



Woory Electric Heat Co., Ltd.

WOORY ELECTRIC HEATER

<http://www.wrheater.co.kr>



  
ISO 9001:2015



take the first step toward success

WOORY ELECTRIC HEATER

Since our founding in 2000, we have grown from a leading domestic manufacturer of cartridge heaters into a global exporter. Through continuous effort and technological innovation, we've expanded beyond Busan and the Gyeongnam region to serve customers around the world.

As a specialized producer of industrial heaters, cartridge heaters, bolt heaters, and preheating heaters, we have been playing a vital role in the heating sectors for molds and oil preheating, which are essential to modern industries. Leveraging our accumulated experience and expertise, we deliver top-notch quality and service from installation to completion. Our commitment to excellent quality, credibility, continuous improvement, and prompt after-sales support ensures the highest level of satisfaction for our customers.

In response to the growing interest in and demand for electrical energy, we are continuously striving to develop more efficient and cost-effective products through ongoing research and dedication. Our goal is to evolve into a leading company not only in Korea but also across Asia. We sincerely ask for your continued interest and encouragement.



WOORY ELECTRIC HEATER

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Certificates



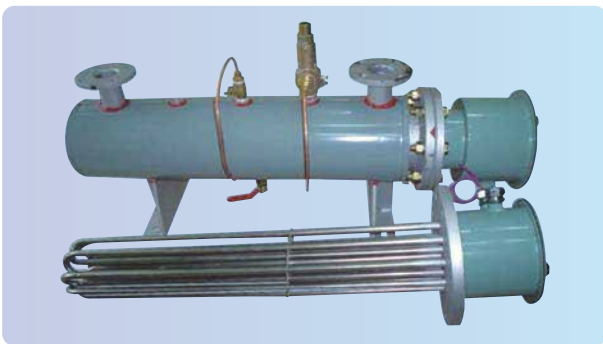
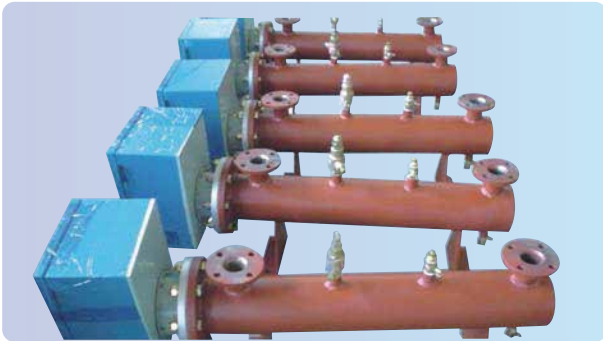
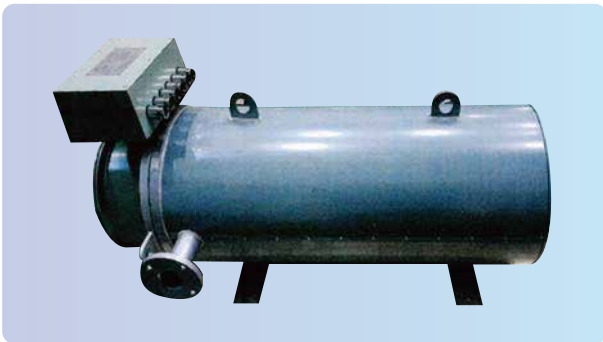
Major History

- 2023.09 Duct heater Explosion-Proof Safety Certificate
- 2021.02 UL Certificate
- 2019.12 Obtained Patent Certificate
- 2019.10 Acquired Explosion-Proof Safety Certificate
- 2019.01 Acquired Electric Heater Safety Certificate
- 2018.04 Certification of Research and Development Department from the President of the Korea Industrial Technology Association
- 2017.04 Established C.I Design Development Support Agreement, Acquired UL Certification
- 2016.05 Obtained Factory Registration Certificate
- 2015.03 ISO 9001:2015 Quality Management System Certification
- 2013.01 Venture Business Confirmation Certificate
- 2012.08 Registered as a Venture Business and Converted to Corporation (Woory Electric Heat Co., Ltd.)
- 2011.07 Factory Relocation 248, Gamjeoncheon-ro, Sasang-gu, Busan
- Industry-Academic Cooperation Agreement with Dongseo University and Busan Energy Science
- 2009.03 Safety Certification for Electric Products for Greenhouses
- 2008.05 Design Registration for Hot Air Blower for Greenhouses
- 2007.12 Acquired ISO 9001:2000 Quality Management System Certification
- 2007.12 Developed Hot Air Blower for Greenhouses
- 2007.10 Clean Workplace Certification
- 2007.06 Established Assembly Facilities and Expanded Sales Stores
- 2007.05 Company Relocation 562-44, Gwaebeop-dong, Sasang-gu, Busan
- 2006.12 Purchased and Remodeled Factory (Expanded to a 4-story Building)
- 2005.04 Independently Developed and Commercialized Bolt Heaters
- 2003.10 Increased Machinery and Equipment, Commenced Comprehensive Heater Production
- 2003.09 Expansion and Relocation to 580, Gwaebeop-dong, Sasang-gu, Busan
- 2001.06 Developed Cartridge Heater with Higher Heat Output Compared to Standard Heaters
- 2000.12 Began Specialized Production of Cartridge Heaters
- 2000.11 Established Woory Electric Heat - 578, Gwaebeop-dong, Sasang-gu, Busan

Preheating Heater (Circulation Heater)

> Overview

Circulation heaters provide a ready-made means to install electric heating with a minimal amount of time and labor. This is designed to heat forced-circulation air, gases or liquids. These units can be made from a wide range of heating element sheath materials, wattages, vessel sizes and materials, pressure ratings, thermal enclosures and control

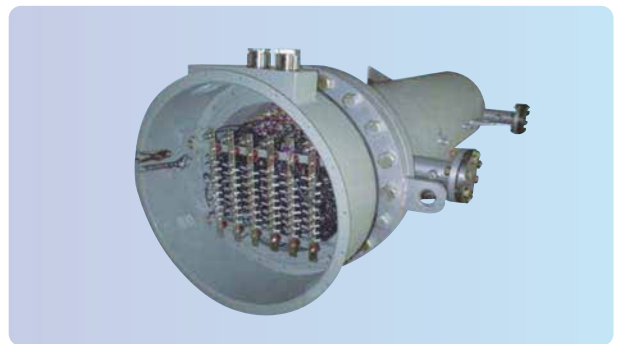


> Applications

1. Oil Heating: Heating of fuel and working oil for marine engines, asphalt, bunker oil, Dowtherm, paraffin, etc.
2. Water Heating: Hot water boilers for greenhouses, hot water boilers for factories, preheating for starting large engines.
3. Air Heating: Air containing gas and superheated steam lines, etc.

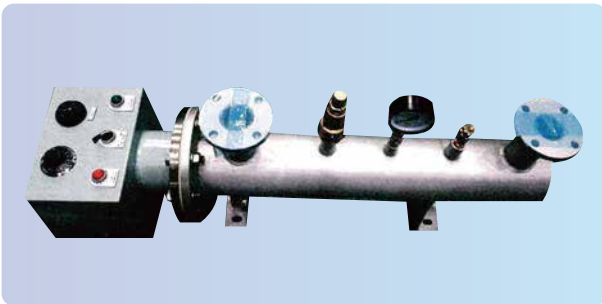
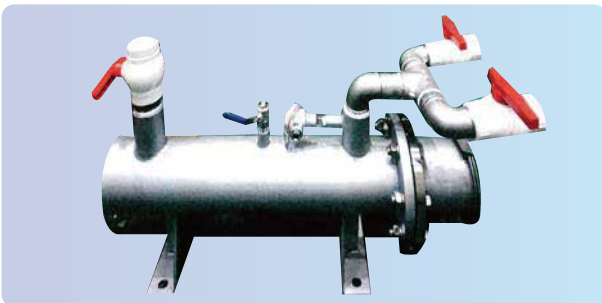
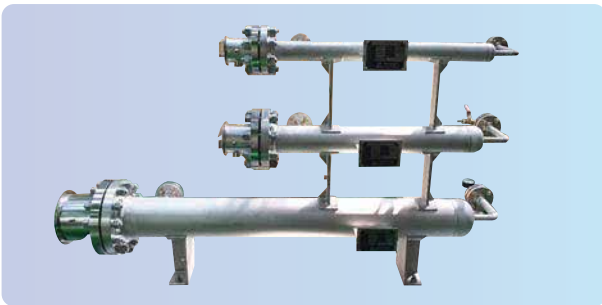
> Features

1. Rather than heating the entire tank, it heats only the portion of the tank that is needed at the time, thereby reducing fuel costs.
2. It is smaller than traditional boilers, making it advantageous for installation in confined engine rooms or boiler rooms, and is convenient to install.
3. Depending on the application, Teflon coating, ceramic coating, acid treatment, and electro-polishing are possible.
4. Maximum Operating Temperature : 800 °C



> **Materials**

- Tube: SUS304, SUS316, INCOLOY, INCONEL
- Insulation: MgO (Magnesium Oxide)
- Resistance wire: Iron-chrome, nickel-chrome, Kanthal
- Flange: SS400, SUS304, SUS316
- Heater Element Pipe : SUS304, SUS316S/L, INCOLOY840/800, TITANIUM etc.



> **Resistance Wiring Methods**

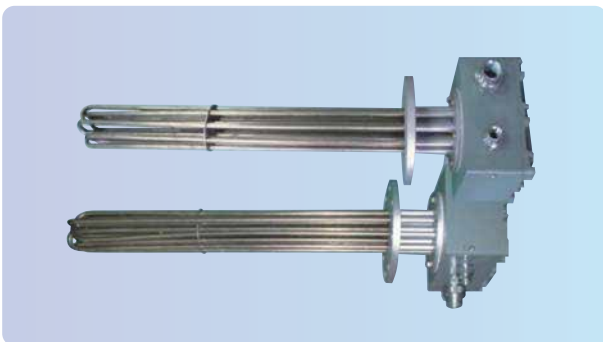
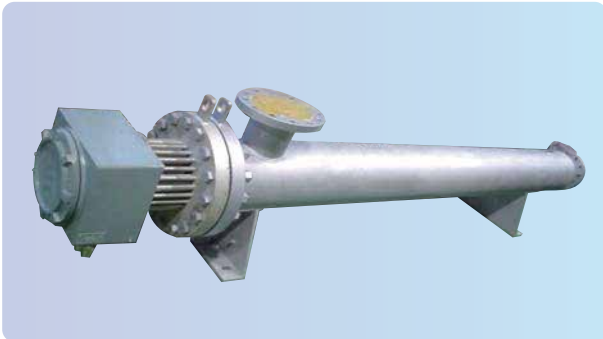
Single Phase		Three Phase	
Serial	Parallel	Y-connection	Delta connection

Explosion Proof Heater

* Usage Range: 690v or below, 1000kW or below

> Overview

This heater is specifically designed and manufactured to prevent the explosion of explosive gases caused by electrical sparks, arcs, or ruptures occurring during use in locations where explosive gases are present. It is used for heating liquids and gases.



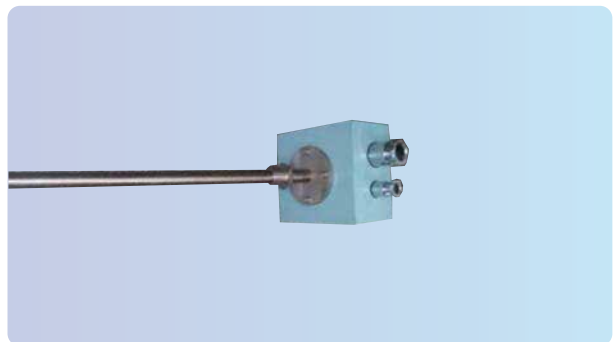
> Explosion Proof Classifications obtained by the woory electric heater

- Certificate : IECEx, ATEX 국내방폭(KCS)
- Grade : Ex d, Ex e
T1~T6
- Kind of Item : Immersion Heater
Duct Heater
Casting Heater
Circulation / Line Heater

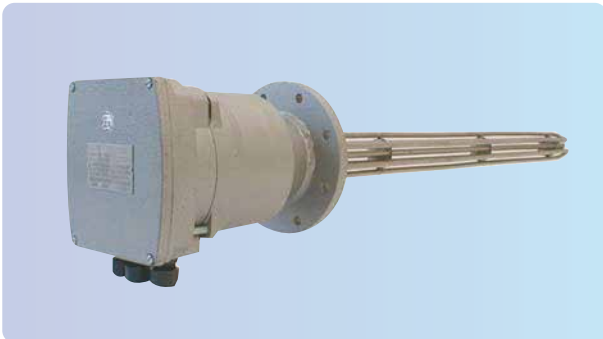
(In addition to the above specifications additional authentication is possible, So please contact us.)

> Precautions for Use

1. When transporting the heater, transport it horizontally as much as possible.
2. Ensure that no load is applied to the heater body.
3. When wiring, confirm that the resistance between R.S.T phases is uniform and check for insulation resistance issues before supplying voltage.
4. Ensure that the heater is not heated without fluid flow and that the correct flow rate flows.
5. After completing the wiring assembly, if a TRIP occurs during power supply, check the insulation and restart the power supply only if the resistance is above 1MΩ.



Explosion Proof Immersion Heater



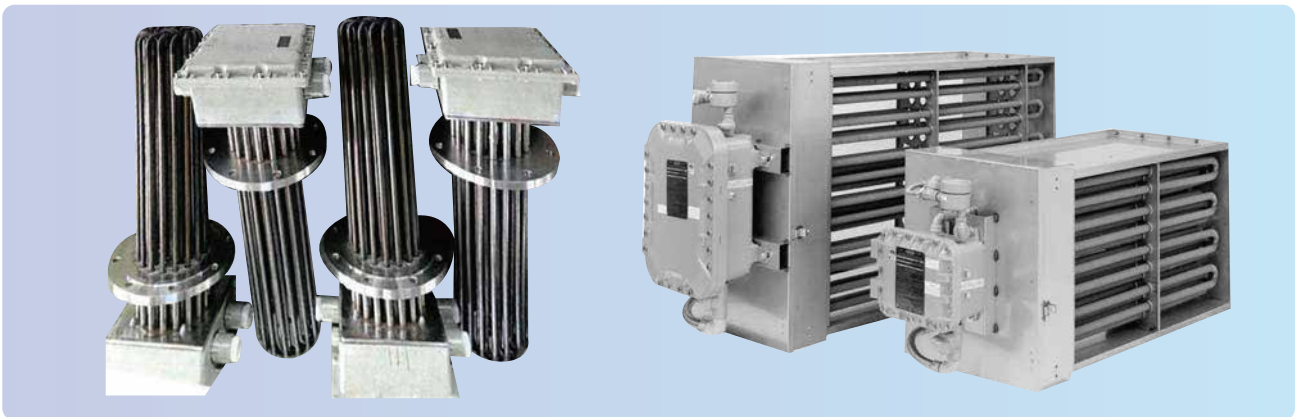
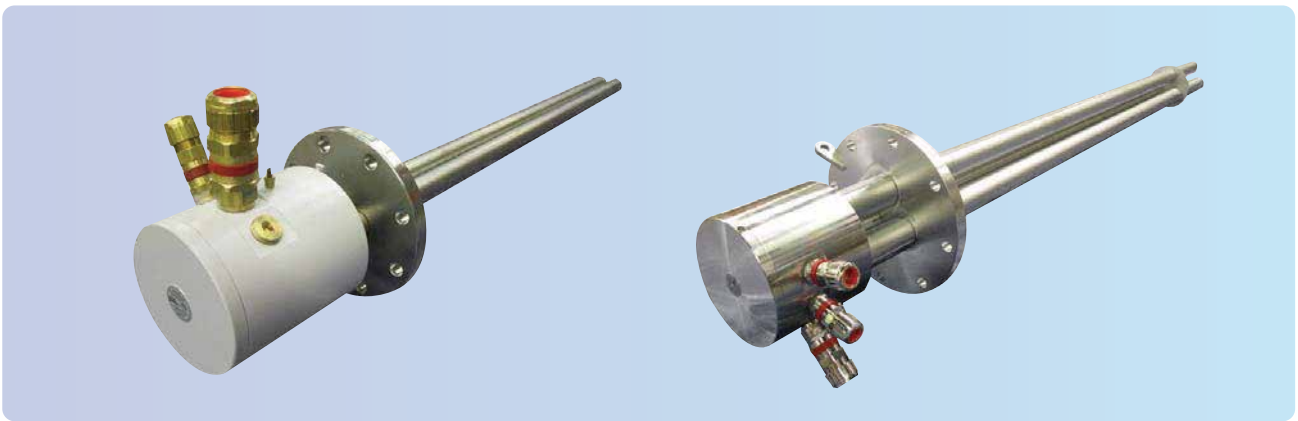
> Features

1. The direct heating method provides excellent efficiency. By attaching a temperature control sensor, automatic operation or overheating prevention is possible.
2. Teflon coating or ceramic coating is available depending on the application.

