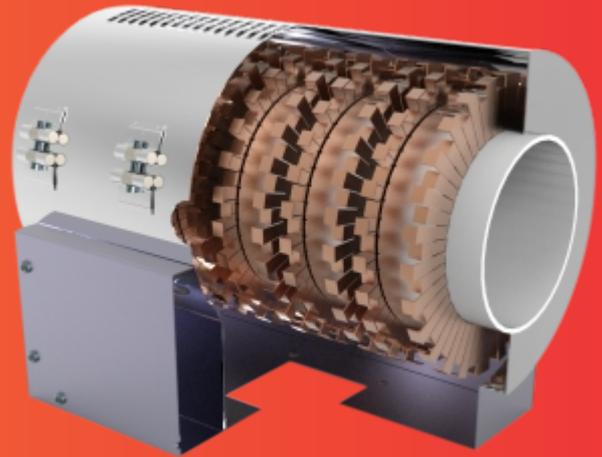


BLOWER ASSEMBLY



A blower assembly is used to distribute air in various kinds of equipment. It is commonly seen in cars, furnaces, and home appliances. During forging or furnace operation, air is the utility that should be available at all time in order to ensure a smooth and standardized operation. Supplying air manually will reduce productivity and more man hour to accomplish a given task.

Thus, an electric blower was designed in this regard with an efficient electric motor as the driver. The suction conditions and other application data are appropriately used to calculate the design parameters such as: suction specific speed, the power input to the blower, the inlet and outlet velocity, the twisting moment of the impeller shaft etc.

Beyond the basic parts of a blower assembly, there are several ways the equipment can be varied. Depending on its use, the wheel can be extremely long or wide. There can also be a wide variance in the way the assembly is secured. This includes different sizes of casings, which can range from small, circular models which are not much bigger than the blower wheel to larger rectangular structures. Depending on the use, the blower assembly can also be made to be affixed to

equipment in several different ways. Primary considerations include the amount of space available to secure the assembly and how much support the equipment needs, which typically depends on the size and power of a particular component. The configuration of a blower assembly depends upon the size and needs of the item being cooled. For small to mid-sized equipment a single assembly will typically suffice. Larger machines may have dual blower assemblies. Housing for the blower assembly will also vary, depending on the amount of space available. While housings can be made snug and still function adequately, these sizes are not ideal. For optimum performance, it will be made with extra space so the parts have room to function efficiently. They are exclusively engineered to endure the most rugged handling and withstand the increased workload expected of quality replacement products through years of service. Furnace blowers account for about 80% of the total furnace electricity consumption and are primarily used to distribute warm air throughout the home during furnace operation as well as distribute cold air during air conditioning operation.

TEMPSENS INSTRUMENTS (I) PVT. LTD.

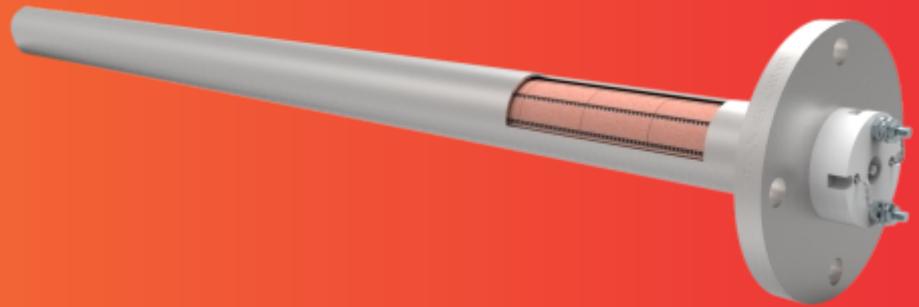
188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

BOBBIN/PIPE HEATERS



Bobbin heaters are mainly used for direct heating of air and indirect heating of liquids and gases where the element is fitted into a pocket in the process tank or system so that the element may be replaced without draining down the system or vessel. Highly energy efficient as heat is generated within the solution. Extensively used for transmission of heat, these heaters are available in various specifications that meet the individual necessity in the best possible manner.

Bobbin heaters are made with sheathed and without sheathed material. The sheath material ranges from nickel plated mild steel, copper, nickel plated copper to stainless steel. Resistance wire are supported on refractory insulators and connected to a terminal block at one end. Construction is done with Ceramic link bobbins in either single or 3 phase connections. Temperature sensors can be provided for accurate sensing. The element allows easy installation and handling. They are normally manufactured for horizontal mounting, but may be specially designed and constructed for vertical installation.

Designed for any voltage or wattage within manufacturing limits, bobbin heaters are mainly used for low watt density heating and low temperature range. Known to be one of the most common and versatile heaters in the vast range, they are economical, simple and have low cost installation.

Sheath Material	Copper, Steel, 304 Stainless steel, INCOLOY
Wattage	Up to 6 kW
Diameter	Up to 50 mm
Terminal Enclosure	IP 54 Standard Terminal Box IP 66 Water Proof Terminal Box
Control	Thermocouple, RTD, Thermostat, Digitally controlled
Immersion Length	Customized
Temperature	0 to 250 °C
Voltage	Customized

Benefits

- High quality
- Long life span
- Good conductor
- Highly efficient
- Versatile and non polluting
- Highly suitable for low watt densities

TEMPESENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

BUNDLE ROD HEATERS



As the name suggests, bundle rod heater consists of circular ceramic beads that hold the heating elements. They are designed for long life and maintenance free operation. The elements can be provided in almost any length but the standard dimensions available are 68 to 170 mm (2.6 to 6.6 inch). These heaters can be used as standalone elements or inside radiant tubes. Because of the ingenious design, Bundle rod heating elements deliver a much higher power (up to 100kW) than conventional cartridge heaters. In combination with the radiant tubes, a system is created which delivers high power, is rugged, versatile and needs low maintenance. Designed & manufactured in low voltages for faster heating in order to achieve temperatures quickly, these heaters can be mounted horizontally or vertically. Either NiCr alloy or FeCrAl alloy can be used as heating element. For temperatures up to 2100°F (1150°C), Austenitic (NiCr) alloy (80/20 or 70/30) and for temperatures up to 2597°F (1425°C), Ferritic (FeCrAl) alloy can be used. A comparison between bundle rod and cartridge heaters shows their effectiveness:

Superior Power Output

Bundle rod elements, with a higher power output, leads to major saving in cost and maintenance. Also when combined with Kanthal radiant tubes, they give highest power rating (up to 100 kW) as compared to any other heater.

Easy installation

Due to its ruggedness and versatility, bundle rod elements are easy to install and replace. Compatibility with radiant tubes allows installation to be either horizontal or vertical depending on the application. Easy repair and high temperature performance gives it an edge over others. Custom designed for the voltage and wattage required, bundle rod heaters are used in heat treat furnaces and die casting machines to molten salt baths and incinerators. With radiant tubes they can be used in high velocity convection furnaces and sealed quenched furnaces. They are also useful in converting gas-fired furnaces to electric heating.

COMPONENTS OF BUNDLE ROD HEATERS

- Terminal Rod: Carries the power supply wiring. Usually made of SS 310 or INCOLOY. Number of rods depends upon the supply connection.
- Ceramic Disc: Used to encompass all the heating elements to form a bundle. Made of Alumina. Usually flower shape.
- Center Rod: Used to provide central support to the heater. Usually made of SS 310 or INCOLOY. Is longer than the terminal rods.
- Fiber Disc : Used to hold the terminal rods and central rod together. Inserted in the cold zone of the heater. Made of ceramic fiber.

TEMPSENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

OPTIONS

Heating Element Material	NiCr / FeCrAl alloy
Wattage	45 kW / 100 kW
Max. Temperature	1200 ° C / 1425 ° C
Diameter	68 to 170 mm
Length	Customized
Voltage	240 or 480 V AC, Single phase or three phase

ADVANTAGES:

- Reduces CO2 emissions by eliminating flue gases.
- Minimized environmental impact
- Inside radiant tubes or as standalone elements
- Higher output with fewer assemblies
- Lower cost
- Reliable production
- Uninterrupted operation

The surface load has some limitations depending upon the temperature. A table shown below gives a brief idea:

Temperature	Max. Surface Load (W/cm ²)
Wattage	45 kW / 100 kW
Max. Temperature	1200 ° C / 1425 ° C
Diameter	68 to 170 mm
Length	Customized
Voltage	240 or 480 V AC, Single phase or three phase

If controlling of temperature is required in these heaters either Individual heating elements can be series connected for operating at voltages higher than supply, eliminating the need for transformers or On/ off supply control using slow or fast fired thyristors, SCR/SSR can be used to offer better control of furnace temperature. If controlling of temperature is required in these heaters either Individual heating elements can be series connected for operating at voltages higher than supply, eliminating the need for transformers or On/ off supply control using slow or fast fired thyristors, SCR/SSR can be used to offer better control of furnace temperature.

