

Resistive Position Sensors

List of Varieties

Type	Rotary Type					Magnetic Rotary Type
Series	RDC40	RDC50	RDC90	RDC80	RD6R1A	RDCC0
Photo						
Direction of lever	Horizontal	Vertical Horizontal	Vertical			
Effective electrical angle (°)	5,400 (15 rotations)	333.3	80,260	340 (1-phase) 360 (2-phase)	320	30
Linearity guarantee range (°)	4,680 (13 rotations)	320	60,244	330 (1-phase) 360 (2-phase)	310	±15
Travel	—	—	—	—	—	—
Operating temperature range	−30°C to +80°C	−40°C to +120°C			−40°C to +85°C	0°C to +50°C
Operating life	100,000 cycles	1,000,000 cycles	10,000,000 cycles	20,000 cycles	500,000 cycles	10,000,000 cycles
Available for automotive use	●	●	●	●	●	—
Life cycle (availability)						
Mechanical performance	Operating force	—	—	—	—	—
	Rotational torque	1.96mN·m max.	2mN·m max.		10mN·m max.	100mN·m
Electrical performance	Total resistance tolerance	±30%			±20%	—
	Linearity (%)	±1	±2	±3	±2 (320°)	±2
	Rated voltage (V DC)	5				
Environmental performance	Cold	−30°C 240h	−40°C 168h			−40°C 240h
	Dry heat	80°C 240h	120°C 168h		85°C 168h	85°C 240h
	Damp heat	60°C, 90 to 95%RH 240h	60°C, 90 to 95%RH 96h		80°C, 90 to 95%RH 96h	60°C, 90 to 95%RH 240h
Terminal style	Connector	Insertion / Reflow	Reflow		Connector	
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Note

● Indicates applicability to all products in the series.

Resistive Position Sensors

List of Varieties

Type	Linear Type		
Series	RDC1010	RDC10	※ RD7
Photo			
Direction of lever	Vertical		Vertical Horizontal
Effective electrical angle (°)	—	—	—
Linearity guarantee range (°)	—	—	—
Travel	10mm	14mm 22mm 32mm 47mm	8mm 12mm 8mm 9mm 12mm
Operating temperature range	−30°C to +85°C		−40°C to +105°C
Operating life	50,000 cycles	200,000 cycles	100,000 cycles
Available for automotive use	—	●	●
Life cycle (availability)			
Mechanical performance	Operating force	0.25N max.	
	Rotational torque	—	—
Electrical performance	Total resistance tolerance	±30%	
	Linearity (%)	±0.5	
	Rated voltage (V DC)	5	
Environmental performance	Cold	−40°C 240h	
	Dry heat	80°C 240h	90°C 240h
	Damp heat	60°C, 90 to 95%RH 240h	
Terminal style	Insertion	Lead terminal/Insertion	Insertion
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Notes

- ※ The RD7 series are used to detect vehicle headlight angles.
- Indicates applicability to all products in the series.



■ Typical Specifications



Items	Specifications		
	RDC40	RDC50	RDC90
Rated voltage	5V DC		
Operating life	100,000 cycles	1,000,000 cycles	10,000,000 cycles
Total resistance	10kΩ		
Operating temperature range	−30°C to +80°C	−40°C to +120°C	

■ Product Line

Mounting method	Linearity guarantee range	Linearity	Hollow shaft variation	Operating life (cycles)	Minimum order unit (pcs.)		Model No.	Drawing No.
					Japan	Export		
Connector type	13 rotations	±1%	—	100,000	770	770	RDC401D07A	1
Horizontal type	320°	±2%	φ3.5 dia	1,000,000	1,500	3,000	RDC501051A	2
			φ3.5 dia with radius				RDC501052A	3
			φ3.5 dia		1,600	1,600	RDC502012A	4
Reflow type		±3%	φ3.5 dia with radius	3,900	3,900		RDC503051A	5
			φ4 dia		3,600	3,600	RDC503052A	6
Reflow type (Low-profile)							RDC506018A	7
Reflow type (Long-life)	60°	±3%	φ3.5 dia	10,000,000	1,960	1,960	RDC9010006	8
	244°						RDC9010007	

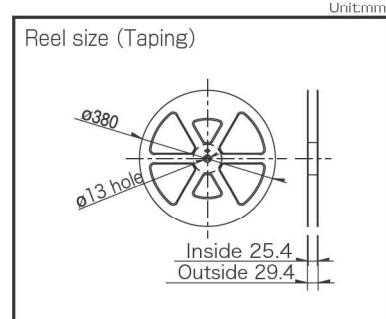
Note

Other varieties are also available. Please inquire.

