

# HIGH POWER HEATING ELEMENTS FOR FURNACE PRODUCTIVITY

KANTHAL® SUPER



# HEATING ELEMENTS FOR IMPROVED FURNACE PRODUCTIVITY

Sandvik's family for heating elements, Kanthal® Super, has long been the preferred choice for quality aware furnace builders and operators. Flexible design, a wide variety of grades, low energy consumption, long life and superior technical service has built a market leading brand, offering maximum productivity and quick return on investment to users of Kanthal® Super around the world.

## KANTHAL® SUPER FAMILY – CUSTOMIZED DESIGNS

Kanthal® Super is the market leading family of high-power electric molybdenum disilicide ( $\text{MoSi}_2$ ) heating elements for element temperatures up to  $1850^\circ\text{C}$  ( $3360^\circ\text{F}$ ). Kanthal® Super heating elements are available as straight or bent elements in a wide range of shapes and sizes, all characterized by long life and consistent performance. We provide customer designed elements according to specific needs, enabling optimized element design for each particular application.

## GRADES FOR DIFFERENT APPLICATIONS

The Kanthal® Super program includes a wide variety of grades with the specific features for use in demanding applications and atmospheres, including nitrogen, hydrogen, vacuum and mixtures of endogas and reducing atmospheres.

## IMPROVED PRODUCTIVITY THROUGH LONG ELEMENT LIFE AND LOW ENERGY CONSUMPTION

The result of choosing elements from the Kanthal® Super family is a furnace that will run longer between maintenance stops, consume less energy and improve plant productivity. To owners of companies producing glass, electronics, steel, ceramics or providing heat treatment service, the choice of Kanthal® Super  $\text{MoSi}_2$  heating elements is a safe way to desirable return on investment.

## SUPERIOR SERVICE

Sandvik is a global company with local service. Our products are developed according to our customers requirements. We offer a wide range of heating solutions from single elements to complete solutions with control systems. Our aim is to offer you the most adaptable and optimal heating solutions concerning productivity, profit and fast return on investment. With our technical experience and leading position, we have been the most preferable choice since 1931.



