





## 企业简介 Company Introduction

宜兴市荣利钨钼制品有限公司位于宜兴市丁蜀镇，是国内二硅化钼电热元件和碳化硅电热元件的专业生产厂家，公司成立以来，始终坚持以诚信为本，以创新为动力，以服务为宗旨，不断提高企业的核心竞争力。

多年来，我们致力于高温材料和技术及其相关领域的研究和开发，不断提高产品品质，积累了丰富的制造经验，拥有雄厚的技术力量，先进的工艺装备，完整的质量保证体系和科学的管理模式，为国内外客户提供着高品质的产品和完善的服务，产品销往国内外各大城市。

宜兴市荣利钨钼制品有限公司诚挚欢迎新老客户光临惠顾。

YIXING CITY RONGLI TUNGSTEN & MOLYBDENUM PRODUCTS CO.,LTD is located in Dingshu town of Yixing city. We are the professional manufacturer of electrical heating element of  $\text{MoSi}_2$  (molybdenum disilicide) and  $\text{SiC}$  (silicon carbide). Since the company was set up, it always takes the honesty and credibility as the basis, innovation as the driving force and good service as the tenet to improve the core competitiveness of enterprise continuously.

During these years, we devote ourselves to the research and development in the related field of high temperature material and technology to improve the quality of product continually. Meanwhile, we have accumulated rich manufacturing experience and owned strong technical power, advanced technology and equipment, complete quality guarantee system and scientific management mode to provide the product with high quality and perfect service for clients at home and abroad. The products are selling to major cities very well domestically and overseas.

YIXING CITY RONGLI TUNGSTEN & MOLYBDENUM PRODUCTS CO.,LTD welcomes new and old clients to visit our company to discuss the business.

传承科技 奉献卓越

Inheritance of science and technology,dedication of excellence.





## 荣利电热元件是你理想的选择

The heating element of Rongli company is your ideal choice.

### ★ 原料检测 *The detection of raw material*

宜兴市荣利钨钼制品有限公司自成立以来就对原料进行严格检测，根据供应商提供的检测分析报告，我公司通过专业设备，对其数据进行分析，包括粒度、纯度等，确保每批产品指标达到客户要求。

Yixing City Rongli Tungsten & Molybdenum Products Co.,Ltd makes strict inspection for the raw material since it was established,according to test report from the supplier,our company will analyze the data including particle size and purity through specialized equipment to ensure that the index of every batch of product can meet the requirement of customer.

### ★ 细节控制 *The control for the details*

宜兴市荣利钨钼制品有限公司十分注重生产过程中的细节控制，从原料到半成品、成品中，严格检测产品配比、密度、烧结温度、电阻，确保产品电阻误差不超过10%。

Yixing City Rongli Tungsten & Molybdenum Products Co.,Ltd pays attention to the control for the details very much during the production process. From raw material to semi-finished product and product, the proportion of formula,density, sintering temperature,electrical resistance will be controlled strictly to ensure that the tolerance for the resistance of product won't exceed 10%.

### ★ 科技创新 *Scientific and technological innovation*

宜兴市荣利钨钼制品有限公司不断自主研发新型产品，取得多项发明专利。多年以来，公司十分注重客户要求，根据客户提供的使用环境和炉内温度，有针对性的提供改良后的产品，以达到客户的最大满意。

Yixing City Rongli Tungsten & Molybdenum Products Co.,Ltd makes the research and development for the new products continuously and has already gotten many patents for invention. Over the years,the company attaches great importance to the requirement of client, we will supply the products after the improvement according to environmental conditions and furnace temperature from the customer,make the client reach the maximum satisfaction.

### ★ 优质售后 *High quality after-sales service*

宜兴市荣利钨钼制品有限公司一直以来秉承客户至上的宗旨，无论新、老客户，不定期回访，或电话或亲临现场，了解客户使用情况，如出现任何问题，及时有效解决，以达到与客户更长久愉快的合作。

Yixing City Rongli Tungsten & Molybdenum Products Co.,Ltd always adheres to the principle of customer orientation,regardless of new or old customer,we will pay a return visit irregularly,call the customer or visit the site in person,ask for the operating condition of customer.if there is any problem,we will solve it effectively in time to make the pleasant cooperation with the customer for long term.

为你提供专业的加热技术解决方案!  
Provide the professional heating technology solutions for you!

## 新型碳化硅加热元件 New type SiC heating element

### 产品概述 Product overview



#### A-抗氧化涂层 A-Oxidation resistant coating

适用于空气气氛中  
It is suitable for air atmosphere.



#### B-耐腐蚀涂层 B-Corrosion-resistance coating

适用于CO<sub>2</sub>, SO<sub>2</sub>等酸性气氛中  
It is suitable for acidic atmosphere such as CO<sub>2</sub>, SO<sub>2</sub>, etc.



#### C-抗强碱防水涂层 C-Strong alkali resistant and waterproof coating

适用于NH<sub>3</sub>等碱性气氛中  
It is suitable for alkaline atmosphere such as NH<sub>3</sub>, etc.

我公司通过近多年对碳化硅加热元件表面涂层的专业打造、研发，使其在各类窑炉中具有极强的耐高温、抗弯曲、抗腐蚀、抗氧化和防水等性能。在同等功率条件下，阻值变化较小，基材使用寿命延长。

Our company has made the research and development for the surface coating of SiC heating element in recent years, this makes our products have very strong properties in this kind of furnace such as high temperature resistance, bending resistance, corrosion resistance, oxidation resistance and water resistance. Under the condition of same power, the value of resistance changes slightly. The service life of base material will be prolonged.



### 高温抗变形性能

The deformation resistance under high temperature

该新型碳化硅加热元件具有极强的耐高温抗变形性能，同样在三元材料辊道炉中普通碳化硅加热元件易变形，而我公司生产的新型碳化硅加热元件，独到地将强度和表面涂层具有的保温性能结合在一起，可以在更高的温度中使用，而且不易变形弯曲。

This kind of SiC heating element has strong deformation resistance under high temperature, the common SiC heating element is easy to suffer from deformation in the roller furnace of ternary material. But the new type SiC heating element which is manufactured in our company, combining the strength and thermal insulation properties for surface coating, can be used in higher temperature and not easy for bending and deformation.

### 高温抗腐蚀性能

High temperature corrosion resistance

该新型碳化硅加热元件，具有极强的高温抗腐蚀性能，其原因在于表面涂有一层密度大、附着力强的氧化物涂层，保护基材免于腐蚀侵害，不与周围任何环境发生反应、剥落，使其使用寿命延长。

This kind of new type SiC heating element, has strong resistance to high-temperature corrosion because it is coated with one layer of oxidants with big density and strong adhesive force which can protect the base material from the damage of corrosion, making the extension of service life through the isolation with surroundings.

### 防水性能

Waterproofness

碳化硅管材本身有空隙易吸水，该新型碳化硅加热元件具有极强的防水性能，防水涂层附着力强，表面具有较好的流动性能，故形成防水效果。

The tubular product has the air gap itself which is easy to absorb the water. This new type SiC heating element has strong waterproof properties and adhesive force of waterproof coating. There is good flowing property on the surface, so it has waterproof effect.

元件涂层的选择可根据客户使用要求专业定制。

The selection for surface coating of heating element can be made specially according to use requirement of customers.

## 碳化硅电热元件 SiC electrical heating element

### 产品概述 Product overview

碳化硅电热元件是选用优质绿色碳化硅为主要原料，经加工制坯，高温硅化，再结晶而成的棒状非金属高温电热元件。该元件与金属电热元件相比，具有使用温度高，抗氧化，耐腐蚀，寿命长，变形微，安装维修方便等特点。因此它被广泛应用于磁性材料，粉末冶金，陶瓷，玻璃，冶金和机械等工业的各种高温电炉及其电加热设备上。

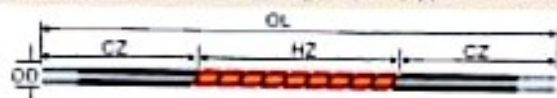
The SiC electrical heating element selects high quality green silicon carbide as the raw material, after the processing of blank making and high-temperature silicification, recrystallize to be rodlike nonmetallic high temperature electric heating element. Comparing with metallic electrical heating element, the heating element is characterized by high operating temperature, oxidation resistance, corrosion resistance, long working life, little deformation and convenient installation and maintenance. Therefore it is used for all kinds of high-temperature electric resistance furnace and electric-heating equipment such as magnetic material, powder metallurgy, ceramic, glass and machine, etc.

我们的碳化硅电热元件采用新的冷端部生产工艺，具有优良的热冷端电阻比，节能，寿命长，同时避免了因冷端部温度过高对炉体造成的损害。

Our SiC electrical heating element adopts the new cold-side manufacturing technique and it has excellent hot-cold side resistance ratio, energy conservation, long working life. Meanwhile, it avoids the damage to furnace body due to excess temperature of cold-side.

