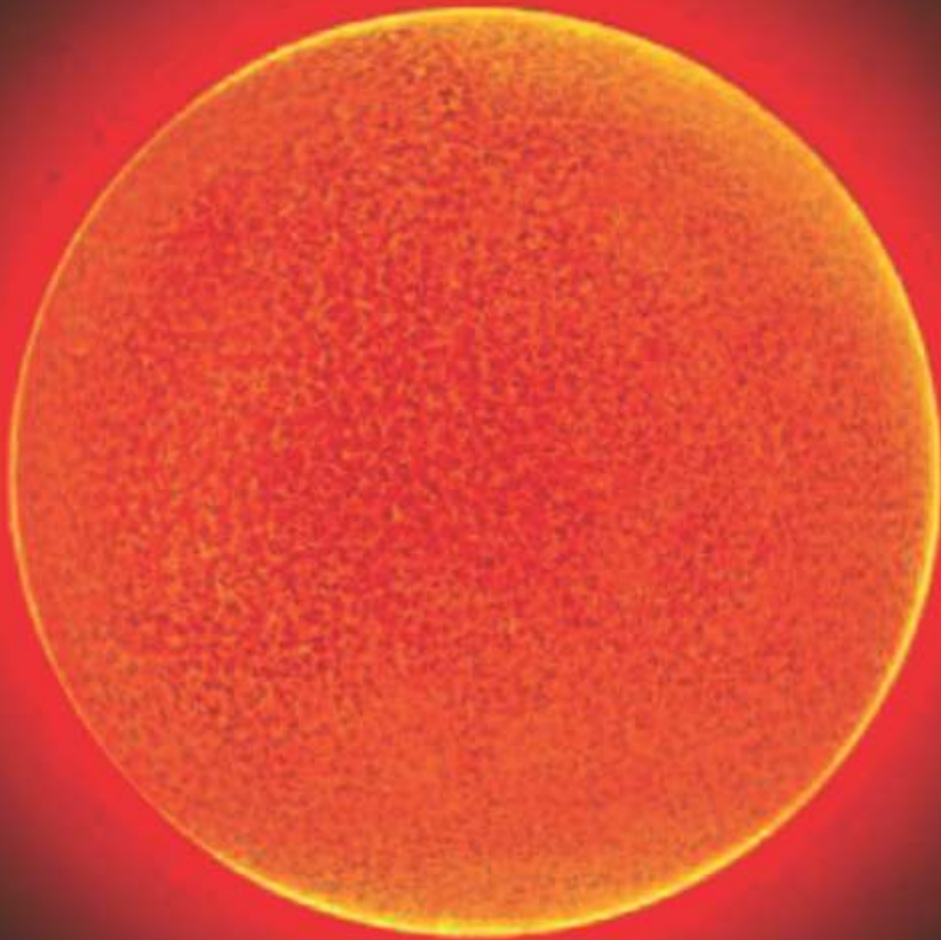




**Engineered Solutions For Heating & Sensing**



[www.marathonheat.com](http://www.marathonheat.com)

# About the Company

**MARATHON HEATER (INDIA) PVT. LTD** is a part of **TEMPESENS** Group which was established at Udaipur, INDIA. Today Tempsens is one of the largest manufacturer of temperature sensors & heaters with world class manufacturing facilities in India, Germany and Indonesia.

Tempsens is an ISO 9001:2015, ISO 14001:2015 certified company with NABL Accredited Laboratory.

The company is involved into manufacturing of Thermocouples, RTDs, Thermowells, cables, Non-Contact Pyrometers, Heaters and Calibration Equipment etc. with Covered Area of 36000 Sq. Ft.

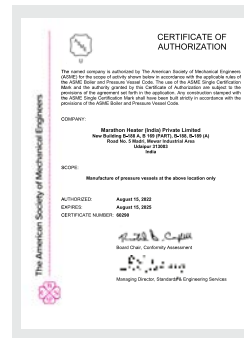
**MARATHON HEATER (INDIA) PVT. LTD** Equipped with modern infrastructure, innovative technologies and a dedicated team of qualified Engineers, we have evolved over the past years to become one of the most trustworthy manufacturers of Industrial heating solutions. Marathon continues its constant endeavor of delivering solutions for critical and challenging process requirements.

We are constantly looking for ways to improve not only our products but also maintain order processing, design process and product literature. Quality and customer satisfaction were and will be our prime motto.

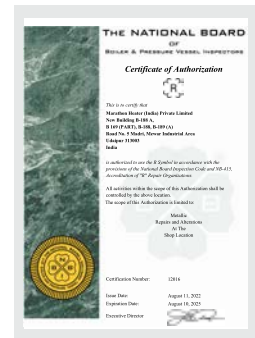
We design, develop and manufacture Electric Heaters (Electric heat exchanger) for various processes in the Oil and Gas Industry, Refinery, petrochemicals, power, chemical, Marine and various other industrial and process applications.

Our well experience Technical team also provides extensive support to privileged customers with Electric heaters required for Research and developments.

Marathon Heaters also manufacturing Metallic Elements, high temperature furnaces, Industrial ovens, Temperature sensors as per customers required and international specifications.



'U' Stamp Certified



'R' Stamp Certified



ATEX Certified



IECEx Certified



EAC Certified



UL Certified



PESO Certified



BIS Certified



ISO 9001-2015 Certified

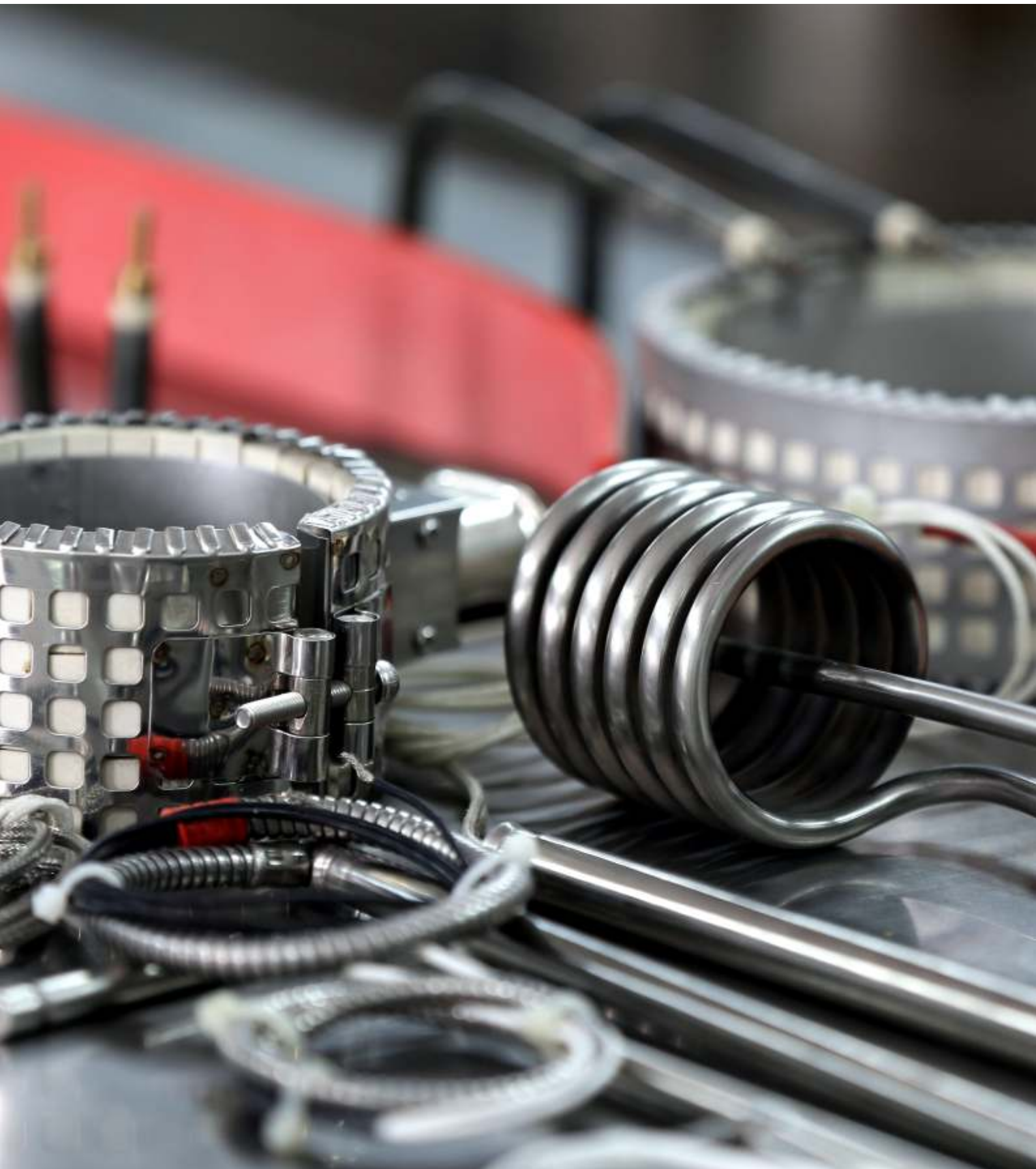


ISO 14001-2015 Certified



ISO 45001-2018 Certified

# Component Heaters



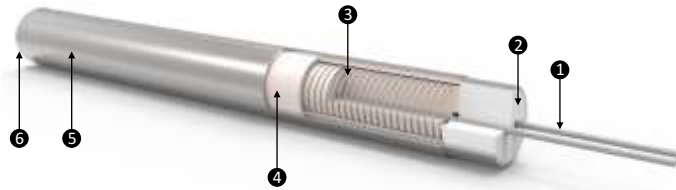
**ENGINEERED SOLUTIONS FOR HEATING & SENSING**



