



# Marathon TempSens

## ENGINEERED SOLUTIONS FOR HEATING & SENSING

ISO 9001-2008



HotRod Cartridge Heaters



Coil Heaters



Silicon Rubber Heaters



Air Heaters



Mineral Insulated Heaters



Tubular Heaters



Mica Band & Strip Heaters



Furnace Heaters



Ceramic Band Heaters



Thermocouples & RTDs



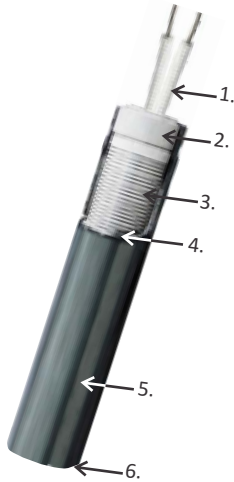
\*Applied for

[www.marathonheater.in](http://www.marathonheater.in)

## 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 450°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. 304 stainless steel sheath for oxidation resistance in a wide variety of environments. 316 stainless steel and Incoloy are also available. Please consult the application guide in the back for help in determining which material is best for your application.
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
1/4"	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	9.86	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
2.54	25	35	45	50	50	50

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

Watt density is calculated by:

**Wattage**

**Heated Lth x Diameter x 3.14**

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

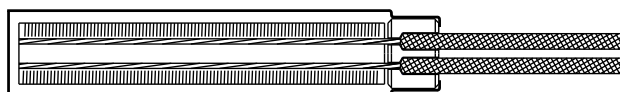
### Lead Wire Characteristics

Wire Type	Temp. Rating	Max. Temp. (Recommended)	Comments
Ultralead	250°C	450°C	Excellent, durable wire, good for high temperature applications
Teflon	250°C	250°C	Good for areas where a small diameter wire is needed.
Silicon Rubber	200°C	200°C	Good moisture resistance
Braided Silicon Rubber	200°C	200°C	Inexpensive wire good for non abrasive applications
MGT	450°C	450°C	Good high temperature wire
SJO cord	90°C	90°C	Rubber jacket, resistant to oil and moisture. For use on 3/8" dia. and larger

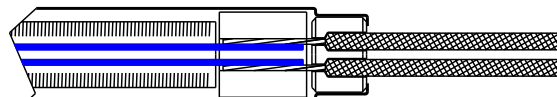
## Hot Rod Cartridge Heaters

### 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.

### Crimped on Leads

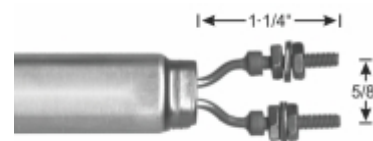
Crimped on leads are generally used where the temperature at the end of the heater exceeds the maximum rated temperature of the lead wire. Crimped on leads are not recommended for applications where the leads must be bent sharply near the heater, or in applications where the leads will be subject to a lot of flexing.



### Post Terminals

Post terminals (also called screw terminals or stud terminals) are used in applications where easy lead replacement is desirable.

They work great with ring terminals or fork terminals. Post terminals are only available for heaters 355.6mm diameter and up. Terminals are #6-32 and supplied with 2 stainless steel washers and 2 stainless steel nuts on each stud.



### 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 epoxylite is rated at 600°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.



## Hot Rod Cartridge Heaters

### 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.



### Stainless Steel Flexible Conduit

Flexible conduit provides maximum lead protection from abrasion but can not be bent as sharply as stainless steel braid. Flexible conduit is swaged into the heater for maximum protection. (Flexible conduit is also known as armor or hose)



### Copper Coupler and Stainless Steel Flexible Conduit

Flexible conduit can also be attached to the sheath with a copper coupler. This method can also be used to attach flexible conduit to stock heaters.



### Hex Head Pipe Fittings

Fittings are available in brass or stainless steel. Brass fittings are brazed on and stainless steel fittings can be either brazed or welded on.



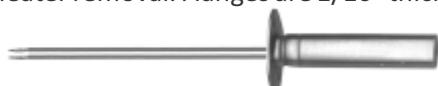
### Double Ended Threaded NPT Fittings

Double ended fittings are normally used when it is desirable to mount a box on an immersion heater. Fittings are available in stainless steel and brass.