■ Packing Specifications

Tray / Taping

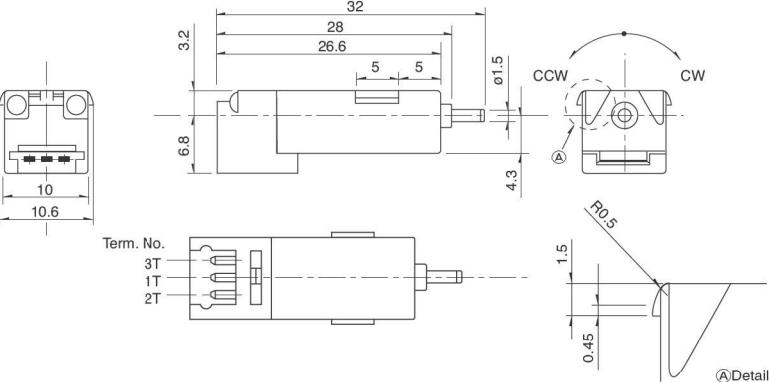
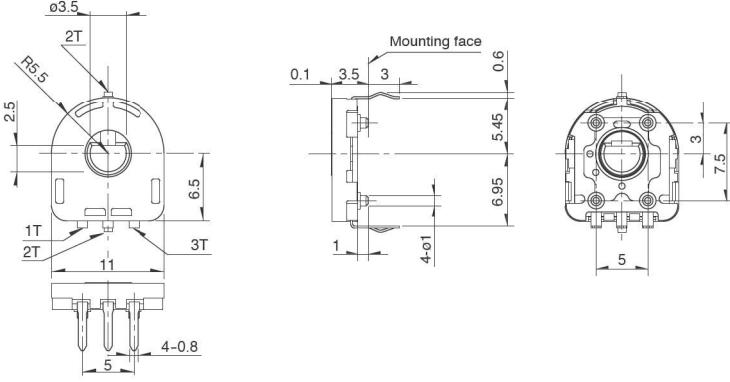
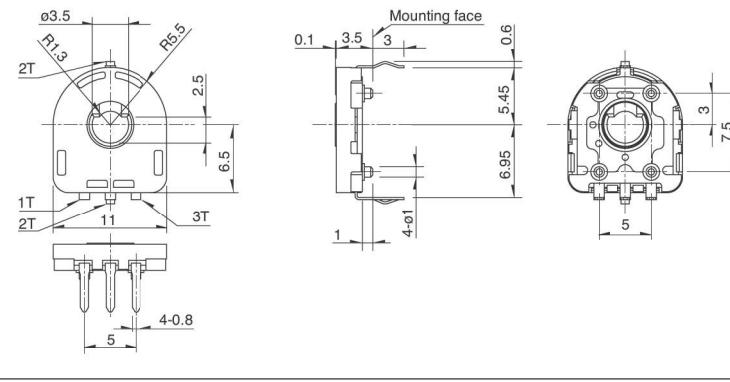
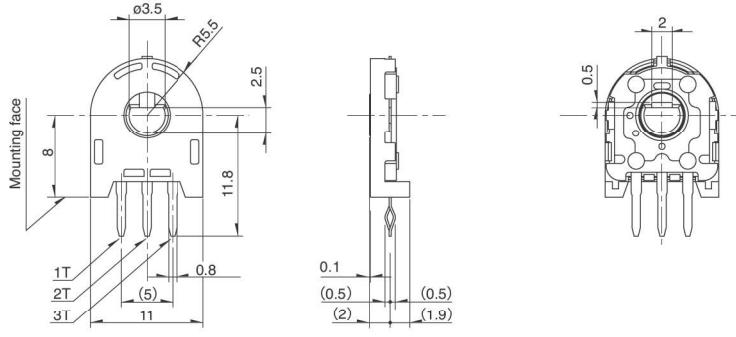
Series	Packing Specifications	Number of packages (pcs.)		Tape width (mm)	Export package measurements (mm)
		1 case /Japan	1 case /export packing		
RDC40	Tray	770	770	—	526×370×191
RDC501		1,500	3,000		370×280×92
RDC502		1,600	1,600		
RDC503	Taping	3,900	3,900	24	407×415×135
RDC506		3,600	3,600		
RDC90	Tray	1,960	1,960	—	240×300×270



Refer to P.488 for product specifications.
Refer to P.489 for soldering conditions.

