

CEMENT RESISTORS

1. Applicable Scope:

This type standard specification is for use in consumer electronics, computer, telecommunications equipments...etc.

2. Part Number:

It is composed by Type, Type Form, Rated Wattage, Nominal resistance and Tolerance.
e. g.

<u>SQ</u>	<u>M</u>	<u>5W</u>	<u>10R</u>	<u>J</u>
Type	Type Form	Rated Wattage	Nominal Resistance	Tolerance

2.1 Type:

Cement Resistors are called "SQ".

2.2 Type Form:

Upon the shape of type form there are "P" form, "M" form, "Z" form, "S" form and "H" form.

2.3 Rated Wattage:

Shown by 'W', such as 1W, 2W, 3W, 5W,....40W.

2.4 Nominal Resistance:

Ω , $K\Omega$ are its unit which be in accordance with JIS-C6409 article 6 (EIA RS-196A) series.

Letter "10R" indicates resistance value 10Ω .

2.5 Tolerance:

It is measured by Bridge-method at room temperature and expressed by a capital letter.

F: $\pm 1\%$, G: $\pm 2\%$, J: $\pm 5\%$ for Wire Wound.

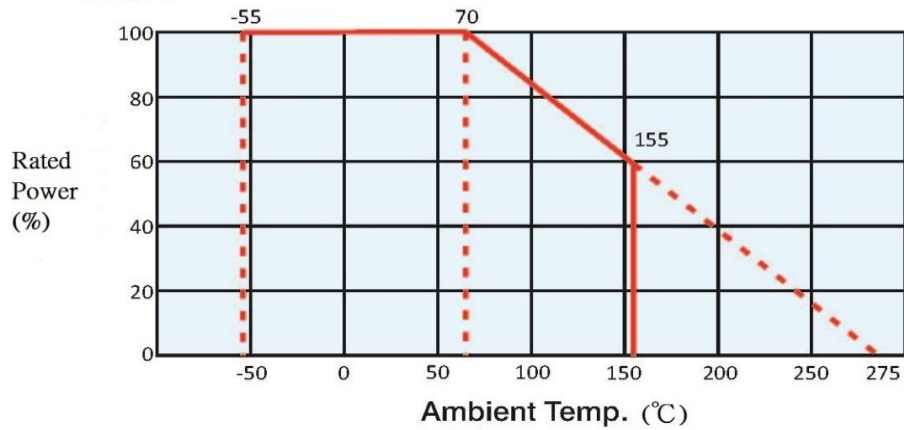
G: $\pm 2\%$, J: $\pm 5\%$ for Power Film.

Remark :SQ Series Resistors are RoHS Compliant.

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3. Rated Power:

Rated power is the value of Max load wattage specified at the ambient temperature of 70°C, and shall meet the functions of electrical and mechanical performance. When the ambient temperature surpasses above mentioned temperature, the value declines as per following DERATING CURVE.



3.1 Rated Voltage:

It is calculated through the following formula:

$$E = \sqrt{PXR}$$

where E: rated voltage (V) P: rated power (W) R: total nominal resistance (Ω)

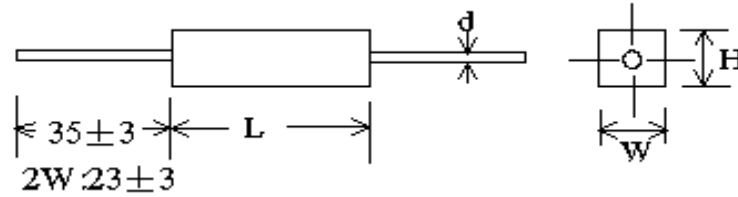
However, in case the voltage calculated exceeds the maximum load voltage, such the maximum load voltage shall be regarded as its rated voltage, means whichever less.

