method

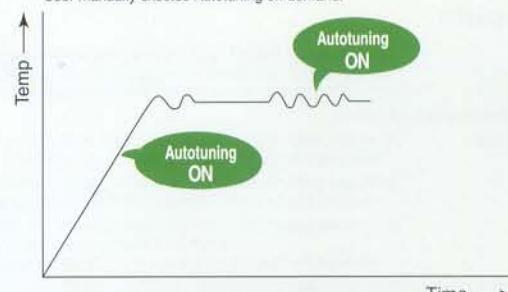
You have a choice of two types of PID constants tuning method. They are Self-tuning and Autotuning. The Self-tuning always monitors control state. When the control begins to be turbulent, it automatically changes or sets PID constants for the optimum control. The Autotuning changes or sets PID constants automatically for the optimum control at your command. The Self-tuning function is not available for Heat/Cool control type.

- Self-tuning
The SA100 automatically determines PID constant.

At start-up or set value change



- Autotuning
User manually executes Autotuning on demand.



SA100 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 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. 0.2μV/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 •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 input)
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 : ±(1% of reading + 1digit) or ±2°C (4°F) (Within either range, whichever is larger) •Accuracy is not guaranteed between 0 and 399°C (0 and 799°F) for type R, S and B. •Accuracy is not guaranteed less than -100.0°C (-158.0°F) for type T and U.
b) RTD :	±(0.3% of reading + 1digit) or ±0.8°C (1.6°F) (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

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°C(F) (Temperature input) 0.2% (Voltage, current input)
b) Heat/Cool PID control (with autotuning function) Air cooling and water cooling type are available.	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, 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 : 250V AC 3A (resistive load), Form C contact •Electrical life : 300,000 cycles or more (resistive load) b) Voltage pulse output : 0/12V DC (Load resistance : more than 600Ω) •Measurement terminals and output terminals are not isolated. c) 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
Setting range :	Loop break alarm (LBA) •Hold action can be added to deviation and process type. •When input is abnormal, the alarm output is ON.
Differential gap :	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.

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 : 500kΩ or more b) CLOSE : 10Ω 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.)

Retransmission (Optional)

Retransmission output is allocated to OUT1.	
Type :	Process value, Set value, Deviation, Manipulated value
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.

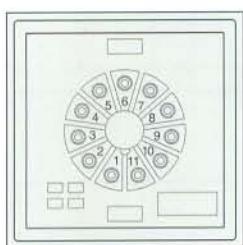
General Specifications

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. If power failure of more than 20 ms occurs, controller will restart.
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°C (32 to 122°F)
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



SA100 Rear Layout and Configuration



PIN	1	2	3	4	5	6	7	8	9	10	11
Contents	+ B B A +	-	(1) RTD (2)	NO C NC (1) Relay contact (2)	(1) Voltage pulse (3)	(1) NO C NC (1) Relay contact (2)	(1) Voltage pulse (3)	(1) NO C NC (1) Relay contact (2)	(1) Voltage pulse (3)	100 to 240V AC N	24V AC/DC
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

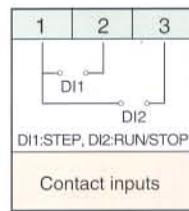
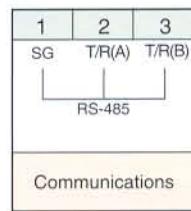
Optional cable with connector is available soon.

1. With terminating resistor and no connector on open end. (Length : 1m)

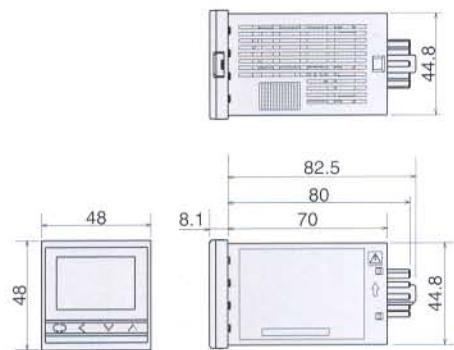
Model : W-BO-01-1000

2. Without terminating resistor and no connector on open end. (Length : 1m)

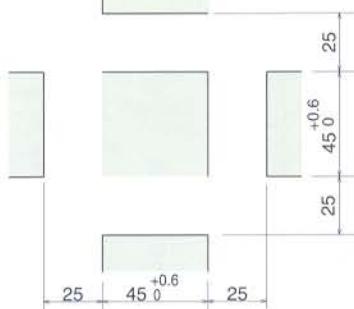
(Can be used for contact input.) Model : W-BO-02-1000



