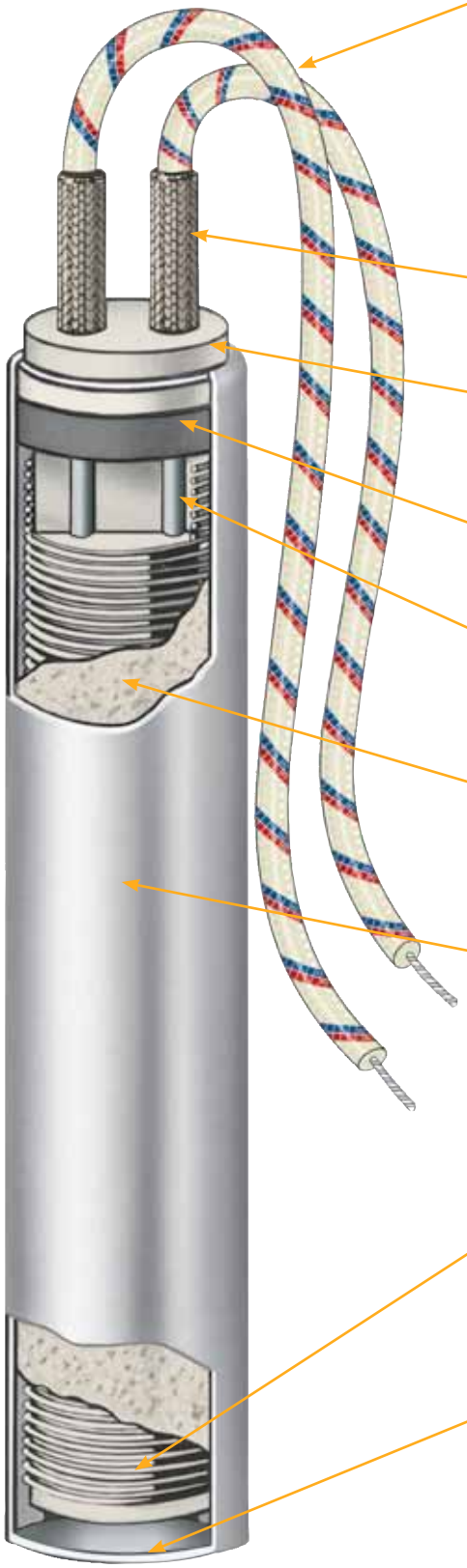
Hi-Density Cartridge Heaters



Features

The standard termination for Hi-Density Cartridge Heaters is Type N, 254 mm (10") long nickel conductor lead wires externally connected to 32 mm (1¼") solid conductor terminal pins. The lead wires have fiberglass insulation and are UL approved for temperatures up to 250°C (482°F). Mica insulated UL approved wires for temperatures up to 450°C (842°F) 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.

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

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.

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

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.

Specially selected grain size high purity Magnesium Oxide (MgO) 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.

Standard sheath material is 321 Stainless Steel. It provides high temperature strength up to 650°C (1200°F), 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 760°C (1400°F) or corrosive immersion heating applications, Incoloy® 800 is available. Consult OMEGA for other sheath materials.

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.

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.*

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

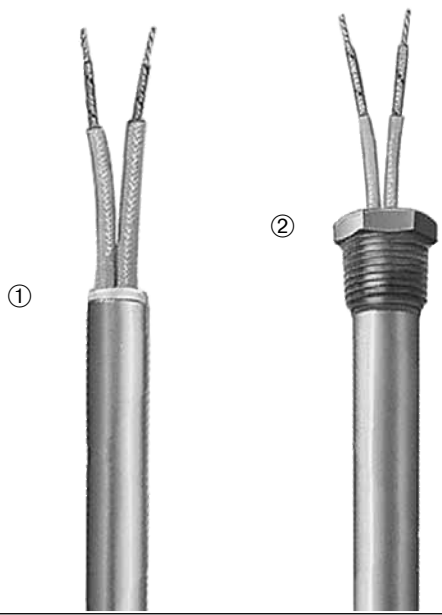
Typical Applications

- Plastic Extruders
- Hot Runner Molds
- Hot Stamping
- Medical Equipment
- Packaging Equipment
- Molds
- Aerospace
- Sealing Bags
- Semi-Conductor
- Plastic Molding
- Shoe Machinery
- Food Processing
- Heating Gases and Liquids
- Glue Guns
- Laminating Presses
- Platens
- Scientific Equipment
- Food Service Equipment

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.

