

Cable Heaters

Versatile, Standard Cable Heaters

The versatile Watlow cable heater can be formed to a variety of shapes as dictated by its many applications. Cable heaters are small diameter, high performance units, fully annealed and readily bent to a multitude of configurations.

The heater can be formed into a compact coiled nozzle heater for use on plastic injection molding equipment supplying a full 360 degrees of heat with optional distributed wattage. A straight cable can snake through a sealing bar in packaging equipment. Flat spiral configurations are used in semiconductor manufacturing while a star wound cable is used for air and gas heating.

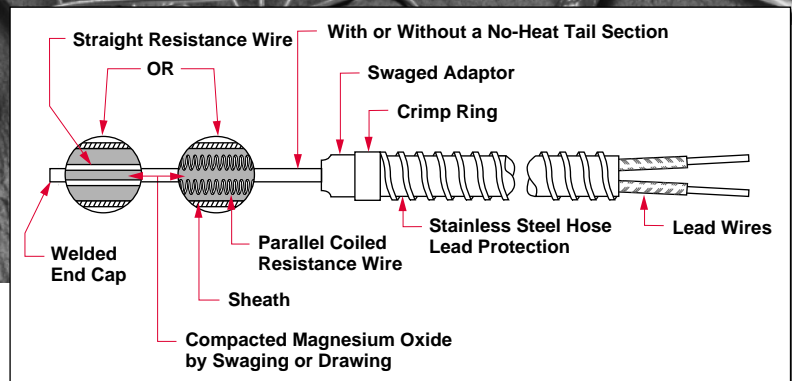
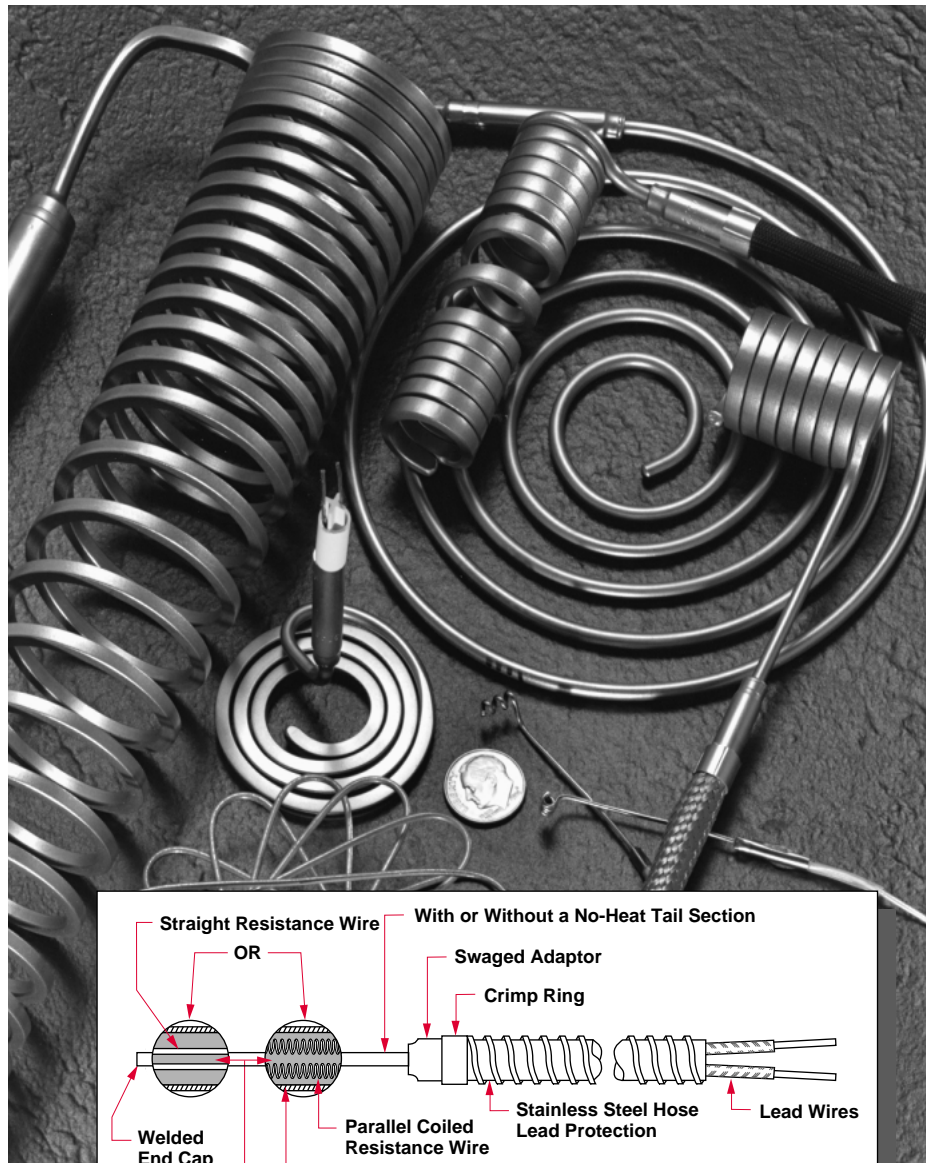
Different applications require different construction methods, including one, two, three or four resistance wires; parallel coil or straight wire; drawn or swaged sheaths; with or without internal thermocouples; leads exiting from one or both ends, and round, rectangular or square cable sheaths. Whatever the application, the Watlow cable heater can be shaped to fit your application needs.

Performance Capabilities

- Continuous operating temperatures to 1200°F (650°C) with intermittent operating periods achieving up to 1500°F (815°C). Dependant on type of element wire used.
- Sheath watt densities on the cable to 30 W/in² (4.65 W/cm²), and as high as 75 W/in² (11.62 W/cm²) within factory approved conditions.

Features and Benefits

- **High ductility** allows the heater to be cold-formed into almost any shape.
- **The heater's low mass** allows for quick response to both heating and cooling.



- **The heater can be isolated or sealed from the process environment** with optional compression fittings or HTF adaptor seals. Cable heaters are constructed with no open seams. Optional testing is available to guarantee the integrity of all surfaces and seams.
- **Standard 304 stainless steel**, or optional 316L stainless steel or Inconel® 600, provide high

temperature corrosion and oxidation resistance along with ideal thermal expansion properties.

- **The heater sheath can be brazed** allowing the permanent attachment of mounted fittings to the heater. Consult factory for additional information.

Inconel® is a registered trademark of Special Metals Corporation.

Cable Heaters

Versatile, Standard Cable Heaters

Features

Continued

- **Ranging from 0.040 inch (1 mm) to 0.188 inch (5 mm) diameter**, the cable heater packs a lot of heat into a tiny space. Lengths range from ¾ inch (19 mm) to over 70 feet (2134 cm).
- **Internal construction options** allow internal thermocouples and no-heat sections. (Not available in all sizes.)
- **Cable heaters can operate in unusual environments**, including cryogenic and sub-freezing temperatures, high vacuum, and gaseous and liquid immersion conditions.

