



华能无锡电热器材有限公司

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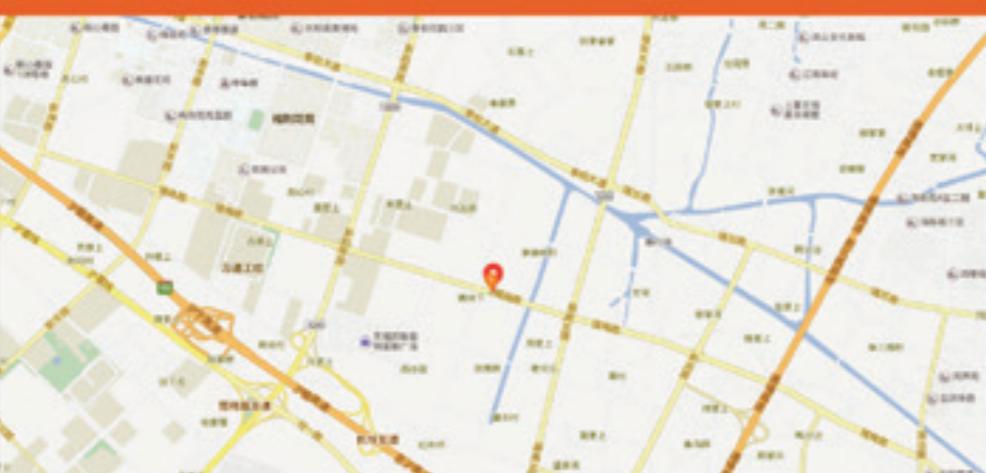
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电加热产品

Electric Heating products



- 电热元件 Heating components
- 电加热系统 Heating systems
- 控制系统 Control systems

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2016版本

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华能无锡电热器材有限公司创建于1975年，从事工业电热领域产品的研发和制造已有四十年历史。属江苏省首批（1992年）高新技术企业。

本公司产品主要是工业电热设备和工业管道电伴热产品二大类，计二百多个品种，一千多个规格，承接国内外重大工程配套。应用于石油、化工、机械、冶金、核工业、电力、航天、海洋、军工、制药、仪表等各大领域。产品销往国内外五千多家企业。

本公司注册资金6300万元，总资产1.4亿元，年销售额15亿元。公司是一支以高级工程师为主管理的团队，现有员工150名。拥有十八项发明专利，八十多项实用新型专利。研发领先、技术全面、装备一流、质量卓越，是国内电热行业各类系列产品的技术起源地和行业先进技术的领军者。“华热”品牌在国内外享有较高的知名度。

Hua Neng (Wuxi) Electric Thermal Equipment Co., Ltd has been researching, developing and manufacturing industrial electric thermal products since 1975. In 1992, Company was recognized as one of the first batch of high and new tech enterprises in Jiangsu Province.

The products of Hua Neng are mainly in industrial electric heaters and electrical tracing products, over 200 varieties and 1,000 specs, which apply to many fields, petroleum, chemical, mechanism, metallurgy, nuclear industry, electric power, aerospace, ocean, military project, pharmacy, instrument, and etc. Company provides affiliated equipment for domestic and overseas big projects, and now having more than 5,000 customers all over the world.

Hua Neng's registered capital is CNY63,000,000, total assets CNY140,000,000, and annual sales CNY150,000,000, with 150 employees and a team led by senior engineers. As an origin and leading company in domestic electric thermal industry, Company owns 18 patented inventions and over 80 utility model patents, advanced research and development, comprehensive technologies, and first class equipment. Its brand, Hua Thermal,





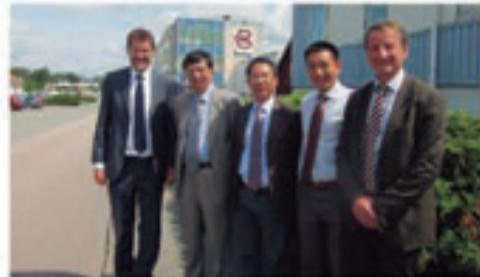
董事长：俞祥九，高级工程师，长期担任企业技术工作，主要从事电热产品的开发研制，曾主持市、省、国家级科研项目，多次获得国家、省、市科技成果奖和科技进步奖，并获得多项发明专利和实用新型专利，在同行业中有一定的知名度，享受国务院特殊津贴，是全国“五一”奖章获得者。

Chairman: Yu Xiangjiu, senior engineer, has engaged in the company's technical work, especially the development of electric heater products. Mr. Yu has taken charge of the municipal, provincial and national research projects, won several national and provincial Science and Technology Achievement Awards, Science and Technology Progress Awards, as well as a number of invention patents and utility model patents. Mr. Yu has had a reputation in the same industry, and enjoys the State Council special allowance and the title of National Labor Medal.



 华能电热器材有限公司
 HUAYU ELECTRICAL EQUIPMENT CO., LTD.





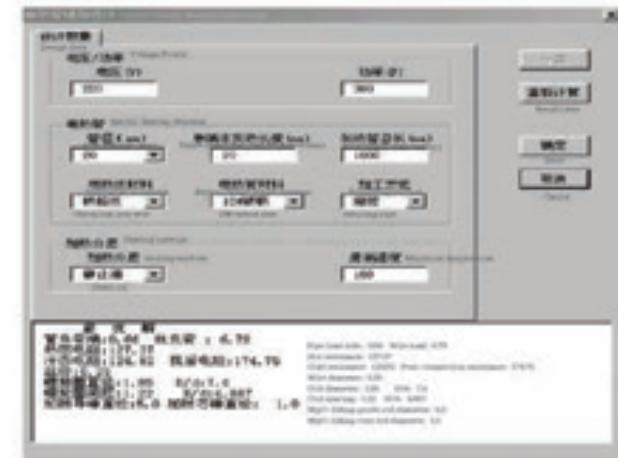
本公司从事于电加热器产品的研发和制造已具有40多年的历史，高度的安全性、可靠性和质量的优良性是电加热器产品的基本要求。公司现有设计人员16人，均具有中、高级技术职称，其中有三名技术人员曾被派往美国著名的电加热器公司培训，每年都与美国著名电加热器公司作技术交流。目前公司的技术设计能力已与国际基本保持同步，电加热器产品的设计均采用计算机辅助设计软件进行，例如：SOLIDWORKS, ANSYS以及我公司自主开发的循环式电加热器设计软件、电热元件的优化设计软件等等。

Our company has been engaging in the research and development and manufacture of electric heater products for more than 40 years. High security, reliability and optimal quality are the basic requirements of electric heater products. Our company now has 16 design personnel, all with middle and senior technical titles, three of whom had been sent to famous electric heater companies in the United States for training, and has annual technical communication with famous electric heater companies in USA. At present, the company's technical design ability is basically in sync with the international standards, and the design of the electric heater products is assisted with computer design software, for example, SOLIDWORKS, ANSYS and the circulating electric heater design software independently developed by our company, software of optimization design of electric heating element, and so on.



上图为我公司的循环式电加热器设计软件，此软件包含1700种的物性数据库系统（所有的物性数据均根据介质温度和操作压力的变化而变化），并可以提供5种不同物性数据的混合计算（计算包括：功率的计算、流程的判断、电热管的最高表面温度、电热丝的温度、容器壁的温度和压力降的计算以及TEMA标准中要求的 pV^2 的计算等）。

The above Figure is our company's circulating electric heater design software, which contains 1700 kinds of physical property database systems (all the physical property data vary according to the medium temperature and operating pressure), and can provide hybrid computing of five different physical property data (calculation includes: the calculation of power, the judgment of the process, the maximum surface temperature of electric heating pipe, the temperature of the heating wire, the temperature and pressure drop calculation of vessel wall and pV^2 calculation required in TEMA standards, etc.).

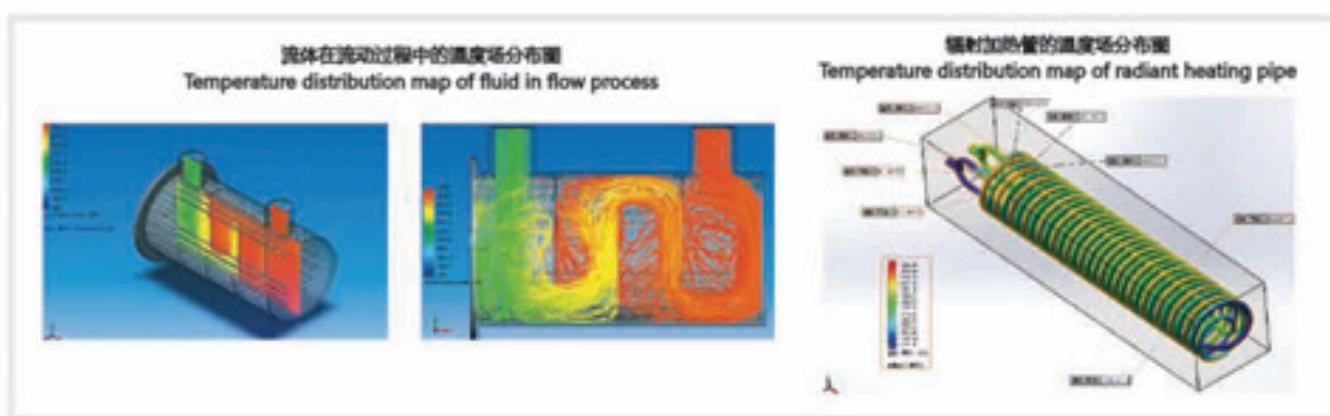


上左图为电热元件的优化设计软件，在根据上面介绍的循环式电加热器设计软件确定电热元件的功率密度（确保电热元件表面温度不超过介质的降解或碳化温度）和系统结构（确保压力降处于允许范围）后，接着最重要的设计就是如何确保电热丝负载的最小化，这就需要电热元件的优化设计，确保丝径的最大化也就保证了电热元件的最大使用寿命，此软件一方面需要大量的工程经验积累，另一方面也需要根据工厂的特点和生产制造能力做修正。

上右图，为集肤效应加热系统设计软件。

The above left figure is electric heating element optimization design software, based on the power density (make sure that the electric heating element surface temperature is no more than the degradation or carbonization temperature of the medium) and the system structure (make sure that the pressure drop is in the allowed range) of the electric heating element determined according to above introduction of circulating electric heater design software, then the most important design is how to ensure minimum heating wire load, which requires the optimal design of electric heating element, to ensure the maximization of the wire diameter so as to ensure the maximum service life of the electric heating element. This software, on the one hand, requires a lot of engineering experience accumulation, on the other hand also needs to make modifications according to the company characteristics and manufacturing capacity.

The above figure is the design software of skin effect heating system.



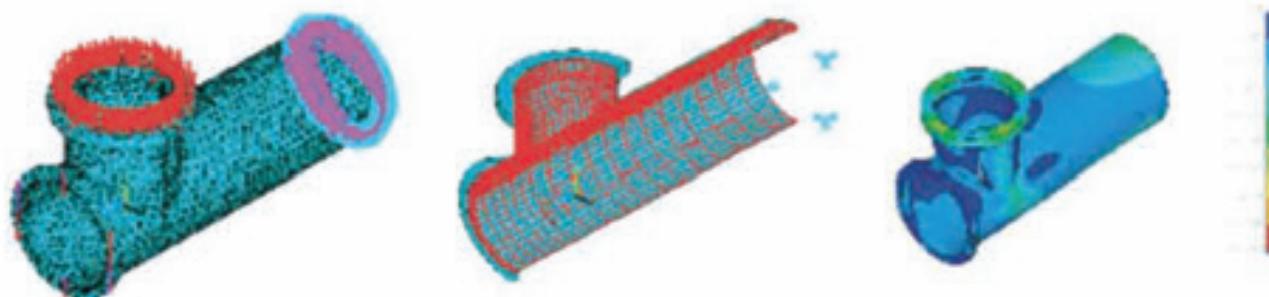
上一页是电加热系统的有限元分析，我们可以观察到流体在流动过程中的温度场的分布情况，也可以观察到电加热器折流板对温度分布的影响。

一个好的电加热器的设计不仅需要机械和电气、仪表的支撑，还需要热力学方面及化工工艺方面的配合。有实力的公司才能提供这方面的技术支持。

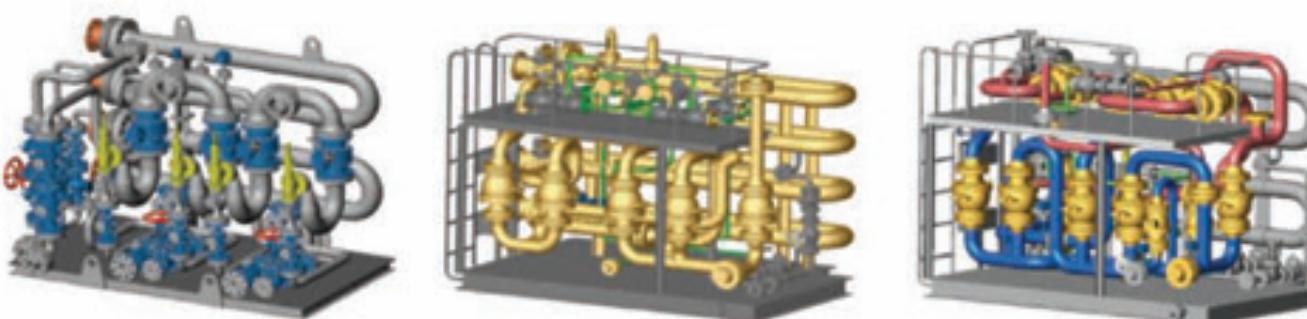
The figure on above page is the finite element analysis of electric heating system, we can observe the distribution of temperature field in the process of fluid flowing, also can observe the electric heater baffle plate's influence on temperature distribution.

A good electric heater design not only needs the mechanical, electrical and instrumental support, but also needs the coordination of thermodynamics and chemical process, which can only be provided by strong companies.

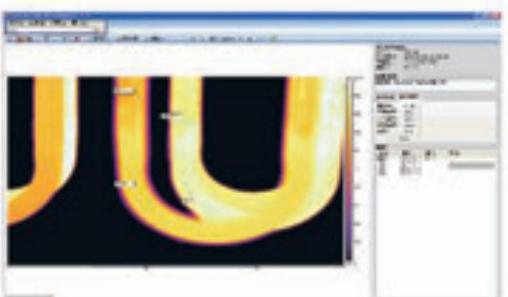
强度分析图例 Strength analysis legend



三维设计图例 3-D design legend



● 电热管散热区及接线盒温度检测
Stand-off and junction box temperature detection



● 电热管的热成像测试
Thermal imaging test of electric heating elements



● 高精度电热元件测试
High definite electric heating elements test.



● 无损探伤室
Nondestructive inspection room



● 美国光谱材料分析仪
USA spectral material analyzer



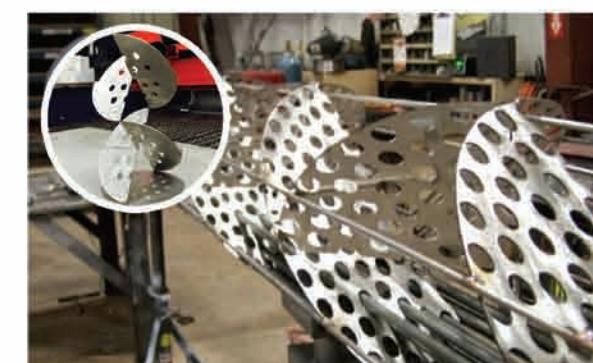
● 电热元件高低温湿热试验
High and low temperature damp heat test of electric heating element



● 通道式电加热器电气测试
Duct electric heater electrical test



● 加热器性能测试
Heater performance test

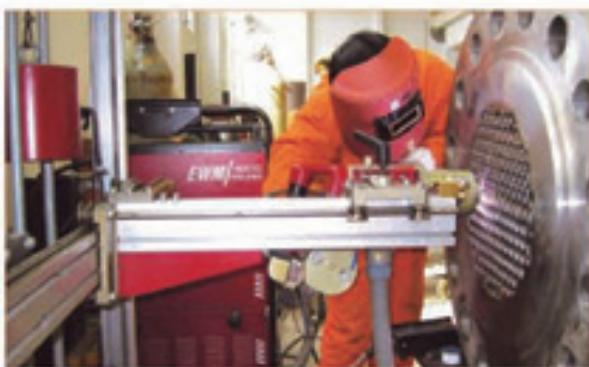




● 全自动弯管设备
Full automatic pipe bending equipment



● 立式车床
Vertical lathe



● 全自动管板焊接设备
Full auto tube sheet welding equipment



● 数控切割设备
CNC cutting equipment



● 深孔自动焊
Deep hole automatic welding



● 高精度轧管系列
High precision pipe rolling series

各类工业电加热器 All kinds of industrial electric heaters



电加热系统：电加热系统主要由电加热器和控制系统组成。电加热器主要有循环式、通道式和管道式电加热器，循环式电加热器又包括电热水加热器、电热水蒸气发生器和导热油电加热器。本公司已有四十多年的电加热器和工业管状电热元件制造经验。其中：工业高精度管状电热元件是本行业技术制高点，是以计算机优化设计和大型高精度设备为基础，它为成套电加热系统提供了坚实的技术基础和可靠的质量保证。循环式电加热器的整体优化设计和系统三维设计软件具有企业独立知识产权。所有工艺和材料包括电柜设计制造都与国际水平同步。每年为石油、石化、海洋等行业（包括高压、高危场合）提供了大量的成套产品。



● 大端套铜加热器
Big tank end copper heater



● 辐射式电加热器
Radiant electric heater



● 空气加热器
Air heater



● 通道式电加热器
Duct electric heater



● 海洋电加热器模块
Marine electric heater Skid Package



● 塔盐电加热器
Molten salt electric heater



● 合成氨高压电加热器
Synthetic ammonia high pressure electric heater



● UOP重整项目加热器
UOP reforming project heater



● 导热油电加热系统
Heat conduction oil electric heater system

- 1、A2类压力容器制造许可证
A2 class Manufacture license of special equipment

2、EX

3、ATEX

4、3C

5、ISO9001

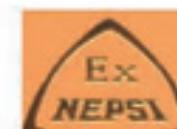
6、ISO14000

7、CE

8、BV

9、ABS

10、CCS



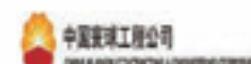
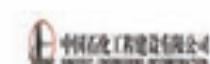
主要客户 Main customers



中国海洋石油总公司
CHINA NATIONAL OFFSHORE OIL CORP.



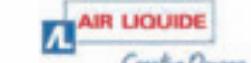
EXON



WISON 惠生
惠不同 生不息



FLUOR.



TBEA



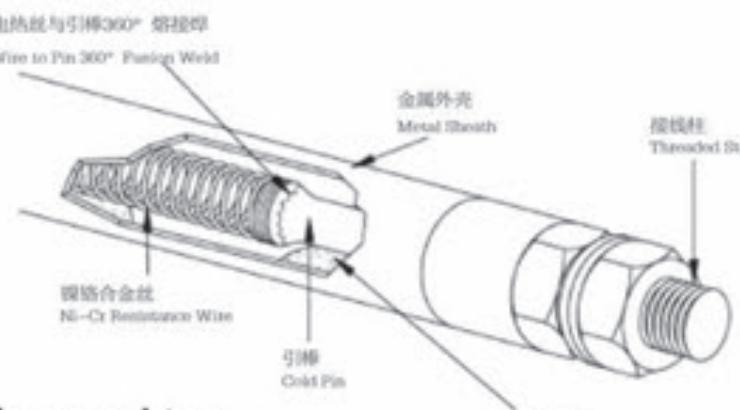
Automotive Systems



一、管状电热元件 Tubular Components

管状电热元件是一种在金属管中放入电阻丝，并在空隙部分紧密填充有良好耐热性、导热性和绝缘性的结晶氧化镁粉，再经其它工艺处理而成的电热元件。它具有结构简单、机械强度高、热效率高、安全可靠、安装简便、使用寿命长等特点。广泛适用于各种硝石槽、水槽、油槽、酸碱槽的加热及易熔金属熔化炉、空气加热炉、干燥箱、热压模等装置。

Tubular components is a kind of electric heating element that is made from the process of placing resistance wire into metal tube, and then tightly filling it in interstice parts with crystal magnesia powder, which has good thermal resistance, thermal conductivity and insulation, then processing it with other process. It has advantages such as simple structure, high mechanical strength, high thermal efficiency, safety and reliability, easy installation and long service time, etc. It is applied widely in the heating of all kinds of niter slots, flumes, oil containers and sulfuric acid and caustic tank and devices such as melting furnace of fusible metal, air heating furnace, drying box and hot die, etc.



型号含义 Type number nomenclature

G Y	□ □ - □ / □	
		功率 Power(kW)
		电压 Voltage(V)
		产品系列号 Series No.
	用途(加热介质)代号: O- 空气, S- 水, XY- 硝盐, Y- 油, J- 碱, M- 模具, C- 节片式	
	Object (heating medium) code: O-air, S-water, XY-nitrate, Y-oil, J-alkali, M-mould, C-finned type	
	管状电热元件 Tubular components (Ex)-explosion proof	

例: GYO1-220/0.5 为空气加热用管状电热元件, 工作电压220V, 功率0.5kW。

GYY4-220/5 为油加热用管状电热元件, 工作电压220V, 功率5kW。

For example: GYO1-220/0.5 Heating components for air heating, working voltage 220V, power 0.5kW.

GYY4-220/5 Heating components for oil heating, working voltage 220V, power 5kW.

1. 管状电热元件表面功率负荷设计及管材的选择参见附件

2. 一般管状电热元件的最小弯曲半径及最大加工长度

1. See Attachments for the surface power load design of tubular components and selection of tubular goods

2. Minimum bending radius and maximum machining length of general tubular components:

管径 Pipe diameter (mm)	半径 Radius (mm)	长度 Length(m)
Φ8	R >=15	<2
Φ10	R >=20	<3.5
Φ10	R >=25	<7.0
Φ16	R >=30	<7.0
Φ20	R >=45	<7.0

3.一般普通电热元件的技术数据 Technical data for general electric heating element:

绝缘电阻 Insulation resistance: $\geq 1M\Omega$, 绝缘耐压强度 Insulation dielectric strength: 2kV/min

选用须知

1.普通电热元件允许在下列条件下工作:

- ◆空气相对湿度不大于95%,无爆炸性和腐蚀性气体。
- ◆工作电压应不大于额定值的1.1倍,外壳应有效接地。

2.加热液体时,有效发热区必须全部浸入液体,严禁空烧。发现电热元件表面有水垢或结碳时,应及时消除干净再用,以免影响散热而缩短使用寿命。

3.加热易熔金属或固态硝盐、碱、沥青、石蜡等时,应先降低使用电压,待介质熔化后,才能升至额定电压。

4.加热硝盐时,应考虑安全措施,预防爆炸事故。

5.加热空气时,元件应交叉均匀排列,使元件有良好的散热条件,使流过的空气能充分加热。

6.接线部分应放在保温层外面,避免与腐蚀性、爆炸性介质、水分接触;引接线应能长期承受接线部分的温度及加热负载,接线螺母紧固时应避免用力过猛。

7.普通电热元件应存放在干燥处,若因长期存放导致绝缘电阻低于1MΩ时,可在200℃左右的烘箱中干燥,或降低电压通电加热,直至恢复绝缘电阻。

8.各种管状电热元件最高使用温度选用见下表:

Notice

1. General electric heating element is allowed to work under the following conditions:

- ◆Relative air humidity is no greater than 95%, no explosive and corrosive gases.
- ◆Working voltage shall not be 1.1 times bigger than the rated value, the shell should be effectively grounded.

2. The effective heating section shall be completely immersed into the liquid when heating the liquid, no fluid heating is strictly forbidden. Any incrustation or carbonization found on the surface of the heating components shall be cleared away immediately for reuse so as not to affect the heat transfer and shorten the service life.

3. When heating fusible metal or solid nitrate, alkali, asphalt and paraffin wax, etc. Firstly, service voltage shall be reduced and not be increased to rated voltage before the medium is melt.

4. Safety measures shall be considered when heating the nitrate to avoid explosion accident.

5. The elements shall be crosswise and evenly arranged to make better heat emission condition for the element and thoroughly heat the flowing air.

6. The connecting wire shall be placed outside the thermal insulation and avoid contact with corrosive and explosive medium and water. The lead wire may be able to withstand the temperature and heating load of the connecting wire very long, excessive force shall be avoided when tightening the connection of nut.

7. General electric heating element shall be stored in a dry place, if the insulation resistance is lower than 1MΩ due to long-term storage, drying it in an oven at about 200°C, or lowering the voltage to heat it until recover the insulation resistance.

8. Maximum service temperature selection of all Heating components: as shown in the following table.

型号 Range	名称 Name	用途 Purpose	最高介质温度 Maximum Medium Temperature
GYO	空气加热 Air heating	供空气加热使用 For air heating	300
GYY	油加热 Oil heating	循环或不循环的敞开式或封闭式器具内供油加热用 Recycled and unrecycled open-type or closed-type appliance for oil heating	300-360
GYXY	硝盐溶液加热 Nitrate solution heating	敞开式槽内供硝盐溶液加热用 Open-type slot for nitrate solution heating	500-550
GYJ	碱溶液加热 Alkali solution heating	敞开式槽内供碱溶液加热用 Open-type slot for alkali solution heating	500-550
GYS	水加热 Water heating	敞开式或封闭式器具内供加热用水 In open-type or closed-type appliance for heating water	105
GYM	模具加热 Mould heating	插入模孔内加热 Insert into the die hole for heating	300

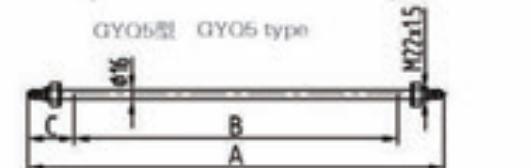
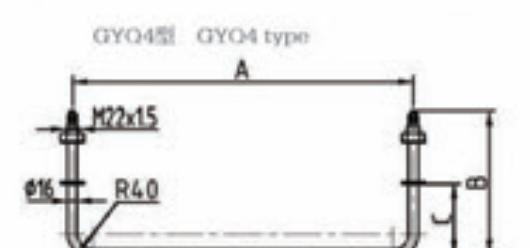
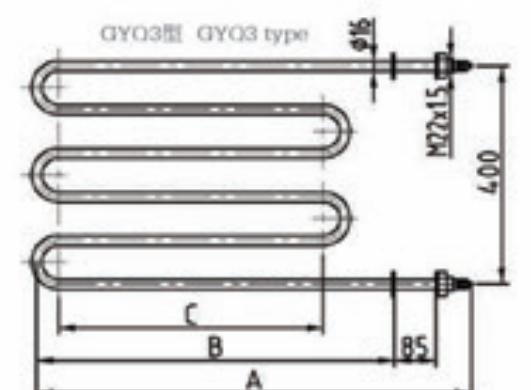
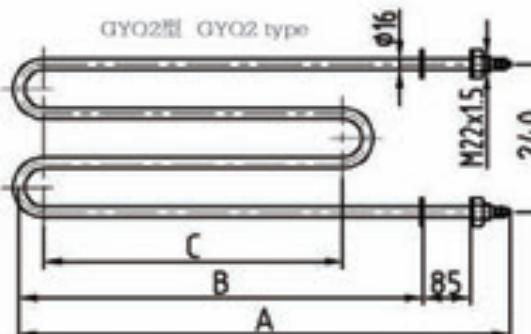
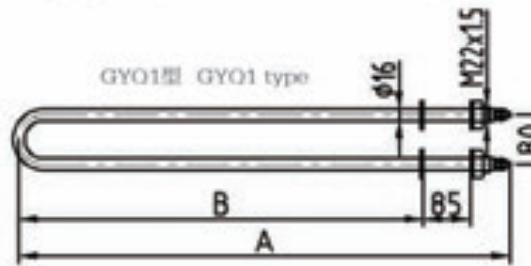
各种普通电热元件的规格和技术参数

Specification and technical parameter for all general electric heating elements

1.GYQ型空气用管状电热元件 GYQ Tubular Components for Air

GYQ型管状电热元件管材为10号钢，最高介质温度300℃左右。适用于各种空气加热系统，可作为各种烘箱、通道和电炉的发热元件。

GYQ type tubular components is made of steel No.10, its maximum medium temperature is about 300℃. Suitable for all air heating systems, also available as the heating element of all ovens, duct and electric stove.