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4. Dimension & Structure:

4.1 DIMENSION:

4.1.1 SQP:



Type	Dimension(mm)				Resistance Range(Ω)		Max Working Voltage
	$W \pm 1$	$H \pm 1$	$L \pm 1.5$	$d \pm 0.1$	Wire Wound	Power Film	
2W	7	7	18	0.65	0.1~100	101~10K	150V
3W	8	8	22	0.8	0.1~150	151~33K	350V
5W	10	9	22	0.8	0.1~150	151~50K	350V
7W	10	9	35	0.8	0.1~430	431~50K	500V
10W	10	9	48	0.8	0.1~470	471~50K	750V
15W	12.5	11.5	48	0.8	0.5~600	601~150K	1000V
20W, 25W	14	13.5	60	0.8	0.5~1K	1.1K~150K	1000V

Notes: 1. Max Overload Voltage is 2 times of Max Working Voltage.

2. Too low or too high ohmic value can be supplied only case by case.

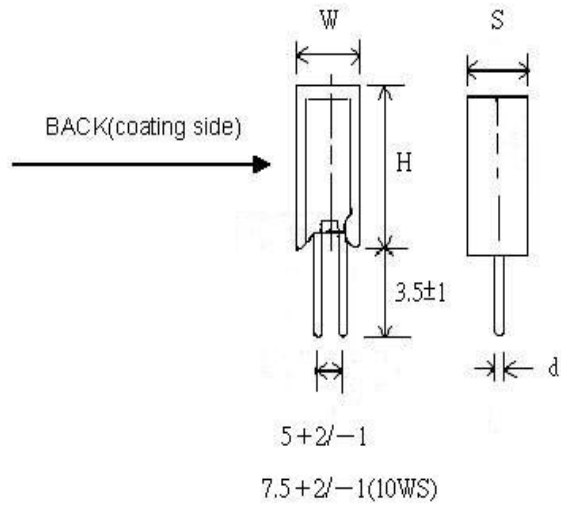
3. Max Working Voltage is applying for all SQ types.

4. Power Film means cutting resistance values instead of wound by resistance wires.

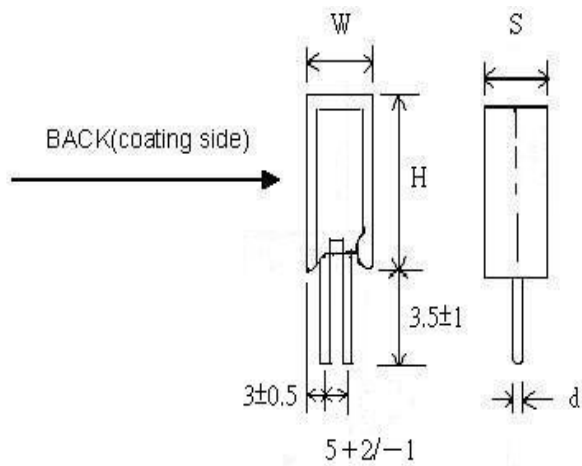
5. Non-Inductive types are also supplied.

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4.1.2 SQM:



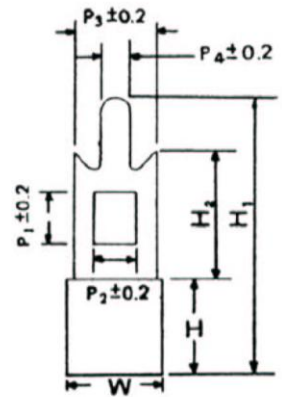
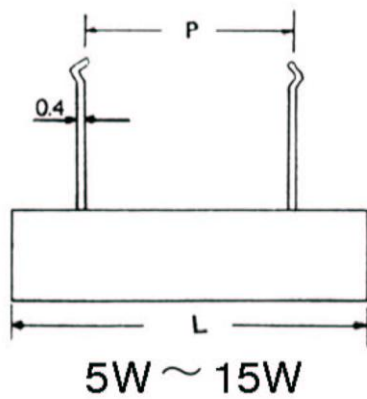
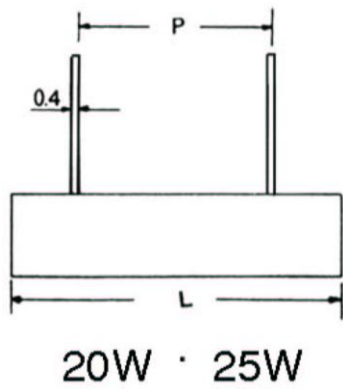
Type	Dimension (mm)				Resistance Range(Ω)	
	H \pm 1.5	W \pm 1	S \pm 1	d \pm 0.1	Wire Wound	Power Film
1W	10	10	5	0.6	0.1~47	48~10K
2W	20	11	7	0.65	0.1~82	83~10K
3W	25	12	8	0.8	0.1~150	151~50K
5W	25	13	9	0.8	0.1~150	151~50K
10WS	35	16	12	0.8	0.1~300	301~100K



