

SQM Cement Resistors (CR-M)

Non-flammable cement wire wound resistors · SQM series,
2W to 10W



Illustration; not a photograph of a specific part.

Features

- Non-flammable cement-type wire wound resistors ①
- For home appliances, computers and information equipment

POWER RATING AT 70°C 2W – 10W	MAX. WORKING VOLTAGE 250V – 500V	RESISTANCE RANGE ±5% 0.1Ω – 100KΩ	OPERATING TEMP. -55°C ~ +155°C ②
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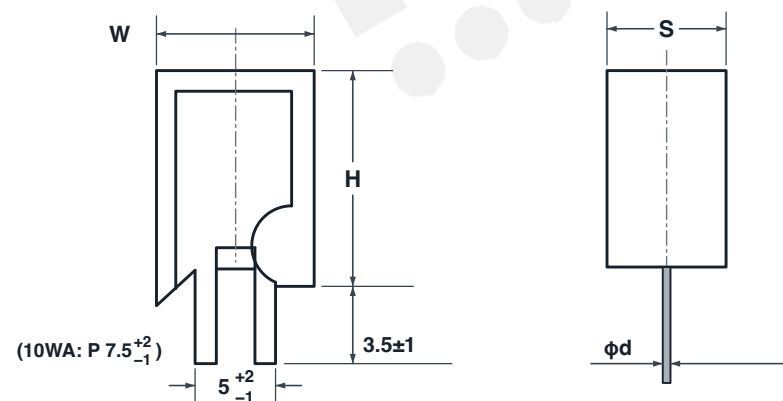
Part number

SQM Product code SQM cement resistors	25 Rated power 1/4W	B Packing Bulk	J Tolerance ±5%	2 Total characters 100=10R=2	100 Resistance value 100=10R
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Ordering example as given on the original sheet; each position is explained in the tables below.

Product code ③		Rated power ④		Tolerance ⑥		Resistance value ⑦
CR-M	SQM cement resistors	Code	Rated power	Code	Tolerance	100=10R
Packing ⑤		12	1/6W	F	±1%	100R=101
		25	1/4W	J	±5%	10K = 10,000
Code	Packing	50	1/2W	No. of total characters ⑦		
T52	Tape/box	125	1/8W			
T73	Tape/box	100	1W			
B	Bulk	200	2W			
R	Tape reel	1WS	1WS	100=10R=2		
		2WS	2WS	100R=101=3		
		500	5W	10K=1000=4		
		700	7W			

Dimensions



Outline (front and side view)

Style	Dimension (mm) ⑧				
SQM	H	W	S	P	φd±0.1
2W	20.5±1.0	11.5±1.0	7.5±1.0	5.0 +2.0/-1.0	0.6
3W	25±1.0	12±1.0	8.5±1.0	5.0 +2.0/-1.0	0.7
5W	25±1.0	13±1.0	9.5±1.0	5.0 +2.0/-1.0	0.7
7W	38±1.5	13±1.0	9.5±1.0	5.0 +2.0/-1.0	0.7
10W	52±2.0	13±1.0	9.5±1.0	5.0 +2.0/-1.0	0.7
10WA	36±2.0	16±1.0	12±1.0	7.5 +2.0/-1.0	0.7

Electrical characteristics

Style (power rating at 70°C)	SQM-2W	SQM-3W	SQM-5W	SQM-7W	SQM-10W
Operating temp. range	-55°C ~ +155°C ②				
Max. working voltage	250V	350V	350V	500V	500V
Max. overload voltage	500V	700V	700V	1000V	1000V
Dielectric withstanding voltage (AC) ⑨	500V	700V	700V	1000V	1000V
Resistance range ±5% (ceramic core) ⑧	0.1 ~ 47Ω	0.1 ~ 100Ω	0.1 ~ 180Ω	0.1 ~ 470Ω	0.1 ~ 680Ω
Resistance range ±5% (metal oxide film)	48 ~ 100K	101 ~ 100K	180 ~ 100K	471 ~ 10K	681 ~ 10K
Temp. coefficient ⑩	±300ppm/°C				

Ratings

Rated power	The maximum power that can be applied continuously at or below the specified ambient temperature (see the table below). It also applies to the other characteristics. When the ambient temperature exceeds the specified temperature, the power is derated according to the power derating curve (Fig. 1).
Rated voltage	The DC or AC voltage corresponding to the rated power: $E = \sqrt{P \times R}$ E: rated voltage (V); P: rated power (W); R: nominal resistance (Ω). If the voltage obtained from the formula exceeds the maximum continuous working voltage, the maximum continuous working voltage is the rated voltage.
Resistance	The nominal resistance value (indicated on the resistor), in Ω or KΩ.
Applicable temperature range	-30°C ~ +155°C ②

Rated power	W ⑪
Ambient temperature	70°C

On the original form the box for 70°C is ticked;
the box for 25°C is not.