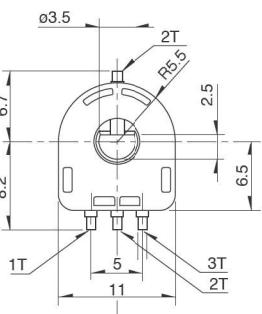
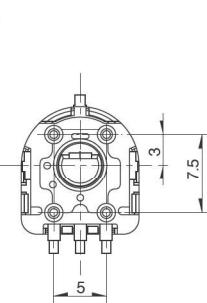
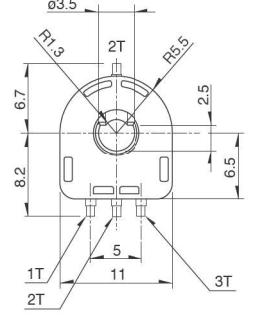
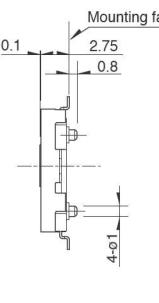
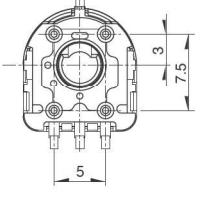
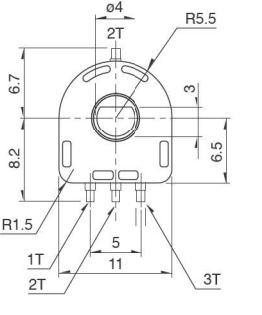
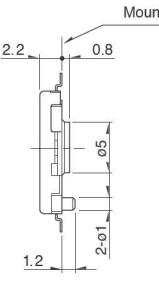
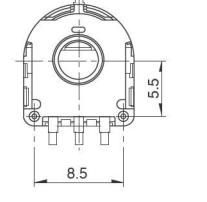
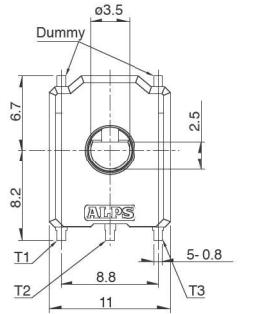
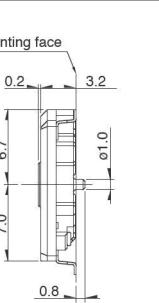
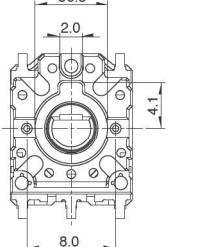
■ Dimensions

Unit:mm

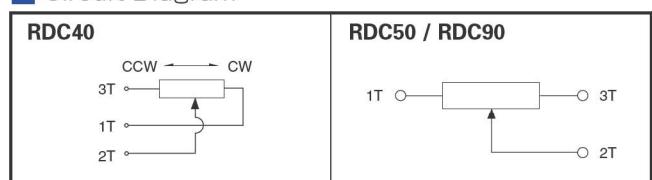
No.	Photo	Style
1		 <p>RDC40 (Multiple turns type)</p> <p>Term. No. 3T 1T 2T</p> <p>CCW CW</p> <p>④ Detail</p>
2		
3		
4		

Dimensions

Unit:mm

No.	Photo	Style
5	RDC503 (Reflow type) 	  
6	RDC503 (Reflow type, $\phi 3.5$ dia with radius) 	  
7	RDC506 (Reflow type, low-profile) 	  
8	RDC90 (Reflow type, Long-life) 	  

Circuit Diagram



Hollow-shaft type that enables output covering the whole 360-degree angle due to adoption of 2-phase output