Type	Dimension (mm)				Resistance Range(Ω)	
	H \pm 1.5	W \pm 1	S \pm 1	d \pm 0.1	Wire Wound	Power Film
7W	39	13	9	0.8	0.1~430	431~50K
10W	52	13	9	0.8	0.1~470	471~75K

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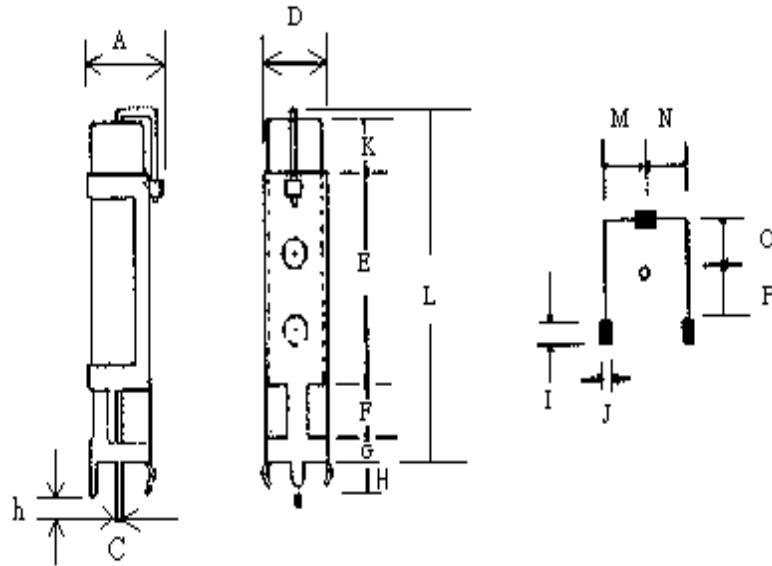
4.1.3 SQZ:



TYPE	Dimension(mm)										Resistance Range(Ω)	
	$L \pm 1.5$	$W \pm 1$	$H \pm 1$	$P \pm 1.5$	P1	P2	P3	P4	$H1 \pm 1$	$H2 \pm 1$	Wire Wound	Power Film
5WS	25	10	10	9.5	4.2	2	5	1.5	25	10	0.1~130	131~50K
5W	28	10	10	15	4.2	2	5(5)(7.5)	1.5	25(30)(40)	10(15)(25)	0.1~130	131~50K
7W	36	10	10	20	4.2	2	5(5)(7.5)	1.5	25(30)(40)	10(15)(25)	0.1~430	431~50K
10W	48	10	9	32	4.2	2	5(5)(7.5)	1.5	25(30)(40)	10(15)(25)	0.2~470	471~50K
15W	48	12.5	12	32	4.2	2	5	1.5	27	10	1~600	601~150K
20W, 25W	60	15	13	42	7	5	10	2.7	32	15	1~1K	1.1K~150K

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4.1.4 SPS:

