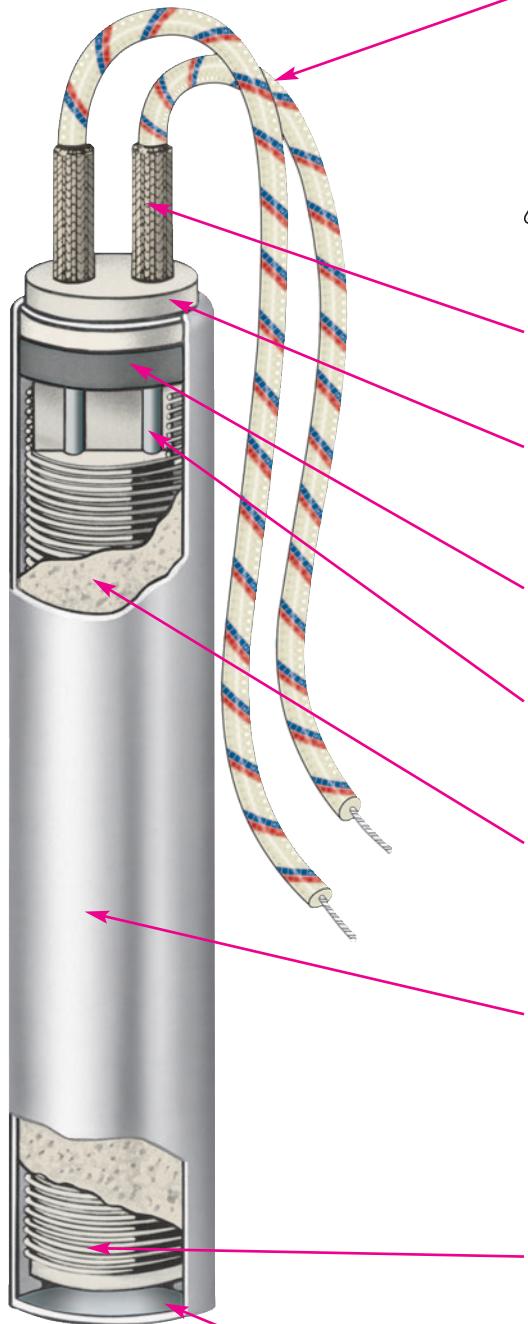


Hi-Density

CARTRIDGE HEATER FEATURES



A The standard termination for Hi-Density Cartridge Heaters is Type N, 10" (254 mm) long nickel conductor lead wires externally connected to 1-1/4"(32 mm) solid conductor terminal pins. The lead wires have fiberglass insulation and are UL approved for temperatures up to 482°F (250°C). Mica insulated UL approved wires for temperatures up to 842°F (450°C) are optional.

Note: To meet the requirements of your application we offer over 40 standard termination styles to select from that will solve many of the most common application problems. See pages 2-39 through 2-60.

B High temperature fiberglass sleeve provides maximum electrical insulation to the crimp connector used to splice the nickel conductors to the flexible leads.

C Ceramic end cap prevents nickel conductors from shorting out against sheath when sharp bending of the leads is required. The ceramic cap may be eliminated in some cases to optimize the heater watt density.

D Ceramic end cap and swaged-in lava plug protect the internal cartridge from outer contamination. Other types of seals can also be provided.

E Solid conductor terminal pins are used to ensure a good electrical connection between the nickel conductor lead wires and the resistance wire. They are sized for the maximum current rating of the heater.

F A high purity Magnesium Oxide (MgO) powder consisting of custom grain sizes is used to fill all remaining space inside the sheath. Heater is then swaged, which compacts the magnesium oxide grains into a solid mass, thereby increasing thermal conductivity and dielectric strength.

G Standard sheath material is 321 Stainless Steel. It provides high temperature strength up to 1200°F (650°C), good thermal conductivity, and resistance to corrosion and scaling. Alloy 321 is a Nickel-Chromium Stainless Steel modified with the addition of Titanium. For higher operating temperatures up to 1400°F (760°C) or corrosive immersion heating applications, Incoloy® 800 is available. Consult Tempco for other sheath materials.

H Grade "A" Nickel-Chrome resistance wire precisely wound on a high purity magnesium oxide core places the resistance wire as close to the inside of the sheath as possible while maintaining dielectric strength. This provides excellent heat transfer and long heater life with the highest possible watt densities.

I Welded end disc made from the same material as the sheath provides a positive seal against moisture and other contaminants.



Hi-Density Cartridge Heaters are UL recognized and CSA certified in many design variations under UL File Number E65652 and CSA File Number 043099.

If you require UL and/or CSA Agency Approval, please specify when ordering.

TEMPCO Offers the Most Comprehensive and Diverse Selection in Hi-Density Cartridge Heaters

Since Their Introduction in 1972, Hi-Density Cartridge Heaters Have Evolved and Today Offer a Multitude of Diverse Product Options:

1. **(HDC)** A Hi-Density cartridge heater in US sizes (see page 2-4).
2. **(HDM)** A Hi-Density cartridge heater in Metric sizes (see page 2-28).
3. **(HDP)** Pennybottom™, A Hi-Density cartridge heater with a Built-in Thermocouple and Flat Copper end disc. (see page 2-24).
4. **(HDL)** A Hi-Density cartridge heater designed with NPT Fittings for Immersion heating (see page 2-23).
5. **(HDB)** Bolt Heater, A Hi-Density cartridge heater designed for assisting in the assembly of large machinery (see page 2-61).



Hi-Density Cartridge Heaters provide maximum processing temperature capability

- Higher watt densities permit smaller heaters to be used without sacrificing life expectancy. This results in up-front as well as long-term cost savings.
- Swaged construction provides maximum support for the resistance wire and excellent heat transfer characteristics, improving the overall life expectancy of the cartridge heater.
- Termination styles and special features allow customization to any application.
- Applications up to 1400°F (760°C)

Typical Applications

- Plastic Molding
- Shoe Machinery
- Food Processing
- Heating Gases and Liquids
- Glue Guns
- Laminating Presses
- Platens
- Scientific Equipment
- Food Service Equipment

• • • • • • • Hi-Density Cartridge Heaters are Classified in Two Distinct Categories • • • • • • •

Multi-Purpose Use

The Multi-Purpose Use Cartridge Heaters represent Tempco's commitment to value-added customer service as we maintain in Stock over 65,000 Semi-Finished Hi-Density Cartridge Heater Substrates, offering a combination of over 1000 sizes in industry standard diameters and lengths ranging from 1" (25.4 mm) to 36" (914.4 mm) in a complete spectrum of wattages and operating voltages. Multi-Purpose Use Cartridge Heaters are the solution for a multitude of original equipment manufacturers (OEMs) or maintenance (MRO) applications.

Available through the Terminator Program.

Complete details are found on
pages 2-12 through 2-21.

Highly Engineered Specific Purpose Use

Tempco has been at the forefront of addressing the challenges of Original Equipment Manufacturers (OEMs) in a broad segment of diversified industries. As a company we are uniquely qualified and committed to providing value-added expertise in engineering and manufacturing capabilities that span over three decades of acquired knowledge, assisting customers in developing highly engineered specific use cartridge heaters for dependable and reliable performance. Let us provide the optimal solution to your thermal loop system and cartridge heater design challenges. Engineering assistance can be found on pages 2-5 through 2-7.

Consult Us With Your Requirements.

We Welcome Your Inquiries.

Ordering Information

Custom
Manufactured



Custom Engineered/Manufactured Heaters

Because an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** will design and manufacture a Hi-Density Cartridge Heater to meet your requirements. **Standard lead time is 3 weeks.**

Please Specify the following:

<input type="checkbox"/> Diameter	<input type="checkbox"/> Termination types (see pages 2-39 through 2-60)	
<input type="checkbox"/> Length	<input type="checkbox"/> Lead Length	<input type="checkbox"/> Application Type
<input type="checkbox"/> Wattage	<input type="checkbox"/> Cable/Braid length	<input type="checkbox"/> Operating Temperature
<input type="checkbox"/> Voltage	<input type="checkbox"/> Special Features	

 **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

(800) 323-6859 • Email: sales@tempco.com

Cartridge Heaters



Standard Specifications

Hi-Density Cartridge Heater Specifications

PERFORMANCE RATINGS

Max. Temperature: \diamond 1400°F (760°C)

Max. Watt Density: 100-300 W/in² (15.5-46.5 W/cm²)
depending on heater size & operating temperature.

NOTE: The maximum operating temperature and the life expectancy of a cartridge heater is dependent on two main factors:

1. The maximum recommended sheath temperature (\diamond 1200°F for a standard heater)
2. The maximum ambient temperature for the termination selected.

Consult Tempco if you require a recommendation for your application.

DIMENSIONAL SPECIFICATIONS

Nominal Diameter	1/8"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"
	in (mm)	in (mm)						
Actual Diameter	.122 (3.10)	.246 (6.25)	.308 (7.82)	.371 (9.42)	.496 (12.60)	.621 (15.77)	.746 (18.95)	.996 (25.30)
Diameter Tolerance	$\pm .002$ (.051)	$\pm .003$ (.076)	$\pm .003$ (.076)					
Minimum Length	1.25 (31.8)	1 (25.40)	1 (25.40)	1 (25.40)	1 (25.40)	1 (25.40)	1-1/4 (31.75)	1-3/4 (44.45)
Maximum Length	12 (305)	36 (914)	36 (914)	48 (1219)	60 (1524)	72 (1829)	72 (1829)	72 (1829)
Length Tolerance Heaters up to 5" (127 mm) long	$\pm 3/32$ (2.4)	$\pm 1/8$ (3.2)	$\pm 1/8$ (3.2)					
Length Tolerance Heaters over 5" (127 mm) long	—						$\pm 2\%$ of Sheath Length	
Camber Tolerance Heaters to 12" (305 mm) long	—						0.010" (.254 mm) per foot of length	
Camber Tolerance Heaters over 12" (305 mm) long	—						0.020" (.508 mm) per foot of length	

A certain amount of Camber is unavoidable. With a slight force, Hi-Density Cartridge Heaters will flex enough to fit into a straight reamed hole.

ELECTRICAL SPECIFICATIONS

Nominal Diameter	1/8"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"
Maximum Voltage	240	240	240	240	240	480*	480*	480*
Maximum Amperage (see next line for exceptions)	3.0	4.4	4.5	6.7	10.5	23	23	23
†Maximum Amperage for Types C1C, C1D, C2C, C2D, CS, F, M3, R1B, S1, S2, SA, W & W3 Terminations	—	3.0	3.0	5.5	7.6	9.7	9.7	9.7
Minimum Wattage at 120V on a 1" long Heater	—	50	45	45	50	50	—	—
Minimum Wattage at 120V on a 2" long Heater	5	20	20	20	20	20	20	20
Maximum Wattage at 120V	360	525	540	800	1260	2760	2760	2760
Maximum Wattage at 240V	720	1050	1080	1600	2520	5520	5520	5520
Maximum Wattage at 480V	—	—	—	—	—	11,000	11,000	11,000
Wattage Tolerance	+10,-15%			Plus 5%, Minus 10%				
Resistance Tolerance	+15,-10%			Plus 10%, Minus 5%				

†Current carrying capacities are for ambient temperatures up to 482°F (250°C) with mica insulated lead wires.

*480V when applicable. Consult Tempco.

LENGTH TOLERANCE FOR:
- LEAD WIRES
- WIRE BRAID LEADS
- ARMOR CABLE LEADS

Up to 36": -1/2", +1" (-12.7 mm, +25.4 mm)

36" to 72": -1", +2" (25.4 mm, +50.8 mm)

Above 72": ± 4 " (101.6 mm)



Note: Specifications detailed on this page are standard. Consult Tempco if your application requires tighter tolerances or has other special requirements.

AVAILABLE ELECTRICAL FEATURES

Diameter	Dual Volts	3-Phase	Dual Circuits	Multiple Heat Zones (maximum 3 zones)
1/8"	No	No	No	No
1/4"	No	No	No	No
5/16"	No	No	No	No
3/8"	Yes*	No	No	Yes*
1/2"	Yes*	Yes	Yes	Yes*
5/8"	Yes	Yes	Yes	Yes
3/4"	Yes	Yes	Yes	Yes
1"	Yes	Yes	Yes	Yes

Consult factory for maximum wattages and voltages.

* Heaters may require a larger diameter transition area at lead end.

View Product Inventory @ www.tempco.com

Recommendations for Improving the Life of Hi-Density Cartridge Heaters

Tempco Hi-Density Cartridge Heaters have been widely used in many demanding and diverse applications since 1972. The commonly used basic applications are platen, plastic mold and die heating, liquid immersion and air heating.



Note: Selection of the wrong termination for a particular application is the primary reason for all heater failures. However, failure to consider other important criteria can also have a negative effect on the life of the heater. To get the best performance and assure long life, it is important to carefully evaluate the following factors.

Operating Temperature

Operating temperature of a heater is a major factor in determining the life expectancy of a heating element. The heater life depends on the actual temperature of the resistance wire within the heater and not on the process operating temperature. The graph in Fig. 1 demonstrates the proper relationship between operating temperature and watt density; the higher the operating temperature, the lower the maximum recommended watt density.

Heater Watt Density

Cartridge heater watt density is defined as the wattage dissipated per square inch of the heated sheath surface. For a particular application a heater's watt density governs internal resistance wire temperature, which determines the outer sheath temperature. These factors are critical to the proper heating of the application and to the life expectancy of the heater. Special construction features that promote excellent heat transfer permit Hi-Density Cartridge Heaters to operate at higher watt densities while maintaining the lowest possible resistance wire temperatures of any style cartridge heater.

Heater watt density (w/in^2) is calculated using the following formula:

$$\text{Watt Density} = \frac{\text{Heater wattage}}{\text{Heated length} \times \text{Heater diameter} \times 3.1416}$$

Heated length is the overall length of the heater minus any unheated (cold) sections. Standard Type N, Hi-Density cartridge heaters have 3/8" at the lead end and 1/4" at the disc end unheated. This would mean a 6" long heater would have 5-3/8" effective heated length. Unheated sections vary with type of heater termination. For descriptions of terminations and options, see pages 2-39 through 2-60.

The graph in Fig. 1 shows the maximum recommended watt density for Hi-Density Cartridge Heaters when used in a steel platen. Watt density limitations for various materials are given in the engineering section of this catalog. For liquid immersion heaters the maximum watt density depends on the type of liquid being heated. The more viscous, or thicker the liquid, the lower the maximum watt density. Higher watt density can cause the liquid to carbonize and accumulate on the heater sheath, which will cause premature heater failure. It is advisable to use heaters that have watt densities below the maximum recommended watt density to get the longest heater life. If the actual heater watt density is close to the maximum recommended watt density, you can correct the problem by:

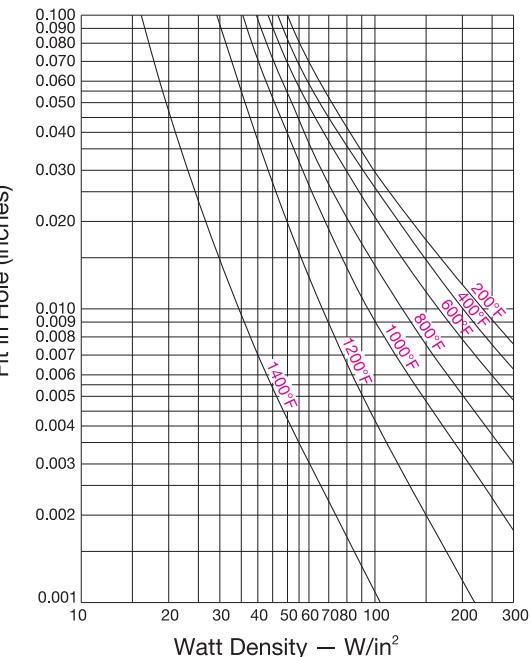
1. Increasing the number, diameter and length of heaters.
2. Lowering the total wattage; however, this may increase the heat-up time.
3. Obtaining tighter fit (see Fig. 2 — Determining Fit).

A Hi-Density cartridge heater designed at the maximum recommended watt density allows the smallest heater to be used to obtain the required wattage with good service life. All things being equal, using a lower watt density heater will typically provide optimized service life.

FIG.

1 Recommended Watt Density for Heating Metal Parts

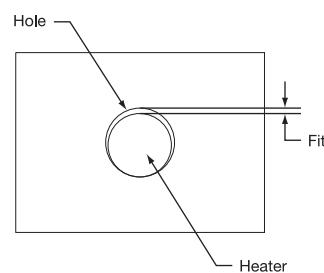
Maximum Watt Density — Heating Metals



The graph shows the recommended maximum watt density for Tempco Hi-Density cartridge heaters at different operating temperatures and fit, when the heater is installed in an oxidized mild steel block. The thermocouple is located 1/2" from the heater. When heating other materials, the data needs to be extrapolated based on the thermal conductivity of the material. Consult Tempco with your requirements.

FIG.

2 Determining Fit



CONTINUED

Recommendations for Improving the Life of Hi-Density Cartridge Heaters

Continued from previous page...

Determining Fit

When heating a platen, mold, die or hot runner probe with Hi-Density Cartridge Heaters inserted into drilled holes, fit is an important factor in determining the life expectancy of the heater. Fit is the difference between the minimum diameter of the cartridge heater and the maximum diameter of the hole. Unheated sections on a Hi-Density cartridge may be smaller in diameter due to swaging. To determine fit, use the smallest diameter on the heated length only.

Example: A 3/8" nominal OD Hi-Density cartridge heater has an actual diameter of $.371 \pm .002$, which translates to a minimum diameter of $.369$. If used in a $.376 \pm .002$ hole, the fit would be $.009$ ($.378 - .369 = .009$).

When medium watt density heaters (less than 60 watts per square inch) are used in low temperature applications (less than 600°F [315°C]) general purpose drills are commonly used to drill holes. The typical hole size may be $.003$ to $.008$ over the drill size. For higher watt density and/or higher temperature applications, we recommend that the holes are drilled and reamed for the tightest possible fit. In applications where precise temperature control and heat transfer properties are required, Hi-Density cartridge heaters can be centerless ground to $\pm .0005$.

Although a tighter fit is desirable to efficiently transfer heat and to get long heater life, a looser fit will aid in installing and removing heaters, especially long heaters. We recommend that you apply Tempco's BNS anti-seize cartridge heater coating as it will improve heat transfer and will make the removal of heaters easier.

The graph in Fig 1. (page 2-5) shows the effect of fit in determining the maximum recommended watt density on a steel platen. As it is indicated in the graph, the tighter the fit, the higher the maximum recommended watt density.

Common Causes of Cartridge Heater Failures

Contamination

Contamination is a major cause of heater failure. Moisture, hydraulic oils, and melted plastic are the most common contaminants that are seen on failed heaters. Since the magnesium oxide insulation in a Hi-Density heater is hygroscopic in nature, moisture is easily absorbed into the heater and typically results in premature heater failure. Moisture absorption during machine washdown or cleanup also is a frequent problem. These contaminants, which are electrically conductive, will short out the heater. Most probably, the failures will be at the lead end of the heater and in some cases can split or blow a hole on the heater sheath. The disc end of a Hi-Density cartridge heater is welded shut with a stainless steel disc.

Generally, contaminants enter the heater through the lead end of the heater. The high temperature lead wires used on Hi-Density heaters have fiberglass or mica insulation. Oil and moisture can wick through the insulation on the lead wire into the heater. Tempco offers a wide variety of terminations to avoid this problem, including epoxy seals, Teflon® seals, convoluted cables, welded end discs, Teflon® insulated lead wires and SJO cable. However, there are temperature limitations on many of these terminations.



Note: If you should encounter premature cartridge heater failure, consult Tempco. Our team of professionals will have the solution to your problem.

Temperature Control and Location of Temperature Sensing Device

In order to better control the heater temperature and hence the resistance wire temperature, use of an appropriate temperature control and the proximity of the heater to the sensor is very important. The graph in Fig. 1 (page 2-5) shows the effect of operating temperature in determining the maximum recommended watt density on a steel platen where the sensor is located $1/2$ " from the heater. Higher watt density heaters can generate heat faster than the surrounding area's ability to dissipate heat. This creates a thermal lag between the heater and the sensor. The closer the sensor to the heater, the better you can control the heater temperature. By keeping the sensor further from the heater, temperature gradients of several hundred degrees can be observed in many applications, especially during initial start-up and heavy thermal cycling. Although the set operating temperature may be low, the heater may be running at a very high temperature. This is a common cause of heater failure. This can be minimized using time proportional and PID functions of the temperature controllers. See Section 13 for temperature controllers and Section 14 for thermocouples and sensors.

