


















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℃ to +80℃	−40℃ to +120℃			−40℃ to +85℃	0℃ to +50℃
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	5mN·m max.
Electrical performance	Total resistance tolerance	±30%				±20%	—
	Linearity (%)	±1	±2	±3		±2 (320°)	±2
	Rated voltage (V DC)	5					
Environmental performance	Cold	−30℃ 240h	−40℃ 168h				−40℃ 240h
	Dry heat	80℃ 240h	120℃ 168h			85℃ 168h	85℃ 240h
	Damp heat	60℃, 90 to 95%RH 240h	60℃, 90 to 95%RH 96h			80℃, 90 to 95%RH 96h	60℃, 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.		2N max.
	Rotational torque	—	—	—
Electrical performance	Total resistance tolerance	±30%		±20%
	Linearity (%)	±0.5		±1
	Rated voltage (V DC)	5		12
Environmental performance	Cold	-40°C 240h		-40°C 96h
	Dry heat	80°C 240h	90°C 240h	105°C 96h
	Damp heat	60°C, 90 to 95%RH 240h		40°C, 90 to 95%RH 96h
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		3.3kΩ (RDC9010006) 10kΩ (RDC9010007)
Operating temperature range	-30℃ to +80℃		-40℃ to +120℃

■ 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
Vertical type			φ3.5 dia		1,600	1,600	RDC502012A	4
Reflow type			φ3.5 dia with radius		3,900	3,900	RDC503051A	5
							RDC503052A	6
Reflow type (Low-profile)			φ4 dia		3,600	3,600	RDC506018A	7
Reflow type (Long-life)	60°	±3%	φ3.5 dia	10,000,000	1,960	1,960	RDC9010006	8
	244°						RDC9010007	

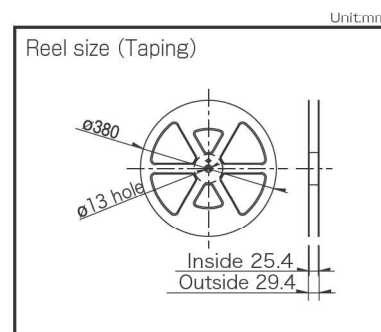
Note

Other varieties are also available. Please inquire.