TEMSENS INSTRUMENTS (I) PVT. LTD.

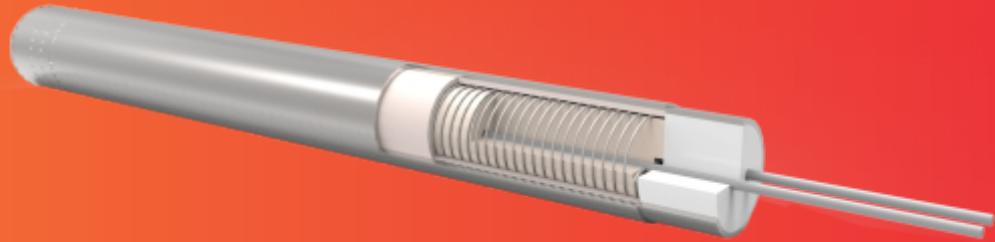
188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

CARTRIDGE HEATERS



Cartridge heater often considered as component heater has a heating coil wound on a ceramic core and are cylindrical-shaped, heavy-duty Joule heating element. Electricity flows through coil when a two or three-phase voltage is applied. The electricity heats the coil and, subsequently, the cartridge sheath. The watt density (in Watt/inch²) depends on the number of spirals or turns per inch. The sheath comes in contact with the surface being heated. Insulation in the cartridge heater ensures that the heating wire never comes in contact with the sheath and protects the sheath from melting in case of any mishap. The leads that come out of the heater terminal have metal conduit, or silicon sleeves to protect from high temperature. Lead wires are often fiberglass or silicon rubber.

These heaters provide a suitable, reliable and competent method of applying concentrated heat to solid metal components to high temperatures, particularly where compact, insert type heating is desirable. Swaged construction provides minimal air gaps, which lead to high efficiency and improved heat transfer. Distinguished for long trouble free service, cartridge heaters have precise dimensions and tolerances. Heating elements are kept close to the material being heated for maximum heat transfer, minimum core temperature, and faster heating. Use of stainless steel sheaths provides non oxidizing surfaces. The surface watts density and operating temperature of

a cartridge is dependent on hole clearance. The larger the hole clearance the lower the recommended watt density. For temperature sensing, a thermocouple should be positioned in the heater but its life is reduced by slow "on/off" cycling of power controllers. So PID auto tuning controllers with solid state relay or thyristor output are suggested.

OPTIONS

Sheath Material	Stainless steel, INCOLOY
Watt Density	Up to 400 W/in ²
Watt Rating	Up to 11.5 kW
Voltage	Up to 480V AC
Length	Up to 72 inches
Leads	Stranded/ Swaged in/ Pin leads/ Customized
Diameter	Up to 1.297 inches
Controls	Thermocouple/ RTD

TEMPSENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

SPECIFICATIONS

Resistance Wire : High grade nickel chromium resistance wire

Insulation : MgO

Leads : Stranded leads with silicone impregnated mica glass insulation or swaged in

Pin Leads : Available; Sealed using Epoxy or Teflon

Graphite Coating : For easy installation and removal

Thermocouples : Type J or K, grounded or ungrounded and attached either at the disc end or the middle of the cartridge.

Cold Section : Customized; controlled independently

APPLICATIONS

Application	Sheath Material
Molds, Metal dies, Patens, hot plates, sealing tools, fluid heating, aerospace, semiconductor industry	Stainless Steel, INCOLOY
Food service and medical equipment, Deionized water	Stainless Steel
General applications	INCOLOY
Highly corrosive applications	Titanium

OPERATING TEMPERATURES & WATT DENSITY

Material	Maximum Operating Temperatures		Maximum Watt Density	
	°F	°C	W/in ² /in ²	W/cm ²
INCOLOY	1400	760	400	62
Stainless Steel	1000	538	400	62

TEMPSENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

CERAMIC BAND HEATERS



Ceramic band heaters are medium-to-high temperature heaters that can deliver up to 1600°F (870°C). The heating element (Nichrome wire) is embedded in a flexible outer wall made of interlocking ceramic tiles, assembled like a brick wall. A ceramic fiber insulating mat and a stainless steel/ Aluminized Steel jacket cover this assembly. This makes them flexible, highly efficient, prevents heat loss and reduces electrical consumption by 20%. An energized ceramic heater that operates at 1200°F internally will have around 400°F on its outside shell. These durable heaters have versatile configurations which allow selection of clamping mechanism, terminal styles, holes and cut outs and perforations. Uniform heat distribution is an added advantage of ceramic band heaters. Limitations on the width of these heaters within a certain incremental range of sizes, is due to ceramic tiles that are available in specific lengths. Ceramic Band Heaters afford customers a means to heat large cylinders from intermediate to high temperatures without concern of failures due to "Hot-Spotting". A layer of thermal insulation reduces ambient heat loss and power consumption.

Some of the advantages of Ceramic band heaters include:

- Lower Operating Cost – Less heat escapes to the air and less wattage is required to maintain barrel

temperature, due to superior insulation.

- Heat transfer – Conduction and radiation are used as the means to transfer heat, thus they are less prone to thermal expansion problems and a near perfect fit is not required as with other heaters.
- Longer Heater Life – because all materials used are rated to operate at very high temperatures.
- Higher Operating Temperatures
- Flexible – easy to install and remove

Band heaters can be combined with high velocity fans to form fast responding heat/cool units in accurate heating applications. These heaters are made with a perforated outside stainless steel sheath, and with no insulating jacket.

OPTIONS

Application	Sheath Material
Sheath Material	Steel or Stainless Steel
Insulation Material	Ceramic Fiber Blanket
Watt Density	Up to 45 W/in ²
Watt Ratings	500 - 5000 W
Voltage	120-600 V
Width	1 ½ - 6"
Diameter	Customized

TEMSENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

CIRCULATION HEATERS



Circulation heater is basically an immersion heater covered by an anti-corrosion metallic vessel chamber. It is accompanied by National Pipe Thread (NPT) screw plug or ANSI flange heater assemblies mated with a pressure vessel. The vessel is mainly used to provide insulation to prevent heat loss in the circulation system. An inlet flange transports the fluid into the circulation system, which is then circulated and heated until the desired temperature is reached. The heating medium will then flow out of the output flange at a fixed flow rate decided by the temperature control mechanism. Since it is a compact heating system, the operation is fast and executed in a short time. The heat generated is evenly distributed and the efficiency of the heater is high. Drain valves are also provided to remove leftover fluids or residues. Temperature sensors can be used with any control to achieve the desired temperature range. To manage the liquid flow rate of the heater, the wattage can be manipulated. When the requirement is such that liquid is to be pumped around anyway, a circulation heater is a logical choice.

Circulation heaters provide a ready-made means to install electric heating with a minimal amount of time and labor. This is accomplished by combining heating elements, vessel, insulation, terminal enclosure, mounting brackets and inlet and outlet connections into a complete assembly. Such kinds of heaters are ideal for processing fluid, including hazardous liquids that require

intermediate heating while maintaining viscosity and flow rate, waste oil, steam, gases, and liquids like DE-ionized water for use in semiconductor and electronics industries. These heaters are specially used to heat up vegetable oils efficiently, so proper viscosity is maintained during food manufacturing using indirect heating. For maintaining correct viscosity, lower watt densities are recommended. Also no additional terminal box is necessary for this application.