External Dimensions



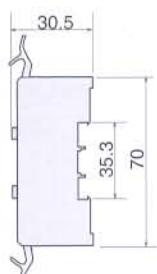
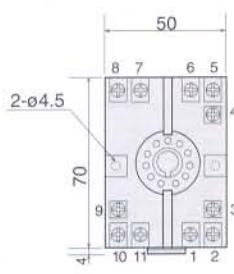
Panel Cutout



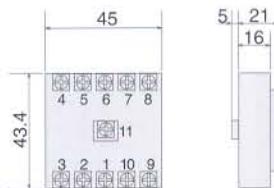
- Panel thickness must be between 1-10mm.
- Mounting frame is optional.

Socket (Optional) External Dimensions

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



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



SA100 Model and Suffix Code

Specifications		Model and Suffix Code									
Size	48 x 48 mm (1/16 DIN) size, socket mounting type controller	SA100	□	□	□	□ - □	□ - □ * □	□ - □	□ / □	□ / □	Y
Control method	PID control with AT (reverse action) PID control with AT (direct action) Heat/Cool PID control with AT (water cooling) Heat/Cool PID control with AT (air cooling)		F	D	W	A					
Input and Range	See Input and Range Code Table		□	□	□						
OUT 1 (Control, alarm or retransmission output)	Relay contact output Voltage pulse output DC current output : 0 to 20mA DC current output : 4 to 20mA		M	V	7	8					
OUT 2 (Control or alarm output)	No output Relay contact output Voltage pulse output		N	M	V						
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	Not supplied		N	5	6	D					
Contact input	Digital communications : RS-485 (RKC standard) Digital communications : RS-485 (MODBUS) External contact input										
Waterproof/Dustproof	Not supplied Waterproof/Dustproof (Released soon)		N	1							
Output allocation code	Standard output 1 See Output Allocation Code Table								No code	□	□
Instrument version	Version symbol										Y

1 When standard output is selected with control method F or D. Out 1 will always be the control output and Out 2 will either be Alarm 1 or unused. Alarm 1 or OR logic output of Alarm 1 and Alarm 2. When Standard output is automatically with control method W or A. Out 1 will become heat-side control output and Out 2 will be cool-side control output.

Input and Range Code Table

Thermocouple

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

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

RTD

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

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	7 : 01	0.0 to 100.0%
4 to 20mA	8 : 01	0.0 to 100.0%

