

# Cartridge Heaters

Tutco Cartridge heaters are high-temperature heating elements providing excellent heat transfer efficiency and a watt density up to 100 W/in<sup>2</sup>.

Two cartridge heater styles are offered. The Hi-Temp is an extremely durable cartridge heater manufactured with a swaging process and used where high operating temperatures are required. It is made to withstand a sheath temperature of up to 1400 °F (760 °C), internally up to 1600 °F (871 °C). Its swaged construction allows for minimal air gaps, providing a dense heater construction with superior heat transfer and resistance to impact and vibration. We also offer a standard cartridge heater with a maximum sheath temperature of 1000 °F (538 °C). Dual voltage and three-phase options are available on select diameters. We can also work with you to design and manufacture cartridge heating elements with distributed or zoned wattages.

## Applications

Tutco manufactures electric cartridge heaters ideal for applications with high heat and excessive vibration characteristics. Applications like hot stamping, sealing bars, forming and heating platens may have parts best suited for a rugged high-temperature cartridge heater. Like our Standard models, many options are available to customize our Hi-Temp Cartridge heaters. Choose Hi-Temp for applications involving high heat and/or excessive vibration. A swaged construction and the appropriate diameter will yield the longest heater life. Consult the factory for additional information and product options to meet your specifications.

## Expedite Service Available

Our standard lead-time on this product is 10-15 business days; however, a 5-business day expedite is available for a fee. Anything less than 5 business days will have to be approved by manufacturing. When requesting a quote, please be sure to indicate any time-sensitive requirements.

## The fight against COVID-19

Electric heating elements are used in many medical devices. One of the key components used in a respiratory ventilator is a small conductive cartridge heater. It is used to regulate the temperature and humidity of the air and oxygen mix administered to patients.

The demand for ventilator products has grown exponentially and everyone is struggling to meet demands. TUTCO is committed to rapidly producing OEM heating solutions to help manufacturers fight against COVID-19.

([https://www.tutco.com/media/large\\_product\\_photos/hitemp\\_cartridge.jpg](https://www.tutco.com/media/large_product_photos/hitemp_cartridge.jpg))



CUSTOM QUOTE

BUY NOW  
(/CARTRIDGE-  
HEATERS/BUY-NOW/)

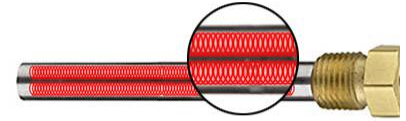
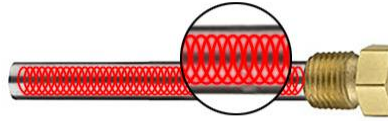
ESTIMATE WATTAGE (/RESOURCES/ESTIMATE-HEATING-POWER-REQUIREMENTS)

- Wattage tolerance** ..... ±5% - 10%\*  
based on NEMA standards
- Resistance tolerance** ..... ±10% - 5%\*\*  
based on internal operating temperature,  
8.5% lower at room temperature for standard heaters  
and 3.3% lower for Hi-Temp heaters.
- Standard voltages** ..... 120V, 240V & others.  
Many others available upon request

## Style Comparison

## HI-TEMP

## STANDARD



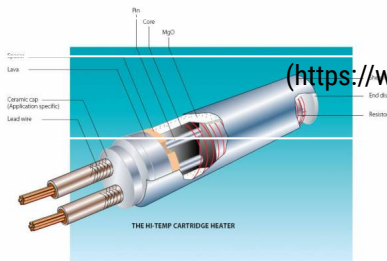
Max Watts/sq. in.	100 Watts/sq.in. <i>Call factory for exceptions.</i>	45 Watts/sq.in.
Max Sheath Temp	1400 °F (760 °C)	1000 °F (538 °C)
Sheath	Incoloy Sheath	Stainless Steel Sheath
Diameters	Metric & Imperial Sizes Available	Imperial Sizes Only
Cap Seal	Cement seal is standard, RTV and Epoxy seals also available.	Ceramic cap standard; cement, epoxy or RTV seal also available.
Country of Manufacture	USA and Global Manufacture	Made in USA
Computer designed specifications	✓	✓
Fast heating coil winding design	✓	✓
Fine grain high purity magnesium oxide (MgO) fills	✓	✓