### 碳化硅电热元件的产品型号 The product model of SiC heating element

#### SC(单螺旋)型元件 SC(single spiral)type elements



型号Type: SC 外径Outer Diameter: OD, mm

发热部长度Hot zone length: HZ, mm

冷端长度Cold end length: CZ, mm

全长Overall length: OL, mm

间距Shank spacing: A, mm

例如Examples:

SC型Type, OD=25mm, HZ=300mm, CZ=200mm

OL=700mm, Resistance1.59Ω

表示为Specify as:

Rongli SC, 25/300/200

#### SCR(双螺旋)型元件 SCR(double spiral)type elements



型号Type: SCR 外径Outer Diameter: OD, mm

发热部长度Hot zone length: HZ, mm

冷端长度Cold end length: CZ, mm

全长Overall length: OL, mm

例如Examples:

SCR型Type, OD=31.7mm, HZ=305mm, CZ=241mm

OL=576mm, Resistance4.46Ω

表示为Specify as:

Rongli SCR, 31.7/305/241



ED(直棒)型元件 ED straight(rod) type elements



型号Type: ED 外径Outer Diameter: OD, mm  
发热部长度Hot zone length: HZ, mm  
冷端长度Cold end length: CZ, mm  
全长Overall length: OL, mm

例如Examples:

ED型Type, OD=54mm, HZ=1575mm, CZ=419mm

OL=2413, Resistance0.90Ω

表示为Specify as:

Rongli ED, 54/1575/419

U型元件 U type elements



型号Type: U 外径Outer Diameter: OD, mm  
发热部长度Hot zone length: HZ, mm  
冷端长度Cold end length: CZ, mm  
全长Overall length: OL, mm  
间距Shank spacing: A, mm

例如Examples:

U型Type, OD=20mm, HZ=300mm, CZ=400mm

OL=700mm, A=60mm, Resistance2.24Ω × 2

表示为Specify as:

Rongli U, 20/300/400/60

W(三相)型元件 W(three phase)type elements



型号Type: W 外径Outer Diameter: OD, mm  
发热部长度Hot zone length: HZ, mm  
冷端长度Cold end length: CZ, mm  
全长Overall length: OL, mm  
间距Shank spacing: A, mm

例如Examples:

W型Type, OD=20mm, HZ=250mm, CZ=350mm

OL=600mm, A=52mm, Resistance0.90Ω × 3

表示为Specify as:

Rongli W, 20/250/350/52

H型元件 H type elements



型号Type: H 外径Outer Diameter: OD, mm  
发热部长度Hot zone length: HZ, mm  
冷端长度Cold end length: CZ, mm  
全长Overall length: OL, mm

例如Examples:

H型Type, OD=25mm, HZ=300mm, CZ=200mm

OL=570mm, A=60mm, Resistance1.5Ω × 2

表示为Specify as:

Rongli H, 25/300/200/60

枪型元件 Gun-shaped elements



型号Type: GN 外径Outer Diameter: OD, mm  
发热部长度Hot zone length: HZ, mm  
冷端长度Cold end length: CZ, mm  
全长Overall length: OL, mm  
间距Shank spacing: A, mm

例如Examples:

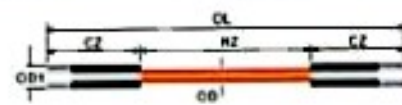
枪型Type, OD=25mm, HZ=300mm, CZ=200mm

OL=570mm, A=60mm, Resistance1.5Ω × 2

表示为Specify as:

Rongli GN, 25/300/200/60

粗端部元件 Dumbbell-shaped elements



型号Type: DB 外径Outer Diameter: OD, mm  
发热部长度Hot zone length: HZ, mm  
冷端长度Cold end length: CZ, mm  
全长Overall length: OL, mm

例如Examples:

粗端部型Type, OD=14mm, HZ=400mm, CZ=300mm,

OD1=22mm, OL=1000mm, Resistance1.5Ω

表示为Specify as:

Rongli DB, 14/22/300 × 400/300

### 碳化硅电热元件的物理性质

Physical property of SiC heating elements

温度 Temperature (°C)	线膨胀系数 Coefficient of linear expansion ( $10^{-6}/^{\circ}\text{C}$ )	热传导率 Heat conductivity (Kcal/Mhr°C)	比热 Specific heat (cal/g°C)
0	/	/	0.148
300	3.8	/	/
400	/	/	0.255
600	4.3	14-18	/
800	/	/	0.294
900	4.5	/	/
1100	/	12-16	/
1200	4.8	/	0.325
1300	/	10-14	/
1500	5.2	/	/

### 元件在不同气氛下使用温度和表面负荷的控制

The operating temperature and control of surface load for the heating element under different atmosphere

气氛 Atmosphere	炉温 Furnace temp (°C)	表面负荷 Surface load (w/cm)	对元件的影响 The effect to the element	解决办法 The solving method
氨 Ammonia	1290	3.8	与SiC作用生成甲烷减少SiO <sub>2</sub> 保护膜 React with SiC to generate the methane to reduce the protective film of SiO <sub>2</sub> .	露点激活 The activation of dew point
CO <sub>2</sub>	1450	3.1	侵蚀碳化硅 Corrode silicon carbide	用石英管保护 Protect with quartz tube
18%CO	1500	4.0	无影响 No influence	
20%CO	1370	3.8	吸附碳粒影响SiO <sub>2</sub> 保护膜 Adsorb the carbon granules to affect SiO <sub>2</sub> protective film	
卤素 Halogen	704	3.8	侵蚀碳化硅减少SiO <sub>2</sub> 保护膜 Corrode the silicon carbide to reduce SiO <sub>2</sub> protective film	用石英管保护 Protect with quartz tube
碳氢化合物 Hydrocarbon	1310	3.1	吸附碳粒而致热污染, 分解的碳沉积, 易造成电器故障 Adsorb the carbon granules to generate thermal pollution, the carbon deposit after (20%) hydrocarbon is easy to happen apparatus failure	送进充分的空气 Feed enough air
氢 Hydrogen	1290	3.1	与SiC作用反应生成甲烷减少SiO <sub>2</sub> 保护膜 React with SiC to generate methane and reduce SiO <sub>2</sub> protective film	露点激活 The activation of dew point
甲烷 Methane	1370	3.1	吸附碳粒而致热污染 Adsorb the carbon granules to generate thermal pollution	
N	1370	3.1	与SiC反应形成氮化硅绝缘层 React with SiC to generate the insulating layer of silicon nitride	
Na	1310	3.8	侵蚀碳化硅 Corrode silicon carbide	用石英管保护 Protect with quartz tube
SO <sub>2</sub>	1310	3.8	侵蚀碳化硅 Corrode silicon carbide	用石英管保护 Protect with quartz tube
真空 Vacuum	1204	3.8		
氧 Oxygen	1310	3.8	碳化硅被氧化 The silicon carbide is oxidized	
水(不同含量) Water (different content)	1090-1370	3.1-3.6	与SiC作用生成硅的不化物 React with SiC to generate silicon compound which is difficult to melt	





## 碳化硅电热元件的安装

The installation of SiC electrical heating element

元件可以看作是简单电阻负载和正常的基本电路定律应用：如，V是电压，I是安培，W是瓦特，R是电阻（Ω）

The heating element can be looked as simple resistive load and basic circuit law is available for it, such as V is voltage, I is ampere, W is watt, R is Resistance(Ω)

$$V=IR=\sqrt{WR}=W/I \quad W=VI=I^2R=V^2/R \quad I=V/R=\sqrt{V/R}=W/V \quad R= V/I= V^2/W=W/I^2$$

在推荐的方式下，对元件进行安装、连接和控制是很重要的，能保证元件寿命最大化。

To install, connect and control the elements base using the recommended method which is very important to ensure the elements with service life max.

元件与元件中心之间的最小距离应为元件直径的2倍，但2.5-3倍为最佳，元件中心与炉壁之间的最小距离应为元件直径的1.5倍，元件中心与被加热物之间的距离至少应为元件直径的2倍。元件与元件中心之间的最小距离应为元件直径的2倍，但2.5-3倍为最佳，元件中心与炉壁之间的最小距离应为元件直径的1.5倍，元件中心与被加热物之间的距离至少应为元件直径的2倍。

The min.spacing between centers of two elements should be 2 times of element diameter, recommended 2.5-3 times of that; the min.distance between of element center to furnace wall should be 1.5 times of element diameter; the distance between element center to products to be heated should be 2 times of element diameter at the least.

## 元件连接

Element connection

元件可以并联，串联或两者混合连接。并联是理想的方式，元件电阻的任何微小变化随着使用会趋于一致。然而，串联方式下，这个变化趋于增加从而导致元件寿命缩减。

元件的电阻增加相当慢，如果元件电阻值匹配的好的话，最多可以串联4支。炉温超过1400度，建议串联的元件限制在2支。

Parallel, series or combinations connections can be made with heating elements, however, parallel connetions are preferred since any small variations in resistance value will tend to balance with use, but with series connection, the small variations will cause element service life to decrease.

The element's resistance increases slowly over time, if the resistance value matches well, they may be connected 4 in series at the most. At furnace temperature above 1400°C, the recommended number of elements in series will be limited to two.



两者混联通常作为一个有效的折中方案,这种情况下,串联的几组应并联。元件任何情况下都不能并联的几组串联,因为一个元件坏掉将导致这一组上剩余的其他元件超载。

三相连接包括星形连接和角形连接。当用星形连接时,建议4线供电,以保证相电压平衡,而与相电阻无关,如果必须使用3线星形连接,那么相电阻必须紧密匹配。

Series/parallel combination is a compromise at best,under this scenario,the groups of series should be connected in parallel,the groups of parallel can't be connected in series in any case,otherwise,if one element failed,the other elements in this group will be overloaded.

3 phase connections include star connection and angle connection.With star connection,4 lines power supply is recommended in order to keep phase voltage in balance,having nothing to do with phase resistance;if star connection with 3 lines is utilized,phase voltage must be matched very closely.

### 电阻值的匹配

To match resistance value

串联下建议元件电阻范围彼此控制在 $\pm 5\%$ 内,并联时元件电阻可以控制 $\pm 10\%$ 范围内,如果任何元件在很短的时间内就不能工作或断掉,可以用新元件替换,但最好挑选电阻较高的元件。如果元件已经使用了相当长时间,整组元件都要换掉,否则新的或旧的元件就要承载过高的负荷,导致其过早的损坏。

把一个炉子上的元件分成一定数量的小控制组是一个不错的操作,以简化将来对电阻进行匹配,比如,一个炉子装48支元件,分成6支8组就比分成16支3组要有弹性的多,匹配电阻就要简单的多。

当替换一组元件后,必须在启动前保证电源供给设备的电压输出减小到正确的值,因为元件过载,即使是很短的时间,也会造成不可挽回的损失。老的元件可以保留下来,随后搭配其他使用一样时间的元件使用。如果可能,替换下来的每一支元件的电压和电流读值都记录下来,增加后的电阻值标在元件的端部,以便以后匹配电阻。

In series connection,the recommended resistance range is with  $\pm 5\%$ ;in parallel connetion,it may be  $\pm 10\%$ .In the case of an element that has failed or broken in a short time frame,replace it with a new element.It's better to choose an element with higher resistance.If an element is used for a prolonged time.all the elements in a group have to be replaced;otherwise,the new or old element will be subjected to too high load and will fail prematurely.

