Heating Technologies

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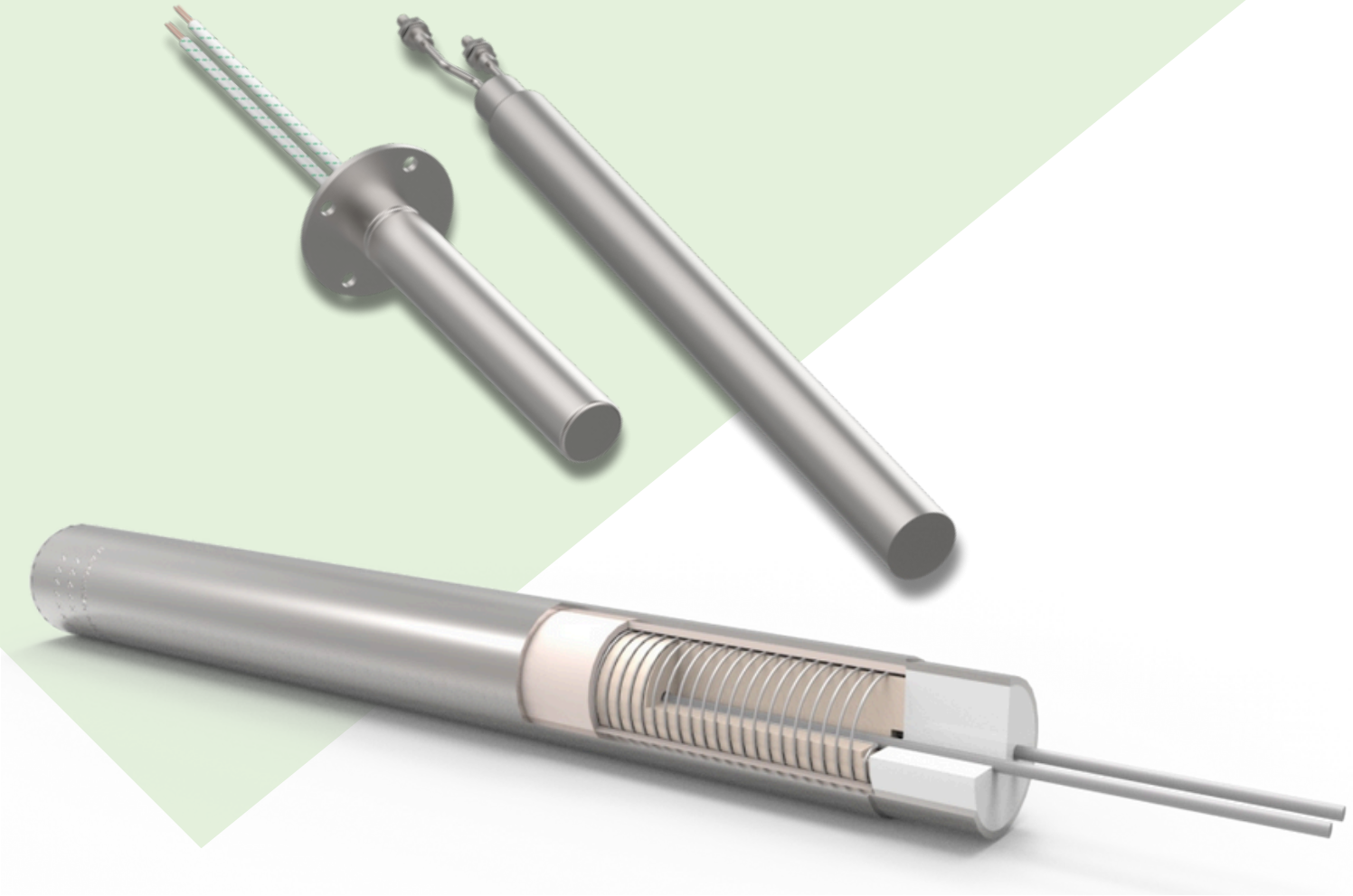

CARTRIDGE HEATERS

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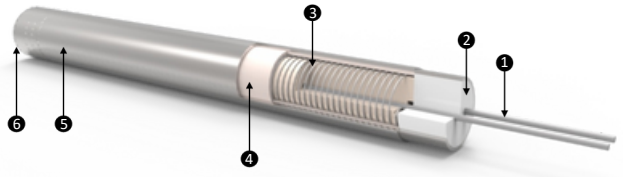
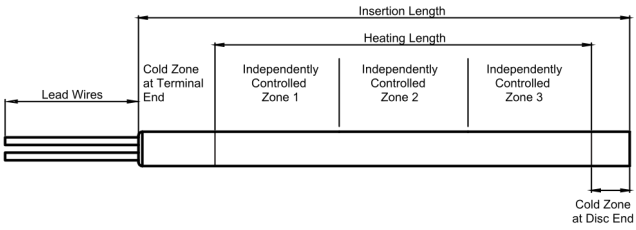
Heating Technologies

Hot Rod Cartridge Heaters : are intended to offer uniform heating and a high heat transfer rate over the heating surface. Individually adjustable heating zones make it possible to produce accurate and uniform temperatures for varied process requirements such as zone-specific heating and distributed wattage.