> Materials

1. Heater Tube: Inconel, Incoloy, SUS316, SUS316L, SUS304, Titanium.
2. Terminal Block (T/B): SUS304, SUS316
3. Flange: SUS304, SUS316, SS400
4. Sleeve: SUS304, SUS316

* Supplied to domestic thermal power plants, nuclear power plants, shipyards, and offshore plants. Our explosion-proof structure has been certified internationally and domestically as an explosion-proof structure with Ex d and Ex e certification.



Immersion Heater

> Overview This heater can be customized according to consumer requirements.

As a heater for heating liquids or air, it directly immerses the heating element into the material to be heated, achieving 100% heat efficiency, unlike indirect heating. It is easy to install even in confined spaces. Additionally, the heater is designed to allow the attachment of a temperature controller to prevent damage to the container due to overheating or to extend the lifespan of the heating element. The heating element can be made of copper, stainless steel, or other metals, and special heat-resistant tubes are also used. Coatings such as aluminum, lead, and various synthetic resins can be applied to the exterior, providing excellent chemical resistance.

> Materials

1. Flange: SS41, A105, SUS304, SUS316L, SUS310S, Titanium, etc.
2. Pipe: SUS, Copper, Inconel, Incoloy 840, Incoloy 800, SUS316S/L, SUS310S, Titanium, etc.
3. Powder: Magnesium Oxide (MgO)

> Features

1. 100% heat efficiency due to direct heating
2. Simple and clear installation and maintenance
3. Durable construction and versatile applications
4. Ideal for preheating water or oil
5. Available with Teflon coating, ceramic coating, depending on the application
6. Can be manufactured with temperature controllers and sensors

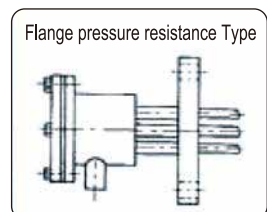
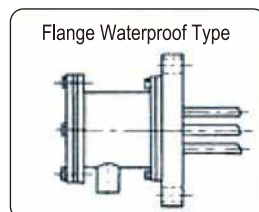
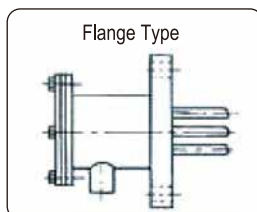
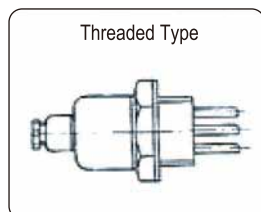
> Applications

1. Copper: When made with copper, the immersion heater prevents corrosion from external factors. It is mainly used for heating stored water for washing parts, preventing freezing in sprinkler systems, and cooling towers.
 - Maximum heating surface temperature: 600°C (Used in baths, for heating water for washing parts, and in sprinkler systems)
2. Steel: Used for heating tanks containing tar, asphalt, paraffin, solvent oils, fuel oil, and alcohol.
 - Maximum heating surface temperature: 750°C (Used for heating petroleum)
3. Stainless Steel: Used for heating solutions such as acetic soda, cleaners, and other aqueous solutions that do not corrode stainless steel.
 - Maximum heating surface temperature: 600°C
4. Incoloy: Used for drying and heating air, gas mixtures, and steam heating. It is the best material for sheath elements.
 - Maximum heating surface temperature: 1500°C

> Surface Load Density (W/cm²) and Materials by Application

Heating Material	Heater Surface Load Density	Heating Material	Heater Surface Load Density
Water	5-10W/cm ²	Instant Hot Water	10-15W/cm ²
Heat Transfer Oil	2-3W/cm ²	Petroleum	2-3W/cm ²
Electrolytic Cell	1-6W/cm ²	Edible Oil	3-4W/cm ²
Ethylene Glycol	3-4W/cm ²	Hydraulic Oil	2.5-3W/cm ²
Heavy Oil	1.5-2.5W/cm ²	Lubricating Oil	1-2W/cm ²
Paraffin	2-3W/cm ²	Molasses	0.5-1.0W/cm ²

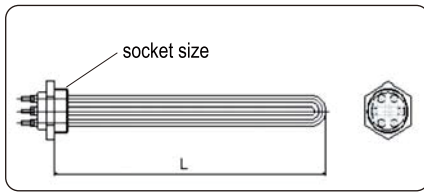
> Flange Types



SOCKET TYPE

> Overview

This method involves attaching a socket to the container and fixing the heater into the socket. It is mainly used in small, low-capacity, and low-pressure applications. It is convenient for use in areas where the pressure is low. Any specification can be manufactured for sockets of 1 inch or more, with 1 to 2-inch sockets being the most commonly used.



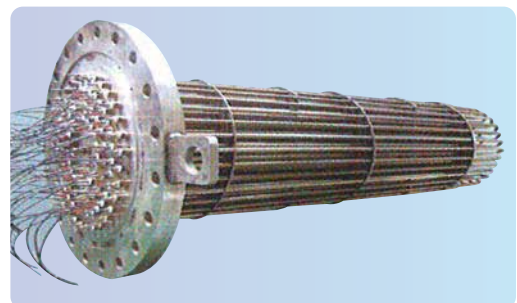
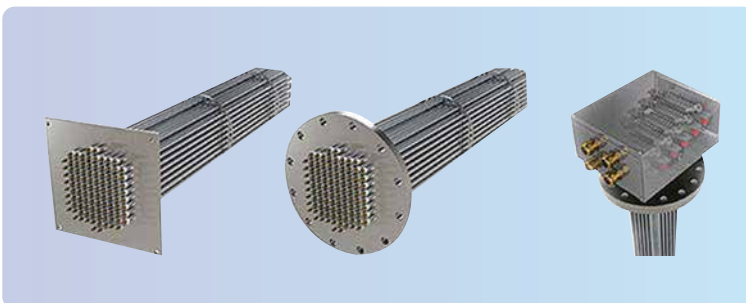
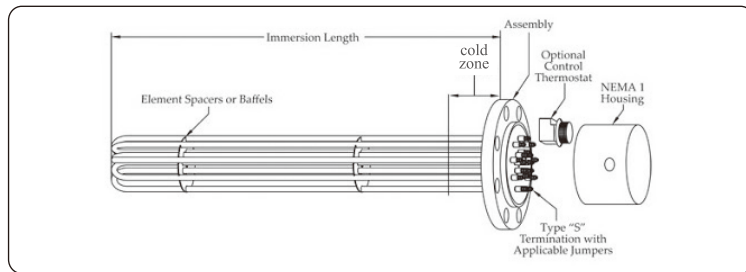
Inch	2	1 1/2	1 1/4	1	Remarks
Millimeters (A)	50	40	32	25	special type (80×80) mm
Outer Diameter	59.6	46.3	41.9	33.2	
Element Q'ty	3	3	2	1	



Flange type

> Overview

This heater is designed by bending sheath (pipe) heaters into a U-shape and attaching them to a plate flange for easy installation on standard pipe flanges. It can be custom-made for various pressures, temperatures, and capacities, and is used for heating liquids and gases in tanks and pressure vessels.



Duct Heater

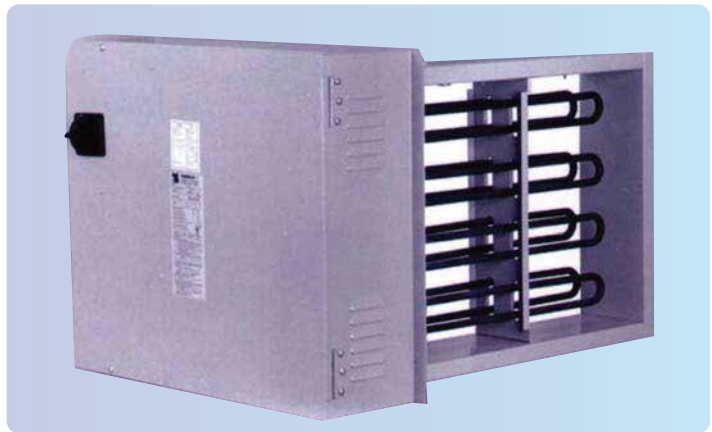


> Overview

Duct heaters are mainly used to raise the temperature of the airflow inside a duct or heating system. By improving the heat exchange efficiency with air or gas, the heater's lifespan and efficiency are enhanced by transferring the heat from the sheath to the air or gas.

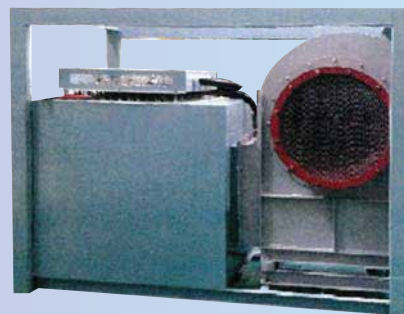
> Applications

Air or gas heating, condensation and evaporation devices, heat conduction systems, melting furnaces and preheating furnaces, and oven systems.



> Features

1. Equipped with air-use fin heaters.
2. An overheat protector is installed inside the heater to respond to faults.
3. The heater is interlocked with a fan, allowing the heater to operate when the fan introduces external air. The fan and heater can be operated together.
4. The motor and heater operation can be controlled and monitored through the control panel, and the temperature can be set as needed.
5. Overheating, overcurrent, motor on/off status can be checked via indicator lamps.
6. Duct heater are easily installed in applications requiring a wide range of temperature versus air flow combinations.
7. It is possible to install thermocouple, thermostat, airflow switch etc.



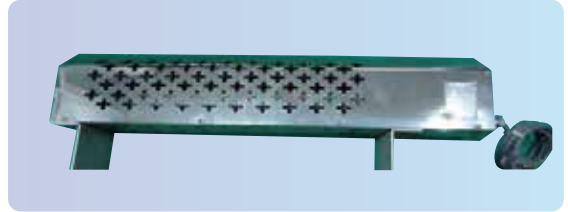
> **Applications**

- Product drying
- Drying of agricultural and marine products
- Paint curing
- Dry rooms (air heating)
- Food drying
- Space heating
- Other temperature control purposes
- Room Air Conditioning system.

- The purpose is to maintain indoor temperature and to provide indoor heating.
- The electric duct heater is used to prevent a rapid drop in indoor temperature when cold air from outside enters the factory or building through ducts, while also providing fresh air. (Additionally, it can serve the purpose of indoor heating.)



Convection Heater



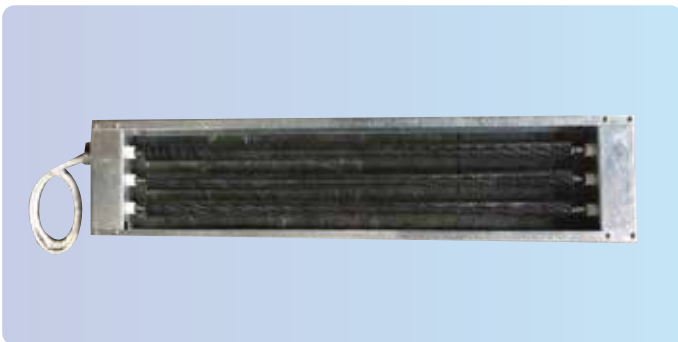
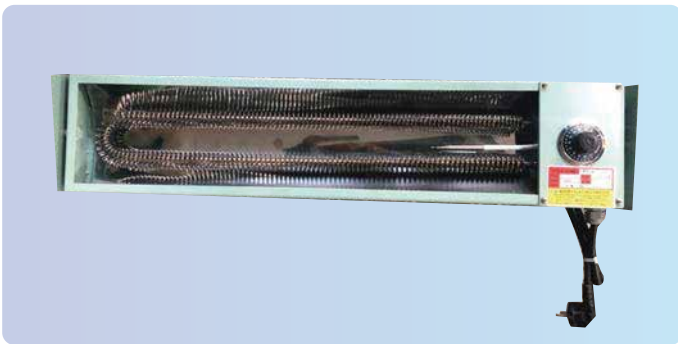
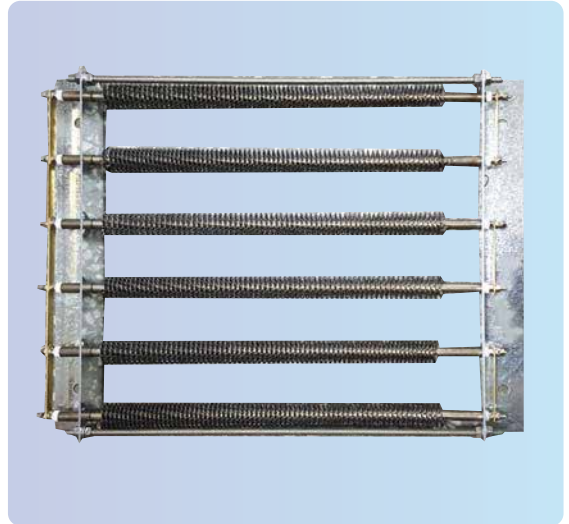
> Overview

A fin heater is attached inside, and it operates using natural ventilation to heat the desired location (particularly in narrow spaces). It is mainly used in ship cabins and, when needed, can be equipped with a fan to directly blow heated air onto the object being heated, making it applicable to various fields such as drying products, electronics, and more.

Thermostat, on/off switch, Lamp can be installed.

> Applications

Widely used for cabin heating and for other heating and hot air generation purposes.



Fin Heater

> Applications

- 1. Hot-air heaters, air-heating dryers, air-conditioning unit heaters
- 2. Constant temperature and humidity unit heaters
- 3. Other heating and hot air generation sources.