A simple way to match the resistance is to divide all the elements for a furnace into several small control groups.For example,if there are 48 elements in a furnace,divide them into 8 groups of 6 elements per group,this is easier than dividing them into 3 groups of 16 elements per group.

After any group of elements is replaced,it is necessary to decrease the voltage output to the correct minimum value from the power supply,otherwise,the elements will quickly overload and cause complete losses.The old elements from a group may be retained to use some other time.If possible,record voltage and current of every element replaced,and mark the increased resisistance value at terminal of element cold end in order to match the resistances in the future.

## 预留电压

### Voltage reserve

为补偿元件随使用而增加的电阻，要提供可调节的电源供给。总的电压预留要根据元件的电阻率增加和预期的寿命，但通常在新元件需要的电压基础上预留50%到100%。

比如，新的元件共需要110V的电压，那么110-220V的电压范围就预留了100%，而110-165V就是预留了50%。

当元件长时间工作在1400℃或超过1400℃，或者炉子自身的情况会导致元件在低温下电阻增长率过高，应预留100%电压。相反，如果元件温度非常低，或者炉子只是偶尔的使用，预留50%或更少一些也是可以的。

In order to compensate the change in voltage needed due to element resistance aging,a variable voltage power supply is necessary.Usually 50%-100% voltage reservations adjustment on a new element is required.

For example,new elements need 110V totally,then 110-220V voltage range reserves 100%,and 110-165V reserves 50% .

Either elements work at 1400℃ or even above 1400℃,unless conditions in the furnace itself are causing resistances of elements to increase rapidly at low temperature,then 100% voltage reservation is needed.On the contrary,if elements temperature is very low or furnace only works occasionally,50% voltage reservation is workable.

## 电源供应

### Power supply devices

元件一般需要使用可调节的电源供应，以保证设计的功率能够保持贯穿元件的整个寿命过程。所用的设备类型可能影响元件的性能，是否能获得元件最好的寿命，有赖于选择正确的电源供应。

Generally,a variable power supply for heating elements is needed to enable the correct power to be maintained throughout element life.Any type of that supply may affect the performance of element,the key factor in getting the best life is to choose the appropriate power supply.

元件可以使用以下几种不同类型的电源供应：

The following power supply devices can be used to heating element:

1、可调的输出变压器

Variable output transformer

2、可控硅

Thyristor unit

3、可控硅/变压器混合系统

Combined thyristor/transformer system

4、直接与电源连接

Direct-on-line connection

关于各种电源供应方式的选择和应用，请联系我们，我们将提供更详尽的技术咨询和服务。

For any power supplies,don't hesitate to contact us,we will provide you with detailed technical consultation and service.



### 间歇式碳化硅元件电炉设计参考数据

Reference date for the design of Batch-type electrical furnace

1、加热功率(KW)=被加热物重量(KG)×被加热物比热×升温速率(最高炉温℃+总加热时间h)  
+860(860千卡=1KW)

设:单位热损失为740千卡/M<sup>2</sup>小时

Heating power(kw)=weight of the object to be heated(kg)× specific heat of the object to be heated × temperature-raising speed max furnace temp.(°C) + [total heating time (hour) × 860](860kcal=1kw).  
Suppose:unit heat-loss is 740kcal/m<sup>2</sup>hour

2、热损失(KW)=炉膛表面积(m<sup>2</sup>)×740+860(860kcal=1KW)

设:炉壁厚10cm,炉温100℃为一个单位常数,此时炉膛每m<sup>2</sup>面积上的蓄热为635千卡。

Heat-loss(kw)=surface area of furnace chamber(m<sup>2</sup>)×740+860

Suppose:furnace wall thickness 10cm and furnace temperature 100℃ is a unit constant,then the heat accumulation quantity on the furnace chamber is 635 kcal per m<sup>2</sup>.

3、蓄热功率(KW)=[[(炉膛厚度cm+10cm)×(最高炉温℃+100℃)]×635]×炉膛表面积m<sup>2</sup>  
+(总加热时间hr×860).

Heat accumulation power(KW)=[[(furnace wall thickness cm + 10cm) × (max. furnace temperature °C + 100°C)] × 635] × furnace chamber area m<sup>2</sup> ÷ (total heating time(hr) × 860).

4、所需总功率(KW),是前三项之和。由于碳化硅电热元件长期在高温下工作,逐渐老化而阻值增大,功率下降。为能及时调整到所需功率,变压器功率应大于所需总功率的60-100%为宜。  
The total power needed(KW)is the sum of the above three terms.Owning to the fact that heating elements work long-term under high temperature,it gradually ages and its resistance value increases,power needed in time,the power of adjust it to the power needed in time,the power of transformer should be 60-100% larger than the total power needed.

5、所需总功率(KW)÷单支元件功率=应安装元件数量。

Total power(kw)needed ÷ single element power=the quantity of elements that should be installed.

### 连续式碳化硅元件电炉设计参考数据(实践)

Reference date for the design of Continuous type electrical furnace(practice)

1、炉车载物:变压器功率230KW/m<sup>3</sup>(炉膛体积),生产最高功率193KW/m<sup>3</sup>(炉膛体积);推板载物:变压器功率194KW/m<sup>3</sup>(炉膛体积),生产最高功率160KW/m<sup>3</sup>(炉膛体积)

Material loaded on furnace car: transformer power 230KW/m<sup>3</sup>,Max work power 193KW/m<sup>3</sup> Material loaded on pushing plate: transformer power 194KW/m<sup>3</sup>,Max work power 160KW/m<sup>3</sup>

2、每M<sup>3</sup>炉膛体积,可安装元件的发热部表面积为19620.7cm<sup>2</sup>

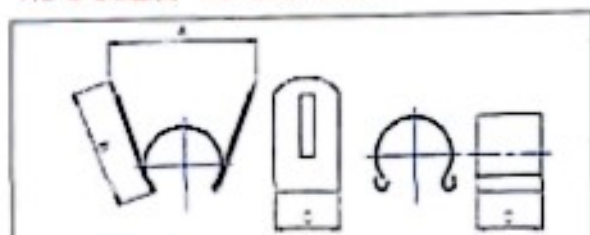
In each M<sup>3</sup> of furnace chamber,the total area for element hot zone that can be installed is 19620.7cm<sup>2</sup>

3、电炉应安装元件的数量=19620.7cm<sup>2</sup>÷所选元件单支发热部表面积cm<sup>2</sup>

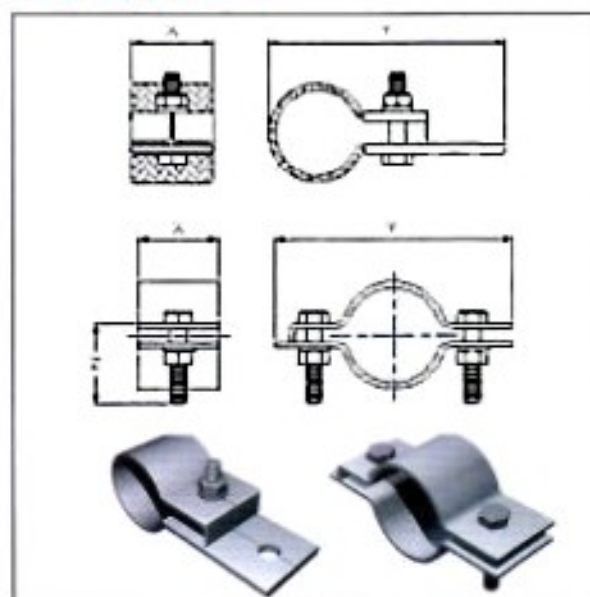
The quantity of elements that should be installed in the electric furnace used=19260.7cm<sup>2</sup> ÷ total surface area of the element hot zone selected(cm<sup>2</sup>)