Applications

- Plastic injection molding nozzles
- Semiconductor manufacturing and wafer processing
- Hot metal forming dies and punches
- Sealing and cutting bars
- Medical, analytical and scientific instruments
- Restaurant and food processing equipment
- Cast-in heaters
- Laminating and printing presses
- Air heating
- Textile manufacturing
- Heating in a vacuum environment

Electrical Data and Coiling Limits

Sheath Diameter		Maximum Voltage	Surface Area Per Linear Foot		Minimum Bend Radius		Minimum Coiled Inside Diameter	
inches	(mm)		in	(cm)	in	(mm)	in	(mm)
0.040 ± 0.002	(1.016 ± 0.051)	48	1.51	(9.743)	⅛	(1.588)	⅛	(3.175)
0.062 ± 0.002	(1.575 ± 0.051)	120	2.34	(15.098)	⅛	(3.175)	¼	(6.350)
0.058 ± 0.002	(1.473 ± 0.051)	240	2.18	(14.065)	⅛	(3.175)	¼	(6.350)
0.094 + 0.002 - 0.003	(2.388 + 0.051 - 0.076)	240	3.54	(22.840)	⅜	(4.763)	⅜	(9.525)
0.102 square ± 0.003	(2.591 ± 0.076)	240	4.90	(31.615)	¼	(6.350)	½	(12.700)
0.103 ± 0.003 x	(2.667 ± 0.076) x							
0.153 ± 0.005 rectangular	(3.886 ± 0.127)	240	6.19	(39.938)	¼	(6.350)	½	(12.700)
0.125 ± 0.003	(3.175 ± 0.076)	240	4.71	(30.389)	¼	(6.350)	½	(12.700)
0.157 ± 0.004	(3.998 ± 0.102)	240	5.92	(38.196)	⅜	(7.938)	⅜	(15.875)
0.188 + 0.003 - 0.006	(4.775 + 0.076 - 0.152)	240	7.09	(45.745)	⅜	(9.525)	⅜	(19.050)
0.128 square ± 0.003	(3.353 ± 0.076)	240	6.31	(40.712)	¼	(6.350)	½	(12.700)

In most cases 30 W/in² (4.65 W/cm²) is the safe allowable limit for cable watt density. Please consult factory before ordering >30 WSI cables.

Standard Resistance/Wattage Tolerance ±10 percent.

Cable heaters can run on both ac and dc, 50 or 60Hz. Consult factory for amperage limitations.

Coiling Tolerances

Cable Diameters	Standard Coiled Width Tolerances		Standard Coiled I.D. Tolerances			
	Coiled Width inches (mm)	Tolerances inches (mm)	Coil I.D. Range inches (mm)		Tolerances inches (mm)	
All Diameters	Below 6 (152.4)	+ 0 - ⅛ (+0.000 - 3.175)	Below 0.625	(Below 15.875)	+0.000 - 0.015	(+0 - 0.381)
	6 to 10 (152.4 to 254.0)	+ ⅛ - ⅜ (+3.175 - 9.525)	0.625 to 0.999	(15.875 to 25.375)	+0.000 - 0.030	(+0 - 0.762)
	Over 10 (Over 254.0)	+ ¼ - ½ (+6.350 - 6.350)	1.000 to 1.999	(25.400 to 50.775)	+0.000 - 0.062	(+0 - 1.575)
			2.000 to 2.999	(50.800 to 76.175)	+0.000 - 0.125	(+0 - 3.175)
			3.000 to 3.999	(76.200 to 101.575)	+0.000 - 0.250	(+0 - 6.350)
			4.000 to 4.999	(101.600 to 126.975)	+0.000 - 0.375	(+0 - 9.525)
			5.000 and Over	(127.000 and Over)	+0.000 - 0.500	(+0 - 12.700)

When the O.D. of the coil is required to be the critical dimension, this fact must be specified at the time of ordering so that proper coiling procedures can be determined. I.D. and O.D. dimensions cannot be held on the same unit. Please consult with the factory before ordering coiled cable heaters requiring other than standard tolerances.

Cable Straight Length Tolerances

Length	≤24"	>24"≤60"	>60"≤100"	>100"
Tolerance	±⅜"	±½"	±1"	±1%

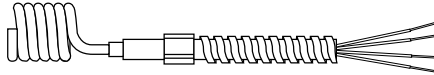
Cable Heaters

Versatile, Standard Cable Heaters Formation Options

Standard Coil

The standard coil can be tight wound, open pitch or anything in between.

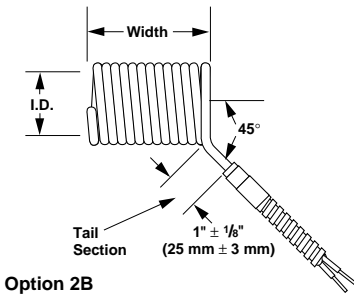
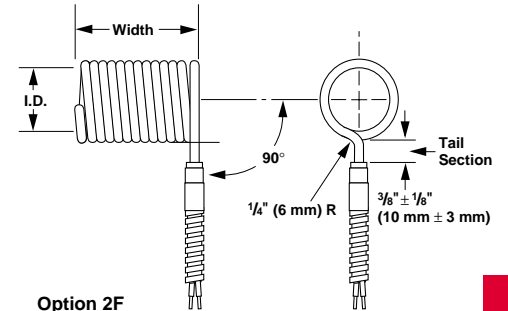
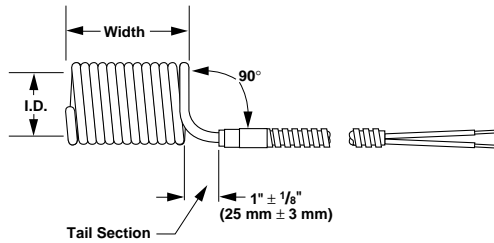
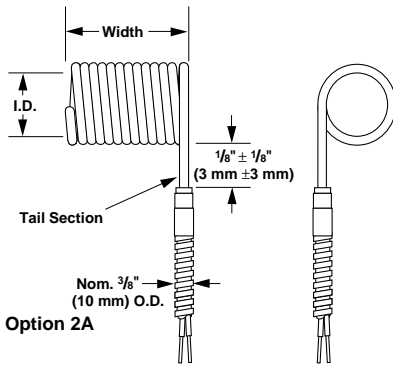
Closed Coil without Distributed Wattage



Closed Coil with Distributed Wattage

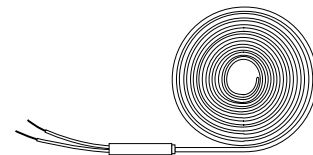


Lead Orientation Options for Coiled Cable Heaters



Flat Spiral

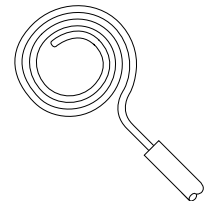
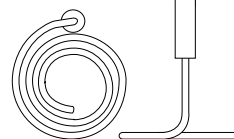
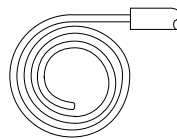
Flat spiral formations are used to heat flat circular surfaces. This formation is often used in semiconductor and medical applications.



Flat Spiral with 2A Type Lead Orientation

Flat Spiral with 2C Type Lead Orientation

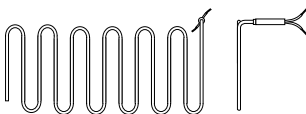
Flat Spiral with 2F Type Lead Orientation



Sinuated

Sinuated cable heaters provide an alternative to the flat spiral coil heater, allowing greater coverage of

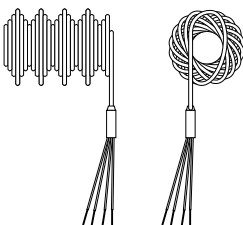
flat rectangular surfaces. The sinuated formation can also be curved to heat cylindrical shapes. This formation is often used in radiant heating applications.