> Features

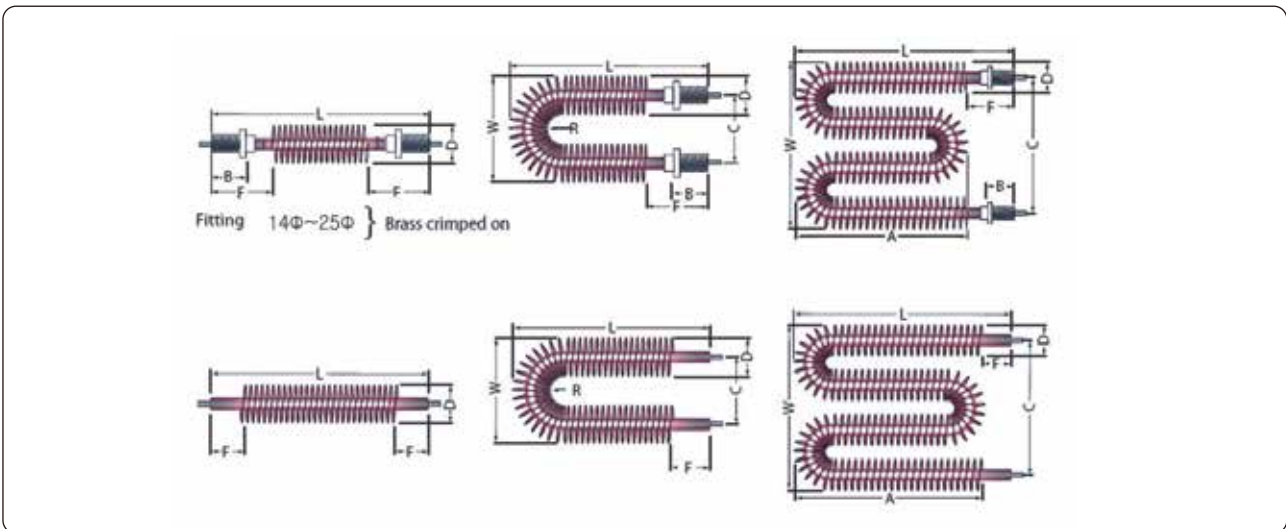
- 1. The fin heater tightly wraps an AIRO-FIN around a sheath heater.
- 2. The close contact between the sheath heater and the fin ensures excellent heat conduction between them. The heat dissipation fin acts as a secondary heat dissipation surface, increasing the heat dissipation area.
- 3. Fin materials include aluminum (AL), steel (ST), and stainless steel (STS), with the standard fin height being 10mm (other options: 6mm, 9mm, 12mm). The standard thickness for stainless steel, iron, copper, and aluminum fins is 0.35mm.



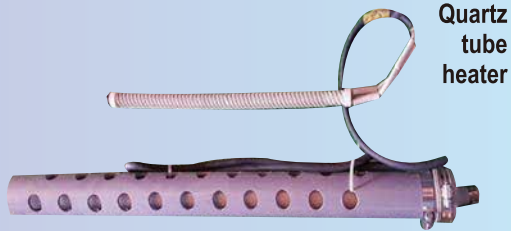
Box-Type Fin Heater

By combining fin heaters made of aluminum, galvanized steel, or stainless steel into multiple blocks, a box-type configuration can be formed. This design allows for automatic temperature control and overheating prevention. It can be scaled up for large-scale applications or used for specific purposes. An overheat protection function can also be added. It can be bent in many shapes.

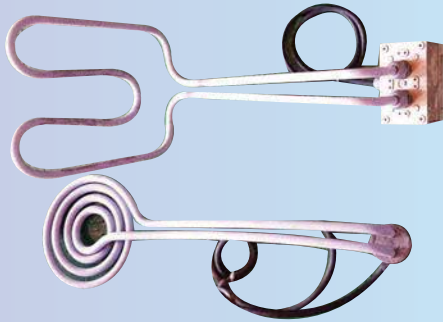
Basic Types of Fin Heater Materials



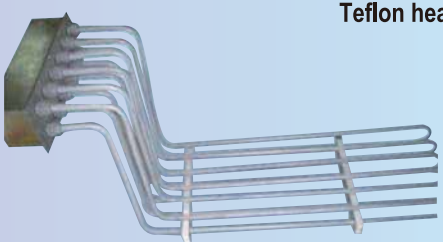
Plating Heater



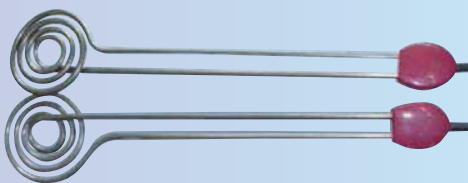
Quartz tube heater



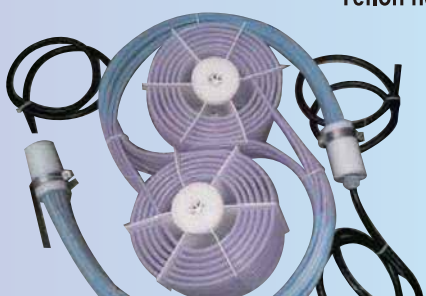
Teflon heater



Teflon heater



316L heater



Teflon heater

> Overview

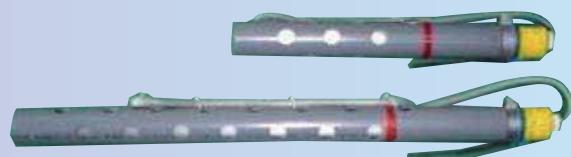
General plating solutions contain various corrosive acid solutions, making it impossible to use steel materials. For plating heaters, quartz tube heaters, Teflon-coated heaters, titanium heaters, and stainless steel 316L heaters are mainly used.

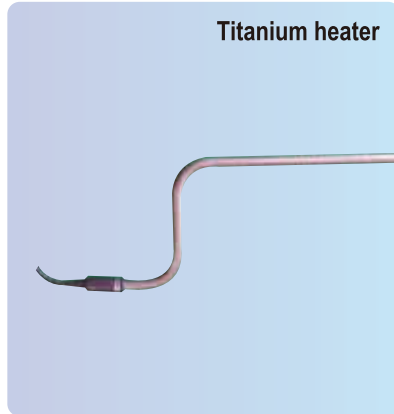
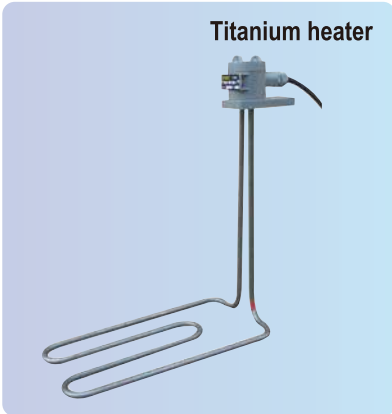
> Applications

1. Quartz Tube Heater: Primarily used in strong oxidizing acids like hydrochloric acid and hydrofluoric acid, generally suitable for high-temperature use.
2. Teflon Heater: Not suitable for phosphoric acid or alkalis but can be used for most other solutions. As it is a low-temperature heater (60~70°C), care must be taken regarding the operating temperature and environment.
3. Titanium Heater: Mainly used for mild acidic aqueous solutions (e.g., petrochemical, thermal, and nuclear power plants).
4. Stainless Steel 316L Heater: Primarily used in cleaning tanks and is suitable for alkalis and mild acids.

> Features

1. Quartz Tube Heater: Suitable for high temperatures but difficult to bend, with limited length and capacity. It is also vulnerable to impact.
2. Teflon Heater: A product where a Teflon tube is inserted or coated over a steel heater, so it cannot be used for high temperatures (above 150°C). Care must be taken to avoid scratching. It can be used in strong acids, and its length can be adjusted or bent, making it a widely used heater.
3. Titanium Heater: It is used for chlorine and seawater because of its strong coating and excellent corrosion inhibition effect. It is recommended below 150°C of liquid operating temperature, and it can be customized in various shapes according to tank specifications.
4. Stainless Steel 316L Heater: Although it is a corrosion-resistant stainless steel, it is still weak against strong acids. It is most suitable for post-plating washing. Designed to resist acids and alkalis, it can be used in industrial settings involving various chemicals.





> **Titanium Heater Features**

The specific gravity of titanium is 4.51, about 50% that of copper or nickel, and about 60% that of stainless steel, making it lightweight and enabling the reduction of structural weight. The tensile strength of pure titanium ranges from 30 to 75 kgf/mm², while titanium alloys can have tensile strengths between 60 and 160 kgf/mm², maintaining exceptional strength up to 500°C, superior to most other metals.

Titanium's corrosion resistance is particularly noteworthy. It can be used in solutions of chlorine, seawater, and sulfuric acid below 6%. The metal's resistance to corrosion stems from the formation of a protective oxide film that is difficult to break down. This film is durable and provides excellent anti-corrosion properties.

Titanium's corrosion is uniform, and severe localized corrosion is rare. It typically resists stress corrosion, fatigue corrosion, intergranular corrosion, and galvanic corrosion. Compared to stainless steel or copper alloys, titanium's corrosion resistance is superior under various conditions, especially in seawater, where it has corrosion resistance comparable to platinum.

Additionally, titanium is harmless to the human body, making it suitable for use in heart valves, artificial bones, and other implants for human tissue.

Separately, temperature control is required, and sensors and thermostat can be applied.



Sheath Heater

> Overview

A Sheath Heater consists of a heating coil embedded inside a metal protective tube. It is filled and compressed with magnesium oxide (MgO), which has excellent thermal conductivity and insulation properties. This structure makes it robust against external physical shocks while improving the thermal efficiency of the electrical energy. It can be processed into various shapes to suit different applications, particularly for medium to high-temperature uses.

> Applications

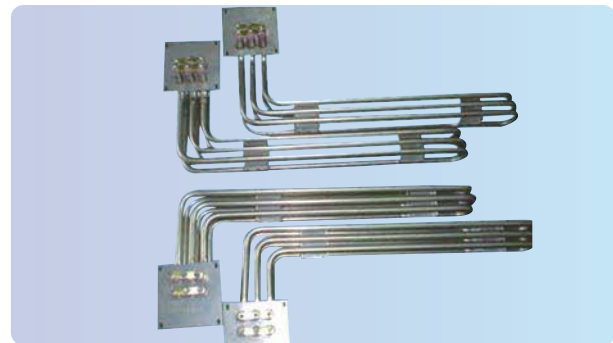
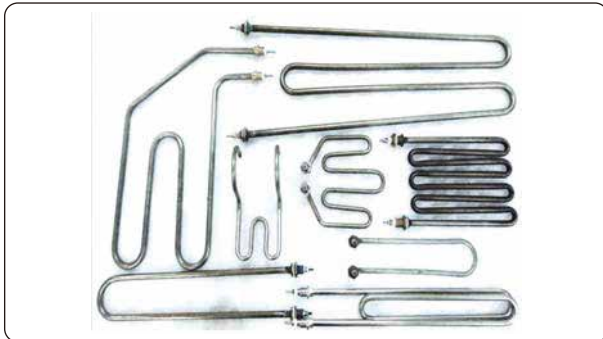
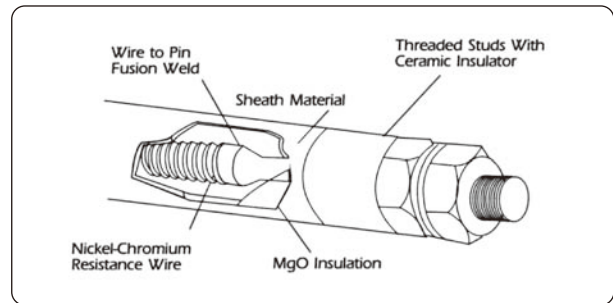
Air heating, internal heating of dryers, mold heating, thermal molding heater heating, lead melting, film bonding, electric furnace, and high-temperature heating for heating, preheating, and temperature maintenance are particularly used as immersion heaters.

> Features

1. Excellent thermal efficiency.
2. Easy to install.
3. Power terminals are exposed at both ends.
4. The heating part is uniform, and it can be customized to have separate heating and non-heating sections. It can also be processed into various shapes.

> Materials

Sheath Material	Allowable Temperature (°C)	Power Density (W/cm ²)		
		No Air	Forced Air	Underwater
Incoloy800	850	7	8	
Incoloy840	850	7	8	
sus321	760	4	5	
sus304	760	3	5	8
sus316L	760	(3)		8
Cu	200			12
Fe	400	(1.5)	(3)	
Al	300	(1)		



Terminal Types

Standard Type		Crimp Terminal Type		Screw Fixing Type		Tab Type	
Lead Wire Type		Tab Type		Cover Terminal Type			

Energy-Saving Greenhouse Hot Air Heater (Heat Radiator)



Air Fan Heater



> Overview

The air fan heater is equipped with a fin heater and an Open Radiant Heater, designed to generate forced circulating hot air. It directly blows hot air onto the object to be heated using Turbo or Sirocco fans. This heater is widely used across various fields.

> Applications

Greenhouses, rubber and plastic products, molds and metal products, paint drying, heating, electric and electronic product drying, food drying, curing and aging rooms, tape shrinkage, etc.

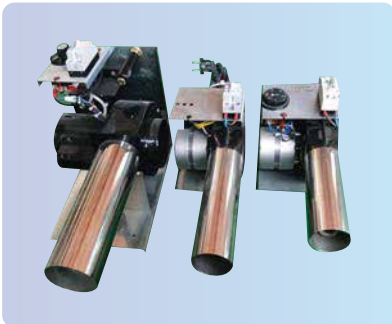
> Features

1. The heat source can be evenly distributed.
2. There is no risk of damage to the object being heated.

> Types

1. Small hot air heater : 10kw or less.
2. Large hot air heater : 10kw or more.

Small Air Fan Heater

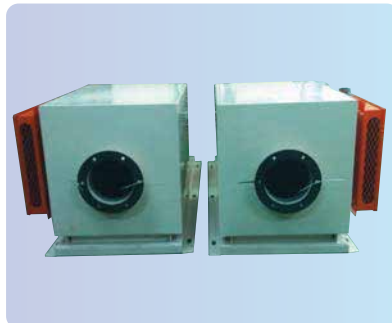
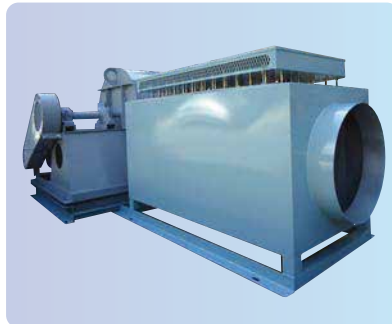


Capacity : 2kW , 3kW, 5kW
Max : 120°C ~200°C

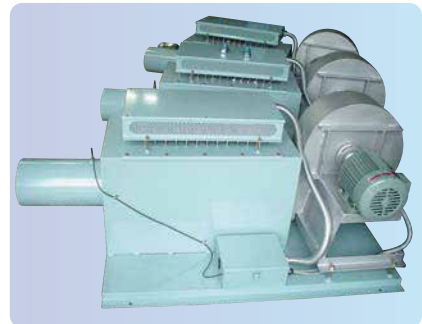


Capacity : 3kW, 5kW, 7kW, 10kW
Max : 150°C~250°C

Large Air Fan Heater



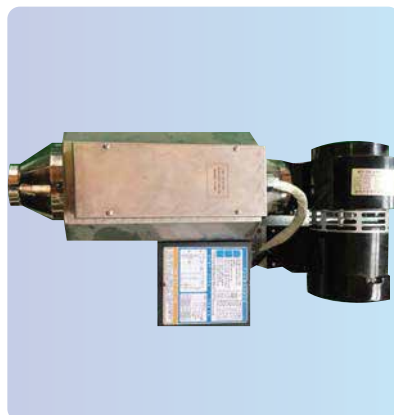
High-Capacity (for heat circulation)
Can be produced mainly in 15kW,
20kW, and up to 200kW.
Max Temperature: 120°C ~ 400°C.



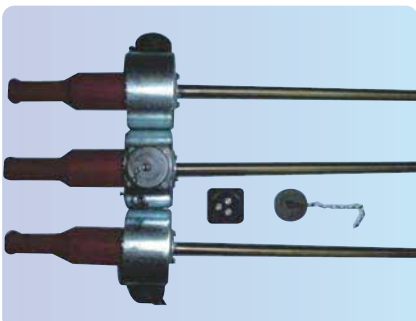
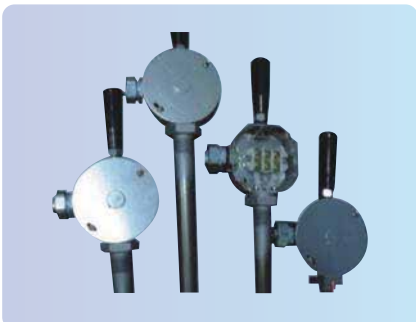
Low-Temperature Hot Air Heater
(below 30°C)
For greenhouses, mushroom cultivation
houses, frost prevention, and construction
heating.