2. (HDL) A hi-density cartridge heater designed with NPT Fittings for Immersion heating.



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 760°C (1400°F)

Hi-Density Cartridge Heaters are Classified in Two Distinct Categories

Multi-Purpose Use

The multi-purpose use cartridge heaters represent OMEGA'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 25.4 mm (1") to 914.4 mm (36") 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 page 8.

Highly Engineered Specific Purpose Use

OMEGA 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 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.

Consult us with Your Requirements
We Welcome Your Inquiries

Hi-Density Cartridge Heater Specifications

Standard Specifications

Performance Ratings

Maximum Temperature: 760°C (1400°F)

Maximum Watt Density: 15.5 to 46.5 watt/cm^2 (100 to 300 Watt/in^2) depending on heater size and 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 [648°C (1200°F) for a standard heater]*
2. *The maximum ambient temperature for the termination selected.*

Consult OMEGA if you require a recommendation for your application.

Length Tolerance for Lead Wires, Wire Braid Leads, and Armor Cable Leads:

Up to 914 mm (36"): -12.7, 25.4 mm (-½, 1")

914 to 1829 mm (36 to 72"): 25.4, 50.8 mm (-1, 2")

Above 72": 101.6 mm (±4")

Dimensional Specifications

Nominal Diameter	⅛" mm (inch)	¼" mm (inch)	5⁄16" mm (inch)	⅜" mm (inch)	½" mm (inch)	⅝" mm (inch)	¾" mm (inch)	1" mm (inch)
Actual Diameter	3.10 (0.122)	6.25 (0.246)	7.82 (0.308)	9.42 (0.371)	12.60 (0.496)	15.77 (0.621)	18.95 (0.746)	23.30 (0.996)
Diameter Tolerance	0.051 (±0.002)	0.051 (±0.002)	0.051 (±0.002)	0.051 (±0.002)	0.051 (±0.002)	0.051 (±0.002)	0.076 (±0.003)	0.076 (±0.003)
Minimum Length	31.8 (1.25)	25.40 (1)	25.40 (1)	25.40 (1)	25.40 (1)	25.40 (1)	31.75 (1¼)	44.45 (1¾)
Maximum Length	305 (12)	914 (36)	914 (36)	1219 (48)	1219 (48)	1829 (72)	1829 (72)	1829 (72)
Length Tolerance Heaters up to 127 mm (5") long	2.4 (±3/32)	2.4 (±3/32)	2.4 (±3/32)	2.4 (±3/32)	2.4 (±3/32)	2.4 (±3/32)	3.2 (±1/8)	3.2 (±1/8)
Length Tolerance Heaters over 127 mm (5") long	±2% of sheath length							
Camber Tolerance Heaters to 305 mm (12") long	0.254 mm (0.010") per foot of length							
Camber Tolerance Heaters over 305 mm (12") long	0.508 mm (0.020") 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	⅛"	¼"	5⁄16"	⅜"	½"	⅝"	¾"	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 and 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 250°C (482°F) with mica insulated lead wires.

**480V when applicable. Consult OMEGA.*

Temperature Coefficient of Resistance

The electrical resistance (ohms) of the heater resistance wire increases with temperature rise.

OMEGA standard hi-density cartridge heaters are manufactured with ohms (cold ohms) 3.3% lower than the actual calculated ohms (hot ohms) to compensate for this increase.

Note: *Specifications detailed on this page are standard. consult OMEGA 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)
⅛"	No	No	No	No
¼"	No	No	No	No
5⁄16"	No	No	No	No
⅜"	Yes*	No	No	Yes*
½"	Yes*	Yes	Yes	Yes*
⅝"	Yes	Yes	Yes	Yes
¾"	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.*

Recommendations for Improving the Life of Hi-Density Cartridge Heaters

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 Figure 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 (watts/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 10 mm (⅜") at the lead end and 6 mm (¼") at the disc end unheated. This would mean a 152 mm (6") long heater would have 265 mm (5⅜") effective heated length. Unheated sections vary with type of heater termination.