Power Control

Power control methods affect the life expectancy of heating elements. In general, although economical, on-off controls increase thermal fatigue and oxidation rate on heating elements by causing wide temperature swings of the internal heating element. Silicon Controlled Rectifiers (SCRs), Mercury Relays and Solid State Power Controls can increase the life expectancy of heating elements by reducing the temperature swings of the internal heating element. See Section 13 for power controls.

Excessive Flexing of Leads

Tempco Hi-Density heaters use flexible grade A nickel stranded lead wires with fiberglass or mica insulation. On certain terminations the lead wires are connected externally to solid nickel conductor pins. In applications where there is excessive movement or vibration, the solid pins could break due to fatigue. A simple solution is to give enough slack on the leads to minimize the stress on the solid pins or provide an internal lead wire connection within the heater. Tempco also offers strain relief brackets and springs to prevent this problem.

Where heater leads can wear out by abrasion due to excessive flexing of the leads, Tempco offers several abrasion resistant terminations. See pages 2-41 through 2-47.

Lack of Heat Sink

Hi-Density heaters are designed with minimum unheated (cold) sections. If the heated sections project from the platen or mold, these sections will get extremely hot due to lack of heat transfer. This will lead to premature heater failure. Tempco can manufacture heaters with cold sections anywhere along the length of the heater to prevent overheating of the heater sheath.

When a Hi-Density heater is used as a liquid immersion heater, make sure the heater's sheath length is completely immersed in the liquid. The heater lead end should not be immersed in liquid, since most of the lead end seals are only moisture resistant, not moisture proof.

[View Product Inventory @ www.tempco.com](http://www.tempco.com)

Recommendations for Improving the Life of Hi-Density Cartridge Heaters

High Operating Temperature

Tempco Hi-Density heaters are designed to operate at sheath temperatures up to 1400°F (760°C). When process temperatures approach the maximum heater sheath temperature, make sure the sheath temperature doesn't exceed its limitations. Location of the thermocouple and the type of temperature and power controls are factors that affect sheath temperature and potential overshoot conditions.

Although the heater is designed to run at temperatures up to 1400°F (760°C), heater lead wires and terminations are rated for much lower temperatures. Care should be taken to make sure that the heater lead end temperatures do not exceed their limitations. Heaters can be made longer with unheated sections at the lead end to bring the lead end out of the high temperature area. Tempco can also provide you with a high temperature wiring harness, which can withstand temperatures up to 1400°F (760°C). See page 15-5 in the accessories section for details.



Note: As explained in the above paragraphs, the single major cause for cartridge heater failure is the selection of the wrong type of heater lead end termination for the specific application. To assist you in selecting the right termination type, pages 2-39 through 2-57 give detailed descriptions of over 40 terminations designed to solve many of the common application problems. If you need further assistance, consult Tempco.

Important Installation Considerations

1. For closest fit and best heat transfer, use reamed holes.
2. When possible, drill holes through the object being heated. This will make heater removal easier.
3. When using an anti-seize coating like Tempco's BNS spray or paste, **do not apply** over lead wires or any other current carrying conductors.
4. When using insulated tape or sleeving, check to make sure it is rated for the temperature of the application. Lower temperature rated materials can contain an adhesive or binder that can carbonize and become electrically conductive.
5. When using heaters near their maximum recommended watt density, it is recommended that the temperature sensing probes be at maximum 1/2" from the heater sheath.

High Wattage Rating

Heaters with very high wattage ratings can create temperature overshoots, uneven temperature distribution and high heater sheath temperatures, causing premature heater failure.

For liquid immersion heaters, maximum watt density depends on the type of liquid being heated. The heavier or thicker the liquid, the lower the maximum watt density. Higher watt density can cause the liquid to carbonize and accumulate on the heater sheath, which will cause premature heater failure.

Scale and Sludge Buildup

In liquid immersion applications, periodic cleaning of the heater sheath is necessary to remove any scale buildup on the sheath. Scale can accumulate on the sheath and cause the heater to overheat and fail. When used to heat liquid in a tank, be sure to clean any sludge from the bottom of the tank. A heater sheath covered with sludge will overheat and fail.

6. Lead wires should not be located in the hole containing the cartridge heater during operation. This may cause the lead wires to be exposed to temperatures above their rated temperature.
7. When used in a vacuum application, make sure the lead end of the heater is outside the vacuum. If the lead has to be in the vacuum, consult Tempco for specific recommendations.
8. Many applications will subject a heater's electrical terminations to one or more of the following potentially damaging conditions:
 - Moisture
 - Oil and other contaminants
 - Flexing
 - Abrasion
 - High temperature

Note: To protect the heater from damage in these harsh environments, Tempco has a wide selection of terminations and options available. See pages 2-39 through 2-60 for details.

BNS Anti-Seize Cartridge Heater Coating

This high temperature, electrically insulating and thermally conductive coating will minimize oxidation and improve heat transfer from heater to the object being heated.

Brush a thin layer of paste or spray lightly over the cartridge heater prior to inserting the heater into a hole.

CAUTION
Do not apply over lead wires or other bare current carrying conductors, since the water in the paste and spray can cause an electrical short circuit.



13 oz.

Aerosol spray can

Part Number:
CML00010

- * Temperature Range
1562°F (850°C)
- * High Heat Transfer



4 oz.

Paste w/brush applicator top

Part Number: CML00020

- * Temperature Range
1562°F (850°C)
- * High Heat Transfer

Note: Formulated to assist in the removal of cartridge heaters.

All Items Available from Stock

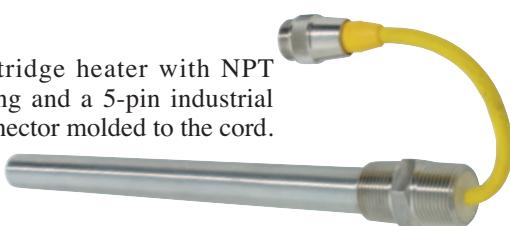
Highly Engineered Custom Manufactured Specific Use Cartridge Heaters

Meeting the Challenges of Original Equipment Manufacturers with Custom Engineering

Tempco has been at the forefront of addressing the challenges of original equipment manufacturers (OEMs) in diversified industries, when dependable and reliable performance of custom engineered cartridge heaters is crucial to the overall operating efficiency and quality of their equipment and machinery.

Tempco is a company uniquely qualified and committed to providing value-added expertise in engineering and manufacturing that spans over four decades of acquired knowledge, assisting customers in developing highly engineered specific use cartridge heaters for equipment and/or machinery systems.

Cartridge heater with NPT fitting and a 5-pin industrial connector molded to the cord.



Cartridge heater for continuous air heating application with Incoloy® sheath, custom machined fitting and silicone rubber moisture barrier.



Cartridge heater with built-in thermal fuse and ground wire for X-Ray processing equipment.



Cartridge heater with built-in thermostat, pipe fitting and ground leads for oil heating in waste handling equipment.



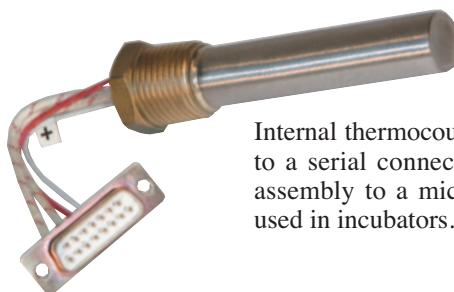
Finned Cartridge Oil Immersion Heater with a liquid-tight electrical termination.

Complete a New Project on Time, Improve Efficiencies and Reduce Cost

Consult Tempco, your strategic partner, in the early stages of a new project requiring cartridge heaters, or to improve a troublesome existing application. By doing so you allow Tempco to place at your disposal our team of professionals, offering you our vast knowledge in product design and manufacturing expertise. We can provide you with the optimal solution to your thermal loop system and cartridge heater design challenges.

Tempco offers you the perfect balance in quality and service with value-added technology. These pictures depict a small sampling of the cartridge heaters we have developed for special applications. Put our knowledge and experience to work for you.

*Our capabilities are limited only by your imagination.
Consult us with your requirements.
We welcome your inquiries.*



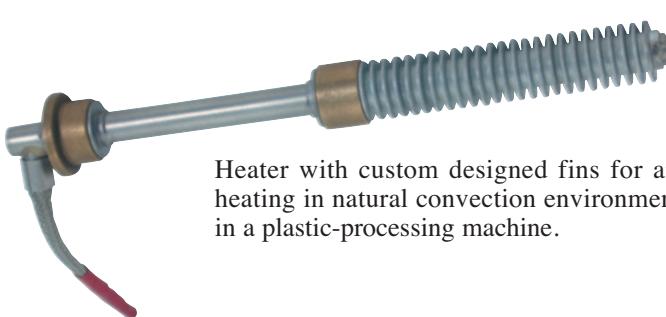
Internal thermocouple is wired to a serial connector for easy assembly to a microprocessor used in incubators.



Incoloy® fitting and seamless Incoloy® 800 sheath material used in an aviation application.

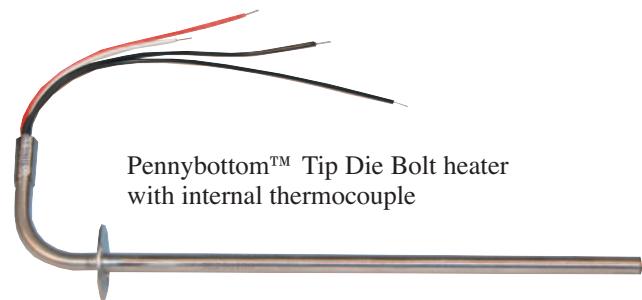
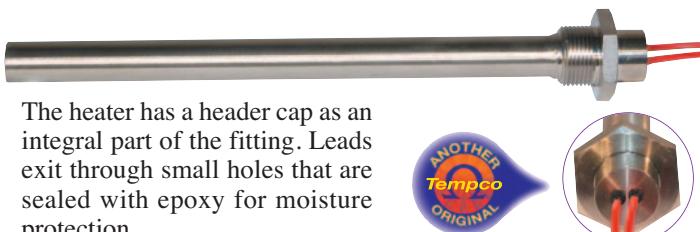


Straight armor cable and adjustable bayonet cap for easy assembly.

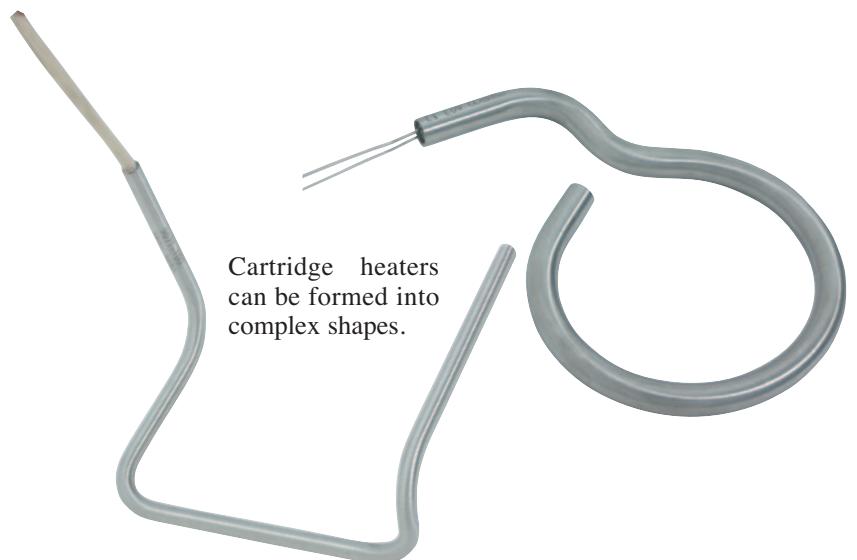


Heater with custom designed fins for air heating in natural convection environment in a plastic-processing machine.

Highly Engineered Custom Manufactured Specific Use Cartridge Heaters



Heater for medical diagnostic instruments has an integrated heat sink and thermal fuse.



Optional Inspection Services and Test Reports

Die Penetrant Test

This non-destructive testing can detect imperfections in weld joints. For critical applications, each individual heater's weld joints by end cap and fittings can be tested. Certified test reports will be sent with each shipment.

Hydrostatic Pressure Test

Cartridge heaters with attached pipe fittings can be pressure tested to your specifications at Tempco. Our in-house testing capabilities can ensure that your products meet your exact specifications.

Electrical Tests

Our state of the art test meter can perform AC/DC dielectric withstand test (Hypot) up to 5000 volts while measuring leakage current in micro amps. It can also measure Insulation resistance (IR) and heater element resistance. Heaters can be serialized and test reports can be sent with each shipment if required.

Consult Tempco with Your Requirements.

We Welcome Your Inquiries.

Cartridge Heaters



Hi-Density Miniature

Hi-Density 1/8" Diameter Miniature Cartridge Heaters

PERFORMANCE RATINGS

Max. Temperature: 1200°F (649°C)

Max. Watt Density: 100-200 W/in² (15.5-31 W/cm²)
depending on operating temperature.

NOTE: The maximum operating temperature and the life expectancy of a cartridge heater is dependent on two main factors:

1. The maximum recommended sheath temperature
2. The maximum ambient temperature for the termination selected

Consult Tempco if you require a recommendation for your application.

DIMENSIONAL SPECIFICATIONS

Nominal Diameter	1/8"
	in (mm)
Actual Diameter	.122 (3.10)
Diameter Tolerance	±.002 (.051)
Minimum Length	1.25 (31.8)
Maximum Length	12 (305)
Length Tolerance Heaters up to 5" (127 mm) long	±3/32 (2.4)
Length Tolerance Heaters over 5" (127 mm) long	±2% of Sheath Length

SHEATH MATERIAL

Standard: Type 304 Stainless Steel

Optional: Inconel 600

ELECTRICAL SPECIFICATIONS

Nominal Diameter	1/8"
Maximum Voltage	240
Maximum Amperage	3.0
Maximum Wattage at 120V	360
Maximum Wattage at 240V	720
Wattage Tolerance	+10,-15%
Resistance Tolerance	+15,-10%

1/8" Actual .122" (3.10 mm) Diameter Hi-Density Cartridge Heaters with Type N Termination (10" leads)

Sheath Length in mm	Watts	Watt Density		Part Number	
		W/in ²	W/cm ²	120V	240V
1 1/4 31.8	25	90	14	HDC19100	—
1 1/4 31.8	35	126	20	HDC19101	—
1 1/4 31.8	50	180	28	HDC19102	—
1 1/2 38.1	30	80	12	HDC19103	—
1 1/2 38.1	60	160	25	HDC19104	—
2 50.8	40	70	11	HDC19105	—

Sheath Length in mm	Watts	Watt Density		Part Number	
		W/in ²	W/cm ²	120V	240V
2 50.8	50	87	13	HDC19106	HDC19112
2 50.8	100	175	27	HDC19107	HDC19113
2 1/2 63.5	50	68	11	HDC19108	—
3 76.2	60	64	10	HDC19109	—
3 1/2 88.9	70	62	10	HDC19110	—
4 101.6	80	60	9	HDC19111	HDC19114



Note: 1/8" Diameter Hi-Density Cartridge Heaters are made-to-order only.
Standard lead time is 3 weeks.

**Custom
Manufactured**

Custom Engineered/Manufactured 1/8" Hi-Density Cartridge Heaters

(Refer to pages 2-2 through 2-9)

Because cartridge heaters can be very application specific, consult Tempco with your special requirements. For sizes, electrical ratings and any other design features required but not listed in the catalog, Tempco will custom engineer and manufacture to your specifications.

Consult Us with Your Requirements. We Welcome Your Inquiries.

View Product Inventory @ www.tempco.com

1/8" Diameter Cartridge Heaters Termination Types

Type N External Pins with Leads

(Standard Termination)

- ▶ Minimum 1/4" cold section at lead end is required
- ▶ 24 ga ultralead leads temperature rating: 482°F (250°C)
- ▶ Leads externally crimped to nickel pins
- ▶ **Standard** 10" (254 mm) leads. Specify longer leads.



Type F Internally Connected Flexible Leads

- ▶ Minimum 1/2" cold section at lead end is required
- ▶ High temperature fiberglass leads temperature rating: 842°F (450°C)
- ▶ Maximum Voltage: 120V
- ▶ **Standard** 10" (254 mm) leads. Specify longer leads.



Type M3 Teflon® End Plug Seal with Teflon® Leads

- ▶ Minimum 1/2" cold section at lead end is required
- ▶ 24 ga Teflon® insulated leads temperature rating: 392°F (200°C)
- ▶ Moisture resistant swaged Teflon® seal
- ▶ **Standard** 10" (254 mm) leads. Specify longer leads.



Type C1B SS Cable, Mechanically Fastened

- ▶ Minimum 1/4" cold section is required
- ▶ Provides maximum protection for abrasive environment
- ▶ Maximum Voltage: 120V
- ▶ **Standard** 10" (254 mm) cable over 12" (305 mm) leads. Specify longer leads or cable.



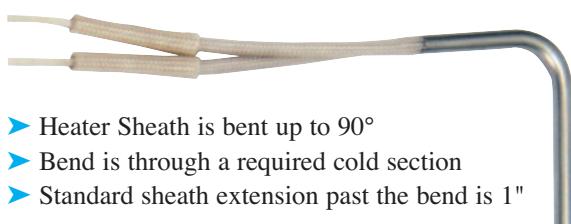
Type W SS Braid, Mechanically Fastened

- ▶ Minimum 1/4" cold section is required
- ▶ Offers sharp bending and abrasion protection
- ▶ Maximum Voltage: 120V
- ▶ **Standard** 10" (254 mm) cable over 12" (305 mm) leads. Specify longer leads or cable.



1/8" Diameter Cartridge Heaters Mounting Options

Type R4 Bent Cartridge



- ▶ Heater Sheath is bent up to 90°
- ▶ Bend is through a required cold section
- ▶ Standard sheath extension past the bend is 1"

Type MFR Mounting Flange

- ▶ 1" diameter; 2 × 9/64" mounting holes are standard
- ▶ Other sizes available

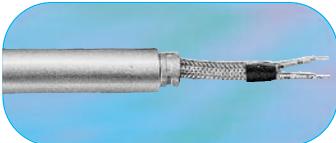


**These Program-Qualified Lead Terminations and Options
for Stock Cartridge Heater Substrates
will ship 2nd or 3rd Day when ordered before 2PM (CST).**

Terminations

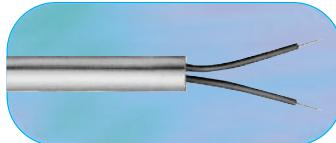
Type W

Straight Wire Braided Leads
(page 2-42)



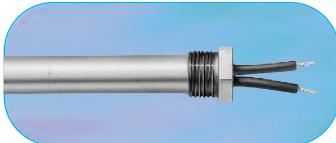
Type M2A & M2E

Potted Lead End Seal
(Cement Only)
(page 2-40)



Type CMB & CMP

Single Threaded Fitting
(page 2-50)



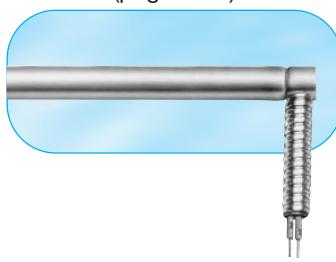
Type W1A & W1B

Right-Angle Wire
Braided Leads
(page 2-46)



Type C3A, C3B, C3C & C3D

Right-Angle Armor Cable
(page 2-47)



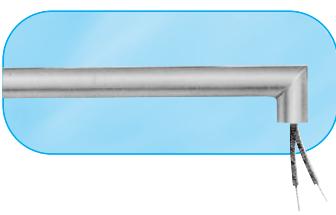
Type R2A & R2B

Right-Angle Leads
(page 2-45)



Type R3

Angled Sheath Extension
(Cement Potting Only)
(page 2-53)



Options

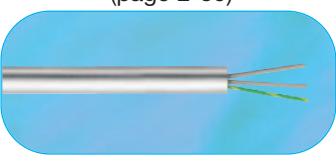
Type E1

General Purpose Box
(page 2-54)



Type GL

Ground Lead Sheath
(page 2-59)



Complete specifications and details on these terminations can be found on the specified catalog page numbers.



Custom Engineered/Manufactured Hi-Density Cartridge Heaters

(Refer to pages 2-2 through 2-9)

Because cartridge heaters can be very application specific, consult Tempco with your special requirements. For sizes, electrical ratings and any other design features required but not listed in the catalog, Tempco will custom engineer and manufacture to your specifications.

Consult Us with Your Requirements. We Welcome Your Inquiries.

Cartridge Heaters



Hi-Density

STOCK — Immediate Delivery through the  Lead Conversion Program



1/4" Actual .246" (6.25 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination).

Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²	Part Number 120V	Part Number 240V
1 25.4	50	127 20	HDC00001	—
1 25.4	80	204 32	HDC00002	—
1 25.4	100	255 40	HDC00003	HDC00004
1 25.4	150	382 59	HDC00005	—
1 1/2 28.6	100	204 32	HDC00006	—
1 1/4 31.8	50	85 13	HDC00007	—
1 1/4 31.8	75	127 20	HDC00008	—
1 1/4 31.8	100	170 26	HDC00009	—
1 1/4 31.8	125	212 33	HDC00010	—
1 1/4 31.8	150	255 40	HDC00011	HDC00012
1 1/4 31.8	200	340 53	—	HDC00013
1 1/4 31.8	225	382 59	—	HDC00014
1 1/2 38.1	50	64 10	HDC00015	—
1 1/2 38.1	75	92 14	HDC08691	—
1 1/2 38.1	100	127 20	HDC00016	HDC00017
1 1/2 38.1	150	191 30	HDC00018	HDC00019
1 1/2 38.1	175	223 35	HDC00020	HDC00021
1 1/2 38.1	200	255 40	HDC00022	HDC00023
1 1/2 38.1	250	318 49	—	HDC00024
1 3/4 44.5	75	76 12	HDC00025	—
1 3/4 44.5	150	153 24	HDC00026	—
1 3/4 44.5	300	306 47	—	HDC00027
2 50.8	50	42 7	HDC00028	—
2 50.8	80	68 11	HDC00029	—
2 50.8	100	85 13	HDC00030	HDC00031
2 50.8	125	106 17	HDC00032	HDC00033
2 50.8	150	127 20	HDC00034	HDC00035
2 50.8	200	170 26	HDC00036	HDC00037
2 50.8	250	212 33	HDC00038	HDC00039
2 50.8	300	255 40	—	HDC00040
2 1/4 57.2	200	146 23	HDC10139	HDC00041
2 1/2 63.5	150	95 15	—	HDC00042
2 1/2 63.5	200	127 20	HDC00043	HDC00044
2 1/2 63.5	250	159 25	HDC00045	HDC00046
2 3/4 69.9	200	113 18	—	HDC00048
3 76.2	75	38 6	HDC00049	—
3 76.2	100	51 8	HDC00050	HDC00051
3 76.2	125	64 10	—	HDC00052
3 76.2	150	76 12	HDC00053	HDC00054
3 76.2	200	102 16	HDC00055	HDC00056

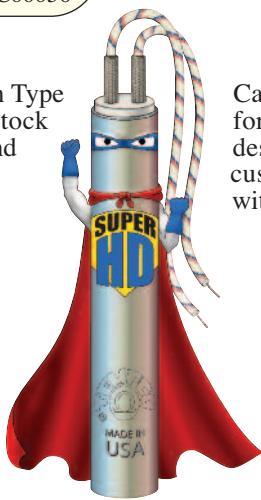
Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²	Part Number 120V	Part Number 240V
3 76.2	250	127 20	HDC00057	HDC00058
3 76.2	300	153 24	HDC00059	HDC00060
3 76.2	350	178 28	—	HDC00061
3 1/2 88.9	200	85 13	—	HDC00062
3 1/2 88.9	300	127 20	HDC00063	HDC00064
3 3/4 95.3	300	118 18	—	HDC00065
4 101.6	100	36 6	HDC00066	—
4 101.6	150	55 9	HDC00067	—
4 101.6	175	64 10	HDC00068	HDC00069
4 101.6	200	73 11	HDC00070	HDC00071
4 101.6	250	91 14	HDC00072	HDC00073
4 101.6	300	109 17	HDC00074	HDC00075
4 101.6	400	146 23	—	HDC00076
4 1/2 114.3	125	40 6	HDC00077	—
4 1/2 114.3	200	64 10	HDC00078	—
4 1/2 114.3	500	159 25	—	HDC00079
5 127.0	200	57 9	—	HDC00080
5 127.0	250	71 11	—	HDC00081
5 127.0	300	87 14	HDC22940	—
5 127.0	350	99 15	HDC00083	—
5 127.0	400	113 18	HDC00084	HDC00085
5 3/4 146.1	350	85 13	HDC00086	HDC00087
6 152.4	150	35 5	HDC00088	—
6 152.4	200	46 7	—	HDC00089
6 152.4	300	69 11	HDC00090	HDC00091
6 152.4	400	93 14	HDC00092	HDC00093
6 152.4	450	104 16	HDC00094	HDC00095
6 152.4	600	139 22	—	HDC00096
6 1/2 165.1	500	106 17	HDC00097	HDC00098
7 177.8	500	98 15	HDC20502	—
7 177.8	600	118 18	—	HDC00099
7 1/2 190.5	525	95 15	HDC00100	—
8 203.2	300	51 8	HDC00101	—
8 203.2	600	102 16	—	HDC00102
9 228.6	675	101 16	—	HDC00103
9 1/2 241.3	525	74 12	HDC00104	—
10 254.0	750	101 16	—	HDC00105
11 279.4	600	73 11	—	HDC00106
13 330.2	725	74 12	—	HDC00107

Ordering Information

Order by Part Number for stock Cartridge heaters with Type N termination. Call Tempco for part numbers for stock heaters with other Terminator Program terminations and options (see pages 2-12 & 2-13).

Custom Engineered/Manufactured

Cartridge Heaters can be application specific; therefore for sizes, electrical ratings, terminations and any other design features not listed in this catalog **TEMPCO** will custom manufacture to your specifications. Consult us with your requirements.



View Product Inventory @ www.tempco.com

STOCK — Immediate Delivery through the  Lead Conversion Program



5/16" Actual .308" (7.82 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination). Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²	Part Number	
			120V	240V
2 50.8	150	102 16	HDC00108	—
2 1/2 63.5	150	76 12	HDC00109	—
2 1/2 63.5	200	102 16	HDC00110	HDC00111
3 76.2	225	92 14	HDC00112	HDC00113
3 1/8 85.7	160	57 9	HDC00114	—
3 1/2 88.9	250	85 13	HDC00115	—

3/8" Actual .371" (9.42 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination). Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²	Part Number	
			120V	240V
1 25.4	50	85 13	HDC00125	—
1 25.4	100	170 26	HDC00127	—
1 25.4	150	255 40	HDC00128	HDC00129
1 25.4	200	340 53	—	HDC00130
1 1/4 31.8	100	113 18	HDC00133	—
1 1/4 31.8	150	170 26	HDC00135	HDC00136
1 1/4 31.8	200	226 35	HDC00137	HDC00138
1 1/16 33.3	100	104 16	HDC00139	HDC00140
1 1/16 33.3	150	157 24	HDC00141	—
1 1/8 34.9	150	146 23	HDC00142	HDC00143
1 1/16 36.5	100	91 14	HDC00144	—
1 1/2 38.1	30	25 4	HDC00146	—
1 1/2 38.1	50	42 7	HDC00147	HDC00148
1 1/2 38.1	75	64 10	HDC00149	—
1 1/2 38.1	100	85 13	HDC00150	HDC00151
1 1/2 38.1	125	106 17	—	HDC00152
1 1/2 38.1	150	127 20	HDC00153	HDC00154
1 1/2 38.1	200	170 26	HDC00155	HDC00156
1 1/2 38.1	250	212 33	HDC00157	HDC00158
1 1/4 44.5	150	102 16	HDC00160	HDC00161
1 1/4 44.5	200	136 21	—	HDC00163
1 1/4 44.5	250	170 26	HDC00164	HDC00165
1 13/16 46.0	150	97 15	—	HDC00166
1 13/16 46.0	200	129 20	HDC00167	—
1 1/8 47.6	250	154 24	HDC00169	—
2 50.8	50	28 4	HDC00170	—
2 50.8	75	42 7	HDC00171	—
2 50.8	100	57 9	HDC00172	HDC00173
2 50.8	125	71 11	HDC00174	—
2 50.8	150	85 13	HDC00175	HDC00176
2 50.8	200	113 18	HDC00177	HDC00178
2 50.8	250	141 22	HDC00179	HDC00180
2 50.8	300	170 26	HDC00181	HDC00182
2 50.8	350	198 31	—	HDC00183
2 50.8	400	226 35	HDC00184	HDC00185
2 50.8	500	283 44	HDC00186	HDC00187
2 1/4 57.2	75	36 6	HDC00189	—
2 1/4 57.2	100	49 8	HDC00190	—
2 1/4 57.2	125	61 9	HDC00191	HDC00192
2 1/4 57.2	150	73 11	—	HDC00193
2 1/4 57.2	175	85 13	HDC00194	—
2 1/4 57.2	200	97 15	—	HDC00196
2 1/4 57.2	250	125 19	HDC00197	HDC00199
2 1/4 57.2	300	146 23	HDC00200	HDC00202

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²	Part Number	
			120V	240V
2 1/4 57.2	350	170 26	HDC00201	HDC00202
2 1/4 57.2	400	194 30	—	HDC00204
2 1/4 57.2	500	243 38	—	HDC00205
2 1/8 60.3	75	34 5	HDC00206	—
2 1/8 60.3	165	75 12	—	HDC00207
2 1/8 60.3	300	136 21	—	HDC00210
2 1/2 63.5	100	42 7	HDC00213	HDC00214
2 1/2 63.5	125	53 8	HDC00215	—
2 1/2 63.5	150	64 10	—	HDC00216
2 1/2 63.5	200	85 13	HDC00217	HDC00218
2 1/2 63.5	250	106 17	HDC00219	HDC00220
2 1/2 63.5	300	127 20	HDC00221	HDC00222
2 1/2 63.5	350	149 23	—	HDC00223
2 1/2 63.5	400	174 27	HDC00224	—
2 1/2 63.5	500	212 33	HDC00227	HDC00228
2 1/2 63.5	400	151 23	—	HDC00231
2 13/16 71.4	300	110 17	—	HDC00235
3 76.2	100	34 5	HDC00236	HDC00237
3 76.2	125	42 7	HDC00238	—
3 76.2	150	51 8	HDC00239	—
3 76.2	200	68 11	HDC00240	HDC00241
3 76.2	250	85 13	HDC00242	HDC00243
3 76.2	300	102 16	HDC00244	HDC00245
3 76.2	375	127 20	HDC00247	—
3 76.2	400	136 21	HDC00249	HDC00250
3 76.2	500	170 26	HDC00251	HDC00252
3 76.2	600	204 32	—	HDC00253
3 76.2	750	255 40	—	HDC00254
3 5/16 84.1	500	151 23	HDC00255	—
3 1/2 88.9	125	35 6	HDC00256	—
3 1/2 88.9	200	57 9	—	HDC00257
3 1/2 88.9	225	64 10	—	HDC00258
3 1/2 88.9	250	71 11	HDC00259	HDC00260
3 1/2 88.9	300	85 13	HDC00261	HDC00262
3 1/2 88.9	350	99 15	HDC00263	HDC00264
3 1/2 88.9	400	113 18	—	HDC00265
3 1/2 88.9	500	141 22	HDC00266	HDC00267
3 13/16 96.8	150	38 6	HDC00269	—
3 13/16 96.8	500	128 20	—	HDC00270
4 101.6	100	24 4	HDC00272	—
4 101.6	125	30 5	HDC00273	HDC00274
4 101.6	150	36 6	HDC00275	—
4 101.6	175	42 7	HDC00276	—
4 101.6	200	49 8	HDC00277	HDC00278

Cartridge Heaters



Made in USA

Hi-Density



Lead Conversion Program

Continued from previous page...

3/8" Actual .371" (9.42 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination).

Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²		Part Number	
		120V	240V		
4 101.6	250	61	9	HDC00279	HDC00280
4 101.6	300	73	11	HDC00281	HDC00282
4 101.6	350	85	13	HDC00283	HDC00284
4 101.6	400	97	15	HDC00285	HDC00286
4 101.6	450	109	17	—	HDC00288
4 101.6	500	121	19	HDC00289	HDC00290
4 101.6	600	146	23	—	HDC00292
4 101.6	700	170	26	—	HDC00293
4 101.6	750	182	28	—	HDC00294
4 1/4 108.0	300	68	11	—	HDC00295
4 1/4 108.0	750	170	26	—	HDC00296
4 1/2 114.3	250	53	8	—	HDC00297
4 1/2 114.3	300	64	10	HDC00298	HDC00299
4 1/2 114.3	450	95	15	HDC00302	HDC00303
4 1/2 114.3	500	106	17	HDC00304	HDC00305
4 3/4 120.7	300	60	9	—	HDC00307
4 13/16 122.2	300	59	9	—	HDC00308
4 13/16 122.2	500	98	15	—	HDC00309
5 127.0	150	28	4	HDC00312	HDC00313
5 127.0	200	38	6	HDC00314	HDC00315
5 127.0	250	47	7	HDC00316	—
5 127.0	300	57	9	HDC00317	HDC00318
5 127.0	350	66	10	—	HDC00319
5 127.0	400	75	12	HDC00320	HDC00321
5 127.0	500	94	15	HDC00323	HDC00324
5 127.0	600	113	18	—	HDC00327
5 127.0	700	132	21	—	HDC00328
5 127.0	750	141	22	—	HDC00329
5 127.0	800	151	23	—	HDC00330
5 127.0	1000	189	29	—	HDC00331
5 1/4 133.3	200	36	6	—	HDC00332
5 1/2 139.7	250	42	7	HDC00334	HDC00335
5 1/2 139.7	550	93	15	—	HDC00338
5 1/2 139.7	600	102	16	—	HDC00339
5 1/2 139.7	1000	170	26	—	HDC00340
5 3/4 146.1	400	65	10	—	HDC00341
5 3/4 146.1	600	97	15	HDC00342	HDC00343
6 152.4	200	31	5	HDC00344	—
6 152.4	250	39	6	HDC00345	HDC00346
6 152.4	300	46	7	HDC00347	HDC00348
6 152.4	400	62	10	HDC00349	HDC00350
6 152.4	500	77	12	HDC00351	HDC00352
6 152.4	600	93	14	HDC00353	HDC00354
6 152.4	675	104	16	—	HDC00355
6 152.4	750	116	18	HDC00356	HDC00357
6 152.4	800	123	19	—	HDC00358
6 152.4	900	139	22	—	HDC00359
6 152.4	1000	154	24	—	HDC00360
6 1/2 165.1	600	85	13	—	HDC00361
6 1/2 165.1	1000	141	22	—	HDC00362
7 177.8	250	33	5	HDC00365	HDC00366
7 177.8	350	46	7	—	HDC00367

Ordering Information

Order by Part Number for stock Cartridge heaters with Type N termination. Call Tempco for part numbers for stock heaters with other Terminator Program terminations and options (see pages 2-12 & 2-13).

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²		Part Number	
		120V	240V		
7 177.8	400	52	8	HDC00368	—
7 177.8	500	65	10	—	HDC00369
7 177.8	600	78	12	HDC00370	HDC00371
7 177.8	750	98	15	—	HDC00373
7 177.8	775	101	16	—	HDC00374
7 177.8	1000	131	20	—	HDC00375
7 1/2 190.5	600	73	11	—	HDC00377
7 1/2 190.5	725	88	14	—	HDC00378
7 1/2 190.5	850	103	16	—	HDC00379
7 1/2 190.5	1000	121	19	—	HDC00380
7 13/16 198.4	750	87	14	—	HDC00381
8 203.2	250	30	5	HDC07944	—
8 203.2	300	34	5	HDC00383	HDC00383
8 203.2	400	45	7	HDC00384	—
8 203.2	450	51	8	HDC00385	—
8 203.2	500	57	9	HDC00386	HDC00387
8 203.2	600	68	11	HDC00388	HDC00389
8 203.2	700	79	12	—	HDC00390
8 203.2	750	85	13	—	HDC00391
8 203.2	900	102	16	—	HDC00392
8 203.2	1000	113	18	—	HDC00393
8 13/16 219.1	500	52	8	—	HDC00395
9 228.6	200	20	3	HDC00396	HDC00397
9 228.6	500	50	8	—	HDC00398
9 228.6	885	88	14	—	HDC00399
9 228.6	1000	100	16	—	HDC00400
9 1/2 241.3	200	19	3	HDC00401	—
9 1/2 241.3	600	57	9	—	HDC00402
9 1/2 241.3	1000	94	15	—	HDC00403
10 254.0	400	36	5	HDC00405	—
10 254.0	500	45	7	—	HDC00407
10 254.0	600	54	8	HDC00408	HDC00409
10 254.0	700	63	10	—	HDC00410
10 254.0	750	67	10	—	HDC00411
10 254.0	1000	89	14	—	HDC00413
10 254.0	1500	134	21	—	HDC00415
10 13/16 274.6	375	31	5	—	HDC00416
12 304.8	400	30	5	HDC00417	—
12 304.8	500	37	6	—	HDC00418
12 304.8	600	44	7	HDC00419	HDC00420
12 304.8	750	57	9	—	HDC14222
12 304.8	1000	74	11	—	HDC00421
12 304.8	1500	113	18	—	HDC06225
12 13/16 325.4	1000	69	11	—	HDC00422
13 330.2	1000	70	11	—	HDC07200
14 355.6	600	39	6	—	HDC22941
14 355.6	750	47	7	—	HDC00423
16 406.4	600	34	5	—	HDC22942
16 406.4	1200	66	10	—	HDC00424
18 457.2	1000	58	9	—	HDC22943
20 508.0	1000	53	8	—	HDC09305
24 609.6	1000	38	6	—	HDC10234

Custom Engineered/Manufactured

Cartridge Heaters can be application specific; therefore for sizes, electrical ratings, terminations and any other design features not listed in this catalog **TEMPCO** will custom manufacture to your specifications. Consult us with your requirements.

[View Product Inventory @ www.tempco.com](http://www.tempco.com)

STOCK — Immediate Delivery through the  Lead Conversion Program



1/2" Actual .496" (12.60 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination). Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²		Part Number	
		120V	240V		
1 25.4	50	64	10	HDC00426	—
1 25.4	150	191	30	HDC00427	—
1 25.4	200	255	40	—	HDC00428
1 1/4 31.8	50	42	7	HDC00429	—
1 1/4 31.8	125	106	17	HDC00430	HDC00431
1 1/4 31.8	180	153	24	—	HDC00432
1 1/4 31.8	200	170	26	—	HDC00433
1 1/4 31.8	250	212	33	—	HDC00434
1 1/2 38.1	50	32	5	HDC00435	—
1 1/2 38.1	150	95	15	HDC00436	HDC00437
1 1/2 38.1	200	127	20	HDC00438	HDC00439
1 1/4 44.5	100	51	8	HDC00440	—
1 1/4 44.5	200	102	16	—	HDC00441
1 1/4 44.5	250	127	20	HDC00442	—
1 1/4 44.5	400	204	32	—	HDC00443
2 50.8	75	32	5	HDC00444	—
2 50.8	100	52	8	—	HDC22944
2 50.8	150	64	10	HDC00445	—
2 50.8	175	74	12	HDC00446	—
2 50.8	200	85	13	HDC00447	HDC00448
2 50.8	250	106	17	HDC00449	HDC00450
2 50.8	300	127	20	HDC00451	HDC00452
2 50.8	400	170	26	HDC00453	HDC00454
2 50.8	500	212	33	HDC00455	—
2 50.8	600	255	40	—	HDC00456
2 50.8	700	297	46	—	HDC00457
2 1/4 57.2	75	27	4	HDC00458	—
2 1/4 57.2	100	36	6	HDC00459	—
2 1/4 57.2	125	45	7	HDC00460	—
2 1/4 57.2	150	55	9	HDC00461	—
2 1/4 57.2	250	91	14	HDC00462	HDC00463
2 1/4 57.2	300	109	17	—	HDC00464
2 1/4 57.2	400	146	23	HDC00465	HDC00466
2 1/4 57.2	500	182	28	HDC00467	HDC00468
2 1/4 60.3	100	34	5	HDC00470	HDC00471
2 1/4 60.3	125	42	7	HDC00472	—
2 1/4 60.3	250	85	13	HDC00473	HDC00474
2 1/4 60.3	400	136	21	—	HDC00475
2 1/4 60.3	500	170	26	HDC00476	HDC00477
2 1/2 63.5	100	32	5	HDC00478	HDC00479
2 1/2 63.5	125	40	6	HDC00480	—
2 1/2 63.5	150	48	7	—	HDC00481
2 1/2 63.5	200	64	10	HDC00482	HDC00483
2 1/2 63.5	250	80	12	HDC00484	HDC00485
2 1/2 63.5	300	95	15	HDC00486	HDC00487
2 1/2 63.5	400	127	20	HDC00489	HDC00490
2 1/2 63.5	500	159	25	HDC00491	HDC00492
2 1/16 65.1	300	93	14	—	HDC00493
2 1/16 65.1	350	108	17	HDC00494	—
2 1/4 69.9	250	71	11	HDC00495	—
2 1/4 69.9	400	113	18	HDC00496	HDC00497
3 76.2	125	32	5	HDC00498	HDC00499
3 76.2	150	38	6	HDC00500	HDC00501
3 76.2	200	51	8	—	HDC00502
3 76.2	250	64	10	HDC00503	HDC00504
3 76.2	300	76	12	HDC00505	HDC00506
3 76.2	350	89	14	HDC00507	—
3 76.2	400	102	16	HDC00508	HDC00509

