DUREX INDUSTRIES

closing the loop on thermal solutions

SA 200

Digital Temperature Controllers

www.durexindustries.com

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 Durex protocols

Large, bright LCD displays

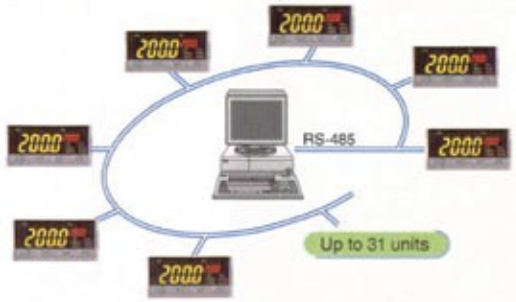
Panel cutout will be different from that of 1/16 DIN unit.

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 6units)

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.

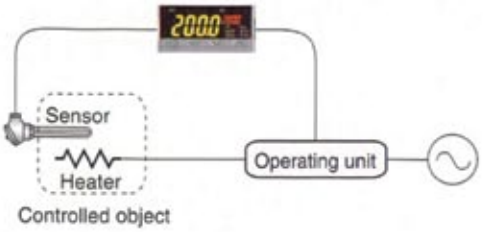
Control loop break alarm and temperature alarms

(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

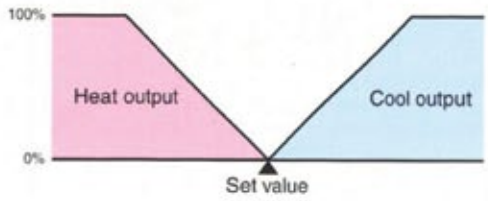
(Optional)

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)

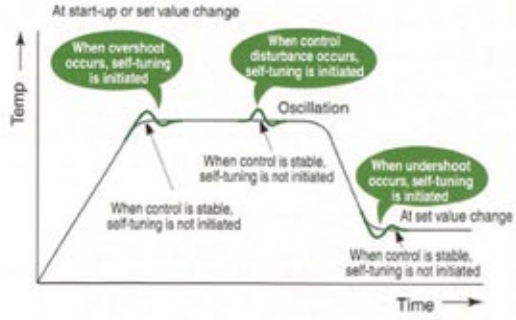
The heat/cool PID controller has heat and cool outputs for use where process-generated heat exists. The controller allows the input of overlap or deadband settings which can contribute to energy savings.



Durex self-tuning
Advanced algorithm for optimum control

Durex 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 Durex 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)
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
•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 : ±(0.3% 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.

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 : 150,000 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.

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°C (°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 : 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.)

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.

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°C (32 to 122°F)

Ambient humidity : 45 to 85% RH

Weight : Approx. 110g

External dimensions : 48(W) X 24(H) X 100(D)mm (1/32 DIN)

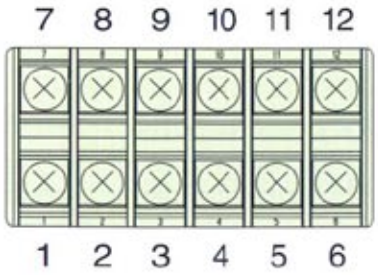
Operating environment : Free from corrosive and flammable gas and dust.

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

SA200 Rear Terminal Layout and Configuration



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

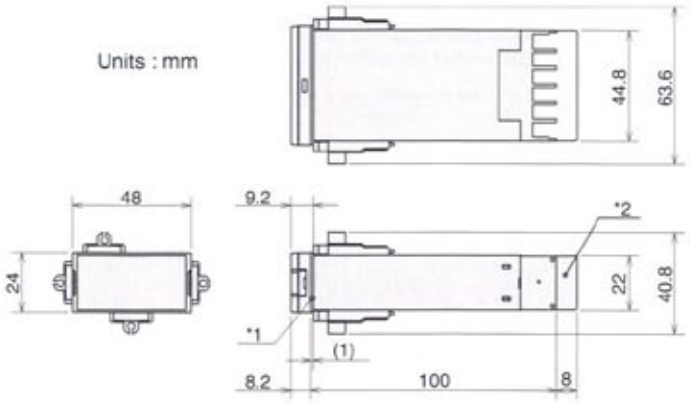
No.	7	8	9	10	11	12
Contents		① ② ③		SG	T/R(A)	T/R(B)
				RS-485		
				DI1		
					DI2	
	① Thermocouple ② RTD ③ Voltage / Current *					
	Measured input			Communications / Contact inputs		

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

Units : mm



*1 For waterproof and dustproof models, a rubber packing is added.