The graph in Figure 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:

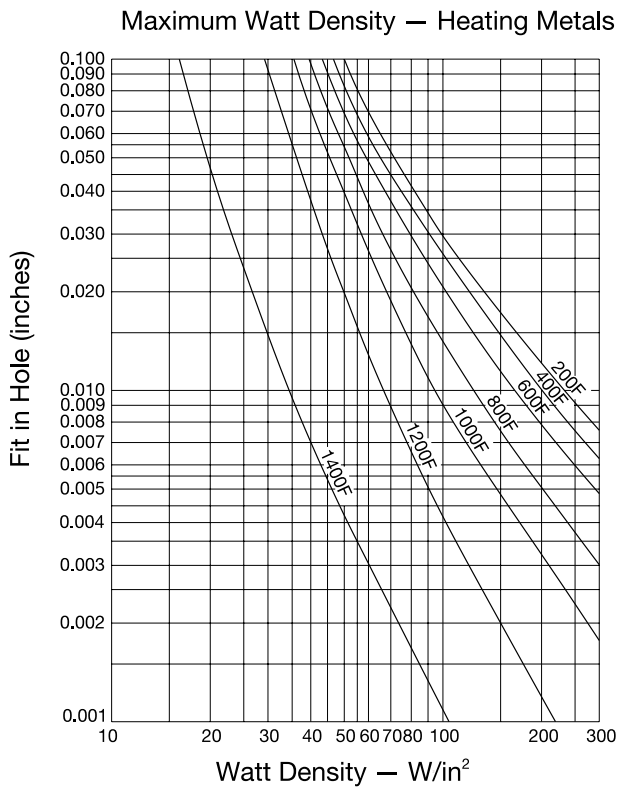
1. Increasing the number, diameter and length of heaters.

2. Lowering the total wattage; however, this may increase the heat-up time.

3. Obtaining tighter fit (see Figure 2 — Determining Fit).

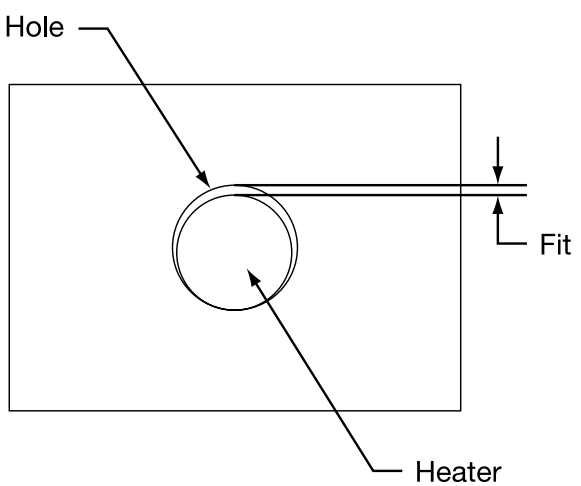
A hi-density cartridge heater designed at the maximum recommended watt density allows the smallest heater to be used to obtain the required wattage with good service life. All things being equal, using a lower watt density heater will typically provide optimized service life.

Figure 1
Recommended Watt Density for Heating Metal Parts



The graph shows the recommended maximum watt density for OMEGA 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 13 mm (½") from the heater. When heating other materials, the data needs to be extrapolated based on the thermal conductivity of the material. Consult OMEGA with your requirements.

Figure 2
Determining Fit



Recommendations for Improving the Life of Hi-Density Cartridge Heaters (Continued)

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 10 mm (⅜") nominal OD Hi-Density cartridge heater has an actual diameter of 9 mm (0.371") ±0.002, which translates to a minimum diameter of 9 mm (0.369"). If used in a 10 mm (0.376") ±0.002 hole, the fit would be 0.23 mm (0.009") 10 – 9 mm = 23 mm (0.378" – 0.369" = 0.009").

When medium watt density heaters (less than 60 watts per square inch) are used in low temperature applications [less than 315°C (600°F)] general purpose drills are commonly used to drill holes. The typical hole size may be 0.1 to 0.2 mm (0.003 to 0.008") 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 ±0.01 mm (±0.0005").

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 BNS anti-seize cartridge heater coating as it will improve heat transfer and will make the removal of heaters easier.

The graph in Figure 1 (page 4) 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.

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 Figure 1 (page 4) shows the effect of operating temperature in determining the maximum recommended watt density on a steel platen where the sensor is located 13 mm (½") 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.

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.

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. OMEGA offers a wide variety of terminations to avoid this problem, including epoxy seals, PTFE seals, convoluted cables, welded end discs, PTFE insulated lead wires and SJO cable. However, there are temperature limitations on many of these terminations.

Excessive Flexing of Leads

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. OMEGA 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, OMEGA offers several abrasion resistant terminations.