1 Accuracy is not guaranteed between 0 and 399°C (0 and 799°F) for type R, S and B.

2 Accuracy is not guaranteed less than -100.0°C (-158.0°F) for type T and U.

3 For DC current input, connect a 250 Ω resistor to the input terminals.

SA100 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		

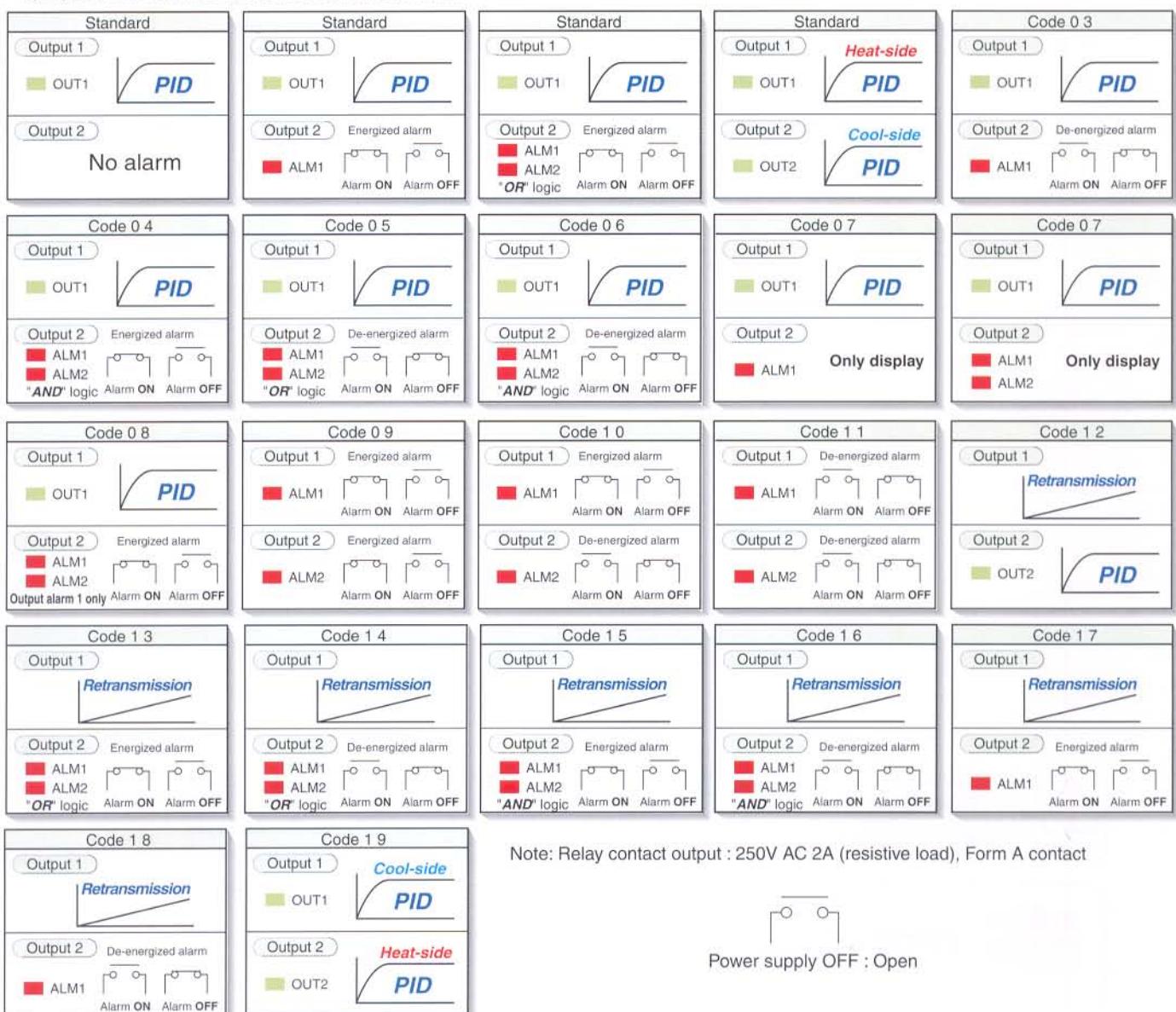
¹ Loop break alarm is not available with Heat/Cool PID control type. Loop break alarm is not available with Alarm 2.

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 2	Retransmission + PID control	Retransmission output	Control output
1 3	Retransmission + Alarm 1, 2	2 Retransmission output	OR logic output of Alarm 1 and Alarm 2 (Energized)
1 4	Retransmission + Alarm 1, 2	2 Retransmission output	OR logic output of Alarm 1 and Alarm 2 (De-energized)
1 5	Retransmission + Alarm 1, 2	2 Retransmission output	AND logic output of Alarm 1 and Alarm 2 (Energized)
1 6	Retransmission + Alarm 1, 2	2 Retransmission output	AND logic output of Alarm 1 and Alarm 2 (De-energized)
1 7	Retransmission + Alarm 1	2 Retransmission output	Alarm 1 output (Energized)
1 8	Retransmission + Alarm 1	2 Retransmission output	Alarm 1 output (De-energized)
1 9	Heat/Cool PID control	Cool output (DC current output)	Heat output (Relay contact or Voltage pulse output)

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 retransmission or alarms.



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



Power supply OFF : Open

Accessory

Socket (Matsushita Denko product)

Name	Model code	Name	Model code
DIN rail mounting sockets	ATC180041	Mounting frame	KCA100-59
Rear terminal socket	AT78051	Shunt resistor for DC current input	KD100-55



- Safety Warning
- 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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