Star Wound

Star wound formations are usually inserted into pipes or ducts and are used to heat moving air or liquids. The offset coils increase/induce

turbulent flow. This allows the flowing material to have better contact with the heater surface, resulting in a more efficient heat transfer.

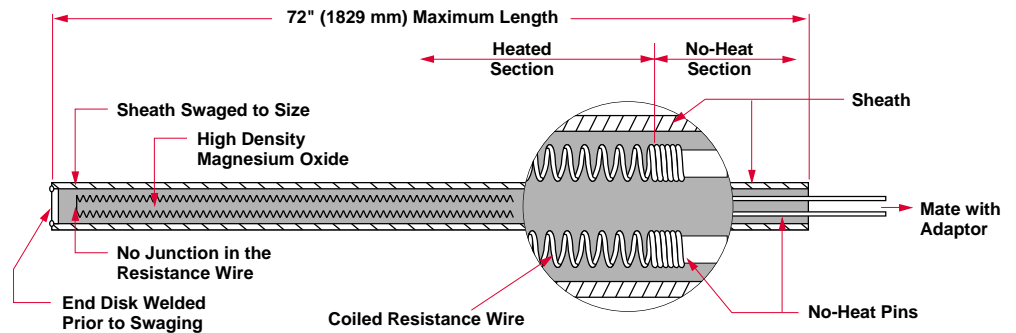


Cable Heaters

Versatile, Standard Cable Heaters

Standard Internal Construction

Sheath with Coiled Internal Resistance Wire



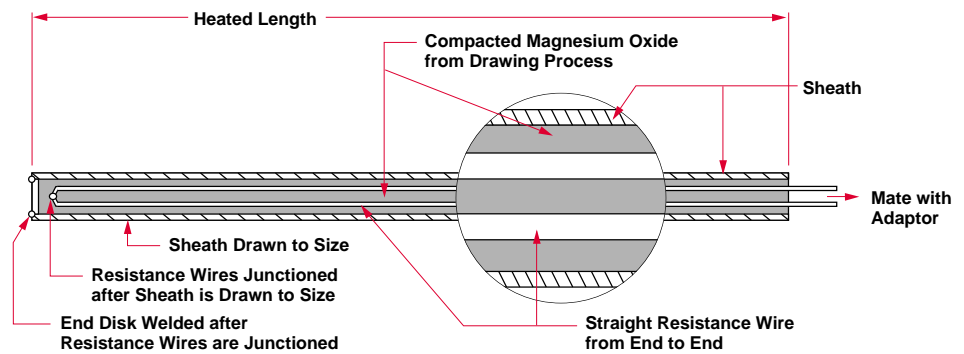
Parallel Coil Construction

Resistance wire, wound into a small coil, is loaded into insulating cores, then into metal tubing and swaged to final size. This method of construction is called **parallel coil**. The parallel coil method allows for a no-heat section in the sheath. The length of either the heated section or no-heat section is variable as long as the combined length does not exceed 72 inches (1830 mm). Other

features of this construction method include:

- Variable ohms/foot within a minimum and maximum range
 - Variable location of the thermocouple junction
 - Grounded or ungrounded thermocouple junction
 - No-heat sections
 - 304 stainless steel, 316L stainless steel or Inconel® 600 sheath material
- A variety of diameters and shapes:
 - 0.058 inch (1.473 mm) round
 - 0.094 inch (2.387 mm) round
 - 0.125 inch (3.175 mm) round (min. dia. with internal thermocouple)
 - 0.102 (2.591 mm) inch square
 - 0.128 inch (3.251 mm) square
 - 0.103 inch X 0.153 inch (2.616 mm X 3.886 mm) rectangular

Sheath with Straight (Uncoiled) Resistance Wire



Drawn Cable Construction

Uncoiled resistance wires are positioned inside a large diameter metal tube. The tube assembly is repeatedly pulled through draw dies until the desired diameter is achieved. Though limited to fixed incremental ohms/foot and without no-heat sections, this **drawn cable** construction method does allow:

- Essentially no limit on cable length
- Thermocouple junction only at the disk end of the sheath
 - Grounded or ungrounded thermocouple junction
 - Sheath heated from end to end
 - 304 stainless steel, 316L stainless steel or Inconel® 600 sheath material
 - A variety of diameters and shapes:
 - 0.040 inch (1.016 mm) round

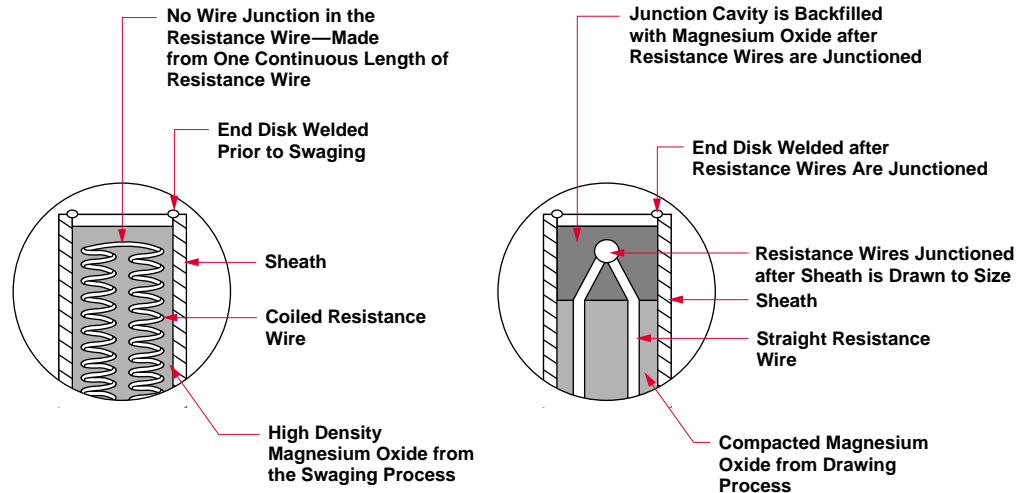
Cable Heaters

Versatile, Standard Cable Heaters

Options

Internal Construction

Disk End of Sheath



The end of the heater sheath opposite from the lead end is called the disk end.

With parallel coil construction methods, the internal resistance wires form a 180 degree bend inside the sheath and, so, do not require a junction. After the end cap has been welded in place, the entire area at the end of the sheath is swaged to provide maximum density of the magnesium oxide.

With drawn cable construction, the internal wires, whether resistance or thermocouple, must be junctioned before the heater sheath can be finished. Magnesium oxide is removed from the tip of the sheath, exposing the wires which are then junctioned by welding. Magnesium oxide powder is backfilled into the cavity surrounding the junctioned wires and lightly compacted. The end cap is inserted and welded into place.

Thermocouples

Internal thermocouples are available in ASTM Type J or K calibration with both the parallel coil or drawn cable construction methods.^①

Parallel Coil:

- 0.125 inch round
- 0.128 inch X 0.128 inch square
- 0.103 inch X 0.153 inch rectangular

Drawn Cable:

- 0.125 inch round
- 0.157 inch round
- 0.188 inch round
- 0.128 inch X 0.128 inch square
- 0.103 inch X 0.153 inch rectangular

External thermocouples with Type J or K calibration can be spot welded or brazed to the heater sheath. The sheath size must be a minimum of 0.094 inch in diameter. Hose clamps can more easily be used to secure the thermocouple.