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. OMEGA 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.

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

Recommendations for Improving the Life of Hi-Density Cartridge Heaters (Continued)

High Operating Temperature

OMEGA hi-density heaters are designed to operate at sheath temperatures up to 760°C (1400°F). 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 760°C (1400°F), 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. OMEGA can also provide you with a high temperature wiring harness, which can withstand temperatures up to 760°C (1400°F).

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.

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, see section of detailed descriptions of over 40 terminations designed to solve many of the common application problems. If you need further assistance, consult OMEGA.*

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 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 13 mm (½") from the heater sheath.
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 OMEGA 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, OMEGA has a wide selection of terminations and options available.*

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 with
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.*

Custom Terminated Multi-Purpose Use Cartridge Heaters from the Terminator Program

OMEGA stocks over 1000 different semi-finished hi-density cartridge heaters in diameters 6, 8, 10, 13, 16, and 19 mm (¼, 5⁄16, ⅜, ½, ⅝ and ¾").

These cartridge heaters are semi-finished (substrates), offering you the option to finish them by choosing from 19 program-qualified lead end terminations and options. Cartridge heaters will be ready for shipment within 1 to 3 days, depending on the termination/option selected.

Ordering Information — Follow These Simple Steps

1. Select an available 6 mm (¼") through 19 mm (¾") hi-density cartridge heater. The model numbers in the tables are for heaters with termination type N [254 mm (10") long externally connected lead wires].
2. Refer to the program-qualified lead terminations reference photos to select the cartridge heater termination type best suited for your application.

NOTE: *Type "N" [254 mm (10") long externally connected plain lead wires] is the most common termination applied in the Terminator program. If a termination other than Type N is selected a new permanent part number will be assigned when your order is placed.*

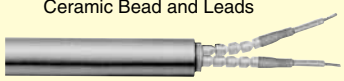
3. Specify your lead requirements in the event that the standard supplied lengths for Plain Leads 254 mm (10"), braid or armor cable [254 mm (10") over 305 mm (12") leads] are not suited for your application.
4. Specify the quantity.

Terminations

Type N
Standard Leads

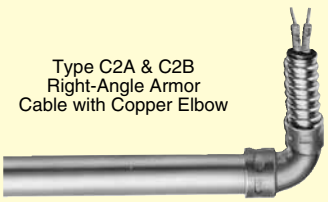
Type B
Ceramic Bead Insulation

Type BL
Ceramic Bead and Leads

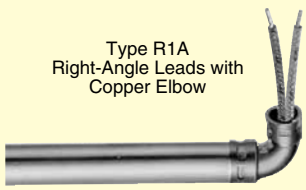


Type C1A & C1B only
Straight Armor Cable

Type C2A & C2B
Right-Angle Armor
Cable with Copper Elbow

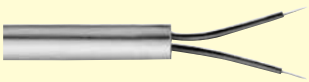


Type R1A
Right-Angle Leads with
Copper Elbow



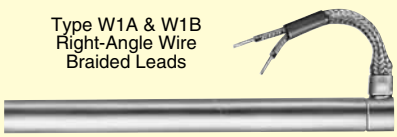
Type W
Straight Wire Braided Leads

Type M2A & M2E
Potted Lead End Seal
(Cement Only)

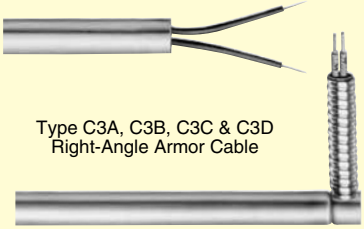


Type CMB & CMP
Single Threaded Fitting

Type W1A & W1B
Right-Angle Wire
Braided Leads



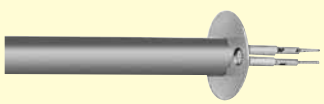
Type C3A, C3B, C3C & C3D
Right-Angle Armor Cable



Type R2A & R2B
Right-Angle Leads

Options

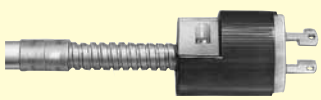
Type MFR
Mounting Flange Round



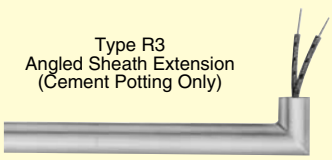
Type LR
Locating Ring

Type PS
Pull Strap

Type P
Quick Disconnect Plug



Type R3
Angled Sheath Extension
(Cement Potting Only)



Type E1
General Purpose Box

Type GL
Ground Lead Sheath

Complete specifications and details on these terminations can be found at omega.com.