# Hot Rod Cartridge Heaters

The engineers at Marathon Heater instruments have developed a cartridge heater that exceeds the performance and durability of other cartridge heaters. Through refinements in the swaging process, specially designed cores, careful selection of magnesium oxide fill, nickel chromium resistance wire, stainless steel tubing, and carefully controlled production processes, HotRods routinely outperform other cartridge heaters in difficult applications.

HotRods are available in a wide variety of diameters and configurations.



1. High temperature lead wires for temperatures up to 550°C.
2. High impact ceramic cap retards contamination and is suitable for high vibration applications. Deep holes in cap prevent fraying of leads when bent.
3. Nickel-chromium resistance wire for maximum heater life, evenly wound for even heat distribution.
4. High purity magnesium oxide fill selected for maximum dielectric strength and thermal conductivity, highly compacted for maximum heat transfer.
5. Stainless steel sheath / Inconel sheath for oxidation and corrosion resistance in wide variety of environment.
6. TIG welded end disc to prevent contamination and moisture absorption.

## Standard Specification

Nominal Diameter	Minimum Diameter	Maximum Diameter	Max. Lead Wire Gauge	Max. Amps	Max. Volts
1/8"	2.97	3.17	24	5	300
1/4"	6.19	6.32	22	9	300
6mm	5.82	5.97	22	9	300
6.5mm	6.35	6.47	22	9	300
5/16"	7.77	7.89	22	9	300
8mm	7.84	7.97	22	9	300
3/8"	9.37	9.49	18	15	300
10mm	9.56	9.98	18	15	300
12mm	11.83	11.96	18	15	300
12.5mm	12.34	12.48	18	15	480
1/2"	12.55	12.67	18	15	480
13mm	12.85	12.97	18	15	480
17/32	13.33	13.46	18	15	480
5/8"	15.72	15.84	14	26	480
16mm	15.84	15.97	14	26	480
17mm	16.84	16.96	14	26	480
11/16"	17.32	17.44	14	26	480
19mm	18.84	18.97	14	26	480
3/4"	18.89	19.02	14	26	480
20mm	19.86	19.98	14	26	480
1"	25.24	25.37	14	26	480
25.4mm	25.24	25.37	14	26	480

## Maximum Allowable Watt Density

Clearance (mm)	Block temperature (°C)					
	649	538	427	316	205	94
0.050	140	270	300	300	300	300
0.076	120	205	295	300	300	300
0.101	100	175	240	300	300	300
0.127	90	145	200	285	300	300
0.177	70	100	150	200	250	300
0.254	60	90	110	150	200	225
0.381	50	75	95	110	140	165
0.762	40	60	80	90	100	110
1.524	30	40	50	55	65	65
2.540	25	35	45	50	50	50

Clearance is determined by taking the hole diameter and subtracting the heater diameter.

Watt density is calculated by:

$$\frac{\text{Wattage}}{\text{Heated Lth} \times \text{Diameter} \times 3.14}$$

**Heated Lth x Diameter x 3.14**

Cycling reduces heater life and high cycling applications should use lower numbers.

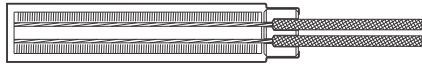
## Lead Wire Characteristics

Wire Type	Temperature	Max. Temperature	Comments
Ultralead	250°C	450°C	Excellent, durable wire, good for high temperature application
Teflon	250°C	450°C	Good for areas where a small diameter wire is needed
Silicon Rubber	250°C	450°C	Good moisture resistance
Braided Silicon Rubber	250°C	450°C	Inexpensive wire good for non abrasive applications
MGT	250°C	450°C	Good high temperature wire
SJO Cord	94°C	90°C	Rubber jacket, resistant to all and moisture. for use on 3/8" dia. and larger

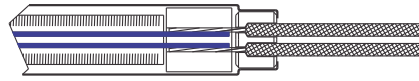
# Hot Rod Cartridge Heaters

## Swaged in Leads

Swaged in leads are ideal for applications where there is a lot of movement or the leads must be bent sharply upon exiting the heater.



In heaters under 3 " long, the leads go directly in to the core, resulting in an unheated section the length of the ceramic end piece.



In heaters over 3 " long the leads make a connection with the power pins in a short unheated section.

## Teflon Seal

When an effective moisture or oil seal is needed, a swaged in teflon seal with teflon leads provides an effective barrier.

## Silicone Rubber Seal

A high temperature silicone rubber seal used with silicone rubber lead wires provides an effective moisture seal up to 400°F (200°C). It is generally the most impervious of the moisture seals.

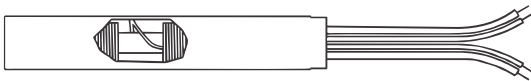
## Epoxy Seal

Epoxy potting forms a good moisture seal with more mechanical strength than a silicone rubber seal. Regular epoxy is rated at 350°F(177°C)and epoxy lite is rated at600°F(316°C). In order to protect the seal.



## Thermocouples

Type 'J' and type 'K' thermocouples can be installed to monitor part temperatures. A thermocouple mounted against the heater sheath in the center of the heater gives a good approximation of block temperature, especially when there is a good fit between the heater and the block. A thermocouple mounted in the tip is useful for monitoring liquid temperatures, or material flowing past the end of the heater. Unless otherwise specified thermocouple leads will be the same length as the heater leads. Standard thermocouple wire insulation is teflon, other types are available upon request.



## Swaged in Braid

Swaged in stainless steel braid provides excellent abrasion protection while allowing the leads to be bent in a tight radius. Because the braid is swaged in, it is extremely resistant to pulling out of the heater.

## Distributed Wattage:

Distributed wattage Hotrods (with a higher watt density on the ends than the rest of the heater) can be used to compensate for end losses in blocks. Distributed wattage Hotrods are available in all diameters.



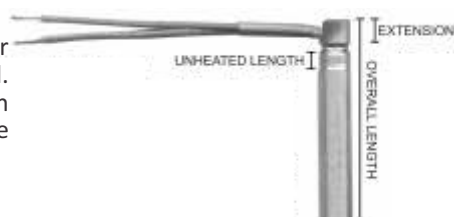
## Right Angle Stainless Steel Conduit

Right angle stainless steel conduit offers the same advantages as swaged in stainless steel conduit but allows use in tight spaces.



## Right Angle Leads

Right angle leads are ideal for applications where space is limited. Leads are covered with a silicon impregnated fiberglass sleeve where they exit the heater



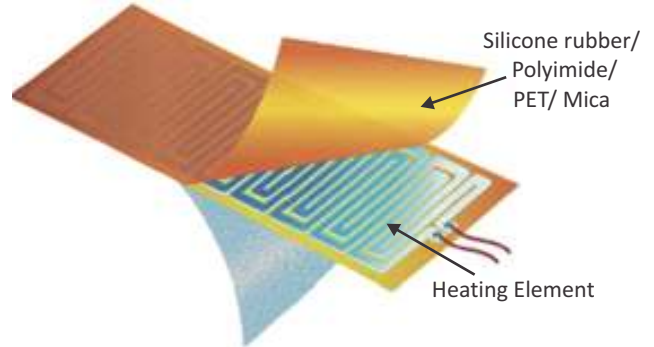
## Applications

- Thermoforming
- Plastic welding
- Portion packaging
- Form fill and seal

# Flexible Heaters

Marathon Silicone rubber and Printed flexible heaters can be customized in various shapes and sizes.