^① Other thermocouple types available. Consult factory.

Cable Heaters

Versatile, Standard Cable Heaters

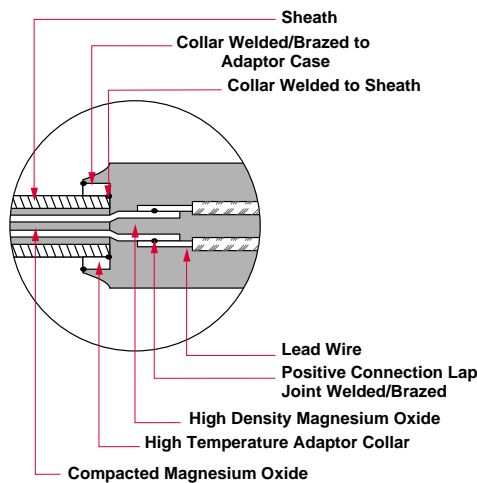
Options

Internal Construction

Continued

Adaptors

Adaptors are the transition sections where the lead wires are attached to the heater sheaths. The lead wires are connected with the internal wires from the sheath.



The **positive connection** lap joint brazes or welds the wire lap joint before the adaptor is swaged. Positive connection is used in all standard applications and provides added protection in high temperature environments and other severe and demanding applications.

An extended length adaptor collar, or **high temperature** collar, is used as a heat sink allowing the heater to be operated in high temperature and other demanding applications.

The positive connection and collar are used in conjunction with both power leads and thermocouple leads.

External Construction

Lead Wire:

100 percent nickel, copper, nickel plated copper or silver plated copper.

Insulation: Teflon®, fiberglass, or a high temperature variety such as MGT or MGE.

Consult factory for other wire options.

Lead Protection:

Stainless steel hose, stainless steel braid or fiberglass braid.

Consult factory for details.

Special Fittings

- VCR® and VCO® vacuum fittings or similar
- Ultra-Torr® compression fittings or similar

- Threaded screw headers
- Flanges
- Heat sinks

Consult factory for details.

Cable Heaters

F.O.B.: St. Louis, Missouri

Versatile, Standard Cable Heaters

How to Order

To order your stock cable heater, specify:

- Watlow code number and/or voltage and wattage specifications
- Forming options (required information):
 - Straight** - standard option unless otherwise specified
 - Nozzle** - coil I.D., coil width, lead orientation
 - Distributed nozzle** - coil I.D., coil width, lead orientation, number of zones
 - Sinuated** - height, width, bend radius, lead orientation

Starwound - coil O.D., coil width, lead orientation

Flat spiral - spiral I.D., spiral width, lead orientation

- Lead wire options (required information):

Standard - 14 inch crimped-on fbg unless otherwise noted

Fiberglass - various lengths available

Teflon® - various lengths available

- Lead protection options (required information):

Standard - 12 inch crimped-on stainless steel hose unless otherwise noted

SS hose - various lengths available

SS braid - various lengths available

Fiberglass braid - various lengths available

- Internal thermocouple option: Type J thermocouple
See stock product list for available units.
- Special adders

If the stock units do not meet application needs, consult factory for a quote on made-to-order units.

Availability

Stock: Straight units can be formed on request requiring one to two working days, contingent upon quantity and required options.

Made-to-Order: Delivery dependent on complexity of order. Consult factory for price and delivery quotations.

Cable Heater Stock Units (Internal Thermocouple Not Available)

Straight Cable Length in (mm)	Volts	Watts	Watt Density W/in ² W/cm ²	No-Heat Length in (mm)	Lead Wire	Lead Protection	Code Number
0.062-inch Diameter Round (with ±10 percent wattage tolerance)							
24 (609.6)	120	240	51 (7.9)	0.00 (0.00)	14" (355.6 mm)	12" (304.8 mm)	62H24A6X
36 (914.4)	120	400	57 (8.8)	0.00 (0.00)	Fiberglass	SS hose	62H36A5X
56 (1422.4)	120	330	30 (4.7)	0.00 (0.00)	unless otherwise specified	unless otherwise specified	62H56A4X
65 (1651.0)	120	500	39 (6.0)	0.00 (0.00)			62H65A3X
0.094-inch Diameter Round (with ±5 percent wattage tolerance)							
30 (762.0)	230	125	17 (2.6)	5.00 (127.00)	36" (914.4 mm)	Lead protection not available	94PC30A1X
30 (762.0)	230	250	34 (5.3)	5.00 (127.00)	swaged-in Teflon® leads only		94PC30A2X
0.125 inch Diameter Round (with ±10 percent wattage tolerance)							
18 (457.2)	240	250	35 (5.4)	1.50 (38.10)	14" (355.6 mm)	12" (304.8 mm)	125CH18A4X
19 (482.6)	120	165	21 (3.3)	1.50 (38.10)	Fiberglass	SS hose	125CH19A1X
24 (609.6)	120	275	29 (4.5)	1.50 (38.10)	unless otherwise specified	unless otherwise specified	125CH24A1X
24 (609.6)	240	275	29 (4.5)	1.50 (38.10)			125CH24A14X
38 (965.2)	240	325	21 (3.3)	1.50 (38.10)			125CH38A1X
38 (965.2)	120	175	12 (1.9)	1.50 (38.10)			125CH38A2X
47 (1193.8)	240	260	14 (2.2)	1.50 (38.10)			125CH47A1X
47 (1193.8)	120	235	12 (1.9)	1.50 (38.10)			125CH47A2X
47 (1193.8)	120	375	20 (3.1)	1.50 (38.10)			125CH47A3X
47 (1193.8)	240	345	19 (2.9)	1.50 (38.10)			125CH47A4X
65 (1651.0)	240	420	16 (2.5)	1.50 (38.10)			125CH65A1X
65 (1651.0)	240	675	27 (4.2)	1.50 (38.10)			125CH65A2X
95 (2413.0)	240	1000	28 (4.3)	0.00 (0.00)			125CH93A1X

CONTINUED

Cable Heaters

F.O.B.: St. Louis, Missouri

Versatile, Standard Cable Heaters

Cable Heater Stock Units (Internal Thermocouple Not Available)

Straight Cable Length in (mm)	Volts	Watts	Watt Density W/in ² W/cm ²	No-Heat Length in (mm)	Lead Wire	Lead Protection	Code Number
----------------------------------	-------	-------	---	---------------------------	-----------	-----------------	-------------

0.125 inch Diameter Round (with ±10 percent wattage tolerance)

126 (3200.4)	240	1500	30 (4.7)	0.00 (0.00)	48" (1219 mm)	Lead protection is available upon request	125H126A4A
150 (3810.0)	240	2000	34 (5.3)	0.00 (0.00)	swaged-in		125H150A3A
223 (5664.2)	240	3000	34 (5.3)	0.00 (0.00)	Fiberglass leads only		125H223A1A

0.128 inch Square Cross-Section (with ±10 percent wattage tolerance)

12 (304.8)	120	200	36 5.6	1.50 (38.10)	14" (355.6 mm)	12" (304.8 mm) SS hose unless otherwise specified	125PS12A24A
12 (304.8)	240	200	36 5.6	1.50 (38.10)	Fiberglass		125PS12A23A
20 (508.0)	120	300	31 4.8	1.50 (38.10)	unless otherwise specified	unless otherwise specified	125PS20A37A
20 (508.0)	240	300	31 4.8	1.50 (38.10)			125PS20A38A
30 (762.0)	120	450	30 4.7	1.50 (38.10)			125PS30A47A
30 (762.0)	240	450	30 4.7	1.50 (38.10)			125PS30A48A
38 (965.2)	240	600	31 4.8	1.50 (38.10)			125PS38A23A

Cable Heater Stock Units (Type J Internal Thermocouple)

Straight Cable Length in (mm)	Volts	Watts	Watt Density W/in ² (W/cm ²)	No-Heat Length in (mm)	Lead Wire	Lead Protection	Code Number
----------------------------------	-------	-------	--	---------------------------	-----------	-----------------	-------------

0.125-inch Diameter Round (with ±10 percent wattage tolerance), Thermocouple located in center of heated section.