Custom Engineered/Manufactured Hi-Density Cartridge Heaters

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

Consult OMEGA with Your Requirements. We Welcome Your Inquiries.

Hi-Density Cartridge Heaters

½" Diameter, Actual 12.6 mm (0.496")

Model numbers listed are for cartridge heaters terminated with 254 mm (10") long leads (Type N termination). Other terminator program terminations and options can also be applied to heaters (see ordering information).

To Order *Visit omega.com/hdc00426_series for Pricing and Details*

Model Number		Sheath Length			Watt Density	
120V	240V	mm	inch	Watts	Watts/cm²	Watts/in²
HDC00426	—	25.4	1	50	10	64
HDC00427	—	25.4	1	150	30	191
—	HDC00428	25.4	1	200	40	255
HDC00429	—	31.8	1¼	50	7	42
HDC00430	HDC00431	31.8	1¼	125	17	106
—	HDC00432	31.8	1¼	180	24	153
—	HDC00433	31.8	1¼	200	26	170
—	HDC00434	31.8	1¼	250	33	212
HDC00435	—	38.1	1½	50	5	32
HDC00436	HDC00437	38.1	1½	150	15	95
HDC00438	HDC00439	38.1	1½	200	20	127
HDC00440	—	44.5	1¾	100	8	51
—	HDC00441	44.5	1¾	200	16	102
HDC00442	—	44.5	1¾	250	20	127
—	HDC00443	44.5	1¾	400	32	204
HDC00444	—	50.8	2	75	5	32
—	HDC22944	50.8	2	100	8	52
HDC00445	—	50.8	2	150	10	64
HDC00446	—	50.8	2	175	12	74
HDC00447	HDC00448	50.8	2	200	13	85
HDC00449	HDC00450	50.8	2	250	17	106
HDC00451	HDC00452	50.8	2	300	20	127
HDC00453	HDC00454	50.8	2	400	26	170
HDC00455	—	50.8	2	500	33	212
—	HDC00456	50.8	2	600	40	255
—	HDC00457	50.8	2	700	46	297
HDC00458	—	57.2	2¼	75	4	27
HDC00459	—	57.2	2¼	100	6	36
HDC00460	—	57.2	2¼	125	7	45
HDC00461	—	57.2	2¼	150	9	55
HDC00462	HDC00463	57.2	2¼	250	14	91
—	HDC00464	57.2	2¼	300	17	109
HDC00465	HDC00466	57.2	2¼	400	23	146
HDC00467	HDC00468	57.2	2¼	500	28	182
HDC00470	HDC00471	60.3	2⅜	100	5	34
HDC00472	—	60.3	2⅜	125	7	42
HDC00473	HDC00474	60.3	2⅜	250	13	85
—	HDC00475	60.3	2⅜	400	21	136
HDC00476	HDC00477	60.3	2⅜	500	26	170
HDC00478	HDC00479	63.5	2½	100	5	32
HDC00480	—	63.5	2½	125	6	40
—	HDC00481	63.5	2½	150	7	48
HDC00482	HDC00483	63.5	2½	200	10	64
HDC00484	HDC00485	63.5	2½	250	12	80
HDC00486	HDC00487	63.5	2½	300	15	95
HDC00489	HDC00490	63.5	2½	400	20	127
HDC00491	HDC00492	63.5	2½	500	25	159
—	HDC00493	65.1	2⁹⁄₁₆	300	14	93
HDC00494	—	65.1	2⁹⁄₁₆	350	17	108
HDC00495	—	69.9	2¾	250	11	71
HDC00496	HDC00497	69.9	2¾	400	18	113
HDC00498	HDC00499	76.2	3	125	5	32
HDC00500	HDC00501	76.2	3	150	6	38
—	HDC00502	76.2	3	200	8	51
HDC00503	HDC00504	76.2	3	250	10	64
HDC00505	HDC00506	76.2	3	300	12	76
HDC00507	—	76.2	3	350	14	89
HDC00508	HDC00509	76.2	3	400	16	102

Hi-Density Cartridge Heaters

½" Diameter, Actual 12.6 mm (0.496")