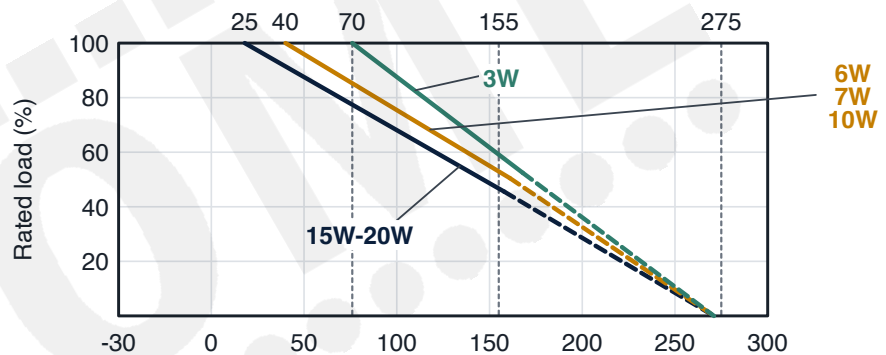


Fig. 1 Power derating curve ⑫

Performance specification

Mechanical characteristics

Item	Test method	Requirement
Terminal solderability ⑬	Dip the terminal into flux up to 7mm from the end for 5 to 10 seconds. Adjust the solder temperature to 230±5°C and wipe the dross and burned flux off the molten solder. Then dip the terminal up to 5mm from the end for 3±0.5 seconds, pull it out within 25.4±6.4 seconds, let it cool in air and wash the flux away.	After removal of the flux: (a) at least 95% of the terminal is soldered, with a clean and smooth surface; (b) pin holes need not be concentrated in one place, but their total area shall not exceed 10%.
Terminal strength: (a) stress	Fix the resistor by one terminal and apply a load of up to 4.5 kg directly, in the direction of the fixed terminal.	No abnormality.
Terminal strength: (b) bend	Apply a load of 500 g to the terminal from any direction for up to 60 seconds.	Bending angle within 5 degrees; no abnormality.

Non-flammability

Item	Test method	Requirement
Burn test (UL-492, item 278) ⑭	Apply the test flame to the resistor for 15 seconds and remove it; within about 10 seconds, before the heat has dissipated, apply the flame again for 15 seconds. Repeat 5 times.	After the cycles, no damage to the appearance.
Overload test	Apply 120% of the rated power for 1 minute.	No smell and no smoke.

Electrical performance

Item	Test method	Requirement
Temperature coefficient ⑩	Keep the resistor at each stage temperature (see the table below) for about 30 to 40 min. and measure the resistance. Calculate the temperature coefficient: $TCR = (R - R_0) / R_0 \times 1 / (T - T_0) \times 10^6$ (PPM/°C) R_0 : resistance (Ω) at the base temperature (2nd stage); R: resistance at each test temperature stage; T_0 : base temperature (2nd stage); T: test temperature (°C).	Within ±260 ppm in all stages.
Short-time overload ⑨	Apply 10 times the rated power (W) to the resistor for 5 seconds, then leave it at room conditions for 30 min.	No flame or charring and no change in mechanical appearance; resistance change within (2%+0.05Ω) ⑩.
Temperature sensitivity (normal state) ⑮	At a constant temperature of 40±2°C and a constant relative humidity of 90~95%, connect the resistor (terminals) as the anode and a metal plate as the cathode, and apply 100V DC for 1,000 hours.	Resistance change within 3%±0.05Ω ⑮.
Durability (rated load)	In a constant-temperature chamber at 70±3°C (over 15W: 25±3°C ⑫), apply the rated voltage for 1.5 hours and disconnect for 0.5 hour, cycling for 1,000 hours; then leave the resistor at room conditions with no load for 1 hour.	Resistance change within 3%±0.05Ω ⑮; no marked change in appearance.
Durability (humidity)	At a constant temperature of 40±2°C and a relative humidity of 90~95%, apply the rated DC voltage for 1.5 hours and disconnect for 0.5 hour, cycling for 1,000 hours; then return the resistor to room conditions with no load for 1 hour.	Resistance change within 3%±0.05Ω ⑮; no marked change in appearance.
Thermal shock	Apply the rated power at room temperature for 30 min.; then, within 8~12 seconds, bring the resistor into air at -30±5°C for 15 min. or longer. Return it to room temperature and keep it there for 1 hour.	Resistance change within 2%±0.05Ω ⑮; no marked change in appearance.
Insulation resistance ⑰	Put the resistor on a flat metal plate and measure between one terminal and the plate at 500V DC.	Over 10,000MΩ.
Withstand voltage ⑨	With the resistor set up as for insulation resistance, apply a 1,000V AC sine wave between the terminals and the plate for 1 min.	No damage.
Resistance to soldering heat ⑱	Dip the terminals up to 5.0±0.8mm from the end under the time and temperature conditions of the table below, then leave the resistor at normal temperature for 24 hours.	Resistance change within 2%±0.05Ω ⑮; no damage to the appearance.
Rated load	Apply the rated power to the resistor for 30 min., then keep it at no load for 2 hours.	Resistance change within 2%±0.05Ω ⑮.
Heat resistance	Keep the resistor at 275°C constantly for 2 hours.	No marked change in appearance.