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²		Part Number	
		120V	240V		
3 76.2	500	127	20	HDC00510	HDC00511
3 76.2	600	153	24	HDC00512	HDC00513
3 76.2	750	191	30	HDC00514	HDC00515
3 76.2	1000	255	40	HDC00516	—
3 1/2 88.9	250	53	8	HDC00517	HDC00518
3 1/2 88.9	300	64	10	—	HDC00519
3 1/2 88.9	350	74	12	—	HDC00520
3 1/2 88.9	400	95	15	—	HDC08472
3 1/2 88.9	500	106	17	HDC00522	HDC00523
3 1/2 88.9	750	159	25	—	HDC00524
3 1/2 88.9	1000	212	33	—	HDC00525
3 1/2 95.3	500	98	15	—	HDC00526
3 13/16 96.8	250	48	8	—	HDC00527
3 13/16 96.8	500	96	15	HDC00528	—
4 101.6	150	27	4	HDC00529	HDC00530
4 101.6	200	40	6	—	HDC07555
4 101.6	250	45	7	HDC00531	HDC00532
4 101.6	300	55	9	HDC00533	HDC00534
4 101.6	350	64	10	HDC00536	HDC00537
4 101.6	400	73	11	HDC00538	HDC00539
4 101.6	500	91	14	HDC00540	HDC00541
4 101.6	550	100	16	HDC00542	HDC00543
4 101.6	600	109	17	—	HDC00544
4 101.6	750	136	21	HDC00545	HDC00546
4 101.6	1000	182	28	—	HDC00547
4 101.6	1200	218	34	—	HDC00548
4 5/16 109.5	550	92	14	HDC00550	—
4 1/2 114.3	250	40	6	HDC00551	—
4 1/2 114.3	350	56	9	—	HDC00552
4 1/2 114.3	500	80	12	HDC00553	HDC00554
4 1/2 114.3	650	103	16	HDC00555	HDC00556
4 1/2 114.3	750	119	19	HDC00557	HDC00558
4 1/2 114.3	1000	159	25	—	HDC00559
4 3/4 120.7	200	30	5	—	HDC00560
4 13/16 122.2	250	37	6	HDC00561	—
4 13/16 122.2	300	44	7	—	HDC00562
4 13/16 122.2	1000	148	23	—	HDC00563
5 127.0	200	28	4	HDC00565	HDC00566
5 127.0	250	35	6	HDC00567	—
5 127.0	300	42	7	—	HDC00568
5 127.0	350	50	8	HDC00569	HDC00570
5 127.0	400	57	9	HDC00571	HDC00572
5 127.0	500	71	11	HDC00573	HDC00574
5 127.0	550	78	12	—	HDC00575
5 127.0	600	85	13	—	HDC00576
5 127.0	625	88	14	—	HDC00577
5 127.0	750	106	17	HDC00578	HDC00579
5 127.0	800	113	18	—	HDC00580
5 127.0	1000	141	22	—	HDC00581
5 1/2 133.4	250	34	5	HDC00582	HDC00583
5 1/2 133.4	1000	134	21	—	HDC00584
5 1/2 139.7	200	25	4	—	HDC00585
5 1/2 139.7	500	64	10	HDC00586	HDC00587
5 1/2 139.7	650	83	13	—	HDC00588
5 1/2 139.7	750	95	15	HDC00589	HDC00590
5 1/2 146.1	350	42	7	—	HDC00591
5 3/4 146.1	700	85	13	HDC00592	HDC00593
5 13/16 147.6	300	36	6	—	HDC00594

Cartridge Heaters



Hi-Density

STOCK — Immediate Delivery through the  Lead Conversion Program

Continued from previous page...

1/2" Actual .496" (12.60 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination). Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²	Part Number 120V	Part Number 240V
6 152.4	200	23 4	—	HDC00595
6 152.4	250	29 5	HDC00596	HDC00597
6 152.4	300	35 5	HDC00598	HDC00599
6 152.4	350	41 6	HDC00600	HDC00601
6 152.4	450	52 8	—	HDC00602
6 152.4	500	58 9	HDC00603	HDC00604
6 152.4	600	69 11	—	HDC00605
6 152.4	750	87 14	HDC00606	HDC00607
6 152.4	850	98 15	HDC00609	HDC00610
6 152.4	875	101 16	—	HDC00611
6 152.4	1000	116 18	HDC00612	HDC00613
6 152.4	1200	139 22	—	HDC00614
6 152.4	1500	183 28	—	HDC16228
6 1/2 161.9	1000	108 17	—	HDC00615
6 1/2 165.1	500	53 8	HDC00616	HDC00617
6 1/2 165.1	1000	106 17	—	HDC00618
6 3/4 171.5	500	51 8	HDC00619	HDC00620
7 177.8	250	24 4	HDC00621	—
7 177.8	340	33 5	—	HDC00622
7 177.8	400	39 6	—	HDC00623
7 177.8	500	49 8	HDC00624	HDC00625
7 177.8	600	59 9	HDC00626	HDC00627
7 177.8	700	69 11	—	HDC00628
7 177.8	750	73 11	HDC00629	HDC00630
7 177.8	1000	98 15	HDC00631	HDC00632
7 177.8	1500	147 23	—	HDC00633
7 1/2 190.5	500	45 7	HDC00634	HDC00635
7 1/2 190.5	1000	91 14	—	HDC00636
7 3/4 196.9	1000	88 14	—	HDC00637
8 203.2	200	17 3	—	HDC00639
8 203.2	300	25 4	HDC00640	HDC00641
8 203.2	500	42 7	HDC00642	HDC00643
8 203.2	600	51 8	—	HDC00644
8 203.2	750	64 10	HDC00645	HDC00646
8 203.2	800	68 11	HDC00647	HDC00648
8 203.2	1000	85 13	HDC00650	HDC00651
8 203.2	1200	102 16	—	HDC00653
8 203.2	1500	127 20	—	HDC00654
8 203.2	2000	170 26	—	HDC00655
8 1/2 215.9	300	24 4	—	HDC00656
8 1/2 215.9	500	40 6	—	HDC00657
8 1/2 215.9	1000	80 12	HDC00658	HDC00659
8 3/4 222.3	1000	77 12	—	HDC00660
9 228.6	500	37 6	—	HDC00661
9 228.6	750	56 9	—	HDC00662
9 228.6	1000	75 12	HDC00663	HDC00664

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²	Part Number 120V	Part Number 240V
9 228.6	1325	99 15	—	HDC00665
9 228.6	1500	112 17	—	HDC00666
9 1/2 241.3	500	35 6	—	HDC00667
9 1/2 241.3	800	57 9	—	HDC00668
9 1/2 241.3	1000	71 11	—	HDC00669
10 254.0	500	34 5	HDC00670	HDC00671
10 254.0	750	50 8	—	HDC00672
10 254.0	800	54 8	—	HDC00673
10 254.0	1000	67 10	HDC00674	HDC00675
10 254.0	1250	84 13	—	HDC00677
10 254.0	1500	101 16	—	HDC00678
10 254.0	2000	134 21	—	HDC00679
10 1/2 266.7	1500	95 15	—	HDC00680
11 279.4	500	30 5	HDC00681	—
11 279.4	1000	61 9	—	HDC00682
11 279.4	1500	91 14	—	HDC00683
11 279.4	2000	121 19	—	HDC00684
11 1/2 292.1	1525	88 14	—	HDC00685
12 304.8	500	28 4	HDC00686	HDC00687
12 304.8	600	33 5	HDC00688	HDC00689
12 304.8	1000	55 9	HDC00690	HDC00691
12 304.8	1100	61 9	—	HDC00692
12 304.8	1500	83 13	—	HDC00693
12 304.8	2000	111 17	—	HDC00694
12 1/2 317.5	1675	89 14	—	HDC00695
13 1/2 342.9	500	24 4	—	HDC00696
14 355.6	1000	47 7	—	HDC00697
14 355.6	1700	80 12	—	HDC00698
14 355.6	2300	108 17	—	HDC00699
15 381.0	800	35 5	—	HDC00700
15 381.0	1000	44 7	—	HDC00701
15 381.0	1500	66 10	—	HDC00702
15 381.0	2000	88 14	—	HDC00703
16 406.4	800	33 5	—	HDC00704
16 406.4	1000	41 6	—	HDC00705
16 406.4	2000	84 13	—	HDC17207
16 1/2 419.1	2200	88 14	—	HDC00706
17 431.8	1000	39 6	—	HDC00707
18 457.2	750	27 4	—	HDC00708
18 457.2	1000	36 6	—	HDC00709
18 457.2	1500	55 9	—	HDC00710
18 457.2	1700	62 10	—	HDC00711
18 457.2	2000	73 11	—	HDC00712
20 508.0	1000	34 5	—	HDC11652
24 609.6	1000	28 4	—	HDC14867

Ordering Information

Order by Part Number for stock Cartridge heaters with Type N termination. Call Tempco for part numbers for stock heaters with other Terminator Program terminations and options (see pages 2-12 & 2-13).

Custom Engineered/Manufactured

Cartridge Heaters can be application specific; therefore for sizes, electrical ratings, terminations and any other design features not listed in this catalog **TEMPCO** will custom manufacture to your specifications. Consult us with your requirements.

STOCK — Immediate Delivery through the  Lead Conversion Program



5/8" Actual .621" (15.77 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination). Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²	Part Number	
			120V	240V
1 1/4	31.8	50	34	5
1 1/4	31.8	200	136	21
1 1/4	31.8	250	170	26
1 1/2	38.1	250	127	20
2	50.8	100	34	5
2	50.8	125	42	7
2	50.8	200	68	11
2	50.8	250	85	13
2	50.8	300	102	16
2	50.8	400	136	21
2	50.8	500	170	26
2	50.8	750	255	40
2 1/4	57.2	100	29	5
2 1/4	57.2	125	36	6
2 1/4	57.2	250	73	11
2 1/4	57.2	350	102	16
2 1/8	60.3	280	76	12
2 1/2	63.5	180	46	7
2 1/2	63.5	275	70	11
2 1/2	63.5	400	102	16
2 1/2	63.5	720	183	28
3	76.2	150	31	5
3	76.2	180	37	6
3	76.2	250	51	8
3	76.2	350	71	11
3	76.2	400	81	13
3	76.2	500	102	16
3	76.2	600	122	19
3	76.2	720	147	23
3	76.2	750	153	24
3 1/4	82.6	200	37	6
3 1/4	82.6	800	148	23
3 1/2	88.9	525	89	14
3 1/2	95.3	525	82	13
4	101.6	250	36	6
4	101.6	300	44	7
4	101.6	350	51	8
4	101.6	400	58	9
4	101.6	500	73	11
4	101.6	550	80	12
4	101.6	600	87	14
4	101.6	750	109	17
4	101.6	1000	146	23
4 1/2	114.3	500	64	10
4 1/2	114.3	750	95	15
4 1/2	114.3	1000	127	20
4 1/4	120.7	750	90	14
5	127.0	250	28	4
5	127.0	500	57	9
5	127.0	750	85	13
5	127.0	875	99	15
5	127.0	1000	113	18
5 1/2	136.5	800	84	13
5 1/2	139.7	800	81	13
5 1/4	146.1	500	49	8
5 1/4	146.1	1500	146	23

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²	Part Number	
			120V	240V
6	152.4	300	28	4
6	152.4	500	46	7
6	152.4	750	69	11
6	152.4	1000	93	14
6	152.4	1200	111	17
6	152.4	1500	139	22
6 1/2	165.1	350	30	5
6 1/2	165.1	500	42	7
6 1/2	165.1	900	76	12
6 1/2	165.1	1400	119	18
6 3/4	171.5	500	41	6
6 3/4	171.5	1000	81	13
7	177.8	500	39	6
7	177.8	750	59	9
7	177.8	1000	78	12
7	177.8	1500	118	18
7 1/2	190.5	325	24	4
7 1/2	190.5	1300	95	15
7 3/4	196.9	400	28	4
7 3/4	196.9	1000	70	11
8	203.2	400	27	4
8	203.2	500	34	5
8	203.2	750	51	8
8	203.2	850	58	9
8	203.2	1000	68	11
8	203.2	1200	81	13
8	203.2	1500	102	16
8	203.2	2000	136	21
8 3/4	222.3	450	28	4
8 3/4	222.3	1800	111	17
9	228.6	500	30	5
9	228.6	750	45	7
9	228.6	1000	60	9
9	228.6	1500	90	14
9 1/2	241.3	975	55	9
10	254.0	500	27	4
10	254.0	650	35	5
10	254.0	750	40	6
10	254.0	800	43	7
10	254.0	1000	54	8
10	254.0	1500	80	13
10	254.0	2000	107	17
11	279.4	1000	49	8
11	279.4	1400	68	11
11	279.4	2000	97	15
12	304.8	500	22	3
12	304.8	600	27	4
12	304.8	775	34	5
12	304.8	900	40	6
12	304.8	1000	44	7
12	304.8	1500	66	10
12	304.8	2000	89	14
13	330.2	1000	41	6
13	330.2	1500	61	10
14	355.6	925	35	5
14	355.6	1000	38	6

Cartridge Heaters



Made in USA

Hi-Density

STOCK — Immediate Delivery through the  Lead Conversion Program

Continued from previous page...

5/8" Actual .621" (15.77 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination).
Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²		Part Number	
		120V	240V		
14 355.6	1500	57	9	—	HDC00880
14 355.6	3700	140	22	—	HDC00881
15 381.0	750	26	4	—	HDC00882
15 381.0	1000	35	5	—	HDC00883
15 381.0	2400	84	13	—	HDC00884
15 381.0	4000	140	22	—	HDC00885
16 406.4	1000	33	5	—	HDC00886
16 406.4	2500	82	13	—	HDC00887
16 406.4	4500	148	23	—	HDC00888
17 431.8	1000	31	5	—	HDC00889
18 457.2	900	26	4	—	HDC00890
18 457.2	1000	29	5	—	HDC00891
18 457.2	1500	44	7	—	HDC00892

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²		Part Number	
		120V	240V		
18 457.2	3000	87	14	—	HDC00893
18 457.2	4700	137	21	—	HDC00894
19 482.6	1000	28	4	—	HDC00895
20 508.0	1000	26	4	—	HDC00896
20 508.0	1500	39	6	—	HDC00897
20 508.0	3500	91	14	—	HDC00898
20 508.0	4700	123	19	—	HDC00899
24 609.6	1000	22	3	—	HDC00900
24 609.6	2000	43	7	—	HDC00901
24 609.6	4700	102	16	—	HDC00902
25 641.4	1500	31	5	—	HDC00903
30 762.0	2800	48	8	—	HDC00904
36 914.4	3000	43	7	—	HDC00905

3/4" Actual .746" (18.95 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination).
Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²		Part Number	
		120V	240V		
2 50.8	200	57	9	HDC00906	—
2 50.8	800	226	35	—	HDC00907
2 1/2 57.2	200	49	8	HDC00908	—
2 1/2 57.2	800	194	30	—	HDC00909
3 76.2	250	42	7	HDC00910	—
3 76.2	500	85	13	HDC00911	HDC00912
3 76.2	600	102	16	HDC00913	HDC00914
3 76.2	1000	170	26	—	HDC00915
3 1/2 88.9	250	35	6	HDC00916	HDC00917
3 1/2 88.9	350	50	8	—	HDC00918
3 1/2 88.9	500	71	11	HDC00919	—
3 1/2 88.9	1000	141	22	—	HDC00920
3 3/4 95.3	250	33	5	HDC00921	—
3 3/4 95.3	500	65	10	—	HDC00922
3 3/4 95.3	1000	131	20	—	HDC00923
4 101.6	250	30	5	HDC00924	—
4 101.6	500	61	9	HDC00926	HDC00927
4 101.6	750	91	14	—	HDC00928
4 101.6	1000	121	19	HDC00929	HDC00930
4 1/2 114.3	350	37	6	HDC00931	—
4 1/2 114.3	875	93	14	HDC00932	HDC00933
4 1/2 114.3	1400	149	23	—	HDC00934
4 3/4 120.7	750	75	12	—	HDC00935
5 127.0	300	28	4	HDC00936	HDC00937

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²		Part Number	
		120V	240V		
5 127.0	500	47	7	—	HDC00938
5 127.0	750	71	11	—	HDC00939
5 127.0	1000	94	15	HDC00940	HDC00941
5 127.0	1200	113	18	—	HDC00942
5 1/2 146.1	1000	81	13	—	HDC00943
6 152.4	500	39	6	HDC00944	HDC00945
6 152.4	750	58	9	—	HDC00946
6 152.4	1000	77	12	HDC00947	HDC00948
6 152.4	1200	93	14	—	HDC00949
6 152.4	1500	116	18	—	HDC00950
6 152.4	2000	154	24	—	HDC00951
7 177.8	500	33	5	HDC00952	HDC00953
7 177.8	1000	65	10	HDC00954	HDC00955
7 177.8	1500	98	15	HDC00956	HDC00957
7 177.8	2000	131	20	—	HDC00958
7 1/2 193.7	450	27	4	—	HDC00959
8 203.2	350	20	3	—	HDC00961
8 203.2	500	28	4	HDC00962	HDC00963
8 203.2	700	40	6	—	HDC00964
8 203.2	1000	57	9	—	HDC00965
8 203.2	1350	76	12	—	HDC00966
8 203.2	2000	113	18	HDC00967	HDC00968
9 228.6	350	17	3	—	HDC00969
9 228.6	500	25	4	—	HDC00970

Ordering Information

Order by Part Number for stock Cartridge heaters with Type N termination. Call Tempco for part numbers for stock heaters with other Terminator Program terminations and options (see pages 2-12 & 2-13).

Custom Engineered/Manufactured

Cartridge Heaters can be application specific; therefore for sizes, electrical ratings, terminations and any other design features not listed in this catalog **TEMPCO** will custom manufacture to your specifications. Consult us with your requirements.

[View Product Inventory @ www.tempco.com](http://www.tempco.com)

STOCK — Immediate Delivery through the  Lead Conversion Program



3/4" Actual .746" (18.95 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination). Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²	Part Number	
			120V	240V
9 228.6	1000	53 8	—	HDC22945
9 228.6	1200	60 9	—	HDC00971
9 228.6	1800	90 14	—	HDC00973
9 1/4 247.7	2000	92 14	—	HDC00974
10 254.0	600	27 4	—	HDC00975
10 254.0	1000	45 7	—	HDC00976
10 254.0	1200	54 8	—	HDC00977
10 254.0	1500	70 11	—	HDC22946
10 254.0	2000	89 14	HDC00978	HDC00979
10 1/2 266.7	550	23 4	—	HDC00980
11 279.4	1000	40 6	—	HDC00981
11 1/4 298.5	2000	75 12	—	HDC00983
12 304.8	800	30 5	—	HDC00984
12 304.8	1000	37 6	—	HDC00985
12 304.8	1200	44 7	—	HDC00986
12 304.8	1500	55 9	—	HDC00987
12 304.8	2000	74 11	HDC00988	HDC00989
12 304.8	2500	92 14	—	HDC00990
12 304.8	4000	148 23	—	HDC00991
13 330.2	1000	34 5	—	HDC00992
14 355.6	800	25 4	—	HDC00993
14 355.6	1000	31 5	—	HDC00994
14 355.6	1125	35 6	HDC00995	—
14 355.6	1250	39 6	—	HDC00996
14 355.6	1400	44 7	—	HDC00997
14 355.6	2500	79 12	—	HDC00998
14 355.6	4500	141 22	—	HDC00999
14 1/4 374.7	1500	45 7	—	HDC01000

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²	Part Number	
			120V	240V
15 381.0	1000	29 5	—	HDC01001
15 381.0	1500	44 7	—	HDC01002
16 406.4	1000	27 4	—	HDC01003
16 406.4	1175	32 5	HDC01004	—
16 406.4	1500	41 6	—	HDC01005
16 406.4	1800	49 8	—	HDC01006
16 406.4	3000	82 13	—	HDC01007
16 406.4	4700	129 20	—	HDC01008
17 431.8	1000	26 4	—	HDC01009
17 1/4 450.9	850	21 3	—	HDC01010
18 457.2	1000	24 4	—	HDC01011
18 457.2	1250	30 5	HDC01012	—
18 457.2	1450	35 6	—	HDC01013
18 457.2	2000	49 8	—	HDC01014
18 457.2	3250	79 12	—	HDC01015
18 457.2	5000	121 19	—	HDC01016
19 482.6	1000	23 4	—	HDC01017
20 508.0	1000	22 4	—	HDC01018
20 508.0	1150	25 4	—	HDC01019
20 508.0	2050	45 7	—	HDC01020
20 508.0	2250	49 8	—	HDC01021
20 508.0	5250	114 18	—	HDC01022
24 609.6	1000	18 3	—	HDC01023
24 609.6	1375	25 4	—	HDC01024
24 609.6	2000	36 6	—	HDC01025
24 609.6	2750	50 8	—	HDC01026
24 609.6	5500	99 15	—	HDC01027
36 914.4	2500	30 5	—	HDC01028

Ordering Information

Order by Part Number for stock Cartridge heaters with Type N termination. Call Tempco for part numbers for stock heaters with other Terminator Program terminations and options (see pages 2-12 & 2-13).