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Model Number		Sheath Length			Watt Density	
120V	240V	mm	inch	Watts	Watts/cm²	Watts/in²
HDC00510	HDC00511	76.2	3	500	20	127
HDC00512	HDC00513	76.2	3	600	24	153
HDC00514	HDC00515	76.2	3	750	30	191
HDC00516	—	76.2	3	1000	40	255
HDC00517	HDC00518	88.9	3½	250	8	53
—	HDC00519	88.9	3½	300	10	64
—	HDC00520	88.9	3½	350	12	74
—	HDC08472	88.9	3½	400	15	95
HDC00522	HDC00523	88.9	3½	500	17	106
—	HDC00524	88.9	3½	750	25	159
—	HDC00525	88.9	3½	1000	33	212
—	HDC00526	95.3	3¾	500	15	98
—	HDC00527	96.8	3 13/16	250	8	48
HDC00528	—	96.8	3 13/16	500	15	96
HDC00529	HDC00530	101.6	4	150	4	27
—	HDC07555	101.6	4	200	6	40
HDC00531	HDC00532	101.6	4	250	7	45
HDC00533	HDC00534	101.6	4	300	9	55
HDC00536	HDC00537	101.6	4	350	10	64
HDC00538	HDC00539	101.6	4	400	11	73
HDC00540	HDC00541	101.6	4	500	14	91
HDC00542	HDC00543	101.6	4	550	16	100
—	HDC00544	101.6	4	600	17	109
HDC00545	HDC00546	101.6	4	750	21	136
—	HDC00547	101.6	4	1000	28	182
—	HDC00548	101.6	4	1200	34	218
HDC00550	—	109.5	4 5/16	550	14	92
HDC00551	—	114.3	4½	250	6	40
—	HDC00552	114.3	4½	350	9	56
HDC00553	HDC00554	114.3	4½	500	12	80
HDC00555	HDC00556	114.3	4½	650	16	103
HDC00557	HDC00558	114.3	4½	750	19	119
—	HDC00559	114.3	4½	1000	25	159
—	HDC00560	120.7	4¾	200	5	30
HDC00561	—	122.2	4 13/16	250	6	37
—	HDC00562	122.2	4 13/16	300	7	44
—	HDC00563	122.2	4 13/16	1000	23	148
HDC00565	HDC00566	127.0	5	200	4	28
HDC00567	—	127.0	5	250	6	35
—	HDC00568	127.0	5	300	7	42
HDC00569	HDC00570	127.0	5	350	8	50
HDC00571	HDC00572	127.0	5	400	9	57
HDC00573	HDC00574	127.0	5	500	11	71
—	HDC00575	127.0	5	550	12	78
—	HDC00576	127.0	5	600	13	85
—	HDC00577	127.0	5	625	14	88
HDC00578	HDC00579	127.0	5	750	17	106
—	HDC00580	127.0	5	800	18	113
—	HDC00581	127.0	5	1000	22	141
HDC00582	HDC00583	133.4	5¼	250	5	34
—	HDC00584	133.4	5¼	1000	21	134
—	HDC00585	139.7	5½	200	4	25
HDC00586	HDC00587	139.7	5½	500	10	64
—	HDC00588	139.7	5½	650	13	83
HDC00589	HDC00590	139.7	5½	750	15	95
—	HDC00591	146.1	5¾	350	7	42
HDC00592	HDC00593	146.1	5¾	700	13	85
—	HDC00594	147.6	5 13/16	300	6	36