Marathon developed the flexible heaters through etching, laser cutting, wire wound and screen-printing techniques. The thin design and direct bonding to the application facilitates efficient and rapid heat transfer resulting in faster heating and lower wattage requirement. The PTC printed heater runs off the high voltage battery to maximize the power delivered to the heater.



## Structure Of Silicone Rubber Heaters

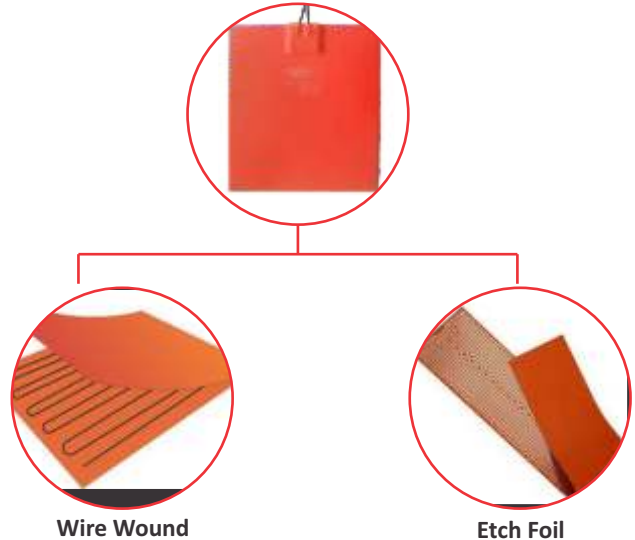
The silicon rubber heaters can be easily structured in any shapes, sizes, and dimensions. Manufactured with wire or etched foil heating circuits placed between two reinforced high-strength fiberglass mesh with silicone rubber. These heating solutions are available in varying watt densities, dual voltages and multiple heated zones.

The thermostat/ thermocouple/ RTD is enclosed in a molded silicone rubber housing and permanently attached to the heater

**Base Material:** Silicone rubber/ Polyimide/ PET/ Mica

**Heating Element:** Steel, Nickel-chrome non-magnetic alloys, Copper, Constantan, Aluminum etc.

### Types (As per Fabrication)

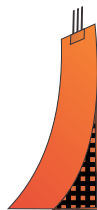


## Design Option

Marathon Heater offers several design options to meet various application requirements.

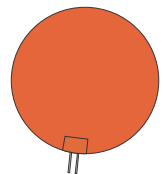
### Ground Mesh

For grounding purpose a second layer of insulating material and a conductive grid can be added to the heater. The heater comes with a ground wire.



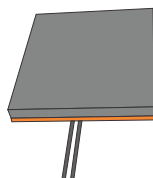
### Round Heaters

Round shapes are also available. Round heaters are best attached to tooling with PSA.



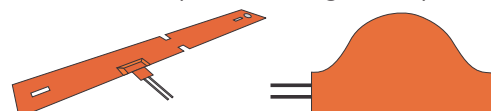
### Silicone Rubber Sponge Insulation

To improve heater efficiency, 1/16", 1/8", 1/4", 3/8" or 1/2" insulation can be bonded to the outside of the heater. Closed cell silicone sponge is extremely flexible and has a Temperature range of "-75°C to 250°C".



### Various Shapes for Various Applications

Odd shapes are available to fit those hard to heat devices. Holes and cutouts help fit those irregular shaped tools.

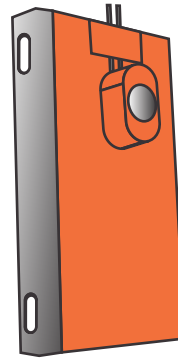


# Flexible Heaters

## Design Option

### Silicone Rubber Enclosure Heaters

Enclosure heaters are used to maintain temperature in any type of electrical box. Typical applications include ATM's, control boxes, traffic signals, utility boxes, cabinets and switch gear. Enclosure heaters are excellent for controlling humidity or moisture within an electrical box. Silicone rubber heaters are typically mounted to an aluminum plate and have an ambient sensing thermostat.



### Other Design Options

- Dual Voltage
- Three Phase
- Distributed Wattage
- Thermocouples
- Thermostats
- Temperature cut-off
- Pull tabs

## Mounting Method

### Pressure Sensitive Adhesive

There are several options for installation or mounting Silicone Rubber Heaters. An easy mounting method is to peel and stick. PSA is attached directly to one side of the heater. Just peel away the protective liner and attach the heater to the desired tool. It is not recommended for curved surfaces. The heater should be installed within 6 months of manufacture.

### Factory Vulcanizing

Another method of installation is to send your tool to the Marathon Heater factory. The tool is placed in a vacuum able and the SRH is vulcanized directly to the tool. This is the strongest bond available.

### Field applied adhesive

SRH may also be attached with field applied adhesive, Marathon Heater will supply the required RTV to adhere the heater to the desired surface. We offer a room temperature curing adhesive. Apply a thin film of RTV on the entire bottom of the heater. After positioning the heater on the part, use a roller to remove all air trapped between the heater and the part. The RTV should be allowed to cure for 24 hours.

## Specifications

	Polyimide (Kapton)	Silicone	PET
Max Operating Temp (°C)	230°C	200°C	100°C
Min Operating Temp	-60°C (-76°F)	-55°C (-70°F)	-40°C
Nominal Thickness	0.15 mm	1 mm & 1.6 mm	0.15 mm
Dielectric Strength	300 V/mil	400 V/mil	1000 V/mil
Watt Density	10 W/in <sup>2</sup> (1.55W/cm <sup>2</sup> )	10W/in <sup>2</sup> (1.55W/cm <sup>2</sup> )	3.5W/in <sup>2</sup> (0.55W/cm <sup>2</sup> )

## Flexible Printing & Thick Film Heaters

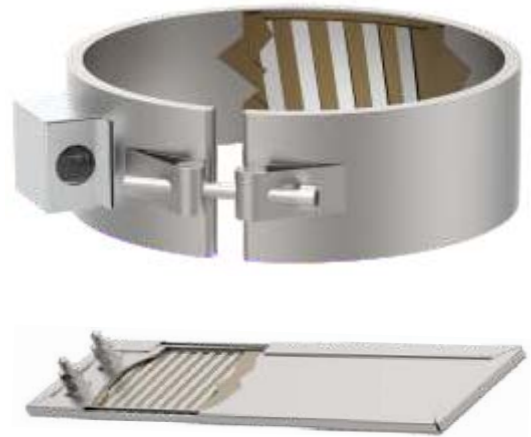
The Printed heaters are warming elements that are screen printed on flexible materials. Their main goal is to add heat to a product. The use of precision screen printing helps to print conductive or resistive inks onto a flexible material. Printed heaters can have several benefits within the automotive and aerospace industries.

- Flexibility in choosing terminations such as mechanical or solder.
- Flexibility in choosing paste according to power density and applications.
- Can be printed on variety of substrates, like ceramic, SS, Al, PET, Polyimide.
- Uniformed / Desired temperature distribution can be achieved.
- Can be printed on different profiles like flat, tabular and flexible, etc.
- Desired Temperature can be achieved Easily.

## Mica Band & Strip Heaters

Mica Insulated Strip heaters / Plate heaters are sheathed in rust-resistance steel or in stainless steel sheath as it provides physical strength and good thermal conductivity.

- High temperature oxidation resistant metal sheath
- Highest grade mica insulation provides excellent electrical insulation at high temperatures and is resistant to moisture.
- Clamping band is low thermal expansion stainless steel construction designed to maintain clamping pressure at elevated temperatures.
- Nickel/Chromium resistance wire evenly wound for uniform heat distribution and reliable accuracy.
- Standard 10" fiberglass leadwires are UL rated and provide protection up to 450°C.
- Approximately 1/8" thick.



### Maximum Allowable Watt Density in Watt/Sq.Inch

Cylinder Temp. °C	94	150	205	260	315	370	425
1.5-3" I.D.	52	51	50	46	41	37	29
3-10" I.D.	47	46	45	42	38	33	25
10" and > I.D.	41	40	39	36	31	27	20

## Ceramic Band Heaters & Blower Assembly

Ceramic band heaters are medium-to-high temperature heaters that have 648°C as a maximum working temperature. These durable heaters can have optional in-built ceramic fiber jackets that make them energy efficient. Ceramic band heaters are available with different terminal styles, are fully flexible, and can accommodate holes and cut-outs.



In a ceramic band heater, nickel-chrome wire is embedded in a flexible outer wall made of special, interlocking ceramic tiles (KNUCKLES), which are assembled like a brick wall. A ceramic fiber insulating mat and a stainless Steel/Aluminised Steel jacket cover this assembly. This construction prevents heat loss and reduces electrical consumption by 20%.