■ Typical Specifications

Items	Specifications
Rated Voltage	5V DC
Operating life	20,000 cycles
Total resistance	10kΩ
Operating temperature range	-40°C to +120°C

■ Product Line

Mounting method	Linearity guarantee range	Linearity	Hollow shaft variation	Minimum order unit (pcs.)		Model No.
				Japan	Export	
Reflow type	330° (1-phase) 360° (2-phase)	±3%	φ4.05	1,600	1,600	RDC803101A

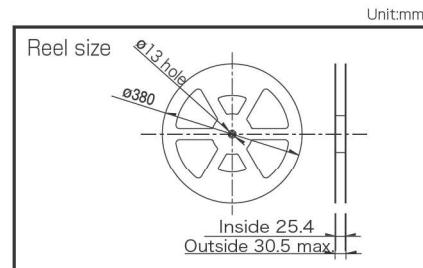
Note

Other varieties are also available. Please inquire.

■ Packing Specifications

Taping

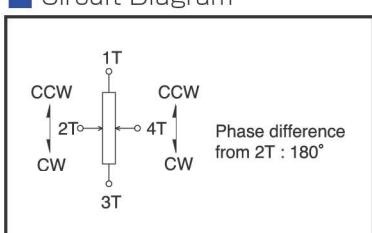
Number of packages (pcs.)			Tape width (mm)	Export package measurements (mm)	Model No.
1 reel	1 case /Japan	1 case /export packing			
800	1,600	1,600	24	401x401x110	RDC803101A



■ Dimensions

Style	PC board mounting hole dimensions (Viewed from mounting side)
	<p>Shaded areas are solder lands.</p>

■ Circuit Diagram



Refer to P.488 for product specifications.
Refer to P.489 for soldering conditions.

The high accuracy space saving design contributes to reduced weight and size of sets



■ Typical Specifications

Items	Specifications
Rated Voltage	5V DC
Operating life	50,000 cycles (RDC1010) 200,000 cycles
Total resistance	10kΩ
Operating temperature range	−30°C to +85°C

■ Product Line

Travel (mm)	Linearity	Length of lever (mm)	Length of terminal (mm)	Minimum order unit (pcs.)		Model No.	Drawing No.	
				Japan	Export			
10	±0.5%	1.3	2	980	2,940	RDC1010A12	1	
14				2,400	4,800	RDC1014A09	2	
22		4.5		2,100	4,200	RDC1022A05		
32				900	1,800	RDC10320RB		
47		4.4		1,000	2,000	RDC1047A03		

Notes

1. RDC1014, RDC1022, RDC1032 and RDC1047 Series can be for automotive use.
2. RDC1014, RDC1022, RDC1032 and RDC1047 Series are available in different varieties to the above.
See Product Varieties (P.485).

■ Packing Specifications

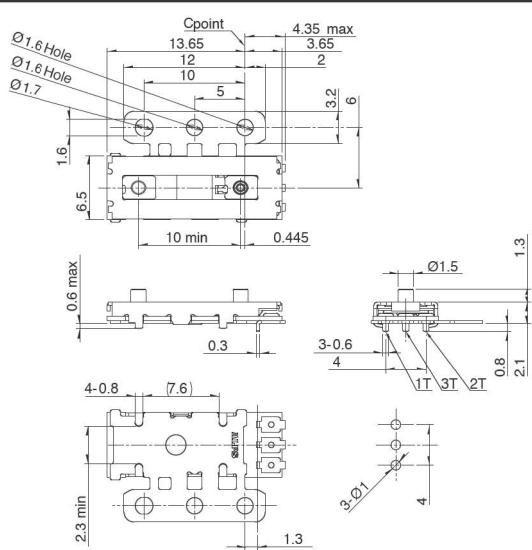
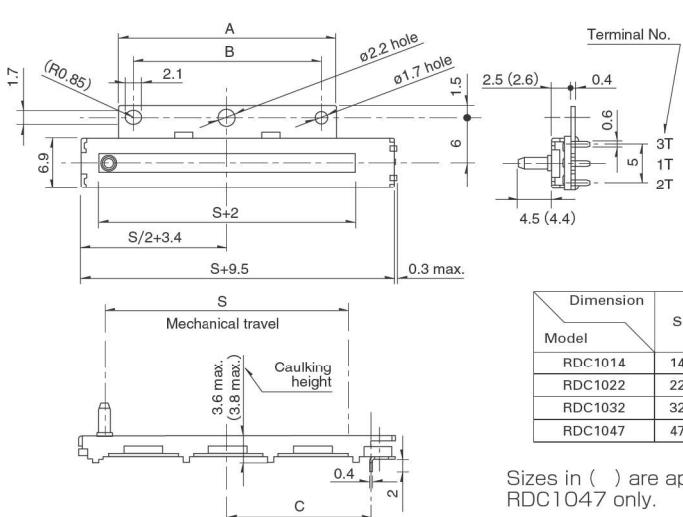
Tray