24 (609.6)	120	275	29 (4.5)	1.50 (38.10)	48" (1219 mm)	Lead protection is available upon request	125CH24A13X
38 (965.2)	120	175	12 (1.9)	1.50 (38.10)	swaged-in		125CH38A18X
47 (1193.8)	120	235	13 (2.0)	1.50 (38.10)	Fiberglass		125CH47A21X
65 (1651.0)	240	675	26 (4.0)	1.50 (38.10)	leads only		125CH65A26X

NEW OFFERING

0.157-inch Diameter Round (with ±10 percent wattage tolerance), Thermocouple located at the disk end of the cable.

124 (3149.6)	240	1500	25 (3.9)	0.00 (0.00)	48" (1219 mm)	Lead protection is available upon request	157CH124AX
150 (3810.0)	240	2000	27 (4.2)	0.00 (0.00)	swaged-in		157CH150AX
220 (5588.0)	240	3000	28 (4.3)	0.00 (0.00)	Fiberglass leads only		157CH220AX

0.128 inch Square Cross-Section (with ±10 percent wattage tolerance), Thermocouple located in center of heated section.

12 (304.8)	240	200	36 (5.6)	1.50 (38.10)	48" (1219 mm)	Lead protection is available upon request	125PS12A22A
20 (508.0)	120	300	31 (4.8)	1.50 (38.10)	swaged-in		125PS20A35A
20 (508.0)	240	300	31 (4.8)	1.50 (38.10)	Fiberglass		125PS20A36A
30 (762.0)	240	450	30 (4.7)	1.50 (38.10)	leads only		125PS30A46A
38 (965.2)	240	600	31 (4.8)	1.50 (38.10)			125PS38A24A

Cable Heaters

Coiled Nozzle

The Watlow coiled nozzle heater features a five-inch long no-heat tail section. This design advantage eliminates failures in the adaptor area due to overheating.

Performance Capabilities

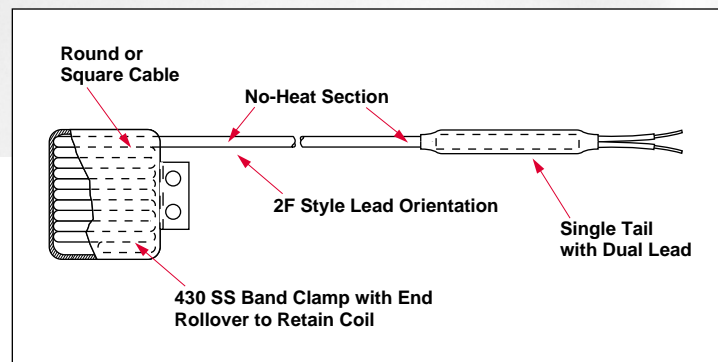
- ± 5 percent wattage tolerance
- Possible operating temperature to 1200°F (650°C). Dependant on type of element wire used.

Features and Benefits

- **Low profile construction** provides easy installation in the tight environment of multiple-gate molds.
- **The no-heat tail section** reduces temperature at the adaptor, eliminating failures due to overheating.
- **The single tail with dual lead** feature occupies less space in the wire raceway.
- **Heat is conducted from the entire 360 degree circumference** for even heating.
- **Optional externally welded thermocouples to the sheath** provide temperature measurement capabilities.
- **Stocked sizes** are available for same day shipment.

Applications

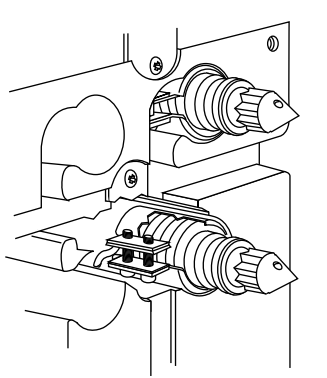
- Plastic injection molding equipment
- Hot runner molds



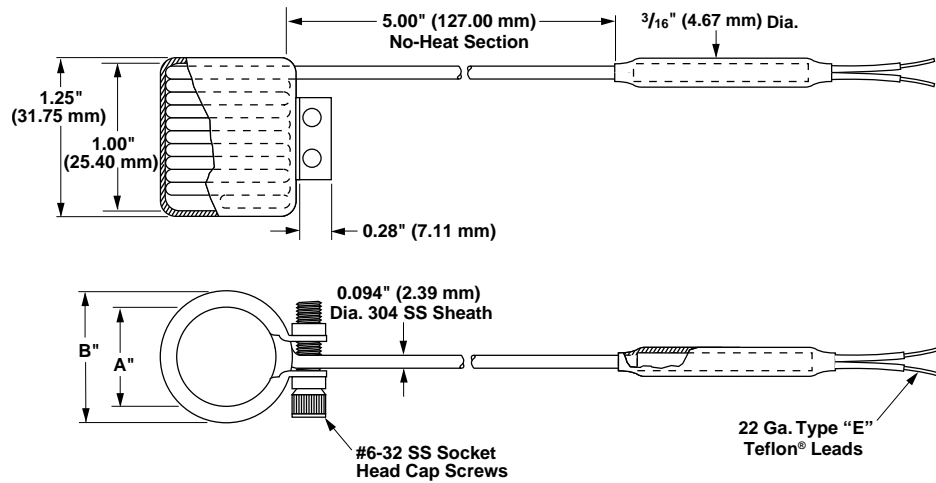
Cable Heaters

Coiled Nozzle

Technical Data



Coiled nozzle heaters mounted on a 64 cavity plastic injection mold.



How to Order

To order your stock coiled nozzle heater, specify:

- Watlow code number
- Voltage

- Wattage
- Quantity

Availability

Stock: Same day shipment

Cable Heater Stock Units (Coiled Nozzle with Clamp Strap)

Volts	Watts	Coiled I.D. in (mm)	Clamp O.D. in (mm)	Clamp Width in (mm)	No-Heat	Lead Wire (Swaged-in) Teflon® Only	Code Number
0.094-inch Diameter Round (with ±5 percent wattage tolerance), no lead protection available.							
230	125	0.75 (19.05)	0.98 (24.89)	1.25 (31.75)	5" (127 mm)	36" (914.4 mm)	94PC30A1A
230	125	0.75 (19.05)	0.98 (24.89)	1.25 (31.75)	only	72" (1828.8 mm)	94PC30A1D
230	250	0.75 (19.05)	0.98 (24.89)	1.25 (31.75)		36" (914.4 mm)	94PC30A2A
230	250	0.75 (19.05)	0.98 (24.89)	1.25 (31.75)		72" (1828.8 mm)	94PC30A2D
230	250	0.75 (19.05)	0.98 (24.89)	1.25 (31.75)		36" (914.4 mm)	94PC30A4A ①

0.102-inch Square Cross-Section (with ±5 percent wattage tolerance), no lead protection available.