Ceramic band heaters can be manufactured with different clamping mechanisms, terminations styles, holes and cut-outs, perforations.

### Features and Benefits

- Uniform heat distribution
- Various termination styles
- High degree of flexibility

### Applications

- Injection moulding
- Extruder line
- Lamination

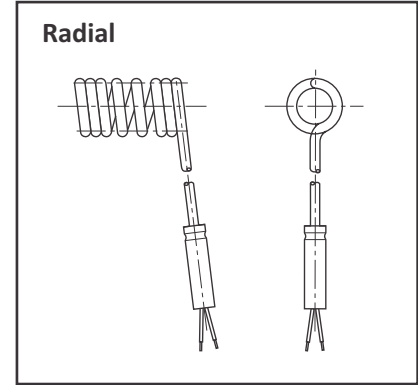
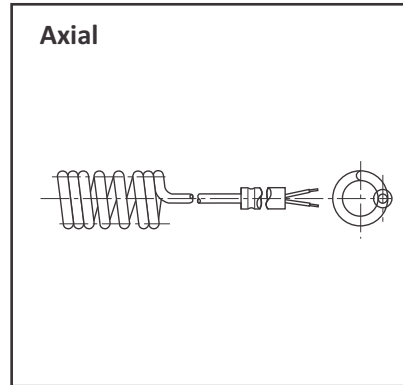
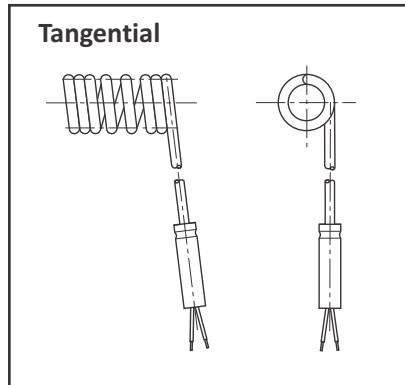


## Coil Heaters

Coil heaters are an advance concept of thermal engineering, is also known as high performance tubular heaters or cable heaters. The basic construction of these heaters consist of compacted MgO, high temperature resistance wire and Chrome Nickel Steel tube. These heaters can be constructed with or without built in thermocouples.



### Types of Termination Exits



### Specifications

<b>Sheath Material</b>	Chrome Nickel Steel
<b>Insulation material</b>	High purity MgO
<b>Heating element</b>	NiCr 80:20
<b>Thermocouple</b>	'J' type (Fe K), 'K' type (Cr Al) grounded or ungrounded
<b>Connection Wires</b>	Stranded Nickel wires with PTFE coating
<b>Voltage Range</b>	24 to 250 volts
<b>Power rating</b>	Depending on application
<b>Power tolerance</b>	± 10%
<b>H. V Testing</b>	800 V (Bent heater), 500 V between T/C and heating element
<b>Insulation Resistance</b>	> 5 MW
<b>Current Leakage</b>	< 0.5 mA
<b>Sheath Temperature</b>	750°C max
<b>Adapter Temperature</b>	150°C max
<b>Length Tolerance</b>	Heated length ± 2%
<b>Unheated Length</b>	5-10 mm on bottom end, 50 mm at the adapter end. Larger lengths available on request.

### Applications

<ul style="list-style-type: none"> <li>● Hot Runner Nozzles &amp; Bushings</li> </ul>	<ul style="list-style-type: none"> <li>● Sealing and cutting bars and jaws for packaging machines</li> </ul>
<ul style="list-style-type: none"> <li>● Tube Extrusion</li> </ul>	<ul style="list-style-type: none"> <li>● Small Manifold Heating</li> </ul>
<ul style="list-style-type: none"> <li>● Pipe Forming</li> </ul>	<ul style="list-style-type: none"> <li>● Hot metal forming dies and punches</li> </ul>
<ul style="list-style-type: none"> <li>● Hot runner distribution plates</li> </ul>	<ul style="list-style-type: none"> <li>● Semiconductor manufacturing and wafer processing</li> </ul>

## Air Heaters

Marathon made air heaters features an open coil of high resistance wire electrically isolated in a stainless steel sheath. Using an open coil for heating is the most efficient type of electric heating and is also the most economically feasible one. As it exposes the maximum heating element surface area directly to the airflow, it provides fast heat up time and improved efficiency. Its design facilitates lower maintenance and easy, inexpensive replacement parts.

It is constructed of high grade nickel chromium wire coils Evenly wounded on mica sheet, placed in center of an SS304 Sheath, and electrically isolated using a layer of flexible mica wrapped inside of sheath. These heaters are widely used in hot air dryers



### Specifications

<b>Sheath Material</b>	SS304
<b>Sheath Outer Diameter</b>	63.5 mm, 101.6 mm
<b>Wattage</b>	Various Wattage available ranging from 2 kW to 30 kW
<b>Watt Density</b>	Up to 77 W/inch <sup>2</sup>
<b>Glass wool Insulation</b>	Up to 1200°C
<b>Wattage tolerance</b>	+5%, -10%
<b>Resistance tolerance</b>	-5%, +10%

### Advantages

- Fast heat up time
- Increased Efficiency
- Lower maintenance
- Easy installation
- Easy and inexpensive replacement

### Applications

- Hot Air Dryer
- Hand Dryer
- Plastic Welding
- Sealing

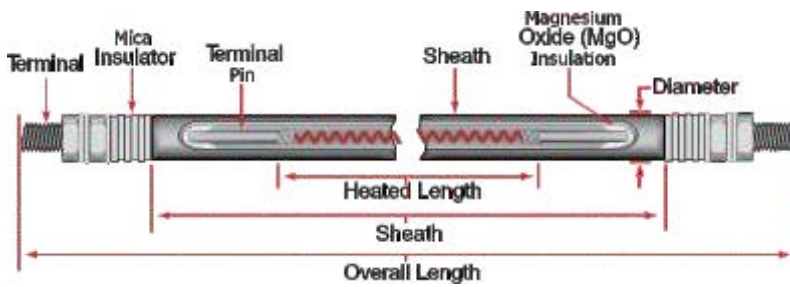


# Process Heaters



**ENGINEERED SOLUTIONS FOR HEATING & SENSING**

## Tubular Heaters



- Tubular heating element consists of a resistant nickel chromium wire type 80/20 inserted into a protective metal tube (outer sheath) filled with high purity electro-melt Magnesium oxide (MgO). The assembly will be compacted by rolling/swaging process to ensure excellent heat transfer. Each edge of the sheathed component consists of a non-heating zone, where the electrical connection is made.
- The electric heater is custom-made with a maximum length of 10500 mm, along with different diameters (8, 11, 12.50, 13.50 & 16 mm).
- Material of construction : Steel (ERW /seamless)
- Stainless as per ASTM Grade 304/304L/310/316/ 316L/321 Alloys 600, 625, 640, 800, 825, 840



### Specifications

Material of outer sheath	Application
Stainless Steel	Immersion Heating's in Water, Alkaline cleaning solutions, Tars, Mild Corrosive liquids, food processing equipment, Indirect and Radiant heating Air heating/ Gas heating. Hopper & tank heatings Large process plant applications.
Alloy 800	Cleaning and degreasing solutions, Corrosive liquids / gases. High temperature / High pressure
Alloy 600 series	Plating and pickling solutions, acid
Titanium	High Corrosive liquids
Temperature	Upto 1800°F



## Immersion Heaters

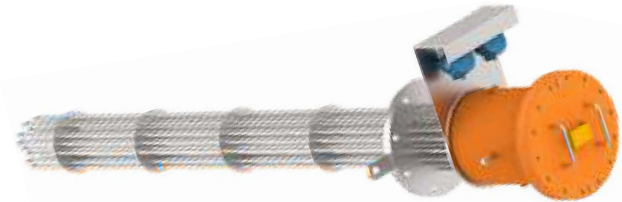
### Immersion Heater

Industrial immersion heaters are used widely in all kind of industrial applications such as chemicals, liquids, gases and food processing industries. The immersion heaters are also used in special applications in petrochemical industries such as Flare KO drum heating application and other heating applications in power as well as nuclear applications.

Immersion heaters are designed and constructed in various forms based on the application and mounting requirement. Some of the common types of immersion heaters are.

### Direct Immersion heater

The heater bundle will be directly mounted inside the Tanks & process fluid will be directly in contact with the process fluid.



