

## Risesun Hotbar HD ——High Density SiC heater

Along with the development of new materials, SiC heater is more and more widely used, meanwhile, the working conditions of SiC heater are getting worse and worse in some fields, such as sintering of NCM811 and NCA, higher corrosions from furnace atmosphere, which press manufacturers of refractories, kiln furniture, heaters to improve performance of the products continuously in order to match demands of the market. For that, recently we developed high density (HD type) SiC heater successfully, which has advantages of higher density, lower porosity, higher rupture strength, anti-corrosion and longer service life. By lab test and clients' trial run, the service life of our high density SiC heater improved more than 50% under various working conditions, the comparisons including in 1530°C intermittent furnace, 1400°C continuous furnace, furnace with strong alkali atmosphere, etc. For example, after heating in lab furnace with 1400°C and clear air continuously 4200 hours and surface loading 3.5W/CM<sup>2</sup>, resistance of common heater increased about 62%, average increasing 14.7% per 1000 hours; but for high density heater, which only increased about 32%, average increasing 7.7% per 1000 hours.

Physical performance contrast table of common heater (DH & DL type) and high density heater (HD type) is the following:

Item	unit	Type	
		DH & DL	HD
Density	g/cm <sup>3</sup>	2.5	2.65
Porosity	%	23	18
Rupture strength	MPa (25°C)	50	60
Thermal Conductivity	W/m·°C (1000°C)	14~19	14~19
Specific heat	kJ/kg·°C (25~1300°C)	1.0	1.0
Coefficient of thermal expansion	(1000°C) × 10 <sup>-6</sup>	4.5	4.5

Furthermore, high density heater has more smooth resistance-temperature curve, assuming 1.0Ω resistance value of heater at 1000°C, the variation of temp.-resistance value of common and HD heater as below table:



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Temp.	25	200	400	600	700	800	900
Common	1.5~4.0	2.20	1.50	0.80	0.84	0.89	0.93
HD type	1.3~2.0	1.80	1.30	0.81	0.85	0.90	0.94
Temp.	1000	1100	1200	1300	1400	1500	
Common	1.00	1.06	1.14	1.23	1.32	1.40	
HD type	1.00	1.06	1.12	1.17	1.19	1.22	

Seeing from above table, firstly, the resistance consistency of HD heater is better under lower temp., as a result, furnace will get better temp. consistency under lower temp; secondly, under high temp., the resistance variation of HD heater is smaller, especially more apparent while temp. higher than 1200°C, which will provide with longer service life of SiC heater under high temp.

Furthermore, due to the characters of the raw materials of HD heater and also improvement of density, HD heater can be produced with much lower resistance value compared to the common ones. For example, 30mm heater with 1000mm hot zone, the min. resistance value of common heater can be produced is about 1.2 ohms, but for HD heater, 0.9 ohm is available even more lower, which provides with more options for design of electrical system of Kiln & furnace, such as more SiC heaters in series connection. Of course, we can also produce HD heater with much higher resistance value compared to common heater, satisfy the needs of customers.