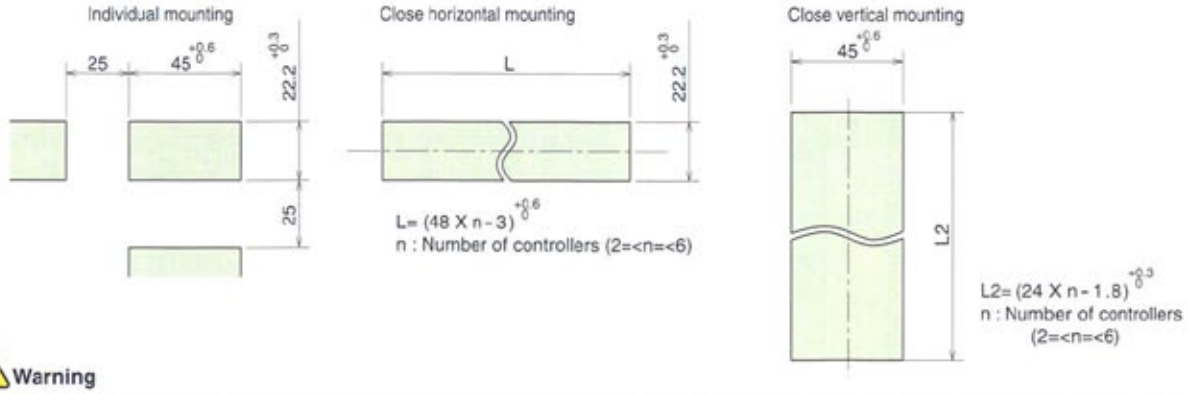
*2 Terminal cover is optional.

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 Model and Suffix Code

Specifications		Model and Suffix Code
Size	48 x 24 mm (1/32 DIN) size	SA200 □ □ □ □ - □ □ - □ * □ □ - □ □ / □ / □ □ / Y
Control method	PID control with AT (reverse action)	F
	PID control with AT (direct action)	D
	Heat/cool PID control with AT (water cooling)	W
	Heat/cool PID control with AT (air cooling)	A
Input and Range	See Input and Range Code Table	□ □ □
OUT 1 (Control or alarm output)	Relay contact output	M
	Voltage pulse output	V
OUT 2 (Control or alarm output)	No output	N
	Relay contact output	M
	Voltage pulse output	V
Power supply voltage	24V AC/DC	3
	100 to 240V AC	4
Alarm 1	No alarm	N
	See Alarm Code Table	□
Alarm 2	No alarm	N
	See Alarm Code Table	□
Communication Contact input	Not supplied	N
	Digital communications : RS-485 (RKC standard)	5
	Digital communications : RS-485 (MODBUS)	6
	External contact input	D
Waterproof and dustproof	Not supplied	N
	Waterproof and dustproof	1
Body color	White	N
	Black	A
Output allocation code	Standard output *1	No code
	See Output Allocation Code Table	□ □
Instrument version	Version symbol	Y

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

Input and Range Code Table

Thermocouple input

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
	K : A3	0 to 2502°F
	K : A9	20 to 70°F
	K : A4	0.0 to 800.0°F
	K : B2	-199.9 to 999.9°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
	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
*1 R (JIS/IEC)	R : 01	0 to 1600°C
	R : 02	0 to 1769°C
	R : 04	0 to 1350°C
	R : A1	0 to 3200°F
	R : A2	0 to 3216°F

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
*1 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
	N : A5	0.0 to 999.9°F
*2 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
	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
W5Re/W26Re (ASTM)	W : 01	0 to 2000°C
	W : 02	0 to 2320°C
	W : A1	0 to 4000°F
PLII (NBS)	A : 01	0 to 1300°C
	A : 02	0 to 1390°C
	A : 03	0 to 1200°C
	A : A1	0 to 2400°F
	A : A2	0 to 2534°F
*2 U (DIN)	U : 01	-199.9 to 600.0°C
	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

*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.

RTD input

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
	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
JPt100 (JIS)	P : 01	-199.9 to 649.0°C
	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

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%

Note : For DC current input, connect a 250 Ω resister to the input terminals.

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.

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

Power supply OFF : Open

Accessory

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

*Modbus is a registered trademark of Schneider Electric

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.

About Durex Industries

Founded in 1980 by Ed Hinz, CEO & President, Durex Industries is a privately owned thermal solutions company specializing in electric heaters, temperature sensors, and temperature controls. Durex's 145,000 sq. ft. business, engineering, and manufacturing campus is conveniently located 25 miles northwest of Chicago in Cary, Illinois.

Since our founding, providing customers with reliable products and excellence in all aspects of the business have been the hallmark of Durex and the basis of our name. "Dur" means durable and "ex" means excellence. Durex Industries, an ISO 9001/2008 registered company, supplies engineering and manufactures thermal solutions for most global industrial equipment markets, including food service, life sciences, packaging, photovoltaic, plastics, process, and semiconductor. Our focus on lean design, manufacturing, and business systems continues to provide customers with the best design and product value in our industry.

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DUREX INDUSTRIES

closing the loop on thermal solutions