■ Packing Specifications

Tray / Taping


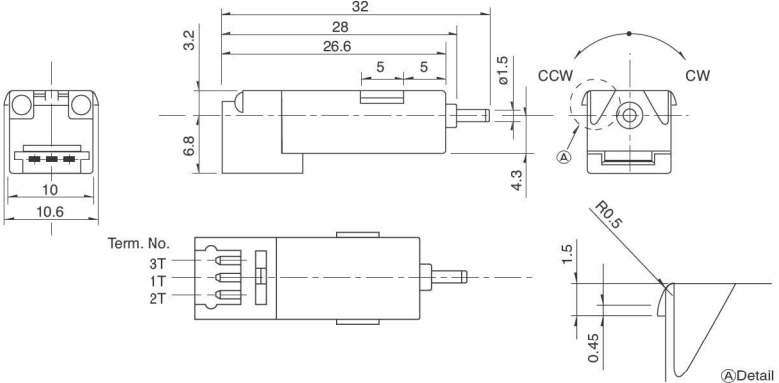

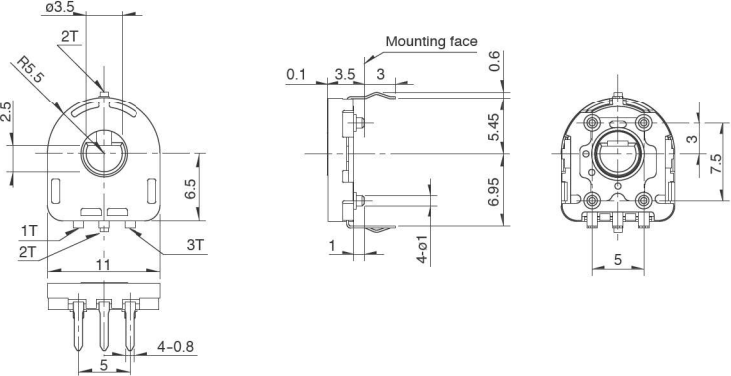

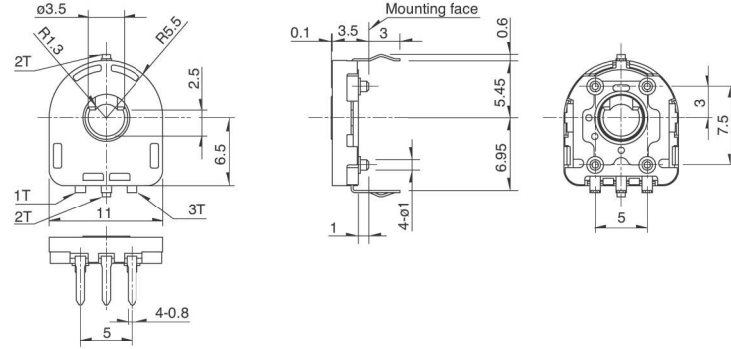

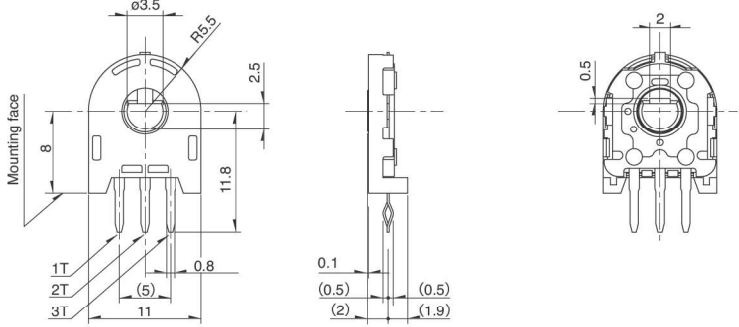
Series	Packing Specifications	Number of packages (pcs.)		Tape width (mm)	Export package measurements (mm)
		1 case / Japan	1 case / export packing		
RDC40	Tray	770	770	—	526×370×191
RDC501		1,500	3,000		
RDC502		1,600	1,600		370×280×92
RDC503	Taping	3,900	3,900	24	407×415×135
RDC506		3,600	3,600		
RDC90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