OPTIONS

Sheath Material	Copper, Steel, 316 Stainless steel, INCOLOY
Kilowatt Ratings	500 KW or lesser
Wearing Watt density	6.5, 15, 23, 45, 65 W/in ² or 1.0, 2.3, 3.5, 6.9, 11.6, 15.5 W/cm ²
Flange & Vessel Material	Carbon steel, Stainless steel
Flange size	Up to 42 inches
Flange Rating	Up to 2500 lb pressure class ANSI
Terminal Enclosure	IP 54 Standard Terminal Box IP 66 Water Proof Terminal Box
Control	Thermocouple, RTD, Thermostat, Digitally controlled
Terminal Enclosure Standoff	4 or 6 inches
Terminal Seals	silicon resin, silicone fluid, RTV, epoxy or hermetic

TEMPESENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

Standard Size	1.25" NPT Screw Plug size to 14" diameter
Flange Gasket	Standard, Spiral wound or any other
Thermal Insulation	Standard, High temperature or weather proof jacket
Mounting position	Horizontal or Vertical
Diameter	0.26, 0.315, 0.375, 0.43, 0.475 inch or 6.5, 8, 9.5, 11 and 12 mm

Different alloys and materials can be used to suit specific applications. The table below shows working temperatures and watt densities of variety of materials

Sheath Material	Maximum Operating Temperatures		Maximum Watt Density	
	°F	°C	W/in ²	W/cm ²
INCOLOY	1600	870	60	9.3
316 stainless steel	1200	650	60	9.3
Steel	750	400	30	4.6

Some of the typical applications of circulation heaters with their specific attributes are shown in the table below.

APPLICATIONS

Application	Sheath Material	Flange Material
Clean water, hot water storage, portable water, freeze protection of liquid	Copper	Steel
Hot water, steam boilers, mildly corrosive solutions (in rinse tanks, spray washers), vapor degreasers	Incoloy	Steel
Oils (light or medium), Gases, hydraulic oil, stagnant or heavy oils, lubricating oil, crude asphalt	Steel	Steel
Process water, soap and detergent solutions, Boiler and water heaters, deionized water, chemical baths, mildly corrosive solutions	Stainless Steel	Stainless Steel
Severe corrosive solutions, demineralized water, food equipment	Incoloy	Stainless Steel

FEATURES

- Thermal insulation provided to prevent heat loss
- Mounting lugs provided for support
- Different terminal enclosures available for easy wiring
- Digitally controlled for precision
- Baffles and flange mounting holes provided.
- Easy to install, compact, clean and durable
- Works in conjunction with control panels
- Custom designed to meet specifications.
- Highly energy efficient and provide maximum dielectric strength.
- Compatible with standard industry piping and safety standards.
- Gaskets and mounting lugs provided as per specifications.

TEMSENS INSTRUMENTS (I) PVT. LTD.

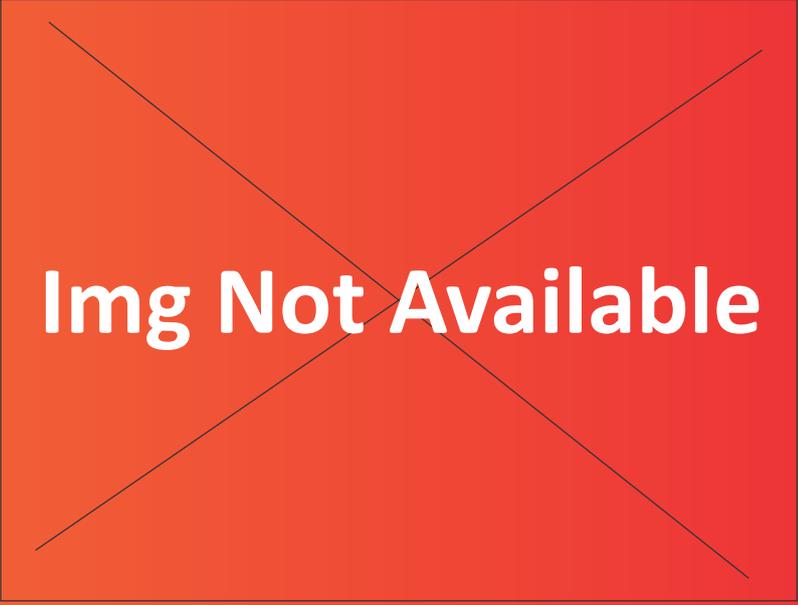
188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

EDGE WOUND HEATERS



Edge wound elements are used in applications where utmost power is required in limited space. These elements replace rod elements in furnaces requiring more power and are used to convert gas-fired furnaces to electric heating. Different furnaces such as roller hearth, pit, batch, low temperature aluminum tempering furnaces and high temperature exothermic gas generators use these heating elements to meet their heating requirement. A nickel-chromium alloy (80/20 or 70/20) forms the basis of these heaters. Dimensions are custom made to suit high temperature and high power ratings. Benefits include

- Higher power density
- Easy to install, replace and install
- Long service life at all temperatures
- Horizontal or vertical mounting
- Repairable to extend service life

OPTIONS

Heating Element Material	NiCr alloy (80/20 or 70/30)
Wattage	65 kW
Max. Temperature	1950 degree F (1050 degree C)
Length	Customized

TEMPSENS INSTRUMENTS (I) PVT. LTD.

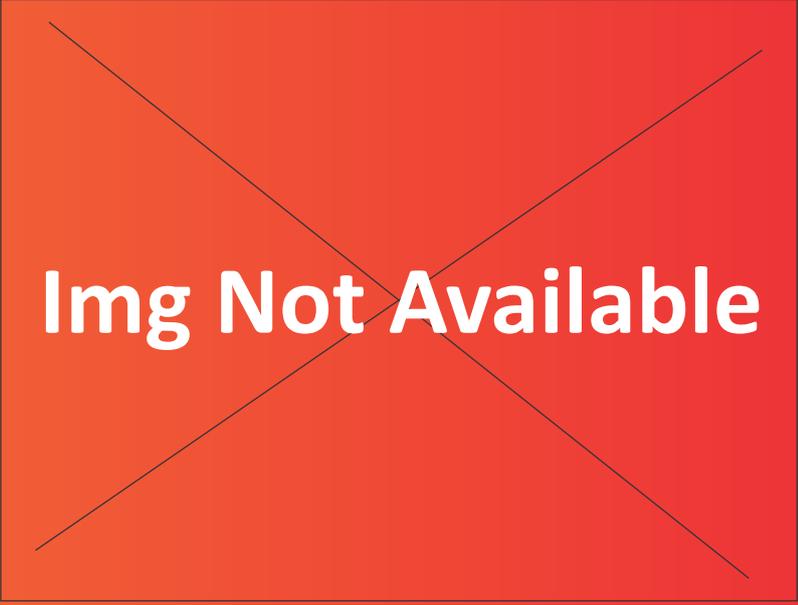
188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

FINNED STRIP HEATERS



Img Not Available

Finned Strip Heaters are used for both forced and natural convection air heating. It is designed using a helically wound resistance coil placed on a ceramic insulator. Remaining voids are filled with high purity magnesium oxide to increase thermal conductivity and dielectric strength. Continuous spiral fins are permanently furnace brazed to the sheath. Stainless steel rectangular tubing is used to house the heater assembly. It can be easily regulated by using a heating control panel or a thermostat as temperatures can reach as high as 500 degrees F. Lower sheath temperature and element life are all maximized by this finned construction as the fins improve heat transfer in free or forced air heating applications.

Finned Strip Heater is a flexible and reasonable heating source used across a wide range of applications such as process air heating (drying cabinets, ovens, baking ovens, vacuum dehydrating ovens, moisture protection for motors); dropping resistors for line applications in railroads and load banks; winterizing (hoppers, conveyors, ducts, car heating, thawing); original equipment (air conditioning, laboratory equipment, food packaging, ovens, presses, drying equipment).

OPTIONS

Sheath Material	Steel, 304 Stainless steel, Iron, Aluminum, Zinc coated Steel
Watt Density	Up to 38 W/square inch
Length	Up to 48 inches
Fins Material	Stainless steel, MS

TEMPSENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

MICA BAND HEATERS



Mica band heaters offer efficient and economical heating solutions to pipes and tubes that require external indirect heating. These heaters are used to heat-up the external surface of drums or pipes for a gradual heat transfer. A mica core surrounds the precisely wound heating element, producing a thin, efficient heater. The mica core is enclosed in a continuous corrosion resistant sheath and formed. All full mica band heaters are designed with closed ends to protect against contamination. The maximum sheath temperature is 800°F and is used mainly in plastic industry. Terminal boxes can be provided that protect terminations and also have the option of temperature controllers to help regulate applied heat. Mica is used as it provides exceptional insulation, dielectric strength and heat transfer capability for long heater life. Insulation is required to direct the heat to the application, avoid heat loss and slow heat-up time. In order to maintain a balance between the insulating characteristics of mica and the ease of heat transfer from the heating core, the thickness of each mica layer is cautiously selected. Various terminations are available with mica band

heaters keeping in mind the diameter, width, voltage, operating temperature and cost. Several types of dimension, wattage, voltages and material are available to suit different applications.