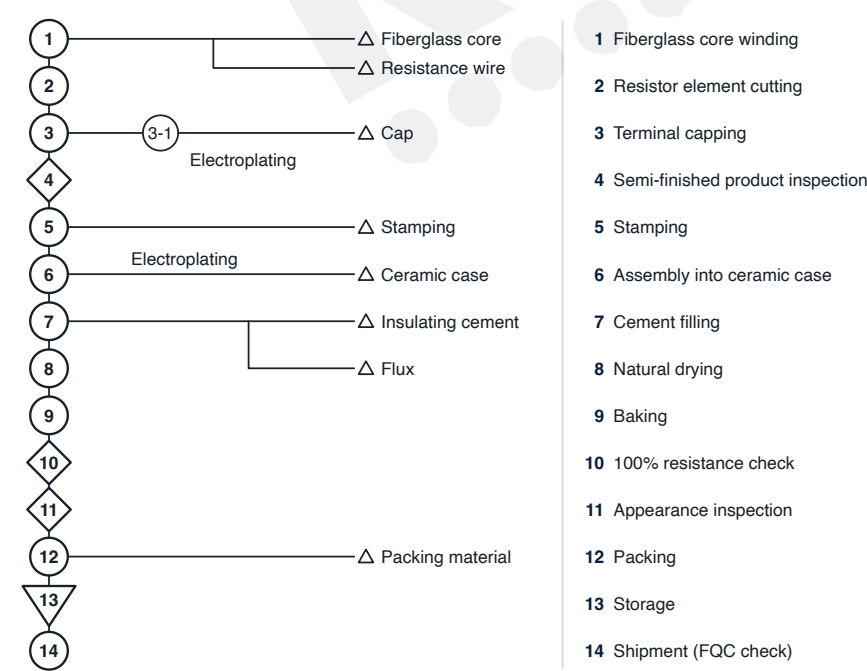
Temperature coefficient: test stages (unit: °C)

Stage	1st	2nd	3rd	4th	5th
Temperature	-30±2	25±2	65±2	105±2	180±2

Resistance to soldering heat: conditions

Item	Soldering temp. (°C)	Dip time (seconds)
Auto soldering	260±5°C	10±1 sec
Manual soldering	350±10°C	3±1 sec