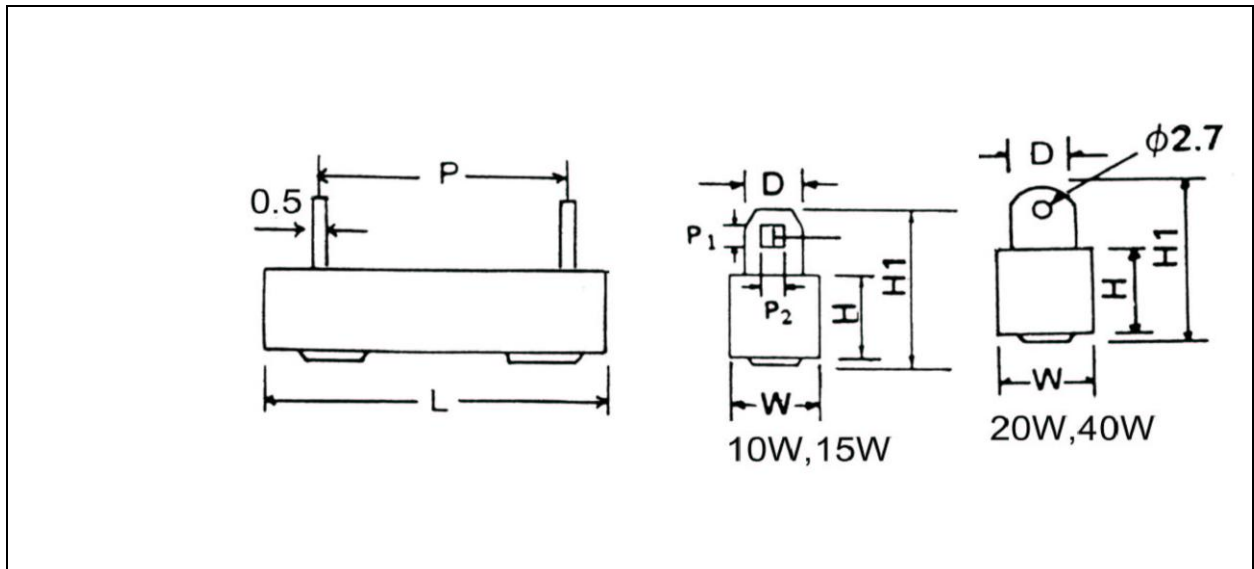


TYPE	Dimension(mm)															
SPS	A	C	D	E	F	G	H	I	J	K	L	M	N	O	P	h
	±1	±0.1	±1	±0.5	±0.5	±0.2	±0.3	±0.1	±0.1	±1	±1.5	±0.5	±0.5	±0.5	±0.5	±0.5
7W	12	0.8	11	28	7	3	4	1.5	0.5	7.5	46	5	5	5	5	2
10W	12	0.8	11	28	7	3	4	1.5	0.5	20	60	5	5	5	5	2

Note: Resistance Range:SPS 7W: 0.1Ω~430Ω(Wire Wound), 431Ω~50KΩ(Power Film)
 SPS 10W: 0.1Ω~470Ω(Wire Wound), 471Ω~50KΩ(Power Film)

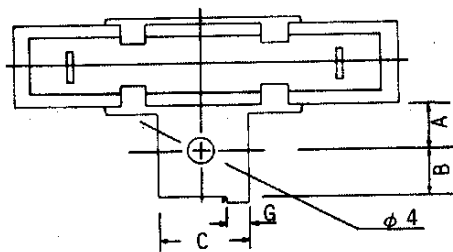
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4.1.5 SQH & SQHG:



TYPE	Dimension (mm)								Resistance Range(Ω)	
	W \pm 1	H \pm 1	L \pm 1.5	P	H1 \pm 1	D \pm 0.5	P1 \pm 0.2	P2 \pm 0.2	Wire Wound	Power Film
10W	10	9	48	32 \pm 1	21	5	2.5	1.7	0.5-600	601-50K
15W	12.5	11.5	48	32 \pm 1	21	5	2.5	1.7	1-600	601-150K
20W	14.5	13.5	60	42 \pm 1	24	6	3	2.5	1-1K	1.1K-150K
30W	19	19	75	55 \pm 2	31	7.5			1-2K	
40W	19	19	90	67 \pm 2	31	7.5			1-2K	

Notes: 1. Max Overload Voltage is 2 times of Max Working Voltage.
 2. Too low or too high ohmic value can be supplied only case by case.



TYPE	Dimension (mm)			
SQHG	A \pm 0.5	B \pm 0.5	C \pm 0.5	G \pm 0.2
10W	8	5	12	3
15W, 20W	8	5.5	12	3
30W, 40W	10.5	8	18	3.5

4.2 STRUCTURE:

4.2.1 Terminal:

Terminal is to be firmly connected with resistors element, both electrically and mechanically, and allow easy soldering.

4.2.2 Stuffing:

Stuffing is made by flameproof cement (resistant to 800°C) which is solid enough to be free from looseness, crack and easy breakage.

4.2.3 Marking:

Marking is made on the surface with Rated Wattage, Nominal Resistance, Tolerance and Maker's trade mark (TY-OHM).