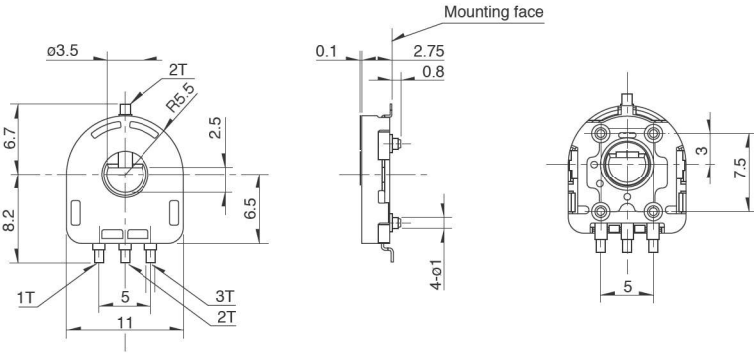

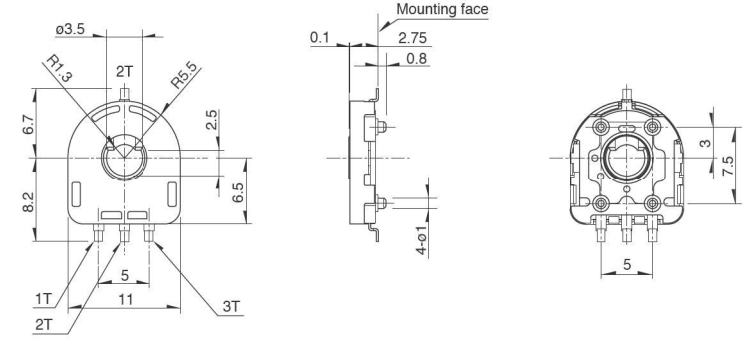

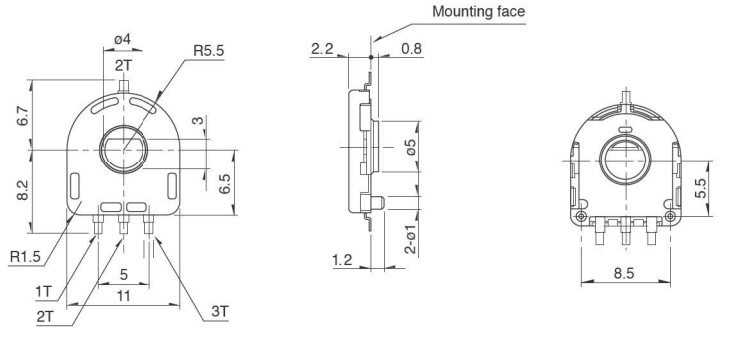

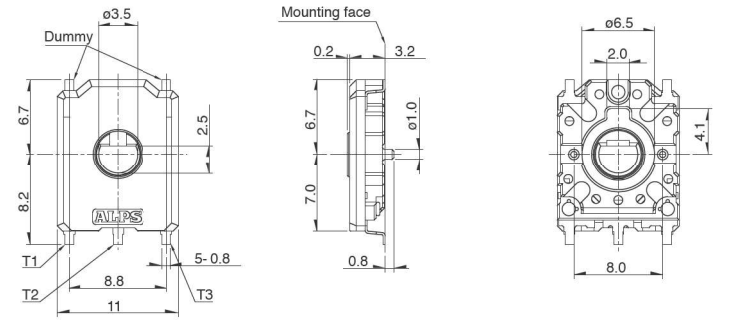
Refer to P.488 for product specifications.
Refer to P.489 for soldering conditions.

Dimensions

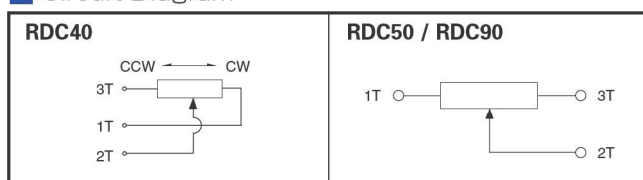
Unit:mm

No.	Photo	Style
1		
2		
3		
4		

Unit:mm

No.	Photo	Style
5		 <p>Technical drawing of RDC503 (Reflow type) showing top, side, and front views with dimensions. Top view: $\phi 3.5$, 2T, R5.5, 6.7, 8.2, 2.5, 6.5, 1T, 5, 3T, 2T, 11. Side view: 0.1, 2.75, 0.8, Mounting face, 4+0.1. Front view: 3, 7.5, 5.</p>
6		 <p>Technical drawing of RDC503 (Reflow type, $\phi 3.5$ dia with radius) showing top, side, and front views with dimensions. Top view: $\phi 3.5$, 2T, R5.5, R1.3, 6.7, 8.2, 2.5, 6.5, 1T, 5, 3T, 2T, 11. Side view: 0.1, 2.75, 0.8, Mounting face, 4+0.1. Front view: 3, 7.5, 5.</p>
7		 <p>Technical drawing of RDC506 (Reflow type, low-profile) showing top, side, and front views with dimensions. Top view: $\phi 4$, 2T, R5.5, 6.7, 8.2, 3, 6.5, 1T, 5, 3T, 2T, 11, R1.5. Side view: 2.2, 0.8, Mounting face, $\phi 5$, 1.2, 2-0.1. Front view: 5.5, 8.5.</p>
8		 <p>Technical drawing of RDC90 (Reflow type, Long-life) showing top, side, and front views with dimensions. Top view: $\phi 3.5$, Dummy, 6.7, 8.2, 2.5, 1T, 8.8, T2, 11, T3, 5-0.8. Side view: Mounting face, 0.2, 3.2, 6.7, 7.0, $\phi 1.0$, 0.8. Front view: $\phi 6.5$, 2.0, 4.1, 8.0.</p>

Circuit Diagram



RDC80



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

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

Other varieties are also available. Please inquire.