230	125	0.75 (19.05)	1.00 (25.40)	1.25 (31.75)	5" (127 mm)	36" (914.4 mm)	102PS28A2B
230	125	0.75 (19.05)	1.00 (25.40)	1.25 (31.75)	only	72" (1828.8 mm)	102PS28A2A
230	250	0.75 (19.05)	1.00 (25.40)	1.25 (31.75)		36" (914.4 mm)	102PS28A1B
230	250	0.75 (19.05)	1.00 (25.40)	1.25 (31.75)		72" (1828.8 mm)	102PS28A4A ①
230	250	0.875 (22.23)	1.12 (28.45)	1.25 (31.75)		36" (914.4 mm)	102PS32A1A

① Units have a 36 inch fiberglass insulated Type J thermocouple externally spot welded to the heater O.D. sheath.

Quick Ship• Same day shipment
on all stock units.

Cable Heaters

Mini-Cable Nozzle

The 0.058-inch mini-cable nozzle heater provides “worry-free” heat for hot runner systems. The heater features a no-heat tail section, and the adaptor has a moisture resistant, hermetic seal to virtually eliminate failures due to moisture contamination and overheating in the seal area. An axial access clamp provides easy installation.

Performance Capabilities

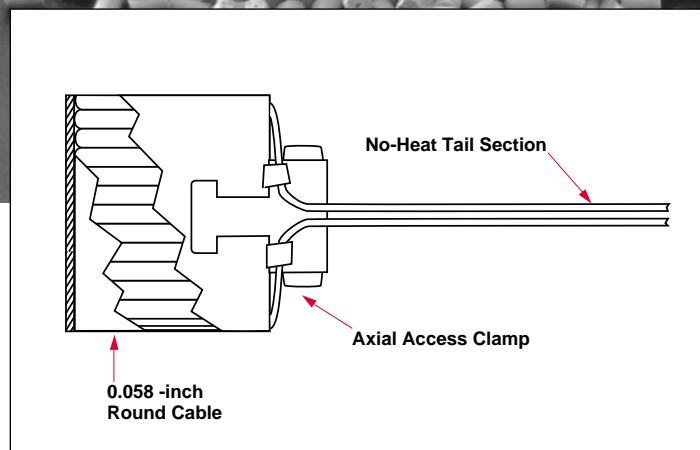
- ± 5 percent wattage tolerance
- Watt densities to 40 W/in²
- Possible sheath temperatures up to 1200°F (650°C) continuously and 1500°F (815°C) intermittent. Dependant on type of element wire used.

Features and Benefits

- **Five-inch no-heat tail section** prevents overheating failure in transition area.
- **Hermetic seal** prevents moisture in adaptor area.
- **304 stainless steel axial access clamp** provides easy installation.
- **Heat is conducted from the entire 360 degree circumference** for even heating.
- **Optional externally welded thermocouples** provide temperature measurement capabilities.
- **72-inch Teflon® lead wire.**

Applications

- Hot runner molds
- Semiconductor fabrication
- Medical instruments
- Packaging
- Environmental
- Small cast-in heaters
- Plastic injection molding



Cable Heaters

F.O.B.: St. Louis, Missouri

Mini-Cable Nozzle

0.058 inch Diameter Round Mini-Cable Nozzle Heater

(with ± 5 percent wattage tolerance)

Coil I.D.		Watts	Volts	Lead Length		Clamp Width		Cable Type	Code No.
in	(mm)			in	(mm)	in	(mm)		
0.75	(19.05)	268	240	72	(1828.8)	1.250	(31.75)	Round	Z5969
0.75	(22.20)	149	240	72	(1828.8)	1.250	(31.75)	Round	Z5968

Note: An optional Type J or Type K thermocouple can be externally spotwelded to the sheath O.D.

How to Order

To order your stock coiled nozzle heater, specify:

- Watlow code number
- Voltage
- Wattage
- Quantity

Availability

Stock: Same day shipment

Quick Ship

• One to three day shipment.

Cable Heaters

STARFLOW Circulation Heater

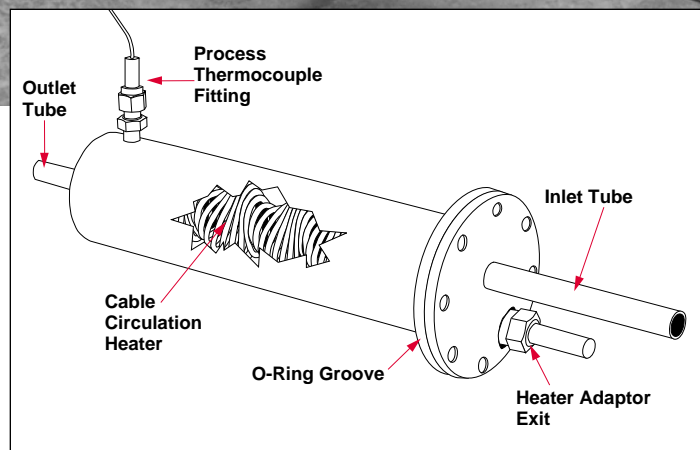
Throughout many steps in the semiconductor manufacturing process, Watlow cable circulation heaters help to improve process time and operating efficiency. Using clean, hot gases reduces wafer drying time. Flameless dry heat efficiently solders and desolders electronic circuits and boards. Heated gas streams quickly dry and cure circuit boards without using a large baking oven, saving precious floor space. Watlow's STARFLOW circulation heater is specifically designed to meet the requirements of these applications.

The STARFLOW circulation heater is engineered to heat a flowing gas stream up to temperatures of 1400°F (760°C). The 316L stainless steel chamber houses a small diameter sheathed element, which allows for quick response to both heat up and cool down cycles. Watlow's starwound coiled cable heater provides extremely efficient and reliable heating by maximizing the contact area of the gas or fluid with the element.

Because the element is sheathed, the unit can operate in gas streams that require a clean environment as well as atmospheres that contain contaminants and moisture. This provides superior performance compared to units with internally exposed or open element wires.

Features and Benefits

- **Small diameter heater** allows for quick response times.
- **Internal star wound heater element** provides fast, efficient heating.
- **Sheathed element** can run in clean or impure streams.
- **Flexibility in configurations** allows for adaptability to any process.
- **316L stainless steel construction** is rugged and corrosion resistant.



- **Electropolishing available on all wetted surfaces** to reduce particulate contamination.
- **Thermocouple Type J or K options** provide precise control and high limit safety.
- **Replaceable thermocouple and heating element** reduces replacement costs.
- **Shipment from stock** reduces downtime.