## 元件附件 Accessories of elements

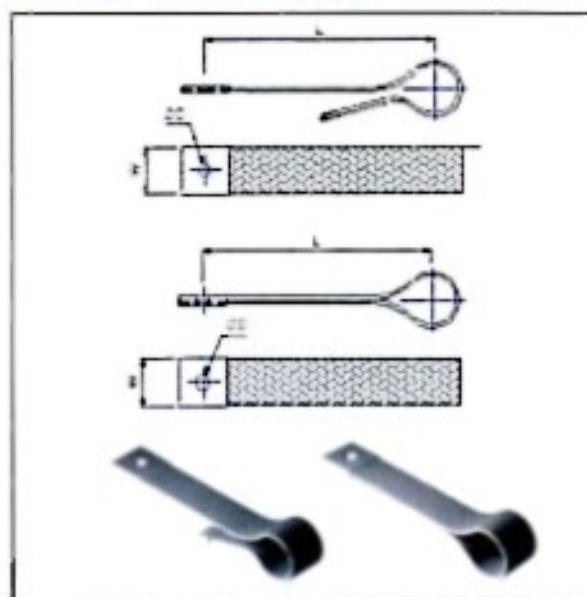
HC & CC型夹 HC & CC CLIPS



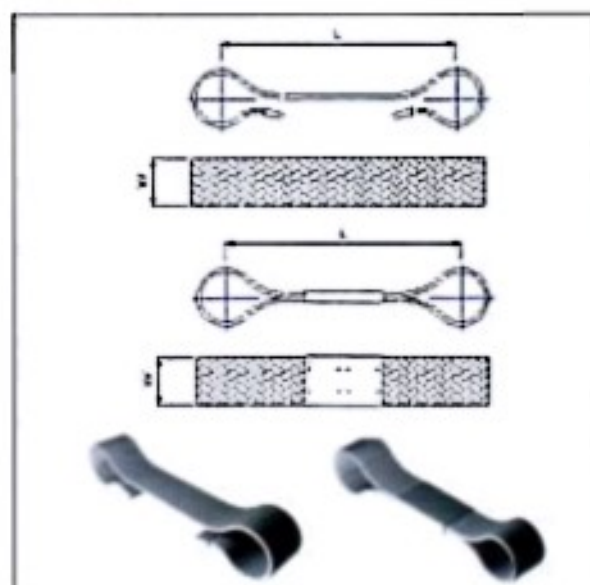
G & D型夹 CLAMPS



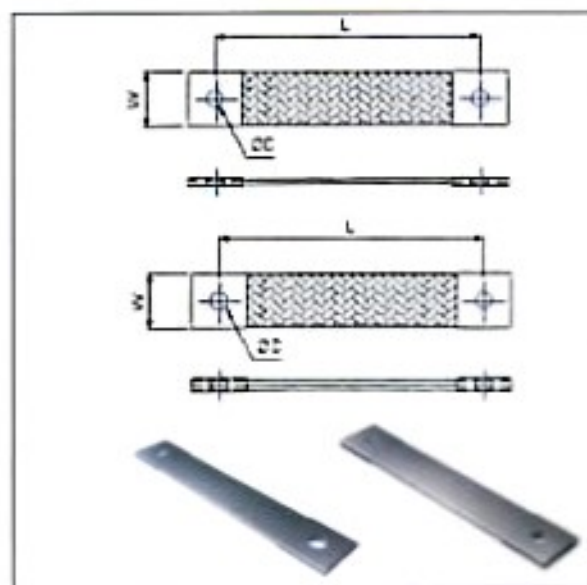
S型连接带 TYPE S-BRAIDS



D型连接带 TYPE D-BRAIDS



O型连接带 TYPE O-BRAIDS





**产品规格表**

The table of product specification

直径 Diameter (mm)	发热部长 The length of hot zone (mm)	冷端部长 The length of cold side (mm)	全长 Overall length (mm)	发热部表面积 The superficial area of hot zone (cm <sup>2</sup> )	额定负荷 (1050℃时测试) Rated load (Test at 1050℃)		
					电压 (V) Voltage	功率 (W) Power	电阻 (Ω) Resistance
12	150	150	450	56	41	896	1.85
	200	200	600	75	50	1200	2.10
	250	200	650	94	63	1504	2.62
	300	200	700	113	75	1808	3.15
14	200	200	600	88	41	1408	1.22
	250	250	750	110	51	1760	1.50
	300	250	800	132	62	2112	1.80
	350	200	750	154	73	2464	2.14
	400	250	900	176	82	2816	2.40
16 (5/8")	300	250	800	150	62	2400	1.60
	350	350	1050	176	70	2816	1.75
	400	350	1100	200	80	3200	2.00
	450	250	950	225	90	3600	2.25
	500	250	1000	250	100	4000	2.50
	600	250	1100	300	120	4800	3.00
20 (3/4")	300	400	1100	188	59	3008	1.14
	400	350	1100	251	76	4016	1.45
	500	400	1300	314	97	5056	1.85
	600	400	1400	376	114	6016	2.15
	700	400	1500	439	138	7024	2.70
	800	300	1400	502	148	7530	2.90
	900	300	1500	565	162	8475	3.10
25 (1")	300	300	900	236	53	3776	0.75
	400	450	1300	314	71	5024	1.00
	500	400	1300	392	90	6272	1.30
	600	400	1400	470	108	7520	1.55
	700	400	1500	550	120	8250	1.75
	800	400	1600	627	134	9405	1.90
	900	300	1500	705	151	10575	2.16
	1000	300	1600	785	168	11775	2.40
30	400	300	1000	380	63	5700	0.70
	500	300	1100	470	80	7050	0.90
	600	400	1400	570	92	8550	1.00
	700	450	1600	660	109	9900	1.20
	800	500	1800	750	125	11250	1.40
	900	400	1700	850	140	12750	1.53
	1000	300	1600	940	153	14100	1.65
	1100	300	1700	1035	168	15525	1.82



直径 Diameter (mm)	发热部长 The length of hot zone (mm)	冷端部长 The length of cold side (mm)	全长 Overall length (mm)	发热部表面积 The superficial area of hot zone (cm <sup>2</sup> )	额定负荷   1050℃时测试   Rated load   Test at 1050℃		
					电压 (V) Voltage	功率 (W) Power	电阻 (Ω) Resistance
31.7 (1.25")	356	280	916	355	52	5315	0.50
	406	280	965	405	59	6060	0.57
	457	280	1016	456	66	6820	0.64
	508	280	1067	507	73	7585	0.71
	559	280	1118	557	80	8345	0.78
	610	280	1168	608	88	9110	0.85
	660	280	1219	659	95	9855	0.92
	711	280	1270	709	103	10615	0.99
	762	280	1321	760	110	11380	1.06
	813	394	1600	811	117	12140	1.13
	864	394	1651	861	124	12900	1.20
	914	394	1702	912	131	13650	1.27
	1016	394	1803	1013	145	15170	1.40
	1067	394	1854	1063	153	15930	1.47
	1118	394	1905	1115	160	16690	1.54
	1448	406	2260	1442	217	21620	2.17
1499	381	2260	1493	224	22380	2.25	
35	400	400	1200	440	67	6600	0.68
	500	400	1300	550	84	8250	0.85
	600	400	1400	660	100	9900	1.02
	700	400	1500	770	117	11550	1.19
	800	400	1600	880	134	13200	1.36
	900	400	1700	990	151	14850	1.53
	1000	400	1800	1100	167	16500	1.69
	1100	400	1900	1210	184	18150	1.87
	1200	400	2000	1320	201	19800	2.04
	1300	400	2100	1430	218	21450	2.21
	1400	400	2200	1540	234	23100	2.38
	1500	400	2300	1650	251	24750	2.55
	1600	300	2200	1760	263	25520	2.72
1700	300	2300	1870	280	27115	2.89	
38.1 (1.5")	406	280	965	487	54	7285	0.40
	457	280	1016	547	61	8200	0.45
	508	280	1067	608	67	9115	0.49
	559	280	1118	669	74	10030	0.54
	610	280	1168	730	80	10950	0.59
	660	280	1219	791	86	11840	0.63
	711	280	1270	851	93	12760	0.68
	762	280	1321	912	100	13675	0.73
	813	394	1600	973	106	14590	0.78
	864	394	1651	1034	113	15505	0.83
	914	280	1702	1095	119	16400	0.87
	965	394	1524	1155	126	17320	0.92
	1016	394	1803	1216	132	18230	0.97
	1118	394	1905	1338	146	20060	1.07
	1219	394	2007	1459	159	21875	1.16
	1312	394	2108	1581	172	23705	1.26
1422	394	2210	1702	186	25520	1.36	





直径 Diameter (mm)	发热部长 The length of hot zone (mm)	冷端部长 The length of cold side (mm)	全长 Overall length (mm)	发热部表面积 The superficial area of hot zone (cm <sup>2</sup> )	额定负荷 (1050℃时测试) Rated load (Test at 1050℃)		
					电压 (V) Voltage	功率 (W) Power	电阻 (Ω) Resistance
40	500	400	1300	628	75	9420	0.60
	600	400	1400	753	90	11295	0.72
	700	400	1500	880	105	13200	0.84
	800	400	1600	1005	118	14573	0.96
	900	400	1700	1130	133	16385	1.08
	1000	400	1800	1255	148	18198	1.20
	1100	400	1900	1381	163	20025	1.32
	1200	400	2000	1506	177	21837	1.44
	1300	400	2100	1630	192	23635	1.56
	1400	400	2200	1760	207	25520	1.68
	1500	400	2300	1880	222	27260	1.80
	1600	300	2200	2010	236	29145	1.91
	1700	300	2300	2140	250	31030	2.02
44.4 (1.75")	508	280	1067	708	61	10625	0.36
	559	394	13469	780	68	11690	0.40
	610	305	1219	851	74	12760	0.43
	660	293	1245	921	81	13805	0.47
	711	394	1499	992	87	14970	0.51
	762	394	1549	1063	93	15935	0.55
	813	394	1600	1134	99	17000	0.59
	864	394	1651	1205	104	18070	0.61
	914	394	1702	1275	112	19115	0.65
	965	394	1753	1346	118	20180	0.70
	991	419	1829	1382	120	20725	0.69
	1016	394	1803	1417	122	21250	0.70
	1118	419	1956	1560	136	23380	0.80
	1219	432	2083	1700	148	25490	0.87
	1270	394	2057	1772	155	26560	0.92
	1295	381	2057	1805	155	27082	0.89
	1321	394	2108	1843	161	27625	0.95
	1372	394	2159	1914	168	28690	1.00
	1422	394	2210	1984	173	29740	1.03
	1473	394	2261	2055	180	30805	1.07
1524	394	2311	2126	186	31870	1.10	
1575	419	2413	2197	192	32940	1.15	
1626	394	2413	2268	197	34005	1.17	
50	1000	400	1800	1570	127	21980	0.73
	1500	400	2300	2360	191	33040	1.10
	1700	400	2500	2670	216	37520	1.24
	2000	400	2800	3140	253	43960	1.46