Mica band heaters provide perfect solution for high watt densities and high operating temperature applications. Pipe heating, drum heating, barrel heating normally used for oils, lubricants or other circular applications prefer these heaters as it offers safety when heating volatile and explosive substances as well as pipes or containers that cannot otherwise be heated using direct heating. Majorly sought for in the plastic industry, other areas where it can be installed are injection molding machines, plastic extruders, food industry, blow molding machines, pharmaceutical industry and container tank and pipe heating as it provides fast heat up.

TEMPESENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

OPTIONS

Max. Sheath Temperature	800 degree F or 427 degree C
Voltage	120 & 240V
Watt Density	Up to 45 W/in ²
Minimum Diameter	2"
Minimum width	1"
Regular gap	3/8"
Terminal Enclosure	Regular or moisture resistant terminal box
Control	Thermostat or thermocouple

FEATURES

- **Independent Straps** : Tightly clamped around the surface
- **Flange Lock-up** : Most economical clamping mechanism
- **Spring loaded** : Useful in thermal expansion
- Built in ceramic fiber insulating mat
- **Clamping Pads** : Designed for two-section partial heaters
- Latch and Hinges

TEMPSENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

DUCT HEATERS



Duct heaters are heat transferring devices which are an assembly of heating elements mounted in a frame or duct. Preferably used for non-pressurized air-heating systems, there are three types of duct heaters available: open coil, tubular or finned tubular heating elements that are either flanged or inserted in the duct. The individual elements are removable through the housing of the assembly, which eliminates the need to pull the complete heater from the ductwork. This reduces downtime costs because the heating elements can be replaced individually. Being the most easily adaptable heating solution, they are easily installed in applications requiring a wide range of temperature versus air flow combinations and offer greater reliability, energy efficiency, quicker response time and reduced infiltration from the air stream. Duct heaters can be equipped with a temperature control system and wired in various power configurations.

OPTIONS

Sheath Material	Steel, Copper, Stainless Steel, INCOLOY
Watt Density	Up to 40 W/in ²
Wattage	Up to 2 MW
Controls	SSR/ SCR/ Digitally Controlled
Diameter of Tube	0.260, 0.315, 0.375, 0.430, 0.475
Voltage	120, 240, 300, 480, 600
Sheath Length	11 – 240 inches
Process temperatures	-29 to 650 ° C

FEATURES & BENEFITS

Terminal Enclosures

In addition to the standard, general purpose terminal enclosure, the following optional terminal enclosures are available to meet specific application requirements:

- Moisture resistant
- Explosion resistant
- High-temperature stand-off enclosures

TEMSENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

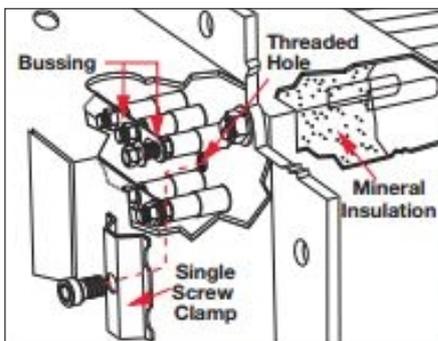
Control

Type J or K thermocouples, inserted in the thermowell, accurately sense element sheath temperature for over-temperature conditions. Using a thermocouple requires an appropriate temperature and power controller.

Field replaceable heating elements

Permits easy service and reduces downtime. Element change out is made simple by a single screw clamp.

Rigid stainless steel support



Prevents element sagging or deformation in various mounting positions

FAVORABLE FEATURES

- Provide great mechanical strength
- Not prone to moisture and dust
- Quite easy to mount
- Durable and easy maintenance
- Rugged construction eliminates hazard of electric shock
- Reinforced frame allows for minimum vibration and elevated temperatures
- Typically used for outdoor applications or in environments that are too harsh for open coil elements

APPLICATIONS

- Heating of platens and molds
- Air dryers
- Load Banks – Resistive
- Industrial Ovens
- Industrial Cabinets
- Preheating
- Reheating
- Laboratory Testing

OPTIONS

Tubular duct heaters offer a number of options

- Digital controls, Contactors, Relays, SCRs available for the most accurate temperature readings
- Disconnecting switches, airflow switches to help control unexpected pressure drops
- Fuse blocks and optional fuses available for low resistance and cool operations.
- Manual reset limit thermal cutout is used to prevent excessive temperatures with this the terminal housing

TEMPESENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

FINNED TUBULAR HEATER



Finned tubular heaters are superior to tubular heaters since fins greatly increase surface area, permit faster heat transfer to air and permits putting more power in tighter spaces—like forced air ducts, dryers, ovens and load bank resistors resulting in lower element surface temperature. They are made of up of tubular heating elements and are equipped with electro galvanized steel fins. Mechanically bonded continuous fins assure excellent heat transfer and helps prevent fin vibration at high air velocities. As the surface area is increased and heat transfer is improved due to fins, it results in lower sheath temperature and maximizing of element life.

These industrial heating solutions are among the most common heaters and are best suited for a large number of applications such as conduction, convection, and radiation for stoves, industrial ovens, drying cabinets, air conditioners etc. They can be used in virtually every industrial environment up to about 750°C (1382°F) and be molded into many unique and complex shapes. Finned heaters are extremely rugged, have low capital cost and require negligible maintenance.

OPTIONS

Sheath Material	Copper, Steel, 304 Stainless steel, INCOLOY, Titanium
Watt Density	Up to 120 W/in ²
Fins Material	MS, Stainless Steel
Voltage	Up to 480 V AC
Operating Temperature	Up to 1200 °F or 650 °C
Diameter	0.375", 0.430", 0.475" or 9.5 mm, 11 mm, 12 mm

FEATURES

- Variety of custom bends available
- Silicone seals to ensure moisture resistance in humid environments.
- Numerous types of terminations available
- Customized cold sections
- Single ended termination
- Stainless steel mounting bracket, welded to the terminal end.

TEMSENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

OPTIONS

Material	Applications
Copper	Water Oil Grease Solutions non-corrosive to copper
Steel	Alkaline cleaning solutions Tars Asphalt Air heating
Stainless steel	Corrosive liquids Food processing equipment Radiant heating
Incoloy®	Cleaning and degreasing solutions Corrosive liquids
Inconel®	Plating and pickling solutions Acid
Titanium	Corrosive liquids

BENEFITS

- Increase in surface area to approximately 16 square inches for every linear inch of element length.
- Precise and easy control of heat Output
- Easy to install and replace
- Provides protection against humid storage conditions
- Configurable to virtually any shape
- Compact size and durable

TEMPSENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

FLANGED IMMERSION HEATERS

Img Not Available

Flanged industrial immersion heaters are amongst the most popular heaters owing to wide customization, easier installation and operations in stringent environment. Made by brazing or welding flange with several hairpin elements or bulge tubular elements, these are designed for heating chemical, petroleum and water based applications specially heat transfer fluids, medium and lightweight oils and water in tanks and pressure vessels. A thermocouple or RTD is often used within the bundle of elements to maintain the desired target temperature. Extra wiring boxes to make electrical connections are provided with it. Tubing known as a thermowell is used to protect thermocouples and heating elements. Temperature readings are then transmitted to a control unit that regulates power. Although, they occupy a small space, but have a large heating element which is perfect for applications which require high wattage heating. This is one of the most efficient forms of process heating with nearly 100 percent efficiency.

Different alloys and materials can be used to suit specific applications.

For instance, steel flanges are used for deionized water, lubricant oils, heavy and light oils, waxes as well as mildly corrosive liquids and low flow gas and water tank heating. Stainless steel flanged heating elements are used with mild and severe corrosive solutions and military applications. The sheath materials used can be steel, stainless steel, copper as well as exotic alloys such as incoloy.