Needs



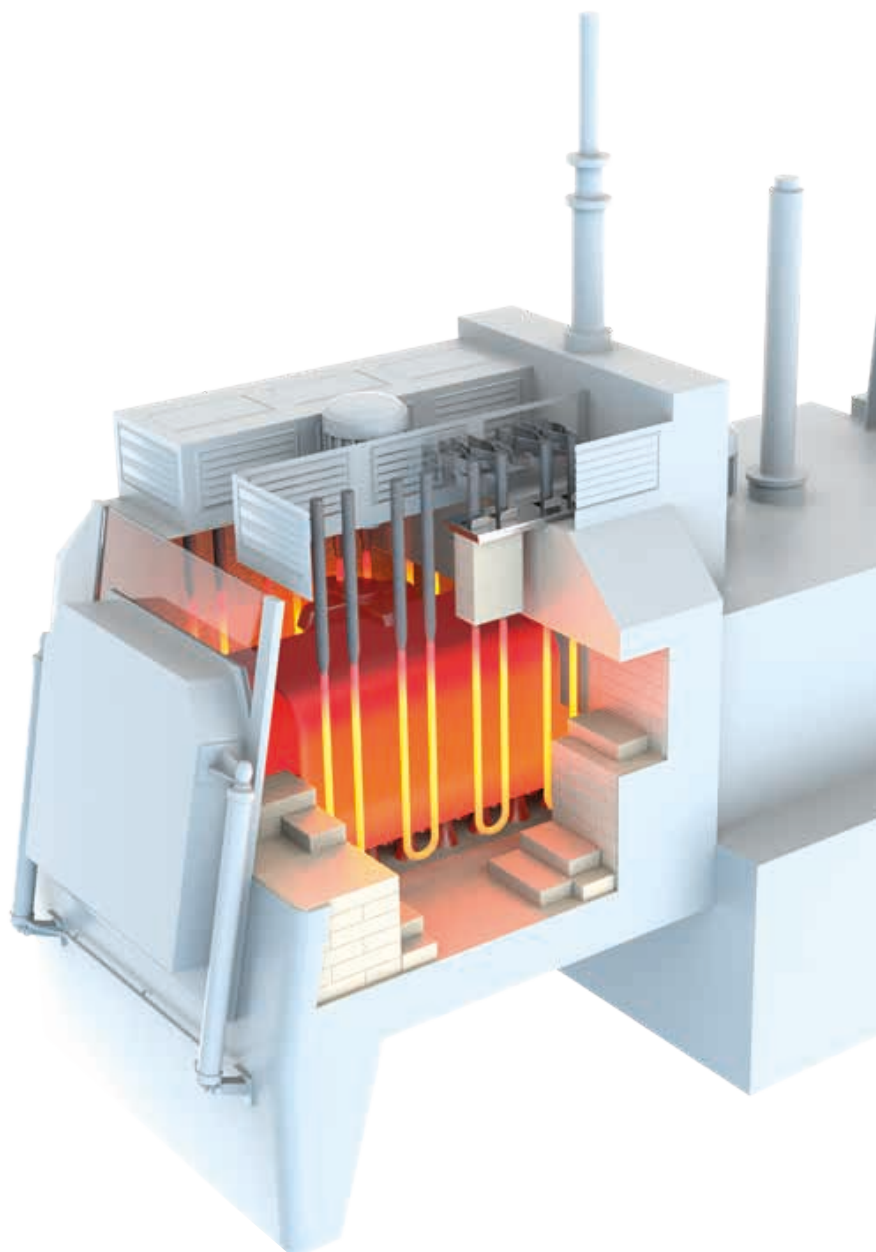
Analysis



Test and simulation



Solution



## GRADES FOR DEMANDING APPLICATIONS

Kanthal® program of MoSi<sub>2</sub> heating element includes several grades with specific features for use in demanding applications and atmospheres.

### KANTHAL® SUPER 1700

Kanthal® Super is a unique material combining the best properties of metallic and ceramic materials. Like metallic materials it has good heat and electrical conductivity and like ceramics it withstands corrosion and oxidation and has low thermal expansion. Maximum temperature 1700°C (3090°F).

### KANTHAL® SUPER 1800

Same core characteristics as Kanthal® Super 1700. Maximum temperature 1800°C (3270°F).

### KANTHAL® SUPER 1900

Same core characteristics as Kanthal® Super 1700, but has higher purity and a surface with better adhesion. Maximum temperature 1850°C (3360°F).

### KANTHAL® SUPER ER

Kanthal® Super ER is a new electric heating element with the unique ability to operate up to 1580°C (2875°F) directly in a wide range of furnace atmospheres from very dry reducing to oxidizing. With Kanthal® Super ER heating elements it is possible, in just one furnace, to operate firing cycles where the atmosphere condition can be altered, during the cycle, between oxidizing, inert, carburizing, nitriding, reducing and rough vacuum.

### KANTHAL® SUPER RA

Kanthal® Super RA offers a long lifetime at high temperature in all reducing and oxygen deficient atmospheres. Specially designed for working in nitrogen atmosphere. Maximum temperature 1700°C (3090°F).

### KANTHAL® SUPER NC

Kanthal® Super NC is a heating element with special features, designed to meet the demands for clean process heating in the research and electronics industries. Maximum temperature 1800°C (3270°F).

### KANTHAL® SUPER HT

Kanthal® Super HT is designed for a longer lifetime of small dimension elements in temperature cycling conditions. The hot strength and form stability is improved. The maximum operating temperature is 1830°C (3330°F), and the element is suitable for furnace temperatures between 1500–1750°C (2730–3180°F) approximately.



Delivery



Follow up

# APPLICATIONS

The Kanthal® Super program offer is based on a wide range of high temperatures applications. Here we present the largest segment with typical processes. We offer infinite options due to our customized designs where demands on high temperature solutions are needed. Our products are best used by customers looking for energy savings, economic benefits, increased productivity and low maintenance.