> High-Temperature Air Heater Features

1. Can heat air up to a maximum temperature of 600°C for use in various industrial processes.
2. Suitable for a wide range of processes (soldering, annealing, drying, welding, sealing, cutting, sterilization, etc.).
3. Can be easily installed in the middle of a line for convenient heating.
4. Allows for precise temperature control.
5. Can continuously heat at the maximum temperature for at least 5000 hours (can be used for several years at lower temperatures).
6. Compact and easy to use.
7. Allows for instant heating (can reach 200-300°C in a short time).
8. Capable of heating blower air, compressed air, nitrogen gas, and other gases.
9. Useful for heating all types of inert gases.
10. Equipped with temperature sensors like K-TYPE, J-TYPE, and pt100Ω to prevent overheating and extend product lifespan by maintaining the optimal temperature.
11. Can be custom-manufactured according to customer requirements, including exterior design, capacity, air volume, and air pressure.
12. During wiring, confirm that the resistance between the R.S.T phases is uniform, and ensure there are no insulation issues before applying voltage.



Bolt Heater



> Overview

Bolt heaters manufactured by Woory Electric Heat Company are made with special materials designed for optimal efficiency, quality, and thermodynamic performance. These heaters are used in high-pressure steam turbines of hydroelectric, thermal, and nuclear power plants, as well as in ships and presses, where powerful physical force is required to fasten or loosen Stud Bolts and other fasteners. To achieve such force, high heat is applied directly to the Stud Bolt, causing it to expand when heated and contract when cooled, thereby maintaining a strong fastening force. These operations require high temperatures, necessitating higher power density in the heater.

Additionally, bolt heaters manufactured by Woory Electric Heat Company are designed to generate high heat in a short time, minimizing heat loss and significantly contributing to the efficiency of turbines and other equipment.

The product range includes sizes from Ø8 to Ø100, with larger sizes also available.

> Features

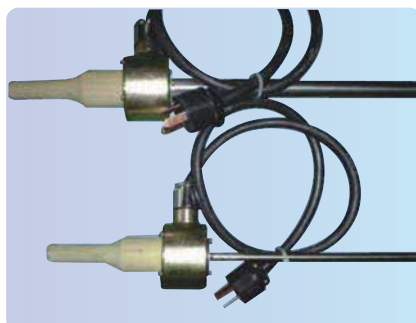
1. Generates high temperatures in a short time, minimizing heat loss.
2. High-density, high-output, and high-performance product.
3. Reaches maximum temperature quickly, drastically reducing maintenance time.
4. The special manufacturing process maximizes heat transfer efficiency.

> Materials

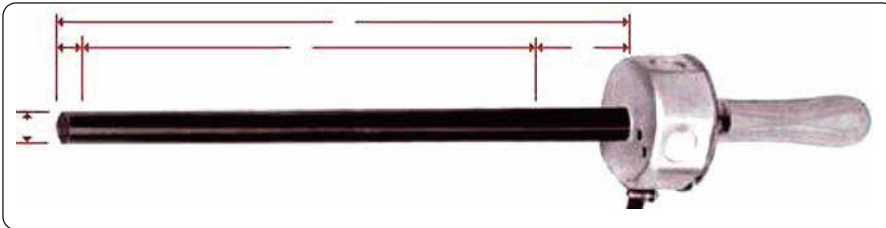
1. Tube: Copper, stainless steel (SUS304, SUS316, SUS310), Incoloy 840, Incoloy 800, inconel 600.
2. Heating Wire: Nickel-chromium alloy, Pyromax-DS, Kanthal-A1.
3. Insulation Material: High-purity magnesium oxide (MgO powder).

> Precautions for Use

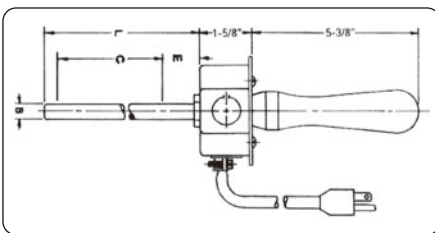
1. The heater must be protected from shock or collision during transport or operation.
2. Ensure that the power to the heater and panel is correctly set up.
3. Before use, the hole for the Stud Bolt should be clean and dry.
4. The heating area should be limited to the body of the Stud Bolt and should match the length of the heater's heating section.
5. Power must be disconnected when inserting or removing the heater from the Stud Bolt.
6. The heated heater must always remain in a vertical position and should not be left unattended for extended periods.
7. The heater should not be heated in open air or moved while in use.
8. After use, the heater must be sealed in a plastic bag with a desiccant and stored in a dry location.



> Specifications



A Overall Length (mm)
 B Outer Diameter (Φ)
 C Heating zone (mm)
 D & E Non-Heating zone (mm)



Heater outer diameter (Φ)
 voltage and capacity (V, W)
 insertion length (mm)
 lead wire length (mm, SQ),
 non-heating section position
 terminal box (steel, sus etc.)
 and other characteristics.

> Purpose of Use



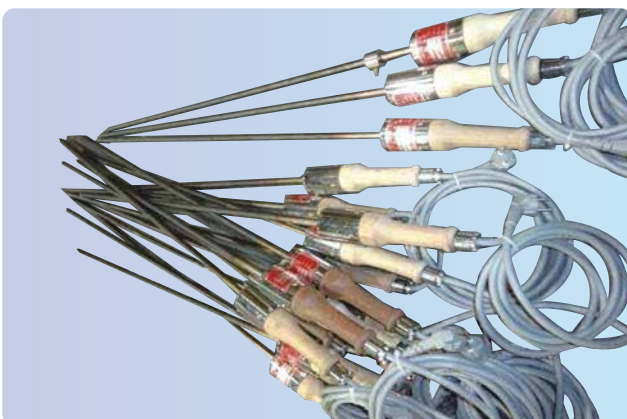
This heater is designed for the locking and unlocking of special bolts used in steam turbines. It is mainly applied in steam-sealed connection areas such as:

- Turbine casing flanges
- Inlet valve covers
- Pipe flanges

It is used for areas that require excessive force for locking and unlocking, such as:

- Bearing covers
- Coupling flanges

> Application Fields

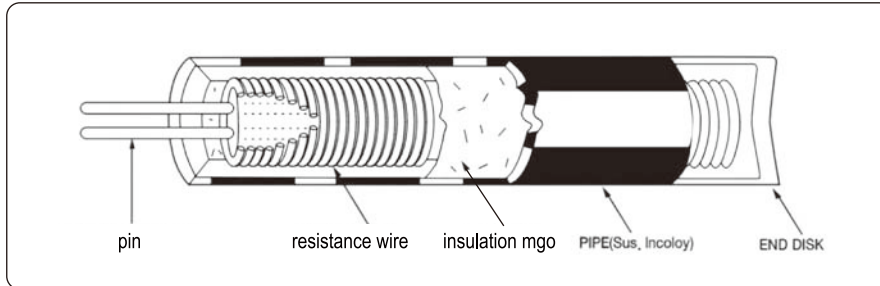


It is widely used for the assembly and disassembly of Stud Bolts in turbine casings at nuclear power plants and various other power plants. Additionally, it is utilized in large compressors, turbines, large cylinders, engine heads, steam generators, and large pressure vessels.

- Surface Load: 14-23W/cm² (Max 36W/cm²)
- Performance: Features anti-short circuit technology to prevent wire breakage, ensuring improved high-temperature performance for long service life. It also prevents malfunctions and provides strong locking capabilities.
- Specifications: Φ8 ~ Φ30.5

Cartridge Heater

> Internal Structure



insulation mgo	The heating wire wound on the core surface is precisely filled and compressed into the center of the pipe with high-purity magnesium oxide, known for its excellent insulation and thermal conductivity. It is compressed to a high density, akin to metal, using a high-pressure compressor.
resistance wire	Nickel-chrome wire is primarily used as the heating wire. This nichrome wire is coiled in a spiral shape with precise spacing on the surface of the high-purity magnesium core.
Pipe	The pipe material is usually made of SUS304, SUS316, or Incoloy. The heater surface, which is compressed to high density, is precisely straightened and polished to enhance the tight fit between the heater and the insertion area.

* Non-Compression is available when the watt density is 4W/cm² or less.

	Minimum ~ Maximum	Classification	Material	Maximum Operating Temperature
Length (mm)	25 ~ (∞)(Inquiry)	Low-Density Cartridge	Stainless Steel, SUS316	500 °C
Phi (Φ)	3.2 ~ 38	High-Density Cartridge	Incoloy 840, Incoloy 800	800 °C

High-Density Cartridge Heater Features

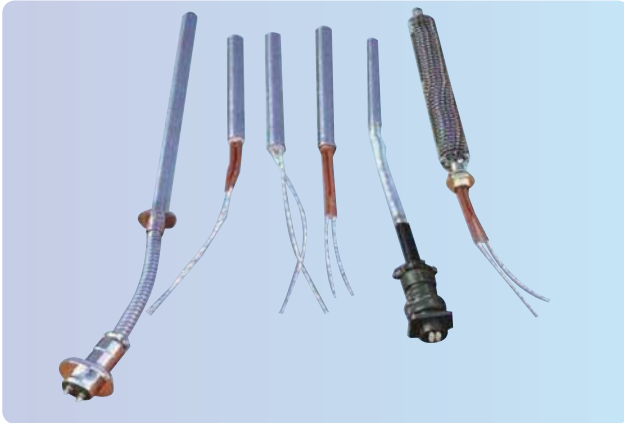
- High-density cartridge heaters help alleviate the problems caused by high-output density and high-vibration heaters, which have shorter lifespans.
- A double-walled, high-temperature fiberglass sleeve is used to insulate the connection between the nickel conductor and the nickel lead with optimal efficiency. Ceramic bobbins prevent the nickel conductor from shorting with the outer sheath when the lead needs to be bent frequently.
- Nickel conductors are used at the maximum allowable diameter, ensuring optimal electrical connections between the nickel conductor and the resistance wire (heating element), maximizing current flow.
- Ni-Cr resistance wire is precisely wound around the high-purity magnesium oxide core (placing the heating wire as close to the sheath as possible) to ensure excellent heat transfer, maximize power density, and guarantee a long lifespan.
- Argon welding ensures 100% protection against moisture and contamination, even during thermal expansion.

Low-Density Cartridge Heater Features

- Ceramic bobbins protect the cartridge heater from external contamination.
- The heating wire and lead wire are mechanically connected by a strong nickel connector.
- The spiral nickel-chrome heating wire is evenly distributed through the ceramic insulator.
- Stainless steel alloy sheaths are used in all low-density cartridge heaters, maximizing strength and resistance to thermal oxidation up to 650°C.
- Specially selected sizes and high-purity magnesium oxide are used to fill the remaining space inside the ceramic insulator, ensuring excellent heat conduction, high insulation strength, and long service life.

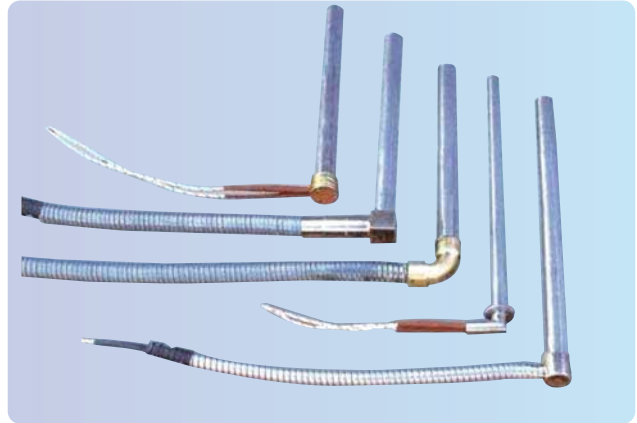
> **Standard Type**

- Semiconductor silicone rubber molding machines, molds exposed to significant impact
- Machines with limited space.



> **Flange Type**

- Pharmaceutical and confectionery automatic packaging machines
- temperature variation within $\pm 2^{\circ}\text{C}$
- Machines that generate dust - gas and liquid heating.



> **Bracket Type**

- Shoe-making machines, film packaging machines, photo development fluid heating, labeling equipment, heat sealing packaging machines.



1. 3-Stage Brass Nipple Type
2. Copper Elbow Flexible Type
3. SUS Square Bellows Type
4. Flange Elbow Type
5. Cap Elbow Type
6. Flange Type
7. Flange Sealed Type
8. Flange Terminal Type
9. Bracket Lead Insertion Type
10. Standard Type
11. Ring Bracket Type
12. Ceramic Lead Insertion Type
13. Square Bracket Type
14. FIN Plug Type
15. Sensor-Embedded Connector Type
16. Flexible Connector Type

$$\text{Required Heat for the Heater (kW)} = \frac{\text{Mass of the material to be heated (kg)} \times \text{Specific heat of the material to be heated (kcal/kg}^{\circ}\text{C)} \times \text{Temperature rise (}^{\circ}\text{C)}}{860 \times \text{Heating time (h)} \times \text{Efficiency (n)}}$$

Cartridge Heater

> Overview

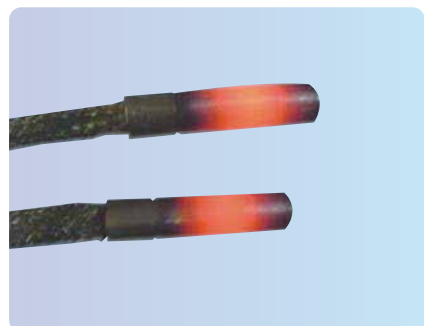
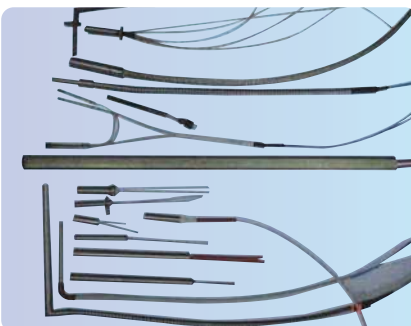
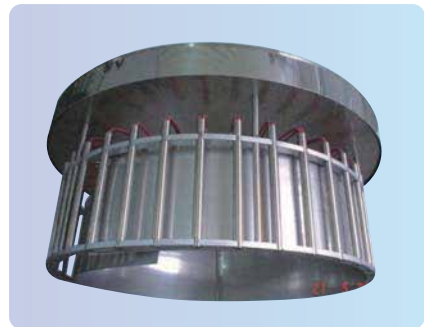
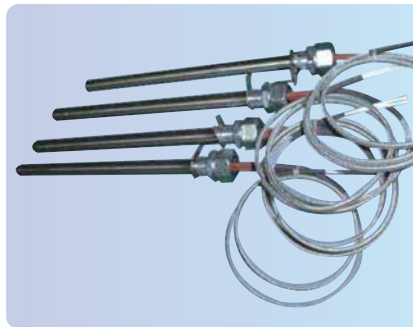
A cartridge heater is manufactured by uniformly winding a heating coil (spiral shape) inside or outside a metal protective tube and filling it with compressed magnesium oxide, which has excellent insulation and thermal conductivity properties. This heater can maintain a constant temperature and provides powerful heating in areas requiring high temperatures. It is typically a small heater that requires a high degree of precision, making it a specialized heater.

- **Internal Wiring Type (Breakage Prevention):** The heating wire inside the sheath is connected to a twisted nickel wire, and the twisted nickel wire and lead wire are connected externally. Since the nickel pins are not exposed, this type is more resistant to bending than traditional designs.
- **Sensor-Inserted Type:** A cartridge heater with an integrated K-type temperature sensor. This design combines the heater and temperature sensor into one, saving space and preventing excessive heating of the heater itself while allowing precise temperature control.
- **Flange Type:** A type with a flange attached to the heater's end, allowing for easy assembly using bolts.
- **Flexible Hose Type:** This type has the lead wires protected by a stainless steel flexible hose, preventing damage from external impacts and ensuring durability.
- **L-Type:** A design where the lead wires are bent in an L-shape, allowing for space-saving installation.
- **Nipple Type:** A type with a nipple welded to the heater's end, compatible with both metric and inch threads.