Taping

Reel size $\phi 1/3$ hole

$\phi 380$

Inside 25.4

Outside 30.5 max

[illegible]

Phase difference from 2T : 180°

480

RDC10 Linear Type

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	0.8	980	2,940	RDC1010A12	1
14		4.5	2	2,400	4,800	RDC1014A09	2
22				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


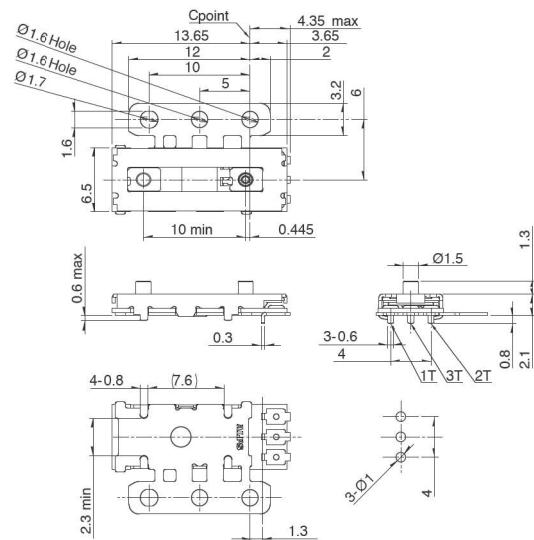

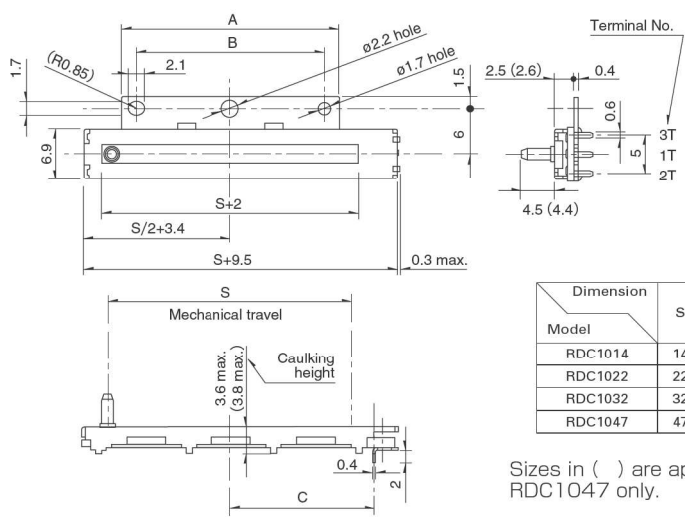
Model No.	Number of packages (pcs.)		Export package measurements (mm)
	1 case /Japan	1 case /export packing	
RDC1010	980	2,940	360×270×230
RDC1014	2,400	4,800	374×508×272
RDC1022	2,100	4,200	374×508×302
RDC1032	900	1,800	540×360×205
RDC1047	1,000	2,000	374×508×272

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

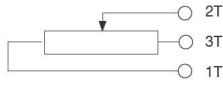
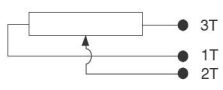
RDC10 Linear Type

Dimensions

Unit:mm

No.	Photo	Style																									
1																											
2		<div><table border="1" data-bbox="1123 1196 1426 1352"><thead><tr><th>Model</th><th>S</th><th>A</th><th>B</th><th>C</th></tr></thead><tbody><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></div>	Model	S	A	B	C	RDC1014	14	19	15	10	RDC1022	22	19	15	14	RDC1032	32	29	25	19	RDC1047	47	37	33	26.5
Model	S	A	B	C																							
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 L2	1.5	2	4	5.5

For lead wiring Unit:mm

Dimensions				
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Note

Shows the specification recommended by Alps.