Model No.	Number of packages (pcs.)		Export package measurements (mm)
	1 case /Japan	1 case /export packing	
RDC1010	980	2,940	360×270×230
RDC1014	2,400	4,800	374×508×272
RDC1022	2,100	4,200	374×508×302
RDC1032	900	1,800	540×360×205
RDC1047	1,000	2,000	374×508×272

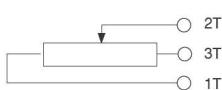
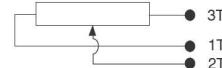
Refer to P.485 for product varieties.
Refer to P.488 for product specifications.
Refer to P.489 for soldering conditions.

Dimensions

Unit:mm

No.	Photo	Style																														
1																																
2		 <table border="1"> <thead> <tr> <th>Dimension</th> <th>S</th> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>Model</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>RDC1014</td> <td>14</td> <td>19</td> <td>15</td> <td>10</td> </tr> <tr> <td>RDC1022</td> <td>22</td> <td>19</td> <td>15</td> <td>14</td> </tr> <tr> <td>RDC1032</td> <td>32</td> <td>29</td> <td>25</td> <td>19</td> </tr> <tr> <td>RDC1047</td> <td>47</td> <td>37</td> <td>33</td> <td>26.5</td> </tr> </tbody> </table> <p>Sizes in () are applicable to RDC1047 only.</p>	Dimension	S	A	B	C	Model					RDC1014	14	19	15	10	RDC1022	22	19	15	14	RDC1032	32	29	25	19	RDC1047	47	37	33	26.5
Dimension	S	A	B	C																												
Model																																
RDC1014	14	19	15	10																												
RDC1022	22	19	15	14																												
RDC1032	32	29	25	19																												
RDC1047	47	37	33	26.5																												

Circuit Diagram

RDC1010	RDC10
	

Linear Type / Product Varieties

In addition to the products listed, we can accommodate the follow specifications.

Applicable to **RDC1014, RDC1022, RDC1032, RDC1047** only

■ Lever Variety

* Sizes in () are applicable to RDC1047 only

Unit:mm

Length	4.5 (4.4)	3.7 (3.6)	3 (2.9)	2.5 (2.4)
Dimensions				

■ Terminal Variety

For printed wiring

Unit:mm

Dimensions				
Length L_2	1.5	2	4	5.5

For lead wiring

Unit:mm

Dimensions				
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Note

Shows the specification recommended by Alps.