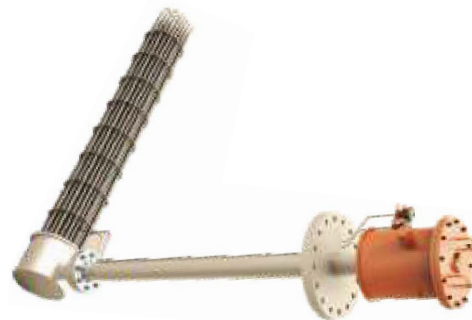
### Indirect Immersion Heater

The heating elements will be mounted inside the pockets welded to tube sheet. The heat from the elements transferred to the pocket tubes and in turn to the fluid. These kinds of heaters are used in large storage tank heaters, in which heater replacement can be done without draining the complete system.



### L Shape Heater

In some critical process where the heater is required to be mounted vertically but also expected to cover maximum tank area horizontally or at bottom of the tank, the "L" shape heaters are best preferred design.



## Air Duct Heaters

Electric tubular heating elements are commonly used to heat air in ducted systems primarily for air drying purposes in various industrial applications.

Duct or air heaters are used in heating ventilation and air-conditioning systems (HVAC) in residential and industrial complexes, as well as in hotels, airports and stadiums etc. for the purpose of maintaining temperatures. The same system is applied in offshore environments.

In industrial applications such as power plants and painting applications, the duct heaters are used for the applications which required hot air purging, or drying purposes.



### Typical Applications for Duct or Air Heaters

#### Include

- Comfort Air Heating
- Heating, Ventilation and Air Conditioning (HVAC)
- Drying
- Industrial Hot Air Generation

#### Typical Industries Include

- Power plants
- Automotive
- Chemical
- Industrial and Residential Buildings
- Facilities for Onshore and Offshore Platforms

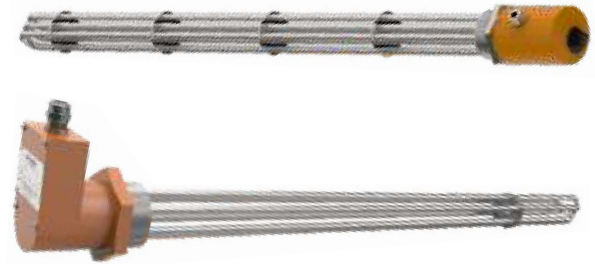
## Screw Plug Heaters

Screw Plug Heaters are smaller version of Immersion Heaters in which heater flange is replaced with a Threaded Plug. A Single or multiple tubular heating elements are fitted into a thread hexagonal head which are then screwed directly through a threaded coupling in the tank wall or vessel, or installed at process line.

Screw plug heaters are an easy way to heat up solutions in smaller containers that may or may not require auto control on temperature. The Heaters can be installed either horizontally or vertically in the tank. The heater is compatible for both Single phase as well as three phase power supply.

### Specifications

<b>Sheath Material</b>	SS , Alloy 600 series, Alloy 800 series, Hastelloy, Titanium, copper etc
<b>Rating</b>	0.1kW to 50kW
<b>Screw Plug Material</b>	Cl, Carbon steel, Brass, SS etc
<b>Screw Plug NPT fittings</b>	1", 1.1/4", 1.1/2", 2", 2.1/2", 3" (BSP/ NPT) or equivalent Metric threads
<b>Voltage</b>	120 to 690V AC Single phase or three phase
<b>Terminal Enclosure</b>	Safe / Hazardous
<b>Control</b>	Thermostat/RTD/Thermocouple.



## Heating Skid

Each heater skid is custom made design to suite respective process specifications. A Typical Heater Skid consist of

<ul style="list-style-type: none"> <li>● Electric Heater bundle</li> <li>● Pressure Vessel or housing for the Heater Bundle</li> <li>● Control Panel for the Heater operation control</li> <li>● Temperature sensors such as RTD's, thermocouples, temperature transmitters, etc.</li> </ul>	<ul style="list-style-type: none"> <li>● Pressure Safety Valve</li> <li>● Valves for flow control</li> <li>● Power &amp; Instrument wiring</li> <li>● Skid base for easy installation at site.</li> </ul>
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Additional Scope such as extended piping, scrubber installation, Instrumentation for flow, pressure & level monitoring etc. can be provided on specific requirement.

In recent years, In response to the growing demand for more different versatile applications we have broadened design range for manufacturing skids. Thus, we produce mobile heaters shaped as compact skids, of application in both heating and cooling processes. We perform "customized" executions by designing each skid in accordance with the needs of the end user, either composed of thermal oil heater, or only by re-circulation units or secondary groups. The main targets of these skids are asphalt sector and petrochemical industry; the automotive industry or wood sector, for heating presses etc.

### Features

<ul style="list-style-type: none"> <li>● Single point piping connections for flow and return.</li> <li>● Optional stainless-steel terminal box and control panel.</li> <li>● Single point terminations for field power and instrumentation cabling.</li> </ul>
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## Medium Voltage Heater

The Heater operating at a voltage greater than 1000 V is considered a Medium Voltage Heater. Medium Voltage Heater has several economic advantages over low voltage heater for large heating loads.

Medium voltage heater having operating voltage up to 6.6 KV developed in Marathon. Instead of MgO powder, the Medium voltage heater can be fabricated by using a preform that is made up of electrically insulating & thermally conductive material i.e., MgO. The heater can be fabricated as single ended and double ended.

These heaters are commonly used in applications where high power and temperature requirements are necessary, such as in large industrial processes, power generation facilities, oil refineries, chemical plants, and other heavy-duty applications. Medium voltage heaters are capable of delivering significant amounts of heat efficiently, making them suitable for heating large volumes of heating loads. Installation cost is very less.



### Advantages

- Operating efficiency of this heater is high.
- Operation and Maintenance cost is less.
- Labour cost is less.
- Economical for the industries which requires heavy thermal loads.

### Technical Specifications

<b>Rating</b>	Up to few Mega Watts as per requirement.
<b>Voltage</b>	up to 6.6KV
<b>Design Temperature</b>	-40°C to 650°C
<b>Design Pressure</b>	Upto 350 bar(g)
<b>Pressure Vessel</b>	LTCS/ CS / SS, Alloys etc.
<b>Heating Elements</b>	Mineral filled insulated Heating Elements or Tubular Heating Elements with Ni-Cr (80-20) as heating Coil and suitable outer sheaths.
<b>Terminal Enclosure*</b>	As required (Weather proof or Flameproof).
<b>Control System:</b>	Thyristor control Panel + Local control Stations. (Safe area or Hazardous area) Protections & control: Element Skin Temperature controls process temperature, Earth leakage protection, Overload current protection, Temperature class Protection (for Hazardous area only)
<b>Installation</b>	Horizontal / Vertical

## Control Panel

The performance of the Electric heaters mainly depends on the well-designed control Panel. To meet the complex and stringent process control, Marathon is continuously working and developing the control Panels to improve various performance and safety features. Heating control panels are typically available for a wide range of voltages and wattage.

Generally, all the process heaters are accompanied with a Thyristor (SCR) control Panel. The large powers of the heaters are divided into multiple small banks for easy and effective control. Installing a control panel with the heating system not only maintains the stability and the heat transfer efficiency of the heating system, but it also provides safety and prevents issues such as overheating and chemical disintegrations.

An electrical panel is generally a metal box with door, side covers, plinths, canopy, mounting plate, lifting hooks, drawing pocket along with electrical switchgears and wiring.

Selection criteria of Control panel as follows.



<b>Rating</b>	Up to few Mega Watts as per requirement.
<b>Voltage</b>	Up to 6.6KV
<b>Construction</b>	CRCA (MS), SS, POLY CARBONATE (plastic), AL. DIE CASTED.
<b>Ingress Protection (IP)</b>	IP-41/42/54/55/65 Depends on Outdoor/ Indoor Location
<b>Basis of Area</b>	Hazardous Area (Al. Die Casted), Safe Area (CRCA, SS).
<b>Feeder Section</b>	Compartmentalized & Non- Compartmentalized Depends on number of heater bank in a panel
<b>Controlling</b>	Contactora/Thyristor/SCR Controlled
<b>Mounting</b>	Floor mounted / Wall mounted
<b>Application</b>	Heater, Motor, Pump, Blower, Conveyer Power output controlling.