Custom Engineered/Manufactured

Cartridge Heaters can be application specific; therefore for sizes, electrical ratings, terminations and any other design features not listed in this catalog **TEMPCO** will custom manufacture to your specifications. Consult us with your requirements.

1" Dia. Actual .996" (25.30 mm) Hi-Density Cartridge Heaters with Type N termination 10" leads

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²	Part Number	
			120V	240V
3 76.2	750	101 16	—	HDC02662
3 1/2 88.9	565	63 10	—	HDC02663
5 127.0	1000	73 11	—	HDC02664
7 1/8 200.0	500	22 3	HDC02665	HDC02666
8 203.2	1500	65 10	—	HDC02667
8 3/4 222.3	875	34 5	—	HDC02668
11 1/2 292.1	1000	29 5	HDC02669	—
13 330.2	1000	26 4	HDC02670	—
14 355.6	2700	64 10	—	HDC02671
15 381.0	1000	22 3	HDC02672	—

Sheath Length in mm	Watts	Watt Density W/in ² W/cm ²	Part Number	
			120V	240V
16 406.4	1800	37 6	—	HDC02673
17 1/4 441.3	2400	46 7	—	HDC02674
20 508.0	1000	16 3	—	HDC02675
20 508.0	2800	46 7	—	HDC02676
25 635.0	1725	23 3	HDC02677	HDC02678
40 1016.0	4400	36 6	—	HDC02679
49 1244.6	3725	25 4	—	HDC02680
50 1/2 1282.7	945	6 1	—	HDC02681
57 1447.8	2800	16 3	—	HDC02682
60 1524.0	1500	8 1	—	HDC02683



Note: 1" Dia. Hi-Density Cartridge Heaters are made-to-order only. Refer to ordering information on page 2-3.

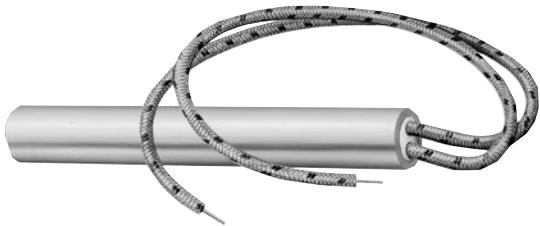
Standard lead time is 3 weeks.

Cartridge Heaters

Type F Terminated Stock Heaters



STOCK Cartridge Heaters with Type F Flexible Lead Termination



Type F Internally Connected Flexible Leads 10" Long

This lead termination provides flexibility; the lead wires are internally connected to the terminal pins. The lead wires can be sharply bent as they exit the ceramic insulating cap without exposing the bare wire.

1/4" Diameter Actual .246" (6.25 mm)

Sheath Length in mm	Watts	Volts	Watt Density W/in ² W/cm ²	Part Number
1 25.4	80	120	204 32	HDC05603
1½ 38.1	50	120	64 10	HDC06151
1½ 38.1	200	120	255 40	HDC10869
2 50.8	200	240	170 26	HDC01989
2 50.8	250	240	212 33	HDC05179
2 50.8	300	240	255 40	HDC04556
2½ 63.5	300	240	191 30	HDC07119
3 76.2	75	120	38 6	HDC10412
3 76.2	300	240	153 24	HDC04490
4 101.6	400	240	146 23	HDC04200
5¾ 146.1	350	120	94 15	HDC04732

3/8" Diameter Actual .371" (9.42 mm)

Sheath Length in mm	Watts	Volts	Watt Density W/in ² W/cm ²	Part Number
1¼ 31.8	150	240	170 26	HDC06254
1¼ 31.8	200	240	226 35	HDC04349
1½ 31.8	250	120	212 33	HDC04402
2 50.8	250	240	141 22	HDC04291
2 50.8	350	240	198 31	HDC11345
2½ 63.5	250	240	106 16	HDC07496
2½ 63.5	350	240	149 23	HDC04759
2½ 63.5	500	240	212 33	HDC05359
3 76.2	300	240	102 16	HDC02094
3 76.2	375	240	127 20	HDC06779
3½ 88.9	350	240	99 15	HDC04861
4 101.6	400	120	97 15	HDC04560
4 101.6	500	240	121 19	HDC04552
5½ 139.7	1000	240	170 26	HDC05431
7 177.8	350	240	46 7	HDC05303
12 304.8	1000	240	74 11	HDC05833

1/2" Diameter Actual .496" (12.60 mm)

Sheath Length in mm	Watts	Volts	Watt Density W/in ² W/cm ²	Part Number
2 50.8	300	240	127 20	HDC03872
3½ 79.4	500	240	121 19	HDC11162
3½ 96.8	250	240	48 7	HDC10330
4 101.6	500	240	91 14	HDC04676
4 101.6	600	240	109 17	HDC03878
5 127	500	240	71 11	HDC04701
6 152.4	500	240	58 9	HDC04677
6 152.4	750	240	87 14	HDC04352
6 152.4	1000	240	116 18	HDC03887
7 177.8	750	240	73 11	HDC03893
8 203.2	500	240	42 7	HDC02265
8 203.2	1000	240	85 13	HDC02263
10 254	1000	240	67 10	HDC04220

5/8" Diameter Actual .621" (15.77 mm)

Sheath Length in mm	Watts	Volts	Watt Density W/in ² W/cm ²	Part Number
3 76.2	750	240	153 24	HDC04483
6 152.4	600	240	56 9	HDC11240
6 152.4	1000	240	93 14	HDC07353

All Items Available from Stock

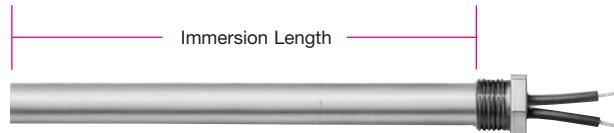


Note: Custom Engineered/Manufactured Hi-Density Cartridge Heaters with Type F Flexible Lead Termination
Refer to ordering information on page 2-3.

Standard Size Stock Type CM 1/2" & 3/4 NPT Screw Plug Hi-Density Cartridge Immersion Heaters

Hi-Density Cartridge Immersion Heaters are designed for heating water and other liquids. The high watt density capability of this heater permits greater heat dissipation in a given area than would a tubular immersion heater.

However, it is important to note that allowable watt density depends on the material being heated. For water heating, watt densities of several hundred watts per square inch are possible; oil heating may be limited to 5 to 20 watts per square inch.



Design Features

- * **Passivated Incoloy® Sheath**
- * **10" long Teflon® Insulated Lead Wires**
- * **Brass Fitting**
- * **Epoxy Seal at Lead End**
266°F (130°C) Standard
UL Rating 194°F (90°C)



Note: See pages 2-50 & 2-51 for other fitting options

Diameter	Heater Immersion Length		Watts	Watt Density		Part Number		
	in	mm		W/in ²	W/cm ²	120V	240V	480V
5/8" Incoloy® Sheath	1 1/2	38.1	100	41	6	HDL00001	—	—
	1 1/2	38.1	400	163	25	—	HDL00002	—
	3 1/2	88.9	250	39	6	HDL00003	HDL00004	—
	3 1/2	88.9	1000	157	24	—	HDL00005	HDL00006
	7 1/8	200.0	500	33	5	HDL00007	HDL00008	—
	7 1/8	200.0	2000	134	21	—	HDL00009	HDL00010
	12	304.8	750	33	5	HDL00011	HDL00012	—
	12	304.8	3000	130	20	—	HDL00013	HDL00014
1/2 NPT Fitting	4 1/4	108.0	500	53	8	HDL00015	HDL00016	—
	4 1/4	108.0	750	80	12	HDL00017	HDL00018	—
	4 1/4	108.0	1000	106	16	HDL00019	HDL00020	—
	4 5/8	117.5	300	29	5	HDL00021	HDL00022	—
	4 5/8	117.5	1200	116	18	—	HDL00023	HDL00024
	4 5/8	120.7	375	35	5	HDL00025	HDL00026	—
	4 5/8	120.7	1500	141	22	—	HDL00027	HDL00028
	5 1/4	146.1	500	39	6	HDL00029	HDL00030	—
3/4" Incoloy® Sheath	5 1/4	146.1	2000	154	24	—	HDL00031	HDL00032
	6 1/4	158.8	500	35	5	HDL00033	HDL00034	—
	6 1/4	158.8	2000	141	22	—	HDL00035	HDL00036
	6 1/2	165.1	625	42	7	HDL00037	HDL00038	—
	6 1/2	165.1	2500	170	26	—	HDL00039	HDL00040
	7 1/4	184.2	750	45	7	HDL00041	HDL00042	—
	7 1/4	184.2	3000	182	28	—	HDL00043	HDL00044
	9	228.6	1000	49	8	HDL00045	HDL00046	—
3/4 NPT Fitting	9	228.6	4000	194	30	—	HDL00047	HDL00048
	10 1/2	266.7	750	31	5	HDL00049	HDL00050	—
	10 1/2	266.7	3000	124	19	—	HDL00051	HDL00052
	10 1/2	273.1	1250	51	8	HDL00053	HDL00054	—
	10 3/4	273.1	5000	202	31	—	HDL00055	HDL00056
	12 1/2	317.5	1500	52	8	—	HDL00057	—
	12 1/2	317.5	6000	208	32	—	—	HDL00058
	13 5/8	346.1	1000	32	5	HDL00059	HDL00060	—
	13 5/8	346.1	4000	127	20	—	HDL00061	HDL00062
	16	406.4	2000	54	8	—	HDL00063	—
	16	406.4	8000	216	33	—	—	HDL00064
	19 1/4	489.0	2500	56	9	—	HDL00065	—
	19 1/4	489.0	10000	223	35	—	—	HDL00066

Ordering Information

Stock Heaters

Part Numbers listed above are for 1/2" and 3/4" NPT Brass Screw Plug Cartridge Immersion Heaters with Type CM termination and 10" long leads. **Standard lead time is 72 hours.**

Custom Engineered/Manufactured Heaters

Because an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** will design and manufacture a Cartridge Immersion Heater to meet your requirements. **Standard lead time is 3 weeks.**

Please Specify the following:

- Screw Plug NPT Size
- Screw Plug material (Brass or SS)
- Sheath material (Incoloy®, 321 SS)
- Element Watt Density
- Immersion Length
- Heated Length
- Wattage
- Voltage
- Termination types
- Lead Length

WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

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Tempco Offers Innovative Cartridge Heater Terminations Focused on Providing Maximum Performance Under a Diverse Segment of Demanding Applications

Cartridge Heater Terminations Can be Elusive to Define and Are Often Overlooked

To ensure maximum efficiency and reliable cartridge heater service, evaluate your existing operating conditions and proceed to select the best suited termination(s) for your application.

Failure to evaluate the operating conditions and the environment of a cartridge heater application and/or improper termination selection will compromise the operating reliability and functional life of the cartridge heater, resulting in costly machine downtime and loss of revenue due to lack of productivity.

The synergy between the cartridge heater termination and the application will result in reduced operating cost, increased productivity, optimized performance and improved customer satisfaction.

Take Advantage of Tempco's Innovative Cartridge Heater Terminations.

We offer a selection of over 40 standard terminations specifically designed to address the operating requirements of a multitude of diverse applications requiring protection against the following conditions:

- Abrasion
- Contamination
- Flexing
- Moisture Resistance
- High Temperatures
- Double-End Powerleads
- Locating Ring or Bushings
- Mounting Flanges
- NPT or Bulkhead Fittings
- Pull Straps
- Built-In Thermocouples & Thermostats
- Electrical Boxes

Refer to pages 2-39 through 2-60 for complete specifications and details on all available terminations and options.

A Wise Man Once Said . . .

“A Cartridge Heater is Only As Good as the Termination that Powers It.”

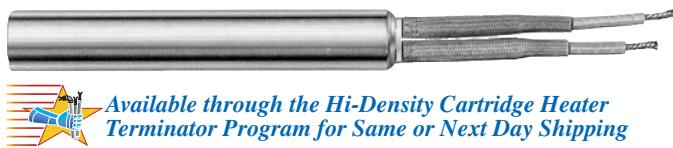
Standard Termination — HDC and HDM Hi-Density Cartridge Heaters

Type N External Pins with Leads

Available on HDC and HDM cartridge heaters

Flexible stranded lead wires have fiberglass insulation and are connected to 1-1/4" (32 mm) long solid conductors. Silicone rubber coated fiberglass sleeving insulates the pin/lead wire connection.

- Nominal 3/8" unheated section at the lead end is required.
- Standard lead wire temperature rating: 482°F (250°C)
- Standard 10" (254 mm) leads. Specify longer leads.



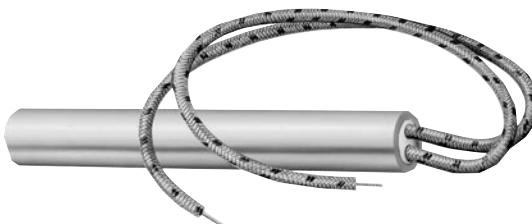
Standard Termination — LDC Low-Density Cartridge Heaters

Type F Internally Connected Flexible Leads

Available on HDC, HDM and LDC Cartridge Heaters

The fiberglass lead wires are internally connected to the terminal pins. This lead termination provides flexibility, permitting the lead wires to be sharply bent as they exit the heater.

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Standard lead wire temperature rating for HDC and HDM cartridge heaters is 842°F (450°C)
- Standard lead wire temperature rating for LDC cartridge heaters is 482°F (250°C)
- Standard 10" (254 mm) leads. Specify longer leads. For HDC & HDM heaters, leads longer than 60" require a splice.



Moisture Resistant Terminations

Cartridge Heater — Moisture Resistant Terminations



Type M1 Polyolefin Liquid Barrier

Available on **HDC, HDM, and LDC** cartridge heaters

A liquid barrier used for low temperature applications primarily in refrigeration or food service applications. The seal bonds to both the heater and the leads.

- Minimum 1" unheated section at the lead end is required.
- Three conductor SJO type cord.
- Available only in certain diameters. Heaters smaller than 1/2" diameter require an adapter.
- **Standard 10" (254 mm) leads. Specify longer leads.**

Type M2 □ Potted End Seal

Available on **HDC, HDM and LDC** cartridge heaters

Potted end seals help to protect the heater from moisture or contamination from plastic material, cleaning solvents, or oils. The bottom end disc seal is welded in.

M2A Cement potting with silicone varnish. Fiberglass lead wires externally connected.

- Cement potting temperature rating: 1000°F (538°C)
- Standard lead wire temperature rating: 482°F (250°C)

M2B Silicone rubber potting. Silicone rubber lead wires internally connected.

- Silicone rubber potting temperature rating: 450°F (232°C)
- Standard lead wire temperature rating: 392°F (200°C)

M2C High temperature epoxy potting. Teflon® lead wires internally connected.

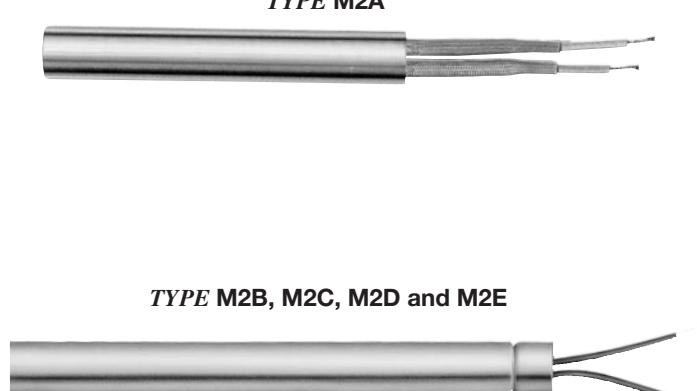
- High temp. epoxy potting temp. rating: 450°F (232°C)
- Standard lead wire temperature rating: 392°F (200°C)

M2D Low temperature epoxy potting. Teflon® lead wires internally connected.

- Low temp. epoxy potting temp. rating: 266°F (130°C), UL rated to 194°F (90°C)
- Standard lead wire temperature rating: 392°F (200°C)

M2E Cement potting with silicone varnish. Fiberglass lead wires internally connected.

- Cement potting temperature rating: 1000°F (548°C)
- Standard lead wire temperature rating: 482°F (250°C)
- Minimum of 3/8" up to 1" unheated section at the lead end is required.
- **Standard 10" (254 mm) leads. Specify longer leads.**



M2A and M2E are available through the Hi-Density Cartridge Heater Terminator Program for 2nd or 3rd Day Shipping

Type M3 Teflon® End Plug Seal

Available on **HDC and HDM** cartridge heaters

A moisture resistant Teflon® seal that is swaged in during the manufacturing process with Teflon® insulated lead wire.

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Teflon® seal temperature rating: 392°F (200°C)
- Standard lead wire temperature rating: 392°F (200°C)
- **Standard 10" (254 mm) leads. Specify longer leads. Leads longer than 60" require a splice.**



[View Product Inventory @ www.tempco.com](http://www.tempco.com)

Cartridge Heater — Moisture Resistant Terminations

Type SA Sealed Corrugated Armor Cable

Available on 1/2" Diameter and Larger HDC, HDM and LDC cartridge heaters

A liquid-proof stainless steel corrugated metal hose is silver brazed to the end of the cartridge heater. The end disc of the heater is also welded or brazed. This termination provides a positive seal against moisture and contamination entering the heater.



- ▶ Minimum 3/8" up to 1" unheated section at the lead end is required.
- ▶ Standard fiberglass lead wire temperature rating
HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- ▶ Standard 10" (254 mm) cable over 12" (305 mm) leads.
Specify longer leads or cable.

Cartridge Heater — Flexible Spring Abrasion Resistant Terminations

Type S1 □ Flexible Spring

Available on HDC, HDM, and LDC cartridge heaters.

The leads are reinforced with a steel spring for applications with extreme flexing. The spring is mechanically fastened or silver brazed.

S1A Mechanically fastened spring.

S1B Silver brazed spring.

- ▶ Minimum 3/8" up to 1" unheated section at the lead end is required.
- ▶ Standard fiberglass lead wire temperature rating
HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- ▶ Standard 10" (254 mm) leads. Specify longer leads.

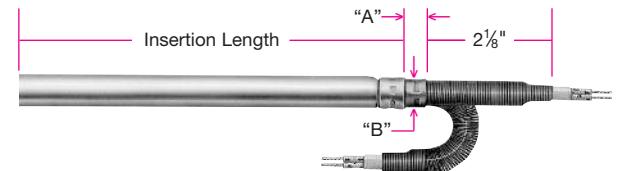
Dimensions for Type S1

	Diameter		"A" Dim.		"B" Dim.		
	in	mm	Fig.	in	mm	in	mm
Hi-Density Cartridge Heaters	1/4	6.35	1	11/16	17.46	5/16	7.94
	5/16	7.94	1	11/16	17.46	7/16	11.11
	3/8	9.53	1	11/16	17.46	7/16	11.11
	1/2	12.70	1	13/16	20.64	9/16	14.29
	5/8	15.88	1	1	25.40	3/4	19.05
	3/4	19.05	1	1-1/4	31.75	7/8	22.23
	1	25.40	2	5/8	15.88	5/8	15.88
	3/16	4.76	—	—	—	—	—
Low-Density Cartridge Heaters	1/4	6.35	1	11/16	17.46	5/16	7.94
	3/8	9.53	1	11/16	17.46	7/16	11.11
	1/2	12.70	1	13/16	20.64	9/16	14.29
	5/8	15.88	2	7/16	11.11	9/16	14.29
	3/4	19.05	2	1/2	12.70	9/16	14.29
	7/8	22.23	2	5/8	15.88	9/16	14.29
	1	25.40	2	5/8	15.88	5/8	15.88
	1-1/4	31.75	2	5/8	15.88	5/8	15.88

TYPE S1 Fig. 1



TYPE S1 Fig. 2



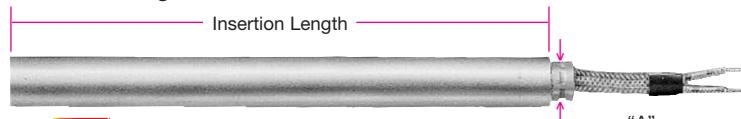
Abrasion Resistant Terminations

Cartridge Heater — Flexible Braid Abrasion Resistant Terminations

TYPE W Fig. 1



TYPE W Fig. 2



Available through the Hi-Density
Cartridge Heater Terminator Program
for 2nd or 3rd Day Shipping

Diameter in mm	Fig.	"A" Dim./HD in mm	"A" Dim./LD in mm
3/16 4.76	1	—	1/4 6.35
1/4 6.35	1	5/16 7.94	5/16 7.94
5/16 7.94	1	3/8 9.53	—
3/8 9.53	2	3/8 9.53	3/8 9.53
1/2 12.70	2	7/16 11.11	7/16 11.11
5/8 15.88	2	9/16 14.29	9/16 14.29

Type W Wire Braided Leads

Available on HDC, HDM, and LDC cartridge heaters

Stainless steel braid over fiberglass leads offers sharp bending not possible with armor cable, as well as abrasion protection.