### Flanges

Small flanges can be welded on the lead end of the heater. Flanges can be used to hold a heater in place to prevent backing out during operation. Flanges also assist in heater removal. Flanges are 1/16" thick.



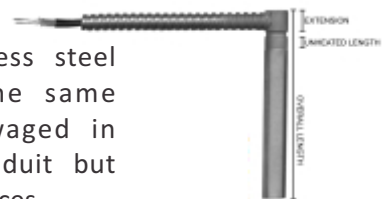
### Distributed Wattage:

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.



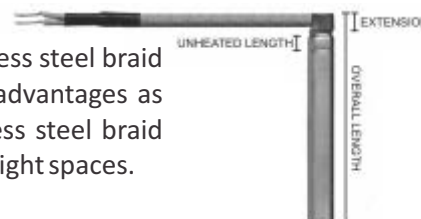
### Copper Elbow and Stainless Steel Flexible Conduit

Right angle flexible conduit can also be attached to the sheath with a copper elbow. This method can also be used to attach right angle flexible conduit to stock heaters.



### Right Angle Stainless Steel Braid

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



### Bent HotRod

Hot Rods can bent at any angle from 10° to 120. Heaters must be bent in an unheated section and can be constructed with most of the other options shown in this Catalogue



### 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



### Double Ended Heater

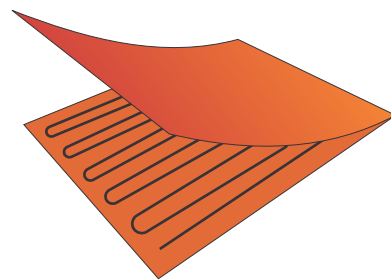
HotRod cartridge heaters are also available with an electrical termination on each end. Heaters can be made with lead wires, straight pins, or screw terminals



## Silicone Rubber Heaters

### Wire Wound Silicone Rubber Heaters

Marathon Heater flexible heaters provide outstanding performance in applications up to 250°C under a variety of operating conditions. Properly applied silicone rubber heater life routinely exceeds 10 years. Silicone rubber has a high dielectric strength and is flame retardant and non-toxic. Design versatility permits special heat profiles allowing zones of higher or lower heat concentration as needed. Their flexible construction makes them very easy to install on a variety of surfaces. Silicone Rubber Heaters can be mounted to flat or curved surfaces. They are not affected by vibration, flexing or repeated mechanical shock.

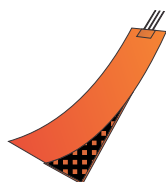


### Design Options

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

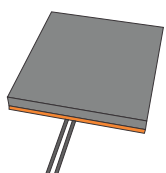
#### Ground Mesh.

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



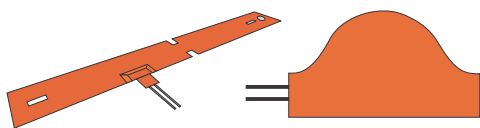
#### Silicone Rubber Sponge Insulation.

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".



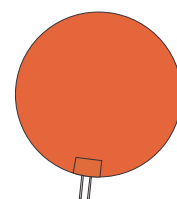
#### Various Shapes for Various Applications.

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



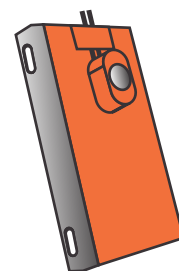
#### Round Heaters.