GET A QUOTE

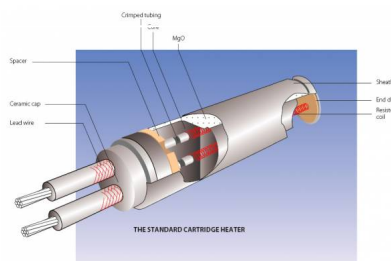
GET A QUOTE

## Product Diagrams

([https://www.tutco.com/media/product\\_diagrams/hitemp\\_cartridge.jpg](https://www.tutco.com/media/product_diagrams/hitemp_cartridge.jpg))



([https://www.tutco.com/media/product\\_diagrams/standard\\_cartridge.jpg](https://www.tutco.com/media/product_diagrams/standard_cartridge.jpg))



## — Additional Information

### Lead Options

Lead Protection

Screw Terminals

Fittings

Thermocouple

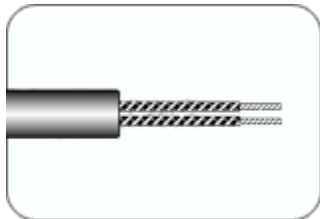
Other Options

Diameter Sizes

Custom Options

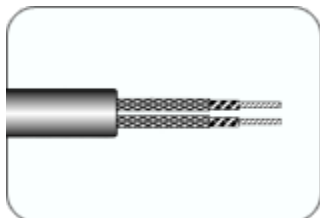
Features

Materials & Construction



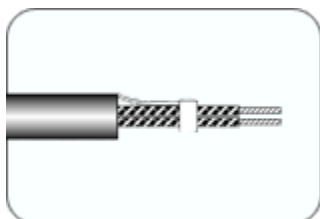
### Flexible Leads

Internally connected leads. For applications requiring maximum flexibility at lead exit. 10" (25.4 cm) leads standard, other lengths are available.



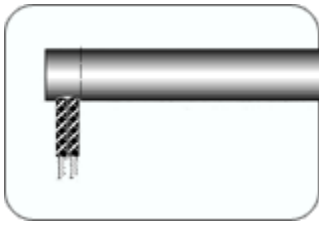
### Externally Connected Leads

Hi-Temp Cartridges are provided with approx. 1" (25.4 mm) sleeving over lead junction as standard. 10" (25.4 cm) leads standard, other lengths are available.



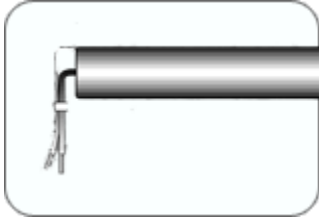
### Straight Leads with Clip Support

Clip support helps to minimize lead breakage where leads exit heater. 10" (25.4 cm) leads standard, other lengths are available.



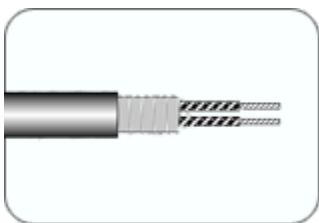
## 90° Leads

Leads exit at 90° angle for applications requiring small radius bends, lead wire protection and where space is limited. 10" (25.4 cm) braid standard, other lengths are available. Order by overall length.



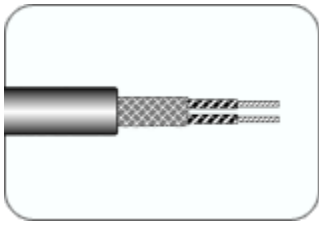
## 90° Leads with Clip

Clip support helps to minimize lead breakage where leads exit heater. 10" (25.4 cm) leads standard, other lengths are available.