> Precautions

- When using the heater in a limited space, the hole into which the heater is inserted should be processed to fit as snugly as possible.
- Applying a suitable lubricant that can withstand the operating temperature makes insertion and removal easier, improves heat transfer, and enhances performance.
- The wiring connected to the heater must be designed to prevent direct mechanical vibration from being transferred to the heater.
- To ensure even heat distribution, the distance between heaters should be approximately the diameter of the heater itself.
- When storing the heater for extended periods, it should be kept in a dry storage room and sealed.
- Long-term exposure to the environment without sealing can cause moisture to infiltrate, leading to electrical leakage.
- Care should be taken to ensure that the lead wires are not exposed to water, oil, liquids, or moisture.

> Product Classification



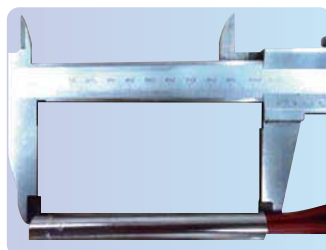
> **Features**

- Woory Electric Heat cartridge heaters can be produced with high densities exceeding 30W/cm² and can generate surface temperatures above 1000°C.
- The standard terminal lead length is 300mm, and the nickel lead wire connected to the terminal is a non-asbestos insulator that has undergone sufficient testing for continuous operation at 300°C, withstanding 300V or 600V. The terminal is connected to a 30mm nickel conductor.
- The maximum diameter of the nickel conductor is used to ensure excellent electrical connection between the nickel conductor and the resistance wire (heating wire), maximizing current flow.
- High-purity magnesium oxide with specially selected particle sizes is used to fill the space between the MgO and the inner wall of the pipe. The inside of the heater is compacted with a ceramic core and compressed magnesium oxide particles, resulting in improved thermal conductivity and insulation strength.
- Materials such as SUS304, SUS316, SUS310, Incoloy840, Incoloy800, and Inconel600 are used as the outer casing for all high-density cartridge heaters, maximizing physical strength and resistance to high temperatures and corrosion.
- Nickel-chrome heating wire is precisely wound around a high-purity magnesium oxide core (placing the heating wire as close to the sheath as possible), providing excellent heat transfer, maximizing power density, and ensuring long life.
- The end disk is argon-welded, providing 100% protection against moisture and contamination, even under thermal expansion.
- Do not heat in open air (risk of breakage or fire).
- Terminals are located on one side.
- Maximum heat is injected into a minimal space, providing the required heat in the smallest area.
- It can be customized in various shapes and size such as bending type and side lead type.



> **Measurement Method for Cartridge Heater Sizes Features**

Required information for product manufacturing: CH (code number) - operating temperature (°C), voltage (V), capacity (W), diameter (Ø), length (L), lead length (L).



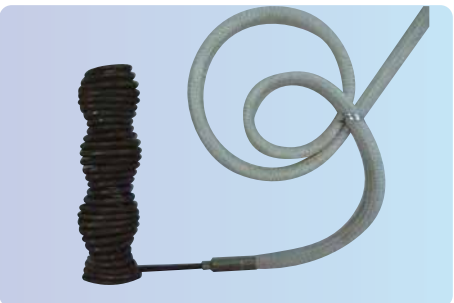
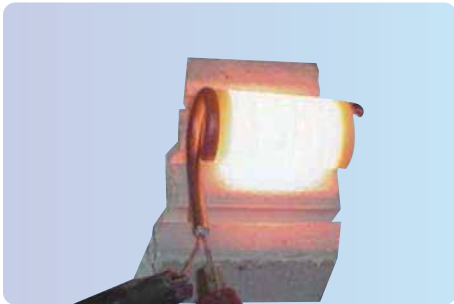
> **Applications**

Injection molds, extrusion molds, automatic packaging machines, film packaging machines, shoe-making machines, press molds, electronics heating equipment industry, plastic extruders, molding and dies, hot runner molds, medical equipment, food processing, gas and liquid heating, etc.

Coil Heater

> Overview

Coil heaters provide high thermal conductivity and insulation strength, continuously supplying uniform heat while preventing oxidation and corrosion at high temperatures, resulting in a long lifespan. When higher heat than conventional heaters is required, coil heaters are advantageous as they distribute heat 360° in all directions. They feature non-heating sections to prevent overheating of power adapters and have unidirectional terminals for compact wiring space.

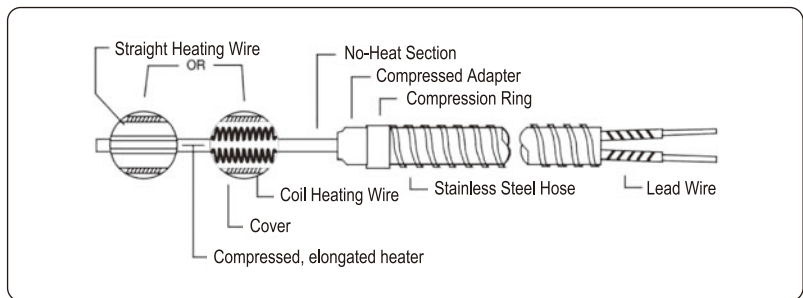


> Applications

1. Injection molding machine heating
2. Mold tip heating
3. Hot runner molds
4. Preheating of circular cylinders and transportation pipes at high temperatures
5. Extruder nozzles

> Features

1. Ideal for areas requiring high power density in round cylinders and molding nozzles, where installation is difficult. The heater can be freely bent, even at a minimum diameter of 3x3mm.
2. A sensor for thermal control (J-type or K-type) can be embedded.
3. Designed with a maximum power density of 15W, it can output more than five times the power of conventional mica heaters and can be custom-made to reach temperatures up to 800°C.
4. The square heating surface provides excellent heat conduction and long lifespan, making it a key advantage.

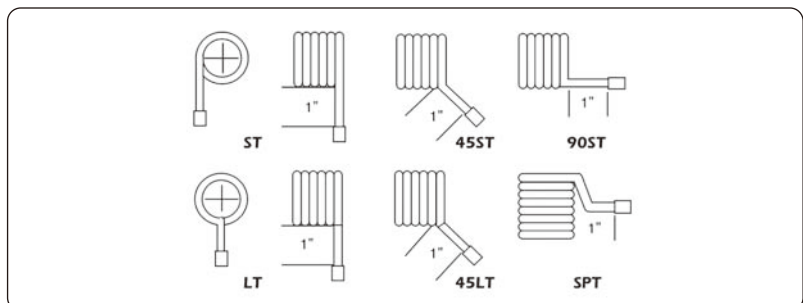


> Usage Method

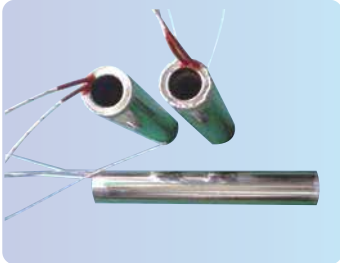
Insert the coil heater into the pipe or molds and tightly fasten the cover bolts. After initial heating, tighten the cover bolts once more. Ensure that the lead wire section is not damaged by eliminating any interference from other components.

> Materials

1. sus 304, 316
2. incoloy 840

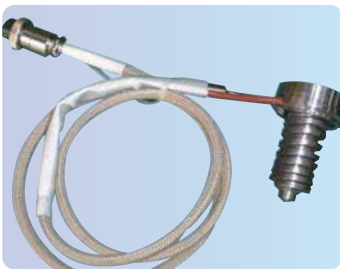


Hot Runner Heater (Mold Preheating Heater)



> Overview

The system is designed to remove the Sprue Bush from a conventional mold and install a nozzle with an integrated heater. This system, controlled by an electrical device called a Controller, applies constant heat to eliminate the sprue, allowing continuous production of the product without interruptions. It can be custom-made according to the mold.



> Features

- 1. External heating method (internal heating can be designed if required).
- 2. Improved productivity through mold automation.
- 3. Automatic runner drop in three-stage molds.
- 4. Easy color changes (Pin Gate Nozzle requires review).
- 5. Applicable to 1 Cavity Gate.

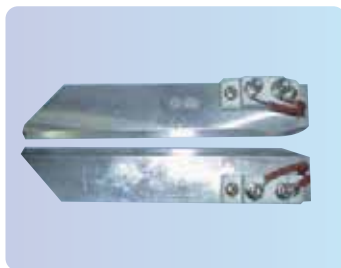
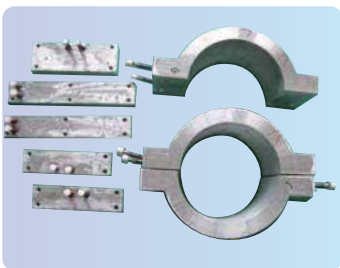
Mold Heater (cast in heater)

> Overview

The mold heater is a heater manufactured using a pipe heater as the heat source. Materials such as aluminum, cast iron, and brass are selected based on the application and temperature requirements, and these materials are cast and processed to fit tightly around the heating section. This allows for extensive and efficient heat transfer. Depending on the need, cooling fins can be installed, or cooling water can be introduced during molding. Due to the molding process, longer lead times may be required.

> Features

This heater is made from pipe heaters with excellent heat resistance, temperature durability, corrosion resistance, and durability. It is precisely cast into various forms, such as cylindrical, semicircular, polygonal, or flat shapes. The heater ensures uniform heating and has a long lifespan.

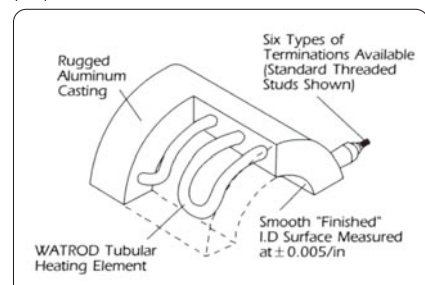
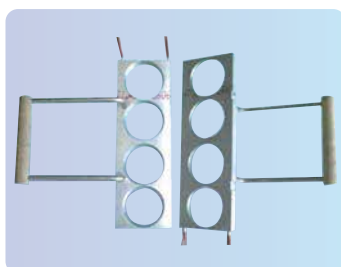
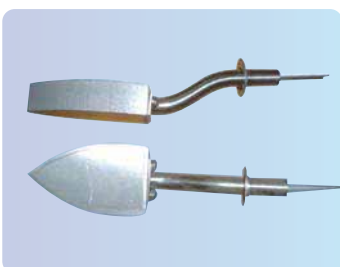


> Applications

Custom-made products suited for injection molding, extrusion machinery, press molds, and other mechanical applications. It is also used in textile production and garment manufacturing.

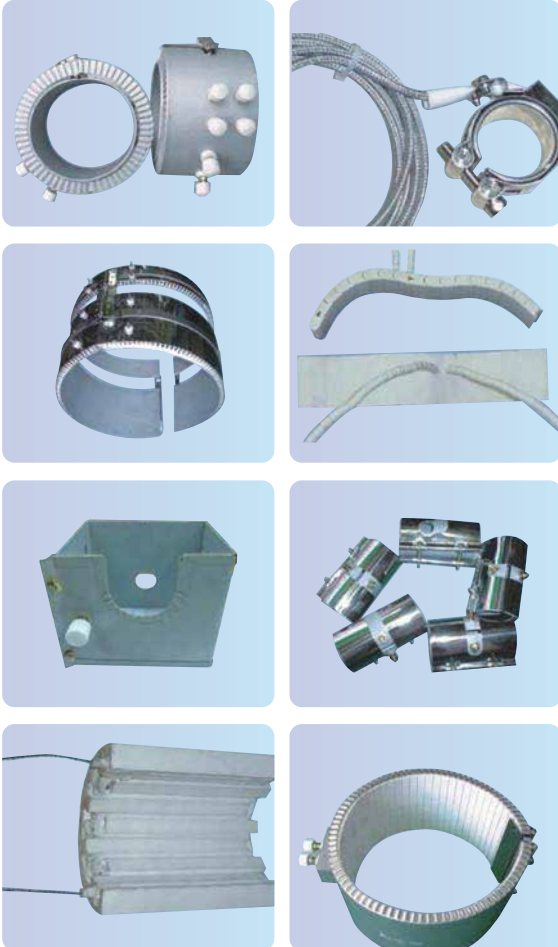
> Types

- 1. Aluminum (Al) - 400°C
- 2. Brass (BS) - 600°C
- 3. Iron (Fe) - 800°C and others



Band Heater

Ceramic Heater, Insulated Band Heater, Mica Band Heater



> Overview

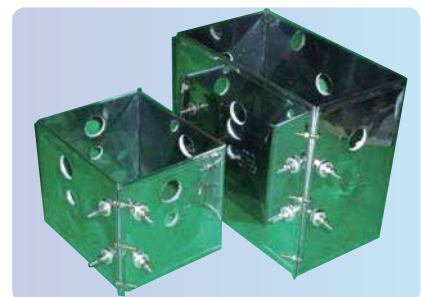
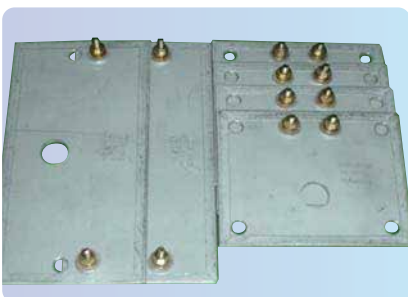
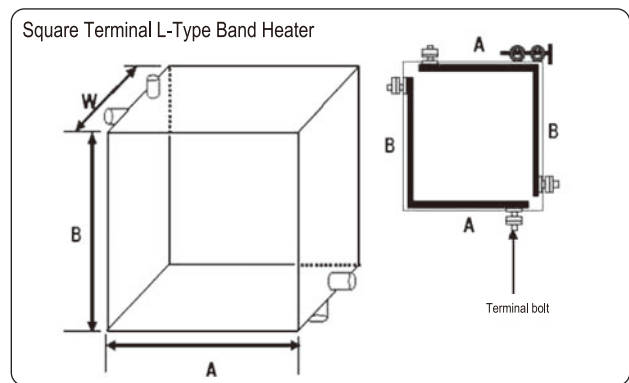
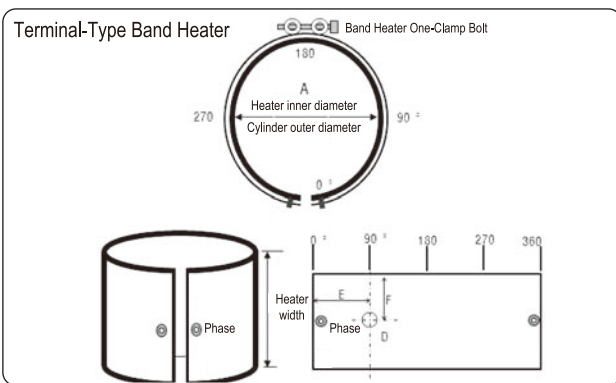
Band heaters are used in areas requiring heat transfer to pipe-shaped components, such as injection molding machines and extruders. They provide uniform heat over a large surface area.

> Applications

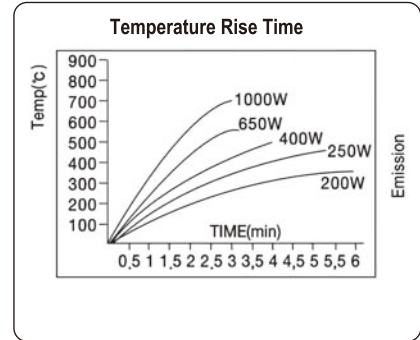
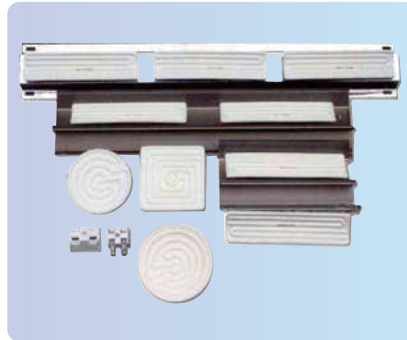
Band heaters are insulated with mica and manufactured with heat-resistant metals like galvanized steel or stainless steel. Due to their low heat capacity, they respond quickly to temperature control and have a very short heating time. As a result, they are used to increase the temperature of cylinders on equipment like injection molding machines and extruders up to 350°C. These heaters are typically manufactured with a power density of 2.5~5.0W/cm².