规格和技术数据
Specifications and technical data

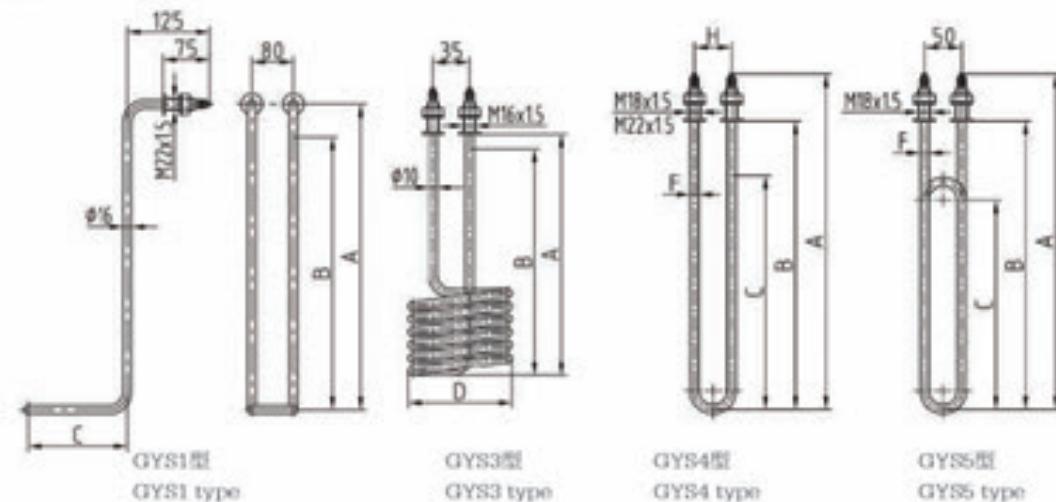
型号 Range	电压 Voltage (V)	功率 Power (kW)	外形安装尺寸 Size (mm)			重量 Weight (Kg)
			A	B	C	
GYQ1-220/0.5	220	0.5	490	330		1.25
GYQ1-220/0.75	220	0.75	690	530		1.6
GYQ2-220/1.0	220	1.0	490	330	200	1.83
GYQ2-220/1.5	220	1.5	690	530	400	2.62
GYQ3-380/2.0	380	2.0	590	430	300	3.43
GYQ3-380/2.5	380	2.5	690	530	400	4.00
GYQ3-380/3.0	380	3.0	790	630	500	4.50
GYQ4-220/0.8	220	0.8	800	128	53	1.2
GYQ4-220/1.0	220	1.0	1000	128	53	1.42
GYQ4-220/1.2	220	1.2	1200	128	53	1.65
GYQ4-220/1.4	220	1.4	1400	128	53	1.87
GYQ5-220/0.7	220	0.7	800	660	100	0.97
GYQ5-220/0.8	220	0.8	1260	860	200	1.4
GYQ5-220/0.9	220	0.9	1560	960	300	1.72
GYQ5-220/1.1	220	1.1	1860	1160	360	2.04
GYQ5-220/1.2	220	1.2	2060	1260	400	2.26
GYQ5-220/1.3	220	1.3	2260	1260	500	2.48
GYQ5-220/1.5	220	1.5	2560	1560	600	2.80

2.GYS型水用管状电热元件 GYS Tubular Components for Water

GYS型管状电热元件适用于敞开式、封闭式的水槽中和循环水系统内的加热。最高介质温度105℃，GYS1(4)型管材为10号钢，GYS3(5)型管材为紫铜管。

GYS type tubular components is suitable for heating in open-type and closed-type slot and circulating water system. Maximum medium temperature is 105℃, GYS1(4) type tube is made of steel No.10, GYS3(5) type tube is made of red copper pipe.

规格和技术数据 Specifications and technical data



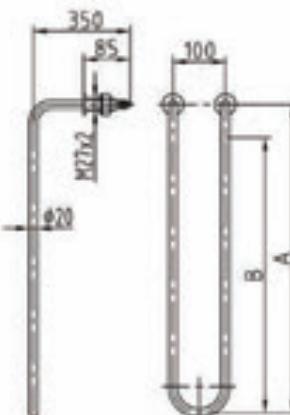
型号 Range	电压 Voltage (V)	功率 Power (kW)	外形安装尺寸 Size (mm)					重量 Weight (Kg)
			A	B最低液面 B minimum level	C	D	F	
GYS1-380/1	380	1	440	300	340			2.00
GYS1-380/2	380	2	480	400	380			2.15
GYS1-380/3	380	3	580	500	480			2.53
GYS1-380/4	380	4	675	575	490			2.80
GYS1-380/5	380	5	775	675	540			3.08
GYS1-380/6	380	6	870	770	560			3.33
GYS1-380/7	380	7	875	755	660			3.50
GYS3-220/0.5	220	0.5	145	100		60		0.40
GYS3-220/1	220	1	175	130		60		0.48
GYS3-220/1.5	220	1.5	200	155		60		0.65
GYS3-220/2	220	2	250	205		60		0.70
GYS3-220/2.5	220	2.5	120	75		80		0.56
GYS4-220/1	220	1	435	380	235		12	0.51
GYS4-220/2	220	2	585	530	385		12	0.73
GYS4-220/3	220	3	785	730	585		12	0.98
GYS4-380/4	380	4	700	625	480		16	0.80
GYS4-380/5	380	5	850	775	630		16	0.92
GYS4-380/6	380	6	1075	1000	825		16	1.21
GYS4-380/7	380	7	1225	1150	975		16	1.73
GYS5-220/1	220	1	330	275				0.50
GYS5-220/2	220	2	480	425				0.67
GYS5-220/3	220	3	390	335	250			0.83
GYS5-220/4	220	4	515	460	375			1.13
GYS5-220/5	220	5	640	585	500			1.43

3.GYXY型硝盐溶液和GYJ型碱溶液用管状电热元件 GYXY for Nitrate & GYJ for Lye

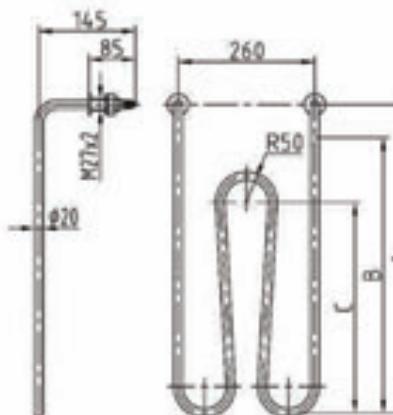
GYXY型管状电热元件管材为不锈钢，适用于加热硝盐溶液，最高介质温度500~550℃；GYJ型管材为10号钢，适用于加热碱溶液。

GYXY type tubular components is made of stainless steel, which is suitable for heating nitrate solution, maximum medium temperature is 500~550℃. GYJ type tube is made of steel No. 10, which is suitable for heating alkali solution.

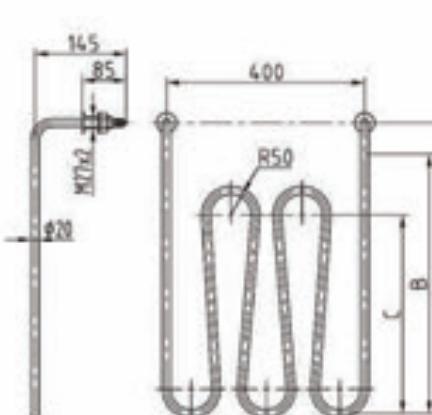
规格和技术数据 Specifications and technical data



GYXY1型 GYXY1 type
GYJ1型 GYJ1 type



GYXY2型 GYXY2 type
GYJ2型 GYJ2 type



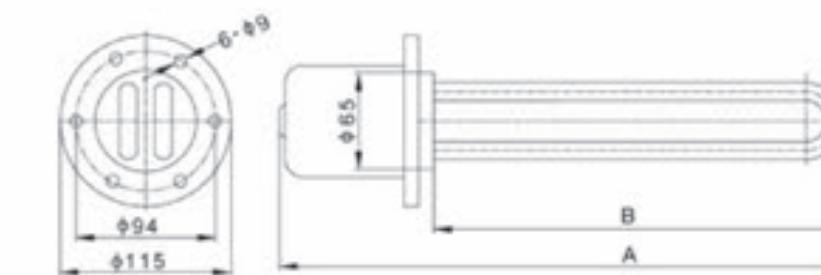
GYXY3型 GYXY3 type
GYJ3型 GYJ3 type

4.GYY型油用管状电热元件 GYY Tubular Components for Oil

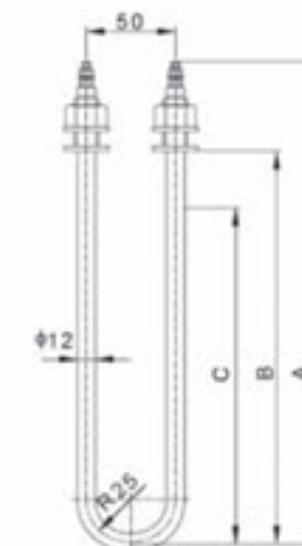
GYY型管状电热元件适用于各种油加热装置，管材为10号钢。GYY2(3)型用于敞开式或封闭式油槽中加热，最高介质温度300℃。GYY4型用于流动或循环油的加热，最高介质温度350℃。GYY2(4)型工作压力应小于0.5MPa。

GYY type tubular components is suitable for all oil heating devices, which is made of steel No.10. GYY2(3) type is used for heating in open-type or closed-type oil groove, its maximum medium temperature is 300℃. GYY4 type is used for heating flowing or circulating oil, its maximum medium temperature is 350℃. The working pressure of GYY2(4) type shall be lower than 0.5MPa.

规格和技术数据 Specifications and technical data



GYY2型 GYY2 type
GYY4型 GYY4 type



GYY3型 GYY3 type

型号 Range	电压 Voltage (V)	功率 Power (kW)	外形安装尺寸 Size (mm)			重量 Weight (Kg)
			A	B最低液面 B minimum level	C	
GYXY1(GYJ1)-380/2	380	2	800	560		4.00 (270)
GYXY1(GYJ1)-380/3	380	3	1080	830		4.90 (450)
GYXY1(GYJ1)-380/4	380	4	1380	1130		6.00 (540)
GYXY1(GYJ1)-380/5	380	5	1800	1460		7.50 (680)
GYXY1(GYJ1)-380/6	380	6	2100	1750		8.70 (760)
GYXY1(GYJ1)-380/7	380	7	2500	2150		9.70 (900)
GYXY2(GYJ2)-380/2	380	2	540	430	280	3.70 (350)
GYXY2(GYJ2)-380/3	380	3	680	570	400	4.70 (440)
GYXY2(GYJ2)-380/4	380	4	850	660	530	5.40 (530)
GYXY3(GYJ3)-380/5	380	5	770	570	460	7.20 (700)
GYXY3(GYJ3)-380/6	380	6	870	670	560	8.00 (780)
GYXY3(GYJ3)-380/7	380	7	1020	820	685	9.00 (870)

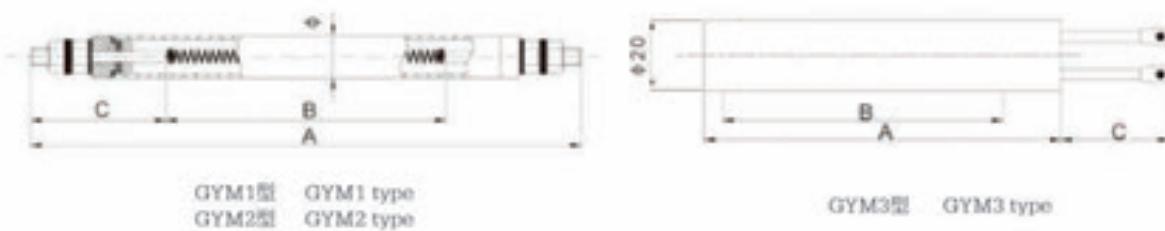
型号 Range	电压 Voltage (V)	功率 Power (kW)	外形安装尺寸 Size (mm)			重量 Weight (Kg)
			A	B浸入长度 B immersion length	C	
GYY2-220/1	220	1	307	230		1.45
GYY2-220/2	220	2	507	430		1.90
GYY2-220/3	220	3	707	630		2.35
GYY2-220/4	220	4	907	845		2.83
GYY3-220/1	220	1	625	570	375	0.77
GYY3-220/2	220	2	825	770	575	1.01
GYY3-220/3	220	3	925	870	675	1.13
GYY3-220/4	220	4	1125	1070	875	1.37
GYY4-220/5	220	5	697	620		2.45
GYY4-220/6	220	6	807	730		2.70
GYY4-220/8	220	8	1007	930		3.05

5. GYM 型模具用管状电热元件 GYM Tubular Components for Dies

GYM型管状电热元件适用于各种油压机、挤出机、热芯机、射芯机等的金属模具加热，模具最高温度300℃。模具孔径GYM1型为16.3mm，GYM2(3)型为20.3mm。GYM1(2)型管材为10号钢，GYM3型为不锈钢。

GYM type tubular components is suitable for the heating of all metal moulds such as oil press, extruder, hot core machine and core shooter, etc. The maximum temperature of mould is 300℃. Mold cavity diameter of GYM1 type is 16.3mm, 20.3mm for GYM2(3) type, GYM 1(2) type tube is made of steel No.10, GYM3 type is made of stainless steel.

规格和技术数据 Specifications and technical data



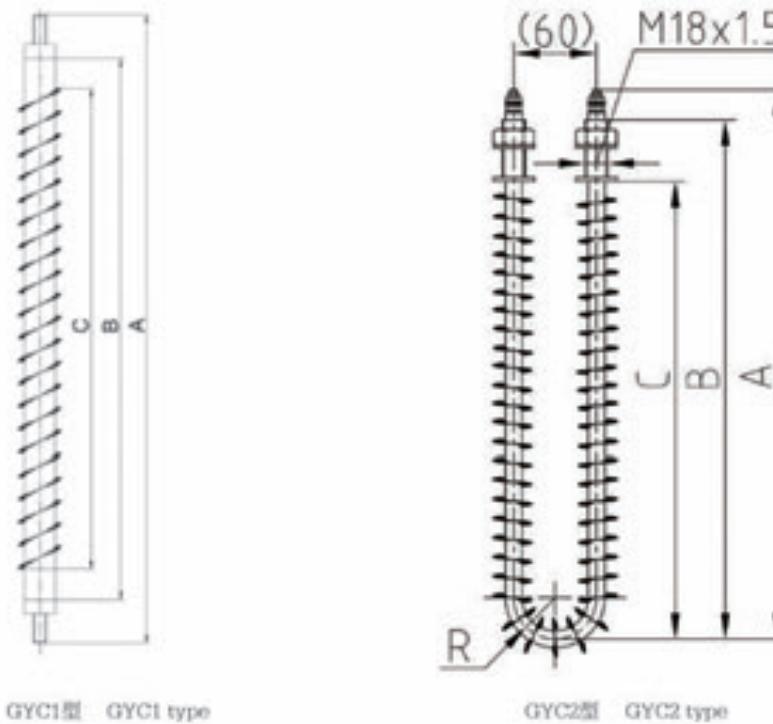
型号 Range	电压 Voltage (V)	功率 Power (kW)	外形尺寸 Overall dimension (mm)			重量 Weight (Kg)	
			A	B(发热长度 Heating length)	C	Φ	
GYM1-36/0.25	36	0.25	260	120	70	16	0.22
GYM1-55/0.25	55	0.25	260	120	70	16	0.22
GYM1-55/0.30	55	0.3	340	200	70	16	0.30
GYM1-110/0.4	110	0.4	390	250	70	16	0.36
GYM1-110/0.5	110	0.5	440	300	70	16	0.41
GYM1-220/0.6	220	0.6	660	520	70	16	0.64
GYM2-110/0.8	110	0.8	390	210	90	20	0.63
GYM2-110/1.0	110	1.0	440	260	90	20	0.71
GYM2-220/1.2	220	1.2	660	400	90	20	0.85
GYM2-220/1.5	220	1.5	630	450	90	20	1.01
GYM2-220/1.8	220	1.8	730	530	100	20	1.17
GYM2-220/2.2	220	2.2	830	630	100	20	1.33
GYM2-220/2.6	220	2.6	960	750	100	20	1.52
GYM2-220/3.0	220	3.0	1080	880	100	20	1.73
GYM3-220/0.3	220	0.3	150	80	50	20	0.23
GYM3-220/0.5	220	0.5	200	130	50	20	0.31
GYM3-220/0.8	220	0.8	300	230	50	20	0.46
GYM3-220/1.0	220	1.0	350	280	50	20	0.54
GYM3-220/1.2	220	1.2	450	380	50	20	0.69
GYM3-220/1.5	220	1.5	560	480	50	20	0.85
GYM3-220/1.8	220	1.8	650	580	50	20	1.00
GYM3-220/2.2	220	2.2	750	680	50	20	1.15
GYM3-220/2.6	220	2.6	850	780	50	20	1.29
GYM3-220/3.0	220	3.0	1000	930	50	20	1.53
GYM3-220/3.2	220	3.2	1100	1030	50	20	1.70

6. 翅片式管状电热元件 Finned Tubular Components

GYC型翅片式管状电热元件适用于各种需要加热空气的场合，尤其在空调器风道行业得到广泛应用。它是在普通元件表面缠绕金属散热片，在相同的功率下，具有升温快、热效率高、使用寿命长等优点。

GYC type finned tubular components is used for heating the air, especially widely used in air conditioner wind screen industry. It winds metal cooling fin on the surface of common element, under the same power, with faster heating speed, high thermal efficiency, long service life and other advantages.

规格和技术数据 Specifications and technical data



型号 Range	GYC1				GYC2			
	电压 Voltage (V)	110	110	220	220	220	240	240
功率 Power(kW)	0.4	0.6	0.8	2.0	1.25	2.4	3.0	3.6
A (mm)	300	420	560	1000	400	620	700	850
B (mm)	260	380	500	940	370	590	670	820
C (mm)	200	320	440	880	345	565	645	795
R (mm)					30	30	30	30
管径 Pipe diameter	Φ10	Φ10	Φ16	Φ16	Φ12	Φ12	Φ12	Φ12

7.HWD高密度电热元件 High Wattage Density Cartridge Heaters

高密度电热元件被普遍和频繁使用在金属块的加热，通常是电热元件被插入金属件的孔中。由于其体积小，功率密度高和安装方便等优点而被广泛使用在模具加热行业。

为方便安装，电热元件的外径通常略比孔径小一点，然而对高密度应用场合，它和孔的配合间隙非常重要，从下图，我们可以看出配合间隙对电热元件表面温度的影响。

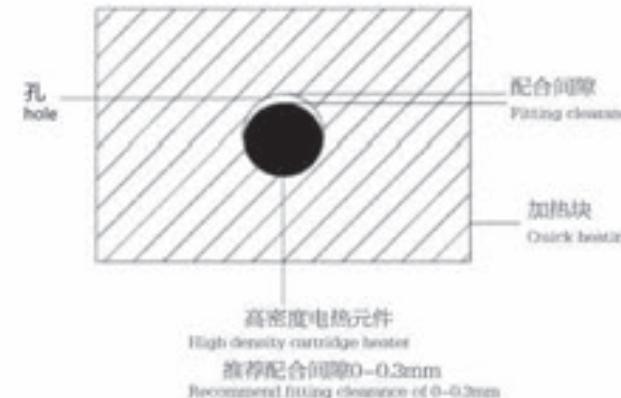
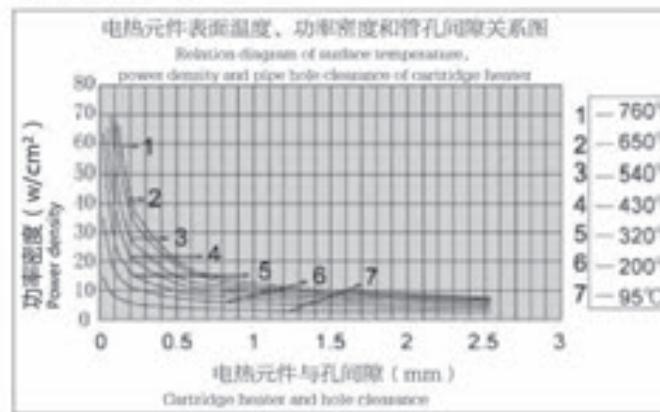
High density cartridge heater is widely and frequently used in the heating of metal blocks, usually cartridge heater is inserted into a hole in the metal parts, because of its small size, high power density, convenient installation, it is widely used in the mold heating industry.

For convenient installation, cartridge heater outer diameter is usually slightly smaller than the hole, but for high density applications, the fit clearance between them is very important, from the following diagram, we can see fit clearance's effects on the surface temperature of cartridge heater.



高密度电热元件示意图 High Wattage Density Cartridge Heater Diagram

规格和数据 Specification and data



8. 防爆型管状电热元件 EX-proof Tubular Components

(Ex)GY型防爆管状电热元件适用于工厂I、II区防爆场合的介质加热，加热元件外管材料有10号钢和不锈钢两种。每只加热器有三支元件组成，每支元件工作电压220伏，接线形式根据工作电压而定，如220伏为三支并联接线，380伏为Y形接线。

(Ex) GY type explosion-proof tubular components are suitable for heating fluids in I, II explosion-proof areas. Tubular components materials have two kinds: No.10 steel and stainless steel. Each heater is consist of three elements, working voltage of each element is 220V, wiring form is determined according to the working voltage, such as 220V for three parallel connection, 380 V for Y type wiring.

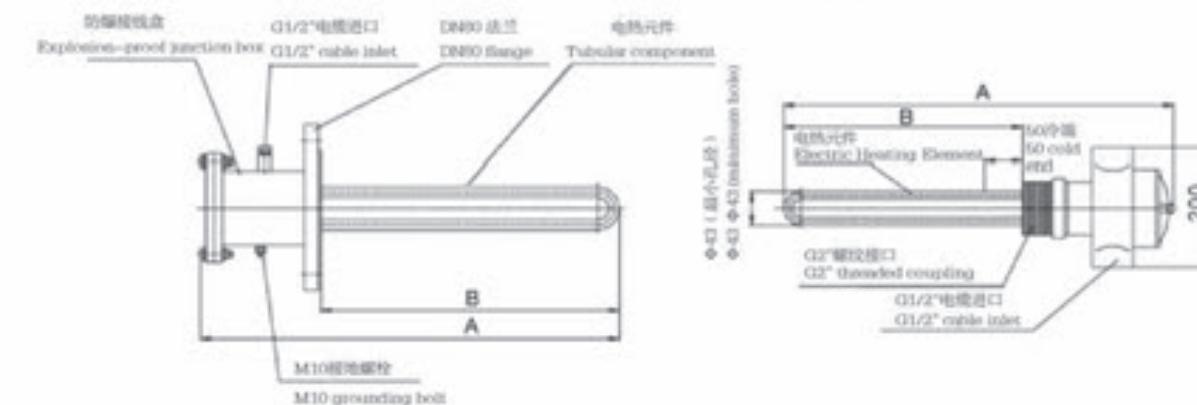
型号含义说明 Type meaning specification

在GY前加Ex-P为防爆法兰式管状电热元件。

Ex - P added before GY is explosion-proof Flange tubular components.

在GY前加Ex-S为防爆螺纹式管状电热元件。

Ex - S added before GY is explosion-proof screw tubular components.



型号 Range	电热元件直径 cartridge heater diameter	电热元件长度 cartridge heater length	功率 Power(W)	功率密度 Power density (W/cm²)
HWD-10/50/50	10mm	50mm	50	4.5
HWD-10/50/100	10mm	100mm	100	8.8
HWD-10/75/200	10mm	75mm	200	10.5
HWD-10/75/300	10mm	75mm	300	16
HWD-10/100/400	10mm	100mm	400	16
HWD-10/100/500	10mm	100mm	500	19
HWD-12/200/300	12mm	200mm	300	4
HWD-12/200/500	12mm	200mm	500	6.5
HWD-12/300/1000	12mm	300mm	1000	8.7
HWD-12/300/1500	12mm	300mm	1500	13
HWD-12/450/1500	12mm	450mm	1500	8.5
HWD-12/450/1700	12mm	450mm	1700	9.6

型号 Range	功率 Power(W)	外形尺寸 Overall dimension (mm)		重量 Weight(kg)
		A	B	
(Ex-P) GY-220/1	1	430	230	3
(Ex-P) GY-220/2	2	630	430	3.3
(Ex-P) GY-220/3	3	830	630	3.5
(Ex-S) GY-220/1	1	430	230	3
(Ex-S) GY-220/2	2	630	430	3.3
(Ex-S) GY-220/3	3	830	630	3.5

防护等级 Protection grade: IP54, IP55, IP65

防爆等级 Explosion-proof grade: ExdIICT1 - T6 Gb

防爆证号 Explosion-proof certificate number: GYB13.1717 X, GYB13.1104 X, GYB14.1426 X

注意：本加热器应与相应的控制系统配合使用

Note: this heater should be used with the corresponding control system

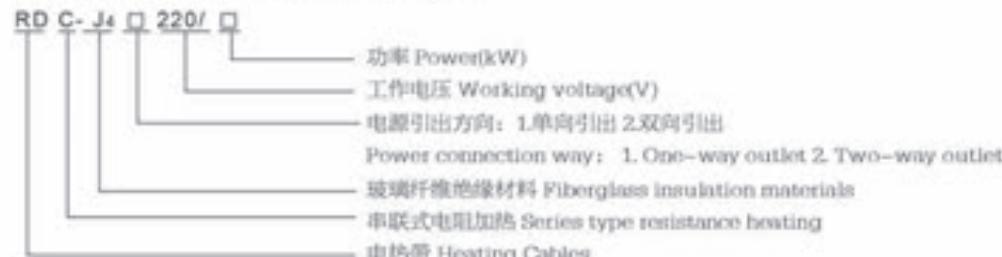
二、玻璃纤维电热带 Fiberglass Heating Cables

本产品适用于各种工业设备的罐、管、槽及其它容器的加热和伴热。它主要由电热材料和绝缘材料等组成，电热材料为镍铬合金带，具有发热快、热效率高、使用寿命长等特点。绝缘材料为多层无碱玻璃纤维，具有良好的耐温性能和可靠的绝缘性能。它结构美观，使用时可直接缠绕在被加热部位的表面加热，温度均匀、安装简单、使用方便、安全可靠。

This product is suitable for heating and heat tracing of tank, pipe, basin and other containers of various industrial equipment, it is mainly composed of electrothermal materials and insulation materials, electric materials are nickel-chromium alloy ribbon, with fast heating, high thermal efficiency, long service life and other characteristics, insulating materials are multilayer alkali-free glass fibers, with good heat resistance performance and reliable insulation performance. It is flexible in structure, when using, can be directly wrapped onto the surface of the heated parts for heating, with uniform temperature, simple installation, easy to use, safe and reliable.



型号含义 Type number nomenclature



最高工作温度 Maximum working temperature: 250°C

绝缘电阻 Insulation resistance: >2MΩ

正常使用寿命 Normal service life: 3000 hours

使用须知

- 1.适用于相对湿度<80%，无爆炸性气体场合。
- 2.为减少热损失，应在电热带外侧加覆保温层。
- 3.如缠绕于阀门等不平整装置表面时，应采用1.5cm狭带，使电热带与被加热装置接触良好。
- 4.在重叠缠绕处，应用金属片相隔，辅助散热，否则会引起重叠处过热，导致早期损坏。

Working directions

1. Applicable to heating with relative humidity < 80%, without explosive gases.
2. In order to reduce heat loss, should add thermal insulation layer outside Heating Cables.
3. If being wrapped to valves or other uneven device surfaces, should use 1.5 cm narrow belt, make the Heating Cables contact closely with the device to be heated.
4. In overlapping application, should be apart from metals, to assist heat dissipation, otherwise the overlapping position will be overheated, lead to damage too early.

规格和技术数据 Specifications and technical data

产品型号 Product Range	电压 Voltage (V)	功率 Power (kW)	长度 Length (m)	宽度 Width (mm)	电源引出方向 Power connection way
RDC-J4-1-220/0.5	220	0.5	1.5	30	单端引出 one-way outlet
RDC-J4-2-220/0.5	220	0.5	3	15	双端引出 two-way outlet
RDC-J4-1-220/0.7	220	0.7	2	30	单端引出 one-way outlet
RDC-J4-2-220/0.7	220	0.7	4	15	双端引出 two-way outlet
RDC-J4-1-220/1	220	1.0	3	30	单端引出 one-way outlet
RDC-J4-2-220/1	220	1.0	6	15	双端引出 two-way outlet
RDC-J4-1-220/1.4	220	1.4	4	30	单端引出 one-way outlet
RDC-J4-2-220/1.4	220	1.4	8	15	双端引出 two-way outlet
RDC-J4-1-220/1.8	220	1.8	5	30	单端引出 one-way outlet
RDC-J4-2-220/1.8	220	1.8	10	15	双端引出 two-way outlet

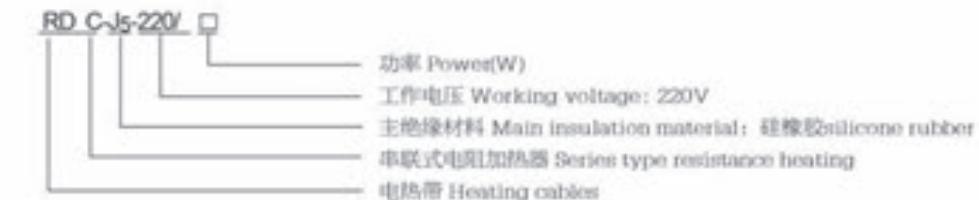
三、硅橡胶电热带 Silicon Rubber Heating Cables

RDC-J5型硅橡胶电热带适用于潮湿的、无爆炸性气体场合的管道、罐体等的加热和伴热。产品主要由镍铬合金电热线和绝缘材料硅橡胶组成，电热线具有发热快、热效率高、使用寿命长等特点。硅橡胶的耐热性能良好，绝缘性能可靠。产品具有极好的柔韧性，可直接缠绕在被加热装置上，接触良好，加热均匀，安装简单，安全可靠。

RDC-J5 silicon rubber Heating Cables can be used for heating and heat tracing of pipes, tanks, etc. in humid conditions, without explosive gases. This product is mainly composed of nickel-chromium alloy heating wire and insulation silicone rubber, heating wire can give quick heating, with high thermal efficiency, long service life and other characteristics. Silicone rubber is with good heat resistance and reliable insulation performance. This product is extremely flexible, can be directly wrapped onto the heating device, with good contacts, uniform heating, installation is simple, safe and reliable.



