

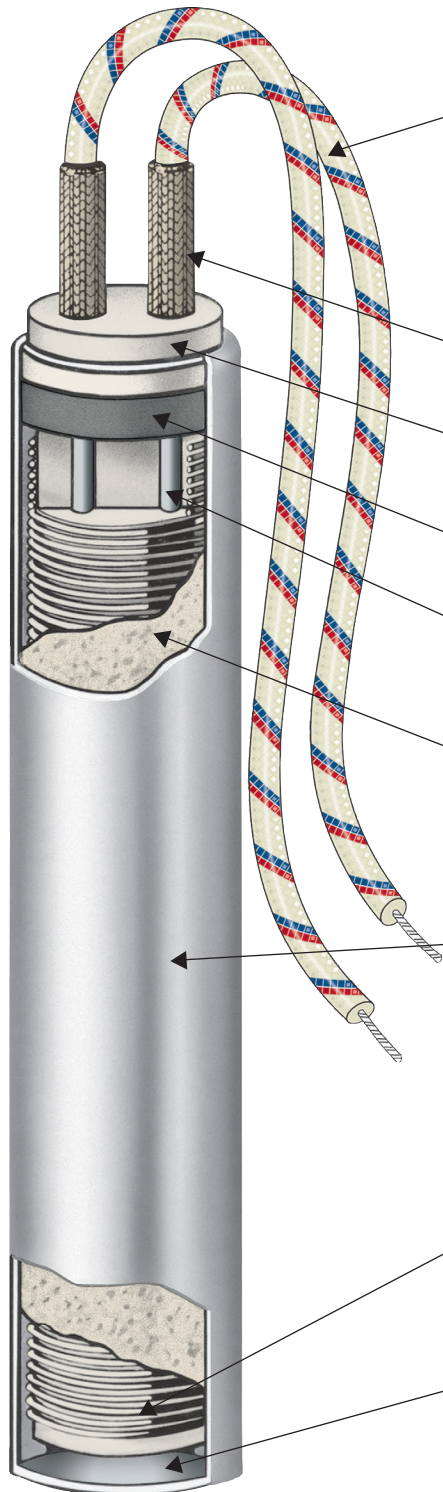
# Hi-Density Cartridge Heaters



HDC Series



Hi-Density Cartridge Heaters Provide Maximum Processing Temperature Capability. Multi-purpose Cartridge Heaters are the Solution to OEM or Maintenance Applications



## 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 (1 1/4") 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. Consult Omega for available options

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.*

# Hi-Density Cartridge Heater Specifications



## Standard Specifications

Performance Ratings - 321 Stainless Steel Sheath

**Maximum Sheath Temperature:** 650°C (1200°F) Maximum

**Watt Density:** 15.5 to 46.5 watt/cm<sup>2</sup> (100 to 300 Watt/in<sup>2</sup>) 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 [650°C (1200°F)] for a standard heater. Special Incoloy® 800 sheath [(760°C (1400°F))]

2. The maximum ambient temperature for the selected termination

**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"	¼"	⅕"	⅜"	½"	⅝"	¾"	1"
Actual Diameter mm (inch)	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"	⅕"	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	Mult. Heat Zones Max. 3 zones
⅛"	No	No	No	No
¼"	No	No	No	No
⅕"	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.

# Modifications & Options for Hi-Density Multi-Purpose Cartridge Heaters



Omega stocks over 1000 different semi-finished hi-density cartridge heaters in diameters 6, 8, 10, 13, 16, and 19 mm ( $\frac{1}{4}$ ,  $\frac{3}{16}$ ,  $\frac{3}{8}$ ,  $\frac{1}{2}$ ,  $\frac{5}{8}$  and  $\frac{3}{4}$ ”).

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 ( $\frac{1}{4}$ ”) through 19 mm ( $\frac{3}{4}$ ”) hi-density cartridge heater. The model numbers in the product data tables are for heaters with termination type N [254 mm (10”) long externally connected lead wires].








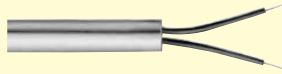


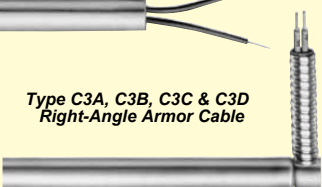

2. Refer to the lead termination reference photos below to select the cartridge heater termination type best suited for your application.

**NOTE:** Type “N” [254 mm (10”) long externally connected plain lead wires] is the most common termination. 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.





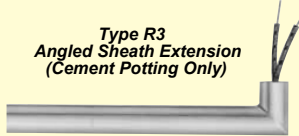


4. Specify the quantity.

### Terminations

<p><b>Type N</b> Standard Leads</p> 	<p><b>Type B</b> Ceramic Bead Insulation</p> 	<p><b>Type BL</b> Ceramic Bead and Leads</p> 
<p><b>Type C1A &amp; C1B only</b> Straight Armor Cable</p> 	<p><b>Type C2A &amp; C2B</b> Right-Angle Armor Cable with Copper Elbow</p> 	<p><b>Type R1A</b> Right-Angle Leads with Copper Elbow</p> 
<p><b>Type W</b> Straight Wire Braided Leads</p> 	<p><b>Type M2A &amp; M2E</b> Potted Lead End Seal (Cement Only)</p> 	<p><b>Type CMB &amp; CMP</b> Single Threaded Fitting</p> 
<p><b>Type W1A &amp; W1B</b> Right-Angle Wire Braided Leads</p> 	<p><b>Type C3A, C3B, C3C &amp; C3D</b> Right-Angle Armor Cable</p> 	<p><b>Type R2A &amp; R2B</b> Right-Angle Leads</p> 

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### Options

<p><b>Type MFR</b> Mounting Flange Round</p> 	<p><b>Type LR</b> Locating Ring</p> 	<p><b>Type PS</b> Pull Strap</p> 	<p><b>Type P</b> Quick Disconnect Plug</p> 
<p><b>Type R3</b> Angled Sheath Extension (Cement Potting Only)</p> 	<p><b>Type E1</b> General Purpose Box</p> 	<p><b>Type GL</b> Ground Lead Sheath</p> 	

Complete specifications and details on these terminations can be found at [omega.com](http://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.**