To maintain lower internal temperatures, heaters are built with little space between the sheath and heating elements. This allows for smaller heaters to operate at higher watt densities.

Construction





1. Lead wires that can withstand temperatures of up to 550° C.
2. High Impact Ceramic Cap is appropriate for high vibration applications and delays contamination. The cap's deep perforations stop the lead from fraying when bent.
3. Chromium and Nickel For optimal longevity, choose resistance wire that is uniformly wrapped to distribute heat evenly.
4. A high-purity magnesium oxide fill that has been carefully compressed for optimal heat transfer and chosen for greatest dielectric strength and thermal conductivity.
5. Inconel or stainless steel sheath for resistance to corrosion and oxidation in a range of conditions.
6. Tig-welded end disc to stop moisture absorption and contamination.

- **Sheath Length:** The total length of the heater from the disc end's unheated zone to the termination point. **Insertion**
- **length:** The heater's length measured from the terminal end's unheated zone to the disc end's unheated zone. One, two, or three independently regulated heating zones Heating
- zones that can be independently controlled are offered based on the needs of the client. These zones may vary in length and power. The sum of all heating zones is known as the "heated length." **Unheated zone:** These areas don't
- produce any heat. These come in different lengths depending on what the buyer wants.
-

Technical Details :

Sheath material : Stainless steel, incoloy.
Design temperatures UPTO 760°C (1400°F).
Watt densities of up to 300 W/in2. Maximum Voltage up to 480 V. Sheath Length tolerance is ±3%. Wattage tolerance is +5%, -10%. Resistance tolerance is +10%, -5%.e.

Thermocouple

Internal thermocouples, which aid in more precise temperature control, can also be accommodated by cartridge heaters. Types of thermocouples include "J" or

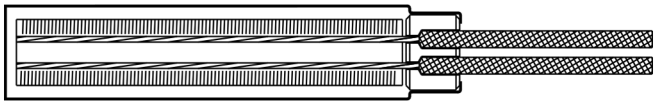
type "K," which can be connected to the heater's disc end or center, and is either grounded or ungrounded.

Unless otherwise noted, thermocouple leads are of the same length and the lead wire is 24 gauge.

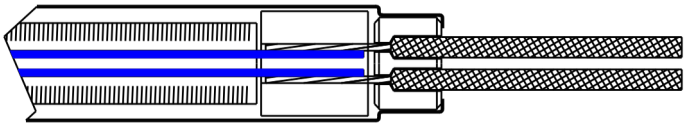
If you have specific design needs or want to discuss a custom project, please reach out to us.

Options for Termination

Swaged in Leads are perfect for applications where lines must bend sharply while leaving the heater or where there is a lot of movement. Leads are linked to power pins in the unheated area of heaters longer than three inches, while leads in heaters shorter than three inches go straight into the core. Additionally, keep in mind that all heaters will come with swaged-in leads unless otherwise noted. If the leads must be fully inserted into the hole, they are exposed to the block temperature (the maximum temperature for standard leads is 550°C).



In heaters under 3 " long, the leads go directly in to the core, resulting in an unheated section the length of the ceramic end piece.



In heaters over 3 " long the leads make a connection with the power pins in a short unheated section.

Stainless steel flexible conduit and copper coupler

A copper coupler can also be used to connect flexible conduit to the sheath. Right angle flexible conduit can also be connected to stock heaters using this technique.

Stainless Steel Braid Swaged

Stainless steel braid that is swaged offers superior abrasion resistance while enabling the leads to bend within a precise radius. It prevents the braid from being yanked out of the heater as it is swaged in.