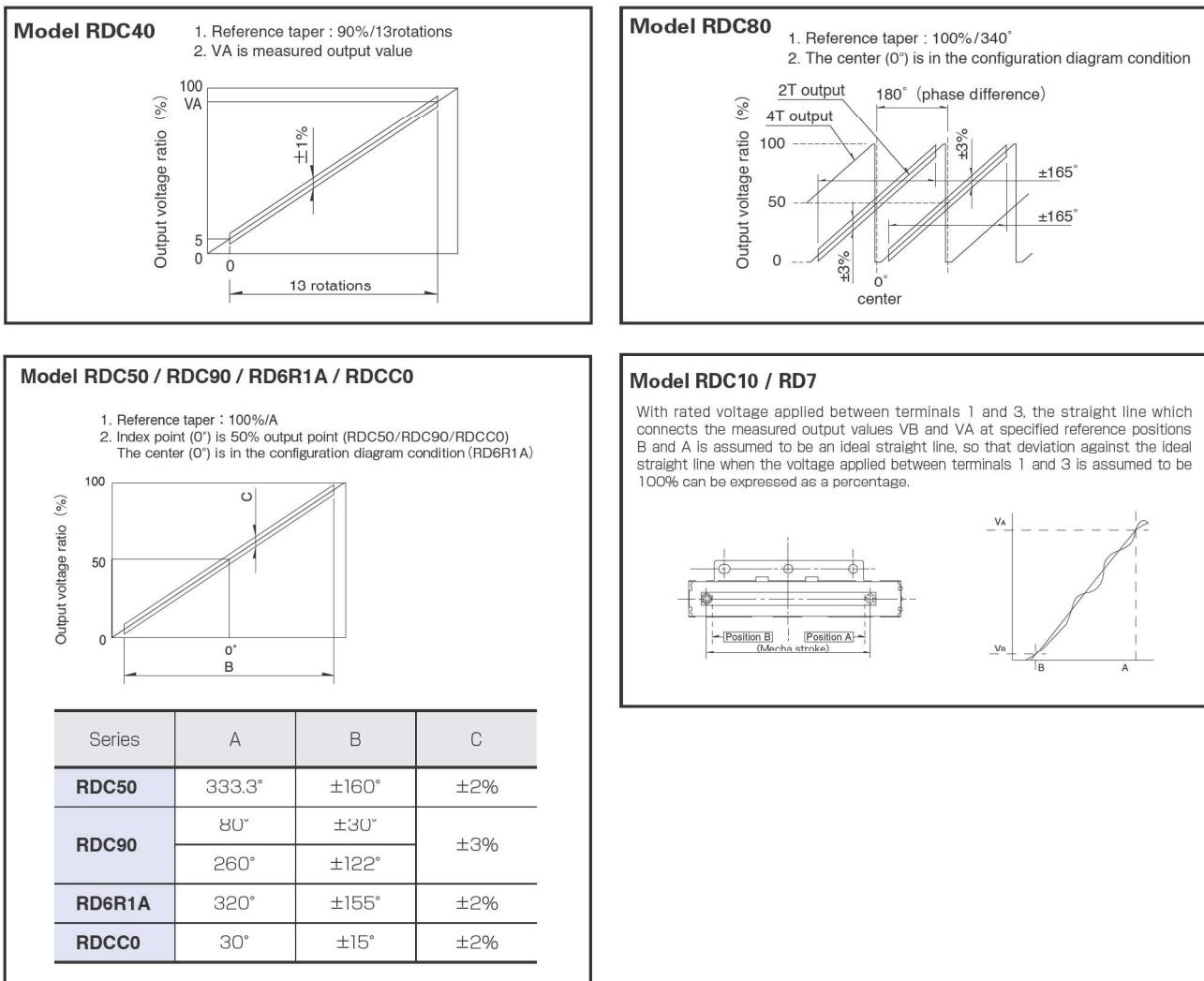
Position Sensors

Rotary Type

Linear Type

Resistive Position Sensors / Product Specifications

Method for Regulating the Linearity



Resistive Position Sensors / Measurement and Test Methods

Resistive Position Sensor

[Total Resistance]

The total resistance, with the shaft (lever) placed at the end of terminal 1 or 3, shall be determined by measuring the resistance between the resistor terminals 1 and 3 unless otherwise specified.

[Rating Voltage]

The rating voltage corresponding to the rated power shall be determined by the following equation. When the resulting rated voltage exceeds the maximum operating voltage of a specific resistor, the maximum operating voltage shall be taken as the rated voltage.

$$E = \sqrt{P \cdot R}$$

E : Rated voltage (V)
P : Rated power (W)
R : Total nominal resistance (Ω)