> Features

- 1. mica Band Heater**
Heats the object at high temperatures while providing excellent electrical insulation and fast heat transfer.
- 2. Plate Band Heater**
Used for heat-insulating plates, synthetic resins, molding, and photo dryers.
- 3. Ceramic Band Heater**
Provides excellent heat efficiency due to ceramic insulation and uniformly heats the object. It is a cylindrical heater, insulated with heat-resistant ceramic and wrapped in a stainless steel sheet, with a maximum operating temperature of 550°C.
- 4. Insulated Band Heater**
Insulates the outer wall of the heater with high-temperature insulation, minimizing heat loss and increasing efficiency by more than 30%.



Ceramic Plate Heater



> Heater Surface Temperature by Capacity

Classification	60 × 245mm	60 × 125mm	122 × 122mm	170 × 600mm
Capacity (W)	300 400 500 600 700 1000	200 300 325 500	400 650	600 800 1000
Average Temperature (°C)	450 510 560 600 630 750	510 600 630 750	550 680	550 620 730
Maximum Temperature (°C)	550 600 630 600 700 800	600 670 700 800	800 700	650 710 800

> Features

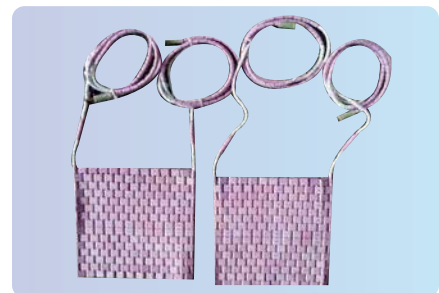
- Compact, making installation in narrow spaces easy.
- Made of material that closely resembles an ideal blackbody, maximizing infrared radiation.
- Insulated to prevent sagging of the heating wire during vertical use.
- The heating wire is molded into the ceramic.
- Resistance changes due to oxidation of the heating wire are minimal, ensuring long life.
- Can be mounted with a reflector. Optional: Reflector material (Aluminum, SUS)
- Uses radiant heat, so even if the heater surface temperature is lower than pipe heaters, the surface temperature of the heated object is higher.

> Applications

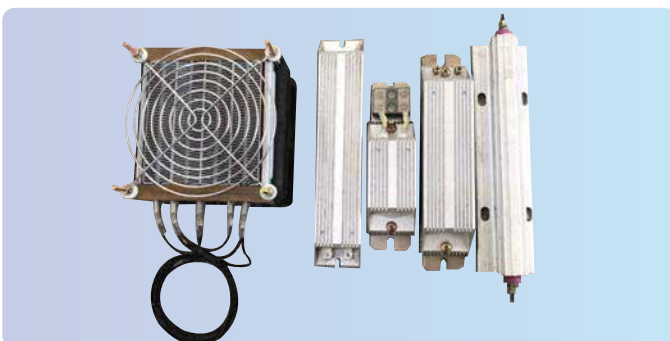
- Applied to heating and drying processes using radiant heat.
- General drying furnaces, painting drying lines, medium- to low-temperature (400°C) drying furnaces, and other radiant heating processes.

> Materials

- Internal: Ceramic
- External: Stainless steel, galvanized steel



Space Heater

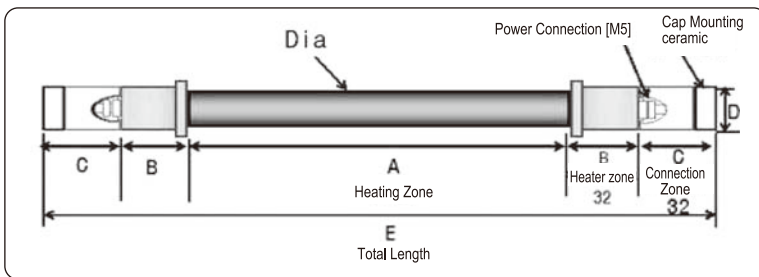
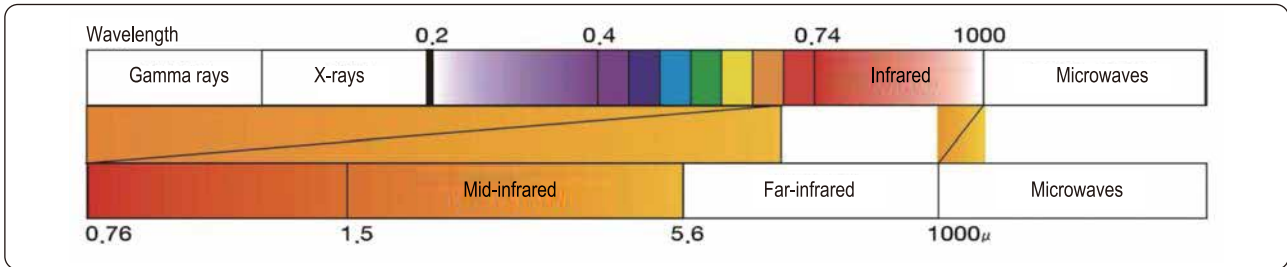


A space heater does not supply electricity during operation but is powered when the load is off to remove moisture from motors or panels. This maintains the insulation of the coil or circuit and enhances the durability of the product.

> Applications

- Dehumidification for medium and large motors.
- Dehumidification for large panel.

Far-infrared Ray Heater



Sunlight can be broken down into different wavelengths, as shown in the diagram, with far-infrared rays having the strongest radiant energy. Ceramic materials are used effectively to emit far-infrared rays.

> Features

1. Radiation (Direct Heating)
 - Far-infrared radiation directly reaches the object to be heated without the need for an intermediate heat transfer medium, resulting in high thermal efficiency and minimal heat loss.
2. Absorption
 - The wavelength of far-infrared radiation matches the wavelength of polymer materials (such as paints, synthetic resins, wood, and food), promoting molecular motion through resonance. This allows the radiant energy to be easily absorbed, reducing heating and drying time, and improving product quality through uniform heating both inside and outside.

> Applications



Fields of Application	Materials/Processes
Heating and drying	Coating, printing, electronic components, adhesives, plastic, resins, food, foam wallpaper
Shrinking	Epoxy curing
Polymerization promotion	Vinyl, heat shrink tubing
Cooking	Bread, cakes, barbecue
Health	Far-infrared therapy devices (promotes blood circulation), far-infrared saunas (promotes sweat secretion)
Agriculture, aquaculture, livestock	Agriculture, aquaculture, and livestock for drying, promoting plant and animal growth, and heating

Tube-Type Heater

> Characteristics of Far-Infrared Radiation

1. High thermal efficiency and strong mechanical strength.
2. Significant energy-saving effects.
3. Reduced processing time and improved product quality.
4. Long lifespan and easy maintenance.
5. A comfortable working environment that enhances productivity.

> Considerations When Designing a Far-Infrared Drying Oven

1. Heat Capacity Calculation - Consider the efficiency and drying time differences between far-infrared radiation and other heat sources.
2. Oven Shape - Depends on the shape of the product, production volume, and installation location.
3. Heater Specifications - Select the type and capacity according to the application.
4. Distance and Angle of Radiation - Affects efficiency, drying time, and product quality.
5. Internal Temperature Variation - Design to minimize temperature differences between the top, bottom, left, and right.

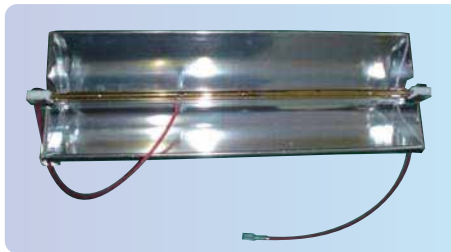
Near-Infrared Ray Lamp Heater

What is Near-Infrared?

In the spectrum of light, infrared refers to the wavelengths beyond the red side of visible light. Infrared has a longer wavelength than visible light, and near-infrared refers to wavelengths between 0.75 and 3μm, which are the shortest wavelengths in the infrared spectrum.



Voltage: 220V
Capacity: 1kW ~ 2kW
Types: Holder type, Lead type
*Custom production available upon request.



Quartz Heater

> Overview

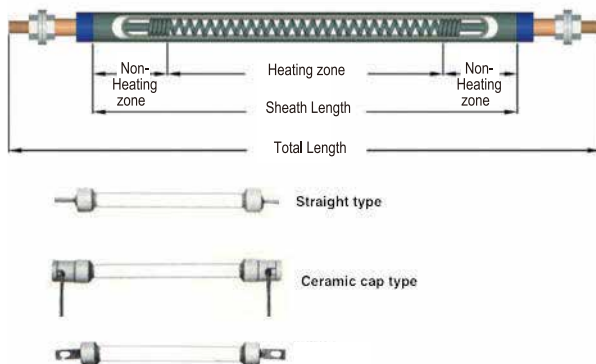
A quartz heater generates heat using a quartz tube, known for its excellent heat resistance and thermal efficiency. It is widely used for drying applications because it can rapidly heat and cool.

> Features

Uses radiant heat, so even if the heater's surface temperature is lower than a pipe heater, the surface temperature of the object being heated is higher. (Infrared radiation has a long thermal wavelength of 3~15μm, allowing deep penetration into the heated object.) Utilizes Ni-Cr heating wire, which has minimal resistance change due to oxidation and a long lifespan. Faster heat response compared to other types of heaters. Can be mounted with a reflector (Reflector material: Aluminum, SUS).

> Applications

Paint drying ovens, printing machines, general dryers, heaters, and other radiant heating processes.



Air Heater

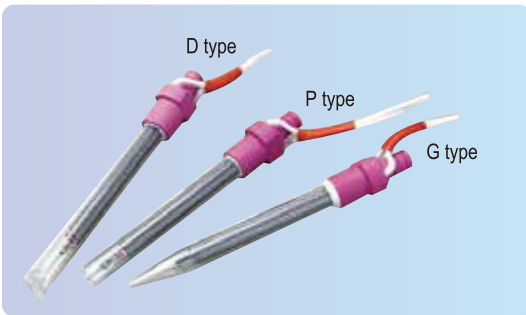
> Overview

The air heater is a groundbreaking product that can generate stable, high-temperature airflow exceeding 500°C. It is made by winding insulated wires around a ceramic insulating rod, followed by high-temperature treatment and oxidation-resistant coating. It is then protected by a stainless steel pipe (SUS PIPE) or quartz tube (QUARTZ).



> Features

- Compact size.
- Precise temperature control (adjustable to $\pm 1^\circ\text{C}$).
- Usable at high temperatures, up to 800°C.
- Capable of rapid heating and localized heating.
- Odorless, environmentally friendly, and pollution-free.
- Energy-saving.
- Instant heating and non-contact heating possible.
- T.P.R (SCR) voltage regulation.

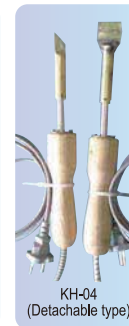
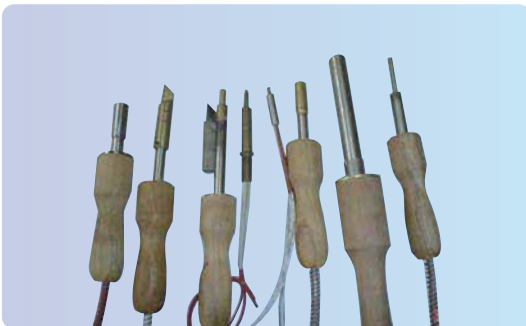


> Applications

- Welding of vinyl and plastic resins.
- Drying of adhesives, paint, ink, etc.
- Preheating of wire conductors.
- Automatic soldering of electronic components and drying of PC boards.
- Bending of rubber and plastic materials.
- Drying chips, moisture, powder, etc.
- Welding of automobile door trims.
- Processing of cosmetics.
- Various industrial processes (preheating, heating, soldering, curing, drying, welding, melting, sealing, cutting).

Hot Knife Heater

The Hot Knife Heater from Woory Electric Heat uses cartridge heaters and is made with copper plates, high-speed steel plates, and brass plates to deliver heat to specific areas.

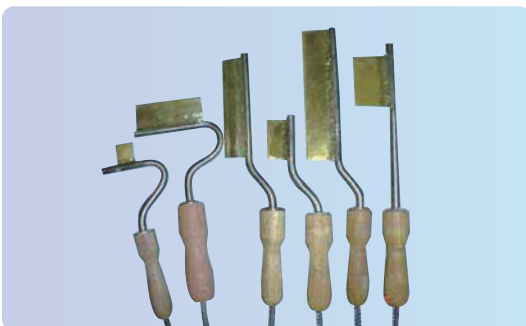


> Applications

1. Cutting nylon ropes
2. Cutting belt-type ropes
3. Processing and cutting holes in Styrofoam
4. Removing edges from injection-molded products

> Features

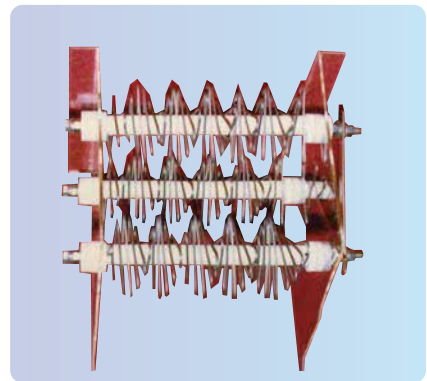
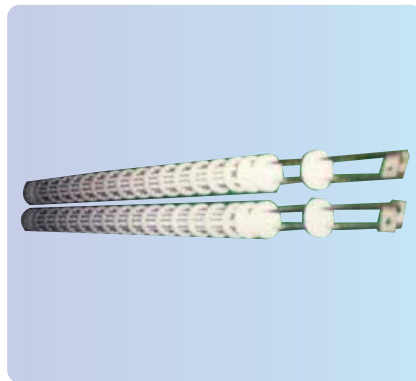
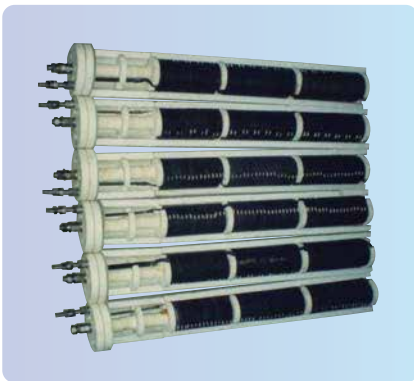
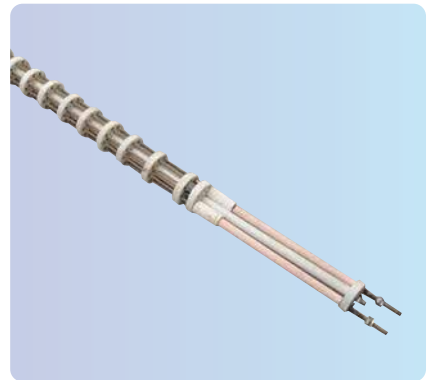
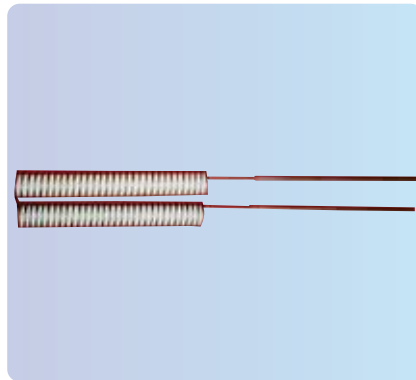
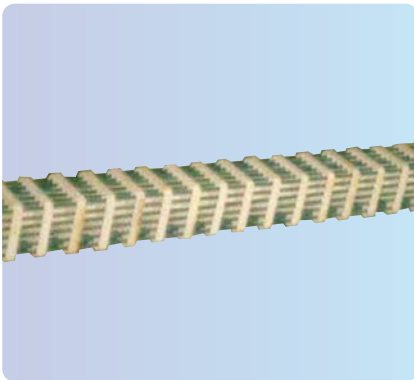
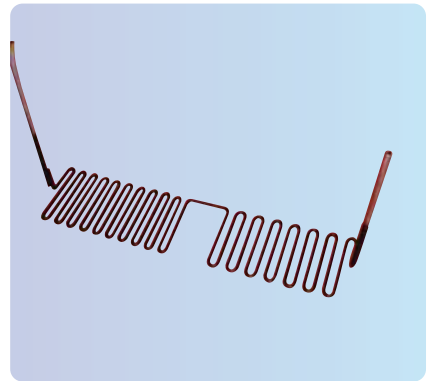
When cutting with a normal knife or scissors, the cut edges can fray. However, with the heat from the Hot Knife, the material melts and fuses, causing a self-welding effect, resulting in clean, smooth edges.