直径 Diameter (mm)	发热部长 The length of hot zone (mm)	冷端部长 The length of cold side (mm)	全长 Overall length (mm)	发热部表面积 The superficial area of hot zone (cm <sup>2</sup> )	额定负荷 (1050℃时测试) Rated load (Test at 1050℃)		
					电压 (V) Voltage	功率 (W) Power	电阻 (Ω) Resistance
54 (2.125")	508	305	1118	862	62	12920	0.30
	553	229	991	904	66	13555	0.32
	559	305	1168	948	69	14220	0.33
	610	305	1219	1035	75	15515	0.36
	660	305	1270	1120	80	16785	0.38
	686	280	1245	1164	84	17450	0.40
	711	305	1321	1208	88	18058	0.42
	762	305	1372	1293	93	19380	0.44
	813	419	1651	1379	99	20675	0.49
	864	419	1702	1466	105	21975	0.51
	914	420	1753	1551	112	23250	0.54
	965	419	1803	1637	126	24545	0.57
	1016	419	1854	1724	123	25840	0.60
	1067	419	1905	1810	129	27140	0.63
	1118	419	1956	1897	135	28435	0.66
	1143	394	1930	1939	139	29070	0.67
	1168	420	2007	1982	142	29710	0.69
	1219	458	2134	2068	147	31005	0.71
	1270	419	2108	2155	153	32300	0.74
	1321	419	2159	2241	159	33600	0.77
	1372	419	2210	2328	166	34895	0.80
	1422	420	2261	2412	171	36170	0.82
	1473	419	2311	2499	179	37465	0.85
	1499	229	1956	2543	175	38125	0.80
	1524	394	2311	2585	184	38760	0.89
	1575	419	2413	2671	189	40060	0.90
	1626	419	2464	2758	196	41355	0.94
	1651	267	2184	2801	198	41990	0.93
	1676	420	2515	2843	202	42630	0.97
	1727	419	2565	2930	207	43925	0.99
	1778	419	2616	3016	213	45220	1.01
	1880	305	2489	3189	225	47815	1.06
1981	254	2489	3361	238	50385	1.12	
2032	242	2515	3447	244	51680	1.15	
2083	330	2743	3534	250	52980	1.18	
2108	267	2642	3576	253	53615	1.19	
2134	241	2616	3620	255	54275	1.20	
2159	445	3048	3663	260	54910	1.23	
2286	343	2972	3878	274	58140	1.29	
2311	420	3150	3921	279	58780	1.32	
2413	267	2946	4094	290	61370	1.37	
2438	420	3277	4136	295	62010	1.40	

注: 1、电阻公差: 每一组元件之间为 $\pm 5\%$ , 发送的每一批元件之间为 $\pm 10\%$ , 批与批之间可以是 $\pm 20\%$ 。  
Note: 1、The tolerance of resistance:  $\pm 5\%$  in every group of heating element,  $\pm 10\%$  in every batch of heating element,  $\pm 20\%$  in different batch of heating element.

2、也可以根据用户的不同需求生产特殊规格。  
2、We can make the production of different specification according to different need of customers.



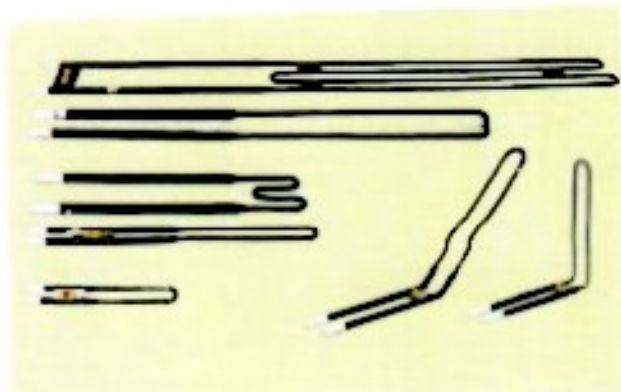
## 二硅化钼电热元件

### MoSi<sub>2</sub>(molybdenum disilicide) electrical heating element

#### 产品概述

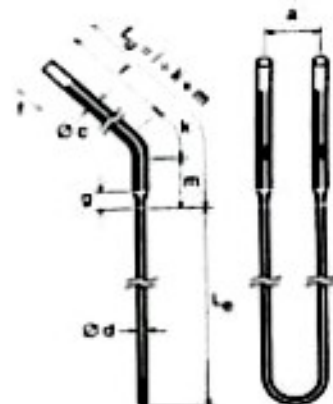
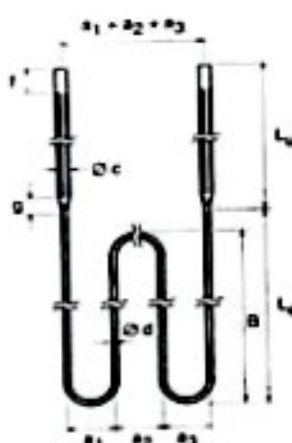
#### Product overview

二硅化钼电热元件是一种以硅化钼为基础的电阻发热元件，其在氧化气氛下加热到高温，表面生成一层致密的石英玻璃膜，保护其不再氧化。因此，其具有独特的高温抗氧化性。在氧化气氛下，其最高温度可达1800℃，其适用温度为900-1700℃，可以作为陶瓷、磁性材料、玻璃、冶金、耐火材料等工业高温炉的加热元件。



The electrical heating element of MoSi<sub>2</sub> (molybdenum disilicide) is a kind of resistance heating element which is based on molybdenum silicide. It will be heated to high temperature under oxidizing atmosphere, it can produce a dense layer of quartz glass-film to prevent it from being oxidized again. So it has the unique high-temperature oxidation resistance. Under the oxidizing atmosphere, its maximum temperature can reach 1800℃, its applicable temperature will be 900-1700℃, it can be used for the heating element of industrial high temperature furnace such as ceramic, magnetic material, glass, metallurgy, refractory material, etc.

标注方式



Hot end 冷端 Cold end	a mm		c mm	d mm	f mm	g mm	k90° mm	k45° mm	m mm	n mm		r mm	
	Standard	Minimum								Standard	Minimum		
3/6	25	20	6	3	25	15	19	9	30	42		12	
4/9	25	20	9	4	25	15	19	9	35	47		12	
6/12	50	40	12	6	45	25	47	24	60	90	80	30	20
9/18	60	50	18	9	75	30	71	35	90	135	110	45	20
12/24	80	60	24	12	100	40							

## 二硅化钼电热元件的理化性质

### The physical and chemical properties of MoSi<sub>2</sub> (heating element)

#### 一、物理性质 Physical property

体积密度 Volume density	弯曲强度 Bending strength	硬度 Hardness	气孔率 Gas hole rate	吸水率 Water absorption	热伸长率 Thermal elongation rate	断裂韧性 Fracture toughness	压缩强度 Compression strength
5.8g/cm <sup>3</sup>	350MPa	12.0GPa	±5%	0.6	4%	4.5MPa.m <sup>1/2</sup>	650MPa

#### 二、化学性质 Chemical property

高温抗氧化性：高温氧化气氛下，元件的表面生成一层致密的石英SiO<sub>2</sub>保护层以防止MOSi<sub>2</sub>继续氧化。当元件温度大于1700℃，熔点为1710℃的石英保护层熔掉，由于表面张力的作用，石英熔聚成滴，而失去保护作用，元件在氧化气氛下，再继续使用时，石英保护层重新生成。

High-temperature oxidation resistance: under the high-temperature oxidation atmosphere, it produces a dense quartz SiO<sub>2</sub> protective layer to prevent MOSi<sub>2</sub> to be oxidized again. When the temperature of heating element is greater than 1700℃, the quartz protective layer with fusing point of 1710℃ will be fused, due to effect of surface tension, quartz is fused to become the drop and loses the protective effect. If the heating element continues to be used under the oxidizing atmosphere, the quartz protective layer will be generated again.

必须指出的是元件不宜在400-700℃范围内长时间使用，否则元件会因低温的强烈氧化作用而粉化。

It must emphasized that heating element is not suitable for using for long period ranging from 400 to 700℃. Otherwise, the element will suffer from strong oxidation effect in the low temperature.

#### 三、不同气氛对元件温度的影响

The effect on the temperature of heating element due to different atmosphere

气氛 Atmosphere	最大元件温度 The maximum temperature of heating element	
	Rongli super Ms17	Rongli super Ms18
空气 Air	1700℃	1600℃
氮气 Nitrogen	1600℃	1700℃
氩气 Argon gas 氨气 Ammonia gas	1600℃	1700℃
氢气 Hydrogen	1100-1450℃	1100-1450℃
M <sub>2</sub> /H <sub>2</sub> 95/5%	1250-1600℃	1250-1600℃
应用领域 Application fields	主要用于工业热处理炉、烧结炉、铸造炉、玻璃熔炉、冶炼炉等。 They are mainly used for industrial heat treatment furnace, sintering furnace, casting furnace, glass furnace, smelting furnace, etc.	主要用于实验炉、测试设备和高温烧结炉等。 They are mainly used for experimental furnace, test equipment and high temperature sintering furnace.



## 二硅化钼电热元件的电气性质

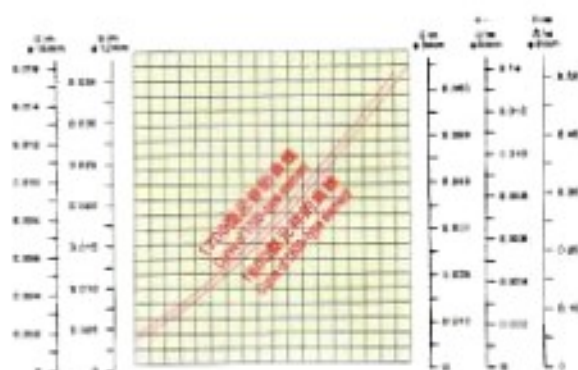
### The electrical property of MoSi<sub>2</sub> (molybdenum disilicide) electrical heating element

#### 一、电阻特性

The property of electrical resistance

二硅化钼电热元件的电阻率随着温度升高而迅速增加,在正常操作情况下,元件电阻一般不随使用时间的长短而变化。因此,新旧元件可以混合使用。

The electrical resistivity of MoSi<sub>2</sub> (molybdenum disilicide) electrical heating element will be increased rapidly with the increase of temperature. Under the normal operating condition, the resistance of heating element will not change according to the length of time. Therefore, the new and old heating elements can be mixed for using.

