

## Silicon Carbide Heating Element Operating Data

### Usage of Elements in Various Atmospheres

Some SiC elements can be operated at temperatures up to 3000°F (1650°C) in air and inert atmospheres. The maximum operating temperature of type LL / RR elements is 2800°F (1538°C). These are ELEMENT SURFACE TEMPERATURES, and resulting furnace operating temperatures will be lower, perhaps by 100°F or more depending on furnace design.

Some atmospheres at certain temperature shorten the element's life. The dew point of the atmosphere and the watt loading on the elements are also factors which combine to affect element life. SiC elements can be operated at up to 2370°F (1300°C) in hydrogen and disassociated ammonia atmospheres. In atmospheres containing nitrogen, silicon nitride will form if a temperature of 2500°F (1370°C) is exceeded. Exothermic gas can be used up to a carbon monoxide content of 18%. Methane and hydrocarbon vapors and certain atmospheres reduce element life.

In a carbonaceous atmosphere, SiC elements will tend to pick up carbon. This is a slow process, and the resistance drop can be noted by a gradual change in amperage. The carbon has a detrimental effect on the element. However, it can short-circuit sections of the element, thus increasing the electrical load on the remaining section and reducing the life. The carbon can be burned out by shutting off the atmosphere and introducing air into the furnace chamber at periodic intervals.

Excessive moisture, methane, and hydrocarbon vapors should be kept out of the high temperature zone of the furnace where the elements are located. The combination of element watt loading, temperature, and atmosphere should be kept in balance at all times, and recommended limits should not be exceeded.

Atmosphere	Recommended Operating Limits	Effect on Element	
	Temperature    Watt Loading		
Ammonia	2370°F	25-30	Reduces silica film, forms methane from silicon carbide
Argon	Maximum	Maximum	No effect
Carbon dioxide	2730°F	20-25	Attacks silicon carbide
Carbon monoxide	2800°F	25	Attacks silicon carbide
Endothermic:			
18% carbon monoxide	Maximum	Maximum	No effect
20% carbon monoxide	2500°F	25	Carbon pick-up
Exothermic	Maximum	Maximum	No effect
Halogens	1300°F	25	Attacks silicon carbide and reduces silica
Helium	Maximum	Maximum	No effect
Hydrocarbons	2400°F	20	Hot spotting from carbon pick-up
Hydrogen	2370°F	25-30	Reduces silica film, forms methane from silicon carbide
Methane	2400°F	20	Hot spotting from carbon pick-up
Nitrogen	2500°F	20-30	Forms insulating silicon nitrides
Oxygen	2400°F	25	Oxidizes silicon carbide
Sodium	2400°F	25	Attacks silicon carbide
Sulfur dioxide	2400°F	25	Attacks silicon carbide
Vacuum	2200°F	25	Below 7 microns, vaporizes silicon carbide
Water:			
Dew Point	60°F    2000°F	20-30	Reacts with silicon carbide to form silicon hydrates
	50°F    2200°F	25-35	
	0°F    2500°F	30-40	
	-50°F    2800°F	25-45	

Foregoing data is courtesy of Kanthal Corporation. Keith Company offers this information to assist customers, but does not warrant its accuracy.