## GLASS INDUSTRY

The Kanthal® Super program includes products for the primary glass manufacturing, such as technical, specialty and fiber glass. Here are two typical glass processes:

- Glass forehearth (feeders)
- Glass fusions/downdraw process



Kanthal® Super cube element.



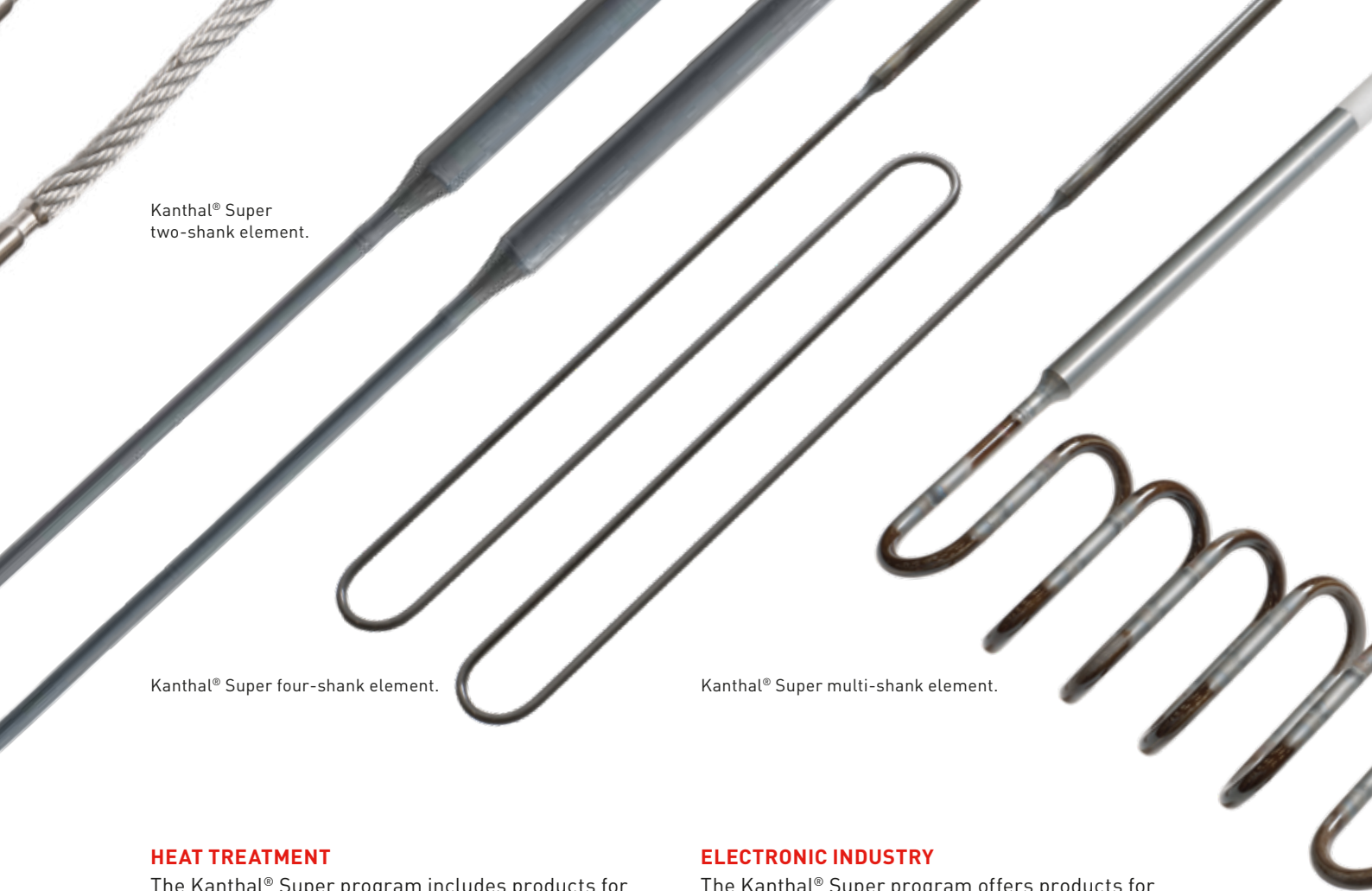
## CERAMIC INDUSTRY

The Kanthal® Super program offers several products for the production of traditional ceramics, functional ceramics and ceramics used as engineering materials. For example, Kanthal® Super products are widely used in:

- Ceramics sintering
- Ceramics firing
- Heat treatment of ceramics







### HEAT TREATMENT

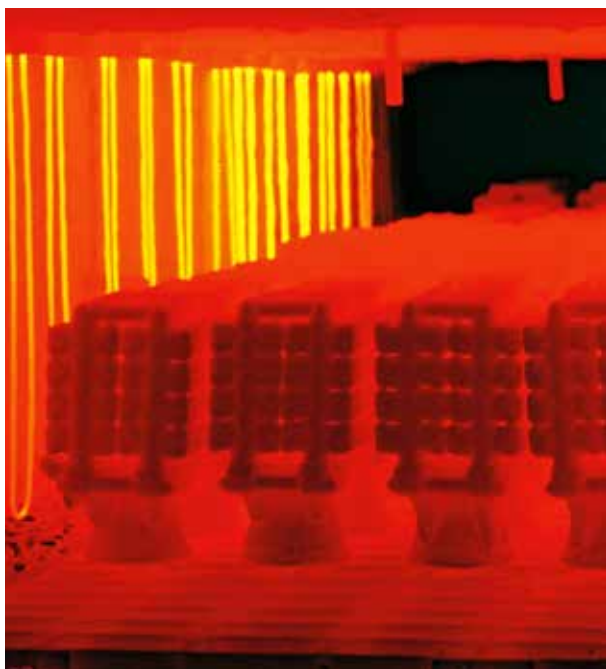
The Kanthal® Super program includes products for different types of heat treatment processes for steel, aluminium and other metallic materials. Our products are widely used in, for example:

