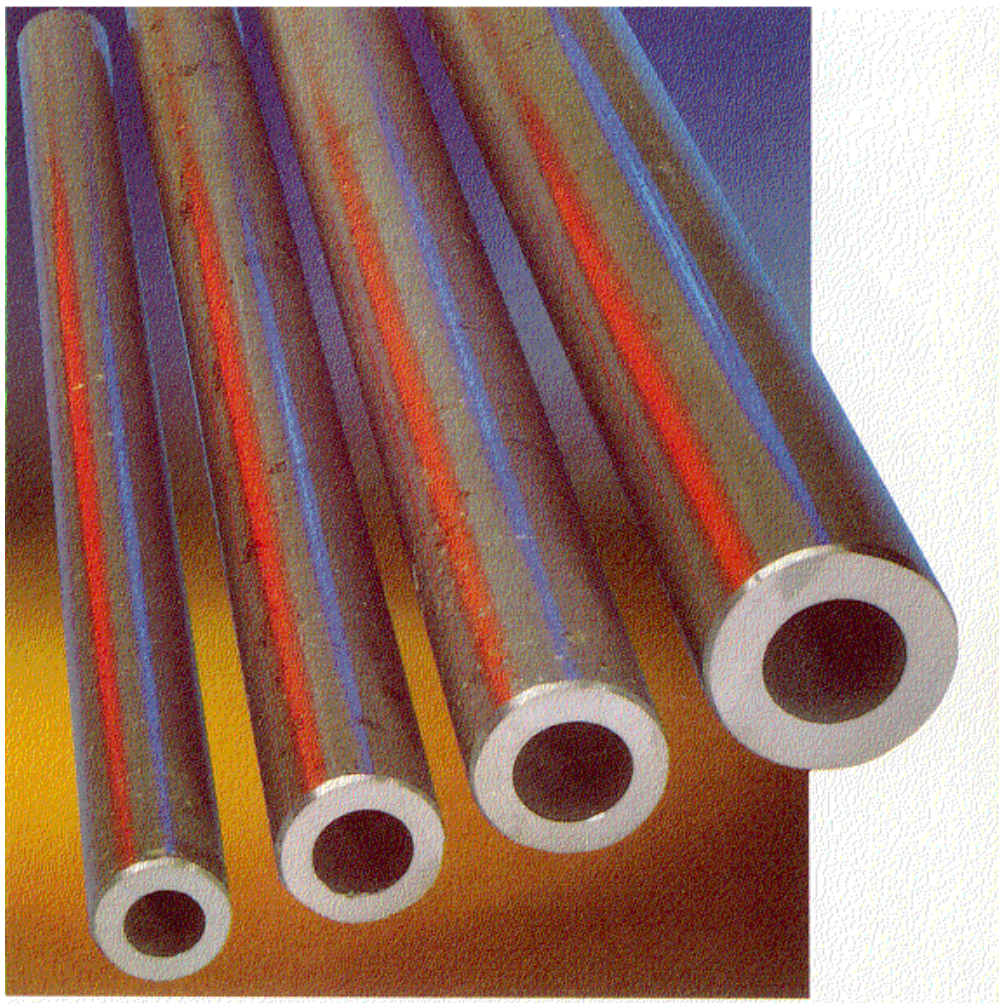


Thermal Alloys Engineering

*Protection Tubes in MoSi_2
for use at
Very High Temperatures*



Thermalloys AB

www.thermalloys.com

High Performance Materials for Very High Temperatures

Tubes in molybdenum disilicide, MoSi₂, has outstanding oxidation resistance at very high temperatures, up to 1700 C (3100 F).

The reason for this is, that at high temperatures, a dense protective layer of glass (SiO₂) is formed on the surface; This protective layer is the key to the superior properties of this material and its usefulness in high temperature furnace applications.

Thermalloys therefore supply tubes in the KANTHAL SUPER* 1700 material for the use as protection tubes, for use as gas injection and gas sampling tubes as well as for the use as bubbler tubes in the glass industry.

Oxidation resistance

KANTHAL SUPER 1700 can be used in most furnace atmospheres; Its highest service temperatures are in oxidizing environments like air, carbon dioxide and water vapour, but the resistance is also high in neutral, reducing and carburizing atmospheres.

In the table below, maximum temperatures for the use of KANTHAL SUPER 1700 in various furnace atmospheres, are listed:

<i>Furnace atmosphere</i>	<i>C</i>	<i>F</i>
Air	1700	3090
Nitrogen	1600	2910
Argon, Helium	1600	2910
Dry hydrogen, dewpoint -80 C (-112 F)	1150	2100
Moist hydrogen, dewpoint 20 C (68 F)	1450	2640
Endogas (e.g. 40 % N ₂ , 40 % H ₂ , 20 % CO)	1400	2550
Cracked and partially burnt ammonia	1400	2550

Microstructure and mechanical properties

Porosity and brittleness is lower in KANTHAL SUPER 1700 as compared to ceramic tubes; This is in particular true at temperatures above 1200 C (2190 F). The large disadvantage of brittle fractures of ceramic tubes is therefore avoided using KANTHAL SUPER 1700.

While KANTHAL SUPER 1700 has a high strength at lower temperatures, at higher temperatures it becomes softer; Therefore, tubes in KANTHAL SUPER 1700 should preferably be mounted vertically.

Physical properties

The thermal conductivity of KANTHAL SUPER 1700 is quite good, superior to that of ceramic tubes.