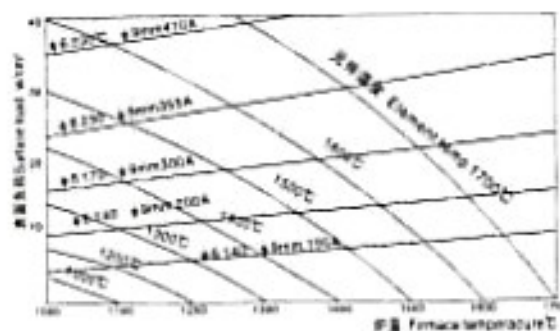


#### 二、表面负荷

Surface load

根据炉子的结构,气氛和温度正确地选择元件表面负荷是达到最好元件寿命的关键。右图示出了元件辐射在阴影部分为常用的表面负荷——温度范围。

According to the structure of the furnace, the correct choice of atmosphere and temperature to reach the corresponding surface load, this is key to reach the optimal working life of heating element. The right figure indicates that the shaded area of element radiation is common surface load ——— temperature range.



#### 三、推荐的表面负荷

Recommended surface load

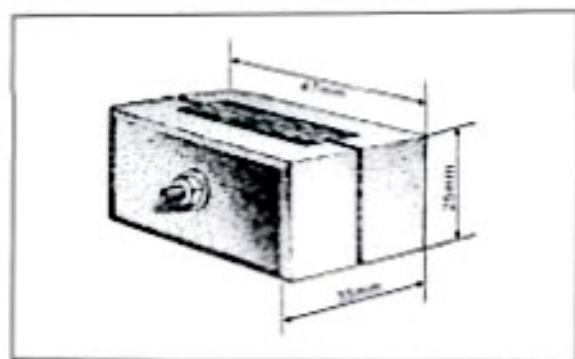
炉温(°C) Furnace temp	1400	1500	1600	1650	1700
发热部表面负荷 Surface load of hot zone(w/cm²)	< 18	< 15	< 12	< 10	< 8

二硅化钼电热元件的附件

Accessories of elements

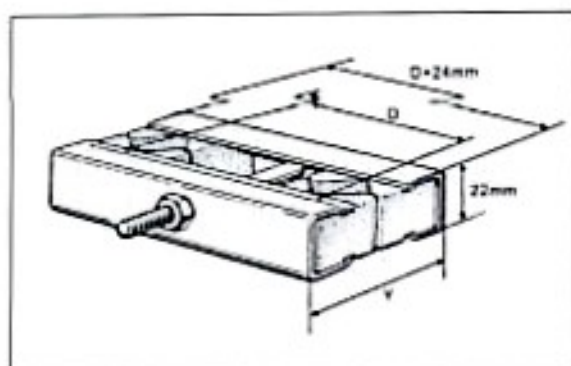
用于3/6和4/9元件的固定夹

Element holders for 3/6 and 4/9 elements



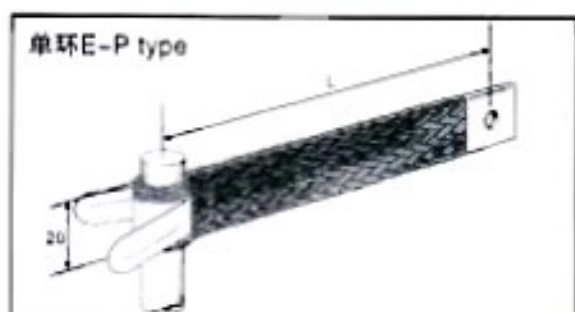
用于6/12和9/18元件的固定夹

Element holders for 6/12 and 9/18 elements



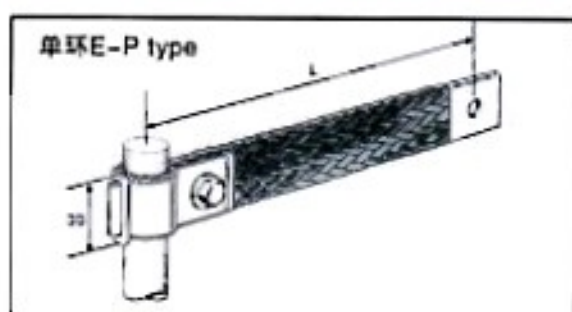
用于3/6和4/9元件的连接带

Connecting straps for 3/6 and 4/9 elements



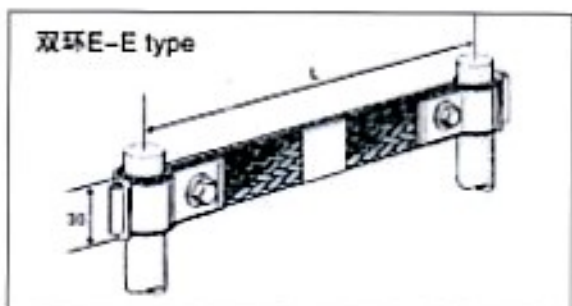
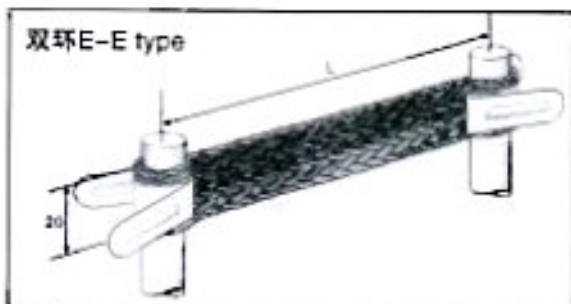
用于6/12和9/18元件的连接带

Connecting straps for 6/12 and 9/18 elements



用于元件与电源的连接 Used for element to power

用于元件与电源的连接 Used for element to power



用于元件与元件的连接 Used for element to element

用于元件与元件的连接 Used for element to element



## 二硅化钼电热元件的安装

### The installation of MoSi<sub>2</sub> (molybdenum disilicide) heating element

安装元件时夹头上的螺丝不要一次拧的太紧，待元件升到高温时再次拧紧，因为这时元件有一定塑性不易折断。夹头部分温度不要高于200℃，因此，夹头导线与元件接触电压应降低0.1V。为了避免辐射热传到夹头，夹头下面和穿砖上面的距离不应小于50mm。为了避免损坏，一般直径6/12mm元件不能长期使用170A，直径9/18mm元件不能长期使用300A。

When the heating element is installed, the clamping head can't be screwed too tightly for first time, when the heating element rises to high temperature, tighten it again, the element is not easy to break at that moment because of its plasticity. The temperature of clamping head shall not exceed 200°C. Therefore the contact voltage between clamping wire and heating element shall be reduced by 0.1V. In order to prevent that radiating heat reaches to clamping head, the distance between the underneath of clamping head and top of fire bricks shall not be less than 50mm. To prevent the damage, the heating element with the diameter of 6/12mm can't use 170A for long term, the heating element with the diameter of 9/18mm can't use 300A for long term.



### 各种硅钼棒元件参考数据

The reference data for all kinds of MoSi<sub>2</sub> heating element

#### 1、1800等级3/6mm的U型元件

1800 Grade U type 3/6mm elements

元件 Code	150	180	200	250	300	350
150	378 0.186 8.4	440 0.217 9.6	483 0.239 10.7	591 0.292 13.1	698 0.345 15.5	805 0.398 17.9
200	351 0.173 8.7	485 0.235 10.1	498 0.246 11.1	625 0.299 13.4	712 0.352 15.8	820 0.405 18.2
250	405 0.200 9.0	470 0.232 10.4	512 0.253 11.4	620 0.306 13.8	727 0.359 16.2	834 0.412 18.5
280	411 0.203 9.1	475 0.235 10.6	518 0.256 11.5	626 0.309 13.9	733 0.362 16.3	840 0.415 18.7
300	420 0.207 9.3	484 0.239 10.9	527 0.260 11.7	634 0.312 14.1	742 0.365 16.5	849 0.419 18.9

条件 Condition: 功率 Power: W  
 元件温度 Element temp 1700°C 热电阻 Resistance: Ω  
 炉子温度 Furnace temp 1600°C 工作电压 Voltage: V  
 电流 Amperage 45A  
 表面负荷 Surface load 11.5W/cm<sup>2</sup>

#### 2、1800等级4/9mm的U型元件

1800 Grade U type 4/9mm elements

元件 Code	150	180	200	250	300	350
150	492 0.116 7.6	579 0.137 8.9	637 0.161 9.8	781 0.185 12.0	925 0.219 14.2	1070 0.253 16.5
200	507 0.120 7.8	634 0.141 9.1	652 0.154 10.0	796 0.188 12.2	940 0.223 14.5	1085 0.257 16.7
250	522 0.124 8.0	629 0.144 9.4	667 0.158 10.3	811 0.192 12.5	955 0.226 14.7	1100 0.260 16.9
280	528 0.125 8.1	615 0.143 9.3	673 0.159 10.3	817 0.193 12.6	961 0.228 14.8	1106 0.262 17.0
300	537 0.127 8.3	624 0.148 9.6	682 0.161 10.5	826 0.195 12.7	970 0.230 14.9	1115 0.264 17.2

条件 Condition: 功率 Power: W  
 元件温度 Element temp 1700°C 热电阻 Resistance: Ω  
 炉子温度 Furnace temp 1600°C 工作电压 Voltage: V  
 电流 Amperage 55A  
 表面负荷 Surface load 11.8W/cm<sup>2</sup>