Resistive Position Sensors / Soldering Conditions

■ Reference for Manual Soldering

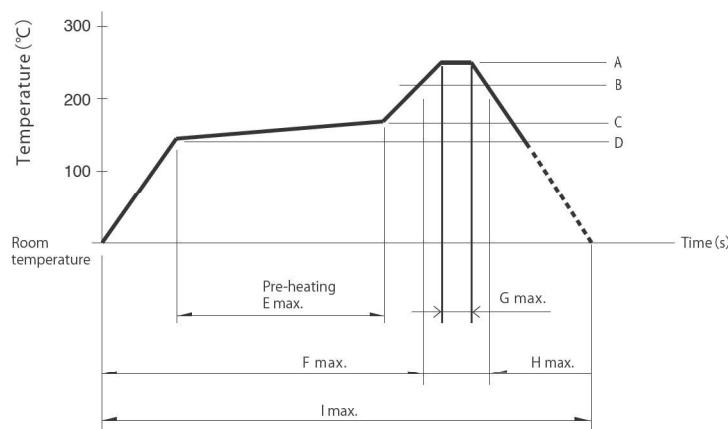
Series	Tip temperature	Soldering time
RDC50, RDC90, RDC80	350±5°C	3±1s
RDC10, RD7	350°C max.	3s max.

■ Reference for Dip Soldering

Series	Preheating		Dip soldering		No. of solders
	Soldering surface temperature	Heating time	Soldering temperature	Soldering time	
RDC501, RDC502	100 to 150°C	1minute max.	260±5°C	10±1s	1 time
RD7	100°C max.	1minute max.	260°C max.	5s max.	1 time

■ Example of Reflow Soldering Condition

1. Cleaning Cleaning should not be attempted.
2. Type of solder to be used Use cream solder that contains 10 to 15 %wt flux.
3. Number of solder applications - apply solder only once
4. Recommended reflow conditions



Series	A	B	C	D	E	F	G	H	I	No. of reflows
RDC503 RDC506	250°C	230°C	180°C	150°C	2min.	—	5s	40s	4min.	1 time
RDC90	255°C	230°C	—	—	—	2min.	10s	1min.	4min.	1 time
RDC80	250°C	—	180°C	150°C	90±30s	—	10±1s	—	—	1 time

Notes

1. When using an infrared reflow oven, solder may not always be applied as intended. Be sure to use a hot air reflow oven or a type that uses infrared rays in combination with hot air.
2. The temperatures given above are the maximum temperatures at the terminals of the sensor when employing a hot air reflow method. The temperature of the PC board and the surface temperature of the sensor may vary greatly depending on the PC board material, its size and thickness. Ensure that the surface temperature of the sensor does not rise to 250°C or greater.
3. Conditions vary to some extent depending on the type of reflow bath used. Be sure to give due consideration to this prior to use.

Resistive Position Sensors / Cautions

[Use of Chemicals]

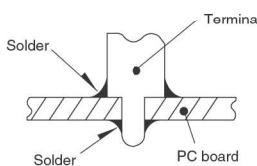
Synthetic resins such as polycarbonate are used in the making of the sensors. Special care must therefore be exercised to prevent exposure of the resistor to heavy atmosphere of ammonia, amins, alkali solutions, aromatic hydrocarbons, ketons, esters, halogenous hydrocarbons or any similar substance known to affect the reliability of the product.

[Measures to Deal with Noise Problems]

While data is being received from the sensor, on rare occasions, penetrating external noise may cause interference with the outputs. To minimize the probability of this phenomenon pay attention to the following when you program the relevant software: receiving of data should always be repeated a number of times to ensure that you obtain a mean value. Have the system determine when/how to invalidate any data received in error. When doubt occurs let the system receive the subject data again and reconfirm that you have eliminated the anomaly.

[Soldering]

Avoid wiring and soldering that causes the solder to seep through to the top of the PC board (as illustrated). This can lead to a contact failure in the terminal section. If solder seepage is unavoidable, please consult with us.

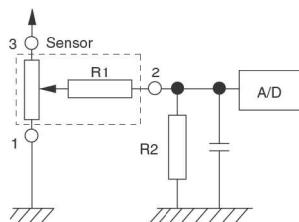


Analog Output Contact Type

[Connection Impedance]

The contact resistance (R1) in this sensor is set to a high level because it is manufactured to use the output terminals directly connected to the A/D port of the microprocessor.

Consequently, set the connection impedance (R2) to greater than 1M ohm to eliminate the influence of the contact resistance (R1).



[Dew Condensation]

Avoid using the sensor where dew or water vapor might be caused to condense on the surface of the resistor-deterioration of insulation or shorting may occur.