Metallic protection tubes can, in some furnaces, be influenced by electromechanical oscillations, which may disturb the function of the thermocouple.

The KANTHAL SUPER 1700 protection tubes, suppresses such oscillations. KANTHAL SUPER tubes can therefore, with advantage, also be used at temperatures below 1000 C (1832 F).

Composition and phase formations

KANTHAL SUPER 1700 is a dense cermet material consisting of MoSi₂ and an oxide component, mainly a glass phase.

KANTHAL SUPER 1700 has the ability to withstand oxidation at high temperatures; This is due to the formation of a thin protective layer of quartz glass on the surface. When MoSi₂ reacts with oxygen, this layer of quartz glass is formed and beneath, a thin layer of molybdenum silicide with a lower silicon content, Mo₅Si₃ is formed.

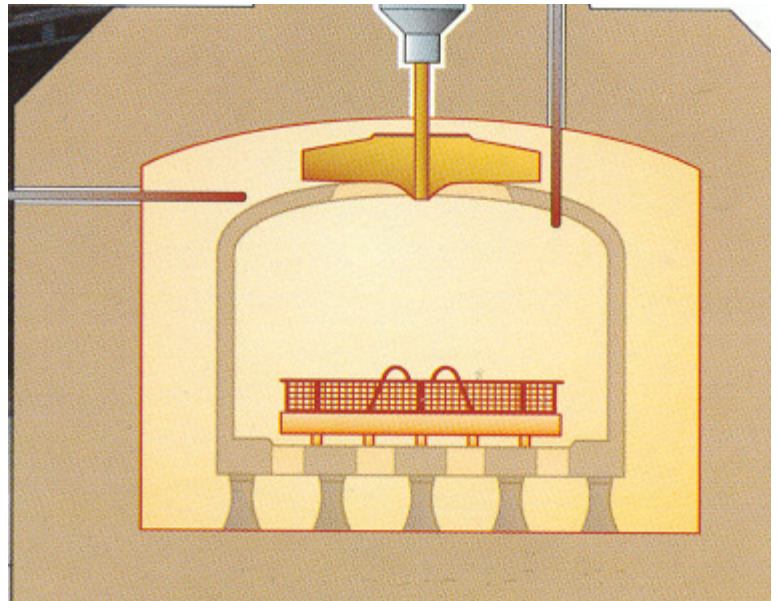
*KANTHAL SUPER is a registered trademark of Kanthal AB

Applications of tubes in MoSi₂-KANTHAL SUPER 1700

1. Protection tubes in high temperature furnaces

In the case of FeCrAl-tubes not having enough oxidation resistance, the KANTHAL SUPER 1700 tubes are suitable

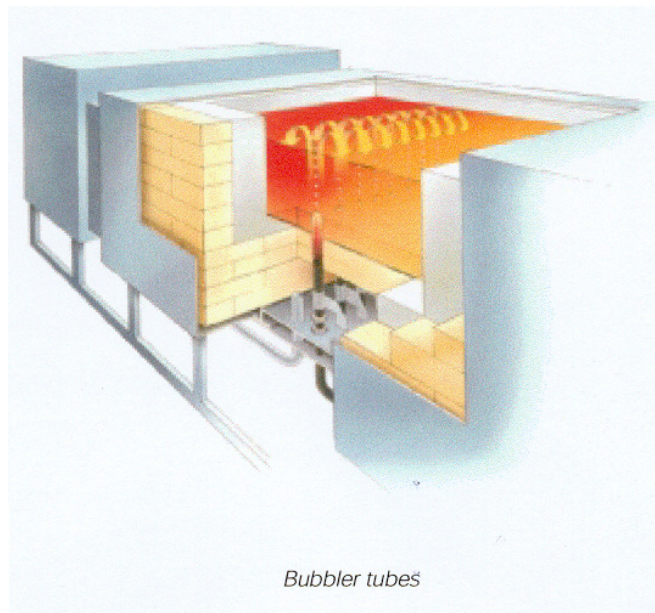
2. Hot gas injection tubes in high temperature furnaces
3. Hot gas sampling tubes in high temperature furnaces
4. Protection tubes when electromagnetic oscillations may disturb the thermocouple
5. Protection tubes when ceramic tubes crack due to brittleness



Bubbler tubes in glass melting tanks

Bubbler tubes in the KANTHAL SUPER 1700 material are used to produce an even melt temperature in the melting tank of glass, by introducing an air current into the molten glass.

If the glass solidifies in the tube, it can be cleared by connecting the tube to an adjacent electrode.



Tubes in molybdenum disilicide, KANTHAL SUPER 1700

Tube size, OD x ID, mm/inch	Maximum length available, mm	Threads
25 x 15/0.98 x 0.59	2000	½”-1”, BSP or NPT
22 x 13/0.87 x 0.51	2000	½”-1”, BSP or NPT
18 x 10/0.71 x 0.39	2000	½”-1”, BSP or NPT
12 x 6/0.47 x 0.24	2000	½”, BSP or NPT
12 x 3/0.47 x 0.12	2000	½”, BSP or NPT
10 x 6/0.39 x 0.24	2000	½”, BSP or NPT
7 x 3/0.28 x 0.12	2000	½”, BSP or NPT

These tubes can be supplied as:

- As straight tubes with open ends, manufactured to required length
- As tubes cut to the required length with an end cap in one end and the other end open
- As tubes cut to the required length with an end cap in one end and the other end with a thread

Please contact us for further information, for technical assistance and/or for a quotation

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