型号含义 Type number nomenclature



规格和技术数据 Specifications and technical data

型号 Range	电压 Voltage (V)	功率 Power (W)	长度 Length (m)	宽度 Width (mm)	引线形式 Form of lead
RDC-J5-220/75	220	75	1	26	单端 one-way outlet
RDC-J5-220/200		200	2.5		单端 one-way outlet
RDC-J5-220/300		300	4		双端 two-way outlet
RDC-J5-220/750		750	10		双端 two-way outlet

绝缘材料最高耐热温度 Highest withstand temperature of insulation material: 250 °C

最高介质温度 Highest medium temperature: <200°C

绝缘电阻 Insulation resistance: >50MΩ

绝缘耐压强度 Insulation dielectric strength: 1500V/1min

使用须知

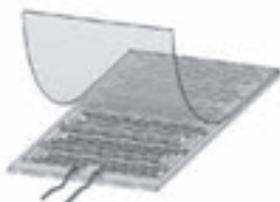
- 1.安装时，电热带的硅橡胶平面侧应紧贴介质管道、罐体的表面，并用铝胶带固定。
- 2.为减少热损失，应在电热带外侧加保温层。
- 3.严禁重叠缠绕安装，以防过热损坏。

Working directions

1. For installation, silicone rubber flat side of Heating Cables should be closely pasted to the surfaces of the medium pipes and tanks, fixed with aluminum adhesive tape.
2. In order to reduce heat loss, should add thermal insulation layer outside Heating Cables.
3. Overlapping wrapped installation is strictly prohibited, to prevent overheating damage.

四、柔性电加热板 Flexible Electric Heating Plate

(一)、概述 Overview



柔性电加热板是一种半透明或全透明的金属柔性电加热膜，其中上、下表面是一种耐温性好、绝缘性能优的薄膜，例如Teflon膜及硅胶膜，中间为特殊合金箔制成的电阻性电路。它比丝状电热结构提供更均匀的热场，更短的加热时间和更快的响应时间，与丝状电热结构相比，功率负荷低，使用寿命更长。根据用户要求，可提供各种形状、规格和功率大小的柔性电加热板，此电加热板结构很薄(最厚仅0.25mm)，可以根据工件的形状任意弯曲，确保与工件接触紧密，保证最大的热能传递。本产品可以提供安装用的压敏胶PSA或环氧胶。

由于本产品重量轻，结构强度高，发热均匀，现已被广泛运用到卫星、航天设备和移动仪器的防冻、加热上。

本产品工作电压：1V—500V，根据加热工件的要求，可以制成各种不同的加热回路，例如可以要求其中的某些回路加热，某些回路作为保温伴热，因此设计非常灵活。

本柔性电加热板耐油、耐化学腐蚀和耐辐射，可广泛使用在工况条件比较苛刻的场合。

Flexible electric heating plate is a translucent or transparent flexible metal electric heating membrane, the upper and lower surfaces of which is a kind of film with good temperature resistance, insulation performance, as Teflon film and silicon film, in the middle is resistive circuits made of special alloy foil. It can provide a more uniform thermal field than the filamentous structure, with shorter heating time and faster response time, compared to filamentous structure, it has lower electric power load, and longer service life. According to user requirements, Can provide flexible power electric heating plates of various shapes, specifications and powers, the structure of this electric heating plate is very thin(maximum thickness is only 0.25 mm), can be bented freely according to the shape of the workpiece, to ensure close contact with workpiece, guarantee maximum heat transfer. This product can provide contact adhesive PSA or epoxy adhesive for installation.

Because this product is light in weight, with high structural strength and even heating, it has been widely used in the antifreeze, heating devices of satellite, space equipment and mobile equipment.

This product's working voltage: 1V~500V, according to the requirements of heating workpiece, can be made into different kinds of heating loops, for example, some of these loops can give heating, some other loops can be used as heat preservation, so the design is very flexible.

This flexible electric heating plate is oil resistant, chemical corrosion resistant and radiation resistant to, can be widely used in place of tough working conditions.

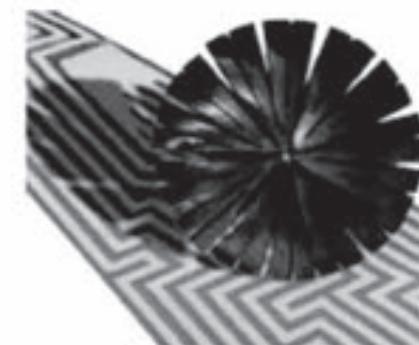
(二)、特点 Characteristics

1. 所占空间极小，重量极轻，厚度极薄。
 2. 极其柔软，其最小弯曲半径仅为0.8mm左右。
 3. 形状及大小极灵活，尤其适合于制作面积极小的柔性电热膜元件。
 4. 采用面状发热方式，容许表面功率负荷极大，最大可达到78W/cm²。因此，本产品具有加热均匀性能好，加热速率快的特点。
 5. 在不同面和部位可满足不同的加热功率要求和加热温度要求，可按要求设计，实现在加热面上的温度分布。
 6. 热惯量小，温度控制精度高，升温速度快。
 7. 作为保护层的绝缘薄膜具有极低的饱和蒸气压，放气性极低，同时具有优异的抗化学腐蚀性能，抗菌性能以及抗辐射性能。因此，本柔性电加热板的系列产品适用于真空环境、与油及大多数化学品(如，酸性、化学溶剂、一般的碱液)接触的环境。
 8. 可以方便地与温度控制器或传感器集成为一体。
 9. 带PSA不干胶的产品更便于快捷的安装(适用于1W/cm²和2W/cm²)，本电加热板也可以由用户用机械压接或环氧胶粘接的方式安装。
 10. 本系列产品安全、可靠，使用寿命长。
1. Take up minimal space; Very light in weight; The thickness is very thin.
 2. Very soft, its smallest bending radius is only 0.8 mm or so.
 3. Shape and size are extremely flexible, especially suitable for making tiny flexible electrothermal film element.
 4. Use planar heating method, great allowable surface power load, the biggest can reach 78 W/cm². Therefore, this product can be heated evenly, and with good performance, rapid heating speed.
 5. Can meet the requirements of different heating powers and heating temperatures in different areas, can realize temperature distribution on the heating surface according to the design requirements.
 6. Thermal lagged small, high temperature control precision, fast heating.

7. The insulating film, as a protective layer, is of a very low saturated vapor pressure, with extremely low deflation, while has excellent chemical corrosion resistance, antibacterial properties and radiation resistance performance. Therefore, this series of flexible electric heating plate products is suitable for vacuum environment, and environment contacting with oil and most chemicals (such as acid, chemical solvents, general lye).
8. Can be easily integrated to temperature controller or sensors.
9. Products with PSA adhesive are easier for quick installation (applicable to 1 w/cm² and 2 w/cm²), this electric heating plate can also be installed by the users by mechanical pressure connection or epoxy adhesive connection.
10. This series of products are safe, reliable, with long service life.

(三)、典型应用领域 Typical application fields

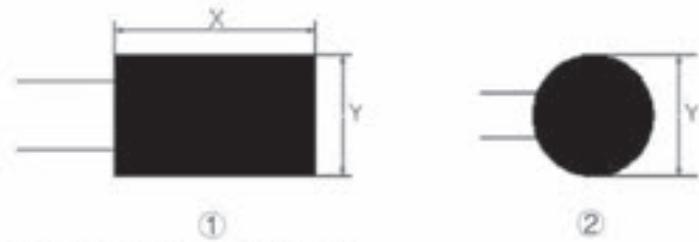
1. 科学分析仪器，例如，为导热系数测定仪提供恒温源，医疗仪器和稳定光电子元件工作温度等。
 2. 在深冷环境中，使仪器设备达到安全工作温度。例如：人造卫星，空间飞行器中仪器以及在高纬度地区使用的仪器，仪表的防低温，如卡式阅读器，液晶显示器LCD等仪器。
 3. 真空加热与烘烤领域。
 4. 军工领域，例如，导弹、舰船、坦克、雷达。
 5. 汽车后视镜除霜片，天线或雷达的除雪、除霜加热元件以及调速电阻片等。
 6. 医疗保健及美容仪器行业。
1. Scientific analysis instruments, such as to provide constant temperature source for thermal conductivity apparatus, and working temperature for medical equipment and stable optoelectronic components, etc.
 2. In deep freezing environment, provide safe working temperature to equipment. Such as: satellite, space vehicles, as well as instruments used in the high latitudes, meter low temperature prevention, such as card reader, liquid crystal display LCD and other apparatus.
 3. Fields of vacuum heating and baking.
 4. Military fields, such as missiles, ships, tanks, radars.
 5. Auto rearview mirror defrost slices, snow removal of antenna or radar, defrost heater element and speed adjustment resistors, etc.
 6. Health care and beauty equipment industry.



(四)、主要规格与性能 Main specifications and performance

1. 工作温度: -200°C~260°C, 带压敏胶PSA的最高工作温度为120°C
 2. 最大厚度: 除引接线外, 最大厚度为: 0.25mm
 3. 最大功率负荷: 7.8 W/cm²
 4. 引接线: Teflon线或硅橡胶线
 5. 介电强度: 1250V
 6. 最小弯曲半径: 0.8mm
1. Working temperature: -200°C ~ 260°C, highest working temperature for PSA with contact adhesive is 120 °C
 2. Maximum thickness: maximum thickness is 0.25 mm, except lead wire
 3. Largest power load: 7.8 W/cm²
 4. Lead wire: Teflon wire or silicone rubber wire
 5. Dielectric strength: 1250V
 6. Minimum bending radius: 0.8mm

(五)、目前结构形式 Current Structural Form

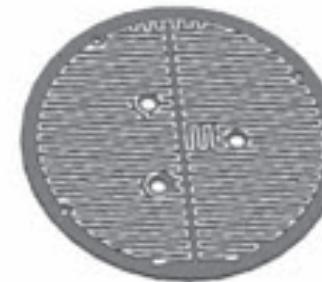
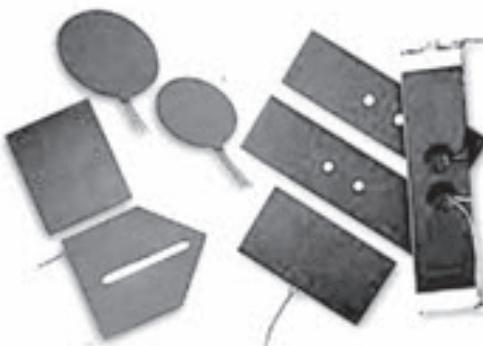


型号含义 Type number nomenclature



尺寸 Dimension (mm)		结构形式 Structural form	电加热板电阻 Electrical heating plate resistance(Ω)			绝缘材料 Insulation material	系列号 Series No.
X	Y	①/②	0°C			HK	
12	50	①	157	284	24.3	HK	5000
50	50	①	112	563	17.4	HK	5010
50	75	①	441	220	68.4	HK	5015
50	150	①	220	110	34.1	HK	5025
50	200	①	137	68.9	21.2	HK	5030
100	200	①	318	178	96	HK	5040
100	250	①	114	56.1	17.7	HK	5045
150	200	①	362	182	56.1	HK	5055
200	300	①	2890	1446	448	HK	5080
125	②	26.1	13.1	0.15	HK	5200	
20	②	32.2	16.1	0.32	HK	5205	
35	②	38	19.0	5.9	HK	5215	
45	②	227	114	36.2	HK	5220	
75	②	200	100	31.0	HK	5230	
85	②	196	99	30.7	HK	5235	
180	②	120	60.1	18.6	HK	5240	

五、硅橡胶电加热板 Silicone Rubber Heating Plates



硅橡胶电加热板可以做成各种形状和图案。由于此产品非常薄且具有很好的导热性能，在很多工业领域、医疗、实验室、食品和航空领域有着非常广泛的运用。硅橡胶电加热板质量稳定，防潮湿和抗化学腐蚀，并可以根据工件大小制成各种形状。温度使用范围能从-62到235°C，最大可以提供的功率负荷达3.1W/cm²。由于本产品非常薄，传热效果好，实际发热元件非常接近工件。

目前有两种电路形式，一种是蚀刻电路法，最大宽度可以做到360mm，长度不限；发热元件为片状电热元件结构，它比丝状电热元件提供更均匀的热场，升温时间短和响应时间快。与丝状电热元件相比，功率负荷低，使用寿命更长。另一种是圆丝发热元件排布法。

Silicone rubber heating plates can be made into different shapes and patterns. Because this product is very thin and has good thermal conductivity, it has very extensive application in the fields of medical, laboratory, food, aviation and many other industries. Silicone rubber plates are with stable qualities, moisture proof and chemical resistance, and can be made into various shapes according to the volume of work-piece. Application temperature range from -62 to 235°C, with biggest power load of 3.1 W/cm², because this product is very thin, heat transfer is good, the actual heating element is very close to the work-piece.

Currently, there are two circuit forms, one is etched circuit method, maximum width of which can reach 360 mm, with unlimited length; Heating element is flat shape electric heating element, which can provide more uniform heating field than wires of that, heating time is short and response quickly, compared with wires element, the power load of which is lower, service life is longer. The other one is round wire heating element configuration method.

安装方式 Installation Mode

1. 在平坦和光滑的工作上可以用压敏胶来粘接。
 2. 压敏胶的最大使用温度为：150°C连续，230°C瞬时。功率负荷不超过0.9W/cm²的场合。
 3. 涂覆压敏胶的硅橡胶加热器最好在出厂后半年内使用，否则会影响胶水的使用性能。
 4. 小型工件可以来工厂预制和硫化，可以确保加热板的最大使用寿命。
1. Can be bonded to smooth and flat workpiece with contact adhesive.
 2. The maximum service temperature for contact adhesive is: 150 °C continuous and 230 °C in intermittent. At no more than 0.9 W/cm².
 3. The silicone rubber heater of contact adhesive is best to be used within the six months after produced in the factory, otherwise the glue performance will be influenced.
 4. Small workpiece can be sent to factory for prefabrication and sulfuration, to ensure a maximum service life for the heating plate.

产品应用 Application

雷达天线防冰雪、光纤设备、航空器、飞机、激光打印机、照相、胶水和层压板、家用电器、液压设备、电池加热、户外电器、开关柜内机冷凝、压机和包装设备等。

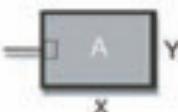
Radar antenna snow-ice proof, fiber optic equipment, aircraft, planes, laser printers, photos, glue and laminate, household appliances, hydraulic equipment, battery heating, outdoor appliances, switchgear condensation resistance, presser and packaging equipment, etc.

1. 硅橡胶电加热板規格 Silicone rubber heating plates of specification

規格 Specification	偏差 Deviation
功率偏差 Power deviation	10%
绝缘电阻 Insulation resistance	DC500V/50MΩ
耐压 Dielectrical voltage	1500VAC/1min
最大宽度(蚀刻型) Maximum width(Etch type)	360mm
厚度 Thickness	1.65mm(Min)

2. 硅橡胶电加热板溫度控制 Silicone rubber heating plates of temperature methods

温度开关 Temperature switch	0~40°C, 10~110°C, 40~320°C,
限温开关 Temperature limitation switch	30, 40, 45, 50, 55, 65, 75,

3. 硅橡胶电加热板 Silicone rubber heating plates


蚀刻型系列号在下列原系列号前加ET, 蚀刻型能提供更长的使用寿命。

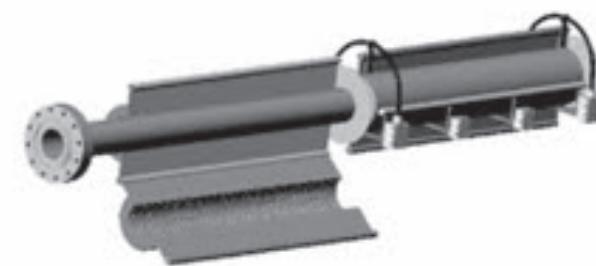
For etch type series numbers, add ET in front of the original series numbers, each type can provide longer service life.

尺寸 Dimension	功率密度 Power density					
	0.9W/cm²		1.5W/cm²		2.2W/cm²	
	宽度 Width [Y](in)	长度 Length [X](in)	功率 Power(W)	系列号 Series number	功率 Power(W)	系列号 Series number
1"	6" [152mm]	30	SR010611	30	SR010641	60
	12" [305mm]	60	SR011217	60	SR011247	120
	16" [380mm]	75	SR011519	75	SR011549	150
2"	2" [51mm]	20	SR020211			
	3" [76mm]	30	SR020312	30	SR020342	60
	12" [305mm]	120	SR021217	120	SR021247	240
	16" [406mm]	160	SR021618	160	SR021648	320
8"	8" [203mm]	320	SR080811	640	SR080841	640
	20" [508mm]	800	SR082014	1600	SR082044	1600
10"	6" [152mm]	250	SR100611	500	SR100641	500
	20" [508mm]	1000	SR102014	2000	SR102044	2000

六、高温低密度陶瓷纤维加热器 High Temp Low Density Ceramic Heaters

HLCH高温低密度陶瓷纤维加热器采用高质量和真空发泡的陶瓷纤维作为绝缘和保温载体，采用埋在陶瓷纤维中螺旋状的铁铬铝或镍铬电热材料作为发热元件，具有重量轻、热效率高和启动迅速等优点，被广泛用于管道加热和管道退火等行业。

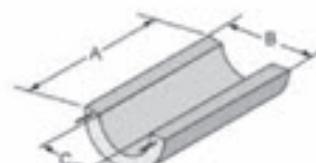
HLCH high temp low density ceramic heaters adopt high quality and vacuum foaming ceramic fiber as the carrier for insulation and heat preservation, uses the helical form iron chromium aluminum or nickel chrome electric heating materials embedded in the ceramic fibers as heating components, has advantages of light weight, high thermal efficiency, and quick start, which is widely used in heating pipeline and pipe annealing, etc.


产品特点

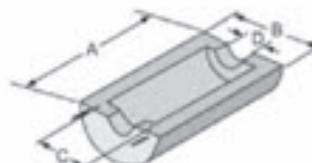
- 最高工作温度可达到1100°C
- 启动加热和冷却速度快
- 温度场均匀
- 运行费用低
- 加热元件和保温一体化

Features of product

- Highest working temperature can reach 1100°C
- Quick start of heating and cooling
- Temperature field uniform
- Low operation cost
- Heating components and heat preservation as whole



无支撑型 Without support model



有支撑型 With support style model

功率 Power(W)	A (mm)	B (mm)	C (mm)	D (mm)	无支撑型 Without support model	有支撑型 With support style model
900	150	178	100	64	HLCH-900	HLCH-900/V
1200	150	230	125	90	HLCH-1200	HLCH-1200/V
1400	300	127	75	50	HLCH-1400	HLCH-1400/V
1800	300	178	100	64	HLCH-1800	HLCH-1800/V
2200	300	230	125	90	HLCH-2200	HLCH-2200/V
3400	450	230	125	90	HLCH-3400	HLCH-3400/V
4000	450		160	115	HLCH-4000	HLCH-4000/V

注：以上型号仅供参考，具体可以根据用户要求定制。

Note: The above models are for reference only, can be specifically customized according to user requirements.

七、铸铜(铝)电加热器 Cast Copper (Aluminum) Heaters

所谓铸铜(铝)电加热器，就是把电热元件浇铸在铜件或铝件中，能按照被加热物的形状进行制造，特点是：

The so-called cast copper (aluminum) heaters are to cast the electric heating components in copper or aluminum parts, can be made according to the shape of the objects to be heated, features are:

1. 温度均匀 Even temperature
2. 传热效率高 High heat transfer efficiency
3. 电热元件使用寿命长 Long service life of electric heating components
4. 电热元件采用特殊的扁平结构，传热面更大 Electric heating components adopts special flat structure, conduction surface is bigger
5. 采用3D模型技术优化设计 Use 3D model technology to optimize design
6. 根据用户要求可以做防爆结构的设计 Can design explosion-proof structure according to user requirements



扁平管状电热元件 (釜式电加热器专用)
Flat tubular components
(dedicated to kettle type electric heater)



小直径整体铸铜电加热器
Small diameter electric heater wholly cast with copper



大直径整体铸铜电加热器 (导热、绝热一体化)
Large diameter kettle type electric heater cast with copper
(thermal conductivity, thermal insulation integrated)

选用须知 Notice

铸铜(铝)电加热器必须根据用户要求进行定制，选用时用户必须提供下列技术参数：

Copper (aluminum) cast electric heater must be customized according to user requirements, the user must provide the following parameters:

1. 工作温度 Working temperature(°C)
2. 详细的结构尺寸 Specific structural dimensions(mm)
3. 加热功率 Heating power (kW)
4. 防爆等级 Explosion - proof grade

一、通道式电加热器 Duct Heaters

通道式电加热器主要用于风道中的空气加热，规格分为低温型、中温型和高温型三种，它们在结构上的共同之处是采用了钢板支撑电热管的结构以减少风机停止时管状电热元件的振动，在接线盒中都装有超温控制装置。低温型可直接安装在风道上，而中温型、高温型由于结构上的不同，在通道外壁与加热器接线盒间夹有100mm厚的保温层，一方面可以减少整个通道的对外散热，另一方面也可以降低接线盒内的温度，因此，中、高温型通道式电加热器的安装，必须在通道上先安装100mm安装框。低、中温型通道式电加热可以选用翅片式电热元件，高温加热型加热器选用管状电热元件。

Duct heaters are mainly used for heating the air in the air duct, the specifications are divided into three types: low, medium and high temperature, the structural common point is that they all use steel plate to support electric heating tube, to reduce the vibration of the tubular electric heating components when the fan stops, all have over-temperature control devices fitted in the junction boxes. The low temperature type can be directly installed on the air duct, while the structures of medium and high temperature type are different, as shown in Fig. there are insulation layer of 100 mm thickness between the channel outer walls and the heater conjunction boxes, it can reduce the external heat dissipation of the whole passage on one hand, and reduce the temperature in the conjunction box on the other hand, therefore, for the installation of medium and high temperature Duct heaters, must first install on the channel 100 mm installation boxes. For low and medium temperature Duct heaters, can select finned electrical heating components, for high temperature heating type, choose tubular electric heating components.



低温型
Low temperature type



中温型
Medium temperature type



高温型
High temperature type

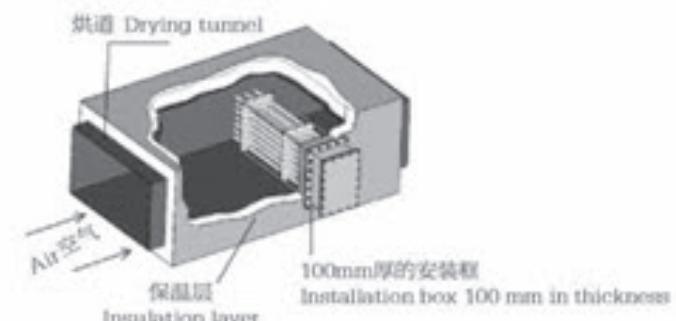
型号含义 Type number nomenclature



- A: 低风速 Low wind speed
- B: 中风速 Medium wind speed
- C: 高风速 High wind speed
- L: 低温型 Low temperature type
- M: 中温型 Medium temperature type
- H: 高温型 High temperature type

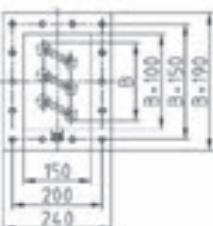
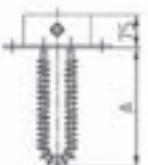
例：DHR-L-A-3；表示用于低温型通道式加热器，功率为3kW，风速度为>130m/min。

Example: DHR - L - A - 3: means low temperature Duct heater, the power of which is 3 kw, wind speed > 130 m/min.



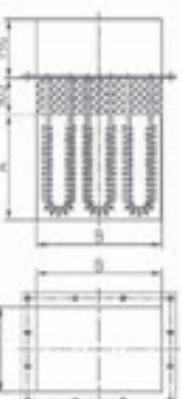
低溫型 Low temperature type

发热区深度 Hot zone depth A (mm)	通道宽度 Channel width B (mm)	风速 > 130m/min Wind speed >130m/min		风速 > 150m/min Wind speed >150m/min		风速 > 180m/min Wind speed >180m/min	
		型号 Type	功率 Power(kW)	型号 Type	功率 Power(kW)	型号 Type	功率 Power(kW)
200	150	DHR-L-A-3	3	DHR-L-B-4	4		
	300	DHR-L-A-6	6	DHR-L-B-8	8		
300	150	DHR-L-A-5	5	DHR-L-B-7	7		
	300	DHR-L-A-10	10	DHR-L-B-13	13		
400	300	DHR-L-A-15	15	DHR-L-B-20	20	DHR-L-C-27	27
	600	DHR-L-A-30	30	DHR-L-B-40	40	DHR-L-C-53	53



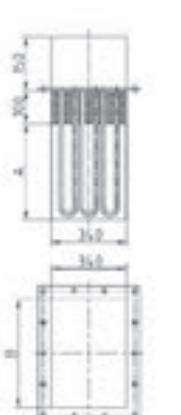
中温型 Medium temperature type

发热区深度 Hot zone depth A (mm)	通道宽度 Channel width B (mm)	风速 > 130m/min Wind speed >130m/min		风速 > 150m/min Wind speed >150m/min		风速 > 180m/min Wind speed >180m/min	
		型号 Type	功率 Power(kW)	型号 Type	功率 Power(kW)	型号 Type	功率 Power(kW)
300	900	DHR-M-A-31	31	DHR-M-B-40	40	DHR-M-C-54	54
	1000	DHR-M-A-34	34	DHR-M-B-45	45	DHR-M-C-60	60
600	900	DHR-M-A-67	67	DHR-M-B-90	90	DHR-M-C-118	118
	1000	DHR-M-A-75	75	DHR-M-B-100	100	DHR-M-C-132	132
1000	200	DHR-M-A-25	25	DHR-M-B-34	34	DHR-M-C-45	45
	400	DHR-M-A-50	50	DHR-M-B-68	68	DHR-M-C-90	90



高温型 High temperature type

尺寸 Dimension (mm)		风速 > 60m/min Wind speed >60m/min		风速 > 80m/min Wind speed >80m/min	
A	B	型号 Type	功率 Power(kW)	型号 Type	功率 Power(kW)
450	310	DHR-H-A-10	10	DHR-H-B-20	20
	410	DHR-H-A-15	15	DHR-H-B-30	30
500	310	DHR-H-A-12	12	DHR-H-B-24	24
	300	DHR-H-A-15	15	DHR-H-B-30	30
610	310	DHR-H-A-15	15	DHR-H-B-30	30
	510	DHR-H-A-30	30	DHR-H-B-60	60



使用须知

控制方面，必须在风机与加热器之间加一联锁装置，以确保加热器启动，需在风机起动工作之后进行。在加热器停止工作后，风机必须延时工作3分钟以上，以防加热器过热而损坏。在单回路接线方面必须符合NEC标准，每一支路电流不得超过48A。通道式加热器加热的气体压力一般不超过0.03MPa，如要超过以上压力规格，请选用循环式加热器。低温型通道式加热器加热气体的最高温度不超过160°C；中温型不超过260°C；高温型不超过500°C。

Notice

As for control, it is necessary to add a inter lock between the fan and heater. Ensure that the heater should be started after the fan operating. When the heater stops, the fan must continue to work for more than 3 minutes, in case that the heater is overheated and damaged. The single circuit connection must conform to NEC standards, each branch current shall not exceed 48A. Generally, the air pressure for Duct heater should be no more than 0.03 MPa, if more than the above pressure specifications, please choose circulation type heater. The highest temperature of the heating gas in low temperature Duct heater should not exceed 160°C; in medium temperature type not exceed 260°C; in high temperature type not exceed 500°C.

二、浸入式电加热器 Immersion Heaters

浸入式电加热器顾名思义是将电加热器浸入液体进行加热，主要特点是由于电加热器浸入液体中，电加热器所散发的能量均被被加热的液体所吸收，因此能效非常高，再加上体积小、易于控制等优点，被广泛用于石油、化工和冶金等领域，是石化行业理想的换热设备。浸入式电加热器的结构有很多种，最常用的有螺纹式(见“防爆型管状电热元件”)、法兰式和L型式等。

Immersion heaters as the name suggests is to heat by immersing electric heaters into liquid, the main characteristic is the energy from electric heater is absorbed by the heated liquid since the electric heaters are immersed into liquid, so energy efficiency is very high, coupled with the advantages of small volume, easy to control, they are widely used in petroleum, chemical industry and metallurgy and other fields, becoming the ideal heat-exchange equipment for petrochemical industry. There are many kinds of structures for Immersion heaters, among them the most commonly used are screw-type [see “explosion-proof mode tubular electric heating components”], flange type and L shape and so on.