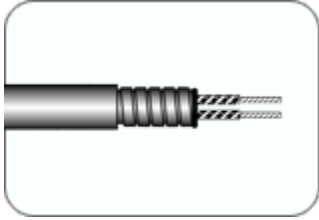
## Straight Strain Relief Spring

Straight strain relief spring minimizes bending strain on lead wires. Spring extends approximately 3" (76.2 mm) beyond end of sheath.



## Stainless Steel Braid

Stainless steel braid over lead wires. For applications requiring small radius bending and lead wire abrasion protection. 10" (25.4 cm) braid standard, other lengths are available.



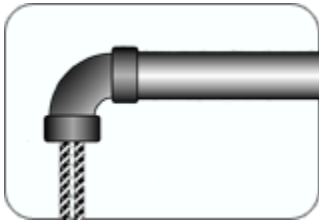
## Stainless Steel Armor

Straight stainless steel armor cable protects leads from abrasion. Sizes include: 1/4", 5/16", 1/2", and 5/8". 10" (25.4 cm) standard, other lengths are available.



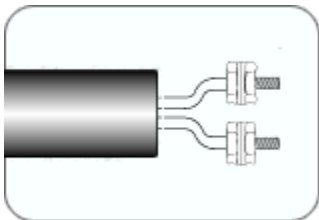
## Convoluted Armor

Used in situations that require moisture resistant armor. Available in most instances in which armor is utilized. Sizes: 3/8", and 5/8" only. 10" (25.4 cm) standard, other lengths are available.

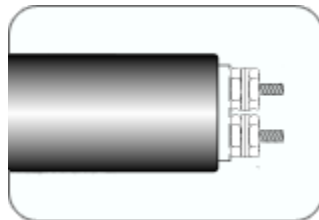


## Right Angle Elbow

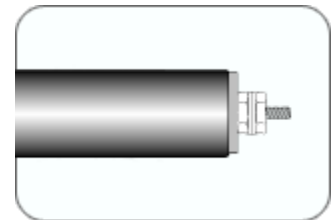
Right angle copper elbow for applications requiring right angle lead exit. Moisture-resistant seal is optional. 10" (25.4 cm) leads standard, other lengths are available.



External Pins

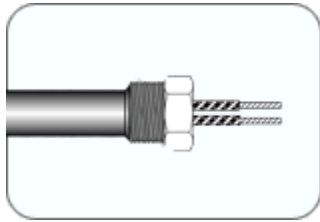


Flush With Cap



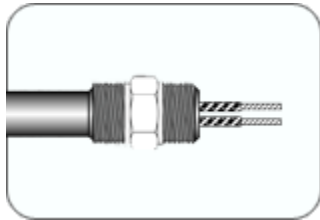
Either End

Screw terminals for applications with high amps and requiring universal connection capability. Terminals can be attached to external pins, flush with cap (not available for Hi-Temp), or one on each end.



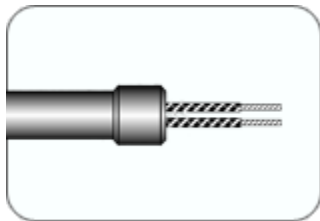
## NPT Bushing

Hex head N.P.T. bushing attached. Must specify insert length and bushing material. Sheath material types: stainless steel, cold rolled or galvanized. Bushing material types: brass, stainless steel or steel. 10" (25.4 cm) leads standard, other lengths are available. Octagonal box available.



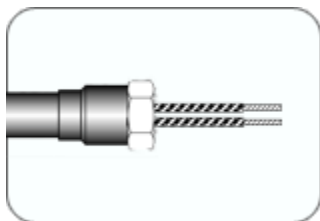
## Hex Center Bushing

Hex head N.P.T. bushing attached. Must specify insert length and bushing material. Sheath material types: stainless steel, steel or brass. Bushing material types: brass, stainless steel or steel. 10" (25.4 cm) leads standard, other lengths are available. Octagonal or explosion-proof boxes can be adapted to both Standard and Hi-Temp Cartridge heaters.