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Standard lead wire temperature rating
HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- Standard 10" (254 mm) braid over 12" (305 mm) leads.
Specify longer braid/leads.

Type W2 □ Embedded Wire Braided Leads

Available on HDC, HDM and LDC cartridge heaters

Diameter in mm	Fig.	"A" Dim./HD in mm	"A" Dim./LD in mm
3/4 19.05	2	9/16 14.29	9/16 14.29
7/8 22.23	2	—	9/16 14.29
1 25.40	2	9/16 14.29	9/16 14.29
1-1/4 31.75	2	—	9/16 14.29

Type W2 □ Embedded Wire Braided Leads

Available on HDC, HDM and LDC cartridge heaters

Stainless Steel braid embedded into seal offers moisture resistance and abrasion protection.

W2A Fiberglass Leads with Cement Potting

- Cement potting temperature rating: 1000°F (538°C)
- Standard lead wire temperature rating: 482°F (250°C)

W2B Teflon® Leads with High Temperature Epoxy

- High temperature epoxy temp. rating: 450°F (232°C)
- Standard lead wire temperature rating: 392°F (200°C)

W2C Teflon® Leads with Low Temperature Epoxy

- Low temperature epoxy temp. rating: 266°F (130°C)
UL rated to 194°F (90°C)
- Standard lead wire temperature rating: 392°F (200°C)
- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Standard 10" (254 mm) braid over 12" (305 mm) leads.
Specify longer braid/leads.

Type W3 Swaged-In Wire Braided Leads

Available on HDC and HDM cartridge heaters

Stainless steel braid over fiberglass leads offers sharp bending not possible with armor cable, as well as abrasion protection. In addition, Type W3 offers contamination resistance due to the Teflon® seal required for holding the wire braid.

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Teflon® Seal temperature rating: 392°F (200°C)
- Standard lead wire temperature rating: 842°F (450°C)
- Standard 10" (254 mm) braid over 12" (305 mm) leads.
Specify longer braid/leads.

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Cartridge Heater — Armor Cable Abrasion Resistant Terminations

Type CS Straight Armor Cable Directly Attached to Sheath

Available on **HDC, HDM, and LDC** cartridge heaters

The armor cable is directly attached to the cartridge heater, eliminating the coupling, to maintain an overall diameter equal to or smaller than the cartridge diameter.

CSA Galvanized armor cable – minimum diameter: 5/16"

CSB Stainless steel armor cable – minimum diameter: 5/16"

► Minimum 3/8" up to 1" unheated section at the lead end is required.

► Heaters with an OD of 3/4" or larger require reducing diameter washer

► Standard fiberglass lead wire temperature rating
HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)

► **Standard** 10" (254 mm) cable over 12" (305 mm) leads.
Specify longer leads or cable.



Type C1 Straight Armor Cable with Coupling

Available on **HDC, HDM, or LDC** cartridge heaters

Armor cable provides the maximum in protection for abrasive, jagged environments. The coupling between the cartridge and the armor cable is mechanically fastened or silver brazed.

C1A Galvanized armor cable, mechanically fastened

C1B Stainless steel armor cable, mechanically fastened

► Standard fiberglass lead wire temperature rating
482°F (250°C)

C1C Galvanized armor cable, silver brazed

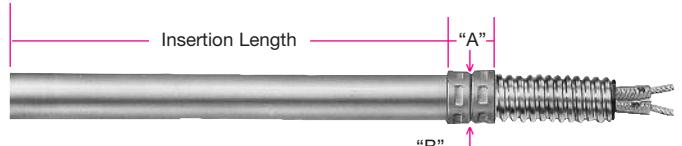
C1D Stainless steel armor cable, silver brazed

► Standard fiberglass lead wire temperature rating
HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)

► Minimum 3/8" up to 1" unheated section at the lead end is required.

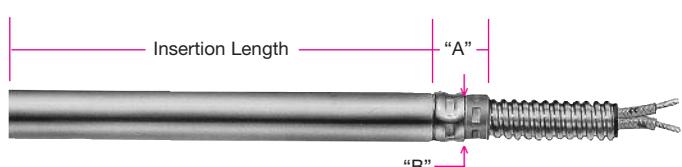
► **Standard** 10" (254 mm) cable over 12" (305 mm) leads.
Specify longer leads or cable.

TYPE C1 Fig. 1



 **C1A and C1B are available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping**

TYPE C1 Fig. 2



Dimensions for Type C1

	Diameter in mm	Fig.	"A" Dim. in mm	"B" Dim. in mm	Cable Dia.
Hi-Density Cartridge Heaters	1/4 6.35	1	11/16 17.46	5/16 7.94	1/4
	5/16 7.94	1	11/16 17.46	7/16 11.11	1/4
	3/8 9.53	1	11/16 17.46	7/16 11.11	3/8
	1/2 12.70	1	13/16 20.64	9/16 14.29	1/2
	5/8 15.88	1	1 25.40	3/4 19.05	1/2
	3/4 19.05	1	1-1/4 31.75	7/8 22.23	1/2
	1 25.40	2	5/8 15.88	5/8 15.88	1/2
Low-Density Cartridge Heaters	3/16 4.76	—	—	—	—
	1/4 6.35	1	11/16 17.46	5/16 7.94	1/4
	3/8 9.53	1	11/16 17.46	7/16 11.11	3/8
	1/2 12.70	1	13/16 20.64	9/16 14.29	1/2
	5/8 15.88	2	7/16 11.11	9/16 14.29	1/2
	3/4 19.05	2	1/2 12.70	9/16 14.29	1/2
	7/8 22.23	2	5/8 15.88	9/16 14.29	1/2
	1 25.40	2	5/8 15.88	5/8 15.88	1/2

Right-Angle Terminations

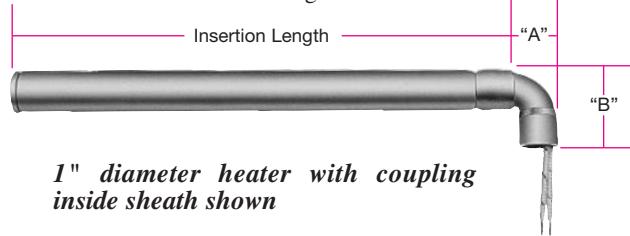
Cartridge Heater — Plain Leads Right-Angle Terminations

TYPE R1 Fig. 1



 **RIA** is available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

TYPE R1 Fig. 2



1" diameter heater with coupling inside sheath shown

Type R1 □ Right-Angle Leads with Copper Elbow

Available on HDC, HDM, and LDC cartridge heaters

This termination is used when space is limited. The copper elbow is mechanically fastened or silver brazed.

R1A Mechanically fastened

R1B Silver brazed

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Standard fiberglass lead wire temperature rating
HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- **Standard** 10" (254 mm) leads. Specify longer leads.

Dimensions for Type R1

	Diameter in mm	Fig.	"A" Dim. in mm	"B" Dim. in mm
Hi-Density Cartridge Heater	1/4 6.35	1	3/4 19.05	3/4 19.05
	5/16 7.94	1	15/16 23.81	15/16 23.81
	3/8 9.53	1	15/16 23.81	15/16 23.81
	1/2 12.70	1	1-1/4 31.75	1-1/4 31.75
	5/8 15.88	1	1-1/4 31.75	1-1/4 31.75
	3/4 19.05	1	1-3/4 44.45	1-1/4 31.75
	1 25.40	2	1-1/8 28.58	1-3/8 34.93
Low Density Cartridge Heater	3/16 4.76	—	—	—
	1/4 6.35	1	3/4 19.05	3/4 19.05
	3/8 9.53	1	15/16 23.81	15/16 23.81
	1/2 12.70	1	1-1/4 31.75	1-1/4 31.75
	5/8 15.88	2	11/16 17.46	1-1/4 31.75
	3/4 19.05	2	3/4 19.05	1-1/4 31.75
	7/8 22.23	2	3/4 19.05	1-3/8 34.93
Cartridge Heater	1 25.40	2	1-1/8 28.58	1-3/8 34.93
	1-1/4 31.75	2	1-1/8 28.58	1-3/8 34.93



Note: For Right-Angle Sheath Options, see page 2-53.



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Right-Angle Terminations

Cartridge Heater — Flexible Spring Abrasion Resistant Right-Angle Terminations

Type R2 Right-Angle Leads

Available on **HDC, HDM, and LDC cartridge heaters**

This termination is used when space is limited. Not suitable for abrasive environments. Same as C3 and W1 except plain leads. Various lead end finishes are available as listed below:

R2A Cement potting, no lead end disc

- Cement potting temperature rating: 1000°F (538°C)
- Standard fiberglass lead wire temperature rating: 482°F (250°C)

R2B Cement potting, welded lead end disc

- Cement potting temperature rating: 1000°F (538°C)
- Standard fiberglass lead wire temperature rating: 482°F (250°C)

R2C Silicone rubber potting, welded lead end disc

- Silicone Rubber potting temperature rating: 450°F (232°C)
- Standard silicone rubber lead wire temperature rating: 392°F (200°C)

R2D High temperature epoxy potting, welded lead end disc

- High Temperature epoxy potting temperature rating: 450°F (232°C)
- Standard Teflon® lead wire temperature rating: 392°F (200°C)

R2E Low temperature epoxy potting, welded lead end disc

- Low Temperature epoxy potting temperature rating: 266°F (130°C)
- Standard Teflon® lead wire temperature rating: 392°F (200°C)

➤ Minimum 3/8" up to 1" unheated section at the lead end is required.

➤ **Standard 10" (254 mm) leads.** Specify other lead lengths.



 **R2A and R2B are available through the Hi-Density Cartridge Heater Terminator Program for 2nd or 3rd Day Shipping**

Dimensions for types R2

Diameter in mm	Availability HD LD	"A" Dim. in mm
3/16 4.76	No	—
1/4 6.35	Yes	5/16 7.94
5/16 7.94	Yes	5/16 7.94
3/8 9.53	Yes	7/16 11.11
1/2 12.70	Yes	9/16 14.29
5/8 15.88	Yes	9/16 14.29
3/4 19.05	Yes	9/16 14.29
7/8 22.23	No	5/8 15.88
15/16 23.81	No	5/8 15.88
1 25.40	Yes	5/8 15.88
1-1/4 31.75	No	5/8 15.88

Type S2 Right-Angle Spring

Available on **HDC, HDM, and LDC cartridge heaters**

The leads are reinforced with a steel spring for applications with extreme flexing. The spring is mechanically fastened or silver brazed.

S2A Mechanically fastened spring

S2B Silver brazed spring

➤ Minimum 3/8" up to 1" unheated section at the lead end is required.

➤ Standard fiberglass lead wire temperature rating
HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)

➤ **Standard 10" (254 mm) leads.** Specify longer leads.

TYPE S2 Fig. 1



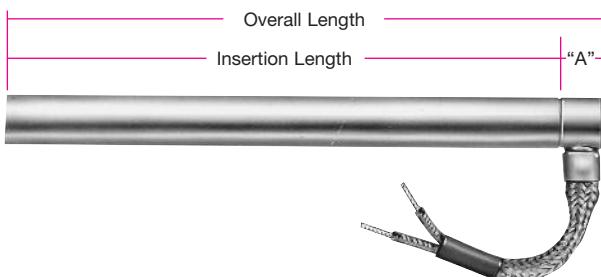
TYPE S2 Fig. 2



	Diameter in mm	Fig.	"A" Dim. in mm	"B" Dim. in mm
Hi-Density Cartridge Heaters	1/4 6.35	1	3/4 19.05	3/4 19.05
	5/16 7.94	1	15/16 23.81	15/16 23.81
	3/8 9.53	1	15/16 23.81	15/16 23.81
	1/2 12.70	1	1-1/4 31.75	1-1/4 31.75
	5/8 15.88	1	1-1/4 31.75	1-1/4 31.75
	3/4 19.05	1	1-3/4 44.45	1-1/4 31.75
	1 25.40	2	1-1/8 28.58	1-3/8 34.93
	1-1/4 31.75	2	1-1/8 28.58	1-3/8 34.93
Low-Density Cartridge Heaters	3/16 4.76	—	—	—
	1/4 6.35	1	3/4 19.05	3/4 19.05
	3/8 9.53	1	15/16 23.81	15/16 23.81
	1/2 12.70	1	1-1/4 31.75	1-1/4 31.75
	5/8 15.88	2	11/16 17.46	1-1/4 31.75
	3/4 19.05	2	3/4 19.05	1-1/4 31.75
	7/8 22.23	2	3/4 19.05	1-3/8 34.93
	1 25.40	2	1-1/8 28.58	1-3/8 34.93
	1-1/4 31.75	2	1-1/8 28.58	1-3/8 34.93

Right-Angle Terminations

Cartridge Heater — Flexible Braid Abrasion Resistant Right-Angle Terminations



 Available through the Hi-Density Cartridge Heater Terminator Program for 2nd or 3rd Day Shipping

Dimensions for Type W1

Diameter in mm		Availability HD	Availability LD	"A" Dim. in mm
3/16 4.76		No	No	— —
1/4 6.35		Yes	Yes	5/16 7.94
5/16 7.94		Yes	No	5/16 7.94
3/8 9.53		Yes	Yes	7/16 11.11
1/2 12.70		Yes	Yes	9/16 14.29
5/8 15.88		Yes	Yes	9/16 14.29
3/4 19.05		Yes	Yes	9/16 14.29
7/8 22.23		No	Yes	5/8 15.88
1 25.40		Yes	Yes	5/8 15.88
1-1/4 31.75		No	Yes	5/8 15.88

Type W1 Right-Angle Wire Braided Leads

Available on HDC, HDM, and LDC cartridge heaters

Stainless steel braid over fiberglass leads for abrasion protection, mechanically crimped to the cartridge sheath at 90°. Wire braid offers extreme flexibility not possible with armor cable. Various lead end finishes are available as listed below.

W1A Cement potting and silicone varnish, no lead end disc.

- Cement potting temperature rating: 1000°F (538°C)
- Standard lead wire temperature rating: 482°F (250°C)

W1B Welded lead end disc.

- Cement potting temperature rating: 1000°F (538°C)
- Standard lead wire temperature rating: 482°F (250°C)
- Minimum 3/8" up to 1" unheated section at the lead end is required.
- **Standard** 10" (254 mm) braid over 12" (305 mm) leads. Specify longer braid or leads.

 **Note:** For Right-Angle Sheath Options, see page 2-53.



Right-Angle Terminations

Cartridge Heater — Armor Cable Abrasion Resistant Right-Angle Terminations

Type C2 Right-Angle Armor Cable with Copper Elbow

Available on **HDC, HDM, and LDC** cartridge heaters

Armor cable provides the maximum in protection for abrasive, jagged environments. The copper elbow between the cartridge and the armor cable is mechanically fastened or silver brazed.

C2A Galvanized armor cable, mechanically fastened

C2B Stainless steel armor cable, mechanically fastened

C2C Galvanized armor cable, silver brazed

C2D Stainless steel armor cable, silver brazed

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Standard fiberglass lead wire temperature rating: HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- **Standard** 10" (254 mm) cable over 12" (305 mm) leads. Specify longer cable or leads.



TYPE C2 Fig. 2



Dimensions for Type C2 Hi-Density Cartridge Heaters

Diameter in mm	Fig.	"A" Dim. in mm	"B" Dim. in mm	Cable Dia.
1/4 6.35	1	3/4 19.05	3/4 19.05	1/4
5/16 7.94	1	15/16 23.81	15/16 23.81	1/4
3/8 9.53	1	15/16 23.81	15/16 23.81	3/8
1/2 12.70	1	1-1/4 31.75	1-1/4 31.75	1/2
5/8 15.88	1	1-1/4 31.75	1-1/4 31.75	1/2
3/4 19.05	1	1-3/4 44.45	1-1/4 31.75	1/2
1 25.40	2	1-1/8 28.58	1-3/8 34.93	1/2

Dimensions for Type C2 Low Density Cartridge Heaters

Diameter in mm	Fig.	"A" Dim. in mm	"B" Dim. in mm	Cable Dia.
3/16 4.76	—	—	—	—
1/4 6.35	1	3/4 19.05	3/4 19.05	1/4
3/8 9.53	1	15/16 23.81	15/16 23.81	3/8
1/2 12.70	1	1-1/4 31.75	1-1/4 31.75	1/2
5/8 15.88	2	11/16 17.46	1-1/4 31.75	1/2
3/4 19.05	2	3/4 19.05	1-1/4 31.75	1/2
7/8 22.23	2	3/4 19.05	1-3/8 34.93	1/2
1 25.40	2	1-1/8 28.58	1-3/8 34.93	1/2
1-1/4 31.75	2	1-1/8 28.58	1-3/8 34.93	1/2

Type C3 Right-Angle Armor Cable

Available on **HDC, HDM, and LDC** cartridge heaters

Use this termination when space is limited and maximum protection is required. The armor cable is tack welded or silver brazed to the cartridge sheath at 90°. The sheath extension is potted with cement. Various lead end finishes are available as listed below.

C3A Cement potting and silicone varnish with no lead end disc, galvanized cable

C3B Cement potting and silicone varnish with no lead end disc, stainless steel cable

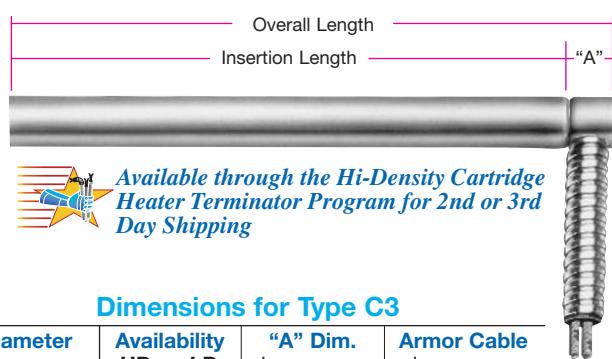
C3C Welded lead end disc, with galvanized cable

C3D Welded lead end disc, with stainless steel cable

- Minimum 3/8" up to 1" unheated section at the lead end is required.

➤ Cement potting temperature rating: 1000°F (538°C)
Standard fiberglass lead wire temperature rating: 482°F (250°C)

- **Standard** 10" (254 mm) armor cable over 12" (305 mm) leads. Specify longer cable or leads.



Dimensions for Type C3

Diameter in mm	Availability HD LD	"A" Dim. in mm	Armor Cable in mm
3/16 4.76	No No	— —	— —
1/4 6.35	Yes Yes	5/16 7.94	1/4 6.35
5/16 7.94	Yes No	5/16 7.94	1/4 6.35
3/8 9.53	Yes Yes	7/16 11.11	3/8 9.53
1/2 12.70	Yes Yes	9/16 14.29	1/2 12.70
5/8 15.88	Yes Yes	9/16 14.29	1/2 12.70
3/4 19.05	Yes Yes	9/16 14.29	1/2 12.70
7/8 22.23	No Yes	5/8 15.88	1/2 12.70
1 25.40	Yes Yes	5/8 15.88	1/2 12.70
1-1/4 31.75	No Yes	5/8 15.88	1/2 12.70

High Temperature Terminations

Cartridge Heater — Screw Terminations



Type T1 Screw Terminals

Available on LDC type cartridge heaters only

For use with leads, crimp terminals, or bus bars. Includes washers and nuts.

- Minimum 1/2" unheated section at the lead end is required.
- Diameters available: 3/4", 7/8", 1", and 1-1/4".
- **Standard:** screw #6-32 x 3/4" long

Diameter	in	3/4	7/8	1	1-1/4
	mm	19.05	22.23	25.40	31.75
"A" Dimension	in	3/8	7/16	1/2	1/2
	mm	9.53	11.11	12.70	12.70



Type T2 Screw Terminals

Available on HDC and HDM type cartridge heaters only

For use with leads, crimp terminals, or bus bars. Includes washers and nuts.