OPTIONS

Sheath Material	Copper, Steel, 304 Stainless steel, INCOLOY, Titanium
Watt Density	Up to 120 W/in ²
Flange Material	MS, Stainless Steel
Flange size	Up to 480 V AC
Flange Rating	Up to 1200 °F or 650 °C
Diameter	0.375", 0.430", 0.475" or 9.5 mm, 11 mm, 12 mm
Terminal Enclosure	IP 54 Standard Terminal Box IP 66 Water Proof Terminal Box
Control	Thermocouple, RTD, Thermostat, Digitally controlled
Immersion Length	Customized
Voltage	Up to 600 V
Wattage	Customized

TEMSENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

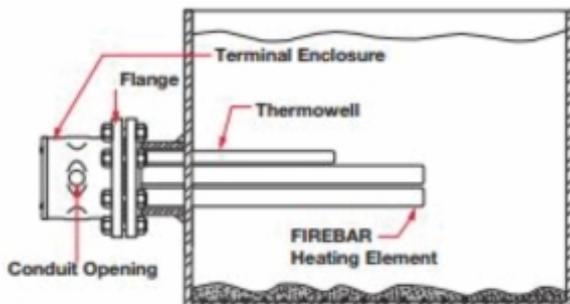
Different sheath materials used have different operating temperatures and watt densities. While selecting the material these values must match your criteria. Table shown below will help to make an ideal selection.

Sheath Material	Maximum Operating Temperatures		Maximum Watt Density	
	°F	°C	W/in ²	W/cm ²
INCOLOY	1600	870	60	9.3
316 stainless steel	1200	650	60	9.3
Steel	750	400	30	4.6

Some of the typical applications of flanged immersion heaters with their specific attributes are shown in the table below.

Application	Sheath Material	Flange Material
Clean water, hot water storage, portable water, freeze protection of liquid	Copper	Steel
Hot water, steam boilers, mildly corrosive solutions (in rinse tanks, spray washers), vapor degreasers	Incoloy	Steel
Oils (light or medium), Gases, hydraulic oil, stagnant or heavy oils, lubricating oil, crude asphalt	Steel	Steel
Process water, soap and detergent solutions, Boiler and water heaters, deionized water, chemical baths	Stainless Steel	Stainless Steel
Severe corrosive solutions, demineralized water	Incoloy	Stainless Steel

OPTIONS WITH FLANGED HEATERS



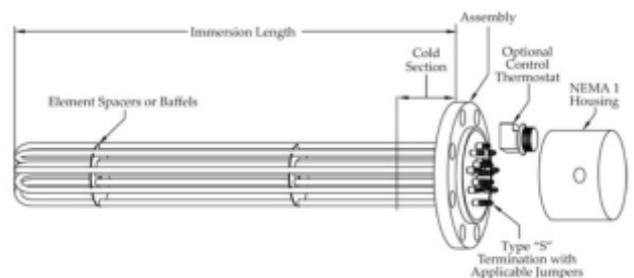
Terminal Enclosures

Apart from general purpose terminal enclosures without thermostats, other types are also readily available.

- Moisture resistant
- Corrosion resistant
- Explosion resistant
- Explosion/Moisture resistant combination
- Standoff terminal enclosures

Temperature Control

- **Thermostats** : It provides process temperature control and is generally mounted inside the terminal enclosure.
- **Thermocouple** : Type J or K thermocouple offers precise temperature control and sensing. It can be mounted inside the thermowell or attached to heater's sheath. It essentially consists of a temperature and power controllers such as digital controllers or SCR as desired.
- **RTD's** : If precision greater than thermowell is desired, an RTD is the right solution to the problem.
- **Gaskets** : Rubber, asbestos-free and spiral wound gaskets are available for all flange sizes.
- **Baffles** : Also called as Element spacers. Standard supports are provided for open tank or convection heating applications. In order to enhance or modify fluid or gas flow for better heat transfer, 316 stainless steel baffles can be provided.



TEMSENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

BENEFITS OF CHOOSING FLANGED HEATERS

- 100% efficient and versatile
- Easy installation, control and maintenance
- Designed and built for safety
- Perfect for higher kW output applications

Before buying flanged immersion heaters, some things are to be kept in mind.

- Supply voltage: Single phase or three phase
- Heat capacity
- Housing
- Sheath Materials
- Heating element materials
- Temperature controls

TEMPESENS INSTRUMENTS (I) PVT. LTD.

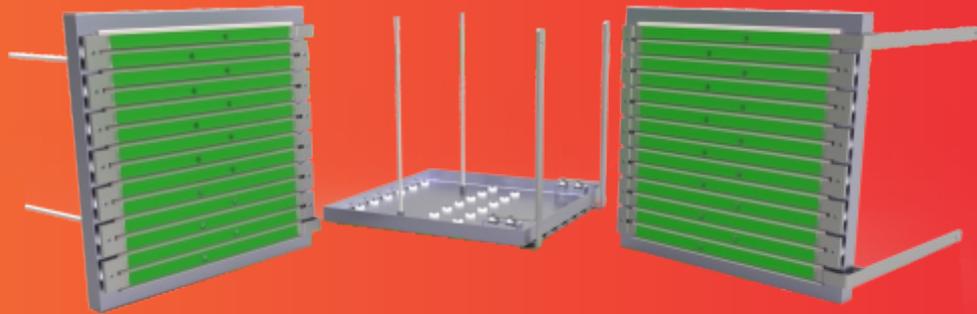
188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

INDUSTRIAL INFRARED HEATERS



Infrared heaters are electric heaters specifically designed to emit infrared heat, where heating by other means is not ideal. As they rely on infrared energy, they are able to transmit heat without losing it to the outside. Infrared heaters use either quartz element or tubular element that radiate ample heat because it attains high temperatures. Terminals are protected by waterproof housing and are used in conjunction with control panels. If the tubular elements need to be replaced, they are available at an economic cost. Different lengths and sizes are available to meet specifications. Industrial infrared heaters are high intensity heaters and used where high temperatures are necessary. These heaters are simple, economic, easy to clean, cost effective and efficient.

Categorized as the most useful heaters, they are designed to work in large and exposed areas (indoor and outdoor) and heavy duty projects. Some areas include arenas, ice rinks, gymnasium, aircraft hangars etc. Some industries that have realized the effectiveness of infrared heating and incorporated their benefits to provide quality services include:

- Medical
- Mining/Oil/Gas
- Construction/Manufacturing
- Thermoforming

Medical: Hospitals, clinics and medical institutions implement infrared radiant heating in separating platelets from the blood, neutralizing viruses and bugs and cleaning incubators hygienically.

Mining/Oil/Gas: The mining, oil and gas industries combine infrared and microwave heat to clean the oil laced sand from the crude oil tanks, hence enhancing their productivity and quality.

Construction/Manufacturing: Infrared radiant heaters are helpful in binding different materials together in extreme temperatures, which can satisfy both domestic and industrial needs.

Thermoforming: The plastic thermoforming industry has gained wide profit margins, by reducing average expenses on thermoforming, through the use of infrared heating.

TEMPSENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

Application	Construction Type	Features
Conveyorised or batch type Ovens Drying Curing	Single tubular element (Type 1)	The mineral insulated alloy sheath heating element prevents splashing and vibration and provides a longer service life than other source types.
De-greasing, Weld preheating, Roll heating, Drying, Sterilization	Double tubular element (Type 2)	Two series wired heating elements in Reflectors
Outdoor installations Wash-down exposed areas	Hairpin tubular element with moisture resistant terminal housing (Type 3)	N/A
Industrial applications with medium intensity infrared heat: Paint spray, Booths, Curing, Drying Softening resins, Vinyl and Plastics	Quartz tube (Type 4)	Horizontal mounting for tube fixtures
High intensity heat applications	Double quartz tube elements (Type 5)	Horizontal mounting for tube fixtures
High intensity radiation, on/off heating: Baking, Drying, Curing (paint, varnishes, lacquers, adhesives, softening plastics, food processing) on/off heating: Baking, Drying, Curing (paint, varnishes, lacquers, adhesives, softening plastics, food processing)	Quartz lamp element (Type 6)	Horizontal mounting for tube fixtures

TEMPESENS INSTRUMENTS (I) PVT. LTD.