螺纹式浸入式电加热器
Screw-type Immersion Heaters



法兰式浸入式电加热器
Flange-type Immersion Heaters



L型式浸入式电加热器
L shape Immersion Heaters

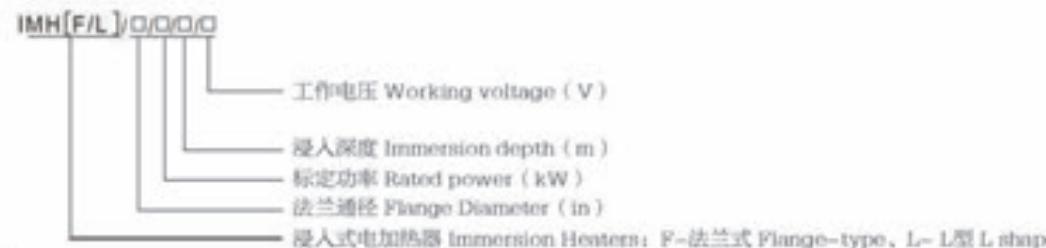
技术数据

- 最高工作电压 : 690V AC
- 目前最大浸入长度 : 10m
- 最大功率 : 单只2000kW
- 最高设计压力 : 42.0 MPa(高精度电热元件)
- 目前最高工作压力 : 23.5 MPa
- 目前最高工作温度 : 600°C(加热氢气)
- 防爆等级 : d II CT1-T6
- 电热元件外壳材料 : 碳钢; 不锈钢(S30408, S32168, S31608, S31008); Incoloy800, Inconel600

Technical data

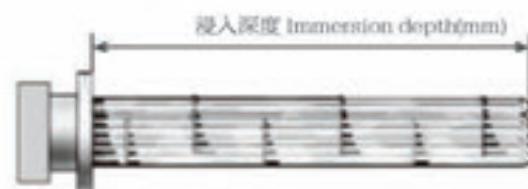
- Maximum working voltage: 690V AC
- The largest immersion length presently: 10m
- Maximum power: single 2000 kW
- Maximum design pressure: 42.0 MPa (high precision electric heating components)
- Maximum working pressure presently: 23.5 MPa
- Maximum working temperature presently: 600 °C (heating hydrogen)
- Explosion-proof grade: d II CT1 - T6
- Shell material of heating components: carbon steel; stainless steel (S30408, S32168, S31608, S31008); Incoloy800, Inconel600

型号含义 Type number nomenclature



注:Note

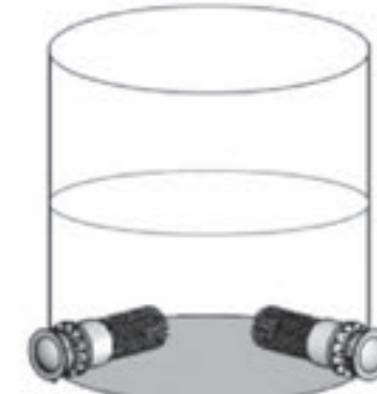
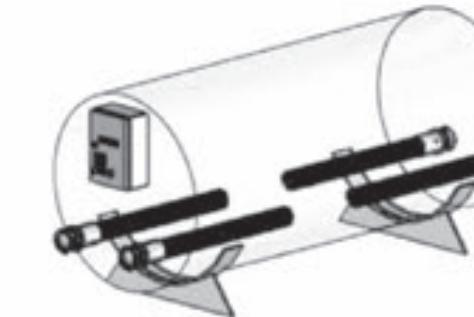
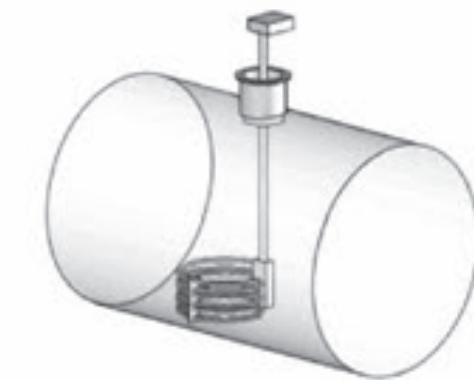
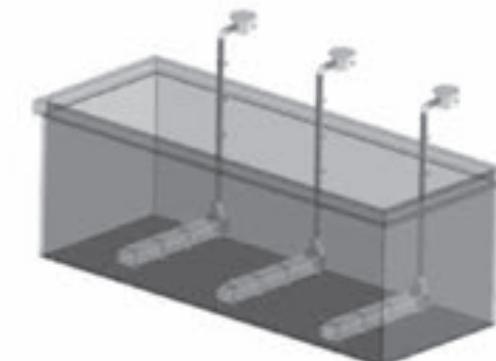
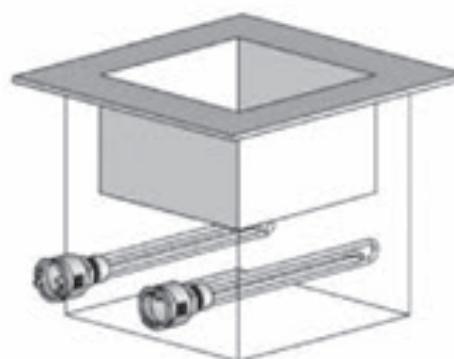
1. 电热元件的外壳材料,在定货时标明 Material of electric heating components, which need indicated in order.
2. 防爆型在前加(Ex) Add (Ex) before explosion-proof type



设备参数表 Technical Data

型号 Type	法兰规格 Flange specification	在不同功率密度下的功率 Power under different power density (kW)		电热管数量 Electric heat pipe quantity	浸入深度 Immersion depth (mm)
		2W/cm²	4W/cm²		
IMH-3/3.5/1/380	IMH-3/7/1/380	3.5	7.0	3	1000
IMH-3/5/1.25/380	IMH-3/10/1.25/380	5	10	3	1360
IMH-3/7/1.80/380	IMH-3/14/1.80/380	7	14	3	1860
IMH-3/12/3.4/380	IMH-3/24/3.4/380	12	24	3	3400
IMH-5/7/1/380	IMH-5/14/1/380	7	14	6	1000
IMH-5/10/1.25/380	IMH-5/20/1.25/380	10	20	6	1360
IMH-5/14/1.80/380	IMH-5/28/1.80/380	14	28	6	1860
IMH-5/25/3.4/380	IMH-5/50/3.4/380	25	50	6	3400
IMH-6/14/1/380	IMH-6/28/1/380	14	28	12	1000
IMH-6/21/1.25/380	IMH-6/42/1.25/380	21	42	12	1360
IMH-6/28/1.80/380	IMH-6/56/1.80/380	28	56	12	1860
IMH-6/50/3.4/380	IMH-6/100/3.4/380	50	100	12	3400
IMH-8/21/1/380	IMH-8/42/1/380	21	42	18	1000
IMH-8/32/1.25/380	IMH-8/64/1.25/380	32	64	18	1360
IMH-8/42/1.80/380	IMH-8/84/1.80/380	42	84	18	1860
IMH-8/76/3.4/380	IMH-8/152/3.4/380	76	152	18	3400
IMH-10/25/1/380	IMH-10/70/1/380	35	70	30	1000
IMH-10/52/1.25/380	IMH-10/104/1.25/380	52	104	30	1360
IMH-10/70/1.80/380	IMH-10/140/1.80/380	70	140	30	1860
IMH-10/130/3.4/380	IMH-10/260/3.4/380	130	260	30	3400
IMH-12/42/1/380	IMH-12/84/1/380	42	84	36	1000
IMH-12/63/1.25/380	IMH-12/126/1.25/380	63	126	36	1360
IMH-12/85/1.80/380	IMH-12/170/1.80/380	85	170	36	1860
IMH-12/150/3.4/380	IMH-12/300/3.4/380	150	300	36	3400
IMH-14/56/1/380	IMH-14/112/1/380	56	112	48	1000
IMH-14/85/1.25/380	IMH-14/170/1.25/380	85	170	48	1360
IMH-14/112/1.80/380	IMH-14/224/1.80/380	112	224	48	1860
IMH-14/200/3.4/380	IMH-14/400/3.4/380	200	400	48	3400

浸入式电加热器的典型应用 Typical Application of Immersion Type Electric Heaters



注: 对于L型加热器, 还必须标明接线盒到加热管距离。以上浸入深度仅供参考。

Note: For L shape heater, distance from junction box to heating pipe must be indicated. Immersion depth above are for reference only.

三、循环式电加热器 Circulation Heaters

循环式电加热器是通过强迫对流的方式对流体进行加热的，即在加热器一头用泵把流体泵进加热腔，经加热后，在加热器另一头流出，是一种通过泵强制循环的加热方式。

Circulation heater by way of forced convection to heat fluid, i.e. pump fluid into the heating chamber with pump at one end of the heater, and after heating, flow out at the other end of the heater, is a kind of a heating mode by forced circulation of pump.

循环式电加热器有以下特点 Circulating electric heaters has the following features

1. 体积小，功率大。循环式电加热器内部主要采用集束式管状电热元件，单个集束式管状电热元件最大功率达2MW。
2. 热响应快，控温精度高，综合热效率高。
3. 应用范围宽，适应性强。循环式加热器可适用于防爆或普通场合，防爆等级可达B级或C级，耐压可达40MPa，并可根据用户要求设计，电加热器形式可采用立式或卧式结构。
4. 加热温度高。加热器设计最高工作温度可达700°C，这是一般换热器所不能做到的。
5. 全自动化控制。通过对电加热器控制电路的设计，可方便实现出口温度、压力、流量等参数的自动控制，并可与计算机联网，实现人机对话。
6. 寿命长，安全可靠性高。电热元件采用特殊电热材料制造，再加上保守的功率负荷设计和控制电路的多重保护，使得本加热器安全性和寿命大大增加。

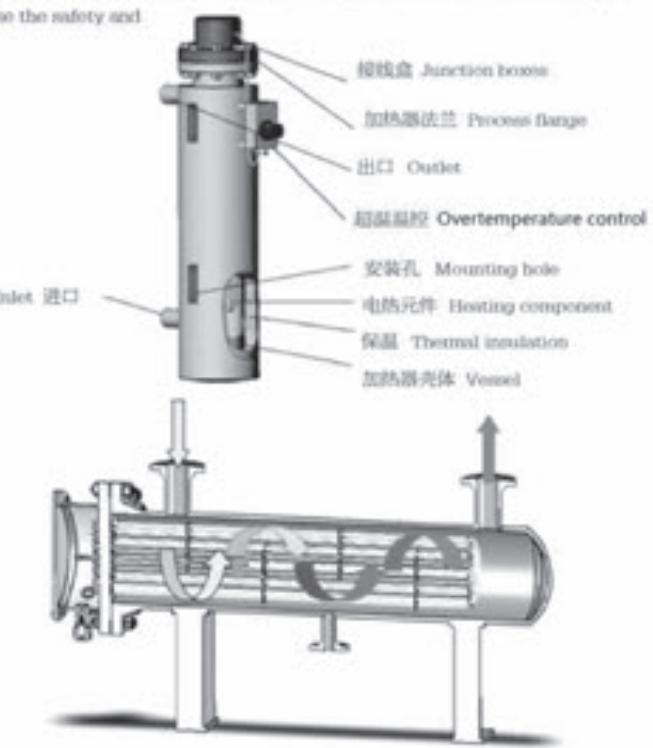
1. Small volume, big power.Circulation heater mainly adopts tubular bundle electric heater. Power of a single tubular bundle heaters up to 2MW.
2. Fast thermal response, high precision temperature control, high integrated thermal efficiency.
3. Wide application range and strong adaptability.The circulating heater can be applied to explosive-proof or ordinary conditions, it's explosive-proof grade is up to Grade B or Grade C, its withstanding pressure is up to 40MPa. And it can design according to user requirements, the form of electric heater can adopt vertical or horizontal structure.
4. High heating temperature.Designed maximum working temperature for the heater is up to 700 °C, which is far beyond the ordinary heat exchanger.
5. Full automatic control.By controlling circuit of electric heater, it is easy to realize automatic control of parameters like outlet temperature, pressure, flow and so on, also can realize man-machine interaction connecting with computer.
6. Long life, high safety and reliability.The heating components adopts special electric heating materials, along with the conservative design of power load and multiple protections for control circuit greatly increase the safety and

典型的应用场合为

Typical application are

各种水加热，例如民用盥洗室里的水加热及工业上工艺水的加热；碳氢化合物的加热，例如导热油、燃料油、沥青、石蜡等等；清洗机、融冰槽的加热，例如NaOH溶液及各种洗涤剂；空气的加热，适用于一定压力下，一些粉末干燥、化工过程及喷射干燥；过热蒸汽的加热；气体加热，例如H₂、N₂及各种惰性气体。

All kinds of water heating, such as bathroom water heating for commercial use and industrial process water heating; heating of hydrocarbons, such as heat conduction oil, fuel oil, asphalt, paraffin, etc.; heating of cleaning machine, dip tank, such as NaOH solution and all kinds of detergent; heating of air, suitable for under a certain pressure, drying, chemical engineering process of powder; heating of superheated steam; gas heating, such as H₂, N₂, and various kinds of inert gas.



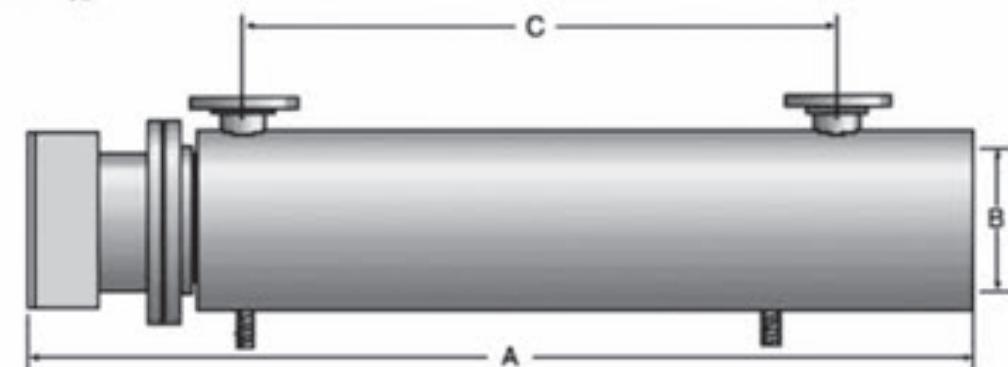
循环式加热器规格选型说明

Type selection description of the circulating heater specifications

1. 以下所列技术数据适用于低温度加热器（接线盒与法兰间无散热区）
2. 实际上气体和油加热功率密度达8W/cm²的情况很少，但可以根据规格表中的参数进行计算，例如某2号燃料油加热至100°C，经计算如需功率28kW；那么我们可查附录功率密度表，选择3.5W/cm²，28kW x 8/3.5=64kW，换句话说我们可以选择CH-O-64/5/8规格的循环式加热器，所有的几何尺寸都保持不变，仅需功率密度按3.5kW/cm²进行设计，就可以满足以上例子的需要。当然循环式加热器的规格选型不是唯一的，具体的选择要根据客户的具体工况而定。

1. Technical data listed in the following is suitable for low temperature heater (no stand-off zone between junction box and flange)
2. In fact, Heating power density of the gas and oil up to 8 W/cm² are seldom used, but it can be calculated according to the parameters in the specification table, such as when heating a No. 2 fuel oil to 100 °C, if the needed power is 28kw after calculation; then we can check the appendix table for power density, select the 3.5 W/cm², 28 kW x 8/3.5 = 64 kW, in other words, we can select circulating heater with CH-O-64/5/8 specification, all geometry size remains the same, only design the power density as per 3.5 kW/cm², thus can satisfy the needs of the above example. Of course, the type selection for specifications of the circulating heater is not exclusive; the specific selection is subject to specific operating condition of the customer.

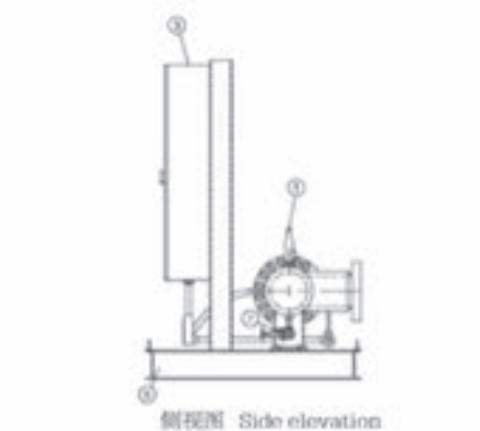
典型安装示意 Typical Installation Sketch



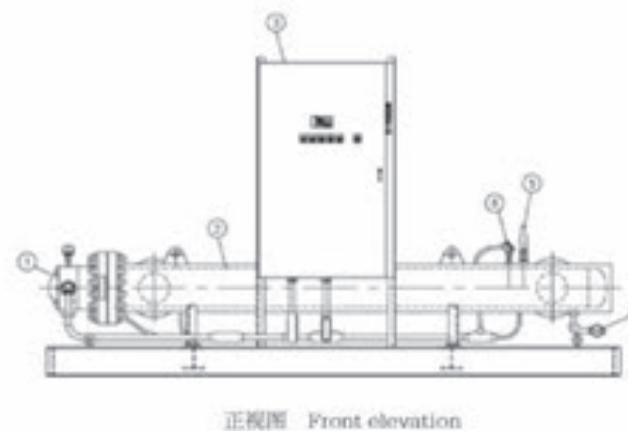
功率 Power (kW)	加热气体时代号 Symbol for heating gas	加热水时代号 Symbol for heating water	加热油时代号 Symbol for heating oil	尺寸 Dimension (mm)		
				A	B	C
DN80法兰, 功率密度为2W/cm ²				DN80 flange, power density 2W/cm ²		
2	CH-A-2/3/2		CH-O-2/3/2	1050	200	600
4	CH-A-4/3/2		CH-O-4/3/2	1450	200	1000
6	CH-A-6/3/2		CH-O-6/3/2	1850	200	1400
8	CH-A-8/3/2		CH-O-8/3/2	2250	200	1800
DN125法兰, 功率密度为2W/cm ²				DN125 flange, power density 2W/cm ²		
9	CH-A-9/5/2		CH-O-9/5/2	1550	250	1000
12	CH-A-12/5/2		CH-O-12/5/2	1960	250	1400
18	CH-A-18/5/2		CH-O-18/5/2	2350	250	1800
24	CH-A-24/5/2		CH-O-24/5/2	2750	250	2200
DN200法兰, 功率密度为2W/cm ²				DN200 flange, power density 2W/cm ²		
20	CH-A-20/8/2		CH-O-20/8/2	1650	340	1000
30	CH-A-30/8/2		CH-O-30/8/2	2050	340	1400

功率 Power (kW)	加热气体时代号 Symbol for heating gas	加热水时代号 Symbol for heating water	加热油时代号 Symbol for heating oil	尺寸 Dimension (mm)		
				A	B	C
40	CH-A-40/8/2		CH-O-40/8/2	2450	340	1800
50	CH-A-50/8/2		CH-O-50/8/2	3250	340	2600
DN250法兰, 功率密度为2W/cm ² DN250 flange, power density 2W/cm ²						
60	CH-A-60/10/2		CH-O-60/10/2	2050	400	1400
65	CH-A-65/10/2		CH-O-65/10/2	2450	400	1800
80	CH-A-80/10/2		CH-O-80/10/2	2850	400	2200
95	CH-A-95/10/2		CH-O-95/10/2	3250	400	2600
DN300法兰, 功率密度为2W/cm ² DN300 flange, power density 2W/cm ²						
60	CH-A-60/12/2		CH-O-60/12/2	2100	450	1400
80	CH-A-80/12/2		CH-O-80/12/2	2500	450	1800
100	CH-A-100/12/2		CH-O-100/12/2	2900	450	2200
120	CH-A-120/12/2		CH-O-120/12/2	3300	450	2600
DN80法兰, 功率密度为3W/cm ² DN80 flange, power density 3W/cm ²						
3	CH-A-3/3/3		CH-O-3/3/3	1050	200	600
6	CH-A-6/3/3		CH-O-6/3/3	1450	200	1000
9	CH-A-9/3/3		CH-O-9/3/3	1850	200	1400
15	CH-A-15/3/3		CH-O-15/3/3	2250	200	1800
DN125法兰, 功率密度为3W/cm ² DN125 flange, power density 3W/cm ²						
12	CH-A-12/5/3		CH-O-12/5/3	1550	250	1000
18	CH-A-18/5/3		CH-O-18/5/3	1950	250	1400
24	CH-A-24/5/3		CH-O-24/5/3	2350	250	1800
30	CH-A-30/5/3		CH-O-30/5/3	2750	250	2200
DN200法兰, 功率密度为3W/cm ² DN200 flange, power density 3W/cm ²						
33	CH-A-33/8/3		CH-O-33/8/3	1650	340	1000
45	CH-A-45/8/3		CH-O-45/8/3	2050	340	1400
60	CH-A-60/8/3		CH-O-60/8/3	2450	340	1800
72	CH-A-72/8/3		CH-O-72/8/3	2850	340	2200
DN250法兰, 功率密度为3W/cm ² DN250 flange, power density 3W/cm ²						
75	CH-A-75/10/3		CH-O-75/10/3	2050	400	1400

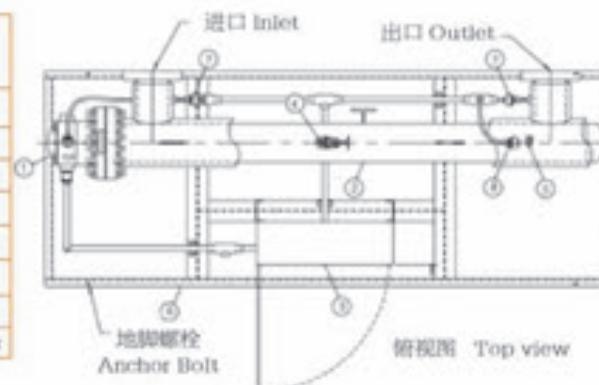
功率 Power (kW)	加热气体时代号 Symbol for heating gas	加热水时代号 Symbol for heating water	加热油时代号 Symbol for heating oil	尺寸 Dimension (mm)		
				A	B	C
95	CH-A-95/10/3		CH-O-95/10/3	2450	400	1800
118	CH-A-118/10/3		CH-O-118/10/3	2850	400	2200
150	CH-A-150/10/3		CH-O-150/10/3	3250	400	2600
DN300法兰, 功率密度为3W/cm ² DN300 flange, power density 3W/cm ²						
90	CH-A-90/12/3		CH-O-90/12/2	2100	450	1400
120	CH-A-120/12/3		CH-O-120/12/3	2500	450	1800
145	CH-A-145/12/2		CH-O-145/12/3	2900	450	2200
175	CH-A-175/12/2		CH-O-175/12/3	3300	450	2600
DN80法兰, 功率密度为8W/cm ² DN80 flange, power density 8W/cm ²						
9		CH-W-9/3/8		1050	200	600
15		CH-W-15/3/8		1450	200	1000
24		CH-W-24/3/8		1850	200	1400
30		CH-W-30/3/8		2250	200	1800
DN125法兰, 功率密度为8W/cm ² DN125 flange, power density 8W/cm ²						
20		CH-W-20/5/8		1150	250	600
36		CH-W-36/5/8		1550	250	1000
50		CH-W-50/5/8		1950	250	1400
64		CH-W-64/5/8		2350	250	1800
DN200法兰, 功率密度为8W/cm ² DN200 flange, power density 8W/cm ²						
54		CH-W-54/8/8		1250	340	600
90		CH-W-90/8/8		1650	340	1000
126		CH-W-126/8/8		2050	340	1400
160		CH-W-160/8/8		2450	340	1800
200		CH-W-200/8/8		2850	340	2200
DN300法兰, 功率密度为8W/cm ² DN300 flange, power density 8W/cm ²						
250		CH-W-250/12/8		2100	450	1400
320		CH-W-320/12/8		2500	450	1800
400		CH-W-400/12/8		2900	450	2200
470		CH-W-470/12/8		3300	450	2600



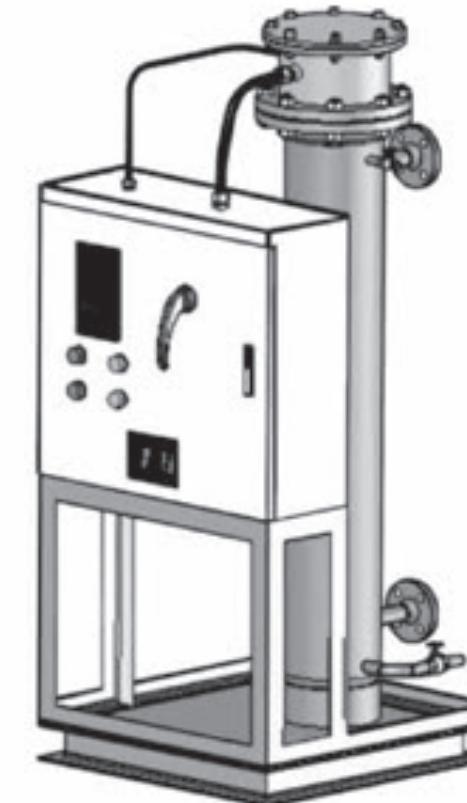
侧视图 Side elevation



正视图 Front elevation



俯视图 Top view



四、贮罐抽吸式电加热器 Suction Heater

贮罐抽吸式电加热器主要用于贮罐内介质的加热，以达到可以用泵抽吸的目的。对于很多大型贮罐，在冬季真正需要达到的目的是将贮罐内的介质可以抽吸泵出。它并不需要对整个贮罐进行加热或伴热。否则，它的整体伴热或加热能耗很大，造成无谓能源损失。

贮罐抽吸式电加热器加热过程是流体进入加热腔体内，依靠内部加热器的加热升温，降低介质流体粘度，然后从泵吸口流入，通过泵把流体泵出。加热器的加热时间，可以与泵的抽吸时间同步，也可视抽吸量的大小，对加热器预先启动预热，但不需要整个贮罐加热，从而大量节约的能源。

设计计算

功率设计：设计功率(kW)=介质流量(Kg / Hr)×比热(Kcal / Kg°C)×温升(°C) / 863/小时

贮罐抽吸式电加热器换热面积和结构设计必须体现低负荷，热场均匀的原则。低负荷的目的是防止产生介质结焦，热场均匀是保证介质有足够的换热面积，保证介质有足够的热交换速率并保证介质温度的均匀性。

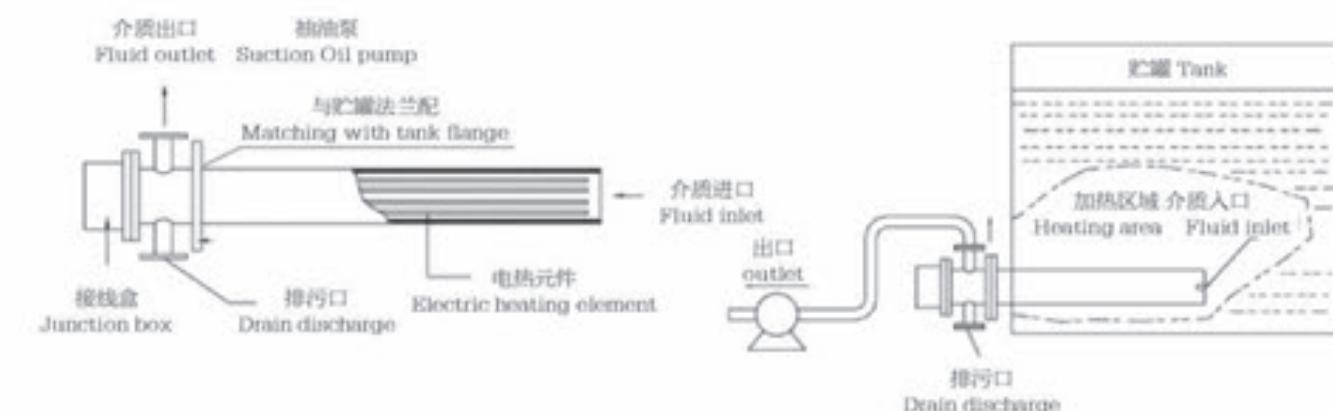
Suction heater is mainly used for fluid heating in the tank, in order to realize the use of pump suction. For many large-scale tanks, the purpose that really needs to be achieved in the winter is to pump out the medium in the tank. It is not necessary to carry out heating or heat tracing for the whole tank. Otherwise, its energy consumption of heat tracing or heating is very high, causing unnecessary energy loss.

The heating process of the suction heater is that the fluid enters the heating chamber, and is heated up depending on the heating of internal heater to reduce the fluid viscosity of the medium, then flows into the pump suction port and be pumped out by the pump. The heating time of the heater can synchronize with the pumping time of the pump, and it is also feasible to start the preheating of the heater in advance according to the suction quantity, but it is not necessary to heat the whole tank for the purpose of saving much energy.