- Minimum 1/2" unheated section at the lead end is required.
- Diameters available: HD — 5/8", 3/4", 1"
HDM — 16 mm and 20 mm
- **Standard:** screw #8-32

Cartridge Heater — High Temperature Termination



 Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

Type B Heat Resistant Ceramic Bead Insulation

Available on HDC, HDM, and LDC cartridge heaters.

The ultimate in high temperature lead protection. Allows for the attachment of flexible leads to the heater away from the high heat area. Used when the ambient temperature exceeds 842°F (450°C).

- **Standard** 10" (254 mm) solid nickel pins insulated with ball and socket construction type ceramic beads



 Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

Type BL Heat Resistant Ceramic Bead Insulation with Leads

Available on HDC, HDM, and LDC cartridge heaters.

High temperature flexible leads are connected away from the high heat area.

- **Standard** 6" (254 mm) solid nickel pins insulated with ball and socket construction type ceramic beads and 10" (254 mm) fiberglass leads rated at 842°F (450°C). Specify longer leads.

Cartridge Heater — Double End Terminations

Type T4 Double End Terminal Pin

Available on **HDC, HDM, and LDC** cartridge heaters

For those applications in which wiring from both ends is an advantage. Various seals are available:

T4A Cement potting seal with silicone varnish

- Cement potting temperature rating: 1000°F (538°C)

T4B High temp. moisture resistant epoxy seal

- High temp. epoxy temp. rating: 450°F (232°C)

T4C Low temp. moisture resistant epoxy seal

- Low temp. epoxy temp. rating: 266°F (130°C)

► Minimum 1" unheated section at each end is required.

► **Standard** terminal pin length is 2".



Type F1 Double End Flexible Leads

Available on **HDC, HDM, and LDC** cartridge heaters

For applications in which it is an advantage to wire from both ends. The leads are internally connected and can be bent sharply as they exit the potted ends. Various seals are available:

F1A Fiberglass leads with cement potting seal and silicone varnish

- Cement potting temperature rating: 1000°F (532°C)
- Standard lead wire temperature rating: 482°F (250°C)

F1B Teflon® leads with high temp. moisture resistant epoxy seal

- High temp. epoxy temperature rating: 450°F (232°C)
- Standard lead wire temperature rating: 392°F (200°C)

F1C Teflon® leads with low temp. moisture resistant epoxy seal

- Low temp. epoxy temperature rating: 266°F (130°C)
- Standard lead wire temperature rating: 392°F (200°C)

► Minimum 1" unheated section at each end is required.

► **Standard** 10" leads. Specify longer leads.
Leads longer than 60" require a splice.



Type T3 Double End Screw Terminals

Available on **HDC, HDM, and LDC** cartridge heaters from 1/2" to 1-1/4" diameter

A double ended heater with quick change wiring screw terminals. Includes zinc plated washers and nuts.

► Minimum 1/2" unheated section at each end is required.

Standard screw sizes:

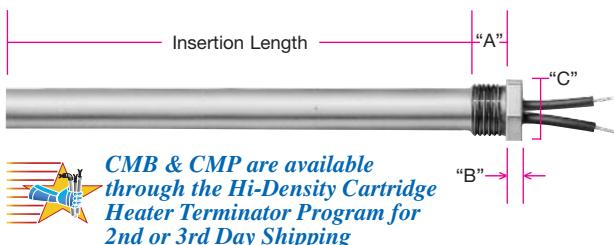
- 1/2" diameter — #8-32 x 3/4" screws
- 5/8" to 1-1/4" diameter — #10-32 x 3/4" screws



Mounting Fitting Termination & Option

Cartridge Heater Termination — Single Ended National Pipe Thread (NPT) Fitting

TYPE CM Fig. 1 – Fitting Flush with Lead End of Sheath



NOTE: Stainless steel fittings are available through the Terminator program for heaters 1/2" diameter and larger.



Note: Fitting can be offset from end of sheath. See Figure 2, Single Threaded Mounting Options CMV and CMW below.

Standard NPT Bushing Dimensions (Fig. 1 & Fig. 2)

Heater Diameter (in)	NPT Size	"A"	"B"	"C"
1/4	1/8-27	3/8	3/16	7/16
3/8	1/4-18	1/2	3/16	9/16
1/2	3/8-18	9/16	1/4	11/16
5/8	1/2-14	5/8	1/4	7/8
3/4	3/4-14	3/4	1/4	1-1/8
7/8	1-11/2	3/4	1/4	1-3/8
1	1-11/2	3/4	1/4	1-3/8
1-1/4	1 1/4-11/2	7/8	5/16	1-3/4

Type CM Single Threaded Fitting Mounting Termination Fitting Flush with Lead End of Sheath

Available on HDC, HDM, and LDC cartridge heaters

A single threaded pipe fitting is attached to the end of a cartridge heater to allow for installation into a threaded hole. Brass fittings are silver brazed and stainless steel fittings are heli-arc welded. Available with the potting seals listed in the table.

Potted end seals help to protect the heater from moisture or contamination from plastic material, cleaning solvents, or oils. The bushing cavity can be sealed with various materials such as:

CMA/CMN Low temperature epoxy potting — 266°F (130°C), UL rated to 194°F (90°C)

Teflon® leads internally connected, rated 392°F (200°C).

CMB/CMP Hi-temp cement potting with silicone varnish — 1000°F (538°C)

Fiberglass leads internally connected, rated 482°F (250°C).

CMC/CMQ Silicone rubber potting — 450°F (232°C)

Silicone rubber leads internally connected, rated 392°F (200°C).

CMD/CMR High temperature epoxy potting — 450°F (232°C)

Teflon® leads internally connected, rated 392°F (200°C).

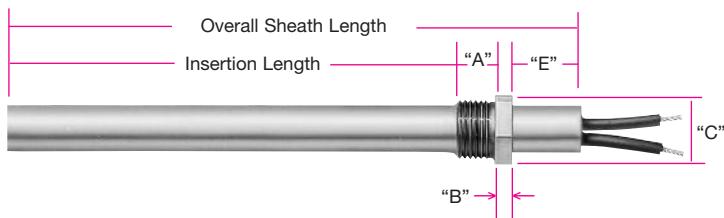
- A minimum of 1/4" unheated section below the bushing is required.
- Standard 10" (254 mm) leads. Specify longer leads.

Type Codes for Single Threaded Fittings

Potting Seal Type	Fitting Material	
	Brass	Stainless Steel
Low Temp Epoxy	CMA	CMN
Hi-Temp Cement	CMB	CMP
Silicone Rubber	CMC	CMQ
Hi-Temp Epoxy	CMD	CMR

Single Ended National Pipe Thread (NPT) Fitting Option

TYPE CM Fig. 2 – Fitting Offset from Lead End of Sheath



Type CM Single Threaded Fitting Mounting Option Fitting Offset from Lead End of Sheath

Available on HDC, HDM, and LDC cartridge heaters

This mounting option available with many terminations attaches a fitting offset from the lead end of the sheath. This option is useful when the lead wires need to be kept away from the heated area. Brass fittings are silver brazed and stainless steel fittings are offset heli-arc welded.

CMV Brass Fitting

CMW Stainless Steel Fitting

➤ Specify offset dimension "E" when ordering.

➤ A termination must be specified separately.

Hi-Density Cartridge Immersion Heater Specifically Designed for Heating Water & Other Liquids



See Page 2-23.

[View Product Inventory @ www.tempco.com](http://www.tempco.com)

Cartridge Heater — Double Ended National Pipe Thread (NPT)

Type CN **Double Threaded Fitting Mounting Termination**
Fitting Flush with Lead End of Sheath

Available on HDC, HDM, and LDC cartridge heaters

A double threaded pipe fitting is attached to the end of a cartridge heater to allow for installation into a threaded hole. Brass fittings are silver brazed and stainless steel fittings are heli-arc welded.

Standard NPT Bushing Dimensions

Heater Diameter (in)	NPT Size	"A"	"B"	"C"
1/4	1/8-27	3/8	1/4	7/16
3/8	1/4-18	1/2	1/4	9/16
1/2	3/8-18	9/16	1/4	11/16
5/8	1/2-14	5/8	5/16	7/8
3/4	5/8-14	3/4	3/8	1-1/8
7/8	1-11/16	3/4	3/8	1-3/8
1	1-11/16	3/4	3/8	1-3/8
1-1/4	1-1/4-11/16	7/8	1/2	1-3/4

Type Codes for Double Threaded Fittings

Potting Seal Type	Fitting Material	
	Brass	Stainless Steel
Low Temp Epoxy	CNA	CNN
Hi-Temp Cement	CNB	CNP
Silicone Rubber	CNC	CNQ
Hi-Temp Epoxy	CND	CNR



Potted end seals help to protect the heater from moisture or contamination from plastic material, cleaning solvents, or oils. The bushing cavity can be sealed with various materials such as:

CNA/CNN Low temperature epoxy potting — 266°F (130°C), UL rated to 194°F (90°C)
 Teflon® leads internally connected, rated 392°F (200°C).

CNB/CNP Hi-temp cement potting w/ silicone varnish — 1000°F (538°C)
 Fiberglass leads internally connected, rated 482°F (250°C).

CNC/CNQ Silicone rubber potting — 450°F (232°C)
 Silicone rubber leads internally connected, rated 392°F (200°C).

CND/CNR High temperature epoxy potting — 450°F (232°C)
 Teflon® leads internally connected, rated 392°F (200°C).

- A minimum of 1/4" unheated section below the bushing is required.
- Standard 10" (254 mm) leads. Specify longer leads.

Cartridge Heater Immersion Heater Top Hat Screw Plug Termination

Type TH **Top Hat Screw Plug**

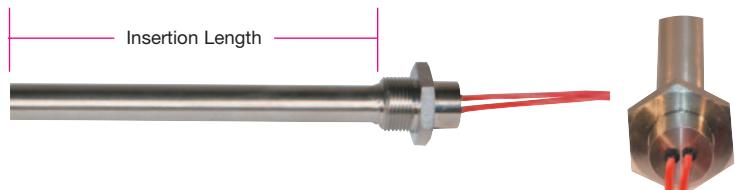
Available on HDC (except 1/8") and HDM cartridge heaters

This heater has a header cap as an integral part of the fitting. Leads exit through small holes which are sealed with epoxy for moisture protection.

Low temperature epoxy potting — 266°F (130°C),
 UL rated to 194°F (90°C)

Teflon® leads internally connected, rated 392°F (200°C).

- Standard 10" (254 mm) leads. Specify longer leads.



Cartridge Heater — Bulkhead Fitting Termination

Type BF **Bulkhead Fitting**

Available on HDC and LDC 1/2" and 5/8" cartridge heaters

A 5/8-18 UNF fitting is attached to the end of the cartridge heater to allow for mounting the heater to the wall of a tank or enclosure. Brass fittings are silver brazed and stainless steel fittings are heli-arc welded. Includes a copper washer and jam nut. The lead wires are internally connected. Available with the potting seals listed in the table.

Type Codes for Bulkhead Fittings

Potting Seal Type	Fitting Material	
	Brass	Stainless Steel
Low Temp Epoxy	BFA	BFJ
Silicone Rubber	BFB	BFK
Hi-Temp Epoxy	BFC	BFL



Potted end seals help to protect the heater from moisture or contamination from plastic material, cleaning solvents, or oils. The fitting cavity can be sealed with various materials such as:

BFA/BFJ Low temperature epoxy potting — 266°F (130°C), UL rated to 194°F (90°C)
 Teflon® leads internally connected, rated 392°F (200°C).

BFB/BFK Silicone rubber potting — 450°F (232°C)
 Silicone rubber leads internally connected, rated 392°F (200°C).

BFC/BFL High temperature epoxy potting — 450°F (232°C)
 Teflon® leads internally connected, rated 392°F (200°C).

- A minimum of 1/4" unheated section below the bushing is required.
- Standard 10" (254 mm) leads. Specify longer leads.

Cartridge Heaters



Options

Cartridge Heater Mounting Flange Options

Type MFR Mounting Flange — Round

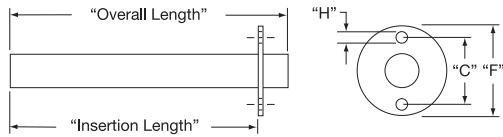
Available on **HDC, HDM, and LDC** cartridge heaters

Recommended for applications where excessive vibration exists and may cause the heater to back out of its mounting hole. The 16 ga. 304 SS flange is used as a means of securing the cartridge heater in place.

The default position of the flange is flush with the lead end. Specify the position of the flange when ordering.



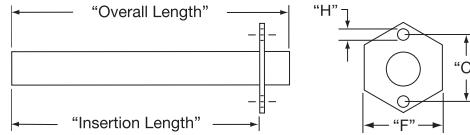
 Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping with flush flange only



Standard Round Mounting Flanges

Heater Diameter in (mm)	"F" in mm	"C" in mm	"H" in mm
1/4 (6.35), 5/16 (7.94), 3/8 (9.53), 1/2 (12.70), 5/8 (15.88), 3/4 (19.05)	1-1/2 38.10	1-1/8 28.57	.156 3.97
7/8 (22.23), 1 (25.40), 1-1/4 (31.80)	2 50.80	1-5/8 41.28	.203 5.16

 Note: 5/16" dia. cartridge heater can only be HDC; 7/8" and 1-1/4" can only be LDC.



Standard Hex Mounting Flanges

Heater Diameter in mm	"F" in mm	"C" in mm	"H" in mm
1/4 6.35	1 25.40	3/4 19.05	.144 3.66
5/16 7.94	1 25.40	3/4 19.05	.144 3.66
3/8 9.53	1 25.40	3/4 19.05	.144 3.66
1/2 12.70	1-3/8 34.93	1-5/32 29.37	.187 4.76
5/8 15.88	1-3/8 34.93	1-5/32 29.37	.187 4.76
3/4 19.05	1-3/8 34.93	1-5/32 29.37	.187 4.76
7/8 22.23	1-7/8 47.63	1-9/16 39.69	.203 5.16
1 25.40	1-7/8 47.63	1-9/16 39.69	.203 5.16
1-1/4 31.80	1-7/8 47.63	1-11/16 42.86	.203 5.16

Custom Mounting Flanges available upon request. Consult Tempco with your requirements.

Cartridge Heater Lead Wire with Strain Relief Options



Type S3 Lead Wire Strain Relief

Available on **HDC, HDM, and LDC** cartridge heaters

Strain relief clip for leads subject to tension and stress. A "T" type strain relief is silver brazed to the sheath.

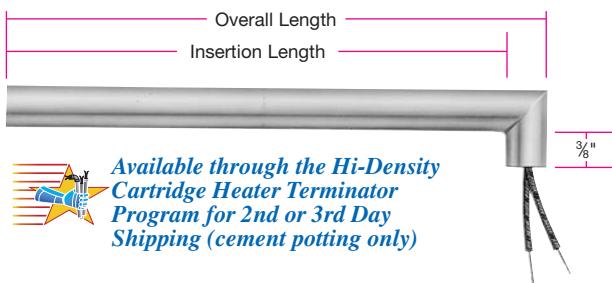


Type S4 Right-Angle Lead Wire Strain Relief

Available on **HDC, HDM, and LDC** cartridge heaters

Strain relief clip for leads subject to tension and stress. A "T" type strain relief is silver brazed to the sheath and bent at a 90° angle.

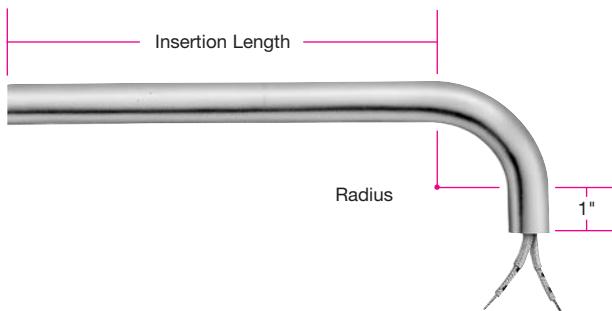
Cartridge Heater Option — Angled Sheath



Type R3 Angled Sheath Extension

Available on HDC, HDM, and LDC cartridge heaters

The sheath extension is silver brazed to the cartridge at a 90° angle. The leads are internally connected. The standard sheath extension is 3/8" long. Specify when ordering if a longer sheath extension is required. If abrasion resistance is required, armor cable or stainless steel wire braid can be attached to the sheath extension. Available with various lead wire types and potted end seals.



Type R4 Bent Cartridge

Available on HDC and HDM cartridge heaters

The heater sheath itself is bent to 90°. The bend is through a required cold section. The standard sheath extension past the bend is 1". Specify when ordering if a longer sheath is required.

Cartridge Dia.	in	1/4	3/8	1/2	5/8	3/4	1
	mm	6.35	9.53	12.70	15.88	19.05	25.40
Bend Radius	in	1/2	1/2	3/4	1	1-1/4	1-1/2
	mm	12.70	12.70	19.05	25.40	31.75	38.10



Type R5 Square Block with Tube Extension

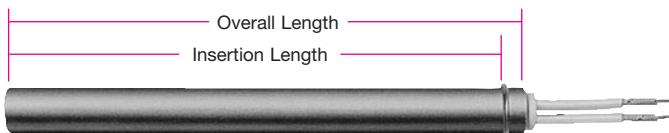
Available on HDC, HDM, and LDC cartridge heaters

The tube extension is silver brazed or tack welded to a square S/S block. The standard tube length is 1", but different lengths can be specified. Available with various lead wire types, abrasion resistant options or potted end seals.

Heater Diameter	"A"		"B"		
	in	mm	in	mm	
1/4	6.35	7/16	11.11	5/16	7.94
3/8	9.53	1/2	12.70	3/8	9.52
1/2	12.70	5/8	15.87	1/2	12.70
5/8	15.88	3/4	19.05	5/8	15.87
3/4	19.05	1	25.40	11/16	17.46

Other Sheath Options

Cartridge Heater Locating Ring



 Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

Type LR Locating Ring

Available on HDC, HDM, and LDC cartridge heaters

A locating ring can be attached to the heater to aid in positioning the heater for the application.

The default position of the ring is 1/4" from the lead end. Specify the position of the ring when ordering.

Cartridge Heater Pull Strap



 Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

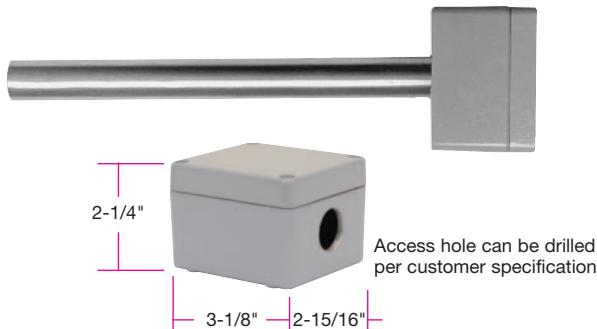
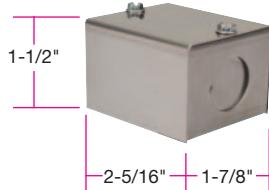
Type PS Pull Strap

Available on HDC, HDM, and LDC cartridge heaters

A nickel wire rope is silver brazed to the lead end of the cartridge heater sheath to assist in removing the heater.

Enclosure Options

Cartridge Heater Terminal Box Options



Type E1 General Purpose Terminal Box

Available on **HDC, HDM, and LDC** cartridge heaters

General purpose Stainless Steel NEMA 1 electrical enclosure designed to provide protection from electrical shock. The boxes have a 5/8" conduit knockout and are welded or brazed to the cartridge sheath.

- A termination must be specified separately.

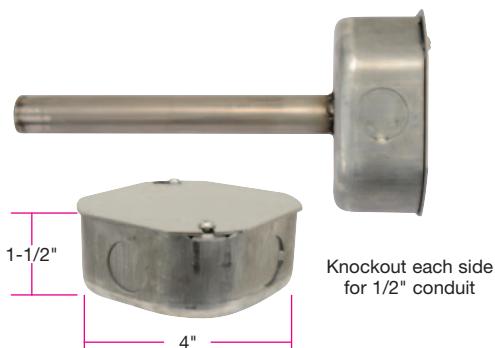


Type E4 General Purpose Terminal Box (mailbox style)

Available on **HDC, HDM, and LDC** cartridge heaters

General purpose Stainless Steel NEMA 1 electrical enclosure designed to provide protection from electrical shock. The box is welded or brazed to the cartridge sheath.

- A termination must be specified separately.



Type E5 Octagon Terminal Box

Available on **HDC, HDM, and LDC** cartridge heaters

General purpose steel NEMA 1 electrical enclosure designed to provide protection from electrical shock. The box is welded to the cartridge sheath.

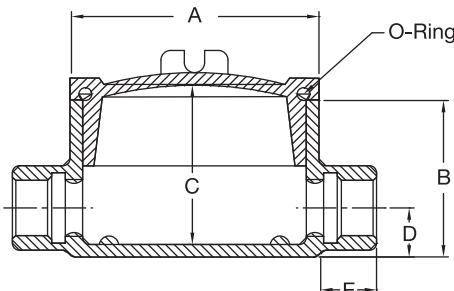
- A termination must be specified separately.