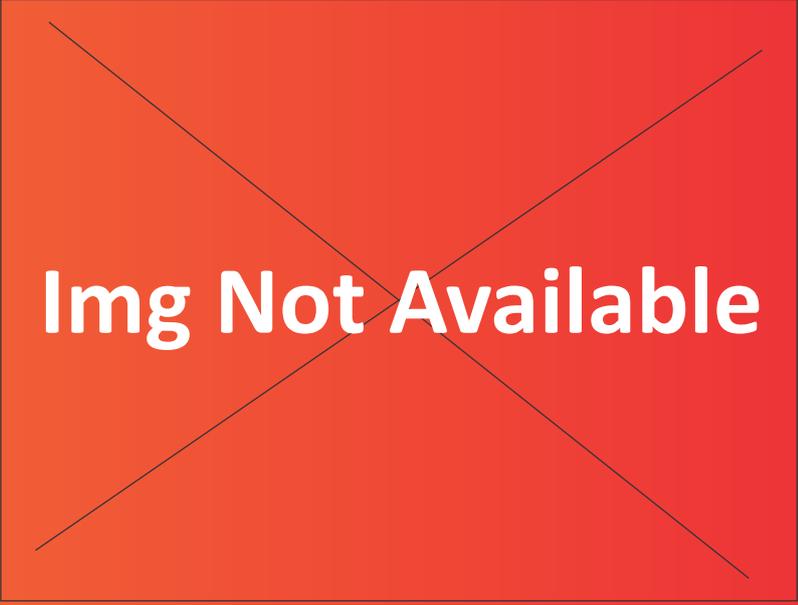
188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

MINERAL INSULATED HEATER CABLES



Img Not Available

Mineral insulated heating cables are series type heating cables and consist of one or two conductors embedded in a highly dielectric magnesium oxide insulation surrounded by a metal sheath. High nickel content Alloy 825 is renowned for its use as sheath material in high temperature applications, and corrosive environments. This alloy has superb resistance to pitting, chloride stress, and acid and alkali corrosion. Stainless steel can also be used as sheath. Highly compacted Magnesium Oxide provides insulation of the resistance wire for voltages up to 600V. Completely sealed sheath protects the MgO from moisture & contamination. MI heating cables are series-type heating cables and appropriate for temperatures up to 1022°F (550°C) and exposure temperatures up to 1200°F (650°C). At lower temperatures, watt densities of up to 50 W/Ft can be designed. It provides superior strength in dynamic cut-through, crush, and corrosion tests and provides rugged and reliable heat tracing for a variety of demanding applications. MI heating cable sets are supplied factory terminated and ready to install. They include a heating section and a non heating cold lead section. They are supplied in fixed lengths, so determining and ordering the correct cable length is critical. The cold lead cable is

connected to a junction box, which in turn is connected to the power supply.

MI heating cable is the ideal choice when an application's temperature and power output requirements exceed the capabilities of self-regulating and power-limiting heating cables.

Advantages of MI heater cables are:

- High power output due to perfect thermal conductivity of the metallic sheath.
- Reduced size due to the high dielectric strength of the magnesium oxide while maintaining good thermal conductivity.
- Easy installation due its reduced size and annealed state of outer sheath.
- High flexibility during the design phase, due to the wide range of available resistances.
- Factory assembled cable sets ready for installation
- Fully annealed sheath allows field bending
- Corrosion resistant sheath

TEMPSENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

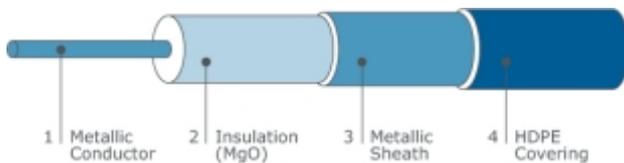
Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

OPTIONS

Sheath Material	Alloy 825, Stainless Steel
Watt Density	Up to 50 W/in ²
Process Temperature	1100°F
Exposure Temperature	1400°F
Maximum Voltage	600 V



APPLICATIONS

- **Refining crude distillation** : Hydro-cracking, Coking, Gas condensate prevention
- **Chemical and Petrochemical** : Synthetic fiber polymer, paints and resins, Nylon
- **Power Generation** : High pressure feed-water, blow-down lines, instrument lines

TEMSENS INSTRUMENTS (I) PVT. LTD.

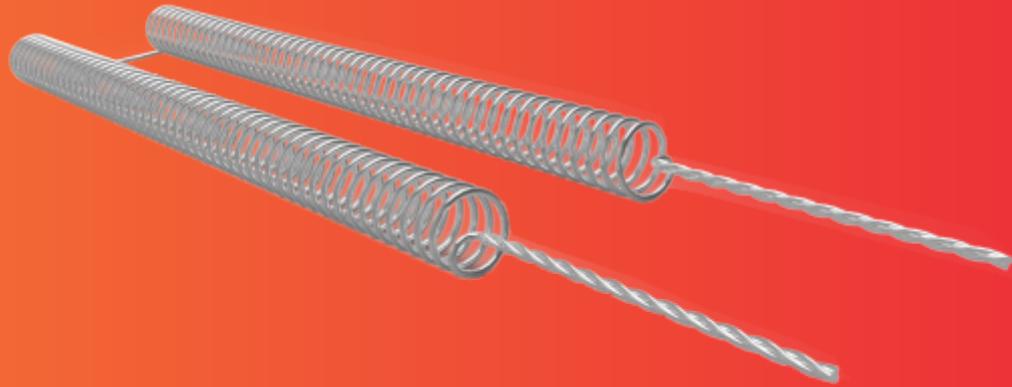
188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

OPEN COIL HEATERS



Open coil heating elements have open circuits consisting of coiled resistance wire (usually Ni-Chrome or FeCrAl) fixed onto a supporting element that heat the medium directly. Termed as the most efficient and versatile while also the most economically feasible solution for heating, these elements have fast heat up times that improve efficiency and have been designed for low maintenance and inexpensive replacement parts. When an electrical current is applied to the wire, it gives off heat. The wire is connected to the control panel which regulates the amount of heat provided by the electric heater and fills the tunnel of the air handling unit. Because of the low mass and fast response time, SSR or SCR switching devices are advisable. They serve as an indirect solution to decrease watt density requirements and prevent heat sensitive materials from breaking down. The heater can be formed into a compact, coiled nozzle heater supplying a full 360 degrees of heat with optional distributed wattage.

The face velocity of the air passing over the open coil elements must not be less than a minimum specified value when the heater is energized. There are three factors that are considered when an appropriate face

velocity is calculated, i.e. kW, frame size and heater element type. Sufficient airflow for the required kW in a given frame prevents an overheating condition. Heat must be dissipated away from the heating elements.

The following calculation is used for determining face velocity :

$$\text{Face velocity} = \text{CFM}/\text{Face Area}$$

Another consideration is the amount of current draw the electric heater will place on the incoming power source. Electric heaters should be divided into individual circuits drawing 48 amps or less. The amp draw can be calculated using the kW and voltage of the heater.

$$\text{Amps} = (\text{kW} \times 1000) / (\text{Vac} \times 1.732)$$

Attention must also be paid to the geographical area in which the open coil heater will be located.

TEMPESENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

DIFFERENT CONFIGURATIONS

- One, two or four resistance wires
- Parallel coil or straight wire
- Drawn or swaged sheaths
- With or without thermocouples
- Round, rectangular or square cable cross sectionals

OPTIONS

Wire	Alloy 825, Stainless Steel
Rating	Up to 50 W/in ²
Watt Density	1100°F
Operating Temperature	1400°F
Length	600 V
Outside diameters	1 7/8" and 2 3/4"
Voltage	240 or 480V AC
Controls	SSR/ SCR/ Relays/ RTD
Terminations	Customized

ADVANTAGES

- High ductility
- Low mass
- Constructed with no open seams

ADVANTAGES

- Plastic injection molding nozzles
- Semiconductor manufacturing and wafer processing
- Hot metal forming dies and punches
- Sealing and cutting bars
- Medical, analytical and scientific instruments
- Restaurant and food processing equipment
- Cast-in heaters
- Laminating and printing presses
- Air heating
- Textile manufacturing
- Heating in a vacuum environment

TEMPSENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

SILICON CARBIDE HEATERS

Manufactured to perform in the widest high temperature range, silicon carbide heating elements have maximum performance at high temperatures. Made of semiconductor material, its resistivity is much higher than metallic resistance materials. Resistivity decreases with increasing temperature and reaches a minimum at 600-900 °C. However, for temperatures above 900°C, resistivity increases with rising temperatures. It can be used in the temperature range of 600 – 1600 °C, in both air and controlled atmospheres. Resistance of silicon carbide heating elements increases during their life in operation; hence a variable voltage supply may be needed during long duration operation. To optimize heating element life, the right element should be selected with element surface loading as low as possible.