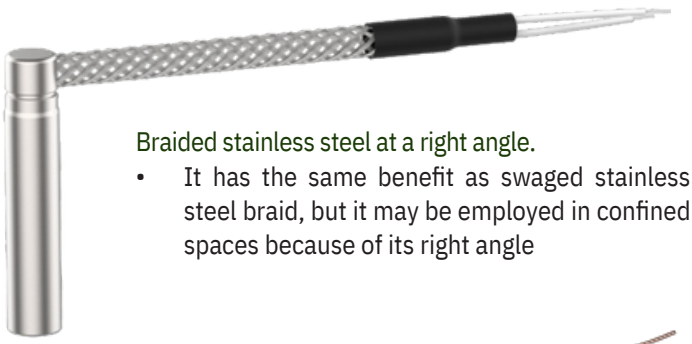
Crimped on Leads

Connectors are used outside the heater to connect the leads to the power pins. When the temperature at the heater's end rises above the lead wire's maximum permitted temperature, crimp-on leads are typically utilized.
Applications where the leads need to be bent abruptly at the heater exit are not advised.
High-voltage silicon rubber-coated fiber glass sleeves are used to protect connectors.

Right angle leads :

For applications involving confined places, right angle leads are perfect. Where the leads leave the heater, they are wrapped in a fiberglass sleeve that has been treated with silicon.

Termination Options



Braided stainless steel at a right angle.

- It has the same benefit as swaged stainless steel braid, but it may be employed in confined spaces because of its right angle

Flexible stainless steel conduit at a right angle.

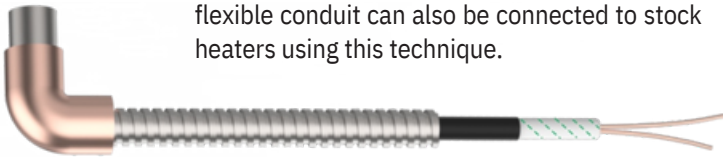
- It has the same benefits as flexible stainless steel conduit, but it can fit in small locations because to its right angle arrangement.

Beads Made Of Ceramic

Ceramic beads shield the wire until traditional insulation may be used when the temperature at the heater's outlet surpasses 590°C.

Flexible Conduit with Stainless Steel and Copper Elbow

A copper elbow can also be used to attach flexible conduit at a right angle. Right angle flexible conduit can also be connected to stock heaters using this technique.



Sleeving

- Both leads can be sleeved together or individually, and each lead has a temperature of 200°C. Fiberglass sleeves are used over crimps and have a maximum temperature of 240°C. They are good for protecting against lead.

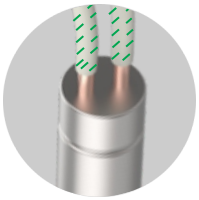
Flexible Conduit made of stainless steel.

Although flexible conduit can't bend as sharply as stainless steel braid, it offers leads the best protection against abrasion. The same advantage of not being dragged out of the heater is offered by flexible conduits, which are similarly swaged in.

Options for End Seals

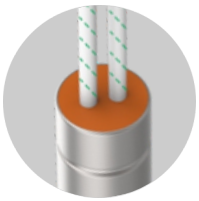
Teflon Seal.

- When an efficient seal against moisture and oil contamination is needed, Teflon seal is utilized. To create an efficient barrier, Teflon lead wire and Teflon seal are combined.



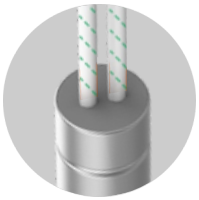
Epoxy Seal

- Compared to silicon rubber, epoxy potting creates a better moisture seal with greater mechanical strength. Epoxylite is rated at 600°F (316°C), while regular epoxy is rated at 350°F (177°C).



Silicon Rubber Seal

- When used with silicon rubber lead wires, a high temperature silicon rubber seal effectively seals moisture up to 400°F (200°C). Out of all the moisture sealants, it is the most impenetrable.

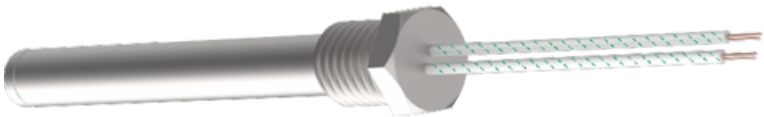


Cement

- Although it is not waterproof, it offers defense against some heavier liquids and dust. Additionally, it can shatter in applications with severe vibration or impact because it is rather brittle. used at temperatures as high as 1425°C (2600°F).

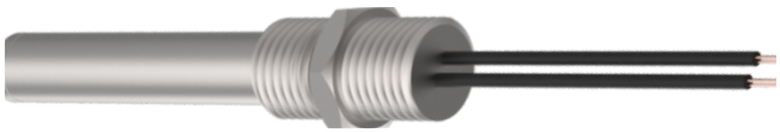
Fitting Options

Single Ended NPT Fitting Brass and stainless steel fittings are offered. Stainless steel fittings can be welded or brazed on, while brass fittings are brazed on.