Design calculation

Power design: design power (kW) = mass flow (Kg / Hr) × specific heat (Kcal / Kg°C) × temperature rise (°C) / 863 / hour

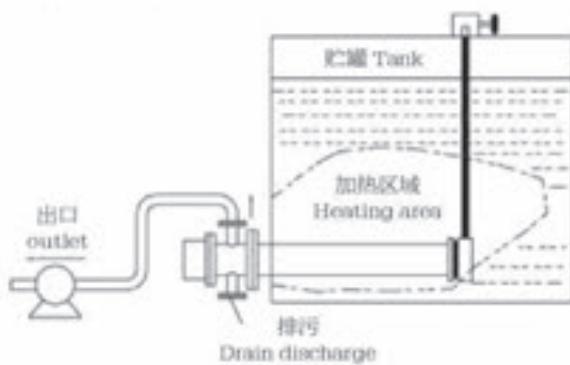
The heat exchange area and structural design of the suction heater must reflect the principle of low load and uniform thermal field. The purpose of low load is to prevent fluid coking, and uniform thermal field is to guarantee large heat exchange area enough for the medium and guarantee enough heat exchange rate and uniform temperature for the fluid.



贮罐电加热芯 Tank Electric Heating Core

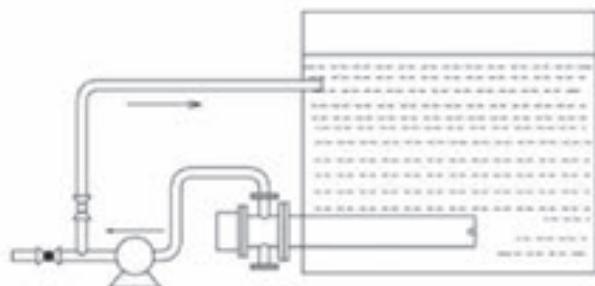
贮罐加热芯目前采用两种结构。一种是采用贮罐加热器的形式，内芯为陶瓷加热芯，特点是不用排空贮罐内介质就可以替换维护；缺点是容器开孔直径大，另一种是采用浸入式加热器结构，采用电热管直接加热；优点是容器开孔直径小，为解决不排空容器就可以替换加热芯的问题，通常在介质入口处增加蝶阀，蝶阀可采用蜗轮蜗杆式或气动结构式（特适合于防爆场合）。

Currently the tank heating core adopts two kinds of structures, one of which takes the form of storage tank heater, which inner core is ceramic heating core, and its characteristic is that replacement and maintenance can be carried out without emptying the fluid in the tank; and the disadvantage is the big diameter of the container's opening. The other one adopts the immersion heater structure and use the electric heat pipe for direct heating; its advantage is the small diameter of the container's opening, and in order to solve the problem of replacing the heating core without emptying the container, the butterfly valve is normally added at the fluid inlet and it can adopt the gear worm type or aerodynamic structural type (especially suitable for explosion-proof area).



贮罐抽吸式加热器新用：贮罐抽吸式加热器还可以利用出口阀门的调节（见右图），通过循环泵循环来提高整个罐体的介质温度。

New use of the suction heater: the suction heater can also utilize the adjustment of outlet valve (see right) to raise the fluid temperature of the whole tank through circulation of the circulating pump.



五、防爆气井加热器 Ex Gas Well Heaters

防爆气井加热器适用于油田气井出口的加热，以防止由于高压油气卸压大量吸热而导致卸压设备和管道设施的冻结、结堵。本加热器的设计原理是根据加热器加热的补充能量大于油气卸压时所吸收的热量。本加热器还适用于高压气体卸压后产生管道冻结的情况。

防爆气井加热器有以下特点：

1. 安全性高，全部电气按防爆标准设计制造。
2. 热效率高，热功率全应用于加热气体。
3. 维护运行简单，此设备调整后，自动化运行，无需专人看管。
4. 体积小，安装方便；不需改变管道流程，相当于管道泵连接形式。
5. 加热器内有分隔板，增加气体流速，增加传热系数，降低加热元件表面温度，延长加热器的使用寿命。
6. 由于本设备在气体汽化前加热，降低了气体的粘度和密度，减少了对卸压口的冲击和腐蚀，大大延长了卸压口的使用寿命。
7. 在气体卸压口敷设电热带，主要用于在气体静止状态防止气候寒冷而冻结堵塞卸压口。



The Ex gas well heater is applicable to the heating of the outlet of oil field gas well to avoid freeze and stopping up of pressure relief equipment and pipeline facility resulting from much heat absorption of pressure relief of high pressure oil and gas. The design principle of this heater is based on the fact that supplemental energy heated by the heater is higher than the heat absorbed during oil and gas pressure relief. This heater is also applicable to the occasion of pipeline stopping up after pressure relief of high pressure gas.

The Ex gas well heater has the following features:

1. High security, and all electrical equipments are designed and manufactured as per the explosion-proof criteria.
2. High thermal efficiency, for the thermal power is completely used to heat the gas.
3. Easy maintenance and operation, for this equipment can operate automatically after adjustment and does not need to be watched by specially appointed personnel.
4. Small in size and easy to install; not necessary to change pipeline flow and equal to the connection form of pipeline pump.
5. There is a separator baffle inside the heater to increase gas flow rate and heat transfer coefficient, reduce the surface temperature of heating element and extend the service life of the heater.
6. For this equipment is heated before gas vaporizing, it reduces the viscosity and density of the gas, cuts down the impact and corrosion to the pressure relief vent, and greatly extends the service life of the pressure relief vent.
7. Apply the ribbon heater at the gas pressure relief vent, which is mainly used to prevent the freeze and stopping up of the pressure relief vent due to the cold weather when the gas is in a stationary state.

型号含义 Type number nomenclature



技术原理

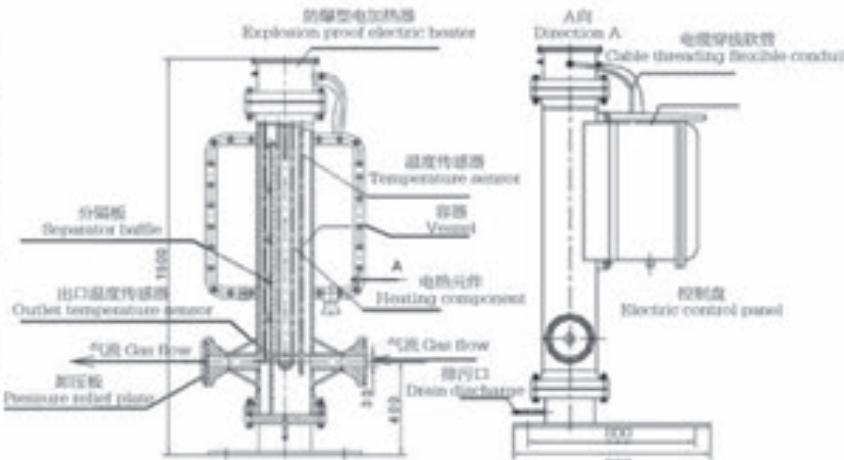
由于高压气体在卸压时要吸收大量的能量，常导致管道设施的结堵。常用加热器一般在导致结堵的地方进行加热，而通常的加热方式是在管道外进行加热。本加热器的设计原理打破了常规的加热方式，把加热器设计在高压气体卸压之前进行加热，采用方式是能量预先补充，使补充能量大于高压气体卸压的吸热。本加热器的特点是热效率高。

加热器采用带PID功能的进口温控仪，能根据介质需要的能量要求进行自动调功。具体的调功执行元件采用无触点的可控硅，使用寿命很长。

Technical principle

High pressure gas needs to absorb much energy when releasing pressure, hence it often causes stopping up of pipeline facility. The common heater generally heats the position that leads to stopping up, and the usually used heating method is to carry out heating outside the pipeline. The design principle of this heater breaks the conventional heating method, designs that the heater carries out heating before the pressure relief of high pressure gas, and the method adopted is energy supplement in advance, thus enabling the supplemental energy to be over the heat absorption of the pressure relief of high pressure gas. The feature of this heater is high thermal efficiency.

The heater adopts the imported temperature controller with PID function, being able to automatically regulate power in accordance with energy requirements necessary for the medium. The specific executive components of power regulating adopt contactless silicon controlled with very long service life.



型号 Range	功率 Power (kW)	压力 Pressure (MPa)	进口尺寸 Inlet size (in)	出口尺寸 Outlet size (in)
OWGH6/6	6	6		
OWGH12/6	12	6		
OWGH18/6	18	6		
OWGH6/15	6	15		
OWGH12/15	12	15		
OWGH18/15	18	15		

根据客户要求
As required by customers

六、电热水加热器和水蒸气器 Electric Water Heaters and Vaporizer

电热水加热器和水蒸气器是用电能加热，是一种在国际上迅速发展的产品，随着我国国民经济的发展，它在我国的应用也将日益广泛。电热水加热器和水蒸气器具有以下特点：

1. 电热水加热器和水蒸气器是绿色工业产品，其最突出的优点是无任何工业污染，如废气、粉尘、废物及噪音等；另外它采用了软控制技术，它的启动、调功对电网无任何冲击和污染。
2. 能源利用率高，尽管电热水加热器所用的是二次能源，但一次能源在电厂的转换效率较一般锅炉要高得多，而本产品的转换率高达97%以上，因此综合效率较高。另外，它可用低谷电蓄能，充分利用电能。
3. 占地面积及空间小，本产品仅为同规格传统锅炉体积的1/2，且无需任何辅助面积，对安装位置无任何要求。
4. 运行费用低，自动化程度高，本产品采用智能自动控制系统，无需专人看管。
5. 本产品可作为学校、公寓、商业的取暖设备及工业加热设备，特别适用于城市市区、旅游区、及高新技术开发区等对环保要求较高的场合。

The electric Water Heaters and Vaporizer uses electric energy for heating, being a kind of product that rapidly develops in the world, and with the development of national economy of China, its application in China will also be widespread. The electric Water Heaters and Vaporizer has the following features:

1. The electric Water Heaters and Vaporizer is a green industrial product, whose greatest advantage is that there is no any industrial pollution, such as waste gas, dust, waste and noise; besides, it adopts soft control technology and its start and power regulation have no any impact and pollution to the power grid.
2. High energy utilization rate. Although the electric water heater uses secondary energy, the transfer efficiency of primary energy in the power plant is much higher than that of the general boiler, and the conversion rate of this product is up to over 97%, therefore, the overall efficiency is higher. In addition, it can use off-peak electricity for energy storage, making full use of electric energy.
3. It takes up small footprint. This product is merely 1/2 of the volume of the traditional boiler of the same specification, and has no need for any service area and no any requirements for installation position.
4. Low operation cost and high automation level. This product adopts intelligent automatic control system and does not need to be watched by specially appointed personnel.

5. This product can act as the heating installation and industrial heating equipment of schools, apartments and business, especially applicable to occasions with higher requirements for environmental protection such as city centers, tourist areas, high-tech development districts, etc.

型号含义 Type number nomenclature



电热水蒸气器 Electric Water Vaporizer

规格和技术数据 Specifications and technical data

型号 Type	功率 Power (kW)	排气量 Quantity discharged Steam/hr(kg/h)	外形尺寸 Overall dimension WxLxH(m)	排汽口径 Outlet diameter(in)	进水口径 Inlet diameter(in)
DGL-150/1	150	200	1.2X1.7X1.6	4	1
DGL-200/1	200	280	1.2X1.7X1.6	4	1
DGL-300/1	300	410	1.2X1.7X1.6	4	1
DGL-400/1	400	560	1.2X1.7X1.6	4	1
DGL-500/1	500	690	1.4X2.2X1.6	6	1
DGL-600/1	600	820	1.4X2.2X1.6	6	1
DGL-700/1	700	960	1.4X2.2X1.6	6	1
DGL-800/1	800	1100	1.4X2.2X1.6	6	1
DGL-900/1	900	1250	1.4X2.2X1.6	6	1.5
DGL-1000/1	1000	1450	1.4X2.2X1.6	6	1.5
DGL-1200/1	1200	1650	1.9X2.2X1.6	6	1.5
DGL-1400/1	1400	1900	1.9X2.2X1.6	6	1.5
DGL-1600/1	1600	2200	2.1X2.2X1.6	6	1.5
DGL-1800/1	1800	2500	2.1X2.2X1.6	6	1.5

电热水加热器 Electric Water Heater

规格和技术数据 Specifications and Technical Data

型号 Type	储水量 Water storage(kg)	功率 Power(kW)	电路级数 Number of the circuit	尺寸 Dimension(mm)		
				长 Length(L)	宽 Width(W)	高 Height(H)
DGSL-200/0.3	570	200	5	1680	1170	1560
DGSL-300/0.3	570	300	5	1680	1170	1560
DGSL-400/0.3	570	400	10	1680	1170	1560
DGSL-500/0.3	570	500	10	1680	1170	1560
DGSL-600/0.3	570	600	10	1680	1170	1560
DGSL-700/0.3	570	700	10	1680	1430	1760
DGSL-800/0.3	1360	800	10	2100	1730	1760
DGSL-900/0.3	1360	900	10	2100	1730	1760
DGSL-1000/0.3	1360	1000	10	2100	1730	1760
DGSL-1200/0.3	1360	1200	10	2100	1730	1760
DGSL-1400/0.3	1360	1400	10	2100	1730	1760
DGSL-1600/1	1360	1600	10	2100	1730	1760
DGSL-1800/1	1360	1800	15	2260	1730	1930
DGSL-2000/1	1360	2000	15	2260	1730	1930

七、导热油电加热器 Heat Oil System

导热油电加热器是一种新型、节能、能提供高温热能的特种工业加热器。供热原理：以导热油为载体，通过泵使热载体强制循环，将热能供给用热设备。

Hot Oil system is a new kind of special industrial heater with energy saving and that provides high temperature thermal energy. Heating principle: use the heat conduction oil as a carrier, and provide thermal energy to heat consuming equipment through the forced circulation of the heat carrier by the pump.

产品特点

- 1.能在较低的运行压力下获得较高的工作温度。
- 2.闭路循环供热，热量损失小，节能效果显著，并可以满足不同使用温度的多个用热设备。
- 3.具有完备的运行控制和安全监测装置。
- 4.运行费用低，回收投资快。
- 5.设备结构合理，配套齐全，安装周期短，运行操作简单，自动化程度高，安全可靠，适用范围广泛。

Features of Product

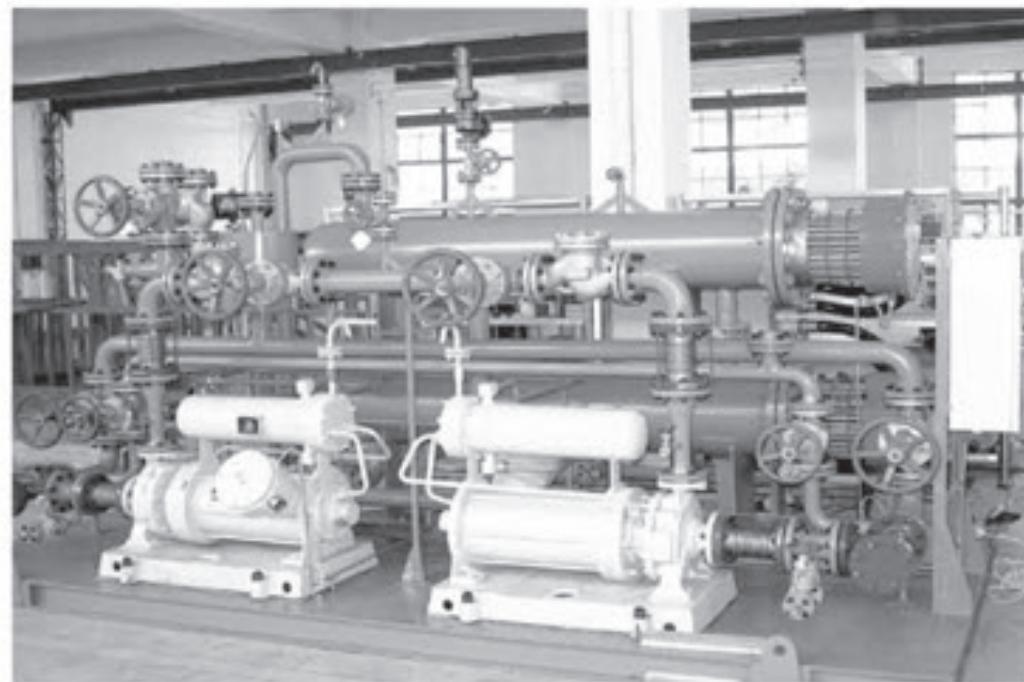
1. Access to higher operating temperature under lower operating pressure.
2. Closed-circuit circulation heating, little heat loss, and remarkable energy-saving effect, meeting more heat consuming equipments of different operating temperatures.
3. With complete devices for operational control and safety monitoring.
4. Low operating cost and rapid return investment.
5. Reasonable equipment structures, fully furnished, short installation period, easy operation, high level of automation, safe and reliable, and wide scope of application.

型号说明 Type number nomenclature

DYLO(B)-□

加热功率 Heating power (kW)
导热油电加热器 Electric oil heater
DYLO:撬体式安装结构 Skid structure
DYLB:箱体式安装结构 Case structure

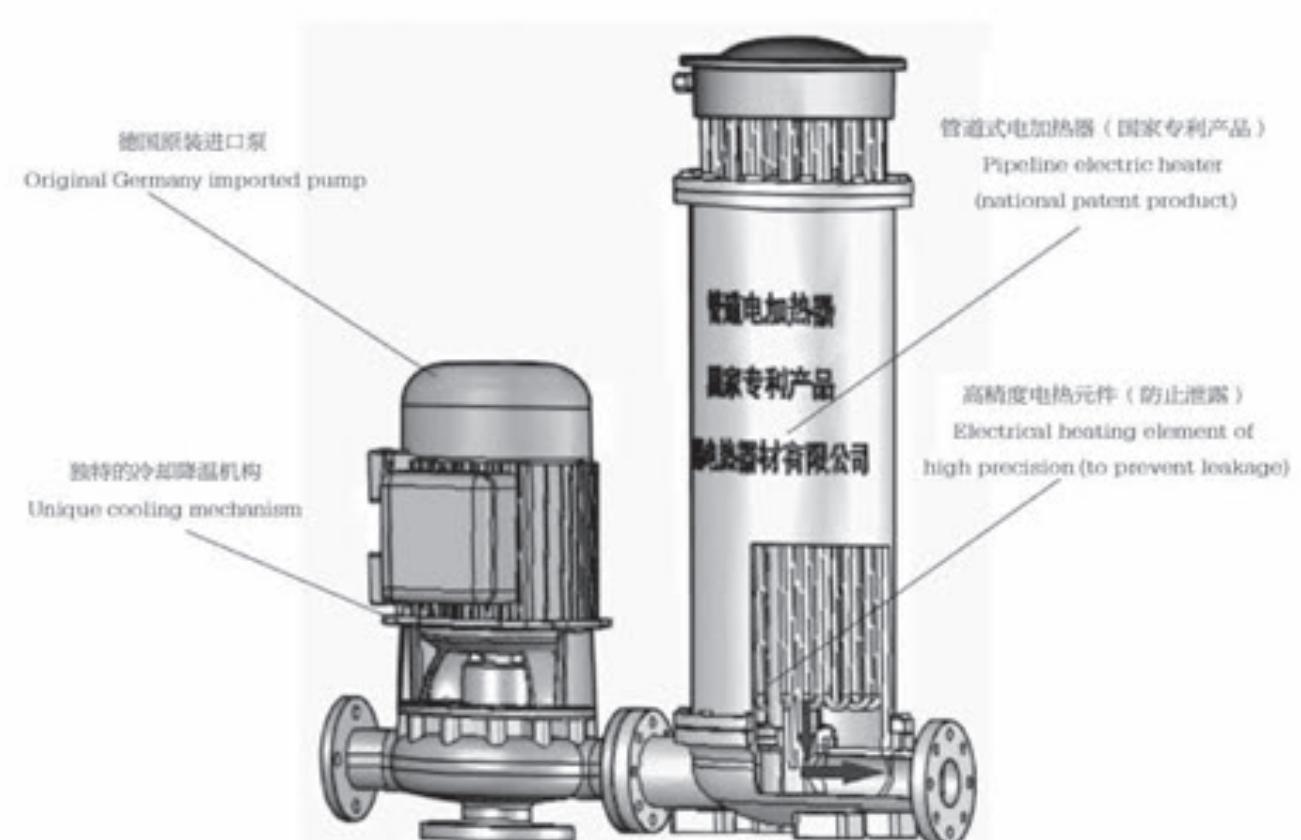
撬体式安装结构 Skid Structure

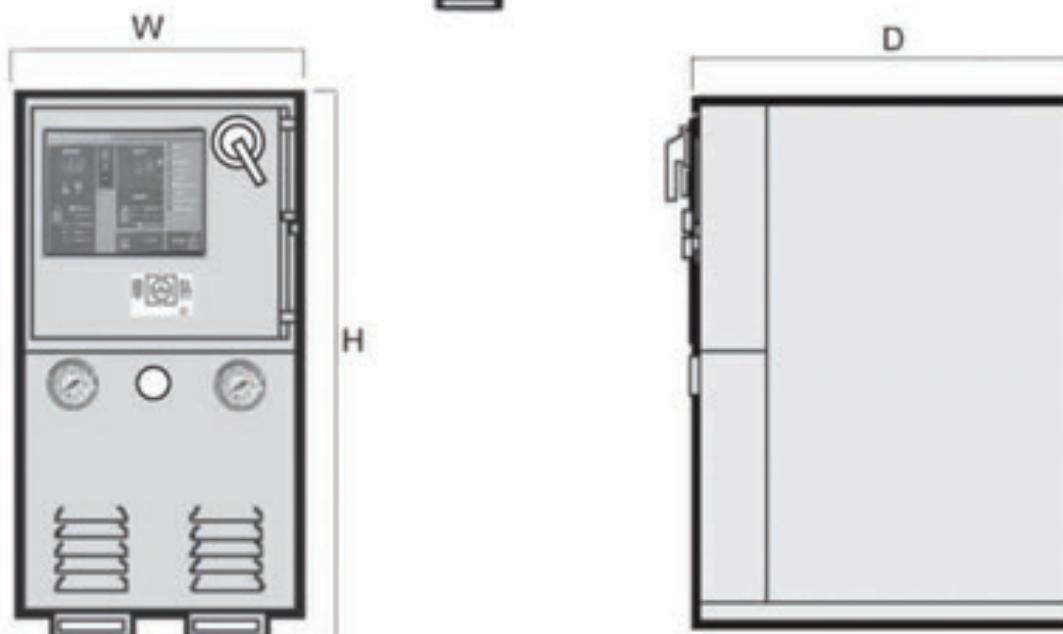
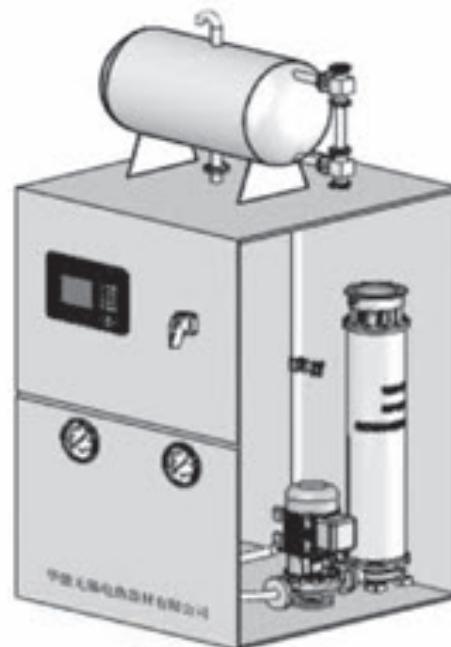


撬体式结构的型号规格表 Model Specification Table of Skid Structure

功率 Power (kW)	输出能量 Energy output (kcal)	加热级数 No. of circuits	最高工作温度°C Maximum operating temperature °C	循环泵 Circulation pump		进出口管径 Pipe inlet and outlet diameter		型号 Type
				流量 Flow(m³/hr)	功率 Power(kW)	进口 Inlet (in)	出口 Outlet (in)	
30	25890	1	350	8	1.5	1-1/2	1-1/2	DYLO-30
40	34520	1	350	12.5	3	2	2	DYLO-40
60	51780	1	350	25	5.6	2	2	DYLO-60
80	60040	1	350	25	5.6	2	2	DYLO-80
100	86300	2	350	25	5.6	3	3	DYLO-100
125	107875	2	350	32	7.5	3	3	DYLO-125
150	129450	2	350	40	7.5	3	3	DYLO-150
200	172600	2	350	52	7.5	3	3	DYLO-200
250	215750	2	350	60	7.5	3	3	DYLO-250
300	258900	3	350	80	15	3	3	DYLO-300
350	302050	3	350	80	15	3	3	DYLO-350
400	345200	3	350	90	18.5	3	3	DYLO-400
450	388350	3	350	90	18.5	4	4	DYLO-450
500	431500	3	350	90	18.5	4	4	DYLO-500
600	517800	4	350	100	22	4	4	DYLO-600
800	600400	4	350	150	55	4	4	DYLO-800
1000	863000	5	350	200	55	4	4	DYLO-1000
1200	1056000	6	350	260	75	4	4	DYLO-1200

箱体式安装结构 Case Structure





图HOS-6

箱体式结构的型号规格表 Model specification table of case structure

介质：导热油，最高使用温度360℃

Medium: heat conduction oil, with the highest operation temperature of 360 °C

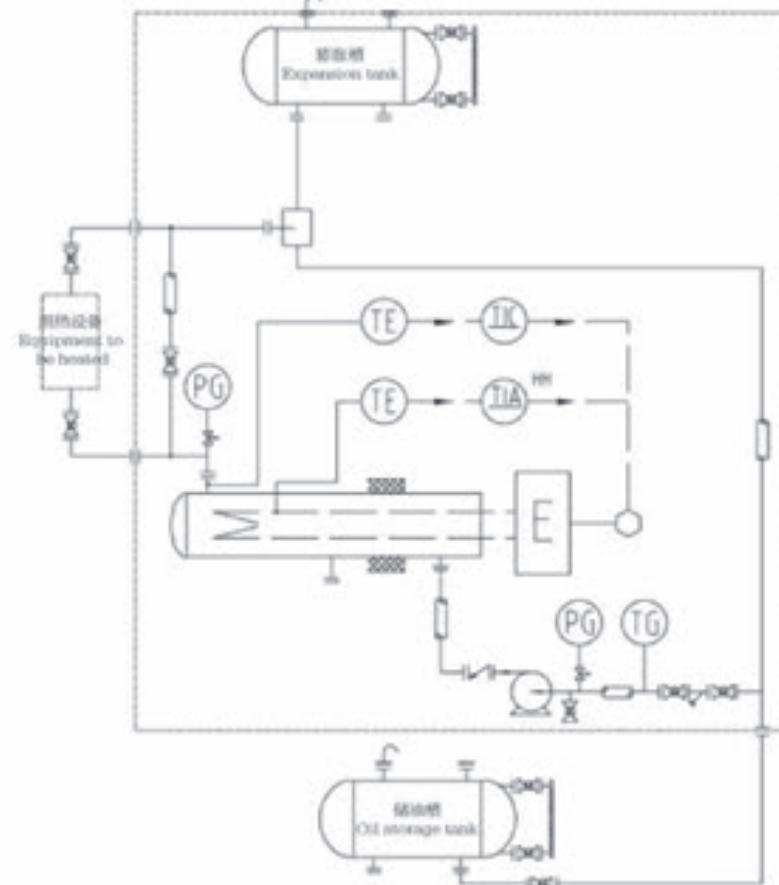
功率 Power (kW)	输出能量 Energy output (kcal)	循环泵数据 Circulation pump data		管道接口 Pipeline interface (in)	最小膨胀箱大小推荐 Recommended size of the minimum expansion box (L)	系统容积 System capacity volume (L)	总长 Total length (mm)			重量 Weight kg	型号 Type
		流量 Flow(m³/hr)	功率 Power(kW)				W	D	H		
30	25890	9	3	1-1/2	70	30	1370	890	1960	600	DYLB-30
40	34520	15	5	2	120	42	1370	1020	1960	640	DYLB-40
60	51780	20	6	2	180	70	1370	1020	2060	770	DYLB-60
80	69040	20	5	2	180	85	1370	1020	2460	820	DYLB-80
100	86300	30	7.5	3	360	125	1370	1020	2460	860	DYLB-100
125	107875	40	7.5	3	360	180	1520	1150	2460	900	DYLB-125
150	129450	40	7.5	3	360	180	1520	1150	2460	900	DYLB-150
200	172600	40	7.5	3	360	230	1520	1150	2460	960	DYLB-200
250	215750	50	10	3	600	330	1570	1520	2460	1400	DYLB-250
300	258900	50	10	3	600	320	1520	1520	2460	1450	DYLB-300
360	30205	50	10	3	600	420	1570	1520	2460	1560	DYLB-360
400	345200	50	10	3	600	420	1570	1520	2460	1590	DYLB-400
450	388350	80	15	4	900	460	2130	1520	2460	2040	DYLB-450
500	431500	80	15	4	900	600	2130	1520	2460	2130	DYLB-500
600	517800	80	15	4	900	600	2130	1520	2460	2270	DYLB-600

介质：水或水和乙二醇混合液，最高使用温度120℃

Medium: Water or mixed liquor of water and ethylene glycol, with the highest operation temperature of 120°C

功率 Power (kW)	输出能量 Energy output (kcal)	离心泵数据 Centrifugal pump data		管道接口 Pipeline interface (in)	膨胀箱大小 Size of the expansion box	总长 Total length (mm)			重量 Weight kg	型号 Type	
		流量 Flow (m³/hr)	功率 Power (kW)			W	D	H			
10	8630	1600	2	24	1-1/2	38	3/4	610	610	1300	DYB-10
20	17260	1500	2	24	1-1/2	38	3/4	610	610	1300	DYB-20
30	25890	1500	2	24	1-1/2	38	3/4	610	610	1300	DYB-30
40	34520	1600	2	24	1-1/2	38	3/4	610	610	1300	DYB-40
60	51780	3600	3	24	2	38	3/4	915	1100	2100	DYB-60
80	69040	3600	3	24	2	38	3/4	915	1100	2100	DYB-80
100	86300	3600	3	24	2	70	3/4	915	1100	2100	DYB-100
120	103660	3600	3	24	2	70	3/4	915	1100	2100	DYB-120
140	120820	5400	5	30	2	90	3/4	915	1100	2100	DYB-140
160	138080	5400	5	30	2	90	3/4	915	1100	2100	DYB-160
180	155340	5400	5	30	2	90	3/4	915	1100	2300	DYB-180
200	172600	9000	7.5	36	3	110	1	1220	1220	2100	DYB-200
240	207120	9000	7.5	36	3	110	1	1220	1220	2100	DYB-240
280	241640	9000	7.5	36	3	150	1	1220	1220	2100	DYB-280
320	276160	9000	7.5	36	3	150	1	1220	1220	2100	DYB-320
360	310680	9000	7.5	36	3	150	1	1220	1220	2100	DYB-360
400	345200	14400	15	36	4	230	1-1/2	1220	1220	2100	DYB-400
440	379720	14400	15	36	4	230	1-1/2	1220	1220	2100	DYB-440
480	414240	14400	15	36	4	230	1-1/2	1220	1220	2100	DYB-480

系统P&ID图 System P&ID Diagram



注：管线上压力表PG、温度计TG，按用户要求选配

Note: Pressure Gauge PG, Thermal Gauge TG on the pipeline are to be selected according to the requirements of customers

导热油系统选择说明

- 表中膨胀槽的大小仅供参考，实际大小还必须按照整个系统的用油情况、使用温度及油品而定。
- 对于箱体式导热油加热器，可提供防爆结构，具体要求用户必须在订货前说明。
- 为便于运输，对于箱式导热油加热器的膨胀槽通常单独包装。

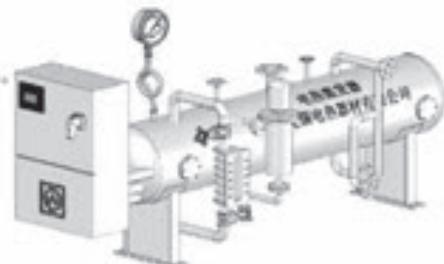
Descriptions of heat oil system selection

- The size of the expansion tank in the table is for reference only, actual size must be in accordance with oil usage of the entire system, usage temperature and oil product.
- For case structure, which can provide explosion-proof structure, specific requirements should be provided by the users before orders.
- To facilitate transportation, the expansion tank of the case structure is usually packaged separately.