As the heating material remains rigid, even at max temperatures, no special supports are required for their installation in either horizontal or vertical direction. Higher electrical loadings are acceptable without disturbing the heat process and performance. Hence great savings in cost are possible with minimum maintenance. Also elements can be easily replaced without the need of a shutdown. Generally available in the form of round rods or tubes, customized heaters are

also available for replacement purposes. Constructed with the conventional central hot zone and two cold ends, they are available in diameters from 10 mm to 55 mm.

FEATURES

- Temperature range from 600 °C to 1600 °C (1110-2910 °F)
- Can operate on higher electrical loading
- Easy maintenance
- Savings in furnace cost.

APPLICATIONS

Silicon carbide heating elements can be used in a variety of furnaces, big or small, laboratory or industrial, in different atmospheres and temperature ranges. Some typical furnaces where they can be used are:

- Aluminum die casting
- Aluminum melting and holding furnace
- Crucible furnace for non ferrous metals
- Laboratory furnace
- Rotary hearth furnace
- Continuous furnace
- Glass Feeder

TEMPSENS INSTRUMENTS (I) PVT. LTD.

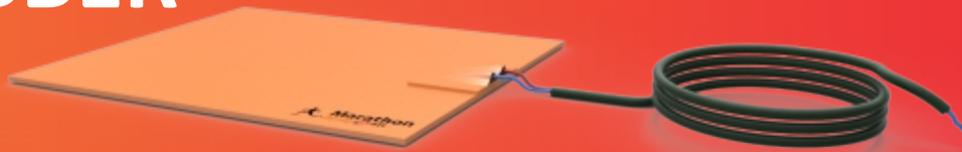
188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

SILICONE RUBBER HEATERS



Famously known as “flexible heaters”, silicone rubber heaters are composed of fiberglass reinforced silicone rubbers that are rugged, moisture and chemical resistant, flame retardant, have high dielectric strength and are non toxic. Wire or etched foil heating circuit is positioned between two “wafers” of silicone which provides flexibility and strength. Design versatility permits zones of higher or lower heat concentration as needed. They are capable of flexing and will conform to contoured surfaces. They can also be pre-formed to complex shapes and can withstand mechanical shock and vibration. Designed to meet the requirements of various low and medium temperature applications, they improve heat transfer; speed warm ups, and decrease wattage requirements. The silicone Fiberglass-reinforced silicone rubber gives the heater dimensional stability without sacrificing flexibility. Thermostats or RTD can be mounted for temperature control. Teflon lead wires can exit any location to make suitable connections. Different mounting methods such as pressure sensitive adhesive, field applied adhesive, Velcro etc. are available according to the requirement.

With silicone rubber heaters, heat can be placed where it is needed. These heaters improve heat transfer; speed warm ups and decrease wattage requirements.

Fiberglass-reinforced silicone rubber gives the heater dimensional stability without sacrificing flexibility. Because very little material separates the element from the part, heat transfer is rapid and efficient. The heater construction creates a very thin heater allowing it to fit applications where space is limited.

OPTIONS

Length	1 to 78 inches
Width	1 to 36 inches
Thickness	0.056" standard, other thicknesses available
Watt Density	80 W/in ²
Wattage Tolerance	+5, -10%
Operating Temperature	-70 to 450 °F
Maximum Temperature	500 °F or 260 °C
Voltage	12V to 600V AC or DC
Lead wire	12 inch Teflon insulated, other types available

TEMPSENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

FEATURES AND OPTIONS

Dimensions : Customized

Mounting Methods

- Pressure Sensitive Adhesive (PSAS)
- Silicone contact cement kit
- Field applied adhesive
- Mechanical fasteners
- Factory bonding

Termination Styles

- Teflon Leads
- Silicon Insulated Leads

Construction

- Wire wound
- Etched foil elements

Holes, Cutouts and Notches : Customized

Thermal Insulation : To increase heat efficiency

APPLICATIONS

- Freeze protection and condensation prevention
- Drum Heaters
- Medical equipment
- Computer Peripherals
- Photo processing equipment
- Semiconductor processing equipment
- Shelving

TEMPESENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

RADIANT TUBES



Seamless high temperature tubes made from either iron-chromium-aluminum alloys (Kanthal APM, Kanthal APMT) or heat resistant casting alloys are called radiant tubes. The composition table for various alloys is given:

	KANTHAL L APM	INCONEL 600	INCONEL 800	HK - 40	HU	HX	SS 310
Ni	-	72.0 (min.) + Cobalt	30.0 – 35.0	19.0- 22.0	37.0- 41.0	64.0- 68.	19.0-22.0
Cr	20.5 – 23.5	14.0 – 17.0	19.0 – 23.0	23.0- 27.0	17.0- 21.0	15.0- 19.0	24.0-26.0
Al	5.8	-	0.15 – 0.60	-	-	-	-
Fe	Balance	6.0 – 10.0	39.5 (min.)	-	-	-	Balance
Mn	0 – 0.4	1.0 (max.)	1.50 (max)	-	-	-	2.00
Si	0 – 0.7	0.5 (max.)	1.0 (max.)	1.75	2.50	2.50	1.50
C	0 – 0.08	0.15 (max)	0.10 (max)	0.35- 0.45	0.35- 0.75	0.35- 0.75	0.25
P	-	-	-	-	-	-	0.045
S	-	0.015 (max)	0.015(max)	-	-	-	0.030
Cu	-	0.5 (max.)	0.75 (max)	-	-	-	-
Ti	-	-	0.15 – 0.60	-	-	-	-
Temp	1250 °C	1095 °C	816 °C	1093 °C	1093 °C	1150 °C	1200 °C
Melting Point	1500 °C	1354-1413 °C	1357-1385 °C	1398 °C	1343 °C	1287 °C	1400-1450 °C

Highly customized to meet specifications, they are mostly used for gas heated or electrically heated furnaces. General designs include straight, U shaped and W shaped radiant tubes in any desired length. The lifetime of radiant tubes in Kanthal APMT and Kanthal APM is often many times longer. Kanthal material allows temperature in the range of 1250°C (2280°F). Used in extremely demanding environments, leak proof and corrosion resistant are other unique features of radiant tubes. Heat resistant casting alloys allow operating temperatures up to 1100 °C. But is inferior to Kanthal material in terms of resistance to sulphurizing and nitriding atmosphere. Radiant tubes can be used as standalone elements or in collaboration with bundle rod heaters. But when used with bundle rod heaters, can be used for temperatures up to 1400 °C and have superior performance. Some of the advantages of radiant tubes include:

- Trouble free, longer service life and provides uninterrupted furnace operation.
- Cost effective solutions for maximized customer productivity and higher power output.
- Installation and replaced relatively easily.

TEMPESENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

- High loading potential and ready to install.
- Supplied flanged, with or without inner tubes or electric heating elements as desired.

The outer and inner diameters of tube have some standards with respect to the ceramic disc diameter. The heater dimensions fit inside these specifications. Huge deviation from the standard designs, however, will be customized. Standards are given in the form of table:

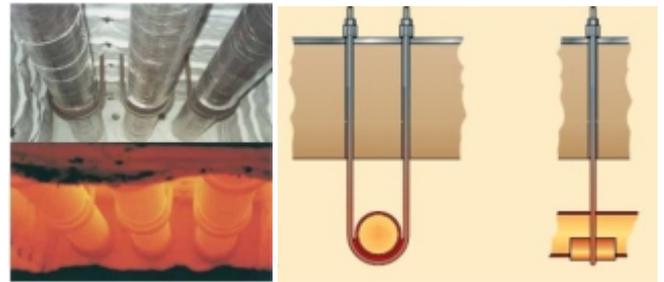
Outer Diameter of Tube	Inner Diameter of Tube	Ceramic Disc Diameter
100	90	80
128	117	110
146	134	124
154	142	124
178	162	154
198	182	170

APPLICATIONS

- Heat treatment furnaces (carburizing furnaces and galvanizing furnaces)
- Melting, dosing and holding furnaces
- Dental furnaces
- Diffusion furnaces
- Laboratory furnaces



Hangers are preferred with radiant tubes and bundle rod heaters to provide support in case of horizontal or vertical installation. It may be a furnace side wall support, constrained to a wall of the furnace or radiant tube support provided with a heating element. Anti sticking feature between the tubular element and the furnace side wall support is provided for supporting the radiant tube and allowing the lateral oscillation thereof, avoiding the sticking on the furnace side wall support.