Radiant Tube Heater and heating element

> Overview

PYROMAX-DS is a premium heating element with an electrical resistivity of $145 \mu\Omega \cdot \text{cm}$ and a maximum heating element temperature of 1400°C , comparable to PX-C materials. This product is particularly known for its excellent oxidation resistance in open air, making it a top-tier heating element.



> Applications

Various high-temperature industrial furnaces, household electric heating appliances, continuous heat treatment furnaces, gas atmosphere furnaces.

> Features

High-temperature heating capability (up to 1400°C)

> Materials

1. Radiant Tube Heater
2. Strip Heating Element Heater

Convection Drying Oven



Interior of the Hot-Air Circulation Dryer
700 x 1500 x 600

> Overview

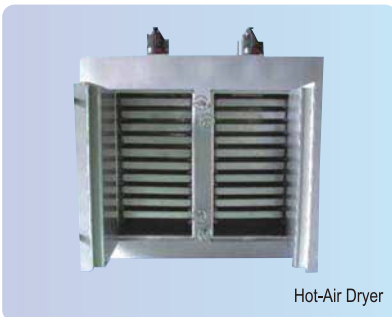
This dryer operates by using a blower fan to forcibly circulate the heat generated by the heater, resulting in very fast heat diffusion and uniform temperature distribution. As a basic drying device, it is applicable in many fields, including as an experimental device for production lines. All products are standardized, ensuring superior performance and an aesthetically pleasing design.

1. The temperature is controlled using PID CONTROL, which reduces temperature fluctuations and maintains a stable temperature over a long period.
2. Safety devices, such as overheating prevention and overcurrent breakers, are installed, making it easy to detect device malfunctions.
3. A timer is installed for better operational efficiency.
4. The hot-air circulation dryer employs forced air circulation with a blower fan to circulate the heat from the heater. This results in faster heat transfer and a higher temperature distribution compared to natural circulation dryers.



Vacuum Dryer

This is a tunnel-type continuous drying system that allows samples to be loaded, dried, and discharged without opening the door. It is mainly used in production lines with short drying times or high production volumes.



Hot-Air Dryer



Conveyor Dryer

Various Furnaces

> Overview

This equipment offers easy operation for various heat treatment products, allowing processes such as tempering and annealing. It can handle a wide temperature range from 0°C to 1050°C and uses lightweight, high-performance insulating materials to maintain precise temperature distribution at low, medium, and high temperatures. It is mainly used in production lines with short drying times or high production volumes. ① Ceramic firing/sintering furnaces ② Laboratory use ③ Heat treatment of small components

④ Mold heat treatment ⑤ Other multipurpose uses (200°C to 1800°C)



Car Bottom Type Furnace



> Applications

Annealing, tempering, normalizing, homogenizing, and heating

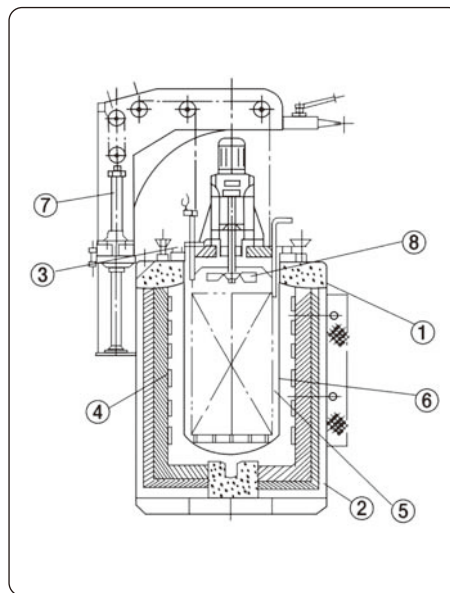
> Features

1. Capable of heat treatment for both small and large components.
2. Automatic or manual door opening and closing systems, and the car button driving system, make loading and unloading materials easy. Heat sources such as oil, gas, or electricity can be automatically controlled to ensure even temperature distribution within the furnace.

3. Energy savings are possible by using a heat exchanger to recover and reuse waste heat.
4. Widely used for tempering large components, heating small parts, and removing internal stress from welded, forged, or cast products.

● Maximum Operating Temperature: 650°C, 950°C, 1250°C

Pit Type Carburizing & Softening Furnace



- ① FURNACE BODY
- ② REFRACTORIES
- ③ DOOR-SYSTEM
- ④ HEAT ELEMENT
- ⑤ CHAMBER
- ⑥ BASKET
- ⑦ LIFTER ARM
- ⑧ CIRCULATION FAN

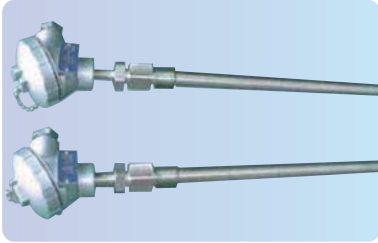
> Applications

Nitriding	Nitriding
Carburizing	Carbonitriding
Annealing	Bright quenching and bright annealing
Tempering	
QUENCHING	Suitable for various heating and heat treatment processes, including quenching and spheroidizing annealing.

> Features

1. Sturdy furnace structure.
2. Effective insulation structure.
3. Facilitates oxidation-free processing.
4. Top Plate design. Lifting mechanism driven by air cylinder
5. Maintains uniform temperature distribution through powerful stirring.
6. Excellent airtightness.
7. Vacuum system, among other features.
8. Forced Cooling System

Temperature Sensors



**Thermocouple Temperature Sensors
Metal-Sheathed Thermocouples –
NT Series**

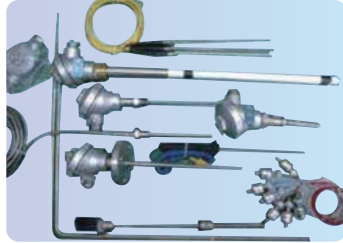
Thermocouple Types:

- K Type: 200°C ~ 1200°C
- J Type: 0°C ~ 750°C
- T Type: -200°C ~ 350°C
- E Type: -200°C ~ 800°C

Protective Tube Material: SUS 304, SUS 316, SUS 310, INCONEL 600, and other special steels depending on the application.

Protective Tube Outer Diameter: 6mm, 12mm, 15mm, 22mm

Mounting Device: PT/PF threads 1/8 inch to 1 inch, RF/FF flanges 10A to 125A



**Ceramic-Sheathed Thermocouples –
CT Series**

Thermocouple Types:

- B Type: 600°C ~ 1700°C
- R Type: 0°C ~ 1600°C
- S Type: 0°C ~ 1600°C
- C Type: 800°C ~ 2300°C

Protective Tube Material:

- Aluminum Ceramic (PT-1)
- Mullite Ceramic (PT-1)
- Silicon Carbide (SiC)
- Zirconia (Zirconium Dioxide)

Protective Tube Outer Diameter: 6mm, 8mm, 10mm, 13mm, 15mm, 17mm, 20mm, 26mm, 40mm, 45mm

Mounting Device: PT/PF threads, RF/FF flanges, special specifications for double-protected and 2-4 multi-point types



**Metal Sheath Thermocouples –
ST Series**

Thermocouple Types:

- K Type: -200°C ~ 1200°C
- J Type: 0°C ~ 750°C
- T Type: -200°C ~ 350°C
- E Type: -200°C ~ 800°C
- N Type: -200°C ~ 1200°C

Sheath Material: SUS 316, SUS 310, SUS 446, INCONEL 600

Sheath Outer Diameter: 0.5mm, 1.0mm, 1.6mm, 2.3mm, 3.2mm, 4.8mm, 6.4mm, 8.0mm, 12.7mm

Mounting Device: PT/PF threads 1/8 inch to 1 inch, RF/FF flanges 10A to 125A

Special Features: Explosion-proof type [d2G4], 2-12 multi-point types, spring-loaded types



**Max. 2300°C Exotic Thermocouples –
XT Series**

Thermocouple Types:

- C Type: 800°C ~ 2300°C
- B Type: 600°C ~ 1700°C
- R Type: 0°C ~ 1600°C
- S Type: 0°C ~ 1600°C

Sheath Material: Titanium (for max. 2300°C)
Molybdenum (for max. 2300°C)
Platinum Alloy (for max. 1650°C)

Sheath Outer Diameter: 1.6mm, 3.2mm, 6.4mm

Applications: Vacuum furnaces, atmosphere heat treatment furnaces



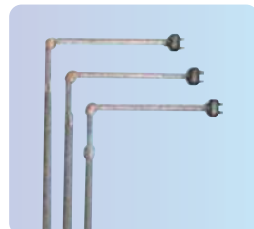
Thermocouples for Molten Metal

Thermocouple Types:

- K Type: 0°C ~ 1200°C
- N Type: 0°C ~ 1200°C
- R Type: 0°C ~ 1600°C

Protective Tube Types: Ceramic-coated cast iron tubes, special ceramic tubes

Protective Tube Outer Diameter: 16mm, 3.2mm, 6.4mm, etc.



**Thermocouples for High-Pressure
Injection Molding Machines**

Thermocouple Types:

- K Type: 0°C ~ 1200°C
- J Type: 0°C ~ 750°C
- T Type: 0°C ~ 350°C
- E Type: 0°C ~ 800°C

Sheath Material: SUS 316, Hastelloy



Controller

Thermostat

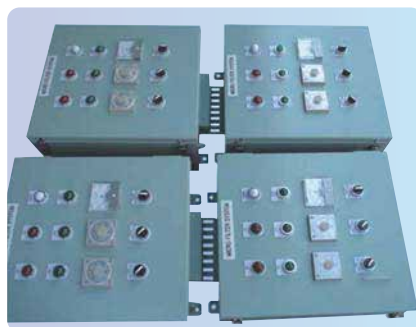


Control Panel



① **2" Socket-Type Heater (Waterproof Type)**
Can be used outdoors with the use of a waterproof HIBOX.

② **Bolt Heater Dedicated Controller**
Designed to safely operate 6 heaters simultaneously.



③ **Line Heater Controller**
Specifically designed to meet marine standards, ensuring stability.



Frost Protection / Self-Regulating / Heating Cable

High-Temperature Self-Regulating Cable

Underfloor Heating



ECO-CUTE 40/50-2CR (Estimated lifespan: 10 years or more)

Underfloor Heating
(Floor Heating)



ECO-CUTE 40/50-2 (Estimated lifespan: 10 years or more)

De-Icing

Gutter & Roof De-Icing Heating Cable



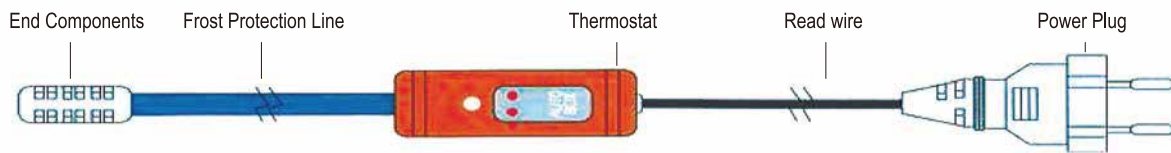
GRX-2CR (Estimated lifespan: 10 years or more)

Snow Melting

(Snow Melting Heating Cable)



SM2-CR (Estimated lifespan: 10 years or more)



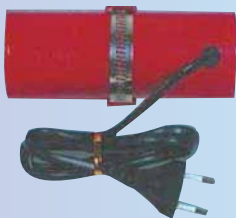
In-Pipe Insertion Type Heater (Camel Faucet), Band-Type Heater (Izen)



In-Pipe Insertion Type

> In-Pipe Insertion Heater

- Designed to prevent water pipes from freezing or bursting.
- Since heat is generated inside the water of underground water pipes, even if the ground is frozen solid, the water inside the pipe does not freeze.
- Convenient for self-installation in water pipes.
- Can be installed without tearing down the walls or floors of existing buildings.
- Can be installed in PVC pipes.
- Easy to install with simple tools.
- Insertion-type frost protection devices should be installed before freezing occurs for optimal convenience.



Band Type

> Band-Type Heater

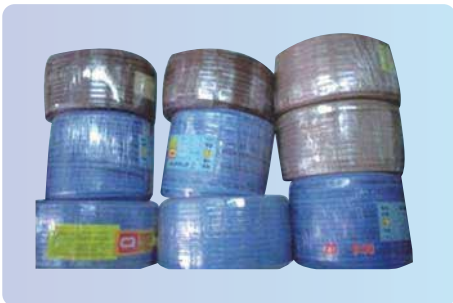
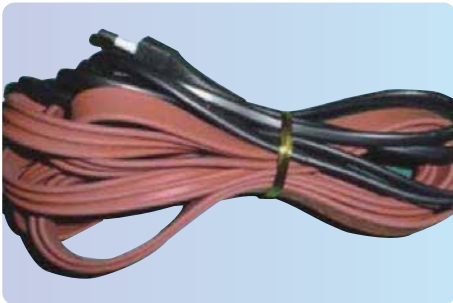
- Suitable for frost prevention and insulation during winter. Made from a highly safe silicone heater, there is no risk of overheating or short-circuiting.
- The band-type heater maintains an insulation temperature between 50°C and 75°C and has a semi-permanent lifespan.
- Designed for easy use, the band-type heater can be attached to water pipes and meter pipes to prevent freezing.

Automatic Sensor



> Product Features

- Turns on at 5°C ± 5°C and turns off at 15°C ± 5°C.
- Wire AWG18: For 220V 7A, use with lengths under 30m.
- Wire AWG16: For 220V 15A, use with lengths over 30m.
- * For lengths over 70m, attach a regulator.



> **Overview**

Raychem automatic control heating cables are designed for a wide range of applications, from general industrial use to residential settings. They can replace system tracing and be applied to any location or part.

> **Applications**

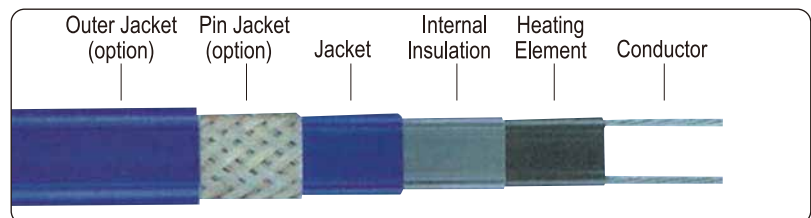
Insulation and temperature maintenance for gas and oil pipes.

1. Dehumidification equipment inside distribution panels.
2. Temperature maintenance for fuel pipelines.
3. Temperature maintenance for chemical pipelines.
4. Underfloor heating for various structures.
5. Freeze and burst protection for various pipes.
6. Heating equipment for various tanks.
7. Snow melting for sloped roads, parking lots, and runways.