八、电热(氨)蒸发器 Electric Vaporizer

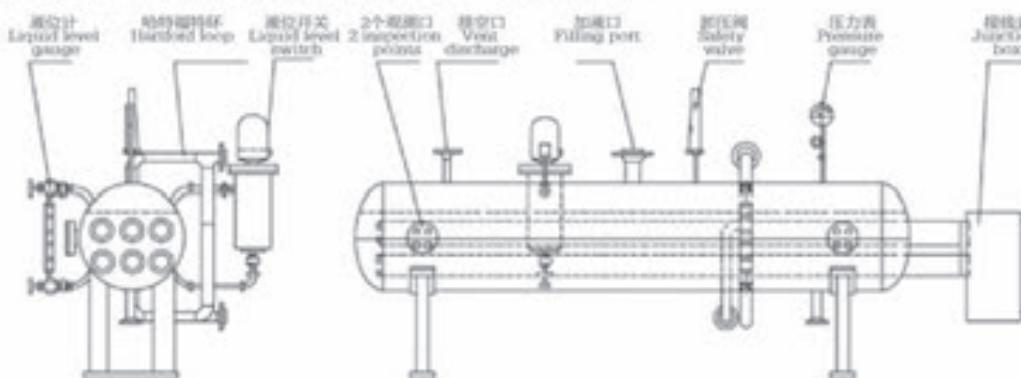
(一)、电热(氨)蒸发器的优点

- 工作温度高，操作压力低。最高工作温度可以达到：400℃，而工作压力最高也仅1MPa。
 - 加热元件替换方便，不需排空整个系统。
 - 与热油系统相比，热媒介质用量相对要少的多。
 - 最显著的特点，整个系统不需要膨胀箱，不需要过滤器等。
 - 系统不需要泵，凝露介质靠自重返回。
 - 由于介质是靠冷凝和蒸发传递能量，存在潜热的变化，传递的能量更多。
- Advantages of Electric Vaporizer
- High working temperature, low operation pressure, the highest working temperature can reach: 400 °C, while the highest working pressure is only 1 MPa.
 - The heating elements replacement is convenient, no need to empty the whole system.
 - Compared with the thermal oil system, thermal mass media consumption is relatively less.
 - Most distinguishing feature, the whole system does not need expansion tank, does not need filter, etc.
 - The system does not need pump, condensation medium returns by gravity.
 - Since the medium delivers energy through condensation and evaporation, with latent heat change, can deliver more energy.



(二)、电热蒸气的工作原理 Operating principle of electric Vaporizer

电热蒸气器与电热蒸汽锅炉非常类似，热载体在加热腔内变成气体，气体沿着管道通过自然对流的方式前进，与用户的被加热介质热交换后，冷凝再变成液体，液体靠自重返回到蒸气器。见下一页系统示意图。



用热设备须高于蒸气器，使其提供静压头来克服系统压力降，便于冷凝液的返回。为防止介质冷凝产生的虹吸问题，系统中需安装哈特福环。

如果用热设备与蒸气器由于条件不允许提供静压头，系统中可考虑采用功率很小的泵来防止系统中冷凝液的积聚。

由于整个系统是一个封闭的系统，在加热过程中几乎不需要添加任何介质，仅需保持一定液位的介质，与导热油系统相比，用量可以大大节省，也不需要膨胀槽。

热载体介质： Fluid.

通常所用的热载体介质为： 氨、道生A或索诺VP-1。

Electric Vaporizer is very similar to electric heating steam boiler, heat carrier turns into steam in the heating chamber, steam proceeds along the pipe through means of natural convection, exchange heat with customers' medium to be heated, condensed into liquid again, liquid returns to the evaporator by gravity. See system schematic diagram on the next page.

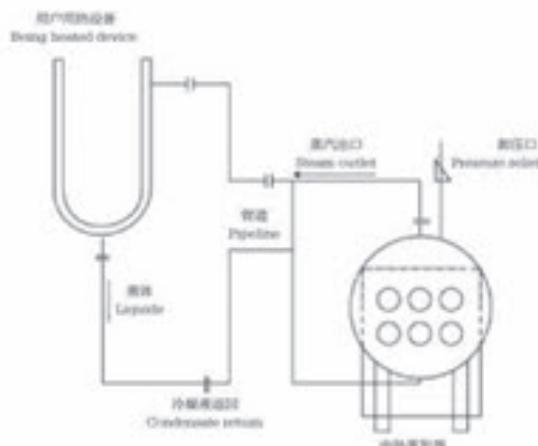
Device to be heated must be higher than the evaporator, provide static head to overcome system pressure drop, convenient for condensate to return. To prevent siphon problem caused by condensation of medium, the system should be installed with Hartford loop.

If the device to be heated and the evaporator cannot provide static head because the conditions don't allow it, can consider to use a small power pump in the system to prevent the accumulation of condensate in the system.

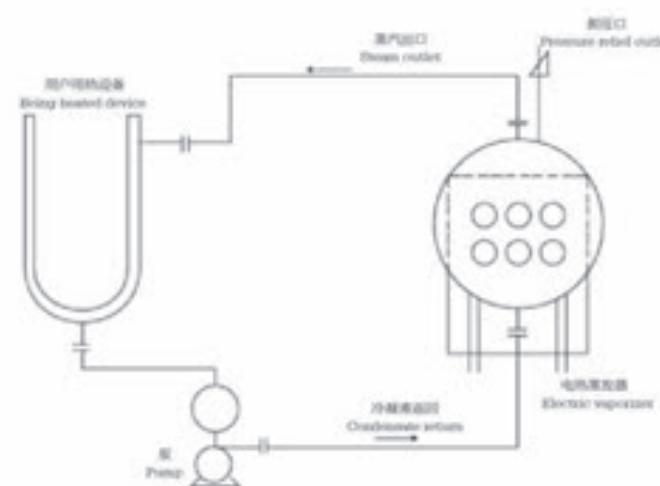
Because the whole system is a closed system, almost no need to add any medium in the process of heating, just need keep a certain liquid level of medium, compared with the heat-conducting oil system, the using quantities can be reduced greatly, do not need expansion tank neither.

Heat carrier medium: Fluid.

The common used heat carrier medium is: ammonia, Dowtherm A or Solutia VP - 1.



有位差型
Gravity return type



无位差型
Pump return type

(三)、型号和规格 Type and specifications

功率 Power(kW)	容器直径 Container diameter(mm)	容器容积 Container capacity (L.)	总长 Total length(mm)	型号 Type
20	450	325	2000	EVH-20
30	450	325	2000	EVH-30
40	450	325	2000	EVH-40
50	600	400	3150	EVH-50
60	600	600	2800	EVH-60
75	600	720	3300	EVH-75
100	600	960	4050	EVH-100
125	750	1150	3300	EVH-125
150	750	1300	3700	EVH-150
175	750	1560	4200	EVH-175
250	900	2702	4800	EVH-250
300	900	3200	5600	EVH-300

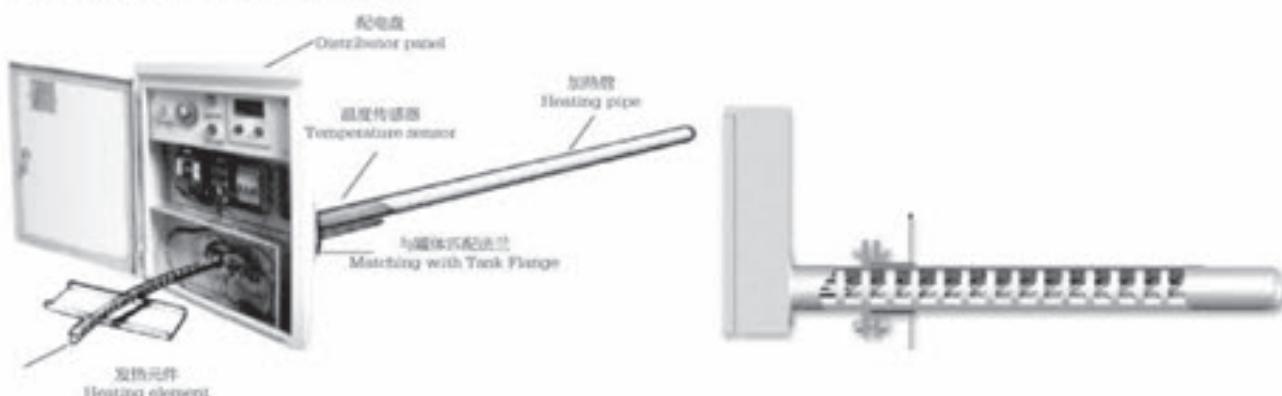
九、贮罐式加热器 Storage Tank Heaters

贮罐式加热器是用特殊的陶瓷件作为绝缘材料，以镍铬丝作为发热元件，以碳钢或不锈钢管作护套的电加热产品，产品具有安全可靠、维护方便、高效节能、管表面功率负荷低等特点，主要应用于大型贮罐、罐车、液压泵中的粘性、热敏性液体介质的加热。

Storage tank heater is an electric heating product, made of special ceramic as insulation material, nichrome wire as heating element, carbon steel or stainless steel as sheath, the product is safe and reliable, convenient to maintain, high efficiency and energy saving, low power load on tube surface and other characteristics, mainly used in the viscous, heat sensitive liquid medium in large storage tank, tank car, the hydraulic pump.

特性 Properties

- 不需要贮罐排空即可更换电热元件。电热元件为挠性结构，更换电热元件时可作挠性弯曲，维修方便。
- 加热器管表面功率负荷低，介质不会在表面结垢、粘结、烧焦、碳化等，是粘性、热敏性液体介质加热的理想元件。
- 有多种结构和安装方式供用户选择。
- 元件最大长度：10m。规格为DN65。
- 可用于防爆场合。
- 不锈钢加热器可用于腐蚀性场合和高温场合。
- 工作使用寿命长——2年保质期。
- Electric heating element can be changed without emptying the storage tank. Electric heating element structure is flexible, when replacing the element, it can be bent, which makes maintenance easier.
- Heater tube surface power load is low, the medium would not get bonded, burned, carbonized, etc. on the surface, it is an ideal element for viscous, heat sensitive liquid medium.
- A variety of structures and installation methods for the users to choose.
- Largest element length: 10m. Specification DN65.
- Can be used in explosion-proof applications.
- Stainless steel heater can be used in corrosive and high temperature application.
- Long service life - 2 years of warranty.



型号含义 Type number nomenclature

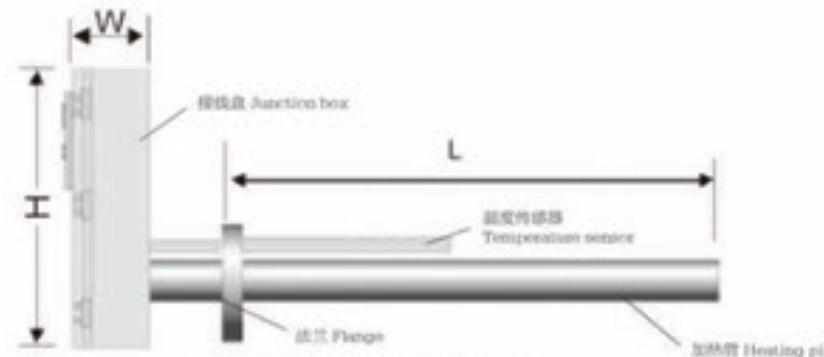


例如：STH3603-15-2.5C-3803为法兰通径360mm，三支总功率15kW，加热器总长2.5米，材质为碳钢，工作电压380V3相。
Such as: STH3603-15-2.5 - C - 3803 is flange diameter 360 mm, three total power 15 kw, total heater length 2.5 meters, made of carbon steel, working voltage 380V 3 phases.

技术数据及规格 Technical Data and Specification

标准的加热器如表所示，如需其它规格产品，请与我公司技术部门联系。

Standard heater is as shown in the table, if you need products of other specifications, please contact our technical department.

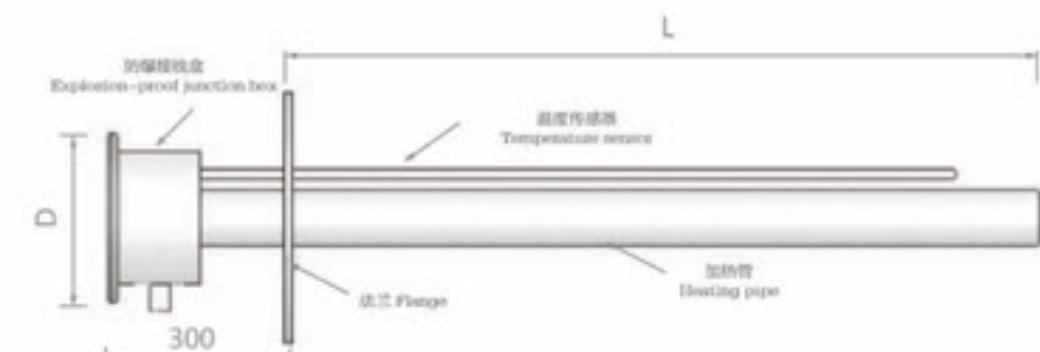


普通型贮罐式加热器尺寸示意图
Ordinary storage tank heater size sketch

型号 Type	功率 Power (kW)	加热管支数 Number of heating pipe	压力等级 Pressure grade 1.0 (MPa) 法兰规格 Flange specification (mm)	电压 Voltage (V)	
功率密度 0.8W/cm ² Power density: 0.8W/cm ²					
STH1001-5-25C-3803	5	1	100	380	
STH1001-10-48C-3803	10	1			
STH1001-15-70C-3803	15	1			
STH2502-10-25C-3803	10	2	250		
STH2502-20-48C-3803	20	2			
STH2502-30-70C-3803	30	2			
STH3503-15-25C-3803	15	3	350		
STH3503-30-48C-3803	30	3			
STH3503-45-70C-3803	45	3			
功率密度 1.5W/cm ² Power density: 1.5W/cm ²					
STH1001-20-50C-3803	20	1	100	380	
STH1001-25-65C-3803	25	1			
STH2502-40-50C-3803	40	2			
STH2502-50-65C-3803	50	2	250		
STH3503-60-50C-3803	60	3			
STH3503-75-65C-3803	75	3			

安装须知 Installation instructions

1. 贮罐式加热器一般水平安装，安装时罐内应有支架以支撑加热器。
 2. 加热器和贮罐间靠安装短节进行联接，加热器和短节的法兰间应加密封垫片。
 3. 加热器发热芯与外壳间绝缘电阻应大于 50MΩ (500V 摆表)。
 4. 加热器的电气接地位应可靠。
1. The storage tank heater is generally installed horizontally; Heater supports should be fixed in tank in advance.
2. The heater and storage tank are connected by installing short connection, there should be seal gasket between the flange of the short connection and the heater.
3. The insulation resistance between the heater heating core and shell should be greater than 50 MΩ (500V megger meter).
4. The heater electrical grounding should be reliable.



防爆型贮罐式加热器尺寸示意图
Explosion-proof storage tank heater size sketch

普通型外形尺寸 Ordinary overall dimension (mm)			防爆型外形尺寸 Explosion-proof overall dimension (mm)	
L	W	H	L	D
2500	420	520	2500	Φ160
4000	420	520	4000	Φ160
7000	420	520	7000	Φ160
2500	420	520	2500	Φ200
4000	420	520	4000	Φ200
7000	420	520	7000	Φ200
2500	420	520	2500	Φ310
4000	420	520	4000	Φ310
7000	500	680	7000	Φ310
5000	420	520	5000	Φ160
6500	420	520	6500	Φ160
5000	500	680	5000	Φ200
6500	500	680	6500	Φ200
5000	600	750	5000	Φ310
6500	600	750	6500	Φ310

防爆型贮罐式加热器

防爆型贮罐式加热器除有一般贮罐式加热器的应用和特点外，还具有防爆性，可适用于防爆场合。

Explosion-proof storage tank heater

Explosion-proof storage tank heater not only has the ordinary application, but is also explosion-proof application which is d II CT6 explosion-proof class.

十、通用管道式电加热器 Pipe Heater

通用管道式电加热器是循环式电加热器的技术延伸，它受管道泵形式的启迪，采用特殊的结构，使得本加热器具有模块化形式。

Pipe heater is technology extension of circulating electric heater, inspired by pipeline pump style, use special structure, the form of this heater is modularized.

(一)、本产品具有以下优点 It has advantages as follows

1. 体积小

体积小源于两个方面，一是加热器采用高密度集成式管状电热元件，它使容器有效体积内介质换热面积较大而占有体积较小；二是产品流体进出口置于同一方向，摒弃了传统循环式加热器上进下出或者下进上出的结构，管线布置简单，缩小了整个系统体积。

2. 安装方便，快捷

由于本产品出口置于同一方向，使得设计、安装、施工较传统循环式加热器简单得多，增大了设计安装的灵活性。即便在原有工艺管线基础上，只须寻找一个合适的较小位置，即可安装使用。安装单台加热器，只需3-4小时/人。

3. 容易实现标准化、系列化

由于本产品为模块形式，它可单独使用，也可根据实际情况串联或并联使用。制造工厂容易实现标准化生产和储备，使得生产成本降低，同时也缩短了设计、制造周期。

4. 适用范围宽，兼容性强

凡是管道内流动的介质如水、油、气体或其他化学介质，如需提高介质温度，使用本产品即可达到目的。用户根据流体压力、温度、耐腐蚀情况、使用场合（如防爆场合、防护等级）等技术参数提高给公司技术部门，本公司可按需配置和组合。

1. Small size

Small size comes from two aspects, 1. The heater adopts high density tubular bundle elements, which makes medium heat exchange area in effective volume larger while takes up smaller volume; 2. The liquid inlet and outlet of this product is in the same direction, abandoned the top-in bottom-out or bottom-in top-out structures in traditional circulation heaters, pipeline layout is simple, reduced the whole system volume.

2. The installation is convenient and fast

Because the inlet and outlet openings of this product are in the same plane, which makes the design, installation and construction much simpler than traditional circulation heater, even if on the basis of the original technical pipeline, only need to find a small suitable position, it can be installed and put into use, the installation of a single heater only takes 3-4 hours/person.

3. Easy to realize standardization, serialization

Because this product is in module form, it can be used singly, or in series or parallel according to the actual situation. It is easy for manufacturing factory to realize standardized production and reservation, which can reduce the production cost, also shorten the design, manufacturing cycle.

4. Wide application scope, strong compatibility

For all the pipe-flow mediums such as water, oil, gas, or other chemical mediums, if need to increase the medium temperature, it can be achieved using this product. Users can provide fluid pressure, temperature, corrosion resistance, using occasions (such as explosion-proof occasions, protection grade) and other technical parameters to the company technical department, the company can produce on-demand configuration and combination.

(二)、型号含义 Type number nomenclature

ExGDN-□ / □ - □

功率 Power(kW)

介质代码 Medium code: O油 oil; W水 water; A²油/gas

通径系列 Size series: 60, 80, 125, 200

管道式电加热器代码 Pipeline electric heater code

的型，非防爆防爆的型可不注

Exlosion-proof, not explosion-proof (not explosion-proof can omit)

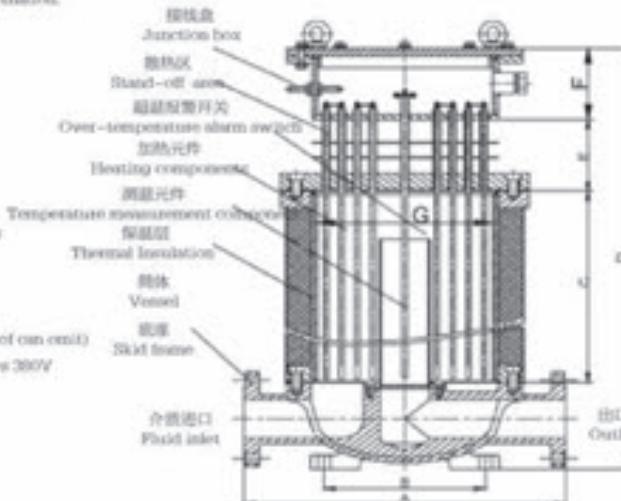
注：供电电压均为380V, Note: Power supply voltage always 380V

例：ExGDN-80-O-60型

防爆管道式电加热器，管道通径DN80, 60kW，用于油加热场合。

Example: ExGDN - 80 - O - 60 type

Explosion-proof pipeline heater, pipe size DN80, 60 kW, can be used to heat oil.



(三)、型号、技术指标及几何尺寸 Model technical Data and geometry size

本型号管道式电加热器进出口法兰符合HG20592法兰(DN50-DN200)-25RF。适用于非腐蚀性流体加热场合。

若需用于高压或腐蚀性流体介质加热，请与本公司技术部门联系。

The inlet and outlet flange of this type of pipeline heater conforms with HG20592 flange (DN50-DN200)-25RF. Suitable for the non-corrosive fluid heating occasion.

If needed to be used in high pressure or corrosive fluid heating, please contact our company's technical department.

专利号: ZL022 43429.1
Patent No.: ZL022 43429.1



ExGDN型通用管道式电加热器型号、规格选用表 ExGDN general pipeline electric heater type, specification table

型号 Range	油加热 Oil heating 1.8 W/cm ²	水加热 Water heating 5.4 W/cm ²	气加热 Gas heating 0.9 W/cm ²	几何尺寸 Geometry size (mm)								
				功率 Power (kW)	型号 Range	功率 Power (kW)	A	B	C	D*	E*	F*
DN50/25MPa												
ExGDN-50-O-20	20	ExGDN-50-W-60	60	ExGDN-50-A-10	10	465	216x216	695	1290	360	125	Φ245
ExGDN-50-O-25	25	ExGDN-50-W-75	75	ExGDN-50-A-125	125	465	216x216	837	1468	360	125	Φ245
ExGDN-50-O-30	30	ExGDN-50-W-90	90	ExGDN-50-A-15	15	465	216x216	981	1602	360	125	Φ245
DN80/25MPa												
ExGDN-80-O-20	20	ExGDN-80-W-60	60	ExGDN-80-A-10	10	518	256x250	367	1013	360	125	Φ290
ExGDN-80-O-25	25	ExGDN-80-W-75	75	ExGDN-80-A-125	125	518	256x250	444	1090	360	125	Φ290
ExGDN-80-O-30	30	ExGDN-80-W-90	90	ExGDN-80-A-15	15	518	256x250	521	1167	360	125	Φ290
ExGDN-80-O-35	35	ExGDN-80-W-105	105	ExGDN-80-A-175	175	518	256x250	597	1243	360	125	Φ290
ExGDN-80-O-40	40	ExGDN-80-W-120	120	ExGDN-80-A-20	20	518	256x250	674	1320	360	125	Φ290
ExGDN-80-O-45	45	ExGDN-80-W-135	135	ExGDN-80-A-225	225	518	256x250	761	1387	360	125	Φ290
ExGDN-80-O-50	50	ExGDN-80-W-150	150	ExGDN-80-A-25	25	518	256x250	828	1474	360	125	Φ290
ExGDN-80-O-60	60	ExGDN-80-W-160	160	ExGDN-80-A-30	30	518	256x250	981	1627	360	125	Φ290
ExGDN-80-O-60	60	ExGDN-80-W-180	180	ExGDN-80-A-30	30	518	256x250	1135	1781	360	125	Φ290
ExGDN-80-O-70	70	ExGDN-80-W-210	210	ExGDN-80-A-35	35	518	256x250	1283	1934	360	125	Φ290
ExGDN-80-O-80	80	ExGDN-80-W-240	240	ExGDN-80-A-40	40	518	256x250	1283	1934	360	125	Φ290
DN125/25MPa												
ExGDN-125-O-30	30	ExGDN-125-W-90	90	ExGDN-125-A-15	15	583	290x290	428	1060	360	135	Φ351
ExGDN-125-O-35	35	ExGDN-125-W-105	105	ExGDN-125-A-17	17	583	290x290	489	1120	360	135	Φ351
ExGDN-125-O-40	40	ExGDN-125-W-120	120	ExGDN-125-A-20	20	583	290x290	561	1182	360	135	Φ351
ExGDN-125-O-45	45	ExGDN-125-W-135	135	ExGDN-125-A-22	22	583	290x290	613	1244	360	135	Φ351

十一、短路加热器 Impedance Heater

产品特点 Product characteristics

短路加热器是采用短路加热法，利用管道（机械设备）自身作为发热元件来加热的加热设备。其主要特点：

1. 由于设备自身发热，使用寿命长。
2. 安装简单方便，费用低。
3. 热场均匀，无过热点，对介质不会产生任何影响。
4. 对于已保温的管道进行伴热、加热，不需要拆除保温，可以节省大量的费用。
5. 几乎不需要任何维护，运行成本低。

Impedance heater uses short circuit heating method, using pipe (machinery equipment) itself as a heating element. Main features:

1. Because heating with the device itself, service life is long.
2. Simple and convenient installation, low cost.
3. Thermal field uniform, no over-hot spot, not affect on medium.
4. When make heating and heat tracing to the insulated pipeline, no need to dismantle the insulation, saving a lot of cost.
5. Almost don't need any maintenance, low operating cost.

短路加热的原理 Impedance heating theory

短路加热是采用低电压大电流方式，也就是把管道（机械设备）作为一个电阻，两端加一电压使管道发热。

一般来说，短路加热法热量的来源主要包括以下三部分：

1. 管道像电阻丝一样发热，其阻值取决于本身的材料、长度及壁厚；若管道中介质为导电性介质，则要产生部分热量。
2. 由于输入电缆靠管道很近，而通过的电流又很大，一般为80A~800A，电缆周围会产生很强的磁场，管道受磁场的作用会产生感应热。
3. 管道中磁滞现象，产生磁滞损耗，也会产生部分热量。

Impedance heating applies low voltage large current method, namely using the pipeline (machinery) as a resistor, with a voltage on two ends to heat the pipeline.