The maximum unsupported length above which supports (hangers) for radiant tubes are considered essential is given below:

Temp (tube)	Dia. 100/90		Dia. 128/117		Dia. 146/134		Dia. 154/142		Dia. 178/162		Dia. 198/182	
	0	1	0	1	0	1	0	1	0	1	0	1
800	2.2	2	2.5	2.2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
900	2.2	2	2.3	2.1	2.5	2.3	2.5	2.5	2.5	2.5	2.5	2.5
1000	2	1.9	2.2	2.0	2.5	2.2	2.5	2.3	2.5	2.4	2.5	2.5
1100	1.5	1.3	1.8	1.6	2.2	1.9	2.2	1.9	2.3	2.0	2.3	2
1200	1.2	-	1.4	-	1.5	-	1.5	-	1.6	-	1.7	-

Where 0 stands for only tube (in meter)

1 stands for with bundle rods (in meter)

TEMSENS INSTRUMENTS (I) PVT. LTD.

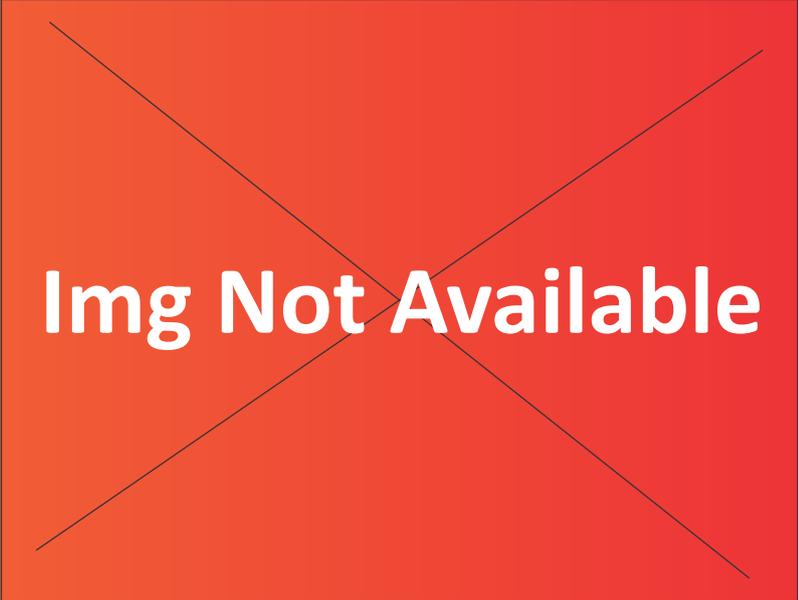
188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

STRIP HEATERS



Strip heaters, commonly called component or clamp heaters, based on the principle of convection air heating, use surface area to transfer heat effectively. Using most advanced heat technologies, strip heaters are an outstanding industrial heating product. It comprises of a heating element, a protective sleeve or sheath, and mounting hardware and can be clamped or bolted onto objects or solid surfaces. A coiled nickel chromium element wire is placed in the center of the heater. Suitable to work in 260 degree C temperatures, magnesium oxide is used for increasing efficiency. Temperatures can be controlled by using a temperature controller such as a thermostat. When using strip heaters, proper sheath material for resisting rusting or oxidation and suitable watt density of the element should be selected keeping in mind the application. These can be shaped and sized according to the use. A moderately inexpensive way of heating, strip heater is a tremendous solution to meet any budget.



OPTIONS

Sheath Material	Iron, Steel, 304 Stainless steel, Aluminum, Zinc coated steel
Watt Density	Up to 100 W/in ²
Voltage	Up to 600 V AC available
Operating Temperature	Up to 1200 °F or 650 °C
Length	5 ½ to 48 inches
Width	1 ½ inch

OPTIONS WITH STRIP HEATERS

Terminations

Offset terminations, Parallel terminals, terminal at each end or lead wires available

Mounting Tabs

Available mounting tabs with holes, slots or without tabs

TEMPSENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

Pressurized

Compressed under high pressure for excellent heat transfer

Thickness

Customized to easily fit into applications.

Heating Element

Centered in the heater to assure uniform heat

APPLICATIONS

- Surface Heating
- Process Air Heating
- Winterizing
- Space Heating
- Food warming
- Packaging and sealing
- Laboratory equipment
- Autoclaves and ovens

BENEFITS

- Easy and economic to install
- Corrosion and vibration resistant
- Durable, versatile and easy to control
- Uniform Heat Distribution
- Suitable for higher temperatures

TEMPESENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

TUBULAR HEATERS



Known for its versatility, ruggedness and dependability, tubular heaters can virtually be factory-configured to suit a variety of industrial heating applications. Tubular elements are frequently regarded as the foundation of all heating elements. The basic design consists of a resistance wire/coil precisely centered in a metal sheath. This wire/coil is surrounded by magnesium oxide to provide efficient heat transfer from coil to heating medium. Diameters are varied to give customized design and adjustable watt densities for best performance and long life. Bending radius is carefully chosen so as to give optimum performance. Tubular heating elements perform heat transfer by all three modes (conduction, convection and radiation). They are available in both single ended and double ended designs.

The single-ended tubular design has both terminals at one end. The opposite end is sealed. Flexible lead wires are 12 in. (305 mm) crimp connected to the terminal pin and have silicone-impregnated fiberglass over-sleeves. Maximum watt density is up to 45 W/square inch while the maximum operating temperature is 1200 degree F, so INCOLOY and stainless steel sheaths can be used.

The double-ended design has round cross sectional geometry, is highly adaptable for bending—especially when bending is performed in the field. Double-ended tubular elements offer several assemblages of resistor coils and thermocouples inside one sheath. They have the ability to sense the heater's internal temperature accurately every time, or offer three-phase capability in one element. Maximum watt density is up to 120 W/square inch while the maximum operating temperature is 1800 degree F, so INCOLOY and stainless steel sheaths can be used.

SPECIFICATIONS

°F	°C	W/in ²	W/cm ²
1800	982	45	6.9
1600	870	45	6.9
1200	650	60	9.3
750	400	45	6.9
350	175	60	9.3

TEMPESENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com

OPTIONS

Sheath Material	Copper, Steel, 304 Stainless steel, INCOLOY, Titanium
Watt Density	Up to 120 W/in ²
Sheath Length	Up to 51 feet
Diameter	6.0 mm, 6.5 mm, 8 mm, 9.5 mm, 10 mm, 11 mm and 12 mm
Terminal Enclosure	Customized terminal boxes
Element clamp	Customized
Mounting brackets	Customized

Electric tubular heaters fits almost every industrial heating applications ranging from immersion to air heating that requires temperatures of 1382 degree F. They are made using high quality alloys to minimize physical stress and offer high efficiency. Used to heat solids, liquids and gases.

Material	Application
Copper	Water, Oil, Grease
Steel	Alkaline cleaning solutions, Tars, Asphalt or air heating
Stainless Steel	Corrosive liquids, food processing equipment, Radiant heating
Incoloy	Cleaning and degreasing solutions, Corrosive liquids
Inconel	Plating and pickling solutions, acid
Titanium	Corrosive liquids

OPTIONS WITH TUBULAR HEATERS

Terminations

Double ended tubular is available with a variety of terminations while single ended tubular has only flexible lead wires.

Bend Formations

Double-ended heating elements can be formed into spirals, compounds, multi-axis and multi-planes etc. Custom bending is also available. However bending is not recommended with single ended elements.

Mounting methods

Brackets, mounting collars, Threaded Bulkheads are available.

Moisture Resistant Seals

It is important for the life and performance of the heater.

While selecting the ideal tubular elements for your application, please consider the following factors:

- Heating element watt density

- Sheath material

- Temperature of the product

- Air velocity within the application

- Medium to be heated

TEMPESENS INSTRUMENTS (I) PVT. LTD.

188A, Road No.-5, M.I.A., Madri, Udaipur - 313 003 (Rajasthan) INDIA

Ph.: +91 294 3057700 Fax: +91 294 3057750

E-mail: info@tempsens.com

www.tempsens.com