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



#### 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.



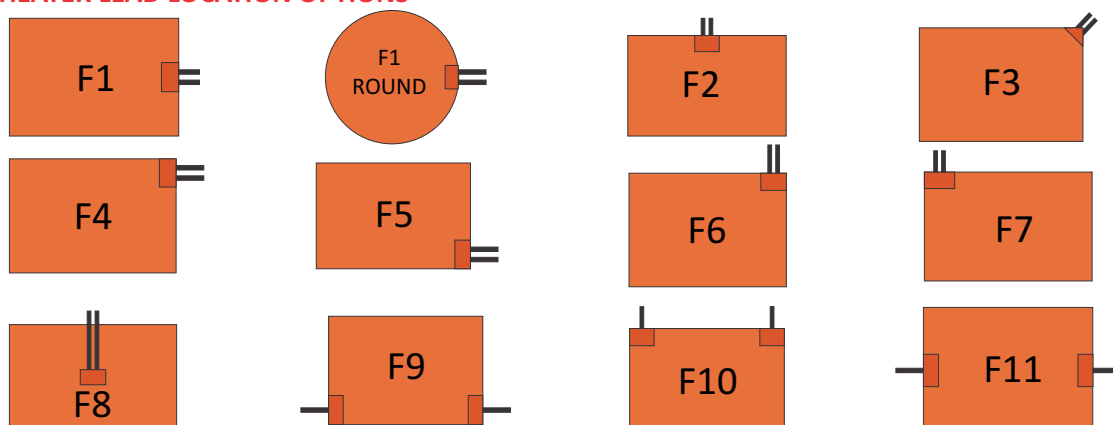
#### Other Design Options

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

### FLEXIBLE HEATER LEAD TERMINATION OPTIONS

Marathon Heater Flexible Heaters come standard with 10" of 22 ga. Teflon leads. Other gauge leads available upon request. The leads are soldered at the lap connection then covered with a vulcanized lead cap.

### FLEXIBLE HEATER LEAD LOCATION OPTIONS





## Silicone Rubber Heaters

### Mounting Methods

#### 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. PSA is rated to a continuous temperature of 300 F and a maximum intermittent temperature of 400 F. It is not recommended for curved surfaces. The heater should be installed within 6 months of manufacture.

#### Factory Vulcanizing

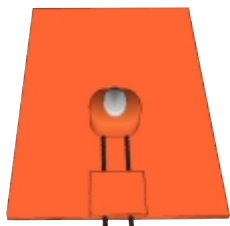
Another method of installation is to send your tool to the Marathon Heater factory. The tool is placed in a vacuum able and the SRH is vulcanized directly to the tool. This is the strongest bond available.

#### 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.

### Temperature Controls For Silicone Rubber Heaters

Marathon Heater Silicone Rubber heaters can accommodate pre-set or adjustable thermostats, thermal cut-offs, RTDs and Type J thermocouples. Each has a specific temperature range and maximum amperage capability. Please contact the factory for availability.



The most common type of temperature control are pre-set and adjustable thermostats. They can be mounted to sense the temperature of the surrounding atmosphere or to sense the part temperature. Not recommended for low voltage applications.

Thermocouples & RTDs are small and are easily embedded anywhere on the heater. Almost any type of Thermocouple can be used. Type J is the most common.

### Drum Heaters

Marathon Heater drum Heaters are an easy way to heat up drum contents. Various sizes and lengths allow you to heat up practically any drum, pail or barrel. Uniform heat prevents scorching or degradation of the contents. The silicone rubber band heater is placed below the level of the fluid. The easy spring lock-up provides movement of the band when content levels fluctuate. The band style drum heater can be used on plastic, alloy or just about any material.



### Mounting Methods

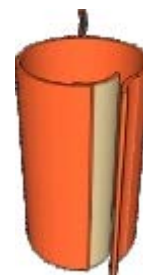
#### Springs and Grommets

Each end of the spring is attached to a grommet, securing the heater to the tool. Grommets are spaced approximately 2" apart.



#### Velcro

1" wide Velcro straps secure the heater to the tool. Temperature rating -35°C to 200°C



#### Band Style Drum Heater applications include:

- Freeze protection
- Viscosity control
- Speeding up the flow of liquids
- Maintaining product consistency

#### Features

- Easy installation with spring loaded fastener.
- 3 conductor cord set.
- Internally grounded.
- Can be wrapped around any object
- Options thermocouples, RTD's, holes and cut-outs.

## Mineral Insulated Heating Cables

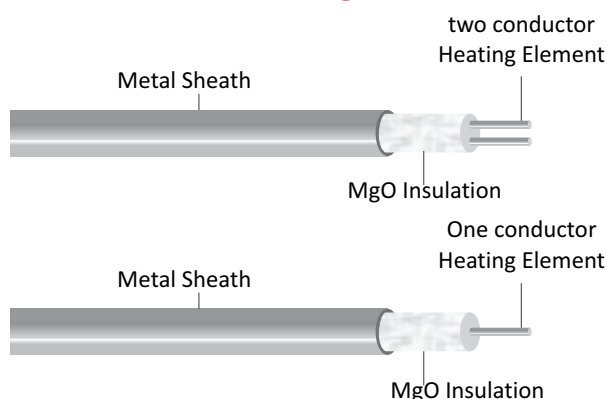
### Marathon Mineral Insulated Heating Cables

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 is Comprised 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:

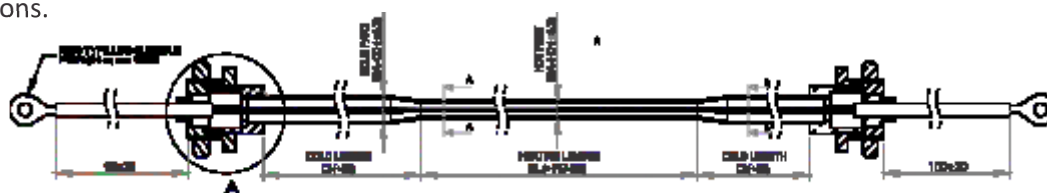
Max. Maintenance Temp. (°C)	Max. Exposure Temp. Power off (°C)	Max. (W/m)	Voltages	Size
550	650	250	Up to 600 Volt	As per Requirement

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.



Extended Cold Region (ECR) Mineral Insulated Heater

#### Applications:

This cable is suitable for the following applications:

- Under-water Radiator
- Container Heaters
- Valves Heaters
- Pipe-accompanying Heaters
- Industrial Process Heaters
- Panel Heaters
- Immersion Heaters



Typical Installation

## Mica & Ceramic Band Heaters

### Mica Band Heaters

- 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.



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.

### 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 and Assemblies

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.

### APPLICATIONS:-

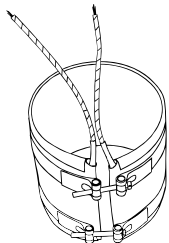
- Reduce power consumption
- Conserve heat
- High degree of flexibility
- Uniform heat distribution
- Various termination styles



## Mica & Ceramic Band Heaters

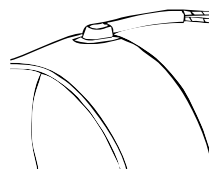
### Fibreglass Lead & Stainless Steel Braid terminations

#### Order Type L1/B1



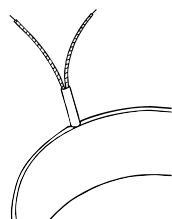
- Leads exiting both sides of gap are standard unless otherwise specified.
- High temperature fiberglass leads are rated to 455°C.
- Standard lead length is 10"

#### Order Type L4/B4



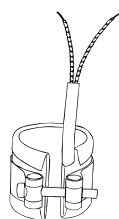
- Leads may exit at right angle out of cap from any position on the heater.
- 1.5" of sleeve protection is standard.

#### Order Type L2/B2



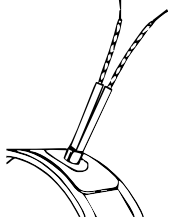
- Lead wires exiting 180 degrees from gap are common on nozzle heater applications.
- 1.5" of sleeve protection is standard on lead exits.

#### Order Type L5/B5



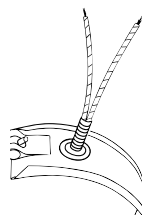
- Lead wires on one side of gap are available on any construction.
- Common exit for small band heaters.
- Standard gap is .300"

#### Order Type L3/B3



- Leads exiting straight out the side are available on any construction.
- Leads exit through a brass eyelet.

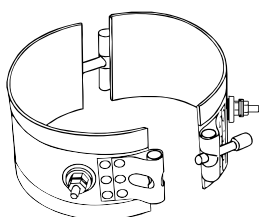
#### Order Type L6/B6



- Stainless steel spring provides extra support, protecting leads from sharp bends.

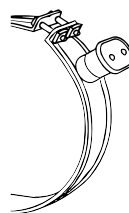
### Marathon Special Constructions

#### Two Piece



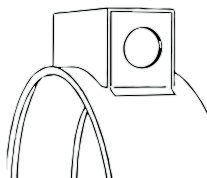
- Two piece construction is available for easy installation and removal.
- Please specify total wattage when ordering
- Min. I.D. 3"

#### Euro Plug



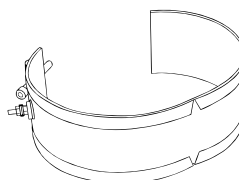
- European type plugs are available upon request.
- 1" x 1.75" x 1"

#### Terminal Box



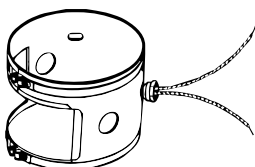
- Terminal boxes are excellent for preventing electrical shock or electrical shorts. Terminal boxes are available on any clamping or construction style.

#### Expandable



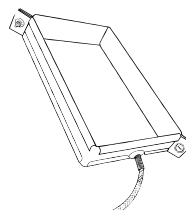
- Expandable Mica Heaters allow you to open the heaters to the diameters of the barrel for easy installation.
- Min. I.D. 3"
- Heaters should only be opened all the way one time.

#### Holes



- Band Heaters can be manufactured with custom holes or slots for thermocouples or special mounting needs.
- Minimum of 1/2" is required from the hole to the edge of the heater.

#### Box



- Box or rectangular heaters are efficient for heating dies on plastic extruders or the barrels of twin extruders.
- They can be manufactured in one or two piece construction.

## Coil Heaters & Air Heaters

### Coil Heaters

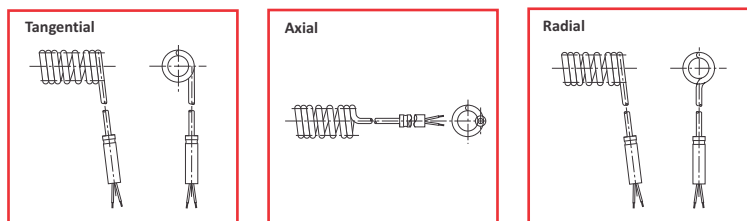
Coil heaters are an advance concept of thermal engineering, is also known as high performance tubular heaters or cable heaters. The basic construction of these heaters consist of compacted MgO, high temperature resistance wire and Chrome Nickel Steel tube. These heaters can be constructed with or without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



### Applications

- Hot Runner Nozzles & Bushings
- Tube Extrusion
- Pipe Forming
- Hot runner distribution plates
- Sealing and cutting bars and jaws for packaging machines
- Small Manifold Heating
- Hot metal forming dies and punches
- Semiconductor manufacturing and wafer processing

### Types Of Termination Exits

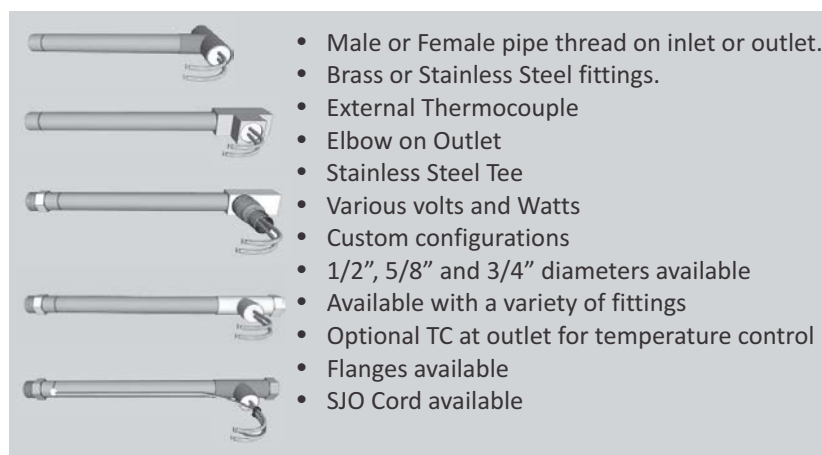


### Technical Data

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

### Air Heaters

Marathon air heaters feature an open coil of high temperature resistance wire electrically isolated in a stainless steel sheath. Because the air being heated passes directly over the resistance wire, maximum heat transfer efficiency is achieved. Marathon brand air heaters are used for heat staking, plastic welding, laminating, drying, heat sealing, and any other operation where air needs to be heated up  $500^\circ\text{C}$ .



### Applications

- Heat Staking
- Shrink Fitting
- Plastic Welding
- Laminating
- Sealing
- Drying

### Standard Construction

- $1/2"$ ,  $5/8"$  or  $3/4"$  diameter
- 304 Stainless Steel Sheath
- High temperature leads or 3 pin connector
- Epoxy Seal
- Copper Tee
- 120 Volt and 240 Volt



### Specifications

- Maximum Amps: 10
- Maximum CFM: 10
- Use clean air only
- Air temp up to  $500^\circ\text{C}$
- Heat air to temperatures as high as  $500^\circ\text{C}$ .

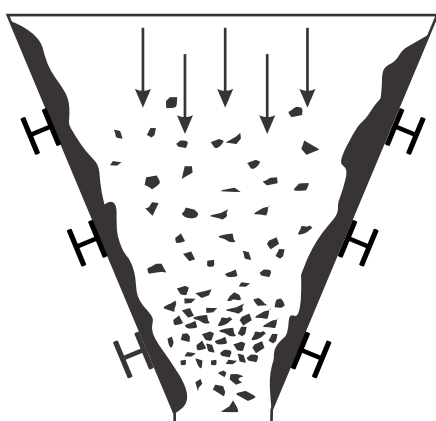


## Hopper Heaters

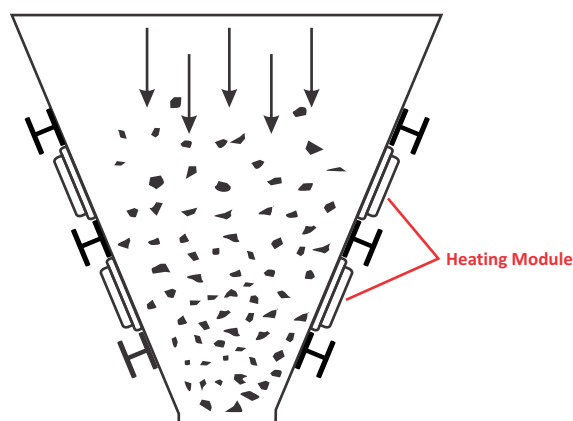
### Hopper Heating Modules for Power Plants

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.

**The Hopper Heating specifically addresses the flash freezing problem.**



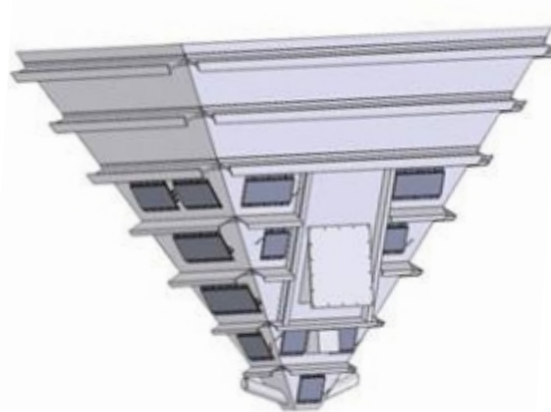
Cross Section of Unheated Hopper



Cross Section of Heated Hopper

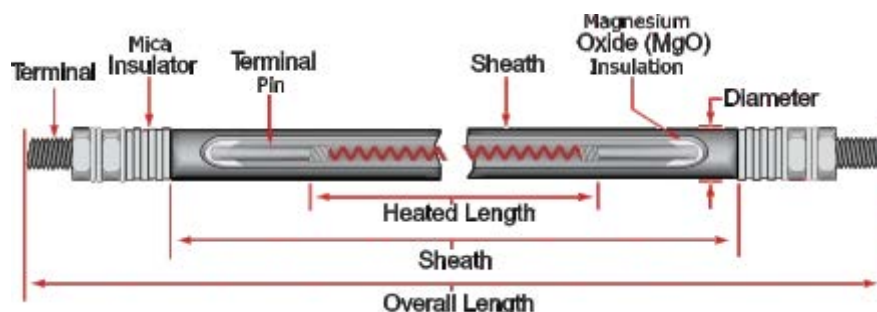
### Marathon Hooper Heating Module

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.



## Tubular Heaters & Heating Bank

### 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 and seamless)

Stainless as per ASTM Grade 304/304L/310/316/ 316L/321 Alloys 600, 625, 640, 800, 825, 840

### Tubular Heater Assembly for Hazardous and Safe Area



Duct Heaters



Finned Duct Heaters



Circulation Heaters



Screw Plug Immersion Heaters



Finned Tubular Heater



Pressure Vessel With Heater Bundle



Ex'd Heaters

## Customized Heating & Control system

### Customized Heating Element

In addition to many different standard heaters Marathon also offers unlimited variations in the form of customized heater designs. If your requirements call for unique physical attributes, special wattage or voltage ratings, Marathon can create a heater to fit your unique application. Many times we are able to incorporate design enhancements at little or no added cost.

To help you become more familiar with our capabilities, please review photos of heater assembled below. They represent just a few ways we have helped other customers improve their process heating operations.



Customized Glass Tunnel Heater



Customized Polymide or Kapton Heaters



Quartz Immersion Heater

### Control System

#### PID Controller:

Marathon offers PID Controller for optimum thermal system performance. Capable of accepting a variety of sensor inputs, including thermocouple, RTD and process. The controller senses the rate of temperature increase (reverse acting) or decrease (direct acting) and adjusts the output action to minimize set point over- and under-shoot. PID controllers can have more than one output channel for alarms, retransmit and serial communications.

It is recommended in systems where the load changes often and the controller is expected to compensate automatically due to frequent changes in setpoint and the system to be controlled.

PID output action requires a Power Controller to withstand rapid switching cycles.

**Marathon offers reputed make SSRs and SCRs for Power Controlling Systems:**

#### SSR Power Controlling System

Solid State Relays well-suited to provide the rapid switching cycles required by PID temperature control, SSRs can switch from 10 to 75 amps up to 480VAC. Switching can be either zero cross from AC or DC input voltages, or random from DC input voltage.

#### SCR (Thyristor) Power Controlling System

Silicon Controlled Rectifier capable of zero cross or phase angle operation, or burst firing to act as a solid state contactor, SCRs offer power switching advantages not possible with SSRs. Available in ratings from 10 to 1000 amps, up to 575VAC, in 1-phase, 3-phase/2-leg and 3-phase/3-leg versions. Zero cross variable time base extends heater life and permits more accurate control. Phase angle firing permits "soft starting" loads that change resistance over time and temperature.

#### Integrated Control Panel System

Marathon offers control panel that integrates temperature controllers, customer input and power control system into a complete package. This precise power control allows process temperature to be controlled to  $\pm 1^\circ\text{C}$ . Marathon offers customized panel sizes for unique applications.





## 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



Temperature Range : Upto 1100°C  
 Heating Element : NiCr 80:20, Kanthal APM, Kanthal A1, Kanthal AF etc.  
 Radiant Tube Material : Kanthal APM, HU, Alloy-600 etc.

Customized Diameters and Length

Application Areas : Annealing Furnace, Spheroidizing Furnace, Other Heat Treatment Furnaces

### Edge Wound Heaters



Temperature Range : Upto 1100°C  
 Heating Element : NiCr 80:20, Kanthal APM, Kanthal AF  
 Radiant Tube Material : Kanthal APM, HU, Alloy-600 etc.  
 Customized Diameters and Length  
 Application Areas : Annealing Furnace, Spheroidizing Furnace, Other Heat Treatment Furnaces

### Metallic Heating Elements



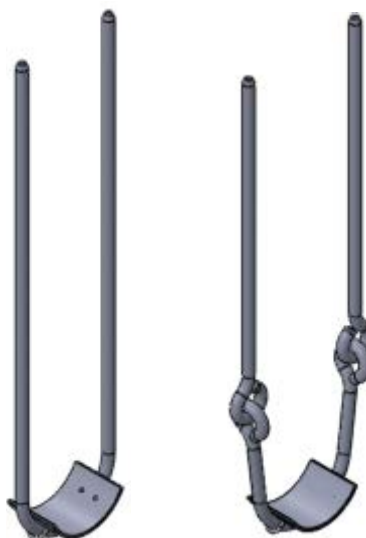
Temperature Range : Upto 1100°C  
 Strip Element : NiCr 80:20, Kanthal APM, Kanthal AF, Kanthal D  
 Application Areas : Ammonia Cracker, Furnace Elements etc.

### Accessories



Radiant Tubes

Radiant Tube Material : Kanthal APM, HU, Alloy-600 etc.



Hangers

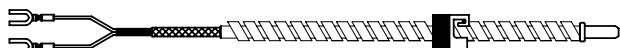
Hanger Material : SS310, Incoloy 800, N40 etc.

## Thermocouples & RTDs

### 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

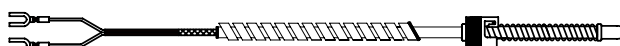
#### Adjustable Depth Thermocouples w/ Stainless Steel Overbraid (Metric)



##### 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

#### Washer Style Surface Thermocouples



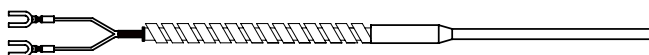
##### Standard Features

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

#### Available Options for all Thermocouples & RTDs

- 2 wire or 3 wire RTD
- 1/8" diameter probe
- Custom probe length
- Polarized plug or jack
- Mini plug or jack
- Ungrounded construction
- 20 ga. Lead wire
- Additional lead lengths available
- Custom orders welcome

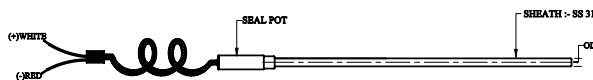
#### Bendable Probe Thermocouples



##### 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

### RTD Sensors



##### Standard Features

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

#### Colour Code of Compensating Cables & Thermocouples

THERMOCOUPLE CONDUCTOR COMBINATION TYPE	CONDUCTOR		INTERNATIONAL COLOUR CODE TO IEC 5843:1989	AMERICAN TO ANSI/MC96.1	JAPANESE TO JIS C 1605-1981
	EXTENSION CABLE	COMPENSATING CABLE			
K	KX				
		KCA			
		KCB			
T	TX				
J	JX				
N	NX				
		NC			
E	EX				
		RCA			
S		RCB			
		SCA			
B		SCB			
		BC			

## About the Company

**MARATHON HEATER (INDIA) PVT. LTD** is a part of **Tempsens** 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 9001:2008 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 300000 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 n 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 n Gas Industry, Refinery, petrochemicals, power, chemical, Marine and various other industrial n process applications.

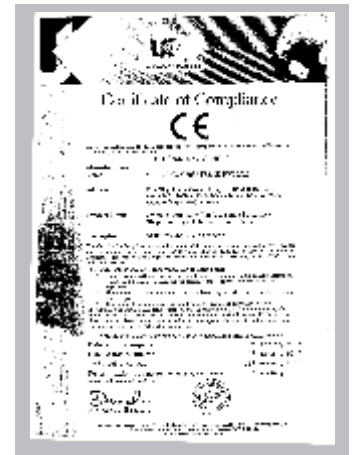
Our well experience Technical team also provides extensive support to privileged customers with Electric heaters required for Research n developments.

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

## Certificates



ISO 9001-2008 Certified



CE Certified



UL & CSA Certified



## ENGINEERED SOLUTIONS FOR HEATING & SENSING



### MARATHON HEATER (I) PVT. LTD.

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