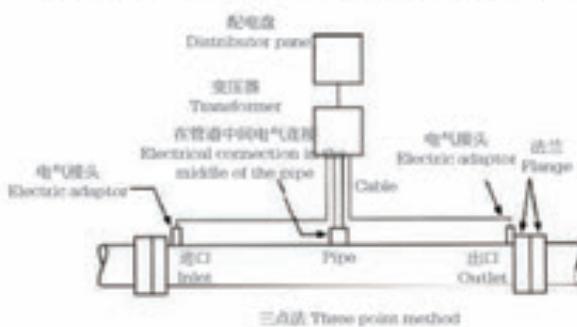
Generally speaking, heat source of impedance heating method mainly includes the following three parts:

1. Pipeline gets hot like resistance wire, resistance value depends on the material, length and wall thickness of the pipeline; If the media inside the pipeline is conductive medium, it will also produce part of heat;
2. Because the input cable is very close to the pipeline, and the current through which is very big, generally 80 A ~ 800 A, which can produce strong magnetic field around the cable, the pipeline, subjected to magnetic field effect, will produce induced heat;
3. Magnetic hysteresis phenomenon in the pipeline, which produces hysteresis loss, also can produce some heat.

短路加热运用举例 Impedance heating usage example

短路加热的方式有很多种，常用的是两点法和三点法，在实际运用中三点法使用的最普通、最安全：原因是它不需要复杂的辅助元件，仅需要一些电气接线块和温度传感器。

There are many kinds of impedance heating methods, commonly used are two points method and three points method, in practice three point method is the most common and the safest; The reason is that it does not need complex auxiliary components, only need some electrical wiring block and temperature sensor.



选用指导 Selection instruction

短路加热器根据用户要求定制，选用时用户需要提供下列技术数据：

1. 加热器使用的工艺条件：加热功率、加热介质、介质流量、工作温度、工作压力等；
2. 控制要求；
3. 防爆和防护要求。

Impedance heater is customized according to user requirements; user needs to provide the following technical data:

1. Heater usage process conditions: heating power, heating medium, medium flow rate, working temperature, working pressure, etc;
2. Control requirements;
3. Explosion-proof and protection requirements.



十二、辐射式电加热器 Radiant Electric Heater

产品特点和适用范围 Product features and applicable scope

在工业过程电加热领域中经常会遇到高温、高压和腐蚀性非常强的加热场合，传统电加热器由于管状电热元件壁薄，易被腐蚀；高温下会出现绝缘下降、电热元件漏电击穿等问题，大大影响了电加热器的正常使用，妨碍了过程工艺安全和生产。

辐射式电加热器采用管壳式换热器的结构形式，由管程和壳程两部分组成，电热元件采用大直径的镍铬丝，采用绝热绝缘一体化的结构，固定安装在壳程壳体内侧上，管程采用耐高温、耐腐蚀的镍基合金材料，加热介质经过管程时，被壳程中的电热元件加热，在管程出口得到满足工艺要求的介质温度。辐射式电加热器可以用于Ⅱ类1区、2区爆炸性环境；适用于加热氯硅烷、氢气、氟材料、氟化物等具有强腐蚀性，易燃易爆的危险性介质和易结垢的介质；且使用寿命长，维护成本低。

In the field of industrial process electric heating, we often encounter high temperature, high pressure and strong corrosive heating occasions, tubular electric heating element of traditional electric heater is easy to corrode because of the thin walls; In high temperature, there would occur insulation decline, electric heating element leakage breakdown and other problems, greatly affecting the normal usage of electric heater, hindering the process safety and production.

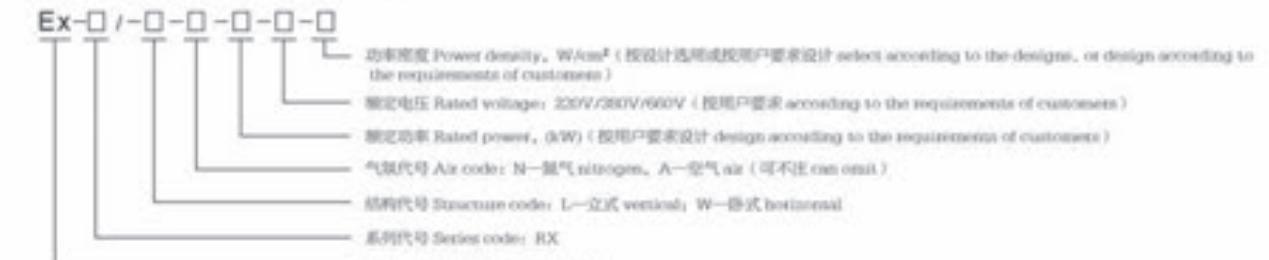
Radiant electric heater adopts the structure of tube and shell heat exchanger, consists of two parts: tube side and shell side, the electric heating element is nichrome wire of large diameter, use the integrated structure of adiabatic and insulation, fixed installed on the inside of the shell side shell body, tube side uses nickel base alloy material with high temperature resistance and corrosion resistance, the heating medium is heated by the electric heating element in the shell side when passing through the tube side, at the tube side outlet, shall meet the technological requirements of medium temperature. Radiant electric heater can be used in Class II, Div 1 and Div 2 explosive environment; Applicable to heating chlorosilane, hydrogen, fluorine material, hydrocarbons and other medium that are strong corrosive, inflammable, explosive dangerous and easy to scale; And service life is long, with low maintenance cost.



产品主要技术指标 Product Main Technical Data

1. 加热器最大功率: 5000kW
2. 最大工作压力: 25.0MPa
3. 最高工作温度: 650°C
4. 适合于小流量甚至断流的场合加热
5. 分段，分区加热，分段控温
6. 控温精确，控温精度可达±1°C
7. 管程壁厚，表面热场均匀，耐腐蚀性高
8. 适合于防爆场合
9. 功率密度 Power density, W/cm² (按设计选用或按用户要求设计 select according to the design, or design according to the requirements of customers)
10. 额定电压 Rated voltage: 220V/380V/660V (按用户要求 according to the requirements of customers)
11. 额定功率 Rated power, (kW) (按用户要求设计 design according to the requirements of customers)
12. 气氛代号 Air code: N—氩气(nitrogen), A—空气(air) (可不注 air omit)
13. 结构代号 Structure code: L—立式 vertical; H—卧式 horizontal
14. 系列代号 Series code: RX
15. 防爆标志 Explosion-proof sign

型号规格含义 Type number nomenclature



选用指导 Selection instruction

辐射式电加热器根据用户要求定制，选用时用户需要提供下列技术数据：

1. 加热器使用的工艺条件：加热功率、加热介质、介质流量、工作温度、工作压力等；
2. 控制要求；
3. 防爆、防护要求。

Radiant electric heater is customized according to user requirements, the user needs to provide the following technical data:

1. Heater usage process conditions: heating power, heating medium, medium flow rate, working temperature, working pressure, etc;
2. Control requirements.

电加热系统中温度控制系统是一个极其重要的部分，温度控制和执行方式有很多种，我们选择控制和执行方式必须从整个系统的角度来考虑，质量好的电加热器如配置了不合适的电气控制方式，整个系统的寿命将大打折扣。

然而对于电加热器系统的电气配置，并不是电器设备配置的越高档越好。设计人员要根据不同的工况进行选择合理的控制方式，为用户提供一个性价比合理的电气控制系统。

Temperature control is a very important part in electric heating system, there are many kinds of temperature control and execution ways, the selection of control and execution ways must be considered from the perspective of the whole system, if a good quality electric heater is equipped with wrong electrical control mode, the service life of the whole system will be greatly discounted.

While the electric configuration of heater system is not the higher grade, the better, design personnel should select reasonable control mode according to different working conditions, to provide users with an electric control system with reasonable cost performance.

1. 温度控制方式 Temperature control mode

目前常用的温度控制方式有以下几种：1、开/关控制；2、比例控制(P)；3、比例积分控制(PI)；4、比例微分控制(PD)；5、比例积分微分控制(PID)；当然最近几年PID基础上又开发出自学习型、神经元型和遗传因子等方式。但基本上还是这五种方式，下面我们可以看到四种（除开关控制）不同的控制方式与控制系统的相应关系。

At present, the commonly used temperature control methods are the following: 1. on/off control; 2. proportional control (P); 3. proportional integral control (PI); 4. proportional-differential control (PD); 5. proportional integral differential control (PID); In recent years, of course, we have developed self-learning mode, neural network mode and genetic factor mode on the basis of PID, but basically are these five methods, here let's examine the four (with the exception of on/off control) different control modes and their corresponding relationships.



2. 传感器的选择 Transducer selection

目前我们最常使用的传感器有温包式温度开关、热电阻和热电偶等，我们知道在自动控制系统中，如果由于纯滞后或容量滞后带来的对控制通道的滞后，对控制是不利的。假如检测装置迟不能将被控变量的动态及时“报送”给调节器，使得调节器仍按照过时的信息进行控制：操作变量方面造成了滞后，相当于上情不能及时下达，使得控制作用不能立即生效以克服扰动的影响，因此传感器的形式和位置的选择对整个系统来说也是非常重要的。

热电阻与热电偶相比，其优点是：1、温度精度高；2、不存在温度点的飘移；3、稳定性好，重复测量精度高；缺点：1、成本高；2、小温度变化灵敏度低；3、响应时间长等等。

At present the most commonly used transducers are bulb type temperature switch, thermal resistance and thermocouple, etc., we know that in the automatic control system, the lag of control channel caused by pure lag or capacity lag is unfavorable to control. If the detection device cannot timely "submit" the dynamic state of the controlled variable to the regulator, then the regulator will make control according to the outdated information. Operation variable has lagged behind, which means the order above cannot be accepted by the lower, makes the control action can not effect immediately in order to overcome the influence of disturbance, therefore, the choice of the form and position of the transducers is also very important for the whole system.

Thermal resistance's advantages comparing thermocouple: 1.High temperature precision; 2.no temperature point drift; 3.good stability, high precision of repeated measurement; Disadvantages: 1. high cost; 2.small temperature change sensitivity low; 3.corresponding time long and so on.

3. 调节器的选择 Selection of regulator

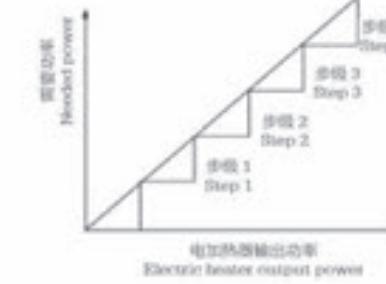
测量温度信号与温控器设定信号经过温控器运算后送到调节器，调节器根据这个信号调节输出功率的大小。调节器最常见的为：1、接触器；2、水银继电器；3、SSR（固态继电器）；4、可控硅；在大型电加热器系统中，常采用这些调节器或其组合。

3.1. 步级控制 Classified control

步级控制根据温控器输出的信号，步级投运或步级降容，优点是：减少大功率设备对电网的冲击，缺点是控温精度与分级的数量有关，适用于流量比较稳定或用热比较均匀的场合。

Measured temperature signal and the thermostat setting signal, after thermostat operations, are sent to the regulator, the regulator adjusts the output power according to the signals, the most common regulators are: 1. contactor; 2. mercury relay; 3.SSR (solid state relay); 4. silicon-controlled rectifier; In large scale electric heater system, often adopt these regulators or their combinations.

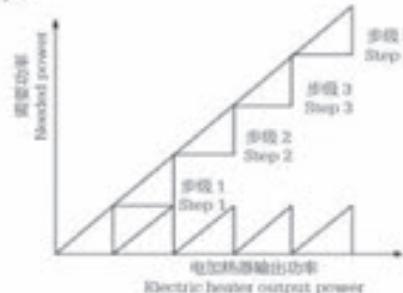
Step circuits control conduct step-circuits operations or steps according to the signals output by temperature controller, the advantage is that it can reduce the impact of high power devices on the grid, the disadvantage is that the temperature control accuracy is associated with the number of classification, is suitable for occasions when the flow is stable or when the heating is uniform.



3.2. 步级加SCR控制 Step plus SCR control

此方法在原有步级控制的方案上，增加一级游动级，这一级游动级是补充步级与步级间的台阶，可以完成0—100%的调功，缺点是：在低流量工况下或用热量减少时，工作级的电热管表面温度很高（特别为气体场合），会影响工作级的电热管使用寿命。

This method, based on the step control mechanism, increases a SCR circuit, this SCR circuit automatically fills the gap between step controlled stage, can complete 0—100% adjusting, the disadvantage is that: Under low flow or low heat consumption conditions, the surface temperature of working level electric heating pipe is very high (especially for gas occasions), which will affect the service life of working level electric heating pipe.



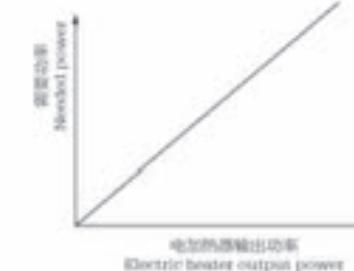
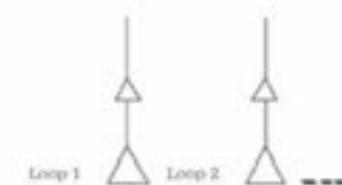
3.3. 全可控硅控制 Full SCR

全可控硅控制，顾名思义是整个系统为整体调功，功率为0—100%调节，特别适合于流量或用热需求为变化的场合。

全可控硅控制又分为定周期控制、变周期控制及移相控制。为考虑电磁兼容的问题，在电加热器上最常用的为变周期控制，特点是控制精度高。

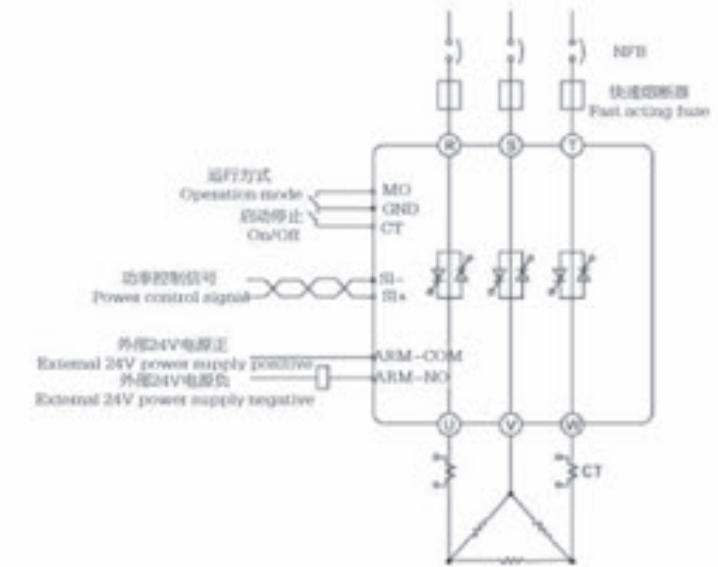
Full SCR control, just as its name implies, is overall power adjustment for the whole system, 0—100% power adjusting, particularly suitable for flow change or heat demand change occasions.

Full SCR control is divided into fixed cycle control, variable cycle control and phase shift control. Considering electromagnetic compatibility problem, the most commonly used is variable cycle control, characterized by high control precision.



随着电子产品的飞速发展，控制方法也多种多样，特别是SCR的发展现在已做成集成化。模块化，并带有通讯接口，可以与DCS联网，我公司提供的SCR分单相和三相两种，具有过电流保护、过电压保护、短路保护、负载断线报警、散热器风扇断电报警和模块超温报警等功能。

With the rapid development of electronic products, the control methods are also varied, especially the development of the SCR has now made integrated, modularized, with communication interface, can be connected to DCS networking, the SCR provided by our company has single-phase and three-phase two kinds, with the functions of over-current protection, over-voltage protection, short circuit protection, load disconnect alarm, radiator fan power outage alarm and module over-temperature alarm, etc.



4、电加热器的电热元件实时自诊断系统 Electric heating element self diagnosis system

我们知道电加热器中的电热元件的绝缘材料为氧化镁粉，氧化镁粉的特点是导热系数高，绝缘性能好，然而它有个缺点就是容易吸潮会造成绝缘降低甚至短路，通电引起断路等。一个大型电加热器有几十根到上百根电热元件组成，通常分成十几个小回路，为了及早发现损坏或有故障的电热元件，我公司新近开发了电加热器电热元件的自诊断系统，该系统充分利用现有的单片机技术和MODBUS通讯协议，此系统实际是模拟人工的方法，对每一回路每一组电热元件进行阻值的测量，与预先设定的电阻值的不平衡率（此不平衡率大小可调）相比较，如超过某一值就进行输出报警，通过液晶显示的方式显示：某一组某一相的阻值及报警组，此信息同时通过MODBUS协议的通讯口送到DCS告知发现的情况，便于用户及早发现。

We know that the insulating material for electric heating element of electric heater is magnesium oxide powder, magnesium oxide powder is characterized by high thermal conductivity, good insulation performance is, but it has a weakness which is easy to absorb moisture, causing insulation reduction even short circuit, or disconnection with power on, etc. A large electric heater has dozen or hundreds of electric heating elements, usually divided into a dozen of small loops, in order to identify the damaged or faulty electric heating element as soon as possible, our company has newly developed electric heating element self diagnosis system, this system makes full use of existing SCM technology and MODBUS communication protocol, the system is actually an artificial simulation method, to conduct resistance measurements for each group of electric heating elements on each loop, comparing with preset resistance imbalance rate (this imbalance rate is adjustable), if surpassing a certain value, then make output alarm through LCD display: the resistance value of a certain phase in a certain group and the alarm group, the information will also be sent to DCS through MODBUS protocol communication port, to inform the findings, making early detection available to users.



5、双闭环串级系统 Double closed-loop cascade system

根据目前国际最新的循环式电加热器标准，为解决由于传感器存在的测量滞后和容量滞后带来的对控制的不利影响，推荐使用双闭环串级控制系统，此系统一方面可以恒定出口温度，另一方面减少了电热元件表面温度的波动，延长了元件的使用寿命。

最新标准又强调了容器壁温度的检测，国内许多制造商忽略了电热元件在气体加热时对容器壁辐射功率的计算，在高温状态（300℃以上），容器壁的温度就非常明显，这一点必须引起用户的关注。

According to the latest international standard of circulating electric heaters, to solve the negative impact on control caused by the measurement lag and capacity lag of transducers, recommend to use double closed-loop cascade control system, this system can on one hand maintain a constant outlet temperature, on the other hand reduce the electric heating element surface temperature fluctuations, thus can prolong the service life of the elements.

The newest standard again underlines the importance of inspection on the temperature of container wall, many domestic manufacturers have neglected the calculation of radiant power of container wall when electric heating element is heating gas, in condition of high temperature(over 300°C), the temperature of the container wall is very obvious, this point shall draw close attention of the user.

6、前馈控制系统 Feed-forward control system

工业生产过程中控制对象往往存在较大的滞后，从扰动作用到系统，使控制量偏移给定值，再从改变控制量，到被控量发生变化需要一定的时间，因此按偏差确定控制作用以使控制量保持在期望值的反馈控制系统，对于滞后较大的控制对象，其作用不能及时影响输出，以致引起输出量较大的波动，直接影响控制品质。如果引起输出量较大波动的主要参量是可测和可控制的，则可在反馈控制的同时，利用外扰动信号直接控制输出（实现前馈控制），在他们还没有对输出产生不利的影响以前，就采取预防措施，这种复合控制能迅速有效地补偿外扰动对整个系统的影响，有利于提高控制精度。

The controlled object often exists great hysteresis in industrial processes, from disturbance action to system,使 controlled quantity shift from the set value, then certain time is needed for change of controlled quantity from the change of controlled quantity, therefore, the control action is determined by deviation to maintain the controlled quantity in the feedback control system of the expected value, as for controlled object with great hysteresis, its action will not immediately affect the output thus to cause considerable fluctuation of output quantity, directly affecting the quality of control. If the major parameters that cause considerable fluctuations on output quantity are measurable and controllable, then external disturbance signal can be used to directly control output to realize feed-forward control while taking feedback control, preventive measures are taken before any unfavorable effects are caused to output, this compound control can quickly and effectively compensate for the influences on the whole system by external disturbance, which is favorable to improve control accuracy.

电热元件表面功率密度的选择和计算 Selection and calculation of surface power density of electric heating element

功率密度（即功率负荷）的选择是很专业的问题，如果功率密度过高，介质在电热元件表面容易结碳或结焦，会缩短加热器的使用寿命；如功率密度过低，将会使加热器体积增大，成本增加。因此功率密度的选择必须根据具体的使用环境而定。它受介质的流量、特性、传热系数、粘度及比热等等的影响；对于一些低组份的介质，一般推荐用实验的方法来获得。

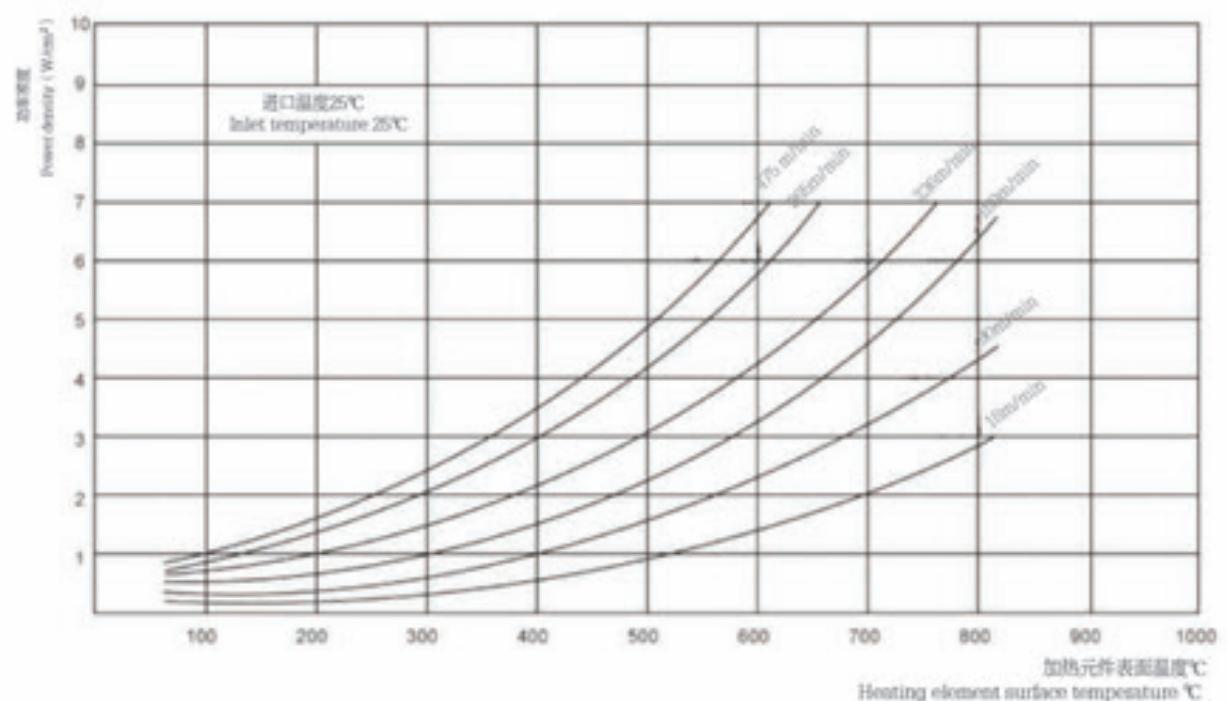
The choice of power density (that is the power load) is very professional problem, if power density is too high, the medium is likely to carbonize or coke on the surface of electric heating element, which will shorten the service life of the heater; if power density is too low, it will make heater volume bigger, thus increasing the cost. So the choice of power density must be according to the specific using environment, which is influenced by medium flow, properties, heat transfer coefficient, viscosity and specific heat and so on; for some low component medium, generally recommend to obtain through experimental method.

介质 Medium	最高工作温度 Maximum working temperature(°C)	最大功率密度 Maximum power density (W/cm²)	介质 Medium	最高工作温度 Maximum working temperature (°C)	最大功率密度 Maximum power density (W/cm²)
醋酸 Acetic acid	82	6.2	桔子汁 Orange juice	85	3.5
硼酸 Boric acid	125	6.2	去污剂 Rust remover	135	3.5
碳酸 Carbonic acid	82	6.2	葡萄糖 Glucose	100	3.1
硫酸 Chromic acid	82	6.2	道生 A Dowtherm A 流速 > 0.3m/s Flow velocity > 0.3m/s	400	3.5
柠檬酸 Citric acid	82	3.5	静止 Standstill	400	1.56
脂肪酸 Fatty acid	65	3.1	道生 E Dowtherm E	200	1.86
乳酸 Lactic acid	50	1.56	颜料 Pigment	100	3.5
苹果酸 Malic acid	50	1.56	电镀槽液 Bath solution		
硝酸 Nitric acid	75	3.1	电镀锌 Zinc plating	82	6.2
丙酸 Propionic acid	82	6.2	电镀铜 Copper plating	82	6.2
2-,4-溴酸苯酚 2-,4-bromo phenol	75	6.2	氟化钾 Potassium fluoride	82	6.2
二羟酸 Diethylene glycol	82	6.2	氯化钠 Sodium chloride	82	6.2
磷酸 Phosphoric acid	82	3.5	乙二醇 Ethylene glycol	148	4.56
鞣酸 Tannic acid	75/82	3.5/6.2	甲醇 Methyl alcohol	82	1.56
酒石酸 Tartaric acid	82	6.2	氟利昂 Freon	148	0.3~0.77
乙醛 Acetaldehyde	82	1.56	燃料油 Fuel oil		
丙酮 Acetone	54	1.56	1.2号油 No.1, 2 no	100	3.5
丙烯醇 Propene alcohol	93	1.56	4.5号油 No.4, 5 no	100	2.0
钛白 Oxide Titanium	100	6.2	6号油 (渣油) 80/100 oil (residual oil)	71	1.24
乙稀水杨酸铝 Ethylene salicylic acid aluminum	50	1.56	汽油 Gasoline	148	3.5
酒石酸铝 Tannic acid aluminum	100	6.2	明胶 Gelatin		
铝酸钾 Aluminum acetate	50	2.17	液体 Lipids	65	3.5
硫酸钾铝 Aluminum potassium sulfate	100	6.2	固体 Solid wastes	65	0.77
醋酸钾 Ammonium acetate	115	3.5	丙三醇 Glycerin	200	1.56
戊醇 Amyl alcohol	100	3.1	甘油 Glycerol	100	3.5
苯胺 Phenylamine	176	3.5	黄油 Grease		
沥青 Asphalt	93~200	0.62~1.56	固体 Solid wastes		0.77
八水氯化钠 Eight water sodium chloride	100	6.2	液体 Liquids		3.5
苯 Benzene	65	1.56	导热油 Heat-transfer oil		2.79
粗酸丁酯 Butyl acetate	107	1.56	静止 Standstill	315	2.17
硫酸氢钙 Calcium bisulfite	204	3.1	流动 Fluid	260	3.72
氯化钙 Calcium chloride	93	0.77~1.24	联氨 Hydrazine	315	3.41
一氧化碳 Carbon monoxide		3.5	亚麻油 Linseed oil	65	7.75
四氯化碳 Carbon tetrachloride	71	3.5	润滑油 Lubricating oil		
苛性钠 Caustic soda			SAE10, 90~100/85/4°C	121	3.5
2%	99	7.44	SAE20, 120~185/85/4°C	121	3.5
10%	99	3.87			
75%	82	3.87			

介质 Medium	最高工作温度 Maximum working temperature(°C)	最大功率密度 Maximum power density (W/cm²)
SAE30, 185~255°C	121	3.5
SAE40~80°C	212	2.0
SAE50, 80~105°C	212	2.0
氯化镁 Magnesium chloride	100	6.2
硫酸镁 Magnesium sulfate	100	6.2
甲胺 Methylamine	82	3.41
氯甲醚 Chloromethane	82	3.1
矿物油 Mineral oil	93	3.5
	204	2.48
蜂蜜 Honey	38	0.62~0.77
石脑油 Naphtha	100	1.55
石蜡(固态) Paraffin (solid)	65	2.48
全氟乙烷 Perfluoromethane	93	3.5
氯酸钾 Potassium chlorate	100	6.2
氯化钾(KCl)	100	6.2
氯氧化钾(KOCl)	71	3.5
抽油机 Oil pumping tank	315	3.87
磷酸钠 Sodium phosphate	100	6.2

介质 Medium	最高工作温度 Maximum working temperature(°C)	最大功率密度 Maximum power density (W/cm²)
氯化钠 Sodium chloride	382	4.34
醋酸钠 Sodium acetate	100	6.2
硫酸(熔化) Sulfur (melting)	315	1.55
全氟乙醇 Perfluoroethanol	93	3.87
甲苯 Tolune	100	3.5
三氟乙烯 Trichloroethylene	65	3.5
松香水 Rosin water	148	3.1
菜籽油 Vegetable oil	204	4.65
乙二醇(50%) Ethylene glycol(50%)	148	7.75
水 Water	100	9.3
Therminol 66	254	5.11
	290	3.41
	300	2.79
	327	1.70
	212	5.11
Therminol 55	249	3.41
	262	2.79
	288	1.70

通道式加热器功率密度的选择 Power density selection of duct heater



电加热系统的设计和计算 Design and calculation of electric heating system

电加热的设计和计算在电加热系统中占有很重要的地位。本章简单介绍一下典型应用中的一些计算和设计。如需进一步研究的话,请参考有关这方面的资料或与本公司技术部门联系。

The design and calculation of electric heater occupies a very important position in electric heating system, in this chapter, we will conduct a brief introduction of some calculation and design in typical applications, for further study, please refer to the information in this aspect or contact our technical department.