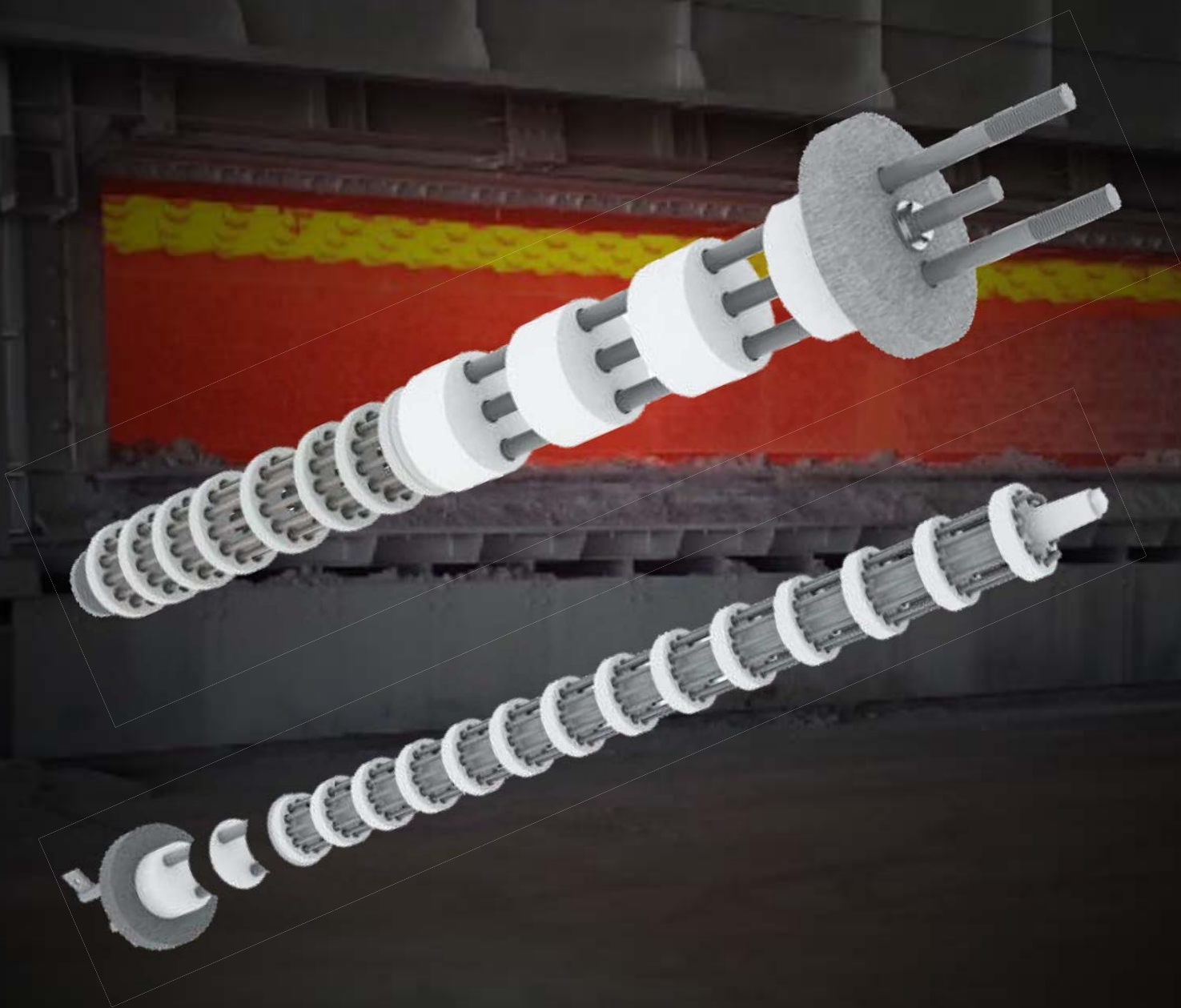
### Features of Standard Control Panel

● Panel indication lamps for	● Controls
● Power ON/OFF	● Heater On /OFF
● Heater ON/OFF	● Local /Remote
● Element over temperature	● Trip Reset
● Tube sheet over temperature (for ATEX heaters)	● Door mounted potentiometer
● Panel Over temperature	● Lamp test button
● Earth leakage indication and relay	● Earth leakage reset
● Current & Voltage	● Emergency shut down
● Annunciator (for fault indications)	





# Furnace Heaters



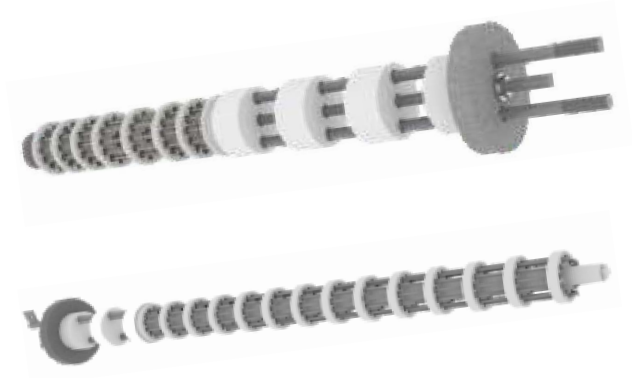
**ENGINEERED SOLUTIONS FOR HEATING & SENSING**

## Furnace Heaters

High Temperature Bundle Rod Heaters and Metallic Heating Elements are used for different furnace applications including Annealing Furnaces, Galvanizing Furnaces etc.

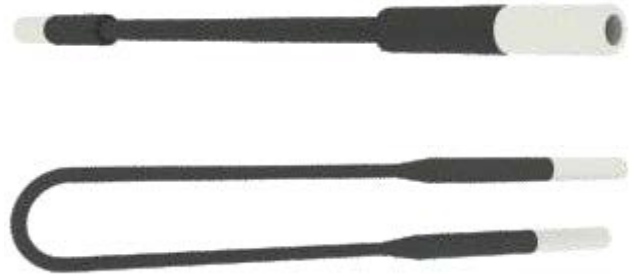
### Bundle Rod Heaters

<b>Temperature Range</b>	Upto 1100°C
<b>Heating Element</b>	NiCr 80:20, Ferritic Alloys (FeCrAl), Powder Metallurgical Heating Element
<b>Radiant Tube Material</b>	HU, Alloy-600 etc. (Customized Diameters and Length)
<b>Application Areas</b>	Annealing Furnace, Spheroidizing Furnace, Other Heat Treatment Furnaces, Aluminium holding & SQF Furnace



### Silicon Carbide Heating Elements

<b>Temperature Range</b>	Upto 1600°C
<b>Heating Element</b>	ceramic material with relatively high electrical conductivity
<b>Application Areas</b>	Aluminium Holding & Melting Furnace, Industrial Ovens, Glass feeder & Float Glass Line, Laboratory Furnaces



### Edge Wound Heaters

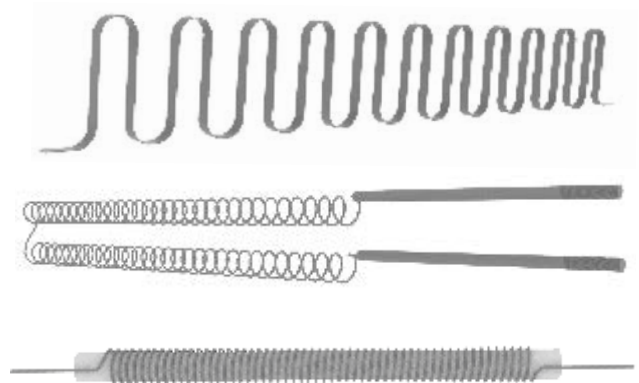
<b>Temperature Range</b>	Upto 1100°C
<b>Heating Element</b>	NiCr 80:20, Ferritic Alloys, FeCrAl
<b>Radiant Tube Material</b>	HU, Alloy-600 etc. (Customized Diameters and Length)
<b>Application Areas</b>	Heat treatment & Galvanizing Furnaces



# Furnace Heaters

## Open Coil Heating Elements

<b>Temperature Range</b>	Upto 1100°C
<b>Strip Element</b>	NiCr 80:20, Ferritic Alloys (FeCrAl), Powder Metallurgical Heating Element
<b>Application Areas</b>	Ammonia Cracker, Hearth Furnace, and many heat treatment applications



## Ceramic Bobbin Heaters

<b>Temperature Range</b>	Upto 800°C
<b>Heating Element</b>	NiCr 80:20
<b>Application Areas</b>	Oil & water heater with immersion tube for indirect heating application, air heating, heat treatment applications



## Radiant Tube

<b>Temperature Range</b>	Upto 1100°C
<b>Tube material</b>	SS310, Inconel 600/800, casting alloy tube, HK, HU, HP grade material
<b>Application Areas</b>	Indirect heating & heater protection in heat treatment applications



## Accessories

### Hanger Material

NiCr 80:20



Hangers



Hangers

## Hopper Heaters

### Hopper Heating Modules for Power Plants

Conveying coal/oil (other material) from stockpile to boiler during winter months is a well-documented nightmare for plant operators. Identical conveying problems exist within the mining industry as coal is moved around the mine site. Coal stored outdoors on the stockpile or delivered by unit train or barges picks up moisture from rain and snow. When this wet or frozen coal is conveyed, it inevitably comes into contact with the plate steel of the various hoppers and chutes within the coal handling system. During winter, this plate steel is below freezing for extended periods.