> **Features**

1. Even if the heater is installed overlapping, no local overheating or damage will occur.
2. The heater automatically adjusts the amount of heat generated according to the increase or decrease in heat loss, minimizing power consumption.
3. The maximum attainable temperature (T_Rating) of the heater is consistent, ensuring safety.
4. Highly resistant to external shocks.
5. Flexible due to silicone molding.

> **Materials**



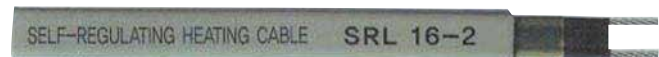
High-Temperature Self-Regulating Heating Cable

Freeze Protection for Cold Water Pipes



SRL 15-2, 30-2 (Lifespan: 10 years or more)

Freeze Protection for Cold Water Pipes



SRL 16-2 (Lifespan: 10 years or more)

Freeze Protection for Cold Water Pipes



SRF 16-2CR (Lifespan: 10 years or more)

Freeze Protection and Temperature Maintenance for Hot Water Pipes (SOLAR-TRACE)



HWSRL 10/30-2 (Lifespan: 10 years or more)

Temperature Maintenance for Chemical Pipes



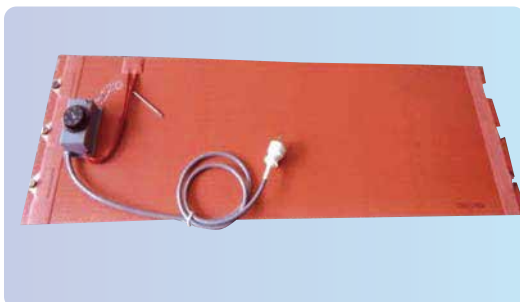
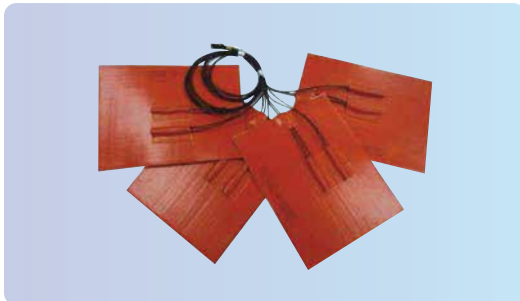
SRM30, 40, 50-2CR/CT (Lifespan: 10 years or more)

Jacket Heater



The primary function and use of the product is to indirectly heat the object. It is installed on the exterior of predetermined lines and vessels and can heat from room temperature (5°C) up to 800°C (max). The main applications include insulation and heating of gas transport lines, heating of gas vessels, heating of gas vaporization devices, pre-heater insulation and external heating, reaction-inducing heating of gas purifiers, and heating of liquid fluid lines to prevent leakage. The product is made from high-temperature (up to 1,200°C) cloth that has passed domestic and international flame-retardant certifications. Insulating materials used include ceramic wool and super wool, both of which are harmless to humans.

Silicone Rubber Heater



> Overview

This heater is designed to facilitate the easy extraction of high-viscosity liquids from drums. It heats the contents, such as adhesives, grease, asphalt, paint, wax, oils, and various resin materials, ensuring a consistent viscosity for use. It can also be used to prevent freezing in various piping systems.

> Features

- The sheet-like thin form and excellent flexibility allow the heater to completely adhere to the object being heated, ensuring superior thermal conductivity.
- Can be manufactured and processed into various shapes.
- Fast temperature rise and fall.
- UL Certification: File No. UL: E220698 Cat No. YHR
- Maximum operating temperature: 200°C
- Maximum production size: 500mm x 3000mm (custom sizes available).
- Operating temperature range: -60°C to 200°C
- Optimal watt density: 0.8W/cm²

> Applications

- Industrial equipment and devices for preventing freezing and solidification.
- Medical equipment, beauty equipment.
- Photo printing devices, printer and copier heating plates.
- Various chemical plants and facilities.
- Satellites and communication equipment.

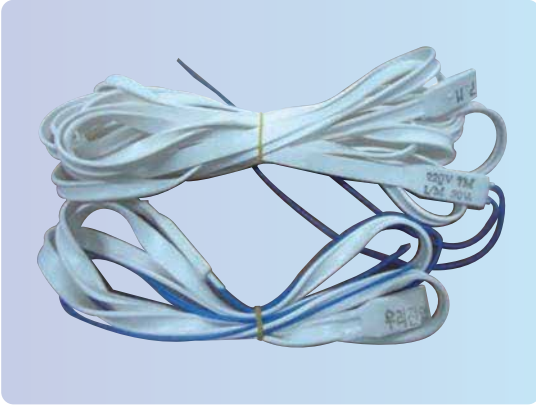
Line Heater & Teflon Tape

> Materials

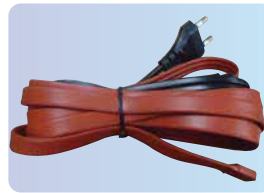


Type Size	Drum-Type		Pail-Type	Square Container
	200L (Large)	200L (Small)	20ℓ	18ℓ
Capacity	240mm × 1680mm	150mm × 1680mm	200mm × 887mm	250mm × 900mm
Temperature Control	220V / 2000W	220V / 1500W	220V / 530W	220V / 650W
Type	Adjustable from 0°C to 150°C			

Line Heater



Electrical Capacity: 220V, 30W/m (Operating temperature: 100°C~110°C)
Specifications: 1m, 2m, 3m, 5m, 7m, 10m, 15m, 20m, 30m
Highly flexible, making installation easy.
Can be used for freeze protection depending on the environment.
Primarily used for heating and maintaining the temperature of gas pipelines or pipe systems



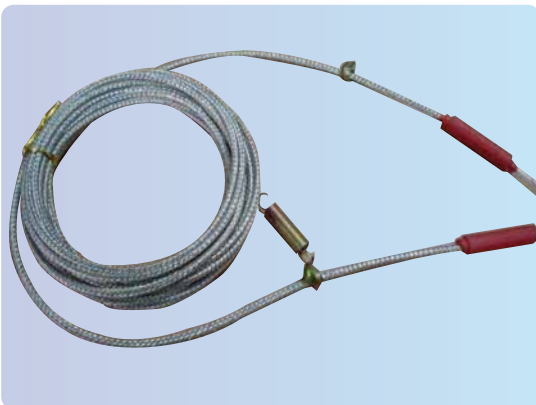
Grass Line Heater



High-Temperature Insulated Heating Cable (Asbestos-Free Heater)
Electrical Capacity: 220V, 200W/m(Operating temperature: 200°C~300°C)
Specifications: 1m, 2m, 3m, 4m, 5m, 10m

This is a high-heat-resistant, asbestos-free heater. It is highly flexible, making installation simple. Since it is not moisture-resistant, it must be used only in dry locations. The typical operating temperature is 200°C~300°C, and the maximum operating temperature is 450°C. The usual width is about 30mm, and the thickness is about 5mm. It is used for heating and maintaining the temperature of high-temperature tanks or pipelines.

Serial Resistance Line Heater



Serial Resistance Heater (Insulated Heating Cable)
Electrical Capacity: 220V, 80W/m (Operating temperature: 100°C~150°C)
Also Available: 40W/m
Specifications: 1m, 2m, 3m, 4m, 5m, 7.5m, 10m, 15m, 20m, 30m
Highly flexible, making installation easy.
Made of fiberglass and silicone rubber, and the outer cover is made of shield coating.
Not moisture-resistant, so it should only be used in dry environments.
The typical operating temperature for the 80W/m heater is 100°C~150°C, with a maximum temperature of 200°C. The outer diameter is approximately 5mm.

Electric Heater Reference Data

> Ohm's Law

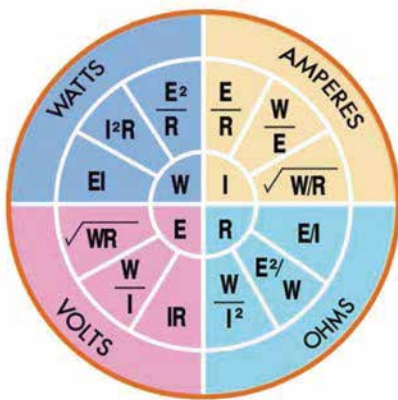
When a voltage (Volt) is applied to a resistor with resistance R (Ohm), a current I (Ampere) flows, as expressed by the following equations:

I = E/R(A), E=IR(V), R=E/R(Ω)

I = Current (Ampere) (A) E = Voltage (Volt) (V)

R = Electrical Resistance (Ohm) (Ω)

> OHM's LAW



> Electric Power

Electric power refers to the work performed by electricity per unit of time. $P = EI = I^2R$

> Heat Carolies

Heat Carolies refers to the amount of heat generated in a resistor with resistance R (Ohm) when a current I (Ampere) flows through it for t (seconds). It is expressed by the following formula:

$W=I^2Rt/4.186=0.24I^2Rt(\text{cal})$

> Unit of Heat Calories

The unit of heat calories is defined as the amount of heat required to raise the temperature of 1 gram of water by 1°C, typically represented as 1 cal. It is often expressed in Kcal or kWh as follows:

$1[\text{Kcal}]=4186\text{Joule(J)} [\text{Ws}]$
 $860(\text{Kcal})=1\text{kWh}$

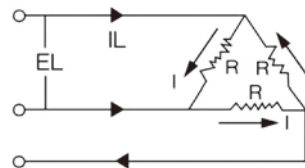
> Oxidation Temperature Table

	K	°C	°F
K	X	X + 273	5/9(X -32)+273
°C	X + 273	X	
°F	5/9(X -32)+273	5/9(-32)	X

> Three-Phase AC Circuit

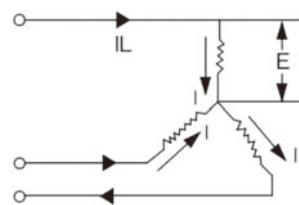
In a balanced three-phase AC circuit with a line voltage of E (V), the relationship between voltage, current, and power for Delta (Δ) or Star (Y) configurations is as follows:

> Delta (Δ) Connection



$IL = \sqrt{3}I$ (A)
 $I = EL/R$ (A)
 $W = 3ELI = 3ELIL(W)$
 $EL = \sqrt{3}E$ (A)

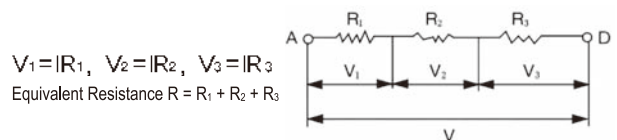
> Star (Y) Connection



$I = IL = E/R = EL/\sqrt{3R}(A)$
 $W = 3ELI = 3ELIL(W)$
 EL = Line Voltage (V)
 L = Line Voltage (V)
 I = Phase Current (A)
 R = Resistance (Ω)
 W = Power (W)
 E = Phase Voltage (V)

> Equivalent Resistance in Series Connection

When resistors are connected in series, the current flowing through each resistor is the same. If the voltage drops across each resistor are V¹, V², V³ and the current is I (A), then:



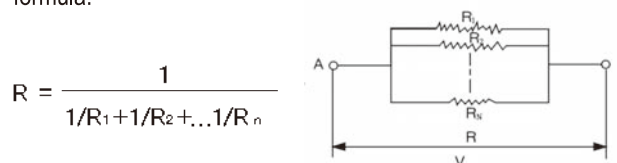
$V_1=IR_1, V_2=IR_2, V_3=IR_3$
 Equivalent Resistance $R = R_1 + R_2 + R_3$

The voltage (V) between points A and D is equal to the sum of the voltage drops across each resistance. Therefore:

$V = V_1+V_2+V_3=IR_1+IR_2+IR_3=I(R_1+R_2+R_3)$

> Equivalent Resistance in Parallel Connection

When resistors R₁, R₂, R₃...R_n (Ω) are connected in parallel, the equivalent resistance R is expressed by the following formula:

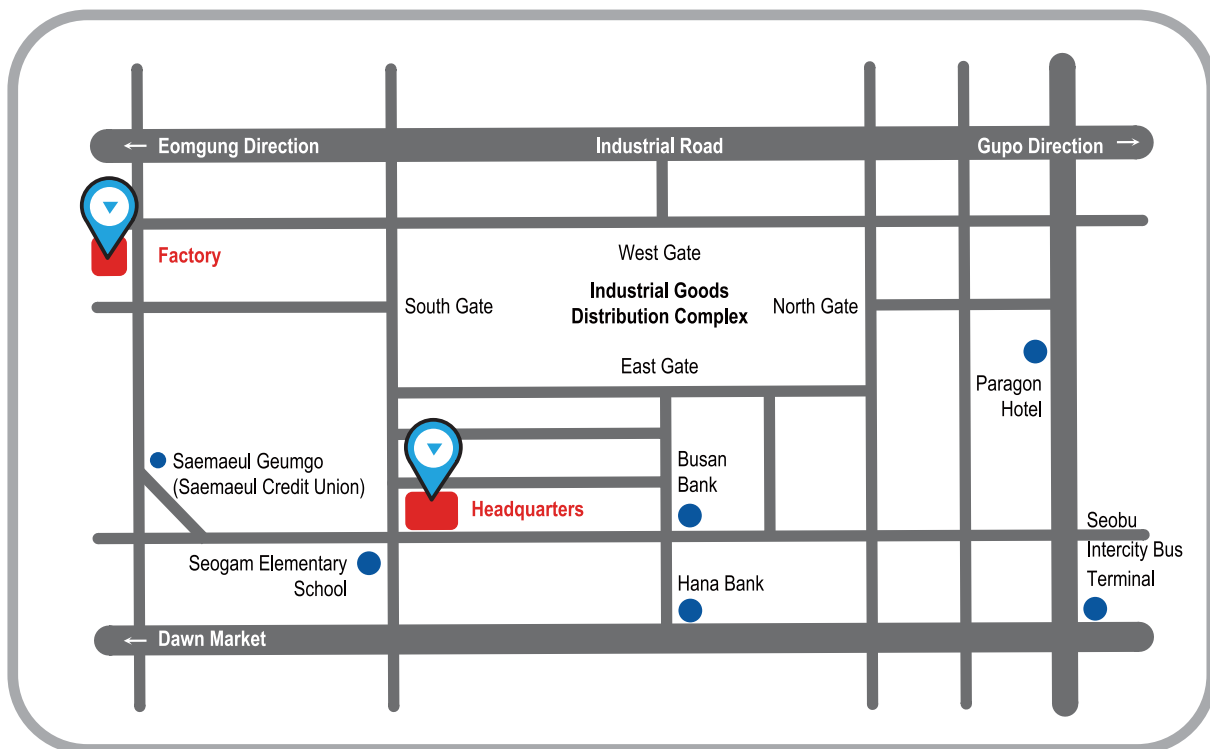
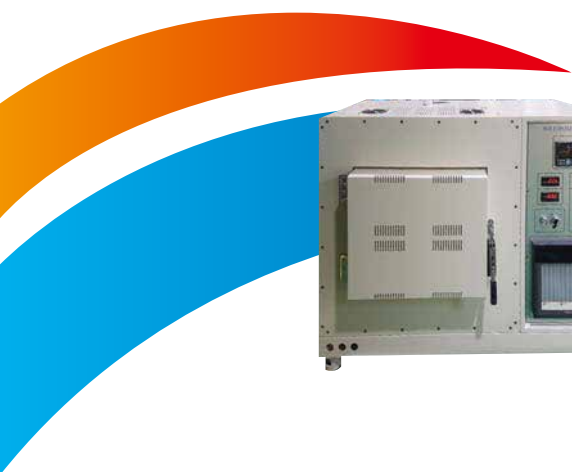


$R = \frac{1}{1/R_1+1/R_2+...1/R_n}$

> Surface Power Watt Density Calculation Formula

$kw/h = \left(\frac{P}{\pi \cdot D \cdot L} \right) (W/cm^2)$

P: Electrical capacity of the heater (W)
 D: Diameter of the heater (cm)
 L: Effective heating length of the heater (cm)



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