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5. Operating Temperature Range: $-55^{\circ}\text{C} \sim 155^{\circ}\text{C}$

6. Mechanical Performance:

6.1 Terminal tensile:

To fix the resistor body, a static load of 4.5kgs. is to be gradually applied into the terminal for 10 seconds without causing any looseness and fall.

6.2 Twist withstand:

To bend the lead wire at the point of about of 6mm from resistor body to 90° , then catch the wire at $1.2 \pm 0.4\text{mm}$ apart from the bent point end and turn it (clockwise) by 360 degrees perpendicular to the resistor axis at speed of 5 seconds per turn, and do the same counterclockwise again which constitute a whole turn. Repeat the turn for 2 times without causing any break and looseness.

7. Electrical Performance:

7.1 Resistance Temperature Coefficient:

It shall be within $\pm 300\text{ppm}/^{\circ}\text{C}$ and if the ohmic value is under 1Ω the T.C. shall be within $\pm 600\text{ppm}/^{\circ}\text{C}$.

$$\text{T.C. (ppm}/^{\circ}\text{C}) = [(R_2 - R_1) \div R_1] \times [1 \div (T_2 - T_1)] \times 10^6$$

where R1: resistance value at reference temperature
R2: resistance value at test temp.
T1: reference temp. (usu. 25°C)
T2: test temp. (about 75°C)

7.2 Temperature Cycle:

Following temp. cycles are to be made 5 times and then put at room temp. for one hour, the resistance value change rate between pre-and-post test shall be within $\pm 1\%$.

Steps	Temperature($^{\circ}\text{C}$)	Time (minutes)
1 st step	-55 ± 3	30
2 nd step	Room temp.	3
3 rd step	155 ± 3	30
4 th step	Room temp.	3

7.3 Short Time Over Load:

When the resistors are applied 10 times (Power Film: 5 times) as much as rated wattage for 5 seconds continuously, it shows no evidence of arc, flame...etc. Removing the voltage and place the resistors to the normal condition for 30 minutes, the resistance value change rate between pre-and-post test shall be within $\pm 2\%$.

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7.4 Insulation Character :

Resistors are located in a V-shaped metal trough. Using the DC 500V megger instrument 2 poles to clutch either side of lead wires and metal trough, measuring the Insulation Resistance which shall be over 1000M Ω .

7.5 Voltage Withstanding:

Resistors are located in a V-shaped metal trough. Applying AC 1000V for one minute and should find no physical damage to the resistors, such as arc, char ...etc.

7.6 Load Life:

The resistors arrayed are sent into the 70°C oven, applying rated voltage at the cycle of 1.5 hours ON, 0.5 hour OFF for 1000⁺⁴⁸₋₀ hours in total. Then, after removing the voltage, take the resistors out of the oven and left under normal temp. for one hour cooling. The resistance value change rate between pre-and-post test shall be within $\pm 5\%$.

7.7 Moisture-proof Load Life:

The resistors arrayed are placed into a constant temp./humidity oven at the temp. of 40 ± 2 °C and the humidity of 90~95%, rated power is applied for 1.5 hours and cut off for 0.5 hour. The similar cycle will be repeated for 1000⁺⁴⁸₋₀ hours in total (including cut-off time). Then remove the voltage, taking the resistors out of the oven and leaving them at room temp. for one hour. The resistance value change rate between pre-and-post test shall be within $\pm 5\%$. There also shall be no evidence of remarkable change on appearance, and the marking shall not be illegible.

7.8 Solder-ability:

The leads with flux are dipped in a melted solder of 235 ± 5 °C for 2 seconds, more than 95% of the circumference of the lead wires shall be covered with solder.

7.9 Resistance to Soldering Heat:

Two leads are together dipped in a melted solder of 270 ± 5 °C for 10 ± 1 seconds, or 350 ± 10 °C for 3.5 ± 0.5 seconds, Then remove the resistors and leaving them at room temp. for one hour. The resistance value change rate between pre-and-post test shall be within $\pm 1\%$.

7.10 Nonflammability:

The resistors are applied the power of 16 times the rated wattage for 5 min. and shall not get flame.