When wet or frozen coal encounters steel at sub freezing temperatures an instantaneous bond is formed. This bond causes immediate and often catastrophic blockage of the hopper and chutes. The bond and resultant blockage are so severe that often pneumatic drilling equipment and explosives are required to free up the system. This problem, known as Flash Freezing, is extremely inconvenient and very costly. Several cases are documented where utility and industrial boilers have been shut down due to blocked conveying systems.

### Marathon Hopper Heating Module

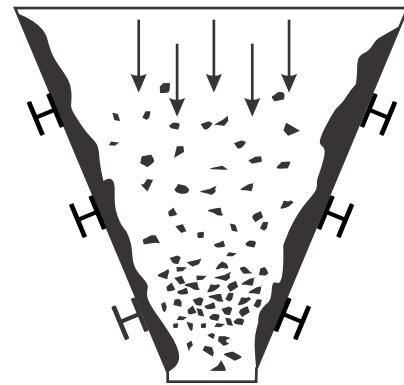
They are exclusively developed to address the unique and specific requirements for the prevention of condensation in fly ash hoppers and are also custom designed to provide low watt density, uniform heating over the lower areas of the hopper also.

#### Ratings

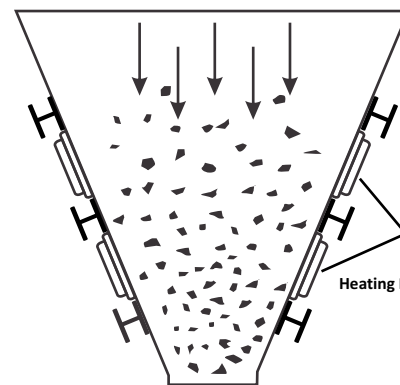
- Maximum watt density : 3 W/Inch<sup>2</sup>
- Maximum supply voltages : 415 V
- Max. operating temperature : 200°C



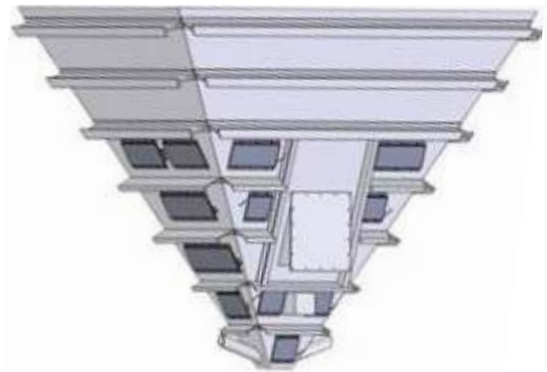
The Hopper Heating specifically addresses the flash freezing problem.



Cross Section of Unheated Hopper



Cross Section of Heated Hopper



## Fiber Glass Heaters

Fiber glass heating jacket are ideally suited to raise or maintain elevated temperature of the contents in reaction vessels, storage tank, tankers and process equipment in industries.





# Heat Tracing Solutions



**ENGINEERED SOLUTIONS FOR HEATING & SENSING**

## Self Regulating heating Cables

Marathon Heaters' self-regulating heating cable provide the maximum versatility in heat trace design and applications. Constructed of a Semi-conductive heater matrix extruded between parallel bus wires, a self regulating cable adjusts its output to independently respond to ambient temperatures all along its length. As temperatures increase, the heater's resistance increase which lower the output wattage. Conversely, as the temperature decrease, the resistance decreases and the cable produces more heat. So it is no need thermostat in some applications. It will never overheat or burnout even when wrapped by itself(overlapped). It can be cut to any length. So it is an convenient ,easy to use and energy saving product.

### LTSRH

Output wattage at 10°C	10, 15, 25, 30, 35 W/M
Braiding covering area	Over 85%
Max. maintain temp @10°C	65°C
Max. exposure temp.	105°C
Min.installation temp.	-40°C
Bending radius	5 times*cable thickness
Voltage	208-277 V
Insulation color	Black
Regular size to insulation	10*4mm (Width*Thickness)



### MTSRH

Output wattage at 10°C	40, 45, 50, 60 W/M
Braiding covering area	Over 85%
Max. maintain temp @10°C	105°C
Max. exposure temp.	135°C
Min.installation temp.	-40°C
Bending radius	10 times*cable thickness
Voltage	208-277 V
Insulation color	Grey
Regular size to insulation	11.8*3.4mm-polyolefin insulation 11.6*3.2 Fluoropolymer insulation (Width*Thickness)



### HTSRH

Output wattage at 10°C	40, 55, 60, 65 W/M
Braiding covering area	Over 85%
Max. maintain temp @10°C	135°C
Max. exposure temp.	205°C
Min.installation temp.	-40°C
Bending radius	10 times*cable thickness
Voltage	110-120/208-277 V
Insulation color	Dark Grey
Regular size to insulation	9.8*3.3 mm (Width*Thickness)



## Constant Wattage Heat Tracing Cables

### CWPHT (Constant Wattage Parallel Heat Tracing)

Constant wattage parallel circuit heating cables are designed to put out a certain amount of wattage per linear foot of cable. These are generally constructed of two #12AWG polymer insulated parallel bus wires with a nickel alloy heating element wire wrapped alternatively along the insulated bus wires. These connections are made at the 'NODE' point where the nickel-alloy heating element is either welded or connected by rivets. The entire element assembly is then dielectrically insulated with an additional polymer jacket. The power output per unit length is constant, regardless of the overall length of the heating unit. The parallel arrangement preserves systems integrity i.e. if any section of cable should fail, the rest of the heater will continue to operate. Ideally suited for applications where a particular watt density is required at all times such as freeze protection and many other low temperature process control applications

<b>Output wattage at 10°C</b>	20, 30, 40, 50, 60 W/M
<b>Braiding covering area</b>	Over 85%
<b>Surface Temperature</b>	200°C
<b>Max. exposure temperature</b>	230°C
<b>Cut to Length</b>	Yes
<b>Min Bending radius</b>	25 mm
<b>Voltage</b>	230 V / Customizable
<b>Insulation</b>	Dark Brown



### CWSHT CWPHT (Constant Wattage Series Heat Tracing)

Series resistance-type heater cables use single or multiple resistive conductors to create a heating circuit. Power output of these cables is relatively constant and as voltage is applied, the power output is determined by a combination of the length of the cable and the overall resistance of the conductor. Heating cable's current and resistance is equal to the length of heating cable, so the heating is equally distributed, and does not result in the power of terminal end to be lower than the beginning end with the increasing length of heating cable. It is suited for long line pipes and large diameter pipe's heat tracing or temp. maintenance.

<b>Output wattage at 10°C</b>	Customizable W/M
<b>Braiding covering area</b>	Over 85%
<b>Surface Temperature</b>	200°C
<b>Max. exposure temperature</b>	230°C
<b>Maximum Circuit Length</b>	3 KM
<b>Min Bending radius</b>	45 mm
<b>Voltage</b>	230 V / Customizable
<b>Insulation</b>	Red



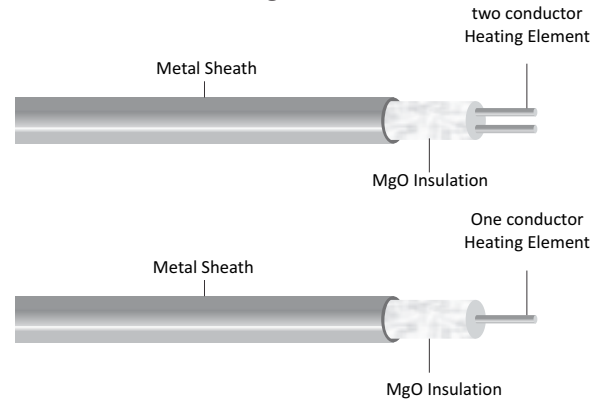
# Mineral Insulated Heating Cables

Marathon Mineral Insulated Heating Cables are the most rugged heating cable in Marathon's product line. Constructed of a solid series resistor element embedded in highly compacted mineral insulation, MI cables are built to handle high temperature, high wattage applications. The series resistor and mineral insulation are encased in a metallic jacket of INCONEL 600/800, SS304/316/321 or Copper for different high temperature or corrosive applications.

### Heater consist of three components:

1. A central conductor of an electrically resistive metal (Conductor can be helically coiled or straight) enables the design of a large range of lengths and wattage.
2. Highly compacted Magnesium Oxide provides insulation of the resistance wire for voltages up to 600V.
3. Sheathed with a metal covering of copper or Stainless Steel or INCONEL 600/800 provides excellent resistance to Pitting, Chloride-stress, acid and alkali corrosion.