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Model Number		Sheath Length			Watt Density	
120V	240V	mm	inch	Watts	Watts/cm²	Watts/in²
—	HDC00595	152.4	6	200	4	23
HDC00596	HDC00597	152.4	6	250	5	29
HDC00598	HDC00599	152.4	6	300	5	35
HDC00600	HDC00601	152.4	6	350	6	41
—	HDC00602	152.4	6	450	8	52
HDC00603	HDC00604	152.4	6	500	9	58
—	HDC00605	152.4	6	600	11	69
HDC00606	HDC00607	152.4	6	750	14	87
HDC00609	HDC00610	152.4	6	850	15	98
—	HDC00611	152.4	6	875	16	101
HDC00612	HDC00613	152.4	6	1000	18	116
—	HDC00614	152.4	6	1200	22	139
—	HDC16228	152.4	6	1500	28	183
—	HDC00615	161.9	6⅜	1000	17	108
HDC00616	HDC00617	165.1	6½	500	8	53
—	HDC00618	165.1	6½	1000	17	106
HDC00619	HDC00620	171.5	6¾	500	8	51
HDC00621	—	177.8	7	250	4	24
—	HDC00622	177.8	7	340	5	33
—	HDC00623	177.8	7	400	6	39
HDC00624	HDC00625	177.8	7	500	8	49
HDC00626	HDC00627	177.8	7	600	9	59
—	HDC00628	177.8	7	700	11	69
HDC00629	HDC00630	177.8	7	750	11	73
HDC00631	HDC00632	177.8	7	1000	15	98
—	HDC00633	177.8	7	1500	23	147
HDC00634	HDC00635	190.5	7½	500	7	45
—	HDC00636	190.5	7½	1000	14	91
—	HDC00637	196.9	7¾	1000	14	88
—	HDC00639	203.2	8	200	3	17
HDC00640	HDC00641	203.2	8	300	4	25
HDC00642	HDC00643	203.2	8	500	7	42
—	HDC00644	203.2	8	600	8	51
HDC00645	HDC00646	203.2	8	750	10	64
HDC00647	HDC00648	203.2	8	800	11	68
HDC00650	HDC00651	203.2	8	1000	13	85
—	HDC00653	203.2	8	1200	16	102
—	HDC00654	203.2	8	1500	20	127
—	HDC00655	203.2	8	2000	26	170
—	HDC00656	215.9	8½	300	4	24
—	HDC00657	215.9	8½	500	6	40
HDC00658	HDC00659	215.9	8½	1000	12	80
—	HDC00660	222.3	8¾	1000	12	77
—	HDC00661	228.6	9	500	6	37
—	HDC00662	228.6	9	750	9	56
HDC00663	HDC00664	228.6	9	1000	12	75

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Model Number		Sheath Length			Watt Density	
120V	240V	mm	inch	Watts	Watts/cm²	Watts/in²
—	HDC00665	228.6	9	1325	15	99
—	HDC00666	228.6	9	1500	17	112
—	HDC00667	241.3	9½	500	6	35
—	HDC00668	241.3	9½	800	9	57
—	HDC00669	241.3	9½	1000	11	71
HDC00670	HDC00671	254.0	10	500	5	34
—	HDC00672	254.0	10	750	8	50
—	HDC00673	254.0	10	800	8	54
HDC00674	HDC00675	254.0	10	1000	10	67
—	HDC00677	254.0	10	1250	13	84
—	HDC00678	254.0	10	1500	16	101
—	HDC00679	254.0	10	2000	21	134
—	HDC00680	266.7	10½	1500	15	95
HDC00681	—	279.4	11	500	5	30
—	HDC00682	279.4	11	1000	9	61
—	HDC00683	279.4	11	1500	14	91
—	HDC00684	279.4	11	2000	19	121
—	HDC00685	292.1	11½	1525	14	88
HDC00686	HDC00687	304.8	12	500	4	28
HDC00688	HDC00689	304.8	12	600	5	33
HDC00690	HDC00691	304.8	12	1000	9	55
—	HDC00692	304.8	12	1100	9	61
—	HDC00693	304.8	12	1500	13	83
—	HDC00694	304.8	12	2000	17	111
—	HDC00695	317.5	12½	1675	14	89
—	HDC00696	342.9	13½	500	4	24
—	HDC00697	355.6	14	1000	7	47
—	HDC00698	355.6	14	1700	12	80
—	HDC00699	355.6	14	2300	17	108
—	HDC00700	381.0	15	800	5	35
—	HDC00701	381.0	15	1000	7	44
—	HDC00702	381.0	15	1500	10	66
—	HDC00703	381.0	15	2000	14	88
—	HDC00704	406.4	16	800	5	33
—	HDC00705	406.4	16	1000	6	41
—	HDC17207	406.4	16	2000	13	84
—	HDC00706	419.1	16½	2200	14	88
—	HDC00707	431.8	17	1000	6	39
—	HDC00708	457.2	18	750	4	27
—	HDC00709	457.2	18	1000	6	36
—	HDC00710	457.2	18	1500	9	55
—	HDC00711	457.2	18	1700	10	62
—	HDC00712	457.2	18	2000	11	73
—	HDC11652	508.0	20	1000	5	34
—	HDC14867	609.6	24	1000	4	28

Ordering Information

Order by model number for cartridge heaters with Type N termination. Call OMEGA for part numbers for heaters with other terminator program terminations and options.

Custom Engineered/Manufactured

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