- Annealing furnaces
- Carburizing furnaces
- Galvanizing furnaces
- Hardening furnaces
- Sintering furnaces

### ELECTRONIC INDUSTRY

The Kanthal® Super program offers products for the heating processes in the electronic industry. Our products are used in, for example:

- Furnace for single growth crystal Si,GaAs
- Diffusion cassettes
- MLCC sintering
- ITO sintering



# TECHNICAL INFORMATION

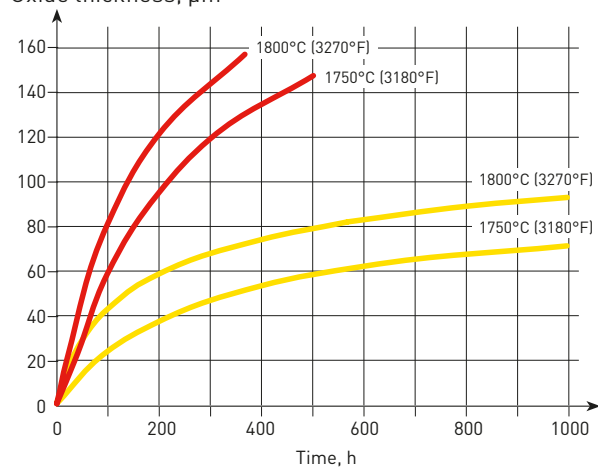
The optimal choice of Kanthal® Super MoSi<sub>2</sub> heating element depends on a number of factors, such as operating temperature in different atmospheres, ambition to improve productivity and element life time.

Your local Sandvik sales representative will be happy to supply you with further detailed information.

Visit [www.kanthal.com](http://www.kanthal.com) to find your local contact.