### Mineral insulated heating cable construction



MI heating cables can be used for applications with the following requirements:

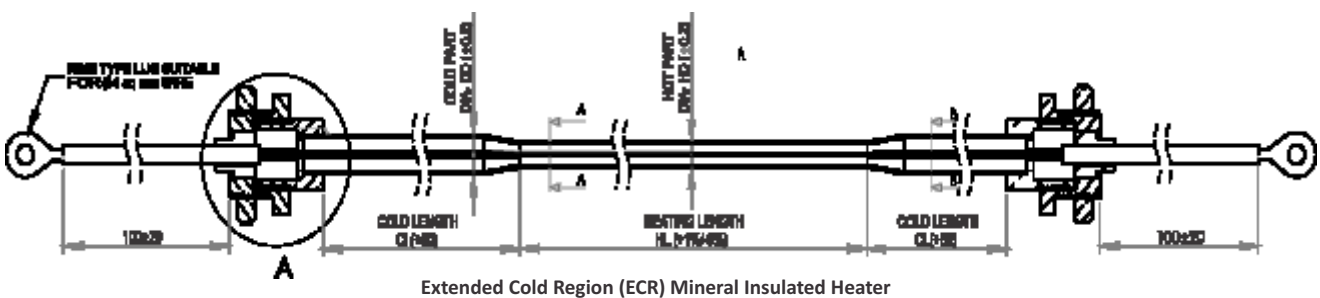
Max. Maintenance Temp. (°C)	Max. Exposure Temp. Power off (°C)	Max. (W/m)	Voltages	Size
600	800	300	Up to 600 Volt	As per Requirement

Higher temperature and power capabilities are available; contact Marathon Heater Management for additional information. Heating cables are supplied as complete factory-fabricated assemblies consisting of a heated section joined to a length of non heating cold lead section, pre-terminated and ready to fasten into a junction box with an NPT-threaded connector.

### Special Heating Cable Design Configurations

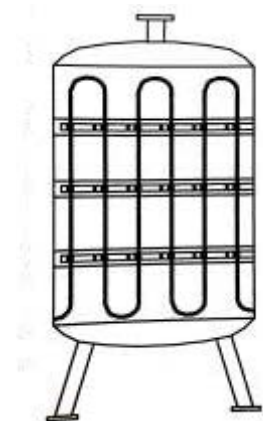
Marathon Heater offers customized designs in MI Heater Configurations to fulfill customer requirements.

Marathon Heater ECR (Extended Cold Region) Heaters are examples of such special type of MI Heaters, which are manufactured with extended cold ends from the Heating Length of the heater which suits to Critical Nuclear applications.



### Applications

- Tank Heating
- Solar power plant
- Food processing
- Used in fuel oil handling system



Typical Installation



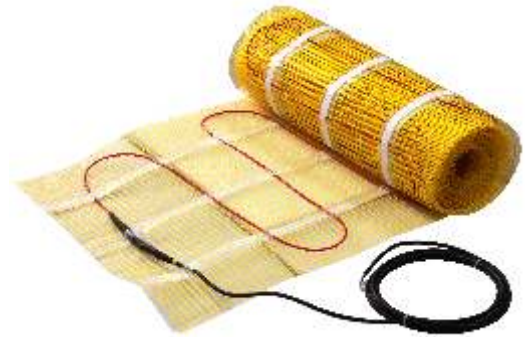
## Floor Heating Cables & Mats

Nothing matches to radiant floor heating. It is more comfortable than any other type of heating system. Radiant floor heating is the most energy-efficient way of delivering heat. There is no other floor heating option that compares in terms of comfort. Radiant floor heating is a low-temperature technology that may be regulated individually in each area. Because it warms the people and item directly rather than heating air.

### Floor Heating Cables



### Floor Heating Mats



### Specifications

Shielding Coverage	100% Coverage
Bending Radius	5 times of cable thickness
Jacketing	Heat Resistant and Flame Retardant Jacketing
Flexibility of Cable	Excellent Flexibility for easy installation
Long Cold Lead	3.5 meter cold tail (Can be customized as per requirement)
Comfort	Higher degrees of comfort can be achieved by using heating cables with close and consistent spacing, as well as thermostat to determine temperature needs.
Range	Standard heat loads are available in 100 watt to 3300 watt. As part of the offered product range, several sizes for various types / sizes of flooring are also available.
Custom-Built	In addition to this broad range, cables can be customized to meet specific length requirements, as well as heat loads and voltage needs.
Temperature Range	Upto 35°C

### Applications

- Floor heating in bedrooms, kitchen, bathroom, etc.

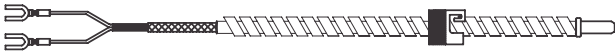
# Thermocouples & RTD's

## Thermocouple Sensors

Marathon Heater is pleased to present our line of premium temperature sensors. We offer standard and customized thermocouples, mineral insulated thermocouples, and RTDs. We use only the highest grade materials and offer a variety of sheath materials for any environment or temperature range. All sensors are subject to rigid quality control procedures and a thorough inspection process. Expert engineering assistance is readily available for any order size, large or small.



### Adjustable Depth Thermocouples w/ Stainless Steel Armor



#### Standard Features

- Fits standard bayonet adapters
- 12" spring with bayonet cap
- Spade lugs
- Grounded & Ungrounded construction
- 24 ga. Fiberglass leads with stainless steel armor

### Adjustable Depth Thermocouples w/ Stainless Steel Overbraid (Metric)



#### Standard Features

- Fits metric bayonet adapters
- Metric bayonet cap with two slots
- Spade lugs
- Grounded & Ungrounded construction
- 24 ga. Fiberglass leads w/ SS overbraid

### Fixed Depth Thermocouples



#### Standard Features

- Fits standard bayonet adapters
- Spade lugs
- 24 ga. Fiberglass leads with SS armor
- Grounded & Ungrounded construction

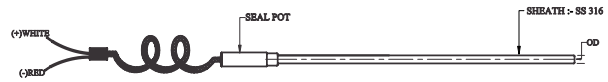
### Bendable Probe Thermocouples



#### Standard Features

- 24 ga. Fiberglass leads w/ SS armor
- Grounded & Ungrounded construction
- Spade lugs

### Miniature Mineral Insulated Thermocouple for HotRunner System



#### Standard Features

- 0.5, 1.0, 1.5, 2.0 upto 6.0mm diameter
- Grounded or ungrounded Constructions
- Kapton Insulated Lead Wire
- High temperature sealing upto 300°C

### Washer Style Surface Thermocouples



#### Standard Features

- Grounded construction
- 24 ga. Fiberglass leads w/ stainless steel overbraid
- Spade lugs

## RTD Sensors



Brass Washer on RTD

#### Standard Features

- 2 wire or 3 wire
- Flexible probe
- Stainless steel braid
- Spade lugs
- RTD probe also available in other TC styles



## Facilities



### Welding and Brazing

- Laser Welding Machines
- Programmable Micro Plasma Welding Machines
- TIG Welding Machines with Pulse Modulation And Rotary Positioner
- Induction Brazing Machines
- Resistance Welding Machines
- Brazing Sets (Oxy-Acetative)
- Deep Penetration Welding Machines

### Heater Plant

- Swaging Machines
- Laser Marking Machines
- Laser Cutting Machine
- Bright Annealing Machine
- Engraving Machines
- Coil Making Machines
- High Frequency Annealing Machines
- MgO Filling Towers
- Rolling Machine & Skinning Machines
- Vacuum Presses
- CNC Breeding Machines

### MI Cable Plant

- Draw Bench 50 meters, Horizontal Draw Benches
- Annealing Furnaces
- MI Polishing Machines
- MgO Plant

### Machining

- CNC Turning Centers
- Turn Mill Centers
- VMC Machines
- Deep Hole Drilling Machines upto 1500mm Drilling Capacity
- Milling Centers
- Manual Lathe Machines
- Cutting Machines

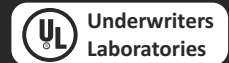
### Testing and Facilities

- Digital Multimeter
- Digital Clamp Tester
- High Voltage Tester
- Digital Insulation & Continuity Tester
- Micrometer
- Vernier Caliper (0-200mm)
- Vernier Caliper (0-1000mm)
- DFT Meter
- Pressure Gauge
- Digital Lux Meter
- Sound Level Meter
- X-Ray Machine
- Vibration Test Bench
- Temperature Gun
- RT Film Viewer
- Ultrasonic Thickness Gauge



**Marathon**  
**Tempens**

ISO 9001-2015



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