3. 1700等级6/12mm的U型元件 1700 Grade U Shape 6/12mm elements

Hot end 热端	150	180	200	250	300	350	400	450	500	550	600
150	887 0.044 6.5	1132 0.051 7.7	1162 0.056 8.4	1538 0.068 10.2	1810 0.080 12.1	2084 0.093 13.9					
200	1028 0.048 6.8	1189 0.053 7.9	1299 0.058 8.7	1573 0.070 10.5	1848 0.082 12.3	2122 0.094 14.1	2396 0.106 16.0				
250	1062 0.047 7.1	1227 0.055 8.2	1337 0.059 8.9	1611 0.072 10.7	1885 0.084 12.6	2159 0.096 14.4	2433 0.108 16.2	2708 0.120 18.1			
270	1077 0.048 7.2	1242 0.055 8.3	1352 0.060 9.0	1628 0.074 10.8	1900 0.086 12.7	2174 0.097 14.5	2448 0.109 16.3	2723 0.121 18.2	2997 0.133 20.0		
300	1100 0.049 7.3	1264 0.056 8.4	1374 0.061 9.2	1648 0.073 11.0	1923 0.085 12.8	2197 0.098 14.6	2471 0.110 16.5	2745 0.122 18.3	3019 0.134 20.1	3294 0.146 22.0	3568 0.158 23.8
350	1137 0.051 7.6	1302 0.058 8.7	1412 0.063 9.4	1686 0.075 11.2	1960 0.087 13.1	2234 0.099 14.9	2508 0.111 16.7	2783 0.124 18.6	3057 0.136 20.4	3331 0.148 22.2	3605 0.160 24.0
400	1175 0.052 7.8	1339 0.060 8.9	1449 0.064 9.7	1723 0.077 11.5	1998 0.089 13.3	2272 0.101 15.1	2546 0.113 17.0	2820 0.125 18.8	3094 0.138 20.6	3369 0.150 22.5	3643 0.162 24.3
450		1377 0.061 9.2	1487 0.066 9.9	1761 0.078 11.7	2035 0.090 13.6	2309 0.103 15.4	2583 0.115 17.2	2858 0.127 19.1	3132 0.139 20.9	3406 0.151 22.7	3680 0.164 24.5
500				1798 0.080 12.0	2073 0.092 13.8	2347 0.104 15.8	2621 0.116 17.5	2895 0.129 19.3	3169 0.141 21.1	3444 0.153 23.0	3718 0.165 24.8
550					2110 0.094 14.1	2384 0.106 15.9	2658 0.118 17.7	2933 0.130 19.6	3207 0.143 21.4	3481 0.155 23.2	3755 0.167 25.0
600					2148 0.095 14.3	2422 0.108 16.1	2696 0.120 18.0	2970 0.132 19.8	3244 0.144 21.6	3519 0.156 23.5	3793 0.169 25.3
650							2733 0.121 18.2	3008 0.134 20.1	3282 0.146 21.9	3558 0.158 23.7	3830 0.170 25.5
700							2771 0.123 18.5	3045 0.135 20.3	3319 0.148 22.1	3594 0.160 24.0	3868 0.172 25.8

功率 Power: W  
热电阻 Resistance: Ω  
工作电压 Voltage: V

条件 Condition:  
元件温度 Element temp 1500°C  
炉子温度 Furnace temp 1300°C  
电流 Amperage 150A  
表面负荷 Surface load 15W/cm<sup>2</sup>

4. 1800等级6/12mm的U型元件 1800 Grade U type 6/12mm elements

Hot end 热端	150	180	200	250	300	350	400	450	500	550	600
150	888 0.044 6.2	994 0.051 7.1	1092 0.056 7.8	1330 0.068 9.5	1568 0.080 11.2	1806 0.092 12.9					
200	882 0.045 6.3	1022 0.052 7.3	1120 0.057 8.0	1358 0.069 9.7	1582 0.081 11.3	1820 0.093 13.0	2058 0.105 14.7				
250	924 0.047 6.6	1054 0.054 7.6	1162 0.059 8.3	1386 0.071 9.9	1624 0.083 11.6	1862 0.095 13.3	2100 0.107 15.0	2338 0.119 16.7	2562 0.131 18.3		
270	924 0.047 6.6	1078 0.055 7.7	1142 0.059 8.3	1386 0.071 9.9	1624 0.083 11.6	1862 0.095 13.3	2100 0.107 15.0	2338 0.119 16.7	2562 0.131 18.3		
300	938 0.045 6.3	1092 0.056 7.8	1176 0.060 8.4	1414 0.072 10.1	1666 0.085 11.9	1876 0.096 13.4	2114 0.108 15.1	2352 0.120 16.8	2576 0.132 18.4	2828 0.144 20.2	3052 0.156 21.8
350	980 0.050 7.0	1120 0.057 8.0	1218 0.062 8.7	1458 0.074 10.4	1680 0.086 12.0	1918 0.098 13.7	2156 0.110 15.4	2394 0.122 17.1	2632 0.134 18.8	2856 0.146 20.4	3084 0.158 22.1
400	1022 0.052 7.3	1162 0.059 8.3	1260 0.064 9.0	1480 0.076 10.6	1722 0.088 12.3	1960 0.100 14.0	2198 0.112 15.7	2436 0.124 17.4	2660 0.136 19.0	2898 0.148 20.7	3136 0.160 22.4
450		1176 0.060 8.4	1274 0.065 9.1	1512 0.077 10.8	1750 0.089 12.5	1974 0.101 14.1	2212 0.113 15.8	2450 0.125 17.5	2688 0.137 19.2	2928 0.149 20.9	3168 0.161 22.5
500				1554 0.079 11.7	1778 0.091 12.7	2016 0.103 14.4	2254 0.115 16.1	2492 0.127 17.8	2730 0.139 19.5	2954 0.151 21.1	3192 0.163 22.8
550					1820 0.093 13.0	2058 0.105 14.7	2296 0.117 16.4	2534 0.129 18.1	2744 0.140 19.6	2982 0.152 21.3	3220 0.163 23.0
600					1848 0.094 13.2	2072 0.106 14.8	2310 0.118 16.5	2548 0.130 18.2	2768 0.142 19.9	3024 0.154 21.6	3248 0.166 23.2
650							2352 0.120 16.8	2590 0.132 18.5	2828 0.144 20.2	3042 0.156 21.8	3268 0.168 23.5
700								2604 0.133 18.8	2842 0.145 20.3	3108 0.158 22.2	3336 0.169 23.7

功率 Power: W  
热电阻 Resistance: Ω  
工作电压 Voltage: V

条件 Condition:  
元件温度 Element temp 1700°C  
炉子温度 Furnace temp 1600°C  
电流 Amperage 140A  
表面负荷 Surface load 10W/cm<sup>2</sup>





5、1700等级9/18mm的U型元件 1700 Grade U type 9/18mm elements

尺寸 Code size	150	180	200	250	300	350	400	450	500	550	600	650	700	750	800		
250	1598 0.021 5.8	1841 0.024 5.8	2005 0.027 7.4	2414 0.032 8.8	2822 0.037 10.5	3231 0.043 11.97	3640 0.048 13.5	4049 0.054 15	4458 0.059 16.5	4866 0.064 18.02	5275 0.070 19.5	5684 0.075 21.1	6093 0.081 22.6	6502 0.086 24.1	6910 0.091 25.7		
300	1853 0.022 6.1	1899 0.025 7.23	2062 0.027 7.6	2471 0.033 9.2	2880 0.038 10.7	3289 0.043 12.2	3697 0.049 13.7	4106 0.054 15.2	4515 0.060 16.7	4924 0.065 18.2	5333 0.071 19.8	5741 0.076 21.3	6150 0.081 22.8	6559 0.087 24.3	6968 0.092 25.8		
350	1711 0.023 6.3	1956 0.026 7.2	2120 0.028 7.9	2529 0.033 9.4	2937 0.039 10.9	3346 0.044 12.4	3755 0.050 13.9	4164 0.055 15.4	4573 0.060 16.9	4981 0.066 18.4	5390 0.071 20	5799 0.077 21.5	6208 0.082 23	6617 0.087 24.5	7025 0.093 26		
400	1768 0.024 6.8	2014 0.027 7.5	2177 0.029 8.1	2586 0.034 9.6	2995 0.040 11.1	3404 0.045 12.6	3812 0.050 14.1	4221 0.056 15.6	4630 0.061 17.1	5039 0.067 18.7	5448 0.072 20.2	5856 0.077 21.7	6265 0.083 23.2	6674 0.088 24.7	7083 0.094 26.2		
450		2071 0.027 7.7	2235 0.030 8.3	2644 0.035 9.8	3052 0.040 11.3	3461 0.046 12.8	3870 0.051 14.3	4279 0.057 15.8	4688 0.062 17.4	5096 0.067 18.9	5505 0.073 20.4	5914 0.078 21.9	6323 0.084 23.4	6732 0.089 24.9	7140 0.094 26.4		
500			2292 0.030 8.5	2701 0.035 10	3110 0.041 11.5	3519 0.047 13.02	3927 0.052 14.5	4336 0.057 16.1	4745 0.063 17.6	5154 0.068 19.1	5563 0.074 20.6	5971 0.079 22.1	6380 0.084 23.6	6789 0.089 25.1	7198 0.094 26.7		
550				2759 0.036 10.2	3167 0.042 11.8	3576 0.047 13.3	3985 0.053 14.76	4394 0.058 16.27	4803 0.064 17.8	5211 0.069 19.3	5620 0.074 20.8	6029 0.080 22.3	6438 0.085 23.8	6847 0.091 25.4	7255 0.096 26.9		
600				2816 0.037 10.4	3225 0.043 11.9	3634 0.048 13.5	4042 0.053 14.97	4451 0.059 16.5	4860 0.064 18	5269 0.070 19.51	5678 0.075 21.03	6086 0.080 22.54	6495 0.086 24.1	6904 0.091 25.6	7313 0.097 27.1		
650					3282 0.043 12.2	3691 0.049 13.7	4100 0.054 15.2	4509 0.060 16.7	4918 0.065 18.2	5326 0.070 19.7	5735 0.076 21.2	6144 0.081 22.8	6553 0.087 24.3	6962 0.092 25.8	7370 0.097 27.3		
700						3340 0.044 12.4	3749 0.050 13.9	4157 0.055 15.4	4566 0.060 16.9	4975 0.066 18.4	5384 0.071 19.9	5793 0.077 21.5	6201 0.082 23	6610 0.087 24.5	7019 0.093 26	7428 0.098 27.5	
750							3806 0.050 14.1	4215 0.056 15.6	4624 0.061 17.1	5033 0.067 18.6	5441 0.072 20.2	5850 0.077 21.7	6259 0.083 23.2	6668 0.088 24.7	7077 0.094 26.2	7485 0.099 27.7	
800								3864 0.051 14.3	4272 0.056 15.8	4681 0.062 17.3	5090 0.067 18.9	5499 0.073 20.4	5908 0.078 21.9	6316 0.084 23.4	6725 0.089 24.9	7134 0.094 26.4	7543 0.100 27.9