Applications

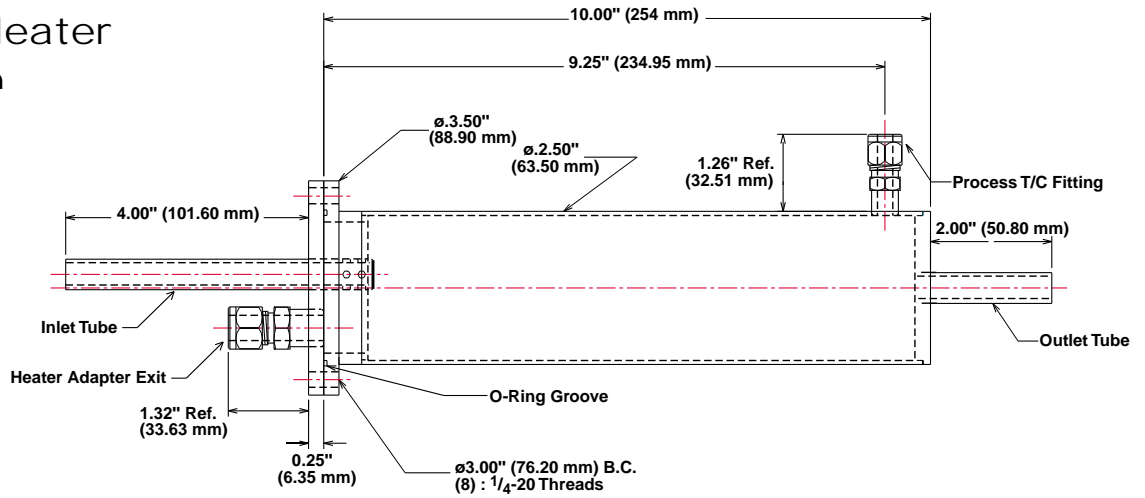
- Semiconductor processing
- Curing and drying
- Electronics
- Heat shrinking
- Thermal forming/sealing

Cable Heaters

F.O.B.: St. Louis, Missouri

STARFLOW Circulation Heater

Ordering Information



1 2 3 4 5 6 7 8 9 10 11 12 13 14
C H

3-4. Type of Inlet

ET = 1/4" (6.35 mm) O.D. tube

JT = 1/2" (12.7 mm) O.D. tube

5-6. Type of Outlet

ET = 1/4" (6.35 mm) O.D. tube

JT = 1/2" (12.7 mm) O.D. tube

7-10. Heater Wattage

0375 = 120V 375W

0500 = 120V 500W

0750 = 120V 750W

1500 = 240V 1500W

2000 = 240V 2000W

3000 = 240V 3000W

11. Internal Thermocouple Calibration (Heater)

J = Type J

K = Type K

12. Surface Finish of Assembly and Heater

X = Unfinished

E = Electropolished

13. Process Thermocouple Calibration (Assembly)

J = Type J

K = Type K

14. O-Ring Material

A = Viton® (500°F/260°C)

F = Aflas® (446°F/230°C)

T = Teflon® encapsulated Viton® (392°F/200°C)

Availability

Consult a Watlow sales engineer or the St. Louis facility for availability of custom manufactured products.

Aflas® is a registered trademark of the Asahi Glass Co., Ltd.

Viton® and Teflon® are registered trademarks of E.I. du Pont de Nemours & Company.

Quick Ship

• Same day shipment on all stock units.

Cable Heaters

K-RING®

Watlow's K-RING® heater takes nozzle heater technology a step ahead of the competition. Thanks to its innovative design, plastic molders no longer have to compromise with sloppy fit tolerances, uneven temperature profiles or short heater life.

Featuring a machined brass casting construction, the K-RING heater can handle very high temperatures while providing maximum heat transfer.

With a precision machined inside diameter, the K-RING heater fits perfectly—and it doesn't even require clamping bands. Precision fit, along with the excellent thermal conductivity of brass, allow the K-RING to give you an extremely even temperature profile.

Performance Capabilities

- Operating temperature to 1200°F (650°C)
- Maximum watt density on inside diameter to 260 W/in² (40 W/cm²).
- Maximum voltage to 240V~(ac)

Features and Benefits

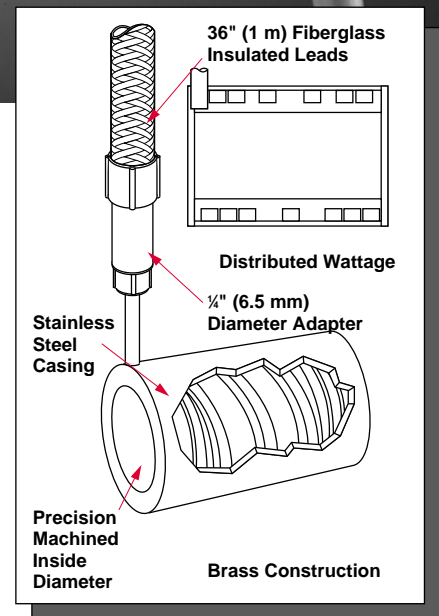
- **Brass casting construction** protects the heater from damage, as well as maximizes transfer of heat to heated parts.
- **Precision machining** of length and inside diameter gives precision fit tolerances.
- **Sealed construction** of the heater body eliminates contamination. The adaptor also effectively seals the lead exit.
- **Stainless steel outer casing** protects the brass heater body, and as an option, can be polished to increase heater efficiency.
- **Distributed wattage** allows heat to be precisely placed for an even temperature profile.
- **Customized diameters**, with quick delivery, are available to meet specific application needs.



Applications

- Sprue bushings in plastic molding equipment
- Plastic injection nozzles
- Process heating of liquids and gasses in processing lines
- Hot melt equipment
- Laboratory and analytical equipment

Electrical Tolerances

Resistance: ±10 percent**Wattage:** ±10 percent

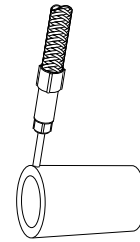
Cable Heaters

K-RING

Termination Options

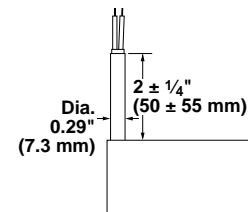
Protection Against Abrasion

Crimped-on fiberglass braid or stainless steel braid offers lead wire protection against abrasion or sharp equipment. To order, specify **fiberglass braid** or **stainless steel braid** and lead length.



Heavy Duty Strain Relief

A heavy duty stainless steel tube is added to the cable transition of the K-RING, providing strain relief to the lead exit. This is supplied as a standard feature.



Sensors

Thermocouple Types

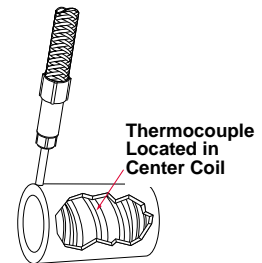
ASTM Code	Conductor Characteristics		Temperature Range °C (°F)
	Positive	Negative	
J	Iron (Magnetic)	Constantan (Non-Magnetic)	-20 to 760 (0 to 1400)
K	Chromel® (Non-Magnetic)	Alumel® (Magnetic)	-20 to 1260 (0 to 2300)

Internal Thermocouple

Internally grounded **Type J** or **Type K** thermocouples, offer accurate sensing of internal heater temperatures. Thermocouple wires attach directly to a Watlow controller, which must be purchased separately.

Thermocouples are supplied with 1 m (36 inches) fiberglass insulated leads. Upon request, longer lead lengths are available.

To order, specify **internal thermocouple, Type J** or **K**, and lead length.