## Adapter

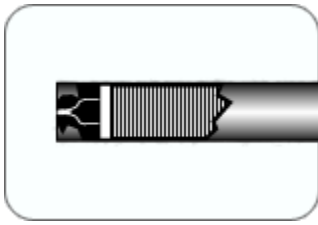
Must specify insert length and bushing material. Sheath material types: stainless steel, cold rolled or galvanized. Bushing material types: brass, stainless steel or steel. 10" (25.4 cm) leads standard, other lengths are available.



## Adapter with Hex Head

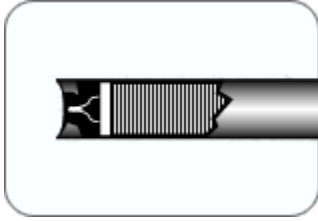
Must specify insert length. Bushing material is copper. 10" (25.4 cm) leads standard, other lengths are available.

**Thermocouple at Bottom**



## Bottom Grounded

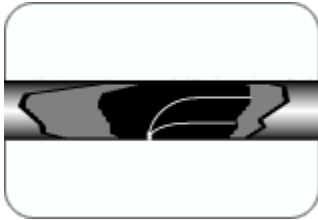
For fast response, heater is positioned in a blind hole or where material flows past or encompasses the heater. The end disk is always welded in place. Machined flat up to 1/2" (12.7 mm) dia.



## Bottom Ungrounded

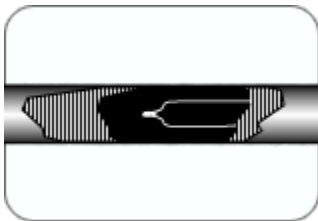
Where circumstances are such that an ungrounded thermocouple is required.

## Thermocouple at Center



## Center Grounded

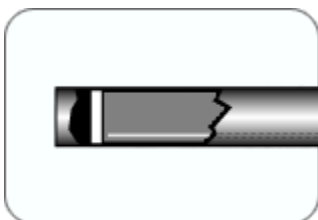
Selected when a fast response is required. The thermocouple can be located in any position along the length of the heater. Standard location is midway along the length with approximately 1/4" (6.4 mm) cold section on either side of the junction. Not available on 1/4" diameter heaters.



## Center Ungrounded

The thermocouple is positioned internally and ungrounded to monitor the heater temperature. Generally used in research and development applications.

## Removable Thermocouple



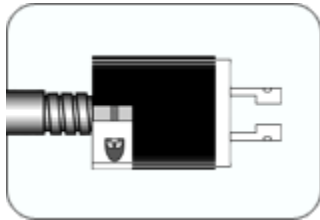
The thermocouple is inserted down a hypotube for easy removal.

## Thermocouple Availability



All heaters shown are Hi-Temp with type "J" thermocouple standard. Type "K" thermocouples are available.

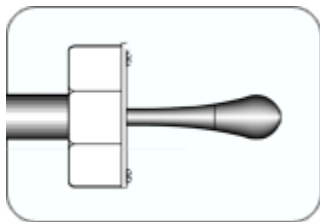
For standard Cartridge heaters thermocouples are available located at the bottom or center, ungrounded only.



## Armor with Plug

Armor cable with power plug attached. Must specify armor length and Hubbell® power plug number. Moisture-resistant armor available. Other Plugs are available.

Also available with Hex Head NPT bushing and armor.



## Bolt Heater

Bolt heaters are designed to heat drilled metal surfaces quickly while minimizing heat loss to surrounding areas. Each is designed to expand drilled bolts or studs while maintaining a uniform heat throughout its heated length. Typically, after a bolt is heated (expanded) the holding nut is tightened. The shrink tightness is obtained when the heater is removed and the bolt cools. This process is frequently used in the assembly and/or servicing of heavy duty equipment such as compressors, steam turbines, pressure vessels, etc.