## OXIDATION PROPERTIES

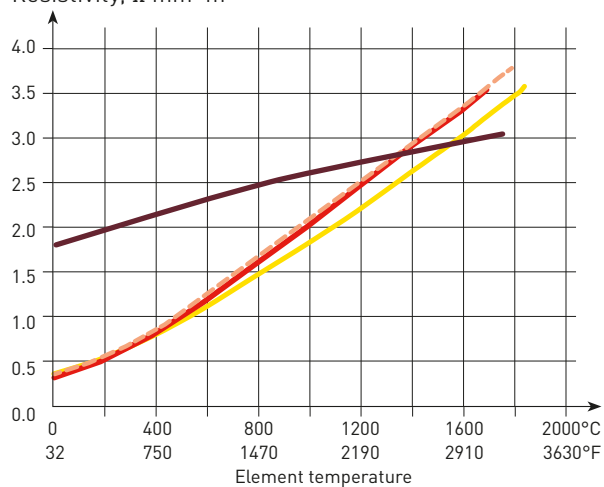
Oxide thickness,  $\mu\text{m}$



■ All other Kanthal® Super ■ Kanthal® Super HT

## RESISTIVITY

Resistivity,  $\Omega \text{ mm}^2 \text{ m}^{-1}$



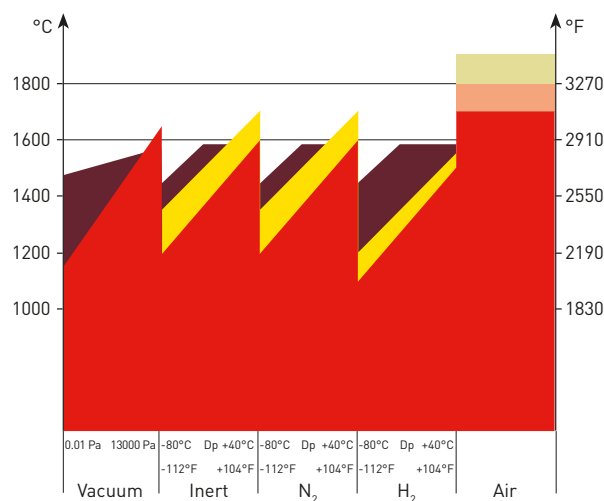
■ Kanthal® Super ER ■ Kanthal® Super RA/1700  
■ Kanthal® Super 1900 ■ Kanthal® Super 1800

## STANDARD PRODUCT RANGE

GRADE	ELEMENT SIZE, MM HEATING ZONE DIAM./TERMINAL DIAM.				
	3/6	4/9	6/12	9/18	12/24
Kanthal® Super 1700	—	—	•	•	•
Kanthal® Super 1800	•	•	•	•	•
Kanthal® Super 1900	•	•	•	•*	—
Kanthal® Super RA	—	—	•	•	•
Kanthal® Super ER	•	•	•	•	—
Kanthal® Super HT	•	•	—	—	—
Kanthal® Super NC	•	•	—	—	—

\* 9/12/18

## MAX TEMPERATURE IN DIFFERENT ATMOSPHERES



■ Kanthal® Super ER ■ Kanthal® Super RA  
■ Kanthal® Super 1700 ■ Kanthal® Super 1800  
■ Kanthal® Super 1900, Kanthal® Super HT, Kanthal® Super NC

Designing heating solutions with Kanthal® Super gives several opportunities to decrease the cost and increase the productivity.

#### BENEFITS WITH KANTHAL® SUPER

- Higher watt loadings compared to other heating solutions up to 1850°C (3360°F) in oxidizing atmospheres 30 W/cm<sup>2</sup> (193.5 W/in<sup>2</sup>) compared to 15 W/cm<sup>2</sup> (97.8 W/in<sup>2</sup>).
- Stable resistance, new and old elements can be connected in series.
- Fast thermal cycling possible without element degradation.
- Relatively easy to change while the furnace is hot.
- Longest inherent life of all electric heating elements.

#### COMPARISON OF SURFACE LOADING