Type E3 Explosion Resistant Terminal Box Options

Available on **HDC** and **HDM** cartridge heaters 1/2" diameter and larger.

NEMA 4/7 electrical enclosures provide protection from contaminants, moisture, and hazardous conditions. These housings are screwed onto a heater with a single or double ended Brass or Stainless Steel fitting.

- A threaded fitting mounting termination must be specified. See pages 2-50 and 2-51.
- Other terminal box configurations available upon request.

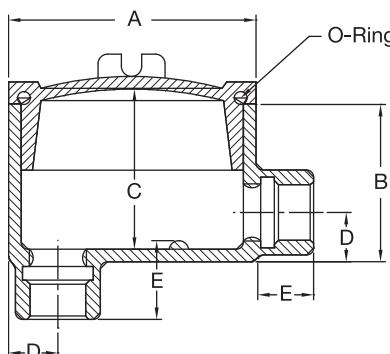


Style **E3C**



Housing E3C Dimensions

Heater Diameter(s)	Hub Size NPT	"A" (in)	"B" (in)	"C" (in)	"D" (in)	"E" (in)
1/2 & 5/8	1/2-14	2-1/2	2-1/4	2-3/16	5/8	7/8
3/4	3/4-14	2-1/2	2	2	3/4	7/8
1	1-11/16	3-1/2	2-5/16	2-3/16	7/8	1

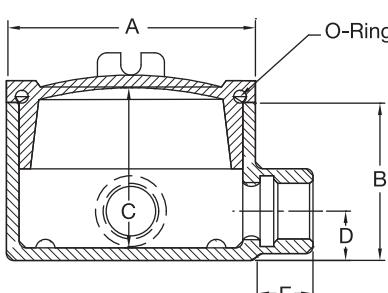


Style **E3D**



Housing E3D Dimensions

Heater Diameter(s)	Hub Size NPT	"A" (in)	"B" (in)	"C" (in)	"D" (in)	"E" (in)
1/2 & 5/8	1/2-14	2-1/2	2-1/4	2-3/16	5/8	7/8
3/4	3/4-14	2-1/2	2-1/2	2-7/16	3/4	7/8
1	1-11/16	3-1/2	2-5/16	2-3/16	7/8	1



Style **E3L**



Housing E3L Dimensions

Heater Diameter(s)	Hub Size NPT	"A" (in)	"B" (in)	"C" (in)	"D" (in)	"E" (in)
1/2 & 5/8	1/2-14	2-1/2	2-1/4	2-3/16	5/8	7/8
3/4	3/4-14	2-1/2	2-1/2	2-7/16	3/4	7/8
1	1-11/16	3-1/2	2-5/16	2-3/16	7/8	1



Explosion resistant terminal housings are intended to provide containment of an explosion in the enclosure only. No portion of the heater assembly outside the enclosure is covered under this NEMA rating. Abnormal use of a heater which results in excessive temperature can create hazardous conditions such as a fire. Never perform any type of service nor remove the housing cover prior to disconnecting all electrical power to the heater.

Cartridge Heaters



Lead Wire Options

Cartridge Heater Options — Lead End Connections

Type RT Ring Terminal

Type ST Spade Terminal

Type QTA 1/4" Female Straight Quick Disconnect

Type QTB 1/4" Female Right-Angle Quick Disconnect

Available on **HDC, HDM and LDC** cartridge heaters

Various types of crimp terminals can be attached to the heater leads to make wiring into applications quick and easy. Non-insulated and insulated with nylon (221°F/105°C) or PVC (194°F/90°C).

Note: Specify insulation type and ring size (#6, #8, or #10) when ordering. Standard is a non-insulated #10 terminal. Consult Tempco with your requirements.



Type RT



Type ST



Type QTA



Type QTB

Type P □ Quick Disconnect Plugs

Available on **HDC, HDM, and LDC** cartridge heaters

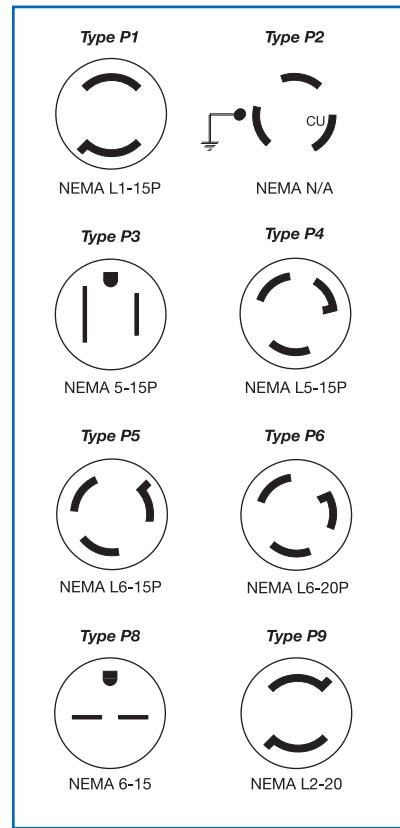
Allows for the quick and easy replacement of the heater. The plug can be attached to galvanized armor cable, stainless steel armor cable, or wire braid.

Plug Type

Description

- 1 2-pole/2-wire twist locking plug, 15 amp 125 volt NEMA L1-15P (Part Number EHD-102-102)
- 2 2-pole/3-wire twist locking plug, 15 amp 125 volt or 10 amp 250 volt NEMA N/A. (Part Number EHD-102-107)
- NOTE:** This plug is not listed by UL, and is recommended for replacement use only.
- 3 2-pole/3-wire straight blade plug, 15 amp 125 volt NEMA 5-15P (Part Number EHD-102-103)
- 4 2-pole/3-wire twist locking plug, 15 amp 125 volt NEMA L5-15P (Part Number EHD-102-113)
- 5 2-pole/3-wire twist locking plug, 15 amp 250 volt NEMA L6-15P (Part Number EHD-102-121)
- 6 2-pole/3-wire twist locking plug, 20 amp 250 volt NEMA L6-20P (Part Number EHD-102-122)
- 8 2-pole/3-wire straight blade plug, 15 amp 250 volt NEMA 6-15P (Part Number EHD-102-114)
- 9 2-pole/3-wire twist locking plug, 20 amp 250 volt NEMA L2-20P (Part Number EHD-102-104)

NOTE: For other types of plugs, consult Tempco or specify the manufacturer's part number when ordering. See page 15-15 for additional information.



Caution! Voltage and Amperage ratings of heater and plug must match.



Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

Cartridge Heater Lead Wire Options

Type MIL High Temperature Lead Wire

Available on **HDC, HDM and LDC** cartridge heaters

When required, high temperature lead wire can be used on most cartridge heaters. The stranded wire is insulated with mica tapes and then a treated fiberglass overbraid.

- Maximum temperature rating: 450°C (842°F)

Type TL Teflon® Leads

Available on **HDC and HDM** cartridge heaters

- Maximum temperature rating: 200°C (392°F)

Type HA Heat Shrink Covered Armor Cables

Available on **HDC, HDM and LDC** cartridge heaters

- Either the galvanized or stainless steel armor cable can be covered with moisture proof heat shrink PVC tubing.

Type HTL Very High Temperature Lead Wire

Available on **HDC, HDM and LDC** cartridge heaters

When required, high temperature lead wire can be used on most cartridge heaters. The stranded wire is insulated with mica composite and then a treated fiberglass overbraid.

- Available wire gauge sizes: 10-18
- Maximum temperature rating: 550°C (1022°F)

Type SR □ Silicone Rubber Coated Fiberglass Sleevng

Available on **HDC, HDM and LDC** cartridge heaters

For added protection, strength, and resistance to various chemicals, the lead wires can be covered with silicone rubber sleeving.

SRA Silicone rubber coated fiberglass sleevng on each lead separately

SRB Silicone rubber coated fiberglass sleevng on both leads together

- Specify length when ordering.
- Maximum temperature rating: 200°C (392°F)

Consult Tempco with your requirements.

We welcome your inquiries.

Cartridge Heater Options — Sheath Surface and Sheath Material

Type IS Incoloy® Sheath

Available on **HDC and HDM** cartridge heaters.

The standard sheath material for all Hi-Density Cartridge Heaters except 1" diameter is 321 stainless steel; standard for 1" diameter is 304 stainless steel. The incoloy sheath option is available on all diameters except 1/8", 5/16", 8 mm and 20 mm.

To assist you in selecting the proper sheath material, corrosion resistant ratings and chemical properties of various heater sheath materials are given in Section 16, Engineering Data, in the back of this catalog.

Type DSM Other Special Sheath Materials

If your application requires a specific alloy sheath material other than described in Type IS above, consult Tempco with your requirements.

Type PAS Passivation

Available on **HDC, HDM, and LDC** cartridge heaters.

Passivating is a chemical process accomplished by dipping the heater in a solution of nitric acid. The process removes surface contamination, usually iron, so that the optimum corrosion resistance of the stainless steel is maintained.

Type OAL Special Length Tolerance

Available on **HDC, HDM, and LDC** cartridge heaters.

If a special length tolerance different than the standard length tolerance specified on page 2-4 is required, consult Tempco with your requirements.

Type ELP Electro-Polish

Available on **HDC, HDM, and LDC** cartridge heaters.

Electro-Polishing is an electro-chemical process that removes surface imperfections and contaminants, enhancing the corrosion resisting ability of the heater sheath.

Type CG Centerless Grinding

Available on **HDC and HDM** cartridge heaters.

For applications requiring high precision fit and tolerance, the sheath can be centerless ground.

Tolerance: ±0.0005 inches (0.013 mm)

Specify diameter when ordering.

Type SDA End Disc Seals Silver Brazed

Type SDB End Disc Seals Heli-Arc Welded

Available on **LDC** cartridge heaters.

End discs on HDC and HDM cartridge heaters are heli-arc welded as standard.

The normally mechanically attached end discs on LD cartridge heaters can be silver brazed or heli-arc welded if desired.

Thermocouple Options

Cartridge Heater With Built-In Internal Thermocouples

Built-in Internal Thermocouples are available on all **HDC, HDM, and LDC** cartridge heater diameters except for **3/16", 5/16" and 8 mm**.



Notes: Type TJ4 and TK4 are not available on 1/4" and 6.5 mm diameter cartridges.

Minimum sheath length: 3" for 1/4", 3/8" and 1/2" diameter. 4" for 5/8" and 3/4" diameter.

10" leads are standard for both heater and thermocouple. Leads are internally connected. Specify longer leads.



Type TJ1 and TK1



Type TJ2 and TK2



Type TJ3 and TK3



Type TJ4 and TK4



Type TJ5 and TK5

ANSI Code	Conductor Characteristics		Temperature Range	
	Positive	Negative	°F	°C
J	Iron (Magnetic)	Constantan (Non-Magnetic)	0 to 1400	-17 to 760
K	Chromel (Non-Magnetic)	Alumel (Magnetic)	0 to 2300	-17 to 1260

For other thermocouple types consult Tempco.

Type TJ1 and TK1 Grounded at Disc End

The thermocouple junction is grounded to the sheath at the disc end and packed with MgO. The concave end disc is filled with silver solder and ground flat. When inserted into a flat end blind hole, it will provide fast responsive temperature readings. Widely used in Hot Runner mold probes.

TJ1 Type J thermocouple; **TK1** Type K thermocouple

Type TJ2 and TK2 Ungrounded at Disc End

The thermocouple junction is ungrounded, located at the end of the heater section, 1/8" behind the end disc and packed with MgO. Only provides reference temperature reading of the part being heated – slower response.

TJ2 Type J thermocouple; **TK2** Type K thermocouple

Type TJ3 and TK3 Ungrounded at Center

The thermocouple junction is ungrounded and is located in the center of the length and diameter of the cartridge heater. It provides internal temperature readings of the heater core. Generally used for research applications and is not recommended for controlling process temperatures.

TJ3 Type J thermocouple; **TK3** Type K thermocouple

Type TJ4 and TK4 Grounded at Center

The thermocouple junction is grounded to the sheath in a 1/2" unheated section located in the center of the cartridge length unless otherwise specified. It provides good temperature readings with quick response.

TJ4 Type J thermocouple; **TK4** Type K thermocouple

Type TJ5 and TK5 Grounded at Lead End

The thermocouple junction is grounded to the sheath at the lead end. A minimum of 3/8" of cold section is required. It provides good temperature readings with quick response.

TJ5 Type J thermocouple; **TK5** Type K thermocouple



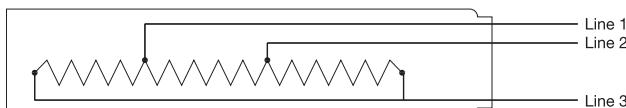
Note: For a complete selection of standard Hi-Density Pennybottom™ Cartridge Heaters, with built-in Type J thermocouple for Hot Runner plastic molds, see pages 2-24 through 2-26.

Available from stock.

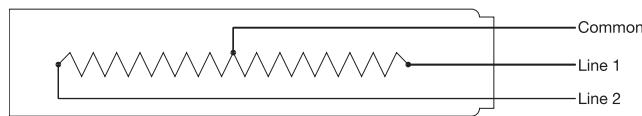
Cartridge Heater Options — Internal Power Variations



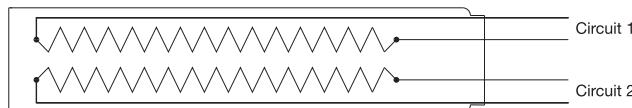
Type DW *Distributed Wattage*



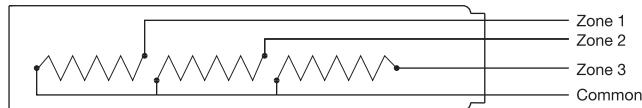
Type 3PH *Three Phase*



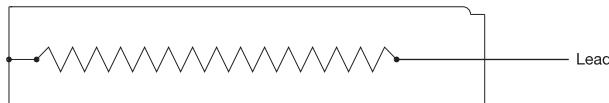
Type DV  *Dual Voltage*



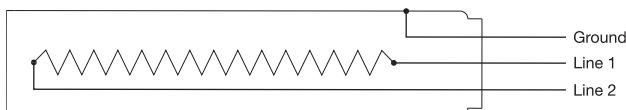
Type DWV *Dual Circuits*



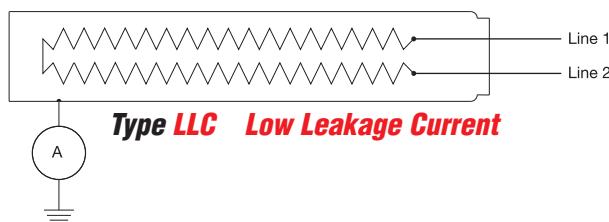
Type MHZ *Multiple Heat Zones (3-Zones Maximum)*



Type GJ *Grounded Element Winding*



Type GL *Ground Lead/Sheath*



Type LLC *Low Leakage Current*

Available on HDC and HDM cartridge heaters

Cartridge heaters can be designed to vary the wattage along the length of the heater. Specify number of zones and the required watts and length per zone starting from the disk end. Leads can be connected externally or internally. Picture shows a heater with Type N externally connected leads. Heaters with other terminations may require a longer cold section at the lead end.

Available on HDC, HDM, and LDC cartridge heaters 1/2" diameter and larger (See page 2-4)

In order to minimize the gauge of the wiring on high wattage cartridge heaters, 3-phase elements can be designed.

Available on HDC, HDM, and LDC cartridge heaters 3/8" diameter and larger (See page 2-4)

3/8" and 1/2" diameter heaters may require a larger diameter transition area at lead end.

Cartridge heaters can be designed using 3-wire series/parallel circuits for dual voltage applications. Whether the heater is run on the high or low voltage, the wattage will be the same.

DV1 120/240 volts **DV2** 240/480 volts

Available on HDC, HDM, and LDC cartridge heaters 1/2" diameter and larger (See page 2-4)

Independent resistance elements can be designed in a single cartridge heater for added versatility.

Available on HDC and HDM cartridge heaters 3/8" diameter and larger (See page 2-4)

3/8" and 1/2" diameter heaters may require a larger diameter transition area at lead end.

Multiple independently operated sections of the heater with a common wiring connection can be designed for increased flexibility.

Available on HDC, HDM, and LDC cartridge heaters

For DC applications where the electrical circuit is negative grounded, the cartridge heater can be designed with one side of the element winding grounded to the sheath and a single lead wire exiting the cartridge heater.

Available on HDC, HDM, and LDC cartridge heaters

For those applications requiring a separate ground lead attached to the cartridge heater sheath.

Standard ground lead wire is a 10" long insulated stranded conductor. Optional insulated and color coded leads are available.



Available through the Hi-Density Cartridge Heater Terminator Program for 2nd Day Delivery

Available on HDC, HDM, and LDC cartridge heaters

Low leakage current construction is available for those applications such as medical products that require strict conformity to the requirements of regulatory agencies.

Cartridge Heaters



Options

Cartridge Heater Internal Sensor and Control Options

Type TF Thermal Fuses

Available on HDC, HDM, and LDC cartridge heaters 1/2" diameter and larger

Thermal fuses can be built into cartridge heaters to act as a high limit for the heater in applications where the temperature must be limited to avoid dangerous situations. When the trigger point is reached, the thermal fuse will open, cutting the electrical current to the cartridge heater. Once the thermal fuse opens, it cannot be reset. Many different trigger temperatures are available.

Type TS Thermostat

Available on HDC, HDM, and LDC cartridge heaters 5/8" diameter or larger

Cartridge heaters with built-in thermostats are very efficient and economical for heating and controlling temperatures. Available with NPT or special type mounting fittings, they provide a self-contained heater mainly recommended for immersion applications. They can also be used as over-temperature safety devices. The thermostats are factory preset for the trip temperature; therefore, prototyping and testing is required to determine the exact fixed setpoint. Maximum temperature—302°F (150°C). Maximum Amps—8@120 Volts.

A minimum 2-1/2" cold section is required to house the thermostat. Consult Tempco with your requirements.

Type TM Thermistor

Type RD RTD Temperature Sensors

Available on HDC, HDM, and LDC cartridge heaters

Tempco has the ability to custom design cartridge heaters with built-in temperature sensors such as thermistors and RTDs. For specific applications that have a limited or single set point range, thermistors or RTDs in conjunction with simple electronic controllers can be an economical choice.

NOTE: For thermocouples see page 2-58.

Type TS



Cartridge Heater Option — Inspection Services and Test Reports

Standard Electrical Tests and Optional Test Reports

1. Resistance test — measures ohms at room temperature.
2. IR (insulation resistance) test — measures the insulation resistance to the flow of current. Standard test is done at 500VDC.
3. Hipot (high potential) test — a high voltage is applied between a product's current carrying conductors and its metallic enclosure to verify that the insulation is sufficient to protect the operator from electrical shock.
4. Leakage current test — measures the current that flows from any conductive part to ground.
5. Heaters can be serialized and test reports can be sent with each shipment if required. Contact Tempco with your requirements.

Optional Die Penetrant Test

This non-destructive testing can detect imperfections in weld joints. For critical applications, each individual heater's weld joints by end cap and fittings can be tested. Certified test reports will be sent with each shipment. Consult Tempco for details.

Optional Hydrostatic Pressure Test

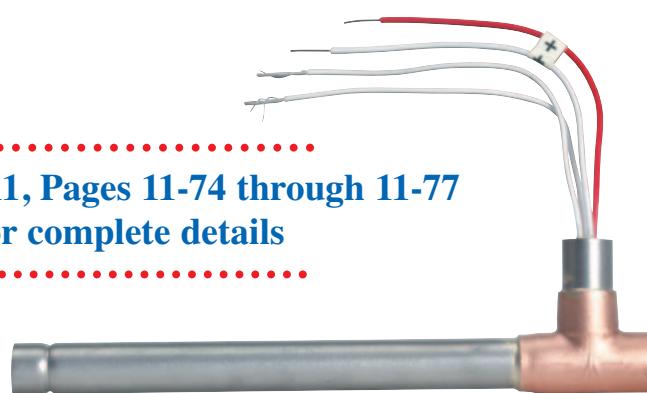
Cartridge heaters with attached pipe fittings can be pressure tested to your specifications at Tempco. Our in-house testing capabilities can ensure that your products meet your exact specifications. Contact Tempco with your requirements.

LDA and HAC Forced Air In-Line Process Cartridge Heaters

TEMPCO manufactures a variety of Air Process Cartridge Heaters. They can be standard units or designed to the customer's specifications. The following diameter sizes are available: 3/8", 1/2", 5/8" and 3/4".

These diameters can be adapted with various types of fittings and made into any practical length.

See Section 11, Pages 11-74 through 11-77
for complete details



View Product Inventory @ www.tempco.com