Resistive
Position Sensors

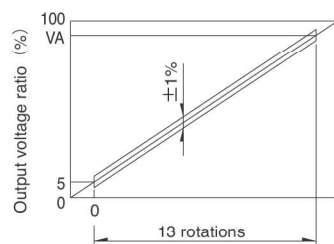
Rotary Type

Linear Type

Method for Regulating the Linearity

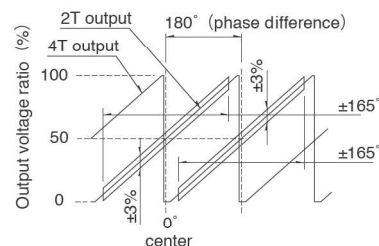
Model RDC40

1. Reference taper : 90%/13rotations
2. VA is measured output value



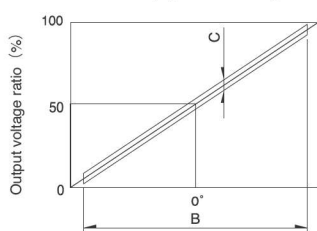
Model RDC80

1. Reference taper : 100%/340°
2. The center (0°) is in the configuration diagram condition



Model RDC50 / RDC90 / RD6R1A / RDCC0

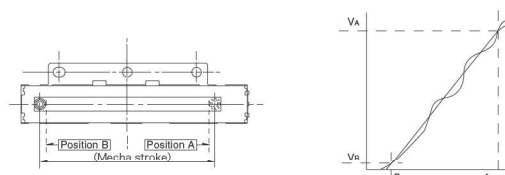
1. Reference taper : 100%/A
2. Index point (0°) is 50% output point (RDC50/RDC90/RDCC0)
The center (0°) is in the configuration diagram condition (RD6R1A)



Series	A	B	C
RDC50	333.3°	±160°	±2%
RDC90	80°	±30°	±3%
	260°	±122°	
RD6R1A	320°	±155°	±2%
RDCC0	30°	±15°	±2%

Model RDC10 / RD7

With rated voltage applied between terminals 1 and 3, the straight line which connects the measured output values VB and VA at specified reference positions B and A is assumed to be an ideal straight line, so that deviation against the ideal straight line when the voltage applied between terminals 1 and 3 is assumed to be 100% can be expressed as a percentage.



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)

Reference for Manual Soldering

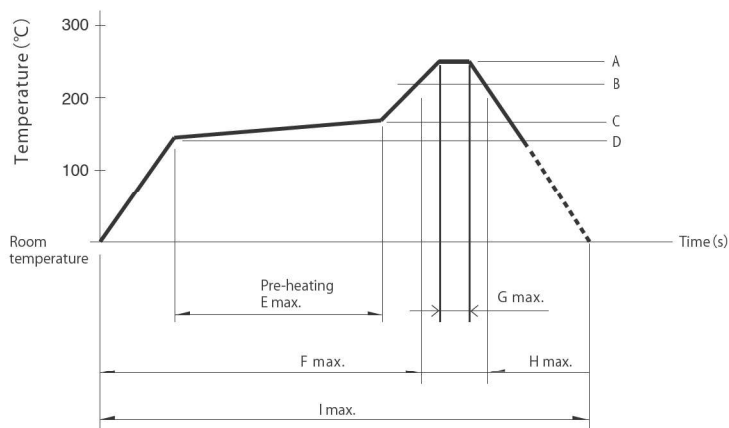
Series	Tip temperature	Soldering time
RDC50, RDC90, RDC80	350±5°C	3 ⁺¹ ₀ s
RDC10, RD7	350°C max.	3s max.

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.

[Use of Chemicals]

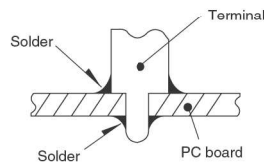
Synthetic resins such as polycarbonate are used in the making of the sensors. Special care must therefore be exercised to prevent exposure of the resistor to heavy atmosphere of ammonia, amines, alkali solutions, aromatic hydrocarbons, ketones, esters, halogenous hydrocarbons or any similar substance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

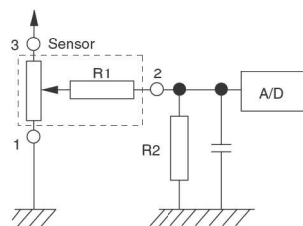


Analog Output Contact Type

[Connection Impedance]

The contact resistance (R_1) 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 (R_2) to greater than 1M ohm to eliminate the influence of the contact resistance (R_1).



[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.