K-RING Stock Nozzle Heater

I.D.		Nominal O.D.		Length		Watts	Volts	Code Number
inches	(mm)	inches	(mm)	inches	(mm)			
½	13	1	25	1	25	175	240	BKR1302501A
½	13	1	25	2	51	300	240	BKR1305101A
¾	16	1½	28	2	51	300	240	BKR1605102A
¾	16	1½	28	3	76	500	240	BKR1607602A
¾	16	1½	28	4	102	750	240	BKR1610202A
¾	20	1½	32	1	25	250	240	BKR1902501A
¾	20	1½	32	2	51	350	240	BKR1905101A
¾	22	1¾	34	2	51	500	240	BKR2205102A
¾	22	1¾	34	3	76	750	240	BKR2207601A
¾	22	1¾	34	4	102	1000	240	BKR2210201A

Inner diameter tolerance to ±0.001 in (0.025 mm).

Length tolerance ±0.02 in (0 to 100 mm ±0.5 mm); over ±0.04 in (100 mm ±1.0 mm).

Note: Custom metric manufactured K-RING heaters, F.O.B. Germany.

F.O.B.: Batavia, Illinois

How to Order

To order stock K-RING heater, specify:

- Required inside diameter
- Maximum allowable outside diameter

- Maximum allowable length of the K-RING
- Volts/watts
- Lead length, protection and thermocouple type if other than standard

- Any of the options required

Availability

Stock: Same day shipment

Made-to-Order: Consult Watlow

Alumel® and Chromel® are registered trademarks of Hosking Manufacturing Co.

Cable Heaters

Metric Mini K-RING®

Watlow's mini K-RING® heater is ideal for applications where space is limited such as hot runner molds with multiple cavities. The heating element fits easily into the small area and heats with precision and efficiency.

The mini K-RING heater features highly flexible unheated ends which give the customer the ability to form leads to the wire channel. The unit also contains small lead adapters which take up less space in the machine.

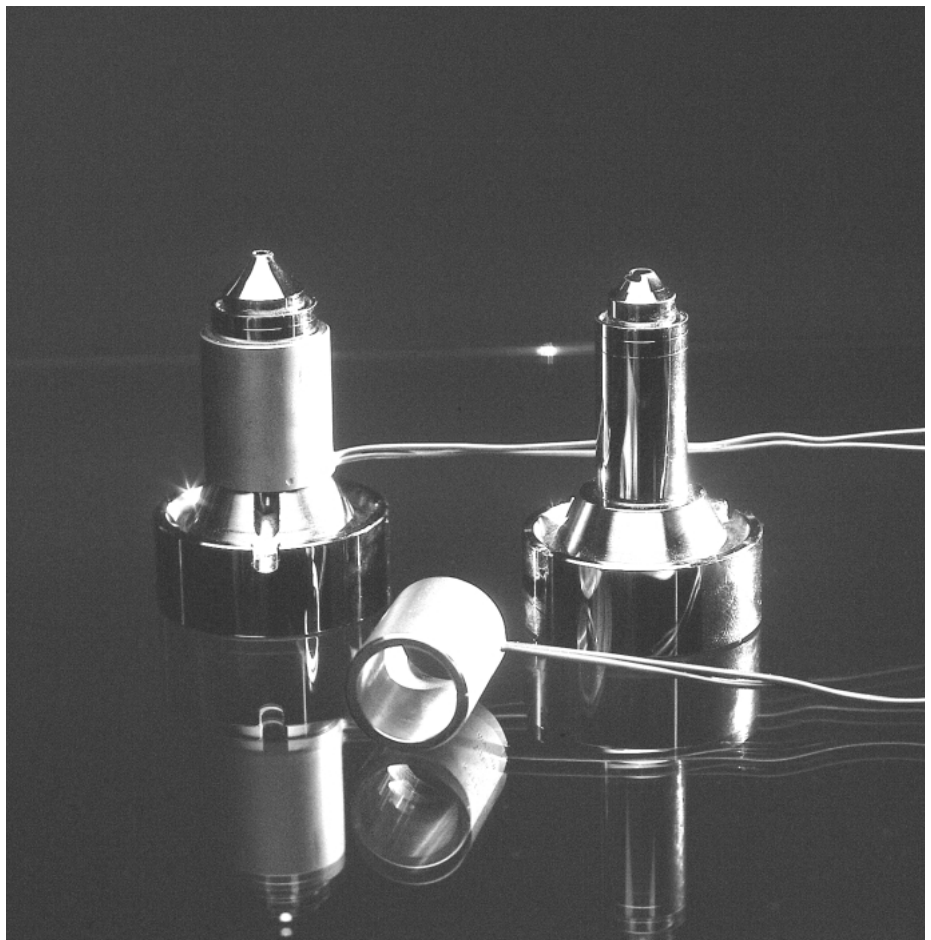
With a precision machined inside diameter, the mini K-RING heater fits perfectly—and it doesn't require clamping bands. Precision fit, along with the excellent thermal conductivity of brass, allow the K-RING to give you an extremely even temperature profile.

Performance Capabilities

- Operating temperature to 650°C (1200°F)
- Maximum watt density on inside diameter to 50 W/cm² (320 W/in²)
- Maximum voltage to 240V~(ac)

Features and Benefits

- **Brass casting construction** protects heater from damage, as well as maximizes transfer of heat to heated parts.
- **Precision machining** of length and inside diameter gives precision fit tolerances.
- **Sealed construction** of the K-RING eliminates contamination.



- **Stainless steel outer casing** protects the brass heater body, and acts as an insulator.
- **Distributed wattage** allows heat to be precisely placed for an even temperature profile.
- **Customized diameters** are available to meet specific application needs.

Applications

- Sprue bushings in plastic molding equipment
- Plastic injection nozzles
- Process heating of liquids and gasses in processing lines
- Hot melt equipment
- Laboratory and analytical equipment

Metric Mini K-RING

Technical Data

K-RING and Mini K-RING Comparison Chart

Characteristic	K-RING	Mini K-RING
Maximum voltage	240 volts	240 volts
Maximum amperage	4.5 amps	2.0 amps
Minimum outer diameter	18 mm (0.70")	10 mm (0.39")
Minimum wall thickness	4 mm (0.16")	2.5 mm (0.10")
Maximum element length	I.D. up to 12 mm (0.47") Length = 100 mm (4") I.D. 12 to 20 mm (0.47 - 0.80") Length = 200 mm (8") I.D. > 20 mm (0.80") Length = 300 mm (12")	I.D. up to 10 mm (0.39") Length = 60 mm (2.40") I.D. > 10 mm (0.39") Length = 100 mm (4")
Thermocouple	Internal Type J or K	External possible
Lead - T/C insulation	Fiberglass Teflon®	Fiberglass Teflon®
Lead protection	Fiberbraid Stainless steel braid Stainless steel hose	None
Lead adapter	Standard swaged 6.5 mm (¼") diameter	Hermetic seal 3 mm (0.12") diameter
Lead exit	Single ended	Dual ended
Lead exit length	Standard = 25 mm (1") to adapter longer possible upon request	Standard = 100/150 mm (4/6") staggered longer or shorter possible upon request
Reinforced lead exit	Yes - Diameter 7.4 mm (0.29") minimum 50 mm (2") long	No
Wattage tolerance	±10%	±10%

How to Order

To order your mini K-RING heater, specify:

- I.D.
- Maximum possible O.D.
- Length
- Voltage
- Wattage
- No-heat at lead end
- Lead exit
- Lead length
- Wattage distribution