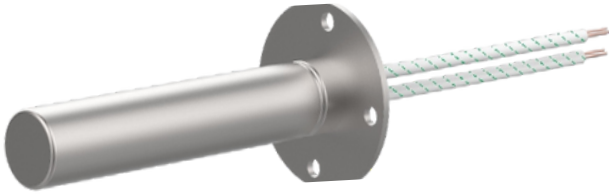
Double Ended NPT Fitting

When mounting a box on an immersion heater is desired, double-ended connections are typically utilized. Brass and stainless steel fittings are offered.



Flanges

In order to keep heaters from backing out while operating, flanges are employed to secure them in place. The heater's lead end has these flanges welded to it. Their thickness is 1/16".



Other Option

Post terminal

- Although it is not waterproof, it offers defense against some heavier liquids and dust. Additionally, it can shatter in applications with severe vibration or impact because it is rather brittle. used at temperatures as high as 1425°C (2600°F).

Bent Hot Rod

- From 10°C to 120°C, heaters can be bent at any angle. At the unheated area, heaters are bent.
- The majority of heaters have the ability to bend.

Double Ended

- Additionally, hot rods with electrical terminations on both ends are available. Lead wire, screw terminals, or straight pins can all be used to make heaters.

Applications

Double Ended

- Additionally, hot rods with electrical termination are offered. heating in a semiconductor chamber. die bonding with semiconductor wire. Equipment in cold environments or applications should be freeze protected and deiced. regulation of humidity. Medical gadgets that use heating for patient comfort. Die casting of metal Equipment for packaging uses seal bars. equipment for glass formation at high temperatures.

Unique Design Choices for Heaters.
Additionally, hot rod cartridge heaters can be made in a variety of unusual shapes.

Technical Details

Nominal diameter	Minimum diameter	Maximum diameter	Std. Lead wire gauge	Max amps with Max std. Lead wire	lead wire gauge	Maximum amps	Maximum volts
1/8”	3.022	3.14	24	3.6	24	3.6	240
1/4"	6.19	6.32	24	6	22	9	300
6 mm	5.82	5.97	24	6	22	9	300
6.5 mm	6.35	6.47	24	6	22	9	300
5/16”	7.77	7.89	24	6	22	9	300
8 mm	7.84	7.97	24	6	22	9	480
3/8“	9.37	9.49	22	9	18	15	480
10 mm	9.86	11.96	22	9	18	15	480
12 mm	11.83	12.48	22	9	18	15	480
12.5 mm	12.34	12.67	22	9	18	15	480
1/2"	12.55	12.97	22	9	18	15	480
13 mm	12.85	13.46	22	9	18	15	480
17/32”	13.33	15.84	22	9	18	15	480
14 mm	13.84	13.97	18	15	14	26	480
5/8”	15.72	15.84	18	15	14	26	480
16 mm	15.84	15.97	18	15	14	26	480
17 mm	16.84	16.96	18	15	14	26	480
11/16”	17.32	17.44	18	15	14	26	480
19 mm	18.84	18.97	18	15	14	26	480
3/4”	18.89	19.02	18	15	14	26	480
25 mm	24.84	24.96	18	15	14	26	480
1”	25.24	25.37	18	15	14	26	480

Maximum Power Density for Metal Heating

Hole Clearance	Block temperature in °C					
	649	538	427	316	205	94
0.05	140	270	300	300	300	300
0.076	120	205	295	300	300	300
0.101	100	175	240	300	300	300
0.127	90	145	200	285	300	300
0.177	70	100	150	200	250	300
0.254	60	90	110	150	200	225
0.381	50	75	95	110	140	165
0.762	40	60	80	90	100	110
1.524	30	40	50	55	65	65
2.54	25	35	45	50	50	50

Options for Lead Wires

Wire Type	Temp. Rating	Maximum Recommended Temp.	Comments
Ultra lead	250°C	450°C	Excellent, durable wire, good for high temperature application
Teflon	250°C	250°C	Good dielectric strength
Silicon Rubber	200°C	200°C	Good moisture resistance
Braided Silicon rubber	200°C	200°C	Inexpensive wire good for non abrasive applications.
MGT	450°C	450°C 90°C	Superior high temperature resistance
SJO cord	90°C		Rubber Jacket, resistance to oil and moisture. For use on 3/8” diameter and larger.

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