功率 Power: W  
热电阻 Resistance: Ω  
工作电压 Voltage: V

条件 Condition:  
元件温度 Element temp 1500℃  
炉子温度 Furnace temp 1300℃  
电流 Amperage 250A  
表面负荷 Surface load 14.5W/cm<sup>2</sup>

6、1800等级9/18mm的U型元件 1800 Grade U type 9/18mm elements

尺寸 Code size	150	180	200	250	300	350	400	450	500	550	600	650	700	750	800			
250	1350 0.0216 5.4	1550 0.0248 6.2	1675 0.0268 6.7	2025 0.0324 8.1	2375 0.0379 9.5	2725 0.0438 10.9	3050 0.0488 12.2	3400 0.0544 13.8	3750 0.06 15.0	4100 0.0656 16.4	4425 0.0708 17.7	4775 0.0764 19.1	5125 0.0819 20.5	5475 0.0875 21.9	5800 0.0928 23.2			
300	1375 0.022 5.6	1600 0.0256 6.4	1725 0.0276 6.9	2075 0.0332 8.3	2425 0.0388 9.7	2750 0.044 11.0	3100 0.0496 12.4	3450 0.0552 13.8	3800 0.0608 15.2	4125 0.0664 16.5	4475 0.0718 17.9	4825 0.0774 19.3	5175 0.0828 20.7	5500 0.088 22.0	5850 0.0936 23.4			
350	1425 0.0228 5.7	1625 0.026 6.5	1775 0.0284 7.1	2125 0.034 8.5	2450 0.0392 9.8	2800 0.0448 11.2	3150 0.0504 12.6	3500 0.056 14.0	3825 0.0616 15.3	4175 0.0668 16.7	4525 0.0724 18.1	4875 0.078 19.5	5200 0.0832 20.8	5550 0.0888 22.2	5900 0.0944 23.8			
400	1475 0.0236 5.9	1675 0.0268 6.7	1825 0.0292 7.3	2150 0.0348 8.6	2500 0.0404 10.0	2850 0.046 11.4	3200 0.0516 12.8	3525 0.0572 14.1	3875 0.0628 15.5	4225 0.0684 16.9	4575 0.074 18.3	4900 0.0796 19.6	5250 0.0852 21.0	5600 0.0908 22.4	5950 0.0964 23.8			
450		1725 0.0276 6.9	1850 0.0296 7.4	2200 0.0352 8.8	2550 0.0408 10.2	2900 0.0464 11.6	3225 0.052 12.9	3575 0.0576 14.3	3925 0.0632 15.7	4275 0.0688 17.1	4600 0.0744 18.4	4950 0.0792 19.8	5300 0.0848 21.2	5650 0.0904 22.6	5975 0.096 23.9			
500			1800 0.0304 7.6	2250 0.036 9.0	2600 0.0416 10.4	2925 0.0472 11.7	3275 0.0528 13.1	3625 0.0584 14.5	3975 0.064 15.9	4300 0.0696 17.2	4650 0.0744 18.6	5000 0.0792 20.0	5350 0.0848 21.4	5700 0.0904 22.8	6025 0.096 24.1			
550				2300 0.0368 9.2	2625 0.0424 10.8	2975 0.048 12.3	3325 0.0536 13.7	3675 0.0592 15.1	4000 0.0648 16.4	4350 0.0696 17.8	4700 0.0744 19.2	5050 0.0792 20.6	5400 0.0848 22.0	5750 0.0904 23.4	6075 0.096 24.7			
600					2325 0.0372 9.3	2675 0.0428 10.7	3025 0.0484 12.1	3375 0.054 13.5	3700 0.0596 14.8	4050 0.0648 16.2	4400 0.0704 17.6	4750 0.0752 19.0	5100 0.0808 20.4	5425 0.0864 21.7	5775 0.092 23.1	6125 0.098 24.5		
650						2725 0.0436 10.9	3075 0.0492 12.3	3400 0.0544 13.8	3750 0.0608 15.0	4100 0.0664 16.4	4450 0.0712 17.8	4775 0.0764 19.1	5125 0.0816 20.5	5475 0.0872 21.9	5800 0.0928 23.2	6150 0.0984 24.6		
700							2775 0.0444 11.1	3100 0.0496 12.4	3450 0.0552 13.8	3800 0.0608 15.2	4150 0.0664 16.6	4475 0.0716 17.9	4825 0.0772 19.3	5175 0.0828 20.7	5500 0.088 22.1	5850 0.0936 23.4	6200 0.0992 24.8	
750								3150 0.0504 12.6	3500 0.056 14.0	3850 0.0616 15.4	4175 0.0672 16.7	4525 0.0724 18.1	4875 0.078 19.5	5225 0.0836 20.9	5550 0.0892 22.2	5900 0.0948 23.6	6300 0.1004 25.0	
800									3200 0.0512 12.8	3550 0.0568 14.2	3875 0.0624 15.6	4225 0.0676 16.9	4575 0.0732 18.3	4925 0.0788 19.7	5250 0.0844 21.0	5600 0.0896 22.4	6000 0.0952 23.8	6400 0.1008 25.2

功率 Power: W  
热电阻 Resistance: Ω  
工作电压 Voltage: V

条件 Condition:  
元件温度 Element temp 1700℃  
炉子温度 Furnace temp 1500℃  
电流 Amperage 250A  
表面负荷 Surface load 12.5W/cm<sup>2</sup>

7. 1700等级6/12mm的W型元件 1700 Grade W type 6/12mm elements

元件 Code	315	355	410	500	620	730	800	820	1000
470	4253 0.190 27.0	4503 0.200 30.0	5121 0.228 34.1	6133 0.273 40.9	7481 0.333 49.9	8718 0.387 58.1	9509 0.422 63.4	9729 0.432 64.9	11750 0.522 76.4
500	4074 0.181 27.2	4321 0.201 30.2	5148 0.229 34.2	6155 0.274 41.0	7504 0.334 50.0	8740 0.388 58.3	9527 0.423 63.5	9752 0.433 65.0	11776 0.523 76.5
520	4091 0.182 27.5	4540 0.202 30.5	5159 0.229 34.4	6170 0.274 41.1	7519 0.334 50.1	8755 0.389 58.4	9542 0.424 63.8	9767 0.434 65.1	11790 0.524 76.6
560	4121 0.184 27.5	4170 0.203 30.5	5189 0.231 34.8	6200 0.278 41.3	7549 0.338 50.3	8785 0.390 58.8	9572 0.425 63.8	9787 0.435 65.3	11820 0.525 76.8
580	4138 0.184 27.8	4585 0.204 30.8	5204 0.231 34.7	6215 0.278 41.4	7564 0.338 50.4	8800 0.391 58.7	9537 0.426 63.9	9812 0.436 65.4	11835 0.526 76.9
600	4151 0.184 27.7	4600 0.204 30.7	5219 0.232 34.8	6230 0.277 41.5	7579 0.337 50.5	8815 0.392 58.8	9552 0.427 64.0	9827 0.437 65.5	11850 0.527 77.0
630	4173 0.185 27.9	4623 0.205 30.9	5241 0.233 34.9	6253 0.278 41.7	7601 0.338 50.7	8838 0.393 58.9	9525 0.428 64.2	9849 0.438 65.7	11873 0.528 77.2

元件 Condition  
 元件温度 Element temp 1500℃  
 炉子温度 Furnace temp 1300℃  
 电流 Amperage 150A  
 表面负荷 Surface load 14.5W/cm<sup>2</sup>

功率 Power: W  
 热电阻 Resistance: Ω  
 工作电压 Voltage: V

8. 1700等级9/18mm的W型元件 1700 Grade W type 9/18mm elements

元件 Code	315	355	410	500	620	730	800	820	1000
470	5864 0.278 27.8	6542 0.292 29.9	7488 0.298 27.4	8989 0.338 33.5	10925 0.388 40.5	12736 0.469 47.2	13889 0.484 51.4	14218 0.488 52.7	17181 0.227 63.6
500	5938 0.278 27.99	6571 0.297 29.4	7502 0.299 27.8	8984 0.338 33.3	10960 0.388 40.8	12771 0.469 47.3	13923 0.484 51.6	14252 0.488 52.8	17216 0.228 63.8
520	5981 0.278 22.7	6620 0.298 29.5	7525 0.300 27.9	9007 0.338 33.4	10983 0.388 40.7	12794 0.469 47.4	13946 0.484 51.7	14275 0.488 52.9	17239 0.228 63.9
560	6007 0.278 22.3	6666 0.298 29.7	7571 0.300 28.04	9053 0.338 33.53	11029 0.388 40.9	12840 0.470 47.6	13992 0.485 51.8	14321 0.488 53.04	17285 0.229 64.02
580	6030 0.280 22.4	6689 0.299 29.9	7594 0.300 28.1	9076 0.338 33.7	11052 0.388 40.9	12863 0.470 47.8	14015 0.485 51.9	14344 0.488 53.1	17308 0.229 64.1
600	6053 0.280 22.4	6712 0.299 29.9	7617 0.301 28.2	9099 0.338 33.7	11075 0.388 41	12886 0.470 47.7	14038 0.486 52	14367 0.488 53.2	17331 0.229 64.2
630	6086 0.280 22.4	6745 0.299 29	7642 0.301 28.3	9133 0.338 33.8	11109 0.388 41.1	12909 0.471 47.9	14073 0.486 52.4	14402 0.488 53.3	17354 0.230 64.3

元件 Condition  
 元件温度 Element temp 1500℃  
 炉子温度 Furnace temp 1300℃  
 电流 Amperage 270A  
 表面负荷 Surface load 14.5W/cm<sup>2</sup>

功率 Power: W  
 热电阻 Resistance: Ω  
 工作电压 Voltage: V