Production flow chart



Notes

- ① Scope: the English text of the original calls the product a “cermet type” wirewound resistor and does not name the applications; the Chinese text (printed here) and the page titles call it a cement type — subject to manufacturer confirmation.
- ② Operating temperature: the electrical characteristics table gives $-55^{\circ}\text{C} \sim +155^{\circ}\text{C}$, while the applicable temperature range under Ratings is printed as $-30^{\circ}\text{C} \sim +155^{\circ}\text{C}$, and the derating curve carries “-30” at its left edge — subject to manufacturer confirmation.
- ③ Product code: the ordering example begins with “SQM”, while the product code list gives the code “CR-M” for SQM cement resistors — subject to manufacturer confirmation.
- ④ Rated power codes: $25\text{S} = 1/4\text{WS}$, $50\text{S} = 1/2\text{WS}$, $300 = 3\text{W}$ and $500 = 5\text{W}$; small-size ratings are ordered as written (1WS, 2WS, 3WS, 5WS, 7WS) (not listed on the manufacturer's sheet; added on supplementary confirmation). A code does not mean the rating is available in this series. $1/6\text{W}$ and $1/16\text{W}$ have no small-size (S) version; not every power rating has one. As printed: “ $12 = 1/6\text{W}$ ” appears twice (shown once), the example code “25” stands for $1/4\text{W}$, and no code is given for 10W , while the series covers 2W to 10W — subject to manufacturer confirmation — subject to manufacturer confirmation.
- ⑤ Packing: tape/box (T52, T73) and tape reel (R) codes are listed, but no taping data are given for this series — subject to manufacturer confirmation.
- ⑥ Tolerance: code F ($\pm 1\%$) is listed, but the resistance ranges are given for $\pm 5\%$ only — subject to manufacturer confirmation.
- ⑦ Total characters and resistance value: the coding examples are printed as shown and not explained further; “ $10\text{K}=1000=4$ ” equates 10K with 1000 , while “ $10\text{K} = 10,000$ ” equates it with $10,000$ — subject to manufacturer confirmation.
- ⑧ Dimensions and electrical characteristics: the $\pm$ and Ω signs are printed as broken glyphs on the original and are shown here as $\pm$ and Ω . The old sheet's lead-diameter header reads “ $\phi d \pm 1.0$ ” with values 0.6 to 0.8 ; the ϕd values, the header tolerance ± 0.1 and the P column now follow the CR-M factory specification (p9). H, W and S are as on the old sheet except 10WA S — subject to manufacturer confirmation.
- ⑨ Withstand voltage: the electrical characteristics table gives 500V (2W), 700V (3W , 5W) and 1000V (7W , 10W) AC, while the withstand voltage test applies $1,000\text{V AC}$ to all styles — subject to manufacturer confirmation.
- ⑩ Temperature coefficient: the electrical characteristics table gives $\pm 300\text{ppm}/^{\circ}\text{C}$, while the test requires $\pm 260\text{ ppm}$ in all stages. The measuring time is 30 to 40 min. in the English text and 30 to 45 minutes in the Chinese text; the English is printed — subject to manufacturer confirmation.
- ⑪ The rated-power table prints the unit “W” without a value — subject to manufacturer confirmation.
- ⑫ Derating curve, reproduced as printed: the curves are labelled 3W , 6W / 7W / 10W and $15\text{W}-20\text{W}$ (the “6” is barely legible), while the series covers 2W , 3W , 5W , 7W and 10W ; the durability test also refers to ratings over 15W . The marks 25 and 70 above the chart do not line up with 25 and 70 of the bottom scale — subject to manufacturer confirmation.
- ⑬ Terminal solderability: the procedure is printed from the English text; the Chinese text makes the second 5mm dip in flux and lets the terminal cool naturally for 25.4 ± 6.4 seconds. Requirement (a) is printed from the Chinese text; the English text reads “terminal should be new smooth” and gives no 95% — subject to manufacturer confirmation.
- ⑭ Burn test: printed from the Chinese text. The English text removes the flame for 15 seconds between applications, requires the heat to be dismissed within 10 seconds after the full cycle and requires no colour change or crack breakage; its last line is overprinted on the next heading — subject to manufacturer confirmation.
- ⑮ This test is headed “temperature sensitivity (normal state)” in both languages, although its conditions describe a humidity test with DC bias — subject to manufacturer confirmation.
- ⑯ Resistance-change limits differ between the Chinese and English texts (Chinese / English): short-time overload $2\% \pm 0.05$ / ($2\% + 0.05\Omega$); temperature sensitivity 3% / $3\% \pm 0.05\Omega$; durability (humidity) 3% / $3\% \pm 0.05$; thermal shock 2% / $2\% \pm 0.05$; rated load $2\% \pm 0.05\Omega$ / $\pm 2\%$ 0.05 OHM . The English is printed, except for rated load; for durability (rated load) and resistance to soldering heat the English gives no limit and the Chinese is printed — subject to manufacturer confirmation.
- ⑰ Insulation resistance: the English text gives over $10,000\text{M}\Omega$ (printed here), the Chinese text $1000\text{M}\Omega$ or more — subject to manufacturer confirmation.
- ⑱ Resistance to soldering heat: printed from the Chinese text; the English text ends “for 24 ” without a unit, gives no resistance-change limit and refers to “Table I” (the rated-power table) for the soldering conditions — subject to manufacturer confirmation.
- ⑲ Short-time overload: the Chinese text specifies ten times the rated power (W), which is printed here; the English text reads ‘APPLY VOLTAGE $10\text{ TIMES OVER RATING POWER}$ ’ — subject to manufacturer confirmation.