电加热器的设计包括以下三个阶段 The design of electric heater includes the following three stages

一、根据工艺条件计算电加热器的功率, 包括以下两个方面

Calculate electric heater power according to the process conditions, which include the following two aspects

1. 系统起动时所需要的功率(包括系统的热损失)。

2. 保持系统正常运行时所需要的功率(包括系统的热损失)。

取以上功率中的最大值, 并考虑一定的安全系数(通常取20%)作为电加热器的功率。

注: 在计算加热器功率时, 必须考虑以下最苛刻的条件:

1. 最低的环境温度。

2. 最大的工件重量(流体为最大的流量)。

3. 最高的操作温度。

4. 最短的加热时间。

1. Power needed to start the system (including system thermal loss).

2. Power needed to maintain the normal running of the system (including the system thermal loss).

Take the maximum value of the above powers, and considering a certain degree of safety coefficient (usually 20%), as the power for the electric heater.

Note: when calculating the heater power, must consider the following most tough conditions:

1. Minimum environmental temperature.

2. The largest workpiece weight (the biggest flow for fluid).

3. The highest operating temperature.

4. The shortest heating time.

二、假定加热器结构, 选择合理的功率密度和电热元件的外壳材料

Assumed heater structure, selecting select rational power density and the sheath materials of electric heating element

1. 根据被加热的介质, 选择合理的电热元件外壳材料。

2. 选择合理的功率密度, 假定加热器结构。

注: 选择功率密度和加热器结构时必须考虑以下情况:

1. 必须考虑介质的物理特性。例如: 流量、比重、比热、粘度、导热系数和允许温度等。

2. 选择加热器结构时, 必须考虑系统允许的压力降。如果不能满足, 结构需作调整,

同时结构调整会影响流速, 对功率密度的选择也有一定影响。

1. According to the heating medium, choose reasonable electric heating element sheath material.

2. Choose reasonable power density, assume heater structure.

Note: when choosing power density and heater structure, must consider the following situations:

1. Must consider the physical and chemical properties of the medium. Such as flow rate, specific gravity, specific heat, viscosity, thermal conductivity and the allowed temperature, etc.

2. When choosing heater structure, system allowed pressure drop must be considered. If it can't meet, the structure should be adjusted, structure adjustment will affect the flow velocity at the same time, also with some influence on the choice of power density.

三、选择合理的控制方案 Choose reasonable control scheme

系统起动时需要的功率 Power needed to start the system: $kW = (C1M1\Delta T + C2M2\Delta T)/963/H + P/2$

系统运行时需要的功率 Power needed for system running: $kW = C3M3\Delta T/963 + P$

散热功率 Heat loss power:

管道 Piping: $P = 2\pi \lambda \Delta T/LN(d+2\delta) \times L/1000$

平面 Plane: $P = \Delta T/(d/\lambda) \times S/1000$

C1	容器比热 Container specific heat: kcal/kg.°C	H	加热时间 Heating time: hour
C2	介质比热 Medium specific heat: kcal/kg.°C	P	散热功率 Heat loss power: kW
C3	每小时增加介质比热: kcal/kg.°C Specific heat of the increased medium every hour	λ	保温材料导热系数 Thickness of insulation layer: W/m.°C
M1	容器重量 Container weight : kg	δ	保温层厚度 Thickness of thermal insulation: m
M2	介质重量 Medium weight: kg	d	管道外径 Pipeline outer diameter: m
M3	每小时增加介质重量: kg Increased medium weight every hour	L	管道长度 Pipeline length : m
ΔT	最终温度与初始温度之差: °C Difference between the overall temperature and the initial temperature	S	平面面积 Plan area: m²

四、工程应用例子 Engineering application examples

在本节中简单地介绍了4个工程应用典例。关于其他方面的工程计算，可向我们技术部门咨询或参考其他类似工程手册。

In this section, we shall briefly review 4 typical engineering application examples, in matters concerning other aspects of engineering calculation, please consult our technical department or refer other similar engineering manuals.

1.水加热 Water heating

一个开口容器，尺寸为600mm宽，1000mm长及600mm深，自重122kg，内装450mm高度的水。容器底部和侧面都有50mm厚的保温，水需在2小时内从20°C加热到65°C，然后每小时抽取15kg的65°C水并加入同样体积的20°C的水。

An open container, 600 mm wide, 1000 mm long and 600 mm deep, self weight 122 kg. Put in 450 mm height of water. At the bottom and sides of the container, there is insulation 50 mm thick, the water needs to be heated from 20 °C to 65 °C within 2 hours, then take out 15 kg of 65 °C water from the container every hour and add into the same volume of 20 °C water.

参考数据 Reference data

1.钢的比热 The specific heat of steel: 0.12kcal/kg·°C

2.水的比热 The specific heat of water: 1kcal/kg·°C

3.水的比重 The specific gravity of water : 1000kg/m³

4.水在65°C时，表面损失: 3176W/m² (环境温度10°C) Water surface loss at 65 °C: 3176 W/m² (ambient temperature 10 °C)

5.保温层热损失: 在65°C时, 27W/m² 6. Thermal insulation heat loss: at 65 °C, 27 W/m²

初始加热，需要的能量 Energy needed for initial heating:

容器内水的加热 Heating water inside container: C2M2ΔT=1 × (0.6 × 1.0 × 0.45 × 1000) × (65-20) =12150kcal

容器自身的加热 Heating container itself: C1M1ΔT=0.12 × 122 × (65-20) =688.8kcal

平均水表面热损失 Average water surface heat loss: 0.6m² × 3176W/m² × 2Hrx1/2 × 863/1000=1644.5kcal

平均保温层热损失 Average thermal insulation heat loss: 2.52m² × 27W/m² × 2Hrx1/2 × 863/1000=58.72kcal

考虑20%的折量 Consider 20% factors:

初始加热需要的能力为 Capacity required for initial heating: (12150+688.8+1644.5+58.72) × 1.2=17414.42kcal

因此初始加热的功率为 So the initial heating power is: 17414.42kcal/863/2Hr=10.08kW

工作时需要的能量 Energy needed when working:

加热补充的水需要的能量 Energy needed for heating supplementary water: 15kg/Hrx (65-20) × 1kcal/kg·°C × 1Hr=675kcal

水表面热损失 Water surface heat loss: 0.6m² × 3176W/m² × 1Hrx863/1000=1644.5kcal

保温层热损失 Thermal insulation heat loss: 2.52m² × 27W/m² × 1Hrx863/1000=58.72kcal

考虑20%的折量 Consider 20% factors:

初始加热需要的能力为 Capacity required for initial heating: (675+1644.5+58.72) × 1.2=2853.89kcal

因此初始加热的功率为 So the initial heating power is: 2853.89kcal/863/1Hr=3.3kW

初始加热的功率大于工作时需要的功率，加热器选择的功率至少为10.08kW

The initial heating power is greater than the power needed when working, choose heater with at least 10.08 kW power.

本例中选取的加热器功率 In this case, the selected heater power: 12kW

2.传导加热 Conductive heating

在1.5m直径的夹套容器中（顶带金属盖），容器高1.2m，搅拌热脂胶，容器的侧面和底部分别有50mm厚的保温层，每批热脂胶重量1150kg，比热为0.56kcal/kg·°C。需要在2小时内从常温20°C升温至190°C，容器自重也为1150kg，估计管道，泵和循环式加热器重量为：230kg，系统中循环的导热油重量为：480kg，初始加热时间不能超过1.5小时。

In a jacketed vessel of 1.5 m in diameter (top with metal cover), the container is 1.2 m high, stir the thermosol, at the sides and bottom of the container there is insulation layer 50 mm thick , each batch of thermosol weights 1150 kg, specific heat of which is 0.56 kcal/kg·°C, needed to be heated from room temperature 20 °C to 190 °C within 2 hours, the container self weight is also 1150 kg, the pipeline, pump and circulation heater weight is estimated to be: 230 kg, heat conduction oil weight circulated in the system is: 480 kg, the initial heating time cannot be more than 1.5 hours.

参考数据 Reference data

1.钢的比热 The specific heat of steel: 0.12kcal/kg·°C

2.钢的比重 The specific gravity of steel: 7800kg/m³

3.导热油的比热 The specific heat of heat conduction oil: 0.46kcal/kg·°C

4.钢在190°C时表面的热损失 Steel surface heat loss at 190 °C: 2968W/m²

5.在190°C时保温层的热损失 Thermal insulation heat loss at 190 °C: 97W/m²

初始加热，需要的能量 Energy needed for initial heating:

保温面积 Insulation area: 1.5 × 3.14 × 1.2+0.6 × 0.6 × 3.14=6.79m²

非保温面积 Non-insulation area: 0.6 × 0.6 × 3.14=1.13m²

加热容器和管道需要的能量 Energy needed for heating containers and pipes:

(1150+230) × 0.12 × (190-20) /863=32.6kWh

加热导热油需要的能量 Energy needed for heating conduction oil:

480 × 0.46 × (190-20) /863=43.5kWh

保温层上的平均损失 Average loss on thermal insulation:

6.79 × 97 × 1.5h × 1/2/1000=3.93kWh

容器盖板上的平均热损失 Average heat loss on container cover:

1.77 × 2968 × 1.5h × 1/2/1000=3.93kWh

考虑20%的折量 Consider 20% factors:

初始加热需要的能量为 Energy needed for initial heating:

(32.6+43.5+0.49+3.93) × 1.2=96.6kWh

初始需要加热的功率 Power needed for initial heating:

96.6kWh/1.5h=64.4kW

工作时需要的功率 Power needed when working:

加热热脂胶需要的能量 Energy needed for heating thermosol:

1150 × 0.56 × (190-20) /863=126.89kWh

保温层上的热损失 Heat loss on thermal insulation:

1.77 × 2968 × 2h × 1/2/1000=10.47kWh

考虑20%的折量 Consider 20% factors:

每周期工作加热需要的能量为 Energy needed for each cycle work of heating:

(126.89+1.32+10.47) × 1.2=166.37kWh

工作时需要加热的功率 Heating power needed at work:

166.37/kWh/2h=83.182kW

由于工作时需要的功率大于初始加热功率，因此加热器选择的功率至少为83kW。

Since the power needed at work is larger than initial heating power, so the power selected by the heater shall be at least 83kW.

3.过程空气加热 Process air heating

在一个奶酪厂，进入空气已经将熟乳加热到90°C，然后再由电加热器提升120±1°C，90°C的空气以70m³/min进入900mm宽，300mm高，1.5m长的通道，从加热器出来是一个干燥室，奶酪浆被喷射到热空气中制成奶酪粉。通道四周有25mm厚的保温层，热空气不循环使用。

In a cheeseery, the intake air has been heated up to 90°C by steam, then it shall be raised to 120±1°C by an electric heater, the air at 90 °C enters into a duct that is 900mm wide, 300mm tall and 1.5m long with flow rate of 70m³/min, out from the electric heater is a drying room, where the cheese slurry get sprayed into the hot air to make cheese grits. There is 25mm thick insulation around the duct, the hot air is not recycled.

参考数据 Reference data

1.空气的平均比热 Average specific heat of air: 0.24kcal/kg·°C

2.空气比重 Air specific weight: 1.03kg/m³ (90°C)

3.保温层热损失 (在120°C) Heat loss of insulating(at 120°C): 97W/m²

初始加热: 无 Initial heating: no

工作时加热 Heating during working:

空气质量 Weight of air: 70 × 60 × 1.03=4326kg/hr

空气加热 Air heating: 4326 × (120-90) × 0.24/863=36kW

通道保温层面积 Insulating area of the duct: 1.5 × 0.3 × 2+0.9 × 1.5 × 2=3.6m²

通道上保温层热损失 Heat loss of thermal insulation in the duct: 3.6m² × 97W/m²=3.56kW

考虑20%的折量 Consider 20% factors:

工作时需要加热的功率: 36.35 × 1.2=43.62kW

4.液氮加热 Liquid nitrogen heating

液氮贮存在-206°C的罐内，现需要使用20°C流量为11m³/min的氮气。输送氮气的钢管的表面积为4.6m²，管道没有保温，将使用两个加热器，第一个加热器加热液氮使其汽化，第二个加热器使汽化后的氮气提升到20°C，液氮的比热为0.47kcal/kg·°C，氮气的比热为0.24kcal/kg·°C。

The liquid nitrogen is stored in a tank at -206°C, now, nitrogen at 20°C, the flow rate of which is 11m³/min is needed. The surface area of discharge pipe which is used to delivery nitrogen is 4.6m², the pipe has no heat preservation effect, so two heaters will be used, the first one is to heat the liquid nitrogen to make it vaporize, the second one is to raise the vaporized nitrogen to 20°C, and the specific heat of liquid nitrogen is 0.47kcal/kg·°C. Specific heat of nitrogen is 0.24 kcal/kg·°C.

参考数据 Reference data

- 液氮的汽化热 Heat of vaporization of liquid nitrogen: 47kcal/kg
 - 液氮的汽化点 Vaporizing point of liquid nitrogen: -196°C
 - 氮气的密度 Density of nitrogen: 1.34kg/m³
 - 平均温差为90°C时，管道需要获得的能量: 1000W/m²
- When the average temperature difference is 90°C, the energy needed by the pipe is: 1000W/m²

初始加热: 无 Initial heating: no

工作时加热: 汽化氮气 Heating when working: Nitrogen vaporization

液氮的重量 The weight of liquid nitrogen: $11\text{m}^3/\text{min} \times 60\text{min/hr} \times 1.34\text{kg/m}^3 = 884.4\text{kg/hr}$

加热液氮需要的能量 Energy needed to heat liquid nitrogen:

$$884.4 \times 0.474 \times (-196 - (-206)) / 863 = 5.34\text{kW}$$

汽化液氮需要的功率 Power needed to vaporize liquid nitrogen $884.4 \times 47 / 863 = 48.17\text{kW}$

考虑20%的安全系数 To take 20% safety factor into consideration:

$$(5.34+48.17) \times 1.2 = 64.21\text{kW}$$

工作时加热: 氮气加热 Heating at work: Nitrogen heating

$$884.4 \times 0.24 \times (20 + 196) / 863 = 52.88\text{kW}$$

从管道得到补充的热量 Supplementary heat from the pipe: $4.6 \times 1000 \times 1 = 4.6\text{kWh}$, 每小时合算为功率 calculate the power by the hour: 4.6kW

考虑20%的安全系数 To take 20% safety factor into consideration: $(52.88 - 4.6) \times 1.2 = 57.94\text{kW}$

因此, 如按每小时加热计算, 选择的第一个加热器功率至少为65kW, 第二个加热器加热功率为: 58kW

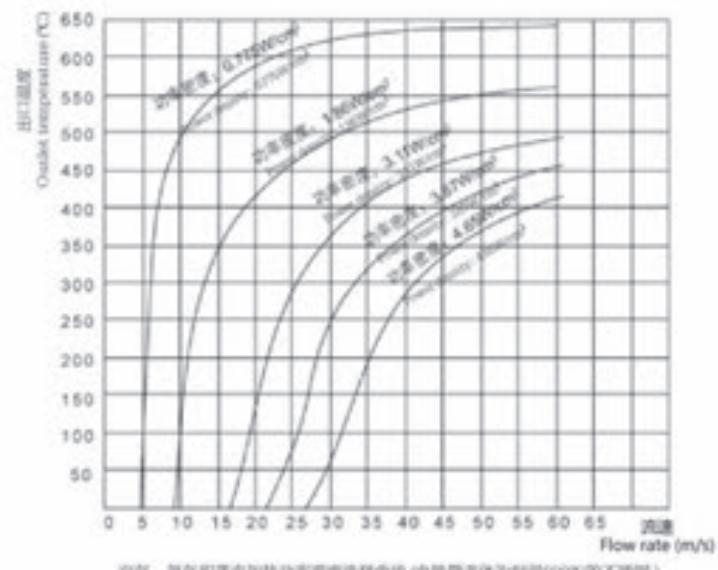
Therefore, if the heating is calculated by the hour, then the power of the first selected heater is at least 65kW, and the heating power of the second heater is 58kW.

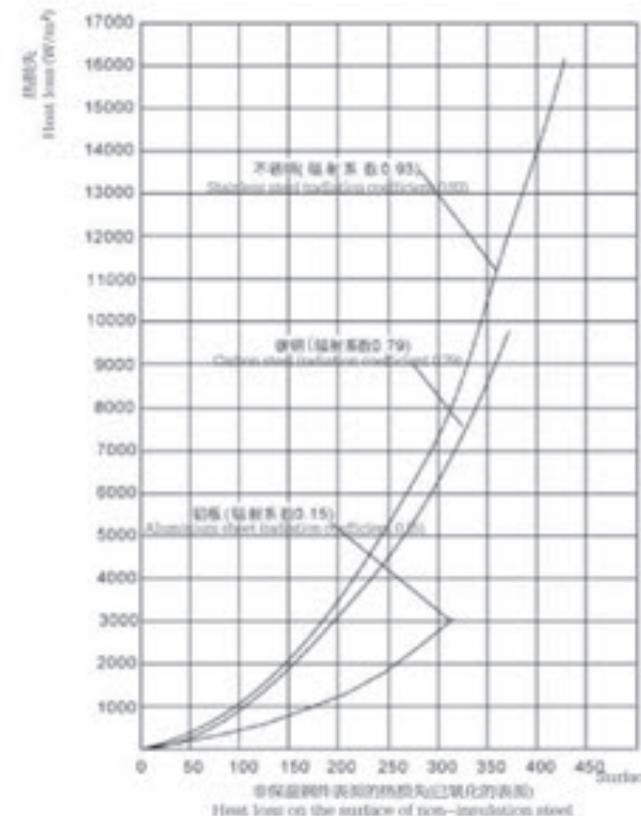
常用性能曲线和常用介质的物性参考数据

Physical property reference data for common performance curve and normal media

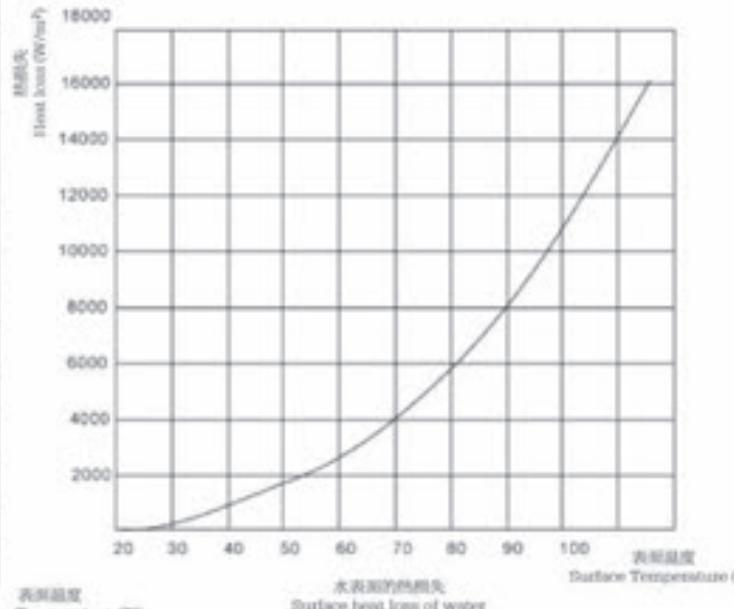
下面是一些在电加热计算中经常要用到的参数曲线, 对我们的设计是很有帮助的。

Below are parameter curves that are commonly used in the calculation of electric heating, which are very helpful for our design.

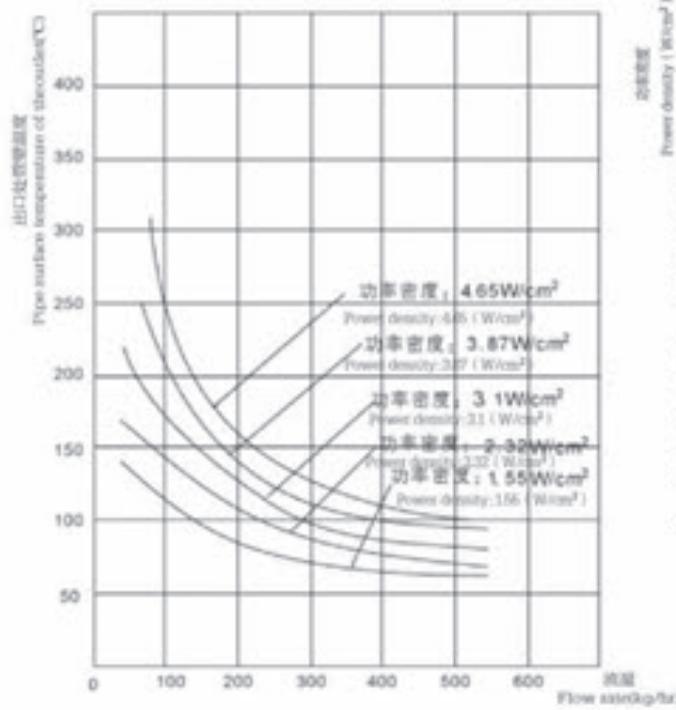




Heat loss on the surface of non-insulation fiber components (in surface has been oxidized)



水表面的熱損失 Surface heat loss of water



温度与流动的关系曲线

浸入式电加热器功率密度与加热管表面温度的关系
〔介值〕30号机油。处于自然对流状态
The relationship between the power density and the heating tube surface temperature of the immersion heater
Journal of China Univ. of Mining & Technology, No. 25, immersing coil, heating tube, natural convection, relation

常用介质的物性参考数据

Physical property reference data for normal media

介质 Medium	密度 Density (g/cm ³)	熔点 Melting point (°C)	溶解热 Dissolution heat (kcal/kg)	沸点 Boiling point (°C)	汽化热 Heat of vaporization (kcal/kg)	粘度 Viscosity (cm ² /s)	比热 Specific heat (kcal/kg·°C)
乙酸 Acetate	0.806	-120		20.8	186	0.00231	
乙酸 Acetic acid	1.05	16.7	43.2	118.5	96.9	0.01222	0.522
丙酮 Acetone	0.792	-94.6	19.6	56.1	124.5	0.0031	0.506
丙醇 Propyl alcohol	0.847	-129.0		97.0	163	0.01363	0.665
戊醇 Pentyl alcohol	0.817	-78.5		137.9	120.2		
苯胺 Phenylamine	1.036	-6.24	20.96	110.9	110.0	0.04467	0.512
苯 Benzene	0.879	5.56	30.34	80.12	94.2	0.00654	0.340
溴 Bromine	3.187	-72	16.2	58.8	48.0	0.01005	0.107
丁醇 Butanol	0.81	-89.8	30.0	117.7	141	0.02948	0.687
醋酸 Butyric acid	0.954	-5.56	30.10	163.5	114	0.01540	0.515
碳酸 Cathartic acid	1.07	4.1	20.03	112.2		0.1274	0.561
二硫化碳 Carbon disulfide	1.293	-111.8		46.26	84	0.00376	0.24
四氯化碳 Carbon tetrachloride	1.594	-22.8	41.57	76.76	46.4	0.00975	0.201
蓖麻油 Castor oil	0.9603					9.96	0.434
氯仿 Chloroform	1.489	-63.8		61.2	59	0.00571	0.236
癸烷 Decane	0.747	-32.0		174		0.0077	0.500
二乙醚 Diethyl ether	0.714	-116.3		34.5	83.9	0.00245	0.529
乙醚 Ethyl ether	0.603			35			0.503
乙酸乙酯 Ethyl acetate	0.899	-83.6		77.1		0.0046	0.467
乙醇 Ethyl alcohol	0.789	-114.6	24.89	78.32	204.3	0.012	0.548
溴乙烷 Ethyl bromide	1.45	-119		38.4	56.9	0.00402	0.215
乙基碘 Ethyl iodide	1.944	-110.85		72.1	45.6	0.00502	0.161
溴乙烯 Vinyl bromide	2.17	10.01		131.7	46.2	0.01721	0.173
氯乙烯 Vinyl chloride	1.246	-35.3		83.7	77.33	0.00638	0.299
蚁酸 Formic acid	1.22	8.4	58.89	100.8	119.9	0.01784	0.525
汽油 Gasoline	0.66-0.69			70.0-90.0			0.5
甘油 Glycerol	1.261	18.1	47.5	230		8.3	0.576
庚烷 Heptane	0.684	-90.7		98.4	76.3	0.00416	0.49
乙烷 Ethane	0.66	-95.4		68.7	79.3	0.00326	0.6
煤油 Kerosene	0.75-0.82						0.5
亚麻油 Linseed oil	0.934	-20	287.0		0.331		
乙酸乙酯 Ethyl acetate	0.927	-96.1		57.1	98.1	0.00388	0.468
甲醇 Methanol	0.792	-97.8	22.0	64.7	262.8	0.00506	0.601
碘甲烷 Methyl iodide	2.285	-64.0		42.3	45.9	0.00600	
苯 Naphthalene	1.152	80.2	36.6	318.0	76.5	0.04	0.396

介质 Medium	密度 Density (g/cm ³)	熔点 Melting point (°C)	溶解热 Dissolution heat (kcal/kg)	沸点 Boiling point (°C)	汽化热 Heat of vaporization (kcal/kg)	粘度 Viscosity (cm ² /s)	比热 Specific heat (kcal/kg·°C)
牛脂油 Butterum oil	0.913~0.917						
硝酸 Nitric acid	1.513	-47	953	86.0	114.9		
硝基苯 Nitrobenzene	1.212	525	225	210.9	79.1	0.021	0.36
壬烷 Nonane	0.718	-51.0		150.6		0.0062	0.503
辛烷 Octane	0.707	-56.9		124.6	70.96	0.00542	0.578
橄榄油 Lucus oil	0.918	20		300		0.84	0.471
正戊烷 n-pentane	0.631	-129.9	36			0.0024	
石油 Oil	0.878						0.511
丙酸 Propionic acid	0.99	-20.8		141.1	98.8	0.01102	0.56
丙醇 Propyl alcohol	0.804	-127		97.5	164.4	0.02256	0.57
离子油 Colza oil	0.913	-35				1.18	
硫磺 Sulphur	0.234			445	652		0.234
牛脂 Ghee ester	0.94	27~41				0.176	
甲苯 Toluene	0.882	-95		110.3	96.53	0.0059	0.44
松香水 Rosin water	0.873	-10		100.0	68.6	0.01487	0.411
水 water	1.00	0	79.7	100	539.44	0.010060	1.0
二甲苯 Dimethylbenzene	0.863	-27.1		142	82.9	0.00881	0.411
醋酸 Acetic acid	1.049		10.36	118	23.01		0.52
乙醇 Ethyl alcohol	0.785		6.17	78.5	48.4		0.58
四氯化碳 Carbon tetrachloride	1.584		9.95	76.6	11.1		0.20
导热油 Heat-transfer oil	0.88				10.11		0.46
机油 Engine Oil	0.929				10.12		0.40
苯胺 Phenylamine	1.03						0.512
空气 Air	0.00129						0.24
二氧化氮 Carbon dioxide	0.00198						0.20
氮 Ammonia	0.00077		2.63		20.57		0.52
氯化氢 Hydrogen chloride	0.00164		5.76				0.20
氢气 Hydrogen gas	0.00009						3409
氮气 Nitrogen	0.00117						0.244
天然气 Natural gas	0.0007						0.593
沥青 Asphalt	1.1						0.40
蜂蜡 Beeswax	0.95						0.32
钢 Steel	7.8						0.12
铝 Aluminum	2.7						0.226
铜 Cu	6.92						0.0548
ABS塑料 ABS Plastic	1.0						0.36

企业拥有十八项发明专利，八十多项实用新型专利

序号	专利名称	专利号	序号	专利名称	专利号
1	四氯化硅电加热器	2010201963685	6	螺旋形换热管	2013200629386
2	垂直式四氯化硅电加热器	2011201432894	7	高温气体加热装置及加工方法	2014100260655
3	内辐射等温型热场电加热器	2012202327090	8	高腐蚀性高粘度导电介质电加热装置	2014100218124
4	高温抗氧化电接头	2012204062793	9	电热管绝缘装置	2014100263079
5	卧式辐射加热器温度控制系统	2012207460696	10	等温度换热管辐射式电加热器	2014106365721
				

电加热器咨询表

项目名称			
项目编号			
设备名称			
电加热器			
出口尺寸及标准	mm		
安装方式		□立式	□卧式
容器材质			
加热元件材质			
控制描述			
电源	<input type="checkbox"/> 380V	<input type="checkbox"/> 380V/220V	其他
控制盒尺寸			
控制盒颜色			
控制描述			
介质情况			
名称			
流量	kg/h		
密度	g/cm ³		
比热	cal (g·°C)		
进口温度	°C		
出口温度	°C		
最大允许温度	°C		
设计温度	°C		
工作压力	MPa		
最大允许压力降	kPa		
设计压力	MPa		
环境情况			
	电加热器	控制盒	
环境类型 (A-普通; B-防爆)			
安装场合 (A-户内; B-户外)			
加热功率	kW		
数据	套		
电加热器选型			
示意图			
			
附件情况			
类型	数量	描述	
温度仪表			
压力仪表			
液位仪表			
阀门			
泵	离心泵 屏蔽泵	流量: ___m ³ /h, 扬程: ___m 电机功率: ___kW, 防爆等级: ___	