	<b>HI-TEMP</b>	<b>STANDARD</b>
Imperial Sizes	Actual Diameter	Actual Diameter
3/16"	N/A	0.183" ± 0.001"
1/4"	0.247" ± 0.002"	0.245" ± 0.002"
5/16"	0.310" ± 0.002"	0.308" ± 0.002"
3/8"	0.370" ± 0.002"	0.370" ± 0.002"
7/16"	0.432" ± 0.002"	0.432" ± 0.002"
1/2"	0.495" ± 0.002"	0.494" ± 0.003"
9/16"	0.560" ± 0.002"	0.562" ± 0.003"
5/8"	0.620" ± 0.002"	0.620" ± 0.003"
11/16"	0.681" ± 0.002"	0.681" ± 0.003"
3/4"	0.744" ± 0.002"	0.744" ± 0.003"
13/16"	0.812" ± 0.003"	0.812" ± 0.003"
7/8"	0.869" ± 0.002"	0.869" ± 0.003"
15/16"	0.932" ± 0.002"	0.932" ± 0.003"
1"	0.995" ± 0.003"	0.992" ± 0.003"
1-1/4"	N/A	1.244" ± 0.003"
Metric Sizes	Actual Diameter	Actual Diameter
6.5 mm	6.43 mm ±0.05 (0.253" ±0.002)	N/A
8.0 mm	7.92 mm ±0.05 (0.312" ±0.002)	N/A
10 mm	9.93 mm ±0.05 (0.391" ±0.002)	N/A
11.9 mm	11.81 mm ±0.05 (0.465" ±0.002)	N/A
12 mm	11.91 mm ±0.05 (0.469" ±0.002)	N/A
12.5 mm	12.42 mm ±0.05 (0.489" ±0.002)	N/A

	<b>HI-TEMP</b>	<b>STANDARD</b>
12.7 mm	12.62 mm $\pm 0.05$ (0.497" $\pm 0.002$ )	N/A
14 mm	13.87 mm $\pm 0.05$ (0.546" $\pm 0.002$ )	N/A
15 mm (Sleeved)	14.91 mm $\pm 0.05$ (0.587" $\pm 0.002$ )	N/A
16 mm	15.93 mm $\pm 0.05$ (0.627" $\pm 0.002$ )	N/A
17.5 mm	17.32 mm $\pm 0.05$ (0.682" $\pm 0.002$ )	N/A
19.5 mm	19.51 mm $\pm 0.05$ (0.768" $\pm 0.002$ )	N/A
20 mm	19.91 mm $\pm 0.05$ (0.784" $\pm 0.002$ )	N/A

## Custom Options

Cartridges can be modified to meet the demands of special applications. Our engineers can utilize a variety of alternative features and options to customize the heater to your specific needs. Common customizations include:

- Internal Thermocouples
- Flanges
- Threaded Bushings
- Epoxy Seals
- Leadwire Termination Options
- Mica Tape Leads
- Stainless-Steel Braid or Armor
- Lead Area Sealing
- Distributed Wattage
- No-Heat Sections
- Three Phase Construction
- Dual Voltage
- Zoned Heaters
- Square Cartridge Heaters

Learn more about customizing cartridge heaters (<https://www.tutco.com/resources/engineer-insight/customize-your-cartridge-heater/>) in Ian Renwick's white paper.

## Features

- High watt density rugged construction
- Efficient dissipation of heat
- Use in distributed wattage systems
- Many voltage variations and power options
- Wide-range of diameters
- Many termination styles - see below
- CSA and UL recognized (where applicable)
- High quality Nickel-Chromium connections provide consistent junctions and terminations

## Materials and Construction

- Computer designed for accurate specifications
- Helically wound Nickel-Chromium resistance wire evenly spaced inside ceramic insulators
- Fine grain, high purity MgO fills any space around the resistor wire in order to optimize heat transfer and increase the life of the heater.
- Resistance wire is joined using Nickel-Chromium for consistent solid connections and junctions
- High temperature Mica tape / Fiberglass insulated lead wire [842°F (450°C)]

931.432.4141

[customerservice@tutco.com](mailto:customerservice@tutco.com) (mailto:customerservice@tutco.com)

**MAILING:**

500 Gould Drive  
Cookeville, TN 38506

Web Development by PaleoSun